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Characteristics of Workers with Painful Acute and Chronic Low Back Pain in an Urban Occupational Medical Center

by

Mary E. Koestler

DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Nursing

in the

GRADUATE DIVISION

of the

UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

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by

Mary E. Koestler

Dedicated to the loving memory of my parents

Eleanor McCoy McKee and Glenn W. McKee

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Characteristics of Workers with Painful Acute and Chronic Low Back Pain in an Urban Occupational Medical Center

Mary E. Koestler

Background: In the workplace, low back problems account for nearly a third of both occupational complaints and workers' compensation (WC) claims. Most low back pain (LBP) resolves within weeks or months. A small percentage becomes chronic or recurrent. This small group accounts for the largest percentage of costs in both personal and economic terms. Due to methodological variations in the literature, no firm conclusions regarding the natural history of work-related LBP can be reached. Objectives: To describe acute LBP in workers after recent injury (< 2 weeks) and determine the proportion that persist 3 months or greater. A second objective is to examine the relationship of predictor variables-gender, age, and history of previous LBP-and the outcome variable-development of chronic occupational low back disability. Design: The descriptive correlational study incorporates secondary data and a mailed questionnaire. Methodology: A database query identified 270 workers with LBP-related medical diagnosis codes (ICD-9) at an occupational medical clinic. A mailed questionnaire assessed post-injury symptoms, work status, and job satisfaction. Measures administered were the Oswestry Low Back Disability Index, Roland-Morris Disability Questionnaire, SF-12, and the Stanford Presenteeism Scale. Results: There were 38 workers with acute LBP in the sample; 65.8% attributed LBP to recent overexertion on the job. Twenty-three (60.5%) developed CLBP and fifteen (39.5%) had acute LBP that resolved within 3 months (binomial test, $P = .10$ ($Z = 10.04$, $p < .0005$). Predictors associated with CLBP were pain level, SF-12 Physical, Oswestry, Roland-Morris,

previous LBP, radiating LBP, and perception of supervisor review of workers' rights. Conclusions: A high proportion of workers with acute LBP developed CLBP (60.5%). Fifteen (39.5%) had acute LBP that resolved within 3 months (median 38.0 days; QD 19.0). These finding suggest that acute OLBP, even when evaluated and treated early after report of injury, persists in many injured workers. This knowledge could support future prospective study of acute OLBP and early disability risk factors that predict CLBP disability.

William L. Holzemer, Chair

Mary E. Koestler

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CHAPTER 1

THE STUDY PROBLEM

Introduction

Low back pain (LBP) has been identified as a highly prevalent and costly condition that is rarely thought of as serious but yet is a major cause of pain, disability, and social costs (Atlas & Nardin, 2003). It is estimated that up to twenty-five percent of the population has low back pain in any given year and up to 80-90% experience it during their lifetime (Frymoyer, 1997; Wipf & Deyo, 1995; Andersson, 1997; Leboeuf-Yde & Lauristesen, 1995; Cunningham & Kelsey, 1984; Kelsey & White, 1980). Costs associated with LBP include those directly related to healthcare, and indirect social costs of lost work time and disability payments, as well as nonquantifiable human costs related to distressing symptoms of chronic pain, diminished productivity, decreased quality of life, and lowered perceptions of self-worth (Schomaker & Ashburn, 2002).

Although the prognosis for acute LBP usually is excellent, no firm conclusions regarding the natural history of LBP can be reached due to a lack of clear definitions and methodological variations of studies in the literature (Hansson & Hansson, 2000). There is questionable evidence supporting the claim that 80-90% of LBP patients become pain-free in one month (Hestbaek et al., 2003; Wahlgren et al., 1997). For example, Thomas et al. (1999) found that a substantial proportion (30%) of patients who presented to primary care in Britain with LBP will have persistent symptoms over the 12 months after consultation.

Of particular concern are those patients with acute LBP, about 5-10%, who do not get better and may go on to experience chronic and recurrent low back pain disability

(van Tulder et al., 1998; Ehrlich, 2003; Klenerman et al., 1995; Borenstein, 1996)l It is this small percentage of patients with chronic LBP, who manifest continuous or recurrent symptoms for greater than three to six months that account for the largest percentage of costs in both personal and economic terms (Spengler et al., 1986; Linton et al., 1998; Shekelle et al., 1995; Hashemi et al., 1998; Watson et al., 1998).

In the workplace, low back pain problems account for about 30% of occupational complaints and workers' compensation claims reported to the Bureau of Labor statistics and they are disproportionately expensive, accounting for 30-40% of costs. Low back pain claims are the most costly workers' compensation claim ailment with an average of $8,000 per claim (Webster & Snook, 1994). In addition, LBP is the most commonly cited reason for disability and missed days of work in many countries (Hannson & Hannson, 2000). Risk factors for first time LBP sufferers in a prospective study of 403 healthcare workers over a three-year period found that 85% had some back pain with 22% experiencing serious back pain (Adams, 1999).

Statement of the Problem

The natural history of the condition in the general population is difficult to assess because few with acute LBP seek medical care and therefore are not available for study; others that do seek care may have varied interventions to relieve the condition, thus confounding the course of the LBP. Few studies have identified and described characteristics of work-related LBP conditions in an outpatient occupational medical center *before* an initial WC claim and linked to characteristics of physical (abatement of LBP or chronic LBP) and employment status 3 months or more later. It is not known if LBP that is evaluated and treated early by occupational medicine providers resolves,

reoccurs, or leads to a workers' compensation claim. In order to improve the understanding of occupational low back disability, it is necessary to study characteristics of workers with acute painful low back conditions evaluated and treated in an occupational medical setting *early* after report. This understanding will assist with the identification of risk factors for persistent LBP and disability.

Aim of the Study

The present study incorporates a framework in which to examine acute occupational LBP, often before Workers' Compensation claim, and link the injury to compensation, employment, and physical status 3 months or more following date of injury report. The purpose of the study is to investigate characteristics of workers with acute low back pain evaluated and treated in an urban occupational medical clinic early after report and describe predictors associated with the development of chronic low back pain disability. Additionally, the study proposes the examination of healthcare resource utilization following acute injury and perceptions of work environment satisfaction that may be associated with the development of chronic low back pain disability.

CHAPTER II

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

In this chapter a review of relevant literature related to acute and chronic low back pain and the conceptual framework which guided the study are presented.

Review of Relevant Literature

There is a large body of research that substantiates that chronic low back pain (CLBP) is a complex medical condition that includes both physical and psychosocial factors as summarized by Schomaker & Ashburn (2002); Schofferman (2002); & Andersson (1999). However, there is a lack of consensus on the definition of CLBP, predictors, treatment modalities, and the effectiveness of treatments.

Most healthy people experience acute low back pain as a self-limiting condition that can be related to over-activity with symptoms that resolve within a few weeks or months. Approximately 5% seek medical advice for their acute LBP symptoms (Roland & Morris, 1983). Even some workers with occupational acute low back injuries severe enough to file workers' compensation claims with full health-care coverage do not seek care during the first 4-16 weeks after onset (Cote et al., 2005). While painful; acute LBP is usually temporary, with a high recovery rate; 60-70% improve within 6-8 weeks and 80-90% by 12 weeks, regardless of the treatment (Andersson, 1999; Spitzer et al., 1987; Webster & Snook, 1994; van Doorn, 1995; Hansson & Hansson, 2000; & McConnell, 2002).

However, recently some investigators argue that due to a lack of clear definitions and methodological variations of studies in the literature, no firm conclusions regarding the natural history of LBP can be reached and that there is questionable evidence supporting the claim that 80-90% of LBP patients become pain-free in one month (Hestbaek et al., 2003; & Wahlgren et al., 1997).

Occupational low back pain differs from non-occupational low back pain in that a sudden onset is usually reported; often related to a specific incident and disability outcomes are less favorable despite earlier evaluation and treatment (Shaw et al., 2005).

Of particular concern are those patients with acute LBP, about 5-10%, who do not get better and may go on to experience chronic and recurrent low back pain (van Tulder et al., 1998; Ehrlich, 2003; Klenerman et al., 1995; & Borenstein, 1996). It is this small percentage of patients with chronic LBP, who manifest continuous or recurrent symptoms for greater than three to six months that account for the largest percentage of costs in both personal and economic terms (Spengler et al., 1986; Linton et al., 1998; Shekelle et al., 1995; Hashemi et al., 1998; & Watson et al., 1998).

In the workplace, low back problems account for about 30% of both occupational complaints and workers' compensation claims reported to the Bureau of Labor statistics and they are disproportionately expensive, accounting for 30-40% of costs. Low back pain claims are the most costly workers' compensation claim ailment with an average of $8,000 per claim (Webster & Snook, 1994). In a large retrospective analysis (N=16,567) of comorbidities, healthcare use, and cost for patients identified with LBP, stratified by number of LBP episodes, it was estimated that in 2005 dollars, over $70 million dollars was spent over a five year period (Ritzwoller et al., 2006). In addition, LBP is the most commonly cited reason for disability and missed days of work in many countries (Hannson & Hannson, 2000). The costs of LBP are estimated over 50 to 100 billion dollars annually in the United States, with chronic low back conditions accounting for 75-90% of that total (Nachemson, 1992). A small percentage of patients with chronic low back pain accounts for a large fraction of the costs (Maetzel, 2002). Ten percent of work-

related low back claims follow a course longer than 3 months and account for 90% of total costs attributed to occupational low back pain (Shaw et al., 2005; Hashemi et al., 1997).

This chapter will review, critique, and synthesize the current knowledge of chronic low back pain in the adult population particularly related to orthopedic spinal disorders and present the conceptual framework conceived from the literature. Part I presents two topics related to CLBP: Prevalence and definitions associated with LBP (Acute, sub-acute, chronic, recurrent, and nonspecific). Part II reviews theoretical frameworks that apply to CLBP. Part III presents measurement tools used in the research of CLBP and Part IV presents various biopsychosocial predictors of chronic low back pain. Part V discusses treatments related to CLBP and Part VI summarizes results of CLBP research and will make suggestions for additional research in CLBP.

Part I Prevalence and Definitions of Low Back Pain

Prevalence rates for CLBP are often presented within the context of the prevalence of low back pain in general. Most studies report the high frequency of LBP complaints in the United States and annual prevalence in the 15-20% range (Andersson, 1997). Multi-national societies report similar proportions in all cultures that interfere with quality of life, and work performance (Ehrlich, 2003; & Hansson, & Hansson, 2000). For instance, a community-based study evaluated annual incident episodes of LBP among a general population in Israel and found 18.4% reported new episodes of back pain during 1 year (Jacob, 2006).

Low back pain is one of the most prevalent work-related conditions affecting employed populations in developed countries, such as the United States and Canada, and

may be even more common in less developed nations. For example, a recent cross-sectional study of self-reported LBP among garment workers, teachers, and kiln workers in the People's Republic of China, the world's largest single-nation labor force, suggests a high annual prevalence rate. Chinese workers in fixed, sedentary postures, such as those in the garment industry, reported an annual prevalence of LBP of 50% compared with 30% among other self-employed study populations surveyed (Jin et al., 2004). Similarly, the World Health Organization Community Oriented Program for Control of Rheumatic Disease (WHO-COPCORD) epidemiological investigations have established LBP prevalence even in countries that were unaware of the problem in their population, and factors involving type of work performed (Ehrlich, 2003). The prevalence and lifetime incidence of LBP in WHO-COPCORD cross-sectional studies ranged from 48.8 to 67%. In the orthopedic spine literature Andersson (1997 & 1999) summarizes that low back pain of at least moderate intensity and duration has an annual incidence in the adult population of 10-15%, a point prevalence of 15-30%, and that LBP rates rise with increasing age up to 65 years, after which it drops off for unknown reasons.

LBP is the fifth most common reason for all physician visits, and is the second most common symptom; upper respiratory symptoms are first, which elicit visits to primary care physicians (Hart et al., 1995). Many healthcare providers in various disciplines care for patients with low back pain, including chronic low back pain. Although the literature indicated that chronic pain consists of only 10% of all LBP in the USA and is reported to account for only 1-5% of all LBP in Britain, a major problem in identifying the prevalence of LBP and its burden has been a dearth of agreed upon definitions and

outcome measures by which to judge the various conditions and responses to interventions (Ehrlich, 2003).

Adams et al. (1999) investigated risk factors for first time LBP sufferers in a prospective study of 403 health-care workers over a three-year period and found that 85% had some back pain with 22% experiencing serious back pain. This evidence supports the high prevalence rates of LBP and is consistent with previous studies (Waddell, 1987; & Frymoyer & Cats-Baril, 1991). However, the literature in the area of LBP prevalence is confusing due to considerable variations in the definitions and classifications of low back pain.

Definitions associated with CLBP

Anatomical definition - Low-back pain is commonly defined within an area bounded by the lowest palpable ribs, the posterior axillary line, and the gluteal folds (Roland & Morris, 1983). Anatomical definitions such as this provide the basis for clinical diagnoses codes (ICD-9) required for insurance claims and for epidemiological tracking of diseases and disorders. In spite of a 1996 U.S. Congressional mandate for ICD-9 codes to be of the highest specificity, low back disorders (724.2) are collectively coded under the outdated term "lumbago". This lack of specificity potentially influences the ability of epidemiological studies to discuss CLBP as a distinct condition and to approximate prevalence rates.

Acute and Recurrent Low Back Pain - Acute lower back pain is the recent onset of back pain in the lumbar region of the spine often associated with over-activity of the sympathetic nervous system. The condition usually lasts six weeks or less and if not caused by a serious condition, will resolve without medical attention. However,

recurrence after a first episode of LBP is common. Recurrence of LBP is so common that it is considered a part of the natural history of low back pain and is more common than previously thought (Coste et al., 1994; & Deyo & Phillips, 1996). In a study of 352 active hourly union employees who were diagnosed with a recent work-related low back injury and then followed over a 12-month period, 24.4% had an additional episode; an additional episode occurred in 2.3%. This supports the recurrent nature of LBP disorders. The precise etiology of acute LBP is rarely identified, although musculoligamentous processes are usually suspected. Contrary to the majority, Hestbaek and colleagues (2003) concluded that LBP does not resolve itself when ignored and thus, is not the self-limiting condition often reported.

The natural history of the condition is difficult to assess because few with acute LBP seek medical care and therefore are not available for study; others that do seek care may have varied interventions to relieve the condition, thus confounding the course of the LBP. For instance, a Norwegian study of prognostic factors in first-time care seekers due to acute low back pain recruited a cohort of 123 patients from general practitioners, chiropractors, physical therapists, and through local paper advertisement (Grotle et al., 2006).

Nonspecific Low Back Pain - Nonspecific low-back pain is defined as pain between the costal margins and the inferior gluteal folds that is accompanied by painful limitation of motion, is affected by physical activities and posture, and might be associated with referred pain (Deyo, 2002). Nonspecific low back pain means there is no evidence for radicular symptoms or underlying systemic disease (Atlas & Deyo, 2001) and can refer to either acute or chronic low back conditions. Diagnostic testing, such as radiographic

films, is not generally indicated for acute LBP; conservative care, time, reassurance, and education are emphasized. Bed rest is rarely recommended (Atlas & Deyo, 2001). It is estimated that up to 85% of patients with low back pain are not definitively diagnosed because of the low correlation between symptoms, physical examination findings, and imaging results (Atlas & Deyo, 2001).

Sub-Acute Low Back Pain - The literature presents several studies that define and classify the duration of time between acute low back pain and chronic low back pain as sub-acute low back pain. Sub-acute LBP is described as the intermediate stage toward CLBP usually less than 3 months duration (Ehrlich, 2003). Schultz et al. (2002) defined sub-acute LBP as 4-6 weeks after injury for their study of occupational low back disability. Karjalainen et al. (2003) investigated outcome determinants of sub-acute low back pain, which they defined as LBP of 4-12 week duration.

There seems to be no consensus of the definition of CLBP. Sub-acute back pain is described as pain present between six and 12 weeks after its onset and is less defined by symptoms than duration of time. This time frame of symptoms may fall into discussions of acute LBP symptoms or CLBP symptoms.

Chronic Low Back Pain - Chronic low back pain, as distinguished from acute pain and cancer-related pain, is often defined as pain that lasts longer than would be expected for healing of the original injury to take place or as pain associated with progressive, nonmalignant disease (Schomaker & Asburn, 2002). Schofferman (2002) describes chronic pain as 'not just acute pain that does not resolve; it is pain that persists well beyond its expected duration, although, formerly it was defined as any pain that lasted more than 6 months'. Approximately 1-10% of incident cases of acute LBP persists

beyond 2-3 months, and is labeled as chronic cases (Andersson, 1999). Six months after the initial onset of LBP, 10% remain unable to work due to the condition (Hansson & Hansson, 2000).

CLBP seems to be equally common in women and men, although spinal disorders are more common in women (Andersson, 1997). Chronic low back pain in the United States as reflected by the 1988 National Health Survey (1985-88) indicated back and spine impairments as the most frequently reported subcategory of musculoskeletal impairment (51.7%). CLBP is a significant cause of morbidity in older persons, including depression (Williamson & Schulz, 1992), functional disability and decreased quality of life (Grimby & Svanborg, 1997). Socially, there are family consequences of chronic low back pain due to its impact on the individual's ability to function in family and social roles (Strunin & Boden, 2004).

Recent research studies exist which attribute CLBP to predominantly psychosocial factors (Frymoyer and Cats-Baril, 1991; Zusman, 1998; Andersson, 1999; Kendall, 1999; Lundberg, 1999; & Hadjistavropoulos & La
LaChapelle, 2000). However, McConnell (2002) suggests otherwise and purports that because CLBP often does not respond to treatment aimed at the site of symptoms, the patient is blamed for treatment failures. Many investigators suggest that depression is related to chronic low back pain (Faucett, 1994; Magni et al., 1990; Fisbain et al., 1997; & Von Korff & Simon, 1996). In CLBP depression may precede or follow the onset of pain (Rush et al., 2000; & Andersson, 1999). When depression is present it influences the pain; conversely the depression may be affected by the level of pain (Rush et al., 2000).

It is also agreed that CLBP is a complex and multi-factorial condition with interacting physical, psychological, and social components. An abundance of literature builds evidence that CLBP has multiple dimensions and is a major concern for patients and clinicians in primary, tertiary, rehabilitative, physical, and psychological disciplines as well as socially and in the workplace. The literature identifies a need to explore prognostic factors of acute LBP that may be indicative of prolonged recovery and chronic low back disability. It is hypothesized that knowledge of such predictors could assist health care providers to identify and direct those patients at risk of disability to more intensive therapy and rehabilitation earlier; while minimizing interventions to those who are likely to recover spontaneously.

Part II Chronic Low Back Pain-Related Theories

Chronic low back pain is a condition with physical, psychological, cognitive, and social underpinnings. It is not defined as a disease or a syndrome but rather a condition that is experienced differently by the individual within the context of his/her environment. Currently there is not a specific biomarker or definitive diagnostic measure or physical examination to confirm its existence. Unlike acute low back pain, treatment guidelines are not available. Consequently, the theoretical framework in which CLBP is most often viewed is multidimensional— through the biopsychosocial approach (Engel, 1980). In addition to the biopsychosocial model, other theoretical frameworks have application and guide the research and contribute to the understanding of CLBP, such as the gate control pain theory, physical-biomechanical spinal pain mechanisms, cognitive-behavioral, coping-adaptation, and fear-avoidance models. A brief discussion of each follows:

Gate Control Theory

In 1965, Melzack & Wall introduced a theory of pain called the Gate Control System. Prior understanding of pain was guided by Descartes' theory that the body worked like a machine; albeit with a soul, and that injury activated specific pain receptors that projected pain impulses through a spinal pathway to the brain. The psychological experience of pain was linked and proportional only to the peripheral injury. During that time, chronic low back sufferers without physical evidence were deemed psychologically disturbed and sent to psychiatrists.

Contrary to the focus on peripheral causes, the Gate Control Theory recognizes the dynamic role of the brain and the modulation of inputs in the spinal dorsal horns. It proposes that a mechanism in the dorsal horns of the spinal cord acts like a gate that inhibits or facilitates the transmissions from body to brain based upon diameters of the active peripheral nerve fibers as well as the action of brain processes. The active role of the brain in filtering and selecting inputs helps explain why psychological factors, such as past experiences, attention and emotion influence pain response and perception by acting on the gate control system (Melzack & Wall, 1965).

However, Melzack (1991) suggests that the Gate Control Theory is not able to explain in totality severe chronic pain, like chronic low back pain or phantom limb pain, and that a new theoretical approach or evolution of the current theory is needed. While the majority of those who suffer CLBP have no physical signs, Melzack posits that it is possible that sudden minor injuries may produce stresses and strains on muscles in a localized part of the body that may in turn set up an abnormal central feedback from the brain. This understanding of pain accounts for changes that occur in the nervous system

after prolonged, noxious stimulus and suggests that long-term changes occur that alter the body's response to further peripheral stimulus. The Gate Control Theory allows for an understanding of various pathways and neural mechanisms that are part of the process of acute and chronic pain and not just the peripheral injury (Melzack, 1991). In CLBP conditions, the Gate Control Theory supports the evidence that rarely is a single organic cause, such as degenerated lumbar disc, enough to explain the patient's pain experience.

Theory of Physical and Mechanical Chronic Spinal Pain Mechanisms

The perception of pain is a complex interaction that involves sensory, emotional, and behavioral factors (Sidell & Cousins, 1997). Chronic refractory spinal pain is often divided into nociceptive and neuropathic pains. Nociceptive pain is caused by a structural disorder, such as a painful, degenerative disc, that stimulates small nerve endings (nociceptors). Neuropathic pain is caused by nerve damage or injury. A damaged nerve is the source of the pain even though the nerve is no longer being stimulated. The nerve is sensitized; pain may increase with only minimal stimulation.

The most common causes of pain in orthopedic spinal disorders are thought to be the result of degenerative disc disease, arthritis, facet-joint degeneration, protrusion or herniation of intervertebral discs, or disorders related to movement (biomechanical causes) or position such as scoliosis deformities, vertebral instability, or spondylolisthesis. However, in 85% of patients no organic cause can be established (Deyo et al., 2001). The pain is generally considered a result of mechanical causes and not related to an underlying condition such as infection, neoplasm, or fracture (Phillips et al., 2003).

Additionally, abnormal posture creates a strain on ligaments and muscles that indirectly affect the curvature of the lumbar spine and may contribute to chronic low back pain (Evcik & Yucel, 2003). Some LBP patients lack hip extension and external rotation in gait, which contributes to tight anterior hip structures, especially in adductor muscles. Many CLBP patients have associated stiffness of the thoracic spine, which results in compensatory changes in passive and active structures in the lumbar spine. This increased mobility of the lumbar spine is also called instability. It has been suggested that superficial lower back muscles may attempt to compensate for deep muscle function in trying to control the instability and whether or not the muscle control problem causes the chronic back pain or whether the back pain triggers a muscle control problem is not established (Hodges, 2000).

Dickey et al. (2002) investigated the relationship between pain and vertebral motion in a clinical biomechanical study of nine CLBP subjects. The study measured vertebral motion of the lumbar spine and associated pain as patients performed a battery of motions in all planes. The strong relationship between pain and segmental motion (R^2 =0.99) supports the mechanical back pain theory (Dickey, 2002). It is also suggested that alterations in the muscle control in CLBP may also be due to neuroplastic changes that have occurred in the nervous system (Coderre et al., 1992).

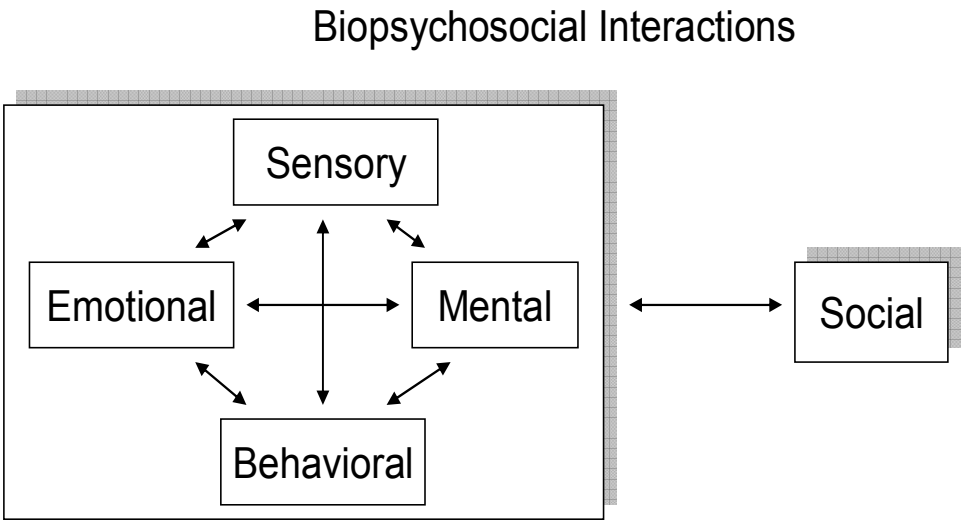
Biopsychosocial Model

The biopsychosocial theoretical approach refers to the conceptual model of the interaction between the physical, psychological and social factors in the experience of a disease or condition, such as chronic low back pain. It proposes the integration of factors when no single factor can provide a satisfactory explanation of the condition on its own

(Turk et al., 1996). According to Engel (1980), the biopsychosocial model uses an inclusive approach to understanding and caring for patients, which is in contrast to the parsimonious approach of the biomedical model that aims to reduce to a single diagnosis of a single disease. Such an approach is not necessarily reserved for chronic conditions but may be applied to acute situations, such as an acute myocardial infarction (Engel, 1980). Such a framework is useful to guide research in CLBP knowledge, measurement, and interventions.

The biopsychosocial model may be useful in assessing the patient's needs in the multiple domains of physical, psychological and social and in outlining a plan of care, including physical and restorative therapy, psychological & family support, and chronic pain management. Based upon the current understanding of CLBP and its complex nature, the biopsychosocial model provides the necessary broad framework to observe relationships between theory, research, and practice.

Figure II-1. The Biopsychosocial Model Applied to Dimensions of Chronic Pain (Modified from Hanson 2000)



Cognitive-Behavioral Theory

Chronic low back pain is rarely correlated to an underlying organic etiology thus the treatment is not primarily aimed at removing a physical pathology. The Cognitive-Behavioral approach is primarily utilized in the treatment of CLBP. It recognizes that pain and pain disability are not only influenced by somatic pathology alone, if it is present, but also by psychosocial factors, beliefs, and attitudes. Reducing disability through modification of the environment (i.e., such as restructuring job requirements and work settings) and by altering cognitive processes are examples of behavioral interventions commonly used in the treatment of chronic disabling, low back pain (van Tulder et al., 2004).

Cognitive-behavioral theory may be applied in interventions by helping CLBP patients to identify and modify their thinking regarding their pain and disability. According to van Tulder et al. (2004), three behavioral treatment approaches can be identified: operant, cognitive and respondent. Each of these three approaches focuses on modifying systems which affect behavior, cognitions, and physiological responses. An example of a cognitive treatment is that of imagery and attention diversion; such techniques may be learned through individual therapy or through participation in an intensive functional restoration program. Biofeedback is a respondent treatment aimed at modifying muscular tension and it presents a model of the relationship between tension and pain for CLBP patients. Operant treatments are based upon conditioning principles include rewarding healthy behaviors such as exercise and withdrawing attention to pain behaviors.

The use of cognitive-behavioral theory as an intervention is derived from a shifting paradigm of multidisciplinary treatments. It is applied to assess, manage, and treat CLBP. Early approaches focused on a traditional biomedical model aimed at pain reduction. Later models adopted a multi-factorial model of interrelating physical, psychological, and social/occupational factors (Waddell, 1996; & Turk & Flor, 1987).

Fear-Avoidance, Catastrophizing, & Coping-Adaption

The Fear-Avoidance Model (Lethem et al., 1983) has been proposed in CLBP to explain why low back pain disables some individuals and not others (Woby et al., 2004). The Model suggests that there are two extreme coping responses available to individuals who fear pain: confrontation and avoidance. Accordingly, those who use a confrontational style of coping are less likely to become disabled by their back pain than those who use avoidance as a coping means. The confrontationist is said to view their pain as a temporary inconvenience and are motivated to return to normal activities, including work and social. In contrast, the avoiders limit their exposure to situations that they perceive as potentially pain-producing and therefore, become disabled or immobilized by their back pain. Similarly, individuals who tend to catastrophize about the cause of their pain and its consequences significantly impact their fear of movement and of re-injury (Al-Obaidi et al., 2000). According to Chaves & Brown (1987), catastrophizing refers to an exaggerated negative perception towards pain experience.

Woby et al. (2004) investigated the extent to which patient's adjustment to CLBP was influenced by their fear-avoidance beliefs, tendencies to catastrophize, and appraisals of control. Eighty-three CLBP subjects completed self-report measures before participating in a physical therapist-led intervention. Of the three psychological factors,

fear-avoidance about physical activity was the only significant predictor of patients' disability. A limitation of the study is that objective measures of disability were not used; only self-report. Replication of such a study using both self-report and physical measures would substantially strengthen the study results. However, it cannot be overlooked that patient's perceptions of their ability to accomplish activity and their fear is correlated even when demographics and pain intensity levels are taken into consideration and controlled in analysis.

Part III Predictors of Chronic Low Back Pain (CLBP) and Long-Term Disability

Predictor variables are independent variables that are believed to cause or influence the dependent variable or outcome of interest (Polit & Hungler, 1999). When considering chronic low back pain as the dependent variable, factors that negatively influence recovery from back pain and are often viewed as predictors. Most studies have examined prognostic factors measured during an episode of acute or sub-acute LBP with the aim of identifying factors which are associated with either a positive outcome; i.e., improvement of LBP or return to work; or a negative outcome such as chronic disability and inability to return to work. A few study designs exist which investigate not only factors related to the inception of an episode of LBP and it's outcome but also factors present prior to the onset of symptoms termed 'premorbid' factors by Macfarlane et al. (1999).

A number of problems confound the design of adequate trials in low back pain which with to base an understanding of predictors of chronic low back pain. First, since the majority of back pain tends to improve and resolve spontaneously, although this is not universal, there are few studies, which provide knowledge of the natural history of low

back pain. Secondly, because of problems in diagnosing patients with back pain (poor correlation between symptoms and diagnostics); it is difficult to select a homogenous group of which to test effects of treatments or follow the natural history of the condition. Therefore, there is a lack of methodologically quality controlled studies to provide adequate evidence of prognostic factors of CLBP but there is a growing body of published studies in recent years identifying factors that are related and perhaps predictive of the transition of acute LBP to chronic disability, return to work, and treatment outcomes (Vendrig, 1999; Gross et al., 2004; Fransen et al., 2002; Werneke et al., 2001; Carey et al., 2000; Macfarlane et al., 1999; Picavet et al., 2002; Fritz et al., 2001; Maxwell et al., 1998; Gatchel et al., 1995; Turner et al., 2004; Romano et al., 1995; Hogg-Johnson & Cole, 2003; Schultz et al., 2004; Klenerman et al., 1995; Reiso et al., 2003; Karjalainen et al., 2003; & Von Korff, 1993.).

Epidemiological studies have identified risk factors and often the literature discusses them in terms of individual, psychosocial, and occupational domains. Even though, a growing number of prognostic studies have emerged investigating CLBP & disability; their independent prognostic value is low (van Tulder, 2002).

Shaw, Pransky, Patterson, & Winters (2005) identified risk factors for prolonged disability in a work-related low back pain population of 568 outpatients as job circumstances, pain coping strategies, and poor expectations for recovery. The study proposes that early identification of risk factors may improve health and work outcomes of back pain treatment.

Demographic and Clinical Predictors

The demographic factor of older age is commonly found to be associated with chronic low back disability (Abenhaim et al., 1995; Infante-Rivard & Lortie, 1996; & Gatchel et al., 1995). However, Roland & Morris (1983) found that age, height, weight, obesity, the primary site of pain, and type of occupation were not related to poor outcome in a cohort of 237 patients presenting in primary care with episodes of back pain during a one-year duration. The study aim was to describe the natural history of LBP and identify from a wide range of history and physical factors present at presentation, those items which were predictive of outcome. Although there was a general tendency for patient's LBP to improve with time; this was not a universal observation. For example, one month after the initial consultation, only 1/3 reported that they were free from pain. Pain and disability was also poorly reflected in the sickness/absence data. Only 8% that were previously employed were still unable to work and sickness absence was strongly related to sex (which could not be explained by occupation). Physical signs recorded by physicians were also poor indicators of disability experienced by the patients. Significant independent prognostic risk factors identified for poor outcome were: straight-leg raising limited to less than 60 degrees in either leg; possibly suggestive of sciatica; gradual onset of pain, and duration of pain for more than 1 week prior to consultation, and a high functional disability questionnaire score. Absence of all or three of these factors (94%) had good outcome. It was not possible to identify a group of patients with a poor outcome but rather the absence of certain factors suggested a more favorable outcome.

Marital status (single), rural residency, and history of back and neck pain were associated with clinically significant low back pain; defined as CLBP, in a Canadian

population-based survey to determine the six-month incidence (8%) in adults living in Saskatchewan (George, 2002). Clinically significant chronic low back pain was defined as differing from acute LBP because the length of the pain episode extended beyond three months and involved longer durations of functional disability.

Work Related Prognostic Factors

Work-related back injuries, secondary gain, and personal-injury litigation have often been considered at least partly responsible for prolonged back disability and are viewed as major barriers to recovery (Schofferman, 2000; & Gatchel et al., 2002). Even though the workers' compensation system was designed in the early twentieth century to help injured workers recover payment from the employer for the consequences of work-related injuries, many injured workers experience the system negatively and describe their overall experience as 'demeaning and dehumanizing' (Strunin & Boden, 2004). Soft tissue injuries, especially low back sprain and strain, are reported to be major causes of work related disability in industrial countries (Frank et al., 1996). The majority of cost associated with these injuries is typically incurred by a small minority of claimants who remain off work; such as those with chronic low back disability.

Abenhaim & Suissa (1987) found that 7.4% of cases absent from work for six months in a Canadian inception cohort of occupational back claimants accounted for 70% of lost workdays, medical costs, and wage replacement costs. Because of the economic burden of these long-term disability cases, early prognostic factors related to swifter return to work could be used to identify workers likely to recover quicker, therefore requiring minimal health care intervention, versus those less likely to recover, therefore

requiring more specialized medical, vocational, and rehabilitative care (Schofferman, 2000).

In a study of workers' compensation claimants with soft tissue injuries; 59% of those to the lower back, Hogg-Johnson & Cole (2003) identified a relatively small number of factors, gathered in the acute phase of disability, which predicted prolonged disability in the first year. Clinically, measures of functional status and "change in pain" from baseline to one month post-injury were early predictors of prolonged disability as was recovery expectation; whereas, demographic factors, such as age and gender, were not significant predictors.

In a consecutive sample of Vermont workers reporting occupational low back injury within 11 days of onset and interviewed 3 months after the initial injury, 10% were not working because of LBP (Hazard et al., 1996).

A two-year follow-up study of 190 injured workers with back disorders in Norway obtained from a national registry identified age (40-49 years), high pain intensity, low self-assessed work ability, and a self-predicted absence status of not returning to work, as factors that predicted longer time until return to work (Reiso et al., 2003). This study adds evidence that psychosocial factors are predictors of long-term work absence in low back disability.

An indirect measurement of CLBP is the outcome variable (dependent) variable of long-term disability. Factors contributing to long-term disability in the literature are: age, location of symptoms, and legal, socioeconomic and psychological. Compensation may also influence length of disability (Sanders, 1996, & Leavitt et al., 1992).

Prognostic factors associated with return to work are often studied within the workers' compensation framework. Of note, medical diagnosis has been found to affect the rate of recovery and thus contribute to long-term disability. For instance patients with sciatica recovered more slowly than LBP alone (Andersson, 1999).

Vendrig (1999) investigated prognostic variables and treatment-related changes that predict return to work in a multi-modal treatment program based primarily on the functional restoration approach (Mayer et al., 1998) in 143 injured workers. Almost 87% did return to work following the treatment program and three negative predictor variables predicted return to work: time off work, previous spinal surgery, and a clinically elevated pre-program score on the MMPI-2 scale Lassitude-Malaise. Since subjects who failed to return to work did not differ with regard to improvement in objective physical measures or psychological distress, the study suggests that the perceived disability status matters in injured workers with CLBP and affecting change of a negative perception of disability is necessary to return workers and keep them on the job.

In a longitudinal study of 121 subjects with acute low back pain that were identified in primary care practices and assessed at 2 and 12 months, those who did not significantly improve within 2 months were more likely to become CLBP. This suggests that the first 2 months in the natural history of LBP is key. Klenerman (1995) recommends considering referral to chronic pain management if patients don't improve within the first 2 months.

According to Fransen et al. (2002) prognostic factors of severe leg pain (odds ration, 1.9), obesity (OR 1.7), higher scores on the Oswestry Low Back Disability Scale (OR 3.1-4), unavailability of light duties upon return to work (OR 1.7) and a job requirement

of lifting ¾ of the day or more (OR 1.7) were all significant, independent contributors of chronicity in a prospective workers' compensation study with three month follow-up.

Psychosocial Factors

Psychological factors are covariates of CLBP and of chronic pain in general, however, their role as predictors is unclear. Several studies indicated that psychological variables present at the beginning of an episode of LBP did not predict long-term disability (Frymoyer & Cats-Baril, 1987) whereas van Doorn's (1995) findings were opposite. Doorn additionally posited that the risk for chronic low back pain increases with age and comorbid conditions, such as depression.

Another strong predictor of CLBP in the first 2 months was the Fear-Avoidance model, which incorporates both stress and personality, although demographics and pain history also contribute. When both physical and psychological variables are combined using multiple discriminant analysis, 85-88% of persons can be correctly classified according to Klenerman et al. (1995) suggesting that fear of pain and its avoidance may be important predictor variables.

Woby et al. (2004) found that changes in cognitive factors following a cognitive behavioral intervention aimed at modifying the patient's level of catastrophizing, their fear-avoidance beliefs, and their appraisals of control, were uniquely related to reductions in disability, even after controlling for reductions in pain, age, and gender.

Within a Workers' Compensation setting positive work-related recovery expectations predicted a 26% faster suspension of time-loss benefits and provided important information for predicting return to work (Gross & Battie, 2005). This finding suggests

that LBP-injured workers' beliefs and expectations regarding recovery influence the clinical course of LBP.

Pain Behaviors

Pain Behaviors as described by Fordyce (1973) are both verbal and nonverbal communication means that pain sufferers use to convey that they are experiencing pain. At times clinicians will designate pain behavior as "inappropriate" or excessive for the degree of detectable physical abnormality present. Excessive pain behaviors are reportedly common in CLBP; as many as 33% of tertiary referrals to spine specialist practices and up to 50% in subjects undergoing work disability assessments for compensation were said to display inappropriate pain behavior (Waddell et al., 1980). However, Dickens et al. (2002) studied 54 CLBP sufferers from a hospital clinic and although 31% exhibited excessive pain behavior according to their criteria, pain behavior did not correlate with anxiety or depression but did correlate with greater pain intensity, being female, and having the pain for a shorter duration.

Romano et al. (1995) studied the interaction between chronic pain patients (54% CLBP) and their spouses and reported that spouse's solicitous responses to pain behavior was associated with greater pain behavior and disability among chronic pain patients. The findings are consistent with behavioral theory that states pain behavior is influenced by social and environmental stimulus.

The literature lacks a sufficient number of well-designed studies with which to interpret the meaning of pain behavior as it relates to CLBP, especially because of the workers' compensation system's influence and clinician bias.

Primary care patients who reported more pain, a lower functional status, and a longer duration of LBP at the baseline had higher pain intensity and a lower functional status during 12 months prospective follow-up. Since prevalent cases were used they may not be prognostic but may indicate that the course of CLBP is stable if it has persisted for 3months or longer and recovery is unlikely. This supports Klenerman's (1995) findings that if patients did not show marked improvement within 2 months of onset of acute LBP, that they were unlikely to improve significantly.

Von Korff et al. (1993) found that pain intensity, disability, and number of days in pain were prognostic indicators of poor outcome in both recent onset and chronic cases.

In summary, the literature review on predictors and chronic low back pain are derived from studies of LBP outcomes. Positive outcomes were those related to early improvement of LBP (Macfarlane et al., 1999) and those related to return to work (Vendrig, 1999; Reiso et al., 2003; & Gross et al., 2004;). Increased age, more severe pain LBP intensity at baseline, sciatica, greater functional disability, and psychosocial factors including recovery expectation, fear-avoidance behaviors, pre-morbid psychological distress (depression, anxiety) tend to be associated with chronic LBP disability. With respect to psychosocial factors, worse outcomes were associated with low expectations of recovery. Several prognostic factors proved to be significantly negative predictors of return to work: workers' compensation status; duration of time off work, previous spinal surgery, and perceived disability status (Vendrig, 1999). However, none of the predictors have causal relationships with CLBP disability; rather they are correlated. While meaningful; such predictors must be viewed with caution and skepticism until more definitive, controlled, studies are done. The role of genetics in

painful low back disorders is being studied. Exploration of emerging data suggests a genetic effect on low back pain (MacGregor et al., 2004).

Part IV Summary of Measurement in CLBP Research

Because of the high prevalence of low back pain the world over and to clarify appropriate approaches of treatment, the World Health Organization (WHO) assigned a task force on the low back pain initiative to determine outcome measures relevant to all cultures that would ensure uniformity of reporting (Ehrlich[2], 2003). Their recommendations included a modified Schober test of spinal mobility, visual analog scale without demarcations, the Oswestry Disability questionnaire, a modified Zung questionnaire, and a modified somatic perception questionnaires. Of interest, twenty-one other commonly used tools to assess LBP were found to lack universality after studies on all six continents (Ehrlich[1], 2003).

Measurement in CLBP research generally covers the domains of pain, function, general health, and psychosocial.

Part V Treatment of CLBP Research

Despite extensive research in areas of prevention and management of LBP, research supporting effective treatment of chronic LBP is lacking. Treatment success is more common with acute LBP, but the literature highlights, that most acute LBP will spontaneously abate within a month, regardless of the treatment (McConnell, 2002). Recent evidence (Hesbaek et al., 2003) based upon results from a 5-year prospective study of the course of low back pain in the general populations concludes that LBP should not be considered transient and therefore, neglected.

Treatment for chronic low back pain is difficult and no single treatment has emerged. In a majority of individuals with LBP, it is not possible to definitively diagnose the cause of the pain and it is thought that a number of different pathological and psychological processes, if present, are responsible for the production of the symptoms (Roland and Morris, 1983). Also, since the natural history of LBP is variable, some LBP resolves in days, while others experience it for years as a chronic condition, it is unlikely that a single treatment modality will be efficacious when applied indiscriminately to all LBP patients.

Treatment methods for CLBP seen in orthopedic spine centers commonly includes nerve block therapy, pharmacologic management, behavioral modification, neural stimulation (spinal cord stimulation), and physical therapy (Schomaker & Asburn, 2002). However, the spine literature is lacking in randomized clinical studies to provide strong evidence of the effectiveness of the treatments.

Due to the fact that many health care provider in various disciplines care for CLBP patients, a large variety of therapeutic interventions are available; however, as with spine clinic treatments, the effectiveness of most of these interventions has not been convincingly demonstrated (van Tulder et al., 2004). For this review, the Cochrane Library of evidence based interventions, based upon methodologically sound clinical trials, was consulted to summarize the CLBP treatment literature.

Pharmacologic

Drugs available for the treatment of CLBP include steroids, opioids, non-steroidal anti-inflammatory drugs (NSAIDs), antidepressants, and muscle relaxants. A combination drug therapy is often used (Schomaker & Asburn, 2002).

The use of muscle relaxants in the management of nonspecific low back pain is debated and it is not clear if they are effective. A Cochrane Library review of the literature concluded that based upon 30 clinical trials, muscle relaxants are effective in the management of LBP but adverse effects associated with some require they be used with caution (van Tulder, M.W. et al., 2004).

Similarly, evidence from fifty-one trials suggests non-steroidal anti-inflammatory drugs (NSAIDs) are effective for short-term symptomatic relief in acute LBP but there is insufficient data regarding NSAIDs and CLBP (van Tulder et al., 2004).

Injections with anesthetics and/or steroids are a treatment modality often used in the treatment of CLBP in tertiary spine centers. There are three main injection sites: facet joints, epidural, or local injections. Eleven trials compared injections to placebo but due to methodological quality of many of the studies, convincing evidence is lacking on the effects of injection therapies for LBP one-month duration (Nelemans et al., 2000).

Physical and Complementary Therapies

For years the elements used to treat low back pain have been pain-relieving measures, rest, soft tissue treatment, and preventative exercises, which a trend towards less rest and more active treatments in the form of back muscle exercises and physical therapy (Indahl et al., 1995). However there is a lack of evidence on the effectiveness of these treatments. Indahl (1995) conducted a randomized investigation to determine the effect of treating LBP of 8 weeks duration as a benign condition and recommending light normal activity versus treating it as a medical malady. The outcome was return to work and survival analysis (P=0.000) showed the mobilization of those with LBP reduced sick leave significantly. Physical therapy interventions improve function in LBP patients,

even those with symptom duration of 6 months or longer; however, greater gains from physical therapy were achieved in symptom duration of less than 1 month (Badke & Boissonnault, 2006).

Exercise and multidisciplinary treatment programs are likely to benefit individuals with CLBP primarily because exercise is thought to decrease fear-avoidance behaviors, improve functional abilities, and improve self image (Liddle et al., 2004). A randomized controlled trial of 213 CLBP subjects found a 10-week spinal stabilization program significantly more effective than manual therapy at reducing pain, dysfunction, medication intake, and improving quality of life (Goldby et al., 2006).

In a randomized, prospective study of over 2000 subjects age 18-59 years with CLBP who had been out of work for a minimum of 90 days due to the condition, the use of bed rest was not found to improve any of the following outcome variables: function, pain level, work capacity (Hansson & Hansson, 2000). Similarly, physical therapy did not cause significant differences at 2-year follow-up. Manipulative and magnet therapy (Hansson & Hansson, 2000; & Collacott et al., 2000) were not found to impact outcome measures. However, back school and exercise were treatment modalities that have shown positive effect on patients with CLBP (Hodselmans, 2001; & Hansson & Hansson, 2000).

Acupuncture

While it is unclear what the exact mechanisms underlying the action of acupuncture, Chinese medical philosophy postulates that it promotes the flow of the life force energy, thereby balancing the human body system (van Tulder et al., 2004). According to the Cochrane Review of eleven randomized controlled clinical trials, there is inconclusive evidence to indicate that acupuncture is effective for the treatment of back pain. Of note,

only two of the trials were of high methodological quality. Meng et al. (2003) concluded that acupuncture is an effective, safe adjunctive treatment for CLBP in older patients in a randomized, controlled investigation of acupuncture biweekly for five weeks versus the usual care (NSAIDS, muscle relaxants, and back exercises). There was a significant decrease in the functional disability score of those receiving the acupuncture as compared to the controls after 6 weeks (P=0.001).

Behavioral therapy

According to van Tulder et al. (2004) behavioral therapy seems to be an effective treatment for chronic low back pain; although which type, whether cognitive, operant, or respondent, is unknown. A review of randomized clinical trials on any type of behavioral therapy for CLBP found six (6) quality trials and strong evidence that behavioral treatment has a positive effect on pain intensity and a small positive effect on functional status. There is additional evidence that adding a cognitive behavioral component to a standard rehabilitation program for CLBP is cost-effective as evidenced by reduced work days lost and thus decreased indirect costs (Schweikert et al., 2006).

Multidisciplinary Biopsychosocial Rehabilitation (Functional Restoration Programs)

Multidisciplinary outpatient treatment centers have rapidly increased in number over the last decades (Fior, 1992). In prolonged CLBP, patients develop a combination of physical, psychological, and social disabilities (Karjainen et al., 2004) and in controlled trials such treatment programs have been shown to improve pain and function and can often assist in improving the relationship between the patient, the rehabilitation team, and the workplace.

Surgery

Surgical intervention for CLBP is rarely indicated. However, if CLBP is due to a disorder of the intervertebral disc, complex surgery may be done. Herniation, disc disruption or degeneration, instability, and spinal stenosis are the most common indications for spinal surgery (Lee & Kopacz, 2002). The number of fusion surgeries in the United States has dramatically increased during the past two decades and one-half of the surgeries were for symptomatic degenerative disc disease (DDD). Even among spinal specialists, the diagnosis of DDD and surgical treatment is controversial. A recent finding of a randomized trial of surgical versus nonoperative treatment for lumbar disc herniation found that both groups improved substantially after 2 years (Weinstein et al., 2006). There is lack of evidence in the literature to support the effectiveness of surgery for DDD and for the natural history of internal disc disruption (Lee & Kopacz, 2002). New spine technologies being studied in clinical trials, such as the artificial disc replacement prosthesis, are targeting the population with DDD, many of whom are CLBP patients. Work status at the time of surgery, independent of Workers' Compensation, number of levels treated, and other demographic variables, was predictive of outcome from anterior lumbar fusion (Anderson et al., 2006). Patients working at the time of surgery had a 10.5 times greater likelihood of working at one-year follow-up.

Part VII Summary

The body of literature on low back pain and chronic low back pain is immense and it continues to grow. One reason is that low back pain is a highly prevalent condition experienced by many at some point in their lifetimes, in all societies. However, the pressing issue of economic burden drives the CLBP research because of the impact of the

condition on the workplace, injured workers, and the healthcare system. There is a lack of proven treatments and because frequently physical pathology cannot be demonstrated, clinicians and CLBP individuals alike experience frustration with each other and the overlay of the Workers' Compensation system.

Total Eradication of LBP is not feasible but further research on the prevention of low back injuries and identifying predictors of CLBP disability in acute LBP is imperative.

In summary, chronic low back pain is a prevalent and costly condition for the individual and society. The literature demonstrates a predilection to study CLBP topics with a high economic impact such as work-related disability and costly interventions over topics related to quality of life such as the impact of CLBP on families. Inadequate attention is given the relationships between CLBP and public health problems such as obesity and sedentary lifestyles. Additionally, there is a difficulty in determining true prevalence rates and the effectiveness of treatments due to a lack of consensus of definitions. Even though the LBP literature is extensive, there continues to be a compelling requirement for well-designed studies addressing the many dimensions of CLBP; particularly occupational acute LBP. Early identification of workers at greatest risk for persistent pain and disability will improve health and work outcomes and provide cost-effective algorithms for the evaluation and treatment of occupational acute low back pain.

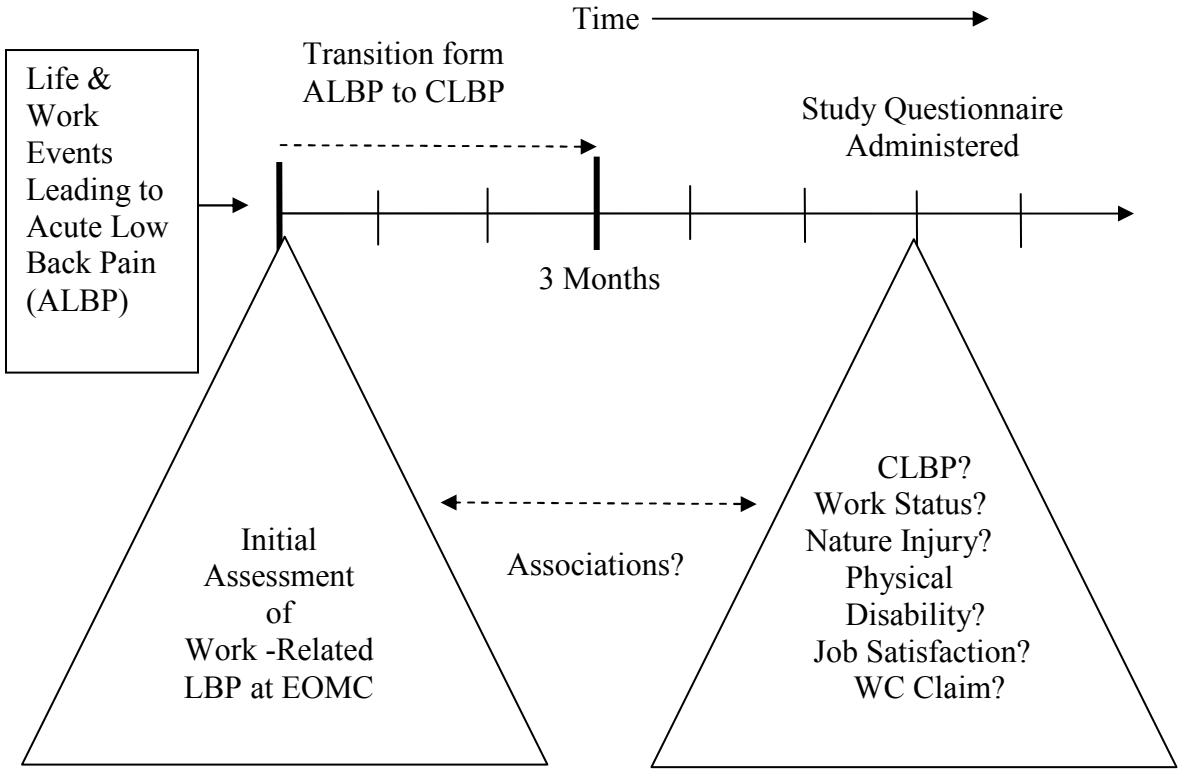
CONCEPTUAL FRAMEWORK

The review of the literature guided the research question development and contributed to the creation of an appropriate conceptual framework (Figure II-2.) to study the relationships among the outcome, development of chronic low back pain, and patient-

level variables such as gender, age, and previous history of low back pain in workers with low back pain.

Shaw et al. (2005) assessed early disability risk factors for low back pain in outpatient occupational health clinics and influenced the conceptual framework and questionnaire content for the current study.

Figure II-2. CONCEPTUAL FRAMEWORK OF THE STUDY



RESEARCH QUESTIONS

1. What are the demographic characteristics of workers presenting to an outpatient occupational medical center who have been diagnosed with acute low back pain?

2. What is the proportion of workers with acute low back pain that develop chronic low back pain?

3. Do demographic, medical, psychosocial, or occupational risk factors predict the development of chronic low back pain?

4. What is the estimated time to self-reported recovery from acute low back pain?

OPERATIONAL DEFINITION OF TERMS

Acute Low Back Pain: Acute low back pain (LBP) in the general population typically means LBP for duration of less than 2 to 4 weeks (Atlas et al., 2001). However, for this study acute LBP is defined as recent onset of occupational LBP for duration of < 14 days that was evaluated at the Emeryville Occupational Medical Center during October 1, 2004 to July 31, 2006 with a medical diagnosis of at least one of the following ICD-9 codes: 847.2, 724.2, 724.02, 722.10, 722.52, or 724.9.

Chronic Low Back Pain: For purposes of the study, CLBP is defined as pain in the lumbosacral area with or without lower extremity involvement for the duration of three (3) months or longer including recurrent or episodic pain not associated with a new low back injury.

Occupational Medical Center: This is defined as a single, urban medical clinic located in Emeryville, California (Emeryville Occupational Medical Center, EOMC) devoted to the evaluation and care of injured workers. The clinic is staffed by occupational physicians, nurse practitioners, chiropractors, and physical therapists.

Race/Ethnicity: The demographic category is as identified and reported by the study participant.

Age: This is defined by subject in years at the time of the initial EOMC evaluation and recorded on in the electronic medical records.

Electronic Medical Records Database: The EOMC electronic medical records system is called IMS (Intelligent Medical System), Meditab, Inc. Patient personal health information is entered into the system by the health providers.

Previous Low Back Pain: This is defined as Prior history of low back pain as reported by study participants or recorded in the electronic medical records at the time of the initial EOMC evaluation.

Assumption of the Study

An assumption of the study is that all study participants had equal opportunity to access available care through the EOMC during the study period.

CHAPTER III

METHODOLOGY

Introduction

This chapter focuses on the methodology used in this research of occupational acute low back pain and the development of chronic LBP. The following aspects of the study will be described: the research design, the setting, the study population, data collection methods, and the statistical analysis plan.

Research Design

The study expands current information related to occupational low back pain by using a descriptive study design with both secondary data analysis and follow-up utilizing a mailed paper-based questionnaire. Both descriptive and analytic components were used. The choice of design was based upon research questions aimed to determine the characteristics and numbers of workers with recent low back pain that transitioned to chronic low back pain; therefore follow-up measurement was implemented. It evaluates workers who have sustained an injury with acute low back pain severe enough to require medical evaluation and treatment at an urban occupational medical clinic. Information obtained from the medical record, study questionnaire, and follow-up telephone contacts were analyzed. Variables (gender, age, and previous history of LBP) were derived from the literature on predictors of chronic low back disability to determine if they shared a relationship with the outcome of the episode of LBP. Other demographic and individual characteristics were examined and their relationship to the development of chronic low back pain described.

Setting

The setting was a for-profit, urban occupational medical clinic located in Emeryville, California. The rationale for selecting a single clinic specializing in occupational medicine was to optimize the identification of acute work-related low back pain cases evaluated and treated early after onset using consistent patterns of care.

Study Population

A query of the clinic electronic medical database identified men and women 18 years and older who were evaluated and treated for occupational acute low back pain during a 23 month duration (October 1, 2004 – July 31, 2006). The duration of time from date of injury to initial evaluation of the acute LBP was 2 weeks or less. Inclusion and Exclusion criteria for study participation are outlined in Table III-1. Medical diagnoses ICD-9 codes at the time of initial evaluation were selected to ensure a sample of workers with musculoskeletal sprain or strain of the lumbar spine region related to their job. The cases were reviewed for qualification based upon study inclusion and exclusion criteria, date of service, and time from date of injury (DOI) to initial medical evaluation. An introductory letter from the occupational clinic, study flyer, study consent form, HIPAA consent form for permission to access private health information, and the study questionnaire were mailed to every potential participant (n=270) who were a minimum of 3 months beyond the initial clinic visit. The sample consisted of both male and female English-speaking individuals.

Table III-1. Study Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria

• 18 years of age or older
• Occupational-related acute LBP condition
• Medical diagnosis with at least one of the following ICD-9 codes (International Classifications of Diseases, Ninth Revision):
  o 847.2 Lumbar Sprain/Strain
  o 724.2 Lumbago, Low Back Pain, Low Back Syndrome, Lumbalgia
  o 724.02 Lumbar Region
  o 7.2210 Herniated disc, without Myelopathy
  o 722.52 Lumbar or Lumbosacral Intervertebarl Disc
  o 724.9 Compression Spinal Nerve Root
	• Less than 18 years of age
	• Medical diagnosis ICD-9 code 724.4 Thoracic or lumbosacral neuritis or radiculitis
	• Low back pain not work-related
	• Initial clinic medical evaluation <3 months ago

Sampling

A clinic-based consecutive sample from the electronic medical records and administrative database was utilized to identify all cases of work-related low back pain conditions (ICD-9 codes) in patients evaluated and treated at the occupational clinic during 23 months duration of time. Since the study aimed to study the natural history of recent onset occupational LBP that was evaluated and treated early after onset, the selection of the occupational medicine specialty clinic provided access to the target population of interest.

Sample Size

The study used secondary data analysis; therefore, the potential sample size was determined before the study was planned. The sample size, approximately 270 acute LBP conditions was estimated to have 10% with the dichotomous outcome variable-chronic low back pain. Therefore, for descriptive analysis purposes, the sample size, with an expected 0.10 proportion with chronic low back pain would have a total confidence interval width of 0.10 for a 95% confidence level.

Recruitment Methods

Potential study participants were mailed a packet containing an introductory letter explaining the study, consent forms, and a low back pain study questionnaire; all approved by the University of California, San Francisco, Committee for Protection of Human Research Subjects (CHR). A return envelope with pre-paid postage was included in the packet, along with a brief study compensation mailing form. The compensation mailing form captured the current mailing address and telephone contact information. The address information was utilized to mail the study compensation check and the

current telephone numbers allowed contact to clarify responses on the study questionnaire if necessary. The method of recruitment was selected to promote voluntary study participation and to observe HIPAA regulations with regards to private health information contained in the electronic medical records and mailed questionnaire. Only those individuals who returned signed informed consents and completed study questionnaires were enrolled in the study.

Maintaining Confidentiality

Confidentiality was maintained to the extent permissible by law. Study participant's medical records were reviewed only after obtaining written consent. Response data from the study questionnaire was protected by assigning study numerical codes to each participant. A master list which linked names and study numbers was kept in a secure, password protected, and encrypted location (PGP encrypted disc) available only to the investigator. Forms requiring participant identification, such as informed consents and personal health information from the medical record, were held separate from the questionnaires. All hard copies of study materials were kept in secured files. Personal identifiers, such as names, will not be used in published study results and statistical summaries will be presented in an aggregate form to protect individual identification. Reporting on the subgroups, necessitating data of small numbers will also be presented in a manner to protect confidentiality.

Human Subjects Protection

The study received approval from the Committee on Human Research (CHR), University of California, San Francisco (UCSF) (H642-28488). A minor modification to the study recruitment method was proposed due to low subject response and was

approved by CHR. The amendment permitted the mailing of reminder post-cards to non-responders and increased participant compensation from $10 to $25 to account for the subject's time in completing and returning the follow-up questionnaire.

Study Procedures

Potential participants, identified by database query using the Inclusion and Exclusion criteria, were contacted by mail at their home address. The introductory letter from the occupational clinic, informed consents, and study questionnaire were accompanied by return envelope with pre-paid postage. One to two weeks following the mailing a telephone call was made to ascertain receipt of the study packet and to answer or clarify any questions. Those who volunteered their participation returned the informed consents and the study questionnaire. A single telephone contact was made to each participant following receipt of study questionnaires to obtain missing or incomplete data. Following the receipt of the signed study consent form, data was abstracted from the electronic medical record for analysis.

Data Collection Methods

In addition to electronic medical record abstraction, a study questionnaire was used to collect subjective data three months or more following the date of the initial medical evaluation for acute LBP. The questionnaire was comprised of questions to provide information on back pain since the initial medical assessment, work status, perceived job satisfaction and employer support, and utilization of health care provider services. Following receipt of participant consent forms and study questionnaire, the clinic electronic medical record was accessed for review and data abstraction. A telephone call verified accuracy of the questionnaire response data. Efforts were made to locate correct

addresses when study packets were undeliverable. All data were entered into a computer database (SPSS v.15.0).

Measures

The study questionnaire (see Appendix) provided a self-assessment of low back-related functional disability, perceptions of workplace factors, and expectations for recovery. The questionnaire was comprised of instruments with evidence of reliability and validity, as well as questions conceived from the literature review identifying the most consistently reported factors contributing to occupational low back pain disability (Shaw et al., 2005).

Shaw Early Disability Risk Factor Questionnaire

The Shaw Early Disability Risk Factor Questionnaire (Shaw et al., 2005) was designed to screen for factors that may contribute to persistent pain and disability during the acute stage of occupational low back pain. The 16-item tool provides self-assessment of potential risk factors by the worker and factors include background demographics, physical health risks, workplace factors, pain, mood, and expectations for recovery. The brief questionnaire completed by 568 outpatients in eight occupational health clinics in the New England region and their clinicians predicted 1-month disability status with 74.3% sensitivity and 70.1% specificity (Shaw et al., 2005). Items from this questionnaire, with permission of the author, were used in the current study because it is specific to occupational health, disability risk factors, and low back pain.

Chronic Pain Measure

Pain is an inner state which can only be measured indirectly. Thus, measurement depends upon the self-report of the individual experiencing it (McDowell & Newell, 1996). Pain severity is viewed as a global construct measured by pain intensity defined as how much a person hurts, and how much it interferes with activities (Von Korff et al., 2000). In CLBP, the framework for pain assessment consists of a focus on global pain (pain intensity + interference with activities) *and* pain persistence (chronicity). Therefore, measuring pain intensity alone is inadequate. There is growing evidence that pain intensity *and* the effect of pain on activities more appropriately assesses disability due to CLBP (Von Korff et al., 2000). However, psychological factors, such as past experiences, attention and emotion influence pain response and perceptions (Melzack & Wall, 1965) as well. Consequently, multiple measures are needed to assess the pain experience (Von Korff et al., 2000). In chronic and recurrent pain conditions, it may be more meaningful to characterize the pain severity during a period of time, such as the past 1 week or past one month, in addition to assessing current and present pain levels.

Pain Intensity Measures

Pain intensity scales provide a quantitative estimate of the magnitude of the perceived pain. The three most commonly used methods to assess pain intensity in low back pain patients are analogue scales: Numerical Rating Scale (NRS), Visual Analog Scale (VAS), and Verbal Rating Scale (VRS).

Numerical Rating Scale (NRS)

The NRS is the endorsed method of assessing pain intensity in spinal conditions because of its clarity and ease of scoring (Von Korff et al., 2000). The NRS asks patient

to rate their pain from 0 to 10 (11-point scale), with the understanding that 0 represents one end of the pain continuum (0 = no pain) and 10 represents the other extreme pain intensity (10 = pain as bad as it can be). The patient verbally states or records the number that best represents their pain intensity (Jensen et al., 1986). Figure III-3. presents an example of an item from The North American Spine Society (NASS) Questionnaire (Daltroy et al., 1996) which utilizes the NRS to assess current pain intensity. The NRS may be simpler for patients to complete as compared

Figure III-3. Numerical Pain Rating Scale (NRS) - Adapted from The North American Spine Society (NASS) Questionnaire (Daltroy et al., 1996)

Please circle the ONE number which best describes your current pain level.

No pain	0	1	2	3	4	5	6	7	8	9	10	The worst pain you can imagine

to the Visual Analogue Scale (VAS) which requires an understanding of the concept of a continuum as represented by a horizontal or vertical 10 cm straight line. However, the NRS is not without problems. For instance, patients completing the NRS are instructed to choose *one* number and yet they may feel their pain level falls between numbers, such as a level of 5 ½ on the scale. They often express frustration about how to accurately mark their pain intensity. This suggests that the tool does not have interval qualities and as a result is not sufficiently responsive in its ability to measure degrees of pain intensity as reported by the patient (Price et al., 1994). A primary advantage of the tool is that it is simple to score, regardless of format, because the pain intensity score is the number indicated. The NRS was selected for use in the mailed study questionnaire because of its clarity and ease of scoring.

Low Back-Specific Disability Measures

The two disability instruments (Table III-2.) used in the follow-up study questionnaire to measure subjective LBP-related functional impairment will be detailed below. Both are commonly used in conjunction with pain intensity measures to assess physical disability (Kopec, 2000). The disability tools are recommended to assess how pain interferes with usual daily activities. Both tools were developed in the early 1980s and are used widely within the spine and pain communities.

Oswestry Low Back Disability Index (ODI)

The Oswestry Disability Index (ODI) (version 2) is a standardized tool used in clinical orthopedic and research settings to assess the extent that functional ability is restricted due to low back pain (LBP). It concentrates on the effects of LBP on the patient's quality of life rather than the nature of the pain. The ODI asks subjects to respond about their status in the past week and can be self-reported, or administered by interview or computer. The ODI has been translated into nine different languages and since its original development (Fairbank et al., 1980) has been cited in the literature more than 200 times (Fairbank, 2000). It consists of ten 6-point scales and the written format takes about 5 minutes to complete. Scale one rates the intensity of the pain and the remaining nine cover the disabling effect of LBP on the following typical daily activities: personal care (bathing/dressing), lifting, sitting, standing, walking, sleeping, sexual activity, social life, and traveling. Each of the 10 scales is scored on a 0-5 scale (ordered from lesser disability to greater disability), with higher values meaning greater disability. The sum of the ten scales is expressed as a percentage of the maximum score (maximum score is 50 if all ten scales scored) and is termed the ODI. Possible scores range from 0-

100%. It is recommended that the ODI is preferable to the RMQ in populations with severe persistent disability because it shows response to change with scores in the higher levels of disability (Roland & Fairbank, 2000). The tool demonstrated responsiveness to change in the functional status of a group of patients participating in a functional restoration program. Total ODI scores decreased indicating improved function at multiple time periods measurements (39 pre-program; 24 at discharge, 25 at 6-8 weeks, and 20 at 1 year after discharge) (Hazard et al., 1991).

The Roland-Morris Disability Questionnaire

The Roland-Morris Questionnaire is a condition-specific measure that was originally designed to assess physical disability in primary care settings. The tool was derived from the Sickness Impact Profile (SIP) (Bergner et al., 1981), which is a 136-item health measure covering aspects of physical and mental function. Twenty-four items were selected from the SIP by authors, Roland & Morris (1983) because they related specifically to physical function affected by low back pain. Each item starts with the phrase "because of my back pain" to distinguish back pain disability from other disabilities. Respondents read and then place a check mark beside a statement if they feel it applies to them for that day, which makes it better suited to observe short-term changes in LBP or response to treatment. The RDQ score is calculated by adding the number of items checked. Since items are not weighted, the score simply ranges from 0 (no disability) to 24 (maximum disability). The tool can be administered on paper, by interview, or by computer, although psychometric testing is lacking on the interview or computer mode of administration. One advantage of the RDQ is that it better discriminates change in those with less disabling LBP whereas the ODI may be more

responsive to change when the there is more severe functional disability due to LBP. These characteristics of the measures influence the choice of instruments in measuring disability due to LBP. Consequently, the RMQ is more commonly used in less disabled low back patients often seen in primary care settings (Beurskens et al., 1995). Table 3. presents evidence of reliability and validity of the Oswestry Low Back Disability Index and the Roland- Morris Questionnaire as measures of functional disability due to low back pain.

Table III-2. Low Back-Specific Pain and Disability Measures

Authors	Purpose	Reliability	Validity	Utility
Oswestry Low Back Disability Index (ODI) Fairbank et al. (1980). The Oswestry low back pain disability questionnaire, *Physiology*, 66, 271-273; Revised Fairbank et al. (1986) Version 2.0	Self-report measure of the extent functional ability (ADLs) are restricted due to LBP and concentrates on the effects (impact on QOL), rather than the character of LBP	ODI Version 1.0 Test-Retest r =0.99 (24 hours interval) ODI Version 2.0 Cronbach's Alpha 0.76 & 0.87 for the entire scale	**Content:** Patients with first episode LBP followed over time & improved - ODI score improved as well **Construct:** Wording of ODI based on patients' self-reports and symptoms of CLBP; ODI correlates positively with the SF-36 Bodily Pain Scale and The Roland-Morris Disability Questionnaire which measure same construct. Note: ODI V.2.0 has not been investigated (Ohnmeiss, D, 2001) **Criterion-related:** No gold standard for self-report functional disability; Concurrent: In 52 CLBP subjects, ODI and dynamic functional performance tests compared with small-moderate inverse correlation with expected results: more disabled - less able perform physical tests (Gronblad, 1997)	Acute, first episode LBP; chronic low back pain with more severe disability Less able to discriminate changes in lower scoring, less disabled.
Roland-Morris Disability Questionnaire (RDQ), Roland, M. & Morris, R. (1983). A study of the natural history of low back pain: Part I. Development of a reliable and sensitive measure of disability in low-back pain, Spine, 8 (2), 141-144.	To assess perceived physical disability due to low back pain	Cronbach's Alpha for the scale 0.84, 0.90, and 0.93	**Content:** LBP patients in primary care followed over time (1 week and 4 months later) improved- the RDQ score also improved; expert observation LBP symptoms directed item design. **Construct:** Activity items chosen as those relevant to LBP patients **Convergent:** RMQ correlates positively with physical scale of SF-36, Quebec Back Scale, ODI **Criterion-related:** No gold standard for self-report functional disability; **Concurrent:** Mod. evidence compared physical exams (aerobic) with RMQ in LBP patients (Filho et al., 2002).	Adults with low back pain, acute, sub-acute, & chronic; Floor/ceiling effect- severe LBP disability score 100% disabled; therefore, less able to detect change severely disabled.

Whenever possible, condition-specific health measures are recommended to assess patients' progress in clinical setting and to measure outcomes in clinical trials (Bombardier, 2000). In 2000, a panel of spine experts convened to discuss measurement issues and as a result, recommended that either the Oswestry Low Back Disability Index (ODI, Version 2.0) or the Roland-Morris Disability Questionnaire (RDQ) be used in the measurement of low back pain conditions in addition to generic pain intensity measures. This finding is consistent with the recommendations of a World Health Organization (WHO) low back initiative task force which formed to determine outcome measures relevant to all cultures that would ensure uniformity of reporting (Ehrlich, 2003). Both expert panels recommended the ODI in addition to a visual analogue pain intensity measure when measuring CLBP.

SF-12 Health-Related Quality of Life

Since CLBP is unlikely to resolve completely and recurrence is likely, improving health-related quality of life (HRQoL) is a major treatment goal of the population (Xuemei et al., 2003).

In this study of occupational acute low back pain, a shorter version of the SF-36, the SF-12 was used to measure health-related quality of life three months or longer after the onset of the pain. The SF-12 was selected to minimize respondent's burden and because its reliability, validity, and responsiveness in patients with back pain has been reported (Xuemei et al., 2003).

In an effort to reduce subject burden, Ware et al. (1996) selected a subset of 12 items from SF-36 and constructed a shortened version of the health survey. Like the SF-36, the SF-12 can be summarized by two subscales: physical component summary (PCS-12) and

mental component summary (MCS-12). Ware et al. (1996) published preliminary tests of reliability and validity in the general population and reported that both the PCS-12 and MCS-12 have a mean of 50 and a standard deviation of 10.

In a low back pain population (n=2,520), the internal consistency reliability for both components are assessed by Cronbach alpha coefficient (PCS-12 was 0.77 and MCS-12 was 0.80) and exceeded the recommended level of 0.70 (Xuemei et al., 2003). There is also evidence of construct validity in that the measures correlated with six other measures theoretically related or unrelated to the summary scales. Responsiveness of the SF-12 correlated with change in back pain intensity and clinical symptoms.

The SF-12 was selected over the SF-36 out of consideration of subjects who may be experiencing chronic pain and because there is published evidence of its reliability and validity in a low back pain population.

Stanford Presenteeism Scale (SPS)

In the current study workers were followed up with a questionnaire 3 months or greater after an acute episode of LBP. Work status, job satisfaction, and job productivity were subjectively assessed to evaluate the impact of ALBP on work performance.

The SPS, a 13-item tool, with permission of the authors, was used to identify ways in which workers were physically present but functioned at less productivity because of low back pain (Koopman et al., 2002).

Demographic Information

Baseline data collected from the EMR included the participant's name, address, phone number, date of birth, gender, date of injury and initial treatment date, history of

previous LBP injury, Workers' Compensation claim, health history of hypertension, diabetes, or depression, and summary of medical evaluation and treatment.

Study Variables

The dependent outcome variable was dichotomous and assessed whether the episode of occupational acute LBP lasted 3 months or longer and therefore transitioned to CLBP. Independent variables were demographic characteristics, gender, age, and history of previous low back pain.

Data Analysis Plan

The data analysis was planned based upon each research question as follows:

Research Question 1. What are the demographic characteristics of workers presenting to an outpatient occupational medical center who have been diagnosed with acute low back pain? Descriptive statistics (means, standard deviation, and minimum and maximum values) were used to provide a profile of the workers with acute LBP, their functional limitations, and perceived HRQoL following the injury. Means and standard deviation were used to describe the continuous variables, Student's T-test unpaired was used for comparisons between groups. Dichotomous and nominal variables were reported using proportions. Chi Square statistics was used to show bivariate associations between predictor variables.

Research Question 2. What is the proportion of workers with acute low back pain that develop chronic low back pain? The hypothesized proportion of acute low back pain patients who will develop CLBP is 0.10. The binomial test was used to determine whether the population proportion represented by the sample differs from 0.10.

Research Question 3. Estimate whether potential demographic, medical, psychosocial, or occupational risk factors predict the development of chronic low back pain. Chi Square test of association between two variables was used to compare observed and expected frequencies. Univariate logistic Regression was used to test the association of continuous variables with the dichotomous outcomes variable.

Research Question 4. To estimate time to self-reported recovery from acute low back pain. Median Time to recovery from acute low back pain was reported with descriptive statistics appropriate for the small subgroup.

CHAPTER IV

RESULTS

Sample Description

Two-hundred-seventy (270) potential study participants were identified by ICD-9 and date of service by query of the clinic medical records database. Study flyer, informed consents, and study questionnaires were mailed. Thirty-six (36) study packets were undeliverable due to address and five (5) individuals declined study participation. Forty (40) consented and returned the study questionnaire for a response rate of 17.5%. Two questionnaires were excluded due to missing data and inability to make follow-up contact. Thirty-eight (38) participants provided complete data, were available for follow-up telephone interview, and were included in the final data analysis. Study recruitment, enrollment, and reasons for declining study participation are presented in Figure IV- 4.

This chapter presents the study findings following each research question.

1. What are the demographic characteristics of workers presenting to an outpatient occupational medical center who have been diagnosed with acute low back pain?

Demographic information regarding the sample (n=38) is presented in Table IV-3. The mean age of the sample was 42.4 years (SD = 11.6) and 55.3% were male. The majority were White, non-Hispanic (36.8%) or Black, non-Hispanic (28.9%). The percentage of Black, non-Hispanics is nearly twice as high in this sample as compared to 2000 United States Census data for Alameda County (14.9%). Nearly two-thirds (65.8%) of the sample reported their educational level as college graduate (34.2%) or high school graduate with some college (31.6%). The high educational level of this sample is similar to 2005 demographics reported by Alameda County (College graduates, 34.9%). Marital

status was single (55.3%), married or partnered (28.9%), and divorced or widowed (15.8%). At the time of injury 37% reported exercising 2-3 times per week; 29% exercised more than 4 times per week. Forty-one percent of workers had an initial evaluation and treatment at the occupational medical center on the same day as report

Figure IV-4. Study Recruitment Algorithm

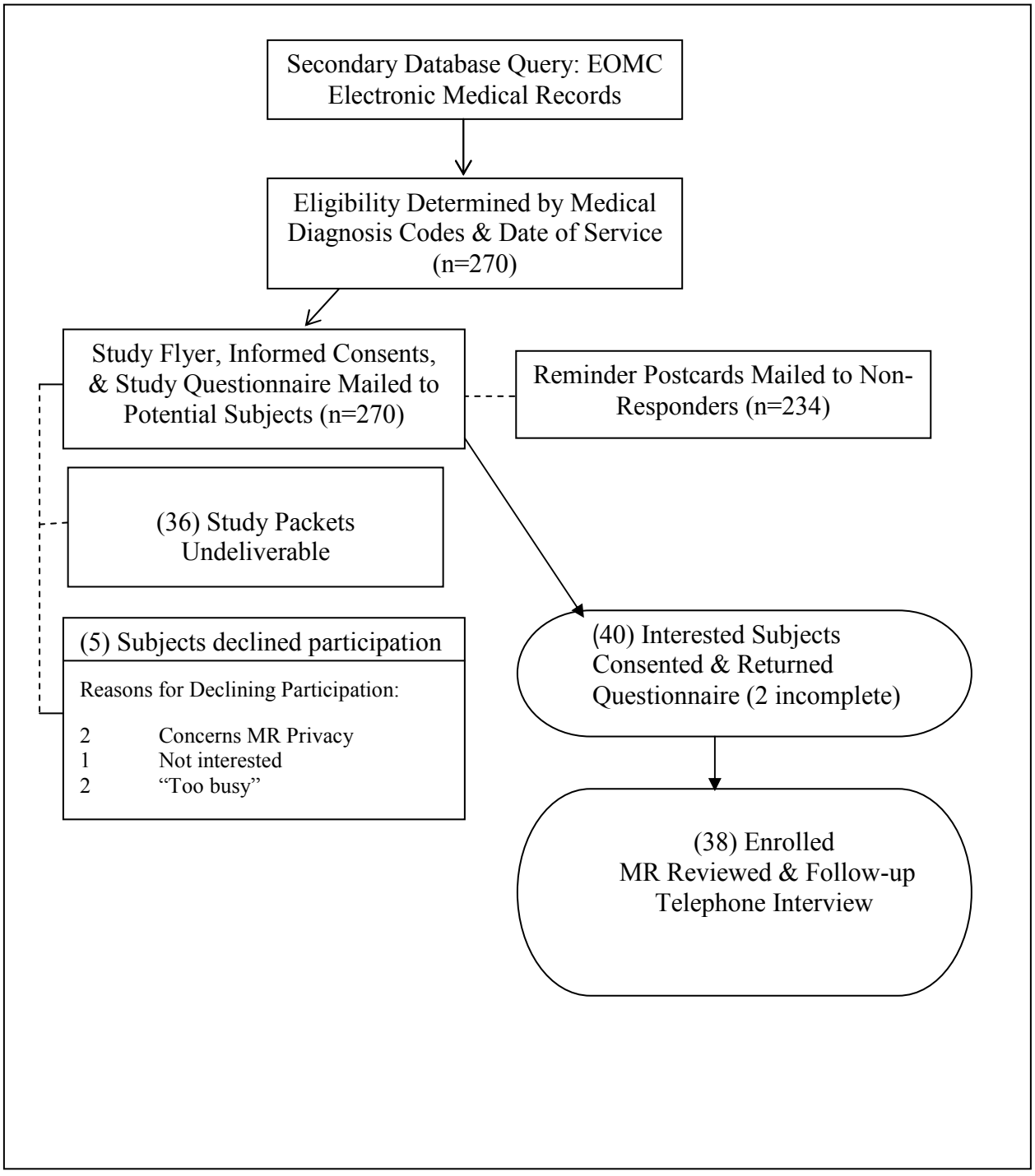


Table IV-3. Demographic Characteristics of Participants (n= 38)

Variable	n (%)	Percent From National Injury Statistics*
Gender		
Male	21 (55.3)	66.2
Female	17 (44.7)	33.8
Ethnic origin		
White, non-Hispanic	14 (36.8)	46.0
Black, non-Hispanic	11 (28.9)	8.2
Hispanic	3 (7.9)	13.2
Asian or Pacific Islander	3 (7.9)	1.1
Other/multi-ethnic	7 (18.4)	0.1
Age		
20-24 yr	2 (5.3)	10.8
25-34 yr	9 (23.6)	23.5
35-44 yr	12 (31.6)	25.3
45-54 yr	6 (15.8)	22.9
55-64 yr	9 (23.7)	11.0
Length of service with employer (n=31)		
Less than 6 mo	1 (0.3)	
6-11mo	1 (0.3)	
1-3 yr	11 (35.5)	
>3-5 yr	4 (12.9)	
>5-10 yr	7 (22.5)	
>10 yr	7 (22.5)	
Work Status		
Unemployed	8 (21.1)	
Employed F/T	29 (76.3)	
Student F/T	1 (2.6)	
Occupational categories		
Transportation, delivery	9 (23.7)	
Sanitation, housekeeping, landscaping	2 (5.3)	
Office worker	5 (13.1)	
Mechanic, machinist	3 (7.9)	
Construction trades	3 (7.9)	
Distribution, warehouse, shipping	4 (10.5)	
Education, childcare	2 (5.3)	
Grocery clerk/food service	7 (18.4)	
Technician/Utility	3 (7.9)	
Injury types		
Fall on same level	6 (15.8)	
Fall to lower level	2 (5.3)	
Transportation accident	4 (10.5)	
Repetitive motion	1 (2.6)	
Overexertion/lifting	25 (65.8)	
Company size		
Small (<50 employees)	4 (10.5)	
Medium (50-500 employees)	10 (26.3)	
Large (>500 employees)	24 (63.2)	

*U.S. Department of Labor, Bureau of Labor Statistics (2005). Case/gender characteristics for work-related injuries and illnesses involving days away from work

of injury to their employer; five (13.2%) had prior evaluation on the same day of a work-related traumatic injury (MVA, fall from higher level) at an emergency room and were then referred to the EOMC.

Diagnostic information was obtained from the medical records of all subjects (100%). Overexertion/lifting (65.8%) was the predominant mode of reported injury, followed by fall on same level (15.8%). Lumbar sprain and strain (ICD-9 medical diagnosis code 847.2) was listed among the diagnosis codes at the initial evaluation in 100% of cases; often it was the primary diagnosis code. Symptoms of radiating LBP, primarily to the buttocks or legs, were present in 15.8%. Twenty-five (65.8%) of the workers had previous history of LBP; none had chronic ongoing symptoms. Co-morbidities of hypertension (21.1%), diabetes (2.6%), and depression (13.2%) were present in the sample. At the time of their occupational acute LBP episode, most (63.2%) described their company size as large (>500 employees); 26.3% medium (50-500 employees); and 10.5% as small companies with less than 50 employees. The most frequently represented occupation was transportation workers (23.7%), followed by grocery clerk/food service (18.4%) and office workers (13.1%). Overall, gender and age were similar to the representation in the United States Department of Labor, Bureau of Labor Statistics (2005), however, the study ethnicity was more diverse overall (Table IV-3). Differences in female and male demographic characteristics are presented in Table IV- 4. and Table IV- 5.

Table IV-4. Demographics of the Male Study Population (n=21)

Demographics					
			Range	Mean	SD
Sample Age (Years)			20-61	43.3	13.7
Race/Ethnicity	*n*	*%*			
White,non-Hispanic	11	30.0	32-61	47.7	11.1
Black, non-Hispanic	5	13.2	27-59	47.4	12.9
Hispanic	2	5.3	20-27	23.5	5.0
Asian, Pacific-Islander	2	5.3	25-51	38.0	18.4
Other, multi-ethnic	1	2.6	0	24.0	0

TableIV- 5. Demographics of the Female Study Population (n=17)

Demographics					
			Range	Mean	SD
Sample Age (Years)			25-57	41.2	8.7
Race/Ethnicity	*n*	*%*			
White,non-Hispanic	3	7.9	32-47	37.0	8.7
Black, non-Hispanic	6	15.8	38-49	42.8	3.5
Hispanic	1	2.6	0	45.0	0
Asian, Pacific-Islander	1	2.6	0	25.0	0
Other, multi-ethnic	6	15.8	29-57	43.8	10.9

Occupational Characteristics

The mean time (in months) from the acute low injury to follow-up with the mailed study questionnaire was 11.8 (SD = 6.8); minimum 4 months and maximum 27 months. At follow-up twenty-nine participants (76.3%) were employed; eight (21.1%) were unemployed and one (2.6%) had became a full-time student. Seven of eight unemployed cited LBP as the primary reason for unemployment. The majority of employed participants (35.5%) reported 1-3 years length of service with their current employer; twenty-six percent of those employed at follow-up had changed employers since the LB injury. The majority of those with the same employer since injury (22.5%) reported service of 10 years or more. Twenty-eight workers (73.7%) missed at least one day or shift of work because of their episode of acute LBP; ten (26.3%) never missed time at the job due to LBP. Workers' Compensation claims were filed in 23 (60.5%) cases. One participant had a previous Worker's Compensation claim of the low back and was the only case to report past history of spine surgery (laminectomy). There were no re-injuries or new low back injuries in the sample, however, during the telephone interview participants in the CLBP group often described their LBP symptoms as recurring or intermittent.

Characteristics of Functional Disability

The disability scores were non normally distributed, therefore, median and quartile deviations were reported (Table IV-6.). At follow-up, the median Oswestry Low Back Disability Index (ODI) was 32.0 (QD = 8.0) in the CLBP group which represents moderate disability (McDowell & Newell, 1996) and 4.0 (QD = 8.0) (minimal disability) in the group without CLBP. The median Roland-Morris Disability Questionnaire

(RMDQ) score in the CLBP group was 9.0 (QD =4.0) and 3.0 (QD = 1.5) in the group without CLBP. Roland and Morris (1980) did not suggest cut points for the tool's scoring, however, the increased RMDQ median score in the CLBP group suggests that LBP interfered with normal daily activities, such as putting on socks and getting up out of a chair.

The mean scores for the two SF-12 HRQoL component, physical (PCS-12) and mental (MCS-12), in the CLBP group were 38.4 (SD = 12.4) and 44.6 (SD = 15.5). Participants with CLBP were 1 SD below the standardized mean population score on the PCS-12 and ½ SD below on the MCS-12 indicating perceptions of less favorable HRQoL (Ware et al., 1996). In the group without CLBP the PCS-12 was 50.5 (SD = 7.8) and the MCS-12 was 46.9 (SD = 8.4). In workers without CLBP the PCS-12 was similar to the standardized mean population score (Mean = 50, SD = 10), however, their MCS-12 mean score was below the reference mean of the general population. (See Table IV- 6.)

Table IV-6. Comparison Summary Scores of Validated Study Measures in Patients With and Without Chronic Low Back Pain

Study Measure	Study Group		
	Patients With CLBP (n =23)	Patients Without CLBP (n=15)	
	Median (QD)	Median (QD)	p<0.05 level
Oswestry LBP Disability Index (ODI)+	32.0 (8.0)*	4.0 (8.0)*	.00
Roland-Morris LBP Disability Questionnaire+	9.0 (4.0)*	3.0 (1.5)*	.00
SF-12 Physical Component Score++	Mean (SD)	Mean (SD)	.00
	38.4 (12.4)	50.5 (7.8)	
SF-12 Mental Component Score++	44.6 (14.5)	46.9 (8.4)	.54

*Asymmetrical distribution
+Higher scores indicated greater pain-related physical disability
++Higher scores indicate perception greater HRQoL

It is reported that 10% of occupational low back pain follows a course longer than three months and accounts for 90% of total costs attributable to occupational low back pain (Hashemi et al., 1997; Shaw et al., 2005). A large portion of the cost is attributed directly to healthcare utilization. In this study, use of health care services was explored by determining the number of patient visits to various providers during the interim time from initial acute LBP evaluation at EOMC until follow-up (Mean 11.8 months, SD = 6.8). Table IV-7. provides a comparison of health provider visits among workers with and without CLBP. In general the CLBP group (n = 23) reported more visits to more provider types than those without CLBP.

Table IV-7. Health Provider Visits Among Workers With and Without CLBP

Healthcare Provider Type	Study Group			
	Patients With CLBP (n =23)		Patients Without CLBP (n=15)	
	Number of Visits (%)		*Number of Visits (%)*	
	Yes	No	Yes	No
Physician	17 (73.9)	6 (26.1)	10 (66.7)	5 (33.3)
Physical Therapist	15 (65.2)	8 (34.8)	5 (33.3)	10 (66.7)
Chiropractor	12 (52.2)	11 (47.8)	4 (26.7)	11 (73.3)
Massage Therapist	8 (34.8)	15 (65.2)	1 (6.7)	14 (93.3)
Acupuncturist	5 (21.7)	18 (78.3)	1 (6.7)	14 (93.3)
Spinal Injectionist	4 (17.4)	19 (82.6)	0 (0)	15 (100)
Nurse Practitioner	4 (17.4)	19 (82.6)	2 (13.3)	13 (86.7)
Neurologist	2 (8.7)	21 (91.3)	0 (0)	15 (100)
Anesthesiologist	2 (8.7)	21 (91.3)	0 (0)	15 (100)
Orthopedist	2 (8.7)	21 (91.3)	0 (0)	15 (100)
Accupressurist	1 (4.3)	22 (95.7)	0 (0)	15 (100)
Spiritual Healer	1 (4.3)	22 (95.7)	0 (0)	15 (100)
Herbalist	0 (0)	23 (100)	1 6.7)	14 (93.3)
Spine Surgeon	0 (0)	23 (100)	0 (0)	15 (100)
Psychologist	0 (0)	23 (100)	0 (0)	15 (100)

2. What is the proportion of workers with acute low back pain that develop chronic low back pain?

Twenty-three workers (60.5%) developed CLBP and fifteen (39.5%) had acute LBP which resolved within 3 months following the acute injury. A binomial test was used and the proportion of CLBP patients in the population represented by this sample differs significantly from P = .10 (Z = 10.04, p < .0005). In this sample the proportion was .61.

Table IV-8. presents the summary statistics for workers with acute LBP that developed chronic low back pain and workers with acute LBP that resolved within 3 months.

In summary, based upon the literature, it was hypothesized that 10 % of the sample would experience persistent or recurring LBP three months or more after the initial EOMC evaluation. More workers transitioned to CLBP three months after an episode of acute LBP than was anticipated.

Table IV-8. Workers Developed CLBP and Workers with Resolved ALBP

Demographics	Workers with CLBP (n=23)			Workers without CLBP(n=15)		
	Range	Mean	SD	Range	Mean	SD
Age (Years)	20-61	42.7	11.2	25-57	41.8	12.7
Gender	*N*	*%*		*N*	*%*	
Male	11	47.8		10	66.7	
Female	12	52.2		5	33.3	
Ethnicity	*N*	*%*		*N*	*%*	
White	8	34.8		6	40.0	
Black	7	30.4		4	26.7	
Hispanic	2	8.7		1	6.7	
Asian	1	4.3		2	13.3	
Multi-ethnic	5	21.7		2	13.3	
Previous LBP						
Yes	18	78.3		7	46.7	
No	5	21.7		8	53.3	
Saw MD LBP						
Yes	14	60.9		6	40.0	
No	9	39.1		9	60.0	

3. *What are the potential demographic, medical, psychosocial, or occupational risk factors that predict the development of chronic low back pain?*

In this sample radiating LBP was a symptom sufficient to predict CLBP (See Table IV- 9). Every participant who reported it eventually developed CLBP and the test statistic could not be estimated using logistic regression technique (Heinze & Schemper, 2002). However, not everyone who developed CLBP reported symptoms of radiating LBP. Previous history of LBP was significantly associated with the development of CLBP in this sample as reported by the deviant Chi-Square statistic (4.011, df 1, p = 0.045) which is the appropriate test statistic for report in a small sample (personal communication with B. Cooper). Gender, age, ethnicity, educational level, marital status and the co-morbidities hypertension, depression, and diabetes were not statistically associated with CLBP; it is unclear if this is due to a Type II error.

Table IV- 9. Radiating LBP Symptom Predictor of CLBP

Symptoms of Radiating LBP?	Group Developed CLBP (n = 23)		Group LBP Resolved (n = 15)	
	N	*%*	*N*	*%*
Yes	6	26.1	0	0
No	17	73.9	15	100

Employer factors (job tenure, physical work demands, availability of modified duty, job satisfaction, and early reporting to employer) and self-rating of pain have been linked to functional improvement and return to work (Shaw et al., 2005). In this study the small sample size limited the use of multivariate analysis and modeling, however, individual employer-related variables were tested for their association with CLBP using binary logistic regression (Table IV- 10). Job tenure, job satisfaction, and the perception of

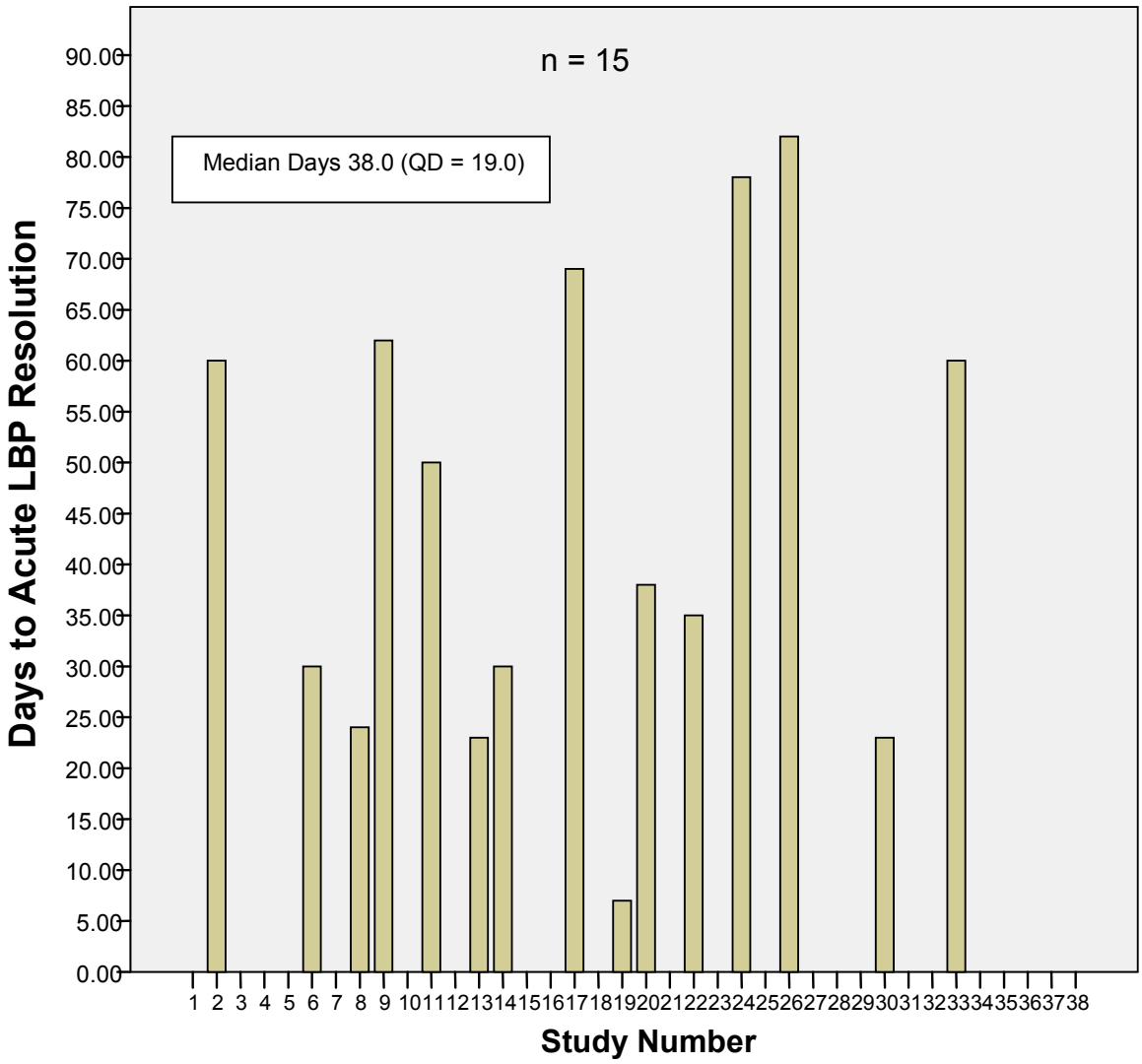
physical work demands were not significantly associated with CLBP. Overall, the sample rated their supervisor's response to their injury favorably. However, self-rated pain ($p < .01$) and worker's perception of whether their supervisor reviewed their worker's rights with them following the LB injury ($p<.04$) were significantly associated with the CLPB group. This may suggest employer bias in responding to workers report of injury

Table IV-10. Simple Logistic Regression Predicting CLBP (n = 38)

Variable	Odds Ratio	Significance	95% CI	
			Lower	Upper
Age	1.007	.81	.952	1.066
Gender	2.182	.26	.566	8.414
Pain Level (NRS)	1.611	.01	1.155	2.247
SF-12 Physical	.895	.01	.824	.972
SF-12 Mental	.984	.57	.933	1.039
Total ODI Score	1.105	.00	1.038	1.177
Total RMDQ	1.439	.00	1.122	1.846
Modify Job If Needed?	.469	.30	.111	1.980
Mean SPS Score	1.028	.31	.975	1.083
Job Satisfaction	1.245	.06	.994	1.561
Supervisor Blame You?	.452	.51	.042	4.821
Supervisor Help You?	.952	.94	.255	3.553
Supervisor Act Angry?	.243	.22	.025	2.329
Supervisor Question Injury?	.972	.97	.221	4.259
Supervisor Tell Where Get Medical Help?	.700	.61	.178	2.750
Supervisor Review Workers' Rights With You?	.208	.04	.046	.951
Supervisor Help Paperwork?	1.038	.96	.273	3.957

4. What is the estimated median time to self-reported recovery from acute low back pain? Fifteen (39.5%) worker's acute low back pain resolved within three months of the date of injury. The median time from injury to self-reported pain resolution (Figure IV-4) was 38.0 days (QD = 19.0 days).

Figure IV-5. Median Days from Injury to Pain Resolution (n = 15)



CHAPTER V.

DISCUSSION

The aim of the study was to investigate characteristics of workers with acute low back pain evaluated and treated in an urban occupational medical clinic early after report of injury and describe predictors associated with the development of chronic low back pain. A discussion of the findings and possible explanations for some of the differences are presented. Limitations, implications, and suggestions for future research are presented in this chapter.

Overall, in this study sample most workers (60.5%) with occupational acute low back pain reported persistent or recurrent chronic low back pain that lasted 3 months or longer after injury. This finding is inconsistent with the abundance of literature that suggests that acute LBP is usually temporary, with a high recovery rate of 80-90% by 12 weeks, regardless of the treatment (Andersson, 1999; Spitzer et al., 1987; Webster & Snook, 1994; van Doorn, 1995; Hansson & Hansson, 2000, & McConnell, 2002). However, the results are consistent with literature that question the evidence that most acute LBP resolves within one month due to lack of clear definitions and variations of studies in the literature (Hestbaek et al.,2003; & Wahlgren et al.,1997).

There is evidence in the literature that the demographic and clinical variables (age, gender, marital status, previous low back pain, radiating LBP, duration of LBP, and high functional disability score) are associated with chronic low back pain disability (Abenhaim et al., 1995, Gatchel et al., 1995, Infante-Rivard & Lortie, 1996, & George, 2002).

In this study sample previous low back pain, symptoms of radiating LBP, and median functional disability scores (ODI and RMDQ), and higher report of perceived LBP were significant predictors of CLBP. However, when predictors ODI, Previous LBP, and SF-12 Physical Component score were combined using multiple logistic regression, only ODI remained the only significant predictor of CLBP. The study did not find an association between the demographic variables (age, gender, and marital status) and the development of CLBP. Conclusions regarding predictors for CLBP are limited by the study design, the population sampled, and small sample size.

Work-related prognostic factors have been viewed as in part responsible for prolonged low back disability and are viewed as barriers to recovery (Schofferman, 2000, & Gatchel et al., 2002). Low self-assessed work ability, and a self-predicted absence status of not returning to work have been associated with longer time to return to work; as well as time off work, workers' compensation claim, job satisfaction, fear of re-injury (Reiso et al., 2003). None of these factors were significantly associated with CLBP in this study. A possible explanation is that workers in this sample were evaluated and treated .shortly following the work injury, most on the same day. Review of medical record notes indicated positive communication from the provider about the LB injury. Patients were instructed to remain active and at-home exercises were discussed promoting stretching and strengthening. Nearly all were instructed to return to work and work modifications were short-limited and evaluated at each follow-up clinic appointment. Work modifications primarily related to lifting restrictions. Follow-up visits were part of the treatment plan and chiropractic and physical therapy modalities were frequently implemented in the early days and weeks post-injury. Medication use

was minimal and muscle relaxants were the most frequently prescribed drug. Referrals to physician specialists were primarily for outpatient epidural injection for persistent, radicular symptoms that were not improving. Positive communication from the occupational providers to patients with acute LBP has been related to patient satisfaction and outcomes (Shaw et al., 2005); however, it is unknown if participants in this study were impacted by provider communication.

Limitations

This study has two important limitations. One is the small sample size with low statistical power. Therefore, a Type II error may occur concluding there is no significant difference between samples when actually there is a difference (Burns & Groves, 1997). Any conclusions of relationship (covariation) or differences among variables may not reflect the true population of workers with LBP due to lack of statistical conclusion validity (Cook & Campbell, 1979).

The second limitation is the descriptive, correlational study design which is non-randomized and not controlled. The nature of the study design limits conclusions but appropriately addresses the study question. No causal inferences can be made among predictors and the development of CLBP. Caution must be used in interpreting study findings

Only 17.5% of 270 potential study participants responded despite additional study mailings, reminder postcards, and study compensation. The non-responders may differ from the responders.

Strengths

This study is unique in that it targeted and accessed workers in an urban setting with recent episodes of acute low back pain (<2 weeks), primarily caused by lumbar sprain and strain, and then followed up 3 months or more later. This provided valuable information on the natural history of acute occupational LBP because workers did not know they were studied and therefore did not alter their behavior. The study suggests that more workers with acute low back pain may transition to CLBP, despite early evaluation, treatment, and positive communication from providers.

The study findings that previous LBP, radiating LBP symptoms, elevated pain intensity, perception of job satisfaction, ODI and RMQ LB disability scores, and HRQoL SF-12 Physical Component Score were associated with the development of CLBP reinforces the need for early screening for disability risk factors at the initial medical evaluation of acute occupational LBP. Although prognostic factors, such as sciatica, have been identified as 'red flags' in acute low back pain clinical guidelines, clinicians may benefit from studies, such as this, that characterize nonmedical, employment factors associated with chronic LBP disability.

Research Significance and Practical Implications

Early screening for disability risk factors in occupational low back pain has been identified as a potential strategy for improving health and work outcomes (Shaw et al., 2005). Most of the findings in this study that were associated with the development of CLBP corroborate other study results. However, the proportion of workers with acute LBP that reported persistent pain and physical limitations 3 months or longer following a

lumbar musculoskeletal strain or sprain was significantly higher and differs from the literature. This study contributes to the knowledge of occupational LBP, both acute and chronic, however, the low response rate suggests an alternate study methodology is needed to gain information from the portion of the workers with acute LBP in this urban setting that chose not to participate by completing a mailed questionnaire. A prospective study with patient and clinician assessment of disability risk factors at the initial medical evaluation of acute occupational LBP, along with follow-up outcome measurement is indicated to further the identification of those workers whose acute LBP does not spontaneously resolve.

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APPENDIX

Low Back Pain Study Questionnaire

Please read the instructions carefully. The following questions ask you about your health within the past year following a visit to the ***Emeryville Occupational Medical Center.*** At that visit, you had low back pain symptoms. Your answers to these questions will help me learn more about work-related low back pain and how it affects you and your work.

- Please complete this questionnaire in a quiet place. Keep in mind that there are **no right or wrong** answers. The questions are designed to get your opinions.

- Feel free to **write any comments** you have in the space provided at the end of the questionnaire or next to questions on which you have comments.

- This questionnaire will take about **20 to 25 minutes** to complete. Please feel free to pause. When you are finished, please put the questionnaire in the enclosed stamped envelope and drop it in the mail. Thank you very much for your time.

Statement of Confidentiality

Your answers are strictly confidential and are used for research purposes only. Your information is not linked to your name or other identifying personal health information and is not seen by your employer or medical provider.

Thank you!

Today's Date: _____/_____/_____
Month Day Year

Your Low Back & Your Work

The first set of questions refers to low back symptoms for which you were <u>first</u> seen at the Emeryville Occupational Medical Center.

1. Did the low back pain that you had when you were first seen at the Emeryville Occupational Medical Center <u>last 3 months or longer</u>?

☐ No

☐ Yes

2. Approximately, when did the low back pain start?

_____/_____/_____

Month Day Year

3. Was this the first time you experienced low back pain?

☐ No

☐ Yes

4. After you were seen at the Emeryville Occupational Medical Center did you reach a point in time when you were free of low back pain?

☐ No

☐ Yes

<u>If Yes,</u> what is the approximate date when you were free of low back pain?

_____/_____/_____

Month Day Year

Comments_____

_____

5. Please briefly describe what you were doing at the time of the injury or when the pain began:

_____

_____

6. On a scale from 0 to 10, how much pain in your back do you have <u>RIGHT NOW</u>? (0 = no pain at all; 10 = worst pain you can imagine) Please Circle Only <u>One</u> Number.

0 1 2 3 4 5 6 7 8 9 10

"No Pain at all" "Worst Pain I can imagine"

7. Since the episode of back pain that <u>first</u> brought you to the Emeryville Occupational Medical Center began, how has your pain changed?

- ☐ greatly improved
- ☐ somewhat improved
- ☐ about the same
- ☐ somewhat worse
- ☐ a great deal worse

8. Have you missed work for at least one day as a result of the back pain that <u>first</u> brought you to the Emeryville Occupational Medical Center?

- ☐ No
- ☐ Yes

9. Since your <u>first visit</u> to the Emeryville Occupational Medical Center, how many complete work days or shifts have you missed due to low back pain symptoms? (Please do not count part days)

_____

Days/Shifts

10. Since your <u>first visit</u> to the Emeryville Occupational Medical Center, have you had any of the following? (Please check <u>all</u> that apply)

_____ New Injury to my low back

_____ Re-Injury of my low back

_____Back Surgery

Comments_____

_____

11. Was a Workers' Compensation Claim filed following your evaluation at the Emeryville Occupational Medical Center?

☐ No

☐ Yes

☐ Don't know

The next set of questions has to do with your employment.

12. How many months or years have you been with your present employer?

_____ Months or Years (Please circle <u>either</u> months or years)

13. Is this the same employer as when you <u>first</u> went to the Emeryville Occupational Medical Center with low back pain?

☐ No

☐ Yes

If Yes, please answer the following questions:

a. Are you employed in the same job you were in when you injured your back?

☐ Yes ☐ No

b. Are you employed with the same duties? ☐ Yes ☐ No

c. Did you modify your job duties because of your low back pain?

☐ Yes ☐ No

If No, please answer the following questions:

a. Are you employed in the same type of work you were in when you injured your back? ☐ Yes ☐ No

b. Did you change jobs because of your low back pain? ☐ Yes ☐ No

c. Did you modify your job duties because of your low back pain? ☐ Yes ☐ No

Comments_____

_____

14. Employers, including supervisors or other managers, may have different kinds of reactions to a work injury. Right after your back pain began, did your supervisor…?

a. blame you for the injury? ☐ Yes ☐ No

b. try to help you? ☐ Yes ☐ No

c. act angry at you for being off work? ☐ Yes ☐ No

d. question whether you were really hurt? ☐ Yes ☐ No

e. tell you where to go to get medical help? ☐ Yes ☐ No

f. review your workers' rights with you? ☐ Yes ☐ No

g. explain and/ or help you with any required paperwork? ☐ Yes ☐ No

h. discourage you from filing an injury report or workers' compensation claim?

☐ Yes ☐ No

15. On a scale from 1 to 10 how physically demanding is your present job? (1 = very light work, 10 = very hard work) Please Circle Only <u>One</u> Number.

1 2 3 4 5 6 7 8 9 10

"very light work" "very hard work"

The next section asks about your work experiences in the <u>past 4 weeks</u>. In thinking about how low back pain affected your ability to do your job, how often:

16. Were you able to finish hard tasks?

☐ Always ☐ Frequently ☐ About half the time ☐ Occasionally ☐ Never ☐ No answer

17. Did you find your attention wandering?

☐ Always ☐ Frequently ☐ About half the time ☐ Occasionally ☐ Never ☐ No answer

18. Were you able to focus on achieving work goals?

☐ Always ☐ Frequently ☐ About half the time ☐ Occasionally ☐ Never ☐ No answer

19. Did you feel energetic enough to work?

☐ Always ☐ Frequently ☐ About half the time ☐ Occasionally ☐ Never ☐ No answer

20. Were the stresses of your job hard to handle?

☐ Always ☐ Frequently ☐ About half the time ☐ Occasionally ☐ Never ☐ No answer

21. Did you feel hopeless about finishing your work?

☐ Always ☐ Frequently ☐ About half the time ☐ Occasionally ☐ Never ☐ No answer

22. Were you able to focus on finding a solution when unexpected problems arose in your work?

☐ Always ☐ Frequently ☐ About half the time ☐ Occasionally ☐ Never ☐ No answer

23. Did you need to take breaks from your work?

☐ Always ☐ Frequently ☐ About half the time ☐ Occasionally ☐ Never ☐ No answer

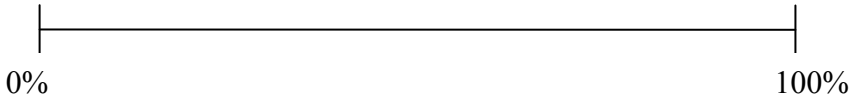
24. Were you able to work with other people on shared tasks?

☐ Always ☐ Frequently ☐ About half the time ☐ Occasionally ☐ Never ☐ No answer

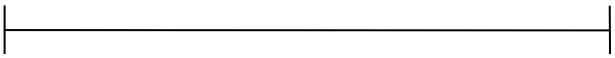
25. Were you tired because you lost sleep?

☐ Always ☐ Frequently ☐ About half the time ☐ Occasionally ☐ Never ☐ No answer

26. Given your low back condition, what <u>percentage</u> of your usual productivity level were you able to achieve while working over the <u>last 4 weeks</u>? (Please place X on the continuous line from 0 – 100%)



27. Because of your low back condition, how many work hours did you miss in the <u>past 4 weeks?</u> (Please place X on the continuous line from 0 – 40+ hours)



0 hours 40 + hours

The following questions pertain to <u>any prior back pain</u> that you have had and any treatment that you have received for your recent back pain.

28. Had you ever seen a medical doctor for back pain before this episode?

☐ Yes ☐ No

<u>If No,</u> please SKIP TO QUESTION 29.

<u>If Yes…</u>

a. Severe enough that you had to restrict your activities? ☐ Yes ☐ No

b. Severe enough that you had to stay home from work? ☐ Yes ☐ No

c. Ever had back surgery? ☐ Yes ☐ No

Comments_____

_____

29. Since you were <u>first</u> seen at the Emeryville Occupational Medical Center, how many of the following health care providers have you seen <u>because of your low back pain</u> symptoms? (Please Check <u>all</u> that apply)

_____Nurse Practitioner # Visits_____

_____Chiropractor # Visits_____

_____Physical Therapist # Visits_____

_____Medical Doctor # Visits_____

_____Orthopedist # Visits_____

_____Neurologist # Visits_____

_____Spine Surgeon # Visits_____

_____Massage Therapist # Visits_____

_____Herbalist # Visits_____

_____Spinal Injection Doctor # Visits_____

_____Acupuncturist # Visits_____

_____Psychologist/psychiatrist # Visits_____

_____Anesthesiologist # Visits_____

_____OTHER (PLEASE DESCRIBE_____ # Visits_____

_____OTHER (PLEASE DESCRIBE_____ # Visits_____

Comments:

_____

_____

30. If you needed to go back to work on restricted or modified duty, do you believe your employer would allow it? ☐ No ☐ Yes

31. On a scale from 1 to 10 how much do you <u>enjoy</u> your present job? (0 = I don't enjoy it at all, 10 = enjoy it a lot)

0 1 2 3 4 5 6 7 8 9 10

"Don't enjoy it at all" "Enjoy it a lot"

32. How worried are you that future physical activity may increase your back pain or result in re-injury?

☐ extremely concerned
☐ very concerned
☐ somewhat concerned
☐ a little concerned
☐ not concerned at all

33. Do you think that you will be able to do your regular job, without any restrictions, 4 weeks from now?

- ☐ definitely
- ☐ probably
- ☐ not sure
- ☐ unlikely
- ☐ no

34. Before this episode of back pain, how often did you engage in at least moderate exercise (activities like walking, jogging, and cycling)?

- ☐ never
- ☐ rarely
- ☐ once per week
- ☐ 2-3 times per week
- ☐ more than 4 times per week

35. How much of the time during the past week have you felt under stress?

- ☐ all of the time
- ☐ most of the time
- ☐ a good bit of the time
- ☐ some of the time
- ☐ a little of the time
- ☐ none of the time

LOW BACK PAIN & EVERYDAY LIFE

These questions refer to low back pain and everyday life. Please answer every section, and <u>select the one answer</u> that best applies to you during the <u>past one week.</u> (Please check only <u>one</u> answer in each section).

36. Pain Intensity (<u>Check one only</u>)

- ☐ I have no pain at this moment
- ☐ The pain is very mild at the moment
- ☐ The pain is moderate at the moment
- ☐ The pain is fairly severe at the moment
- ☐ The pain is very severe at the moment
- ☐ The pain is the worst imaginable at the moment

37. Personal Care (washing, dressing, etc.) (<u>Check one only</u>)

- ☐ I can look after myself normally without causing extra pain
- ☐ I can look after myself normally, but it is very painful
- ☐ It is painful to look after myself and I am slow and careful
- ☐ I need some help, but manage most of my personal care
- ☐ I need help every day in most aspects of self care
- ☐ I do not get dressed, wash with difficulty, and stay in bed

38. Lifting (<u>Check one only</u>)

- ☐ I can lift heavy objects without extra pain
- ☐ I can lift heavy objects, but it gives extra pain
- ☐ Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned, e.g. on a table.
- ☐ Pain prevents me from lifting heavy weights, but I can manage light to medium weights if they are conveniently positioned.
- ☐ I can lift only very light weights
- ☐ I cannot lift or carry anything at all

39. Walking (<u>Check one only</u>)

- ☐ Pain does not prevent me walking any distance
- ☐ Pain prevents me from walking for more than 1 mile
- ☐ Pain prevents me from walking for more than ¼ mile
- ☐ Pain prevents me from walking for more than 100 yards
- ☐ I can only walk using a stick or crutches
- ☐ I am in bed most of the time and have to crawl to the toilet

40. Sitting (<u>Check one only</u>)

- ☐ I can sit in any chair as long as I like
- ☐ I can sit in my favorite chair as long as I like
- ☐ Pain prevents me from sitting more than 1 hour
- ☐ Pain prevents me from sitting more than ½ hour
- ☐ Pain prevents me from sitting more than 10 minutes
- ☐ Pain prevents me from sitting at all

41. Standing (<u>Check one only</u>)

- ☐ I can stand as long as I want without extra pain
- ☐ I can stand as long as I want, but it gives me extra pain
- ☐ Pain prevents me from standing for more than 1 hour
- ☐ Pain prevents me from standing for more than ½ hour
- ☐ Pain prevents me from standing for more than 10 minutes
- ☐ Pain prevents me from standing at all

42. Sleeping (<u>Check one only</u>)

- ☐ My sleep is never disturbed by pain
- ☐ My sleep is occasionally disturbed by pain
- ☐ Because of pain I have less than 6 hours sleep
- ☐ Because of pain I have less than 4 hours sleep
- ☐ Because of pain I have less than 2 hours sleep
- ☐ Pain prevents me from sleeping at all

43. Sex Life (Check one only)

- ☐ My sex life is normal and causes no extra pain
- ☐ My sex life is normal, but causes some extra pain
- ☐ My sex life is nearly normal, but is very painful
- ☐ My sex life is severely restricted by pain
- ☐ My sex life is nearly absent because of pain
- ☐ Pain prevents any sex life at all

44. Social Life (Check one only)

- ☐ My social life is normal and gives me no extra pain
- ☐ My social life is normal, but increases the degree of pain
- ☐ Pain has no significant effect on my social life apart from my limiting my more energetic interests, e.g. sports, etc.
- ☐ Pain has restricted my social life and I do not go out as often
- ☐ Pain has restricted my social life to my home
- ☐ I have no social life because of pain

45. Traveling (Check one only)

- ☐ I can travel anywhere without extra pain
- ☐ I can travel anywhere, but it gives extra pain
- ☐ Pain is bad, but I manage journeys over two hours
- ☐ Pain restricts me to journeys of less than one hour
- ☐ Pain restricts me to short necessary journeys under 30 minutes
- ☐ Pain prevents me from traveling except to receive treatment

The next section refers to how you feel today.

46. When your back hurts, you may find it difficult to do some of the things you normally do. Mark only the sentences that describe you today. (Please mark all that apply)

- ☐ I stay at home most of the time because of my back.

- ☐ I change position frequently to try to get my back comfortable.
- ☐ I walk more slowly than usual because of my back.
- ☐ Because of my back, I am not doing any jobs that I usually do around the house.
- ☐ Because of my back, I use a handrail to get upstairs.
- ☐ Because of my back, I lie down to rest more often.
- ☐ Because of my back, I have to hold on to something to get out of an easy chair.
- ☐ Because of my back, I try to get other people to do things for me.
- ☐ I get dressed more slowly than usual because of my back.
- ☐ I only stand for short periods of time because of my back.
- ☐ Because of my back, I try not to bend or kneel down.
- ☐ I find it difficult to get out of a chair because of my back
- ☐ My back is painful almost all of the time.
- ☐ I find it difficult to turn over in bed because of my back.
- ☐ My appetite is not very good because of my back.
- ☐ I have trouble putting on my sock (or stockings) because of the pain in my back.
- ☐ I can only walk short distances because of my back pain.
- ☐ I sleep less well because of my back.
- ☐ Because of my back pain, I get dressed with the help of someone else.
- ☐ I sit down for most of the day because of my back.
- ☐ I avoid heavy jobs around the house because of my back.
- ☐ Because of back pain, I am more irritable and bad tempered with people than usual.
- ☐ Because of my back, I go upstairs more slowly than usual.
- ☐ I stay in bed most of the time because of my back.

The following set of questions asks for your views about <u>your health</u>. Please answer every question by marking <u>one</u> box. If you are unsure about how to answer, please give the best answer you can.

47. In general, would you say your health is?

- ☐ Excellent
- ☐ Very Good
- ☐ Good
- ☐ Fair
- ☐ Poor

The following questions are about activities you might be doing during a typical day. Does your health now limit you in these activities? If so, how much?

48. Moderate activities such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?

- ☐ Yes, limited a lot.
- ☐ Yes, limited a little.
- ☐ No, not limited at all.

49. Climbing several flights of stairs?

- ☐ Yes, limited a lot.
- ☐ Yes, limited a little.
- ☐ No, not limited at all.

50. During the <u>past 4 weeks</u>, have you had any of the following problems with your work or other daily activities as a result of your <u>physical health</u>?

a. Accomplished less than you would like ☐ Yes ☐ No

b. Were limited in the kind of work or other activities ☐ Yes ☐ No

51. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

a. Accomplished less than you would like? ☐ Yes ☐ No

b. Didn't do work or other activities as carefully as usual? ☐ Yes ☐ No

52. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

☐ Not at all ☐ A little bit ☐ Moderately ☐ Quite a bit ☐ Extremely

These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks…

53. Have you felt calm and peaceful?

☐ All of the time
☐ Most of the time
☐ A good bit of the time
☐ Some of the time
☐ A little of the time
☐ None of the time

54. Did you have a lot of energy?

☐ All of the time
☐ Most of the time
☐ A good bit of the time
☐ Some of the time
☐ A little of the time
☐ None of the time

55. Have you felt downhearted and blue?

- ☐ All of the time
- ☐ Most of the time
- ☐ A good bit of the time
- ☐ Some of the time
- ☐ A little of the time
- ☐ None of the time

56. During the past 4 weeks, how much of the time has your <u>physical health or emotional problems</u> interfered with your social activities (like visiting with friends, relatives, etc.)?

- ☐ All of the time
- ☐ Most of the time
- ☐ A good bit of the time
- ☐ Some of the time
- ☐ A little of the time
- ☐ None of the time

57. Are there other aspects of your low back injury that I should know about?

_____

_____

_____

<u>Thank you</u> for completing this questionnaire!

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