EVALUATING OUTCOMES OF A RETURN-TO-WORK REHABILITATION PROGRAM FOR PATIENTS WITH WORK-RELATED LOW BACK PAIN

by

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Abstract

Purpose: The overall aim of this thesis is to contribute new knowledge by examining psychosocial factors and return-to-work profiles of occupational low back pain patients in a rehabilitation clinic. Outcome measures for injured workers with subacute low back pain included: change in measures, program utilization, pain profiles and return-to-work. Methods: A total of 147 patients who met the eligibility criteria and consented, participated in a clinic-based, individualized, exercise-based treatment that included patient education and reassurance. A before-and-after design was used, with data collection on admission to and discharge from the program. Results: Pre-to-post analyses revealed that statistically significant improvements had occurred. However, subgroup analyses revealed differences in responses to treatment among the subgroups. Specifically, two sets of cluster analyses were conducted; each yielded two distinct subgroups of patients, one set with different lengths of time in the program, and another showing two pain intensity profiles. Furthermore, return-to-work rates varied between the groups although the overall return-to-work rate appeared high. Conclusion: Significant improvement was achieved following participation in the return-to-work rehabilitation program. However, participants with subacute nonspecific low back pain do not form a homogenous group in terms of their clinical presentation and responses to rehabilitation. Therefore, special attention might be warranted for subgroups within the sample, whom are at an increased risk for prolonged disability.
Co-Authorship

Dr. Marc Corbiere (University of Sherbrooke) contributed to the analysis reported in Chapter 7. Dr. Joan M. Stevenson (Queen’s University) was senior author and provided valuable expertise in reviewing and improving the manuscript (in press) based on the results reported in Chapter 7.
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Dedication

To my parents, Nester and Alfred Mngoma.
To my wonderful children, Ayanda, Tshepo and Yolanda.
I love you all.
Outline of Thesis

This thesis is organized in the following sections: Chapter 1 provides a brief background to the problem of low back pain, the rationale, research questions, hypotheses and objectives; and Chapter 2 the review of the literature; Chapter 3 provides a detailed description of the return-to-work rehabilitation program that was the setting for the study. Each of the four objectives is addressed in a separate chapter (Chapters 4 through 7). The main methods are described at the beginning of Chapter 4 and any other additional information on methods relevant only to a specific chapter is described at the beginning of that chapter. A summary of findings is provided at the end of each results chapter, and general discussion, limitations, and recommendations appear at the end of the thesis.
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Chapter 1
Introduction

Low back pain (LBP) is one of North America’s most challenging and costly occupational health problems. LBP within the context of this thesis refers to nonspecific low back pain, and excludes specific cases of low back pain as a result of “red flag”\(^1\) conditions such as tumours, infections, or fractures. It is estimated in the USA and Canada, for example, that nearly 80% of the population will suffer from significant LBP at least once in their lifetime (Frank et al., 1998). In Canada, soft tissue injuries in the Ontario workforce account for between 60% and 65% of all lost time claims, 40% of which are back injuries (Frank et al., 1998). The high socioeconomic cost of work-related LBP and associated disability has led to increased focus on rehabilitation interventions that are effective.

The healthcare system represents one dimension of a dynamic interaction of multiple factors believed to determine the outcome of a back pain episode (Loisel et al., 2001). The healthcare system in general, and the actions of healthcare providers such as physicians and physiotherapists, in particular, has been implicated in the iatrogenesis of low back disability (Spitzer, 1993). Excessive diagnostic testing, unnecessary or excessively prolonged therapy, the use of inconsistent diagnostic labels, and other similar actions have been linked to increased disability claims rates (Deyo, 2000; Loisel et al., 2001). While it is important to heed this caution, the challenge for healthcare providers is likely to be finding the balance between excessive treatment and adequate treatment.

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\(^{1}\) “Red flags” is a term used to denote back pain conditions indicative of serious spinal pathology.
The overall aim of this thesis was to contribute new knowledge regarding various patient profiles to further our understanding of psychosocial factors and return-to-work in the field of occupational low back pain. In addition to determining change in measures and program outcomes, one of the objectives of the current work was to identify distinct subgroups within the study sample, based on the utilization of rehabilitation services and responses to the program. Furthermore, the differences in the characteristics of the subgroups were determined. This information could be used to inform clinicians and program administrators about the specific and different needs of their patients. Policymakers, particularly within the compensation system, could also benefit from information demonstrating that injured workers with low back pain have different healthcare needs. If this is true, then perhaps current policies that dictate the same eligibility criteria for all workers within a clinical group may need to be reviewed.

1.1 Rationale

In the Ontario workers’ compensation jurisdiction, published studies evaluating outcomes associated with outpatient return to work rehabilitation programs for injured workers are limited. Furthermore, little is known about the extent of utilization of services, particularly with regard to associated clinical factors. Although it is understood that, beyond the guidelines of the specific compensation program, the patient-therapist interaction often influences how long patients remain in a given program, only limited attention has been given to exploring some of the clinical factors that may be associated with program utilization, particularly within rehabilitation programs for workers with low back pain. Even less understood are the characteristics of the participants who end up as
high service users, and whether their differences from low service users are apparent at the start of the program. Therefore, the current research was undertaken to add to key stakeholders’ understanding of the return-to-work rehabilitation program in relation to the profile of participants who use the program, the degree of possible change in clinical measures and patterns of utilization along with associated factors.

1.2 Research Questions
The current study sought to answer four main research questions related to the admission characteristics of participants with low back pain, upon entry into a rehabilitation program. But before subgroup analysis into program utilization could be undertaken, it was necessary to establish the parameters of the program. Therefore, the first question was: “What is the degree of change in measures that could be achieved as a function of participation in the program?” Participants’ pre- and post-test scores on select measures were compared with population norms. The second question was: “What are the factors associated with program success, as determined by return to work (RTW) and improvement in perceived disability?” As well, the characteristics of those who returned to work versus those who did not were determined. The third question looked at, “Are there different patterns of rehabilitation service utilization among injured workers with low back pain? If so, what are the distinguishing characteristics?” The final research question was: What are the pain intensity profiles within the study sample?
1.3 Hypotheses

In regard to question 1, the studies were structured to test the hypotheses that there will be statistically significant improvements in the measures between admission and discharge of LBP participants in a return-to-work rehabilitation program; and that, while there will be differences between admission scores and population normative data, these differences will be minimal at discharge. Additional hypotheses were that there will be significant differences in pain, psychosocial distress, anxiety, depressive symptoms, perceived disability, and quality of life measures between those who returned to work and those who failed to do so. As well, it was expected that different patterns of service utilization and different pain profiles among the participants would emerge.

1.4 Objectives

The four objectives of the study are restated at the beginning of each corresponding results chapter (chapters 4 through 7). The objectives of the study were to:

- Determine change in measures pre-to-post program participation and evaluate outcomes of the program relative to (population level) normative data;
- Determine factors associated with three program outcomes: return to any work, return to prior work, and perceived disability at discharge; compare the RTW and non-RTW groups in terms of pain, psychosocial distress, anxiety and depressive symptoms, perceived disability, and quality of life measures;
• Identify subgroups by extent of service use and compare their characteristics (high versus low service users), in order to determine whether the groups were different in their experiences of the rehabilitation process; and

• Identify pain profiles and determine differences in the main characteristics of the profiles.
Chapter 2
Literature Review

A review of selected literature was conducted that included the extent of the problem of low back pain, the course of low back pain, and some of the interventions that have been used in the management of low back pain.

The multi-factorial nature of LBP makes its resolution a complicated process, meaning that multiple individual and system factors determine its course. The healthcare system (specifically, the response of healthcare providers) plays a significant role in the progression of LBP. For example, the most comprehensive guidelines caution against excessive medical/clinical intervention in order to avoid overmedicalizing low back pain (AHCPR, 1994).

While there are numerous responses to the problem of low back pain, the disability associated with LBP continues to pose a challenge to all stakeholders involved, particularly as a relatively small proportion of individuals is responsible for the majority of disability and associated compensation costs (Hunt et al, 2002). Participants who are off work with low back pain have been shown to report higher pain and disability scores than people who are working (Truchon, 2000). Therefore, subgroup analysis by work status may be important in determining the prognosis of return-to-work. It remains unclear if the prognosis of participants initially off work is worse than those who are not.

Similarly, Durand & Loisel (2001) and Faber et al. (2006) have raised the question of whether being back at work itself has a positive or therapeutic effect on the resolution/outcome of an episode of low back pain. It is probable that the strategies currently used in the management of low back pain need to be tailored to the specific
group of individuals at an increased risk of chronicity. Therefore, it is important to continue to refine the ways in which these individuals are identified from a number of different clinical populations and settings, such as patients consulting in a general outpatient physiotherapy clinic. As well, there is a need for ongoing evaluation of healthcare services and programs in order that clinicians, payers and policymakers continue to learn more about the users, their needs, and treatment outcomes.

A number of rehabilitation interventions that have been used for the treatment of nonspecific LBP include active and passive therapies, ranging from educational interventions to intensive functional restoration programs. In addition to the sociopolitical context (e.g., compensation and healthcare system), the type of therapy chosen will mostly be dictated by the model of diagnosis and treatment (theoretical framework) within which LBP is viewed; these tend to vary in clinical practice. For example in the biomedical model, biological pathology is responsible for illness, with mind and body considered as separate entities. Typical in this approach is the heavy reliance on diagnostic testing, with a belief that once the underlying pathology has been identified, then a cure, usually in a form of physical treatment modalities, can be undertaken. Psychosocial factors are generally not taken into account in this approach. By contrast, the main tenet of the biopsychosocial model is that an individual’s response to injury (such as nonspecific LBP) is multidimensional and that impairment does not reliably predict disability. In this model, pain is seen as a function of several systems, including the biological (organic), physical, psychological, and social. Treatment in this model is focused more on reduction of disability and improvement of quality of life rather than curing the impairment (Gatchel, 2004). Generally, evidence of effectiveness for most of
the rehabilitation interventions is lacking. Positive outcome of interventions/ prevention efforts will depend on successful identification of various high-risk subgroups of individuals, and then tailoring interventions to target specific risk factors.

2.1 Definition of Low Back Pain

LBP is a term typically used to refer to pain, muscle tension, or stiffness (van Tulder et al., 2002) occurring anywhere on the back from below the shoulder blades to just above the cleft of the buttocks (Heymans et al., 2004), with or without associated leg pain (van Tulder et al., 2002). “Nonspecific” or “simple” LBP, the type most commonly seen in primary care (Koes et al., 2006), has been defined as LBP with no specific identifiable cause, such as infection, neoplasm, metastasis, osteoporosis, rheumatoid arthritis, fracture or inflammatory process (Loisel, 2002; McCarthy et al., 2004; Koes et al., 2006). In a study of primary care patients consulting with LBP, Deyo et al. (1992) reported that 90% had no identifiable cause, 4% had a compression fracture, 3% spondylolisthesis, 0.7% tumour or metastasis, and 0.01% infection.
2.2 Epidemiology of Low Back Pain

LBP is one of the most common benign medical conditions in the working age population, worldwide, and has high incidence and prevalence rates (van Tulder et al., 2002). To facilitate the discussion of the epidemiology of low back pain, a number of key terms will be defined. Incidence refers to the proportion of the population of interest reporting a first episode of LBP in a given period of time (van Tulder et al., 2002; Waddell, 2004). Prevalence refers to the proportion of the population of interest that has or has had LBP (van Tulder et al., 2002; Waddell, 2004). Prevalence rates can be described as: occurrence rates at a particular point in time (point prevalence), during a specified period of time (period prevalence), or ever in a lifetime (lifetime prevalence) (van Tulder et al., 2002; Waddell, 2004).

Reports of low back pain statistics from various countries around the world seem to indicate that the estimated lifetime prevalence rates range from 59 to 84% (Walker, 2000). Van Tulder et al. (2002) have reported an estimated lifetime prevalence of 49 to 70%, point prevalence of 12 to 30%, and period prevalence of 25-42%. In a Dutch study conducted between 1993 and 1995, and involving 13,927 participants from the general population, the 12-month prevalence was 49.2% (van Tulder et al., 2002). On the other hand, in another report, the incidence of non-consulting episodes of LBP over the same period was 31% in males and 32% in females (Papageorgiou et al., 1996).

The burden and costs associated with back problems in Canada are similar to those reported in other industrialized countries. For example, an estimated 3.1 million
Canadian adults (13.6% of the adult population) reported having chronic back problems, including over 1 million new cases in the 1996/97 National Population Health Survey (NPHS) (Perez, 2000). Gross et al. (2006), in a population-based survey in two Canadian provinces, found 83.8% lifetime prevalence and 34.2% 1-week prevalence of low back pain, with 12.3% reporting a period of work absence related to their last episode of low back pain.

In the 1996/97 survey, 39% of those with a chronic back problem reported activity restriction compared with 13% of Canadians without a chronic back problem (Perez, 2000). As well, the group with chronic back problems also reported more frequent episodes of pain or discomfort, more disability days, greater use of pain medications, and higher use of healthcare services compared to those without chronic back problems (Perez, 2000).

To further illustrate the burden imposed by LBP on the Canadian population, the 1996/97 NPHS revealed statistically significant differences in a number of health-related areas between those with diagnosed chronic back problems and those without. In terms of healthcare utilization in the previous year, those with back problems reported 6.4 and 2.8 mean number of visits to physicians and physiotherapists, respectively, while the corresponding figure for those without back pain were 3.8 and 0.6, respectively. The trend was similar for visits to other healthcare providers (Perez, 2000). A greater percentage of Canadian adults who were followed in the longitudinal sample reported newly diagnosed chronic back problems in the 1996/07 NPHS (43.3%) than in the 1994/95 survey (23.9%) (Perez, 2000). It has been estimated that 30-40% of all lost work time in Canada is due to low back pain.
Low back pain is costly to individuals and society in both monetary and non-monetary terms. Monetary costs can be expressed as direct (i.e., costs associated with health care for back pain) and indirect costs (i.e., those associated with loss of work time and disability) (van Tulder et al., 2002). Compensation costs can also include wage replacement costs for the injured worker and costs associated with training of replacement staff, or additional staffing to supplement the worker who is on modified duties. There are several studies of direct and indirect costs from other countries in the scientific literature. In the Netherlands, a larger proportion (92.6%) of the estimated total costs for back pain (US$3.7 billion in 1991) were associated with indirect costs, amounting to US$3.4 billion (US$2.4 billion incurred due to work loss and 1.0 billion due to disability) (van Tulder et al., 2002). Therefore, from these statistics, it is clear that while healthcare costs for LBP are high, the indirect consequences are more costly, even before factoring in the non-monetary human costs.

Although many studies tend to focus on absenteeism, LBP has also been associated with high loss of productivity in those who continue to work. Sometimes reduced performance due to health-related conditions has been shown to account for four times more lost time than absenteeism (Stewart et al., 2003). For example, the American Productivity Audit, which surveyed a nationally representative sample of the United States workforce, found that of the US$19.8 billion in total productive time lost primarily due to LBP (2002), US$13.8 billion was associated with those at work but work impaired (Stewart et al., 2003). Furthermore, none of the estimates included indirect costs of hiring and training replacement costs or the toll it takes on co-workers who have to perform additional duties to compensate for their colleagues (Stewart et al., 2003).
There are conflicting estimates regarding the rates of low back pain in men and women. For example, while Garg and Moore (1992) reported that women were at a higher risk for work-related back problems and for filing associated compensation claims, MacDonald et al. (1997) found that the majority of injured workers with one or more claims were young men. On the other hand, van Tulder et al. (2002), commenting on a 1991 publication of a study including 335,000 primary care patients conducted in the Netherlands between April 1987 and April 1988, observed that the incidence of LBP was higher for men (32.0) than for women (23.2). The overall incidence of LBP was 28.0 episodes/1000 persons per year (van Tulder et al., 2002). In the UK, in a longitudinal study of 2,715 adults who were LBP-free at baseline, the 12-month cumulative incidence of new consulting episodes was 3% in men and 5% in women, while the rates for new non-consulting episodes were 31% in men and 32% in women (Papageorgiou et al., 1996). In Canada, the two-year incidence was similar for male (9.2%) and female (8.6%) workers (Perez, 2000).

These data highlight the magnitude of the low back pain problem and the burden to individuals and society. Studies that improve the understanding of interventions and responses to interventions have an important role in helping find solutions to the back pain problem and related disability.
2.3 Course of Low Back Pain

Several studies have described the course of LBP in a variety of settings (Pengel et al., 2003). Many of the studies have shown that the majority of work-related LBP cases resolve spontaneously and without complications (Von Korff & Saunders, 1996; van Tulder et al., 2002). Other studies, however, illustrate a different picture, showing a course of back pain that is marked by fluctuations and recurrences (von Korff & Saunders, 1996).

The natural evolution of low back pain follows three fairly distinct stages (Beals & Hickman, 1972; Shelton & Robinson, 1991; Frank et. al., 1996). These stages are: the acute (less than four weeks after injury), the subacute (four to 12 weeks) and the chronic stage (beyond 12 weeks) (Frank et. al., 1996). The majority of low back cases in the acute and subacute phases seem to recover reasonably well without too many complications. For example, Frank et al (1996), in a study following the recovery of a cohort of injured workers with back pain, found that approximately 52% of individuals with simple low back pain returned to work within three to four weeks of injury, regardless of the intervention; approximately 80% were back to work by the end of the first three months. Others have concurred that marked reductions in pain and disability are typically noted approximately six weeks after onset of simple or non-specific LBP (Pengel et al., 2003).

Ample reported evidence has shown that once progression has been made from the subacute to chronic stage, a host of problems will manifest (Von Korff & Saunders, 1996; Frank et al., 1996). Indeed, very little change has been noted once pain or disability
persists past three months (Pengel et al., 2003). Therefore, if low back pain progression can be arrested at the acute or even subacute phase, many of the disabling sequelae can be avoided (Barnes, 1991; Burton, 1995; Frank et al., 1996). This is especially important since the likelihood of ever returning to work diminishes the longer one has been off work as a result of back pain.

The small percentage of workers still off work at six to 12 months is the group at risk of prolonged problems (Fordyce, 1995; Loeser, 1995; Waddell, 2004). This small group of cases that fail to resolve (5-10%), accounts for most (75-90%) of the costs in lost time and compensation claims, and utilization of healthcare services (Spitzer, 1987; Hunt et al., 2002, Perez, 2000). Therefore, efficacious and well-timed interventions are necessary to prevent transition to persistent pain and long-term disability.

Although most cases of simple back pain fall neatly into the three mentioned stages, some authors have expanded on the definition of the stages of back pain to include other presentations (von Korff, 1994; von Korff & Saunders, 1996; Croft et al., 1997). Von Korff (1994) and later von Korff & Saunders (1996) have described phases of low back pain as follows: transient (back pain present no more than 90 consecutive days with no recurrence), recurrent (back pain occurring in multiple episodes, on less than half the days in a 12-month period), and chronic (single or multiple episodes of back pain, on at least half the days in a 12-month period). Von Korff (1994) further describes “first onset” and “flare-up” episodes: first onset refers to the first occurrence of back pain in the person’s lifetime, whereas flare-up refers to an episode where back pain is more severe than is usual for the patient and should be time limited (Von Korff, 1994). More recently, the Paris Task Force defined the stages of back pain as acute (complaints lasting up to
four weeks), subacute (complaints beyond four weeks and lasting up to 12 weeks) and chronic (complaints lasting more than 12 weeks) (Schoene, 1999). These phases have significant implications for the prognosis of low back pain (Von Korff, 1994; Von Korff & Saunders, 1996). Croft et al. (1997) have emphasized that the actual course of LBP is characterized by fluctuations in symptoms over time.

Rehabilitation programs that consider the phase specificity of low back pain have a better chance of success than those that do not. For example, the Program of Care (PoC) for Acute Low Back Injuries (ALBI) of the Workplace Safety and Insurance Board (WSIB) of Ontario, Canada, is one such program. It provides an algorithm outlining key actions by clinicians for various stages of low back pain, with the overall aim of improving clinical outcomes, reducing disability, and improving participants’ quality of life. Studies that improve the understanding of how subgroups of clients respond to treatments are important in order to tailor intervention for greater success.

### 2.4 Psychosocial Risk Factors in Low Back Pain

For purposes of this thesis, the discussion of risk factors in low back pain will include both the risk factors for back pain and those associated with persistent pain and work disability. The literature on back pain tends to distinguish between risk factors associated with the first occurrence of an episode (i.e. onset of index episode) and those associated with the progression of low back trouble into the various consequences of low back pain, including persistent pain and work disability, medication, and healthcare use. Both physical and psychosocial factors have been implicated in low back disability. However,
due to the scope of this thesis, the discussion will be limited to psychosocial risk factors in back pain.

Although many psychosocial factors have been associated with low back pain and work disability, most can be grouped into individual or worker-related, and workplace or system-related psychosocial risk factors (Pincus et al., 2002; Waddell, 2004; Sullivan et al., 2005). A number of review studies on the risk factors in low back pain have been conducted. For example, a systematic review of workplace-related psychosocial factors as risk factors for back pain, reported by Hoogendoorn and colleagues (2000), found insufficient evidence of an effect of high work pace, job demands, job content, job control, and job latitude, as risk factors for back pain. There was some evidence to support low social support at work and poor job satisfaction as risk factors for back pain (Hoogendoorn et al., 2000).

The relationship between psychosocial and biomechanical risk factors continues to be debated. There is currently no agreement in the scientific literature on the relative contribution of each of these risk factors to the problem of low back pain. A number of pathways of how psychosocial work factors might be influencing low back pain have been proposed. For example, Davis & Heaney (2000) have suggested that biomechanical and psychosocial factors could each have an independent influence on back pain, or they could interact such that when psychosocial work conditions are poor, biomechanical demands have a greater influence on the etiology, reporting, or progression of low back pain. Another possible mechanism is that perhaps high biomechanical demands may be common in the same workplaces with poor psychosocial work characteristics, thus raising the possibility of confounding (Davis & Heaney, 2000). Some of the
biomechanical demands that have been implicated in the occurrence of low back pain include: heavy lifting, excessive sitting, standing, awkward postures, whole body vibration, static postures, and repetitive movements (Davis & Heaney, 2000).

Pincus and colleagues (2002) in a systematic review of predictors of chronicity concluded that psychological distress (including depressive symptoms), depressive mood, and somatization were consistently significant predictors of poor outcome, regardless of baseline pain and function. Other worker-related psychosocial risk factors that have been implicated in back pain and its consequences include: baseline levels of perceived pain and disability, pain-related fears, beliefs about back pain, catastrophic thinking, expectations of return to work, and many others (Sullivan et al., 2005).

### 2.5 Back Pain Disability

Disability resulting from low back pain is one of the most common causes of activity limitation in adults under the age of 45 years (Bradley et al., 1995; Frank et al., 1996; Andersson, 1999). Disability refers to restriction in a person’s ability to perform a function in a manner considered normal for a human being; for example, to walk or to have full use of one’s senses, or simply put, difficulty in performing an activity (Reneman et al., 2002). While work disability could be described as incapacity to perform work-related tasks as a result of a condition such as pain that causes a worker to miss at least one day of work (Loisel et al., 2005; Young et al., 2006), work disability may also be any situation where a worker is not able to perform at his/her optimal capacity as a result of, for example, persistent pain.
Work disability, as is often seen in patients with persistent work-related musculoskeletal disorders (WRMSDs), is a complex, multidimensional phenomenon influenced by a dynamic interaction of factors in many domains, including the physical, social, psychological, and environmental domains (Teasel & Merskey, 1997; Andersson, 1999; Loisel, et al., 2005), and in multiple systems, such as the worker, workplace, compensation, and healthcare systems (Loisel, et al., 2005; Young et al., 2006). Psychosocial issues, both in the workplace and in the personal lives of the workers, have been shown to be strong predictors of recovery (Yelin et al, 1980; Deyo & Diehl, 1988; Barnes, 1991; Burton, 1995).

Rates of disability associated with back pain are fairly high (Watson et al., 1998; Waddell, 2004). Rates of work disability may vary depending on workplace practices and how work disability is measured. For example, workers’ compensation claims for back pain were estimated at 700,000 per year in the United States (Waddell et al., 2002). Nearly 50% of the 1.5 million Americans on social security benefits for disability for musculoskeletal injuries had disability due to back pain (Waddell, 2004). One of the striking features of disability associated with low back pain is that the small proportion of individuals who continue to experience back problems beyond the subacute are responsible for the majority of the costs associated with persistent pain and disability (Watson et al., 1998). For example, a UK study found that a large proportion of injured workers with back pain (85%) for short durations (less than seven days) accounted for only half the lost days, whereas the 15% with persistent problems, were responsible for 50% of lost work time (Watson et al., 1998). Although great progress has been made in the understanding of best practice in the management of low back pain, these data
underscore the importance of focusing research efforts on identifying subgroups of patients that do not seem to recover in the expected manner, that is, the small proportion of individuals with greater likelihood to progress to persistent pain and long-term disability.

2.6 Interventions

2.6.1 Best Practices in the Management of Low Back Pain

There is now general agreement on the best practice management of simple, nonspecific low back pain. Most clinical practice guidelines for LBP recommend a detailed history-taking, along with a thorough physical examination. This process is usually sufficient to rule out serious pathology (red flags) and to arrive at a diagnosis of simple, nonspecific LBP. Once this has been established, the clinician should be able to confidently reassure the patient that the majority of cases of nonspecific low back problems typically resolve spontaneously without too many complications. As well, the most important recommendation in the acute phase is the advice to continue with or return to normal/usual activity, including work, as soon as possible.

The response of clinicians to a patient presenting with LBP can also contribute to the problem of LBP (Loisel et al., 2001; Snook, 2004). The advice, language, tests, and other behaviours of the clinician could send a patient down the wrong path of excessive and inappropriate illness behaviour. Therefore, in the absence of serious pathology, the advice to clinicians is to not overmedicalize, and to reassure and promote
continuation/resumption of usual activities including return to work. The term *overmedicalize* is commonly used to refer to lengthy durations of treatment or length of stay (LOS), excessive number of treatment sessions within a period of time, excessive use of diagnostic tests (overdiagnosis) and imaging, and referral of patients to several specialists, when unwarranted (Snook, 2004). Overdiagnosis, for example, is likely to lead to more anxiety about the cause of back pain and serious disease, and to increased dependence on medical care. An estimated 40% of patients fear that some serious pathology is associated with their low back pain (Waddell, 2004).

In rehabilitation, the term *overmedicalize* can also be used to refer to injudicious use of modalities. This is thought to give the patient the impression that something is gravely wrong with them (or their back), that the condition is so severe, complex, and mysterious that they need to consult multiple specialists and healthcare providers, as well as undertake multiple treatment strategies. Some of the unintended effects that may result from this management style could include: heightened illness behaviour, expectation of worse outcome, pain catastrophizing, increased fear of movement and re-injury, and over-dependence on the healthcare provider (Snook, 2004).

To further explore the concept of *overmedicalizing*, one of the objectives of the current study was to determine if there were subgroup differences by length of stay in the program, as this variable might be expected to reflect differing patterns of use of rehabilitation services and need for care. To this end, a subgroup analysis was conducted to compare high and low service users. Subgroup analysis is also important because there
is now evidence in back pain research that differential responses to interventions can be expected and are likely due to the influence of personal factors (Cole & Rivilis, 2004).

2.6.2 Clinical Interventions

Low back pain interventions can be provided in clinical settings (such as clinics or hospital outpatient departments) or workplace settings, with programs providing a combination of the two concurrently or in a staged approach, as in the case of the Sherbrooke model (Durand & Loisel, 2001). A number of clinical interventions that have been used for the treatment of acute and subacute nonspecific LBP include active and passive therapies, ranging from educational interventions to intensive functional restoration programs. Selected interventions commonly used in the rehabilitation of LBP are discussed below. The use of pharmacological agents falls outside the scope of physiotherapy; nevertheless, a brief discussion of these agents is included for completeness.

2.6.2.1 Pharmacological Agents/Drugs

A variety of drugs commonly used for the treatment of LBP include, nonsteroidal anti-inflammatory drugs (NSAIDS), acetaminophen, muscle relaxants, opioids, and antidepressants (Cherkin et al., 1998). In a study of 219 patients, aged 29-60 years, who were consulting for first episode of LBP, while 20% were not prescribed any medication,
69% were prescribed NSAIDS, 35% muscle relaxants, 12% narcotics, and 4% acetaminophen (Cherkin et al., 1998).

While acetaminophen is inexpensive, easier to obtain and has clinically proven analgesic effects for LBP, it does not have the ability to reduce inflammation, relieve muscle spasms, or correct sleep disturbances (Malanga, 2000). Therefore, for the treatment of LBP, other drugs, such as NSAIDS, perform better than acetaminophen. NSAIDS offer anti-inflammatory benefits in addition to analgesic effects. For the treatment of acute LBP, there is evidence that, NSAIDS are more effective than placebo, and conflicting evidence that NSAIDS are more effective than paracetamol (van Tulder et al., 2006). Van Tulder and colleagues further reported that there is strong evidence that NSAIDS are more effective than placebo in improving function and reducing pain intensity and disability in chronic LBP populations (van Tulder et al., 2006).

Another group of drugs commonly prescribed for back pain is known as muscle relaxants. This group of drugs includes antispasmodics (benzodiazepines and nobenzodiazepines) and antispasticity medications (van Tulder et al., 2006). Cherkin et al. (1998) reported that 35% of LBP patients in primary care were prescribed muscle relaxants. Muscle relaxants have been shown to be more effective than placebo in reducing pain intensity in subacute LBP. In the Cherkin et al., (1998) study, patients who were on medications, particularly muscle relaxants, reported less pain severity on one-week follow-up compared to those who were not on medication. Also, patients on an NSAID and muscle relaxant combination reported the best outcomes (Cherkin et al., 1998).
Regarding chronic LBP, muscle relaxants (benzodiazepines) have also been shown to be effective for pain relief, although the evidence is currently unclear about the effectiveness of non-benzodiazepines for this group (van Tulder et al., 2006). However, some experts warn that because of high risk of physical and psychological dependence, the dangers far exceed the benefits of muscle relaxants, and they should, therefore, not be used in the management of back pain (Manniche et al., 1999).

Studies of other less frequently used drugs, including opioids and antidepressants, seem to indicate that these are more effective than placebo (Fishbain, 2000; Schnitzer et al., 2000; Maier et al., 2002; Sarlano et al., 2002; Staiger et al., 2003). However, again because of increased risk of addiction associated with long-term opioid use, these drugs should be considered only when other treatments have failed.

2.6.2.2 Modalities and Active Therapies

Treatment programs rarely are delivered as a single intervention. Typically, a selection of physical agents may be combined with a number of exercise types (such as conditioning and flexibility exercises) and/or a kind of manual therapy approach (Li & Bombardier, 2001). Some of the interventions cited in the literature include: thermal agents, massage, exercise therapy, back school educational programs, and cognitive-behavioural interventions.
2.6.2.2.1 Thermal Agents

Thermal agents, such as hot water bottles, soft heated pack filled with grain, heat wraps, heat pads, and many others, are routinely used in the treatment of musculoskeletal disorders including LBP (French et al., 2006). According to a recent systematic review of the literature, there is moderate evidence of short-term benefit from heat application (heat wrap therapy), although the effect was small (French et al., 2006). Compared to oral placebo, heat wrap therapy was shown to result in significant pain reduction after five days based on analyses of two trials with a total of 258 patients with acute and subacute LBP (French et al., 2006).

The beneficial effects of heat therapy also have been demonstrated in a randomized controlled trial of one hundred patients with subacute LBP (Mayer et al., 2005). In this trial of three treatment groups (heat wrap, preference-based exercise, and heat wrap plus exercise) and an information booklet control group, treatment was administered for five consecutive days. The combined heat and exercise treatment group had significantly superior outcomes with regard to pain reduction, functional improvement, rates of return to pre-injury function, and reduction in disability (Mayer et al., 2005). While there is evidence for the use of superficial heat for the treatment of LBP, there is, as yet, insufficient evidence for or against the use of cold therapy (another common practice) for the treatment of LBP (French et al., 2006).
2.6.2.2.2 Massage

There is limited evidence that massage therapy may be beneficial for patients with LBP. The definition of what constitutes massage varies greatly. For example, in some studies mechanical devices are used to produce the massage, whereas in others, hands are used (Furlan et al., 2002). The level of training of the clinicians and the dose, location, and extent of the massage all vary, making comparisons among studies and pooling of data difficult (Furlan et al., 2002). Some studies have shown massage to be beneficial compared to placebo (Preyde, 2000), while others have shown no difference in outcomes when massage was compared to other treatments, such as spinal manipulation (Godfrey, 1984; Hoeler, 1981).

Massage was shown to be beneficial in a study of 107 patients with LBP (Preyde, 2000). Patients were randomized into four groups: comprehensive massage, soft tissue manipulation, remedial exercise, and a sham laser group. Compared to before-treatment measures, patients receiving comprehensive massage therapy showed the most and significant improvements in function and pain at end of treatment. However, of note, is that the “comprehensive massage” group received both soft tissue manipulation (massage) plus remedial exercises (Preyde, 2000), indicating that massage in combination with exercise is more beneficial than massage alone.

In general, massage is not recommended for the treatment of acute LBP. A number of international guidelines, for example, from Europe, United States, United Kingdom, and New Zealand, have not recommended massage for acute LBP (van Tulder et al., 2006; Bigos et al., 1994; Royal College of General Practitioners, 1999; ACC and
National Committee, 1997). On the other hand, for chronic LBP, there is limited evidence that massage therapy may be more effective for short-term pain relief than progressive relaxation therapy (Hernandez-Reif et al., 2001), acupuncture (Cherkin et al., 2001), and self-care education (Cherkin et al., 2001).

2.6.2.2.3 Exercise Therapy

Exercise therapy is the most commonly used active therapy in the management of LBP. The term *exercise therapy* refers to a mixed group of intervention strategies that involve specific movements used to train or develop the body (van Tulder et al., 2006; Abenhaim et al., 2000). Since a number treatment techniques commonly used in physiotherapy also involve exercise, such as the McKenzie program, they can be included as exercise therapy in its broadest sense. The discussion will focus on exercise in general, including unspecified exercise therapy, stretching and strengthening individually or in combination, aerobic-type exercise, graded activity, and many others. The rationale for this approach is that in clinical practice, exercise therapy is often prescribed as a combination of different movement techniques, nature and types of exercise (Abenhaim et al., 2000).

There has been some conflicting evidence regarding the effectiveness of exercise in the treatment of acute low back. While some individual studies may have shown some positive results for effectiveness, the results of systematic reviews have tended to be negative. A pooled analysis in a recent review (Hayden et al., 2005) revealed that there was no difference in short-term pain between exercise therapy and no treatment, (effect
of -0.59 points/100) or when compared to other treatments (0.31 points; CI: -0.10 to 0.72).

When individual studies are considered, exercise therapy for treatment of subacute LBP, seems to have conflicting results. For example, in a recent randomized trial of 112 workers with LBP-related work absence of more than 8 weeks, a graduated activity program was compared with usual care by patient’s occupational physician (Steenstra et al., 2006). There was no statistically significant difference between the two groups in pain or function; furthermore, graded activity appeared to prolong return to work (139 days) compared to usual care (111 days) in this study (Steenstra et al., 2006).

In contrast, two earlier studies of individuals with subacute LBP in occupational settings found that graded activity resulted in reduced work absence compared to usual care (Lindstrom et al., 1992; Staal, 2004). However, in pooled analyses of studies of exercise therapy, the evidence was not sufficient to support or refute the effectiveness of exercise therapy in reducing pain or improving function in subacute LBP (Hayden et al., 2005). This is not surprising, given the fact that different activities are considered collectively as ‘exercise’.

2.6.2.2.4 Back School Educational Programs

One of the interventions that have been used in the management of LBP is group education - commonly referred to as “back school”. This type of intervention, which was quite popular in the ‘80s and early ‘90s, in its original form, consisted of group instruction on the anatomy and biomechanics of the spine, injury mechanisms, proper posture and lifting techniques, as well as back exercises (Heymans et al., 2004). This type
of back school, usually offered in four sessions of 45 minutes duration, has been shown to be less effective than other interventions, and its use is no longer recommended in most clinical practice guidelines and models of care (Heymans et al., 2004). However, there appears to be some confusion in the literature on the basis of terminology. For example, a number of reviews have suggested that “back schools” conducted in an occupational setting and focusing on psychosocial issues rather than biomechanical factors may be effective in the treatment of low back pain (Heymans et al., 2004). The field may have been better served by the introduction of new terminology that clearly distinguished the later versions of group education, which reflect current evidence in the management of low back.

Back school group educational programs for LBP (“back schools”) vary greatly in terms of theoretical basis, content, delivery, frequency, and other factors. To further add to the confusion of what constitutes a back school intervention is the fact that some back schools are delivered in combination with other interventions; for example, one group of subjects could participate in a back school in addition to one or more other interventions (Heymans et al., 2004). Other back schools may have a strong exercise component in addition to the education, or they are given as part of a comprehensive program including for example, worksite visits, making it difficult to determine which components made a difference, unless this was specifically studied (Di Fabio, 1995).

A systematic review restricted to studies of the original version of the back school (Di Fabio, 1995) concluded that back schools were no more effective than control or comparison interventions, and that while there were improvements in educational/compliance and strength/endurance outcomes, there were no improvements
in pain, spinal mobility, disability, or work outcomes. Nearly a decade later, a systematic review to assess the effectiveness of back schools for patients with LBP (Heymans et al, 2004) concluded that there was moderate evidence that back schools have better pain and functional outcomes compared to control or other interventions, in the short and intermediate term, but only in the chronic LBP population. However, the main concern with the validity of these results is that this review included a number of quite varied interventions (all classified as back school) ranging, for example, from a traditional Swedish back school model of four 45-minute sessions to a single 4-hour psycho-educational session, and six 90-minute sessions (Heymans et al., 2004). The rationale offered for lumping all these studies together was that in their previous reviews it had been difficult to reach any firm conclusions due to paucity of homogenous RCTs in this area (Heymans, 2004). Unless newer and convincing evidence emerges and based on the review by Di Fabio (1995), it appears that back schools, at least in the original format, are not considered effective for the management of LBP.

2.6.2.2.5 Cognitive-Behavioural Interventions

Cognitive-behavioural intervention (CBI) is not a specific treatment but rather a term used to refer to a group of treatments strategies that use the principles of cognitive behavioral therapy in their approach. Although they can vary considerably in content, CBIs are typically multidisciplinary interventions that incorporate techniques designed to address cognitions, emotions, beliefs, and behaviours (Vlaeyen & Morley, 2005). CBIs address negative appraisals about pain and its consequences, in order to prevent associated fear and avoidance behaviour, which in turn lead to functional disability. CBIs
recognize the importance of addressing psychosocial issues in the treatment of LBP. The term *psychosocial factors* includes psychological factors, such as mood states (e.g., depression and anxiety), beliefs about activity/work (e.g., fear avoidance), attitudes (e.g., catastrophizing), as well as social factors, such as the response of the family/friends/coworkers or social support), and behaviours (e.g., bedrest) (Vlaeyen & Morley, 2005).

The effectiveness of CBIs has been the subject of numerous studies and systematic reviews (Guzman et al., 2002; Karjalainen et al., 2003). Three kinds of behavioural approaches have been described, namely operant treatments, cognitive treatments, and respondent treatments (Ostelo et al., 2005). Operant treatments are based on the principles of operant conditioning, such as positive reinforcement of treatment successes (e.g., meeting exercise quotas). Cognitive treatment involves identifying and modifying patients’ thoughts around the meaning of pain and their expectations regarding pain control. Respondent treatment involves modifying the physiologic response system (e.g., by reduction of muscular tension); these techniques include relaxation techniques, such as electromyographic biofeedback, progressive relaxation, and applied relaxation (van Tulder et al., 2000). The three approaches are often used together as part of a comprehensive CBI program (Ostelo et al., 2005).

Content varies considerably, and some authors have investigated effectiveness based on a specific type of CBI. Previous studies have compared CBIs with waiting list controls (Stuckey, 1986; Turner, 1982), alternate treatments such as exercise (Turner, 1990), or various types of CBI to one another (Turner, 1993). For example, one systematic review on CBIs for chronic LBP, found that there was moderate evidence of
the effectiveness of a respondent-cognitive therapy for a medium positive effect on pain, and moderate evidence that progressive relaxation had a large positive effect on both short-term pain [pooled effect size of 2 studies, 39 people = 1.16 (95% CI 0.47; 1.85)] and behavioural outcomes [pooled effect size = 1.31(CI 0.61; 2.01)] (Ostelo et al., 2005).

Further evidence has been demonstrated in a review of seven RCTs of mixed quality, where data from 419 patients were statistically pooled (van Tulder et al., 2006). This review showed that in chronic LBP populations, and when compared to placebo, no treatment, or waiting list controls, behavioural interventions were effective in both pain reduction (pooled effect size: 0.62, 95% CI 0.25 to 0.98), and behavioural outcomes (pooled effect size: 0.40, 95% CI 0.10 to 0.70). As well, there was no evidence of effectiveness on functional improvement.

Scant information exists on the effectiveness of cognitive-behavioural interventions for acute LBP, primarily because CBIs are not recommended for acute situations. In most cases, acute LBP will resolve spontaneously within the first four weeks after onset (Koes et al., 2006). Therefore, it would be difficult to demonstrate any additional benefit beyond natural history during this period. However, CBIs may be important for those whose symptoms persist beyond the acute phase and who are at higher risk for chronicity, in order to prevent the transition from subacute to persistent pain (van Tulder et al., 2006).

Few studies have investigated the effectiveness of CBIs on return-to-work outcomes (Linton et al., 2005; Staal et al., 2005). For example, in a recent study of 185 patients with non-specific low back and neck pain, those who participated in the cognitive-behavioural group only or combined with preventive physical therapy had the
best work-related outcomes (i.e., sickness absence) in the 12-month follow-up period compared to the comparison group of minimal treatment (usual care) (Linton et al., 2005). Regarding long-term sickness disability, those in the minimal treatment group had slightly greater than a 5:1 odds ratio of developing long-term disability compared to those in the cognitive-behavioural groups (Linton et al., 2005). There were no statistically significant differences in key outcomes between the two cognitive-behavioural intervention groups. In other words, there was no additional benefit for supplementing CBI with preventive physical therapy (Linton et al., 2005). On the other hand, slightly different results were reported in a study of 134 workers with LBP who were assigned to behaviourally oriented graded activity (n=67) or usual physician care (n = 67) (Hlobil et al., 2005). While the graded activity group returned to work sooner (median 54 days) than the usual care group (median 67 days), there were no statistically significant differences in pain or functional status (Hlobil et al., 2005).

Cognitive-behavioural type interventions show promise in the prevention of disability, particular when applied in the later stages of low back pain. However, the current evidence seems to suggest that not all individuals with low back pain respond to these interventions in a uniform manner. Therefore, future studies should perhaps focus more on identifying subgroups more likely to positively respond to such interventions.

2.6.3 Workplace-based Interventions

A variety of workplace-based interventions have been described in the literature (Williams et al., 2007). Workplace-based rehabilitation interventions are those strategies
designed to facilitate safe, timely, and sustainable return to work, thus reducing lost work time and productivity. When successful, these interventions can help reduce compensations and healthcare costs, improve quality of life, and improve employee morale. Examples of workplace-based interventions include: early return to work/modified work, clinical interventions with an occupational component, ergonomics, exercises, lumbar supports, exercise plus worksite visit, and supervisor involvement for return to work (Williams et al., 2007).

Strategies aimed at prevention of onset of musculoskeletal injuries, such as back pain, are considered primary prevention strategies. Most such strategies are aimed at the reduction of physical risk factors for back pain, including ergonomic interventions, and the use of back belts and lifting devices. Other primary prevention strategies involve workplace policies and procedures aimed at minimizing the impact or preventing the actual onset of WRMSDs by offering workers access to onsite early intervention programs. For example, workers experiencing early warning signs of over-exertion injuries are required to report for first aid and advice on early management strategies before the symptoms develop into a serious injury. Although not strictly so, such interventions may be regarded as primary prevention, since they are likely to prevent actual musculoskeletal injuries.

Workplace-based interventions also involve secondary prevention strategies aimed at preventing the consequences of back pain, such as work disability, once back pain onset has occurred. These might include such disability management practices as: early return to work or modified work strategies, clinical interventions with occupational interventions, ergonomic interventions, and supervisor involvement for return to work
(Westmorland et al., 2005). As well, workplace-based interventions could be aimed at primary prevention of back injury or onset of related work disability; secondary prevention, which typically refers to prevention of consequences of back pain; and tertiary prevention strategies aimed at prevention of further work disability.

In a multinational study by Anema and colleagues (2004), ergonomic interventions were defined to include: workplace adaptations (e.g., changes to chairs, desk/tables, lifting devices), adaptations to working hours (e.g., shorter shifts or more breaks), and adaptations to job tasks (e.g., modified duties, reduced weight lifted, reduced bending or overhead lifting). The authors concluded that there were significant differences between the workers who received a workplace adaptation versus those who did not (p<0.001). There were no significant differences between the groups when changes to job tasks and changes to work hours were considered.

Other authors have suggested that maintaining contact with the workplace or linking clinical interventions to the workplace is an important aspect of the return to work process. Indeed, clinical interventions that address workplace issues with the aim of providing workplace-oriented interventions are likely to be successful in improving return to work outcomes.

2.6.4 Assessment Issues

Two main approaches that have been used in the evaluation of pain-related disability include self-report measurement and physical or performance-based testing (Reneman et al., 2002; Simmonds et al., 1999). Although there has been ample evidence demonstrating relatively poor association between functional loss or disability and
impairment measures (Jette & Jette, 1996; Sullivan et al., 2000), physical testing to measure the degree of impairment is common in the rehabilitation of work-related musculoskeletal disorders (WRMSDs) (Battie et al., 1994). Some consider it important that specific human performance measures be completed in order to determine work capability and vocational status (Gross and Battie, 2005; Polatin et al., 2005), and therefore, pain-related disability is often inferred from the results of these measures (Battie et al., 1994). The physical measures include: impairment measures (e.g., range of motion and muscle strength) (Battie et al., 1994), physical performance measures (e.g., weight lifted from floor to waist, or waist to shoulder) (Simmonds et al., 1998), and physical performance measurement systems (e.g., Isenhagen’s Functional Capacity Evaluation (FCE)) (Reneman et al., 2002; Gross and Battie, 2005). FCEs are standardized batteries of performance measurement systems, often used in the context of third party payers, to make decisions about work abilities and physical readiness for work resumption (return-to-work) with the assumption being that those who perform better on these tests should be able to handle the physical demands of their job. Again, this has not been demonstrated consistently in research studies (Gross & Battie, 2005).

The two most popular performance measures used within physiotherapy practice are the measurement of spinal range of motion and muscle strength (Battie et al., 1994), perhaps because of the belief that these are linked to back disability (Sullivan et al., 2000). Indeed, when a group of physiotherapists was surveyed on three hypothetical cases, 81-93% said that they would measure spinal range of motion (Battie et al., 1994). In another survey, more than 50% of physiotherapists listed increasing muscle strength as a primary objective in their management of chronic LBP (Poitras et al., 2005). However,
the reliability of spinal range of motion measurement, for example, has been questioned in previous studies. Tools used in clinical practice to measure primarily lumbar flexion and extension range of spinal motion include: the inclinometer, fingertip-to-floor measure, and tape measure (Sullivan et al., 2000). Regardless of the method used or the direction of movement, spinal range of motion measures have consistently been shown to correlate poorly with disability measures, such as the Roland-Morris Disability Questionnaire (Poitras et al, 2000; Sullivan et al., 2000).

In a study to determine whether performance measures and self-report measures in chronic non-specific low back pain measured the same construct of disability, Reneman and colleagues (2002) found that the correlations between the FCE measures and self-report disability measures were poor to moderate at best. The correlation coefficients ranged from $r = -0.20$ for FCE and Roland Morris to $r = -0.52$ between FCE and Oswestry. Two seemingly contradictory conclusions could be drawn from the results if either the FCE or a self-reported disability questionnaire were used on its own. The mean scores of the self-report measures indicated that the patients had moderate to severe disability, whereas according to the performance-based indices the participants should have been functioning at a moderate to heavy level of physical intensity (Reneman et al., 2002). The implication therefore, is that these two approaches do not appear to be measuring the same construct.

Other indicators of physical impairment status previously used in LBP populations have included trunk velocity and acceleration (Marras et al., 1993; Ferguson et al., 2005), as well as endurance of the trunk musculature (Ito et al., 1996). It has been
suggested that content validity of the Sørensen test for endurance of the back musculature may be compromised by the limitations of comfort and motivation (Cole et. al., 1994).

Return-to-work (or work loss) has also been used as a measure indicative of or as a proxy for recovery or disability. Return-to-work of injured workers is a reflection not only of the medical or physical condition itself (i.e., resolution of back pain), but also psychosocial and environmental factors (Loisel et al., 2005). Some regard return-to-work as a subjective measure because the decision to return to work can be, and often is, influenced by many factors, including worker-related and healthcare provider influences (Ferguson et al., 2005). Administrative data have sometimes been used in an attempt to achieve objective measurement of pain-related disability. However, the use of administrative records may not yield a better indicator of true disability than self-report measures. For example, in a population-based survey of patients with chronic pain, 44% of the participants currently reporting chronic pain were employed fulltime, with another 15.6% working parttime. Most of these participants reported that the effectiveness of their work had been reduced to varying degrees due to their pain (Blyth et al., 2003). While only a small proportion (5.5%) reported lost work time of more than 30 days (over a six-month period) due to pain-related reasons, an astounding 66.6% of the working chronic pain group reported no or few days off work due to pain (Blyth et al., 2003).

Work-related recovery expectation and perceived future workplace support has been shown to influence the probability of RTW. Therefore, even RTW appears to be influenced by psychological appraisal processes. Further, since RTW is non-linear, and LBP resolution is often marked by recurrences (Linton et al., 2005), first RTW may not give a complete picture of pain-related disability, thus necessitating lengthier follow-up.
However, the lengthier the follow-up period, the greater the likelihood of work status/work loss being confounded by other events, thus making it difficult to relate work status to a specific index back pain episode.

Time to return to work, which often is used as one of the primary outcome measures, usually does not give the complete picture either because there could be any number of levels of return to work, such as: modified work status, full duties but reduced hours, part-time hours of regular duties, and return to work followed by any number of subsequent absences related to the index episode (Linton et al., 2005). Furthermore, the decision to return to work and/or remain at work may not always rest solely with the injured worker. At times, the employer, the availability of modified work/work accommodations, the insurance/compensation system, and healthcare system will contribute to the decision of if, when, and how the worker returns to or remains at work (Linton et al., 2005). However, it is often difficult to account for all these factors in any given study, thus potentially leading to confounding.

Therefore, while return-to-work is an important primary outcome measure in studies evaluating RTW programs, a comprehensive battery of measures is necessary in order to gain a better understanding of other areas of life such as psychosocial factors and quality of life.
2.7 Summary

Clinical practice guidelines for the management of non-specific low back pain (acute/subacute) recommend continuing with or returning to normal daily activity as soon as possible after onset of LBP (RCPG, 1999); ordinary or normal activity in this context includes work (Waddell & Burton, 2000). Although some stakeholders (e.g., union and worker representatives, employers, and worker groups) have questioned the wisdom of early return to work before the complete resolution of low back symptoms, and workers themselves may fear re-injury or worsening of symptoms, there is strong research evidence that, for many workers with low back pain, it is possible and reasonable to continue working or to return to work within a few days or weeks (Carey et al., 2000). It is not necessary to wait until the worker is completely pain free before returning to work (Carey et al., 2000; Waddell & Burton, 2000).

There is some evidence that continuation of or return to normal activity, despite pain, can facilitate the resolution of acute symptoms, result in less work loss, and fewer recurrences (Waddell et al., 1997; Abenhaim et al., 2000). However, it has not been established how remaining at work or returning to work early following an episode of LBP can influence rehabilitation outcomes such as: pain reports, quality of life, anxiety and depressive symptoms, and perceived disability.

The value of work in the life of an individual has been studied in sociological studies. However, the influence on rehabilitation progress and outcomes of remaining at work or returning early to work has not been investigated in workers with subacute low back pain within the Ontario workers’ compensation context. Although returning to work
as soon as possible and not waiting for complete resolution of back pain symptoms is recommended, the influence of the length of stay in the program on RTW and other rehabilitation outcomes has received limited attention in the literature. While being in treatment for low back pain and being involved with work are not mutually exclusive, it is possible that an interrelationship exists between the two.

An international forum of low back pain experts agreed that one of the main priorities for primary care research on LBP is the identification of subgroups of patients with LBP (Borkan et al., 1998). Early identification of subgroups likely to achieve poorer or better outcomes over time might be important in ensuring that tailored interventions are directed at target patient groups, thus improving chances of treatment success (Enthoven et al., 2004). Therefore, an investigation of the influence of work status on the progression through the rehabilitation process and rehabilitation outcomes is important. It is also important to examine the influence of service use, as represented by time in a rehabilitation program, and the influence of work status on pain reports, quality of life, anxiety and depressive symptoms, and perceived disability.
Chapter 3
Description of the RTW Rehabilitation Program for Low Back Pain

3.1 Description of Program

The setting for the evaluation project was the Injured Workers Clinic (IWC) at Providence Care - formerly Providence Continuing Care Centre (PCCC) - St. Mary’s of the Lake Hospital site, Kingston, Ontario, Canada. The IWC has seen some changes since its inception; as well, the program goals and priorities have also changed.

3.1.1 History
The IWC at Providence Care was established in 1989 when the then Workers’ Compensation Board (WCB) of Ontario introduced the model of care known as the medical rehabilitation program, a program model dedicated to the treatment of soft tissue injuries that utilized a network of physiotherapy and chiropractic-based clinics. The IWC at Providence Care was one of the clinics in the network, and in 1990 was awarded a contract to pilot the WCB’s Community Clinic Program (CCP). In the CCP approach, workers received treatment for pain relief, mobilization, and functional conditioning, as well as education on the nature, cause, and prevention of their injury. Treatment could begin at anytime within the first 70 days after injury. Intensive daily treatments were recommended to aid recovery and facilitate return-to-work.

In 1995, the Institute for Work and Health conducted the Early Claimant Cohort (ECC) study commissioned by the WCB. The ECC was a prospective cohort study of 1,572 cases that compared treatment in the CCPs with usual care (routine management
by primary care physician) covered under WCB for the treatment of soft tissue injuries. The study showed that the community clinic program did not reduce lost time or associated costs. Furthermore, the CCP did not yield significant differences in pain, function, or quality of life compared to usual care. The recommendations of the ECC study led to changes in the CCP approach. In November 1995, the WCB changed the referral timeframe for community clinic treatment to between 29 and 70 days after injury, thus eliminating intensive treatment in the first 28 days. Assessment and instruction in self-management strategies could be offered in the acute phase; this was in line with the latest evidence in the literature that was already indicating that intensive clinical intervention was not beneficial in the acute phase. The revised community clinic approach remained in effect until 2002.

Meanwhile, in 1998 the WCB of Ontario adopted new roles, responsibilities, and accountabilities and acquired a new name: the Workplace Safety and Insurance Board (WSIB) of Ontario. It was during this transition period that the WSIB, recognizing that the current health care model was not optimal, began a redefinition process that would result in an overhaul of current approaches to back pain treatment. In November 2002, the WSIB introduced a new model of care for the treatment of acute injuries of the lower back, the Program of Care (PoC) for Acute Low Back Injuries (ALBI), based on best practice guidelines and the latest scientific evidence. As soon as sufficient information on the PoC was available, Providence Care Rehabilitation Services initiated training to ensure that the IWC staff was fully prepared to implement the PoC (ALBI) as it was intended.

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The key components of the PoC (ALBI) were outcome measurement, communication, and use of best evidence in the treatment of uncomplicated back pain. Ongoing measurement of the injured workers’ recovery guided clinical decision-making and communication. New in the 2002 approach was the requirement that clinicians identify and report the presence of psychosocial issues that could potentially interfere with recovery. These factors are commonly known as “yellow flags”.

### 3.1.2 Goals of the Program

The goal of the IWC was to provide physiotherapy intervention with an emphasis on education and active rehabilitation to return the injured worker to work as safely and efficiently as possible. The specific objectives of the program were:

- To maximize the client’s level of function and his/her ability to return to work through accurate assessment, appropriate treatment, exercise prescription, and education. The IWC is committed to the WCB philosophy of early active intervention.
- To enhance the client’s recovery and equip the worker with the knowledge and the sense of responsibility essential to the prevention of re-injury. The IWC is dedicated to the continuous quality improvement and to the responsible use of resources.
- To maintain professional standards and continuing education as essential components of quality client care in the IWC.
3.1.3 Activities

Program activities stated as functions in a 1993 revision of the program manual included:

- **Client Assessment**
  
  A thorough subjective and objective assessment is performed to determine a clinical diagnosis and problem list. Realistic goals pertaining to recovery and return to work are set with the client’s informed consent and collaboration.

- **Client Treatment**
  
  Rehabilitation of the injured worker through individual treatment and exercise prescription to maximize level of function and ability to return to work.

- **Client Education**
  
  Education is carried out on an individual basis with the aim of informing the worker about the nature of the injury and how to prevent further job-related injuries. This education is also aimed at maximizing the worker’s ability to take an active part in the rehabilitation process.

- **Student Education and Evaluation**
  
  Education and evaluation of physiotherapy students through clinical placement were part of the program. Student education includes assessment techniques, analysis of clinical findings, formulation of an appropriate approach, proper application of treatment techniques, re-assessment and treatment progression, charting, ethical and professional issues, application of theoretical knowledge, and patient education. Evaluation and feedback were used to enhance student performance.

- **Physician Education and Communication**
Education of and communication with physicians are undertaken in order to improve physician awareness of goals and criteria of the program. The referring physicians will be kept informed about their patient’s progress. Staff maintain ongoing collaboration regarding planning for early and safe return-to-work.

- **Equipment (acquisition)**
  The program is committed to providing a range of rehabilitation equipment for optimal treatment of injured workers.

- **Research (client profile statistics)**
  Detailed statistics on injured workers participating in the program are kept in order to inform marketing activities, research, and ongoing program development.

### 3.1.4 Resources
The Injured Workers Clinic was supported by three Full-Time Equivalent (FTE) physiotherapists, 1 FTE secretarial support, and 0.3 Departmental Assistants. Computers and a range of exercise equipment were shared with two other outpatient programs.

### 3.1.5 Intervening Variables
- **Sociopolitical context:** the RTW rehabilitation program is funded by the Ontario WSIB; as such, program guidelines, timelines, and expectations specific to the context are followed. Clinical decision making occurs within this greater sociopolitical context
- **Workplace factors:** availability of modified work and supervisor and coworker support may influence the success of return to work.
Individual factors: co-morbidities, beliefs, and attitudes will impact on perceptions of pain and disability.

3.2 Key Stakeholders and Program Logic Model

Table 3.1 outlines the Injured Workers Clinic’s key stakeholders, their roles, and their responsibilities. Figure 3.1 is a graphical representation of the underlying rationale of the program, and Figure 3.2 is the logic model.
Table 3.1: Key Stakeholders: Roles and Responsibilities

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Roles</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior management of PCCC</td>
<td>Oversee operations of the</td>
<td>Administers of finances; accountable to PCCC board</td>
</tr>
<tr>
<td></td>
<td>hospital including the RTW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>program</td>
<td></td>
</tr>
<tr>
<td>Workplace Safety and Insurance Board (WSIB) of</td>
<td>Fund medical rehabilitation</td>
<td>Ensure judicious use of compensation funds. Make sure that approved or funded</td>
</tr>
<tr>
<td>Ontario</td>
<td>and wage replacement</td>
<td>programs produce superior outcomes (value for money)</td>
</tr>
<tr>
<td>Nurse Case Manager (WSIB)</td>
<td>Case management</td>
<td>Overseer case file from reporting to closure, including ensuring that client</td>
</tr>
<tr>
<td></td>
<td></td>
<td>receives appropriate care</td>
</tr>
<tr>
<td>Family Physician</td>
<td>Medical care of patient</td>
<td>Referral, progress reports, and final approval of RTW</td>
</tr>
<tr>
<td>Patient’s Employer/Workplace</td>
<td>Health and safety</td>
<td>Report work injuries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cooperate with compensation process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide supportive environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>including modified work, to facilitate timely and safe RTW</td>
</tr>
<tr>
<td>Patient</td>
<td>Key program participant</td>
<td>Report work injuries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cooperate with compensation process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Actively participate in rehab process</td>
</tr>
<tr>
<td>Family</td>
<td>Supportive role</td>
<td>Provide social support of patient</td>
</tr>
<tr>
<td>Program Director</td>
<td>Provide leadership and</td>
<td>Overseer financial and administrative processes of program</td>
</tr>
<tr>
<td></td>
<td>oversee operations of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>program</td>
<td></td>
</tr>
<tr>
<td>Senior physiotherapist</td>
<td>Provide clinical and</td>
<td>Overseer/manage service delivery</td>
</tr>
<tr>
<td></td>
<td>administrative leadership</td>
<td></td>
</tr>
<tr>
<td>Staff physiotherapists</td>
<td>Deliver program intervention</td>
<td>Assessment</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Clerical staff</td>
<td>Clerical administration</td>
<td>Process referrals</td>
</tr>
<tr>
<td>Physiotherapy Assistants</td>
<td>Assist physiotherapists in managing patients</td>
<td>Administer questionnaires on admission and discharge</td>
</tr>
<tr>
<td>Research Associate</td>
<td>Promote outcome measurement and use in clinical decision making</td>
<td>Planning, implementation, ongoing monitoring, and adjustments of evaluation</td>
</tr>
</tbody>
</table>
Underlying Problem:
Perceived disability in LBP is related to Activity Limitation due to and Appraisals about back pain.

Goals of Program:
Reduce perceived disability and facilitate return-to-work by program completion.

As suggested by Renger and Titcomb (2002)

- Biomechanical Factors
  - Spinal flexibility
  - Spinal stability
  - Spinal postures and
  - Lifting techniques
  - General physical fitness
  - Poor spinal health
  - Activity Limitation
  - Lack of knowledge about LBP best practice

- Healthcare System Factors
  - Timing of rehab
  - Intensity of rehab
  - Duration of rehab

- Personal Psychosocial Risk Factors
  - Depression
  - Anxiety
  - Beliefs e.g. Hurt vs Harm
  - Illness behaviour

- Workplace Factors
  - Biomechanical Risk Factors
  - Psychosocial/organization of work

- Workplace RTW Practices
  - Modified work (RTW) programs
  - Work accommodations
  - Workplace culture

- Low Back Pain
  - Nonspecific
  - Mechanical

- Persistent Pain Problems

1. Reduction in self-reported disability as measured using the Oswestry
2. Reduction in work loss (work disability) by end of 12-week program as measured by RTW

Fig. 3.1: Visual representation of underlying rationale of program
Target Population
- 18-65 year old
- Workers with nonspecific low back pain (NSLBP)
- Referred to program
- Insured under WSIB

Resources
- Cost
- Staff
- Equipment
- Setting (office & clinical)

Inputs/Activities
Intake
- Screen referrals
- Place client in appropriate program
Assessment
- Complete initial assessment
- Rule out serious pathology
- Design individualized treatment program
Intervention
- Exercise prescription & monitoring

Antecedent Variables
- Age
- Gender
- Type of job
- Activity level
- History of LBP

Outcomes
Short-term
- Improve function
- Increase activity
- Increase knowledge of natural history NSLBP

Intermediate-term
- Reduce perceived disability (correct appraisals)

Long-term
- Reduce disability

Process Measures
- # of referrals received
- # of days from referral to initial assessment
- # of assessments completed
- # of clients entering program
- # of visits per client
- Length of stay in program
- # of clients discharged

Figure 3.2: Logic model of return-to-work rehabilitation program
Chapter 4
Evaluating Outcomes of a Return to Work Rehabilitation Program for Low Back Pain (Objective 1)

4.1 Introduction

The primary objective of this research was to determine the degree of change in clinical measures and treatment outcomes in patients with subacute, nonspecific low back pain, following their participation in a hospital-based general outpatient RTW rehabilitation program. A secondary objective was to compare selected measures with normative data from a non-patient general population. We hypothesized that there will be statistically significant improvements in the measures between admission to and discharge from the RTW rehabilitation program; and that, while there will be differences between admission scores and population normative data, these differences will be minimal at discharge.

4.2 Methods

4.2.1 Study Design

A prospective cohort study with pre-test and post-test measurement was conducted to address the research questions and sub-questions (see section 1.2). Data collection occurred on admission and discharge from the program. Although within a Workplace Safety & Insurance Board (WSIB) rehabilitation program most patients were typically allowed a maximum of 12 weeks of rehabilitation, the length of time between admission
and discharge in this study setting varied according to each individual patient’s circumstances.

The study, necessarily, was completed within a WSIB program evaluation context in order to address the needs of the key stakeholder group (administrators of the rehabilitation program) who commissioned the work. Steps were taken to compensate for some of the methodological challenges inherent in non-experimental designs. For example, it is not possible to assign cause-and-effect using this design, compared to a randomized controlled trial design. It was also not feasible to have a comparison group due to program guidelines and requirements. The compensation board of Ontario (WSIB) funds the program and expects all clients referred to the program to be seen within five business days; furthermore, the program delivers the standard of care; to have a no-treatment comparison group would have been performing below standard of care and would be unethical. Comparisons could have been made to low back pain patients seeking care from primary care physicians; however, that was not a feasible option in this study due to limited resources, and the likelihood that patients with low back pain who were referred to physiotherapy would have been different from those whose back pain episodes were managed by their primary care physicians.

The design used was pragmatic and adequate to fulfill the objectives of this project. The strategy used to compensate for the design was the comparison of pre- and post-treatment scores with normative data from adult non-patient general population. As well, multivariate and cluster analyses were used to further strengthen the study design in terms of explanatory power of specific variables and subgroup identification. However, since a control group was not used in this study, it is not possible to determine how the
observed changes in measures would compare to changes that would be seen in a no-treatment control group.

### 4.2.2 Procedures for Sample Selection

The study was approved by the Queen’s University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board, Kingston, Ontario, Canada (Appendix 1). All low back pain patients referred by their physicians to the Injured Workers’ Clinic at PCCC, between October 2000 and September 2002 were invited to participate in the study. Patients were eligible to participate in the study if they had: 1) been referred for treatment of work-related non-specific low back pain; 2) an approved workers’ compensation claim, 3) the ability and willingness to attend treatment sessions; and, 4) a good command of the English language. Patients were excluded from the study if they had: 1) back pain that resolved in fewer than three visits; 2) serious pathology such as vertebral fracture or tumour; and, 3) cauda equina involvement.

### 4.2.3 Program Procedures

Patients in the RTW rehabilitation program had to be referred by their family physician, as per hospital policy. Once the referral letter was received, the program secretary called the patient to schedule and appointment for the initial assessment by the physiotherapist. A detailed treatment plan would be outlined at the end of the initial assessment session. The treatment plan would outline the parameters of the program (i.e., intensity, frequency, and duration) for the patient; the parameters were based on individual needs. Typically, patients in the subacute phase of LBP would initially be seen two to three
times per week. In the subsequent weeks, the frequency of visits would then be altered or kept the same, depending on the findings of regular re-assessments by the physiotherapists. The duration of each treatment session also varied according to individual needs but typically ranged between one hour and two hours.

Study participants received an individualized treatment program, which included the following core components: initial assessment, reassurance, patient education (natural course of LBP), self-management strategies, conditioning, stretching, modalities (if applicable), hydrotherapy, work hardening, RTW strategies, monitoring and discharge planning. Communication with the WSIB, employer, case manager, family physician, and other key stakeholders, forms another important part of the interaction.

4.2.4 Participants

One hundred and eighty patients with low back pain who reported to the PCCC outpatient physiotherapy clinic were invited to participate in the study. Twelve potential participants were excluded due to following reasons: declined (4), fractures (2), no low back pain (4), language barrier (1) and on disability (1). One hundred and forty seven patients met the eligibility criteria and agreed to participate. However, approximately half of these patients failed to return for discharge appointments; therefore their discharge data were not captured. Telephone follow-ups were attempted after missed visits; however, as per clinic policy, failure to respond resulted in an automatic discharge from the rehabilitation program. As a result, some of the analyses were performed on the whole sample of “completers” (n=72) and “non-completers” (n=75), whereas other analyses could only be performed on the “completers” where discharge data were known. A summary of the
characteristics of study participants, including completers and non-completers is provided in Table 4.1.

The initial analyses were to determine if there were any differences between completers and non-completers in demographic and baseline variables at program entry. In terms of entry into the program, the completers entered 35.0 ±21.5 days after back pain onset whereas non-completers entered after 32.7 ± 20.3 days. Based on a t-test and chi-square comparisons, there were no significant differences between completers and non-completers at program entry, except for work status. Chi-square test comparison of work status between completers and non-completers showed statistically significant differences at program entry (Chi-square test; p=0.025); a greater proportion of the non-completers were working on admission. (56.0%) compared to the completers (37.5%).
Table 4.1: Characteristics of Study Participants at Baseline

<table>
<thead>
<tr>
<th>Variables</th>
<th>Total Sample (N= 147)</th>
<th>Completers N=72 (49%)</th>
<th>Non-Completers N=75 (51%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Men</td>
<td>88 (59.9%)</td>
<td>42 (58.3%)</td>
<td>46 (61.3%)</td>
</tr>
<tr>
<td>- Women</td>
<td>59 (40.1%)</td>
<td>30 (41.7%)</td>
<td>29 (38.7%)</td>
</tr>
<tr>
<td>Age: Mean (±SD) (years)</td>
<td>39.7 (±9.7)</td>
<td>39.0 (±9.9)</td>
<td>40.3(±9.6)</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Lives alone</td>
<td>23 (15.6%)</td>
<td>11 (15.3%)</td>
<td>12 (16.0%)</td>
</tr>
<tr>
<td>- With spouse</td>
<td>95 (64.6%)</td>
<td>44 (61.1%)</td>
<td>51 (68.0%)</td>
</tr>
<tr>
<td>- With family/friend</td>
<td>29 (19.7%)</td>
<td>17 (23.6%)</td>
<td>12 (16.0%)</td>
</tr>
<tr>
<td>Educational Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Less than grade 9 – High School</td>
<td>66 (44.9%)</td>
<td>33 (45.8%)</td>
<td>33 (44.0%)</td>
</tr>
<tr>
<td>- Trade school, college, professional certificate(s) or some university without diploma</td>
<td>74 (50.3%)</td>
<td>36 (50.0%)</td>
<td>38 (50.7%)</td>
</tr>
<tr>
<td>- University degree(s) / Post-graduate degree(s)</td>
<td>7 (4.8%)</td>
<td>3 (4.2%)</td>
<td>4 (5.3%)</td>
</tr>
<tr>
<td>Work Factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Hours worked per week</td>
<td>16.9 (±18.2)</td>
<td>15.3 (±18.2)</td>
<td>18.4 (±18.2)</td>
</tr>
<tr>
<td>Baseline Work Status*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Working</td>
<td>69 (46.9%)</td>
<td>27 (37.5%)</td>
<td>42 (56.0%)</td>
</tr>
<tr>
<td>- Not Working</td>
<td>78 (53.1%)</td>
<td>45 (62.5%)</td>
<td>33 (44.0%)</td>
</tr>
</tbody>
</table>

*Statistically significant differences in baseline work status between completers and non-completers (Chi-square test; p=0.025).
4.2.5 Administration of Measures and Program

Once the participant had agreed to participate, they were taken through a complete description of the proposed study and the ethics consent process. Then the participants were escorted to a study room where they could complete the entry questionnaires in quiet surroundings. The questionnaires were administered by a research assistant, but completed by the participant; the research assistant was available to answer questions, whenever needed. It took approximately 50 minutes to complete the initial test battery. Then each participant was taken to the treating physiotherapist for the initial clinical assessment, which included two study procedures, the Biering-Sorensen test for back endurance and the Trunk Velocity Test. Once the assessment portion was completed, the physiotherapist would then prescribe and initiate an individualized treatment plan. The patient would continue through subsequent treatment appointments under the care of their physiotherapist, with no contact with the study personnel until the discharge appointment.

The treating physiotherapist notified the research assistant whenever a discharge appointment was booked for one of the study participants. On that day, the treating physiotherapist conducted the final clinical assessment, including the Biering-Sorensen test and trunk velocity test; the patient was then seen by a research assistant for the administration of the discharge self-report questionnaires. Patients who failed to report for their discharge appointment and assessment received a telephone call from a research assistant; if they did not respond to the first telephone call and message, they would receive a final call one week later. Failure to respond would result in file closure and discharge from the program, as per department policy.
4.2.6 Measures

The selection of measures for inclusion in the research study was informed by the biopsychosocial model of work disability, where the interaction of biological, psychological and social factors contributes to recovery or persistent disability.

4.2.6.1 Days Worked per Week
Participants were asked the number of hours they had worked in the previous week; this number was then converted to days. For those participants who were not working, the score assigned was zero.

4.2.6.2 Work Status
Work status was established at two time points, at admission to and discharge from the program: patients were asked whether or not they were working at each time; response options were “Yes” or “No”. For those who had returned to work, a distinction was also made whether the person had returned to regular or to modified duties; the term regular duties was defined as pre-injury level of work (prior work); the term modified work included both working modified duties or modified hours, in other words, any change from “regular work routine” as a result of the current back problem. For those participants who did not complete the program, their RTW data were taken from the last visit made to clinic. Therefore, data on work status (RTW data) were available for the entire study sample (N=147).

4.2.6.3 Psychosocial Distress, Depressive Symptoms and Anxiety Symptoms (Brief Symptom Inventory)
The Brief Symptom Inventory (BSI) is a shortened version of the Symptom Checklist-90 (SCL-90-R) (Derogatis & Melisaratos, 1983). The SCL-90-R was developed to assess
current psychological distress and symptoms in both patient and non-patient adult populations (Derogatis, 1993). It was chosen for use in the current study for its applicability and brevity; it requires only 8-10 min to complete, an important consideration in a busy outpatient clinic. Another advantage of using the BSI was that any clinician could score it, without always requiring the services of a psychologist. The BSI is a 53-item self-report inventory with nine primary symptom dimensions and is designed to reflect psychological symptoms in patient and non-patient populations (See Appendix 2 for a sample of BSI instructions). The response options available range from 0 = (has bothered me) not at all to 4 = (has bothered me) extremely (Derogatis, 1993). Scores for each symptom dimension are derived by adding the values for each item and then dividing the sum by the number of endorsed items (Derogatis, 1993). The BSI has the following nine scales or symptom dimensions: Somatization (SOM), Obsessive-Compulsive (O-C), Interpersonal Sensitivity (I-S), Depression (DEP), Anxiety, (ANX), Hostility, (HOS), Phobic Anxiety (PHOB), Paranoid Ideation (PAR) and Psychoticism (PSY) (Derogatis, 1993). As well, three global indices can be computed, namely, the Global Severity Index (GSI), The Positive Symptom Distress Index, (PSDI), and the Positive Symptom Total (PST) (Derogatis, 1993). Values for each symptom dimension and two global indices (GSI and PSDI) range from 0.00 to 4.00. Values for the PST range from 0-53 (Derogatis, 1993).

Two of the nine primary symptom dimensions (Depression and Anxiety) and one global index (Global Severity Index) were used in this study. The Depression subscale is made up of items 9, 16-18, 35, and 50. Statements that reflect various symptoms are listed on the left-hand side of the scale. On the right-hand side, space is provided for
participants to indicate their responses to the question: “How much that problem has distressed or bothered you during the past 7 days including today?”, corresponding to each symptom statement. The response options are: 0 = not at all; 1 = a little bit; 2 = moderately; 3 = quite a bit; and 4 = extremely (Derogatis, 1993). Typical examples of symptom statements for the Depression subscale include: “Thoughts of ending your life”; “Feeling lonely”; and Feeling blue”. The Anxiety subscale is made up of items 1, 12, 19, 38, 45, and 49. Examples of typical items for the Anxiety subscale include “Nervousness or shakiness inside”; “Suddenly scared for no reason”; and “Feeling fearful” (Derogatis, 1993). The GSI, a global indicator of psychosocial distress level, is calculated by adding together the sums for the nine symptom dimensions and then dividing by the total number of responses (i.e., 53 when there are no missing items) (Derogatis, 1993).

The BSI has demonstrated good psychometric properties (Derogatis, 1993). A Cronbach’s coefficient alpha of 0.87 has been reported for the Depression and Anxiety subscales (Schwannauer & Chetwynd, 2007). The reported test-retest reliability coefficients have ranged from 0.68 for the Somatization dimension to 0.91 for the Phobic Anxiety dimension (Derogatis, 1993), demonstrating fair to excellent stability over time. The reliability coefficients for the GSI, Depression, and Anxiety subscales fall within that range, at 0.90, 0.85, and 0.81, respectively (Derogatis, 1993). The BSI has shown good convergent validity with the Minnesota Multiphasic Personality Inventory (MMPI), with correlations of 0.72 and 0.57 for the Depression and Anxiety subscales, respectively (Derogatis, 1993).

The Global Severity Index, DEP, and ANX subscales of the BSI were chosen for focus in the current study because previous research has demonstrated that psychological
factors (distress, depression, and pain-related anxiety) are associated with low back pain and pain-related disability, including failure to return to work (RTW) (Sullivan et al., 1992; Pincus et al., 2002; Vowles et al., 2004). For example, in a study of 232 patients from 40 physiotherapy clinics, approximately 40% of patients with nonspecific LBP had depressive symptoms (Haggman et al., 2004). In a study of 685 patients with chronic low back pain (Michalski & Hinz, 2006), significantly high levels of depressive and anxiety symptoms were found in the patient group compared to a representative sample of the adult non-patient population.

Four norm groups have been established for the BSI. The adult nonpatient norm group is the one most relevant for comparisons with data from the current study. The adult nonpatient norm group consisted of 974 adults (494 males and 480 females) with a mean age of 46(14.7) years (Deorgatis, 1993).

4.2.6.4 Health-Related Quality of Life (QoL) (Medical Outcomes Study (MOS) 36-Item Short Form (SF-36)

Health-Related Quality of Life (QoL) was evaluated using the SF-36, which is a 36-item generic tool for the assessment of health-related quality of life in eight health domains (Appendix 3). The SF-36 was developed by the RAND Corporation and JE Ware as a shortened version of the original 245-item Medical Outcomes Study questionnaire (McDowell & Newell, 1996). The eight domains of the SF-36 are: 1) limitations in physical activities because of health problems; 2) limitations in social activities because of physical or emotional problems; 3) limitations in usual role activities because of
physical health problems; 4) bodily pain; 5) general mental health (psychological distress and well-being); 6) limitations in usual role activities because of emotional problems; 7) vitality (energy and fatigue); and 8) general health perceptions (Ware & Sherbourne, 1992; McDowell & Newell, 1996) (Appendix 4). All of these measures were used as independent variables in the current study analyses.

In addition, the SF-36 has two component scores that were used in the analyses; the physical component score (PCS), which is made up of physical functioning, role physical, bodily pain, and general health, and the mental component score (MCS), which is made up of vitality, social functioning, role-emotional and mental health. Scores range from 0 to 100, with 0 indicating worst and 100 best quality of life. The SF-36 has been shown to be a reliable measure in patients with musculo-skeletal problems (ICC = 0.85) (Beaton et. al., 1994), and its validity has also been demonstrated in previous studies (McDowell & Newell, 1996).

4.2.6.5 Perceived Disability (Oswestry Low Back Pain Disability Questionnaire)

Perceived disability was measured using the Oswestry Low Back Pain Disability Questionnaire (Oswestry). The Oswestry was first published in 1980 by Fairbank et al. (1980) for assessment of functional disability in patients with low back pain. It is a self-report questionnaire that was designed to quantify the degree to which a person’s function is affected by back or leg pain. The Oswestry consists of ten six-point scales, one addressing pain, and nine addressing various components of function related to activities of daily living. The functional activities included are: personal care, lifting, walking, sitting, standing, sleeping, sex life (optional, if applicable), social life, and
travelling (Appendix 5). Each section is scored on a 0-5 scale, with higher values representing greater disability. The sum of the ten scores is expressed as a percentage of the maximum score obtained, termed the Oswestry Disability Index (ODI); for example, if a score of 30 is obtained, the ODI will be 60% (30 out of 50 x 100). The levels of disability are classified as: 0–20 represents minimal disability, 20–40 represents moderate disability, 40–60 represents severe disability, while a score of 60 and over represents severe disability in a number of areas of life. Good test-retest reliability (ICC = .99) and good internal consistency have been reported (Fairbank, 1980). Similarly, ICCs of 0.90 (Fritz & Irrgang, 2001) and 0.91 (Kopec et al., 1995) have been reported in previous studies.

4.2.6.6 Pain Visual Analogue Scale (VAS)
Several types of standardized self-report measures of pain are available for use in research and clinical setting. For example, therapists frequently use one of pain drawing, verbal rating scales, numerical rating scales for pain, or visual analogue scales (Downie et al., 1978; Huskisson, 1983; Echternach, 1987, Jensen & Karoly, 1992). Based on the advantages described in the scientific literature, a visual analog scale (VAS) was selected for this study.

The VAS scale allows patients to rate their level of pain intensity by placing a mark on a 10-centimetre (or 100-millimetre) horizontal or vertical line (Downie et al., 1978; Huskisson, 1983; Echternach, 1987). The extreme limits of this line are marked with short perpendicular lines, that denote “no pain” at the left end, and “unbearable pain” at the right end (Downie et. al., 1978; Huskisson, 1983; Echternach, 1987). The
magnitude of pain is estimated by measuring the distance (in millimetres) between the lower end of the scale and the mark made by the participant.

Pain intensity scales have undergone considerable review in the scientific literature. Dixon and Bird (1981) found that the reproducibility of the VAS varied in different segments of the line with the extremes and the middle being most reproducible, while horizontal scales were better than vertical ones (Huskisson, 1983). The minimal clinically significant difference in pain for the VAS has been reported in a previous study as 1.2 cm (95%CI; 0.9 to 1.5 cm) (Kelly, 2001). The minimal clinically significant difference was similar among patients classified as having mild [1.1 cm (95%CI; 0.4 to 1.8 cm)], moderate [1.4 cm (95%CI; 1.0 to 1.8 cm], and severe pain [1.0cm (0.6 to 1.4 cm)] intensity (Kelly, 2001), indicating that the VAS performs consistently when different pain intensities are reported.

4.2.6.7 Endurance of the Back Musculature (Biering-Sørensen Test for Endurance of the Back Musculature)

The Biering-Sørensen test for back endurance was one of the significant indicators of low back pain in a one-year prospective study (Biering-Sørensen, 1984). It has since been used in other prospective and cross-sectional LBP studies (Stevenson et al., 2001; Mannion et al., 2001; Luoto et al., 1995; DeLuca et al., 1993) and to develop normative health-related fitness data (Payne et al., 2000). In the original test, participants lay prone on a plinth with the trunk (from the upper border of the iliac crest) hanging over the edge in a horizontal position while the legs and buttocks were held firmly. The length of time (in seconds) that participants could hold the unsupported trunk extension was then measured (Biering-Sørensen, 1984). To be more suitable for patients with low back
disability, Ito et al. (1996) modified the Biering-Sørensen test so that participants lay in a prone position on the floor/plinth with a pillow under the abdomen and arms by the side (Latimer et al., 1999); trunk extension was then performed from this position, and the length of time was scored in the same way (see figure 4.1). For the current study, the modified Biering-Sørensen test was used (Ito et al., 1996). This test and its variants have been used in participants with and without previous history of low back pain, as well as participants with current non-specific low back pain (Latimer et. al., 1999).

Both types of Biering-Sørensen tests have been studied for their repeatability and reliability. The reliability coefficients reported have varied widely (ranging from $r = 0.216$ to an intraclass correlation coefficient of 0.974). This variability has been attributed to the different ways the test was performed (Latimer et. al., 1999) and to the fact that maximal endurance holding times is subject to motivational factors (Mannion et al., 2001). Since content validity may be compromised by the limitations of comfort and motivation (Cole et. al., 1994), the protocol was designed to maximize comfort by use of a pillow under the hips and maximize motivation by offering continuous encouragement.
Figure 4.1: Illustration of the modified Biering-Sørensen test (Ito et al., 1996).
4.2.6.8 Trunk Velocity Test

The Trunk Velocity Test (TVT) was developed by Marras et al., (1995, 1999) as a measurement tool to examine the causes and treatment of low back disability. It consists of five repetitions of trunk flexion and extension, where the patient moved as far and as fast as possible. Although the original test took into account the movement profiles, it was also measured by total time taken. This test has been used by several researchers in its original and modified versions to examine the relationship between functional characteristics of the trunk and the occurrence of low back pain (Ferguson et al., 2004; Marras et al., 1995; Masset et al., 1998). Gill and Callaghan (1996) and Marras et al. (1994) assessed the reliability of their measurement tools for the TVT and found excellent results (ICC = 0.69 to 0.96).

In this study, only the total time taken for the completion of three trunk flexion and extension motions was recorded using a stopwatch. Participants were instructed to stand with feet shoulder-width apart and arms crossed in front of the chest. They would then perform a total of three repetitions of flexion-extension movements as far and fast as they could tolerate. The time from start to finish was recorded in seconds using a stopwatch.
4.2.6.9 Time Since Onset and Length of Stay (LOS)

Time from the reported onset of the current episode of low back pain was calculated in Microsoft Excel as the number of days between reported date of injury and date of program entry (admission). Length of stay was calculated as the duration of time between date of program admission and discharge.

4.2.7 Discharge Outcomes

In addition to the measures, there were three discharge outcomes, namely return to any level of work, return to pre-injury level or modified work, and perceived disability at program completion.

4.2.8 Statistical Analysis

Data were recorded onto individual data sheets, transposed to and verified in a Microsoft® Excel file for storage, and analyzed using SPSS (Statistical Package for the Social Sciences) version 12.0 for Windows. The completers, where there were data from program entry (Time 1) and discharge (Time 2) measures, were compared to the non-completers where there were only program entry (Time 1) measures to determine if there were statistically significant differences between the two groups. It was hypothesized that no differences would be found on the independent measures. Bivariate relationships were explored, using t-tests and chi-square tests at 0.05 level of significance. To determine change in measures after program completion, pre-test to post-test analyses were conducted.
4.3 Results

4.3.1 Characteristics of Participants

The first objective was to determine change in measures of pre- to post- program participation and to evaluate outcomes of the program relative to (population level) normative data. Study participants were employed (83% fulltime) at the onset of the index back pain episode. However, on admission to program (pre-test), slightly more than half (53.1%) were off work due to back pain complaints and 38.8% were on modified work. On admission, which was an average of 30 days after onset of back pain, 8.2% of participants were working at their pre-injury level of work. Most (72.1%) described their regular paid work as predominantly involving lifting, and 17% reported working mostly in a standing position. Participants reported working a median of 14.25 hours per week in the week before program admission. Detailed demographic information appeared previously in Table 4.1.

Table 4.2 contains summary data of the health-related factors for the total sample and for subgroups of completers and non-completers at baseline. There were no statistically significant differences in psychosocial distress, pain intensity, perceived disability, and quality of life between the two subgroups. However, the general trend was that the non-completers appeared to score better on most of the measures; for example, the non-completers reported less pain intensity, perceived disability, and psychosocial distress than did the completers. Again, while there were no statistically significant differences between the groups, the non-completers consistently scored higher in all eight quality of life domains and two component scores, reflecting better quality of life.
Table 4.2: Baseline Psychosocial Distress, Perceived Disability, Pain, and SF-36 Mean (SD) for Completers, Non-Completers, and Total Sample

<table>
<thead>
<tr>
<th></th>
<th>Completers N=72 (49%)</th>
<th>Non-Completers N=75 (51%)</th>
<th>Total Sample N = 147</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Psychosocial Distress (BSI-GSI)</td>
<td>0.60(.49)</td>
<td>0.57(.50)</td>
<td>0.58(0.49)</td>
</tr>
<tr>
<td>Perceived Disability (ODI)</td>
<td>39.9(4.8)</td>
<td>40.3(7.4)</td>
<td>40.0(16.0)</td>
</tr>
<tr>
<td>Pain (VAS)</td>
<td>5.3(.7)</td>
<td>5.2(2.0)</td>
<td>5.2(1.0)</td>
</tr>
<tr>
<td>PHYSICAL FUNCTIONING (0-100)</td>
<td>38.1 (25.0)</td>
<td>39.1(24.9)</td>
<td>38.8(24.9)</td>
</tr>
<tr>
<td>ROLE-PHYSICAL (0-100)</td>
<td>7.5(23.1)</td>
<td>11.0(28.6)</td>
<td>9.3(26.1)</td>
</tr>
<tr>
<td>PAIN INDEX (0-100)</td>
<td>23.7(14.0)</td>
<td>26.3(15.9)</td>
<td>25.1(15.0)</td>
</tr>
<tr>
<td>GENERAL HEALTH PERCEPTIONS (0-100)</td>
<td>62.0(18.7)</td>
<td>69.6(19.7)</td>
<td>65.7(19.5)</td>
</tr>
<tr>
<td>VITALITY (0-100)</td>
<td>36.9(20.8)</td>
<td>44.9(21.9)</td>
<td>41.0(21.7)</td>
</tr>
<tr>
<td>SOCIAL FUNCTIONING (0-100)</td>
<td>50.7(26.1)</td>
<td>50.8(27.4)</td>
<td>50.9(26.8)</td>
</tr>
<tr>
<td>ROLE-EMOTIONAL (0-100)</td>
<td>55.2(44.6)</td>
<td>60.5(42.3)</td>
<td>58.0(43.5)</td>
</tr>
<tr>
<td>MENTAL HEALTH INDEX (0-100)</td>
<td>70.3(17.3)</td>
<td>70.8(19.8)</td>
<td>70.7(18.5)</td>
</tr>
<tr>
<td>SF36 PCS</td>
<td>27.3(7.4)</td>
<td>29.2(7.0)</td>
<td>28.3(7.29)</td>
</tr>
<tr>
<td>SF36 MCS</td>
<td>48.2(11.2)</td>
<td>49.7(11.6)</td>
<td>49.0(11.4)</td>
</tr>
</tbody>
</table>

At program entry (N=147), the mean scores for the three subscales of the Brief Symptom Inventory (BSI), namely, Depression, Anxiety and Global Severity Index (GSI) were 0.54(±0.66), 0.69(±0.62) and 0.58(±0.49), respectively, indicating moderately high psychosocial distress. The mean score for perceived disability (ODI) was 40 (±16), which was considered to be a moderate disability score for LBP patients. The ODI scores
ranged from 6 - 86 and were normally distributed with most participants reporting moderate (41.8%) or severe disability (35.6%).

The eight domains and two component scores of the SF-36 (0-100) were calculated to measure health-related quality of life. Role Physical was the worst score with a mean of 9.3(26.1), which was quite low considering that the comparable population norm score is RP = 85.4(3.6). The Pain Index, which measures bodily pain, was also low with a mean (SD) of 25.1(15). The highest (best) score (mean=70.7; SD=18.5) was obtained on the Mental Health Index, which compared well with the population norm of 77.1. All domains and the Physical Component Score of the SF-36 were significantly lower than age-and-sex adjusted population norms, indicating a higher burden of illness in this group of patients on admission to the program.

Two physical performance measures were used to estimate the extent of back impairment in this study. The trunk velocity test was not completed 26.5% of the time, with the most frequently cited reasons being “too much pain” or “fear of pain”. This test was completed in 18.1 ± 8.6 seconds in total time with scores ranging from 5.0 to 54.3 seconds. The Biering-Sorensen test was not completed by 28% of participants, either because they declined, citing fear of increased pain, or at their therapist’s discretion. On admission, scores ranged from 0 to 188.4 seconds with a mean score of 23.2 ± 33.1 seconds. In a Canadian study, typical times for a non-patient community sample were 80.4 ± 10 seconds for 30-39-year old men and 124.4 ± 28 seconds for women (Payne et al., 2000).
4.3.2 Change in Pain, Psychosocial Distress, Perceived Disability, Quality of Life, and Physical Measures

One of the objectives of the present study was to determine if change in key variables had occurred during the course of the program. Therefore, pain, psychosocial distress, perceived disability, quality of life, and work status were determined before and after program participation. Since, except for work status, there were no statistically significant differences in key variables between the completers and non-completers, it was reasonable to assume that the subset of participants with pre-test and post-test data (completers) was representative of the whole sample, other than in work status. The median length of time between pre-test and post-test was eight weeks.

There were statistically significant pre- to post-test improvements in pain (VAS), psychosocial distress (BSI), depression (BSI), anxiety (BSI), and perceived disability (ODI) (t-tests; p<0.001) (see Table 4.3). There were significant improvements from pre- to-post-test in all domains and summary scores of the SF-36 (p<0.05). Most improvement was observed in the Physical Functioning domain, with the mean change of 32.2(27.3) points. The General Health domain changed the least; the mean (SD) change was 6.0(14.9). The PCS admission and discharge mean (SD) scores were 27.4(7.4) and 38.1(10.0), respectively. Overall, the MCS was rated higher at both times with corresponding scores being 48.0(11.1) and 51.7(9.5) on admission and discharge, respectively. Greater change was observed in the PCS [10.7(8.5)] compared to the MCS [3.7(10.9)] (see Table 4.4 and Fig. 4.1).

The average back extensor muscle endurance increased from 20.6 sec on admission to 48.6 sec at discharge, indicating an improvement in participants’ ability to
sustain back extension. Trunk velocity also improved from admission to discharge, with mean scores of 17.2 sec and 11.3 sec, respectively. Additional information on the physical measures appears in Table 4.5.
Table 4.3: Pain, Psychosocial Distress, and Perceived Disability Mean (SD) scores at Pre- and Post-Test, N=72

<table>
<thead>
<tr>
<th></th>
<th>Admission Mean (SD)</th>
<th>Discharge Mean (SD)</th>
<th>Change Mean (SD)</th>
<th>Sig. (2-tailed) p-value [CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain (VAS) (0-10)</td>
<td>5.2 (1.7)</td>
<td>1.9 (2.2)</td>
<td>-3.3 (2.1)</td>
<td>p=0.001 [2.8-3.8]</td>
</tr>
<tr>
<td>Psychosocial distress</td>
<td>.60 (.49)</td>
<td>.38 (.44)</td>
<td>-.22 (.47)</td>
<td>p=0.001 [0.11-0.34]</td>
</tr>
<tr>
<td>Depression (BSI-DEP)</td>
<td>.60 (.70)</td>
<td>.30 (.59)</td>
<td>-.30 (.68)</td>
<td>p=0.001 [.14-.4]</td>
</tr>
<tr>
<td>Anxiety (BSI-ANX)</td>
<td>.69 (.64)</td>
<td>.37 (.57)</td>
<td>-.32 (.65)</td>
<td>p=0.001 [.16-.48]</td>
</tr>
<tr>
<td>Perceived Disability</td>
<td>39.9 (14.8)</td>
<td>17.1 (17.2)</td>
<td>-22.8 (17.0)</td>
<td>p=0.001 [18.8-26.9]</td>
</tr>
</tbody>
</table>
Table 4.4: Quality of Life Mean (SD) Pre-Test, Post-Test, and Change Scores (N=72)

<table>
<thead>
<tr>
<th>Quality of life (SF-36) (0-100)</th>
<th>Admission (Pre) Mean (SD)</th>
<th>Discharge (Post) Mean (SD)</th>
<th>Change Mean (SD)</th>
<th>p-value</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Functioning</td>
<td>38.0(24.8)</td>
<td>70.2(28.3)</td>
<td>32.2(27.3)</td>
<td>p=.001</td>
<td>[25.8-38.6]</td>
</tr>
<tr>
<td>Bodily Pain</td>
<td>23.2(13.8)</td>
<td>49.7(23.3)</td>
<td>26.5(21.0)</td>
<td>p=.001</td>
<td>[21.5-31.5]</td>
</tr>
<tr>
<td>Role Physical</td>
<td>7.5(23.1)</td>
<td>29.0(37.7)</td>
<td>21.6(40.2)</td>
<td>p=.001</td>
<td>[12.0-31.1]</td>
</tr>
<tr>
<td>Social Functioning</td>
<td>50.7(26.0)</td>
<td>73.9(23.5)</td>
<td>23.2(23.6)</td>
<td>p=.001</td>
<td>[17.7-28.8]</td>
</tr>
<tr>
<td>Vitality</td>
<td>37.1(20.8)</td>
<td>54.5(20.5)</td>
<td>17.4(24.3)</td>
<td>p=.001</td>
<td>[11.6-23.2]</td>
</tr>
<tr>
<td>Role Emotional</td>
<td>55.9(43.9)</td>
<td>70.942.1)</td>
<td>15.0(52.2)</td>
<td>p=.018</td>
<td>[2.7-27.4]</td>
</tr>
<tr>
<td>Mental Health</td>
<td>70.0(17.3)</td>
<td>77.1(16.5)</td>
<td>7.1(15.3)</td>
<td>p=.001</td>
<td>[3.5-10.7]</td>
</tr>
<tr>
<td>General Health</td>
<td>62.0(18.7)</td>
<td>68.0(18.9)</td>
<td>6.0(14.9)</td>
<td>p=.001</td>
<td>[2.4-9.5]</td>
</tr>
</tbody>
</table>

Summary Scores

| Physical Component Score        | 27.4(7.4)                 | 38.1(10.0)                  | 10.7(8.5)        | p=.001  | [8.7-12.8]  |
| Mental Component Score          | 48.0(11.1)                | 51.7(9.5)                   | 3.7(10.9)        | p=.007  | [1.1-6.3]   |
Figure 4.2: Quality of Life pre- and post program, SF-36 Mean (SE) scores
Table 4.5: Biering-Sorensen and Trunk Velocity Test, Pre- and Post-Test, Mean (SD) scores

<table>
<thead>
<tr>
<th>Test</th>
<th>Pre-Test Mean (SD)</th>
<th>Post-Test Mean (SD)</th>
<th>Change Mean (SD)</th>
<th>p-value [CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back extensor endurance</td>
<td>20.6(26.5)</td>
<td>48.6(40.6)</td>
<td>28.0(37.0)</td>
<td>p = .001 [-37.1 to –18.8]</td>
</tr>
<tr>
<td>Trunk Velocity Test (N=67)</td>
<td>17.2(9.9)</td>
<td>11.3(9.6)</td>
<td>5.9(10.3)</td>
<td>p = .001 [3.4 to 8.4]</td>
</tr>
</tbody>
</table>
4.3.3 Change in Work-Related Measures

Work status was determined in two ways, working versus not working, as well as by level of work (working at pre-injury status, on modified duties, or not working). Admission and discharge work status data were available for all participants. More participants were working at discharge (73.5%) than on admission (47%) (see figure 4.3). Most (90%) of those who were working on admission were still working at discharge, compared to those who were initially off work (59%). Moreover, 41.5% were working at their pre-injury level at discharge, compared to 32% who were on modified work and 26.5% not working. As well, the number of days participants were working per week on admission and discharge were compared, and statistically significant improvements were found (p<0.001). Finally, while on admission there were statistically significant differences ($\chi^2 = 0.025$) in the proportions of participants who were working versus those not working between the completers and non-completers, no significant differences were found at discharge (see figure 4.4).
<table>
<thead>
<tr>
<th>Admission</th>
<th>Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Working</td>
<td>Total Working</td>
</tr>
<tr>
<td><em>N</em>=69 (47%)</td>
<td><em>N</em>=108 (73.5%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Working</th>
<th>Still Working</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>N</em>=69 (47%)</td>
<td><em>N</em>=62 (90%)</td>
</tr>
</tbody>
</table>

| No Longer Working | *N*=7 (10%) |

<table>
<thead>
<tr>
<th>Not Working</th>
<th>Working</th>
<th>Still Not Working</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>N</em>=78 (53%)</td>
<td><em>N</em>=46 (59%)</td>
<td><em>N</em>=32 (41%)</td>
</tr>
</tbody>
</table>

Figure 4.3: Work status pre and post program for total sample, *N*=147
Table 4.6: Number of days participants worked per week and work status; N=147

<table>
<thead>
<tr>
<th>Days worked per week; Mean (SD)</th>
<th>Admission (Pre)</th>
<th>Discharge (Post)</th>
<th>Change</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.6(2.5) days</td>
<td>3.5(2.2) days</td>
<td>0.9(2.7) days</td>
<td>p=.001 [95%CI: 0.43-1.4]</td>
</tr>
<tr>
<td><strong>RTW</strong></td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>69(47.0)</td>
<td>108(73.5)</td>
<td>39(26.5)</td>
<td>(X^2)</td>
</tr>
<tr>
<td>No</td>
<td>78(53.1)</td>
<td>39(26.5)</td>
<td>-39(26.6)</td>
<td>p=.001</td>
</tr>
</tbody>
</table>

Table 4.7: Admission and discharge work status; “Completers” versus “Non-Completers”

<table>
<thead>
<tr>
<th>RTW</th>
<th>Admission</th>
<th>Discharge</th>
<th>Admission</th>
<th>Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>Yes</td>
<td>27(37.5%)</td>
<td>55(76.4%)</td>
<td>42(56.0%)</td>
<td>53(70.7%)</td>
</tr>
<tr>
<td>No</td>
<td>45(62.5%)</td>
<td>17(23.6%)</td>
<td>33(44.0%)</td>
<td>22(29.3%)</td>
</tr>
</tbody>
</table>
Figure 4.4: Percentage of “Completers” and “Non-Completers” who were working versus not working at admission and discharge.
4.3.4 Comparisons of measures with normative data

A selection of measures was compared to normative data derived from previous studies in order to estimate the burden of LBP, as well as to estimate the level of success possible as a function of program participation. Pain, perceived disability, psychosocial distress, and quality of life measures were included in this comparison.

The mean scores on the three psychosocial distress subscales returned to population norm levels at discharge, although they were quite high at admission (see figure 4.3). The mean BSI GSI, BSI DEP, and BSI ANX on admission were .60, .60 and .69, respectively, considerably higher than the corresponding normative data of .30, .28, and .35. The discharge mean scores were within the normative range at .38, .30, and .37, respectively. Quality of life, scores on the other hand, remained below population norms even at program completion, with the exception of the Mental Health domain and Mental Health Component Score. These two quality of life items had remained at population norm level at both pre-treatment and post-treatment measurement; for example, the MH pre-test and post-test scores were 70.0 and 77.1, and were comparable to normative MH mean score of 77.3 (see Table 4.7 for detailed information).

In terms of the SF-36, all physical domains and the Physical Component Score (PCS) were significantly lower than age- and sex-adjusted population norms, indicating a higher burden of illness in this group of patients on admission to the program. Role Physical was the poorest score with a mean of 9.3 ± 26.1, which was quite low in comparison to the population norm score of 85.4 ± 3.6. The Pain Index was also low in comparison to population norms, with a mean score of 25.1 ± 15.
Figure 4.5: Comparison of participants’ Brief Symptom Inventory Global Severity Index, Depression, and Anxiety subscales admission and discharge mean scores with adult population norms.
Table 4.8: Main measures, pre- and post-test mean (SD) scores, relative to normative scores

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pre-Test</th>
<th>Post-Test</th>
<th>Normative/ Levels in non-clinical populations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain (VAS) (0-10)</td>
<td>5.2 (1.7)</td>
<td>1.9 (2.2)</td>
<td>2.2 (2.2)</td>
</tr>
<tr>
<td>Perceived Disability (ODI)</td>
<td>39.9 (14.8)</td>
<td>17.1 (17.2)</td>
<td>15 (14)</td>
</tr>
<tr>
<td>Depressive symptoms (BSI-DEP)</td>
<td>.60 (.70)</td>
<td>.30 (.59)</td>
<td>.28 (.46)</td>
</tr>
<tr>
<td>Anxiety symptoms (BSI-ANX)</td>
<td>.69 (.64)</td>
<td>.37 (.57)</td>
<td>.35 (.45)</td>
</tr>
<tr>
<td>Psychosocial distress (BSI-GSI)</td>
<td>.60 (.49)</td>
<td>.38 (.44)</td>
<td>.30 (.31)</td>
</tr>
<tr>
<td>Quality of life (SF-36)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0-100)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Functioning</td>
<td>38.0 (24.8)</td>
<td>70.2 (28.3)</td>
<td>90.9 (15.1)</td>
</tr>
<tr>
<td>Role Physical</td>
<td>7.5 (23.1)</td>
<td>29.0 (37.7)</td>
<td>83.4 (31.6)</td>
</tr>
<tr>
<td>Bodily Pain</td>
<td>23.2 (13.8)</td>
<td>49.7 (23.3)</td>
<td>76.2 (22.1)</td>
</tr>
<tr>
<td>General Health</td>
<td>62.0 (18.7)</td>
<td>68.0 (18.9)</td>
<td>78.9 (16.9)</td>
</tr>
<tr>
<td>Vitality</td>
<td>37.1 (20.8)</td>
<td>54.5 (20.5)</td>
<td>66.1 (18.4)</td>
</tr>
<tr>
<td>Social Functioning</td>
<td>50.7 (26.0)</td>
<td>73.9 (23.5)</td>
<td>85.5 (18.4)</td>
</tr>
<tr>
<td>Role Emotional</td>
<td>55.9 (43.9)</td>
<td>70.9 (2.1)</td>
<td>83.2 (32.5)</td>
</tr>
<tr>
<td>Mental Health</td>
<td>70.0 (17.3)</td>
<td>77.1 (16.5)</td>
<td>77.3 (14.5)</td>
</tr>
<tr>
<td>Physical Component Score</td>
<td>27.4 (7.4)</td>
<td>38.1 (10.0)</td>
<td>52.0 (8.0)</td>
</tr>
<tr>
<td>Mental Component Score</td>
<td>48.0 (11.1)</td>
<td>51.7 (9.5)</td>
<td>50.9 (9.0)</td>
</tr>
</tbody>
</table>
Mean scores on the Sorensen back muscle endurance test obtained from the study sample were also compared with normative data obtained from a Canadian community population sample ranging in age from 19 to 69 years (Payne et al., 2000), described as “apparently healthy” according to the Physical Activity Readiness Questionnaire (Thomas et al., 1992). The normative data in the Payne et al. study (2000) were reported by gender and by history and no history of back pain. For participants without a history of back pain, there did not appear to be much difference between male (112.9±4.1 seconds) and female (117.2±4.8 seconds) back endurance mean scores; however, female participants with a history of back pain scored higher (92.5±9.3 seconds) than males (77.5±9.5 seconds). The Sorensen back endurance mean scores in the current study were substantially lower than the Canadian norms, even for people with previous low back pain (Payne et al., 2000). Combined mean scores were 20.6±26.5 seconds at pre-test and 48.6±40.6 seconds at post-test. Other authors have reported different values for back endurance in subjects with low back pain; for example, Ito et al. (1996) reported mean scores of 85.1 seconds for male and 70.1 seconds for female participants with low back pain.

4.4 Summary of Findings

At program entry, participants reported moderate levels of pain intensity, psychosocial distress, depressive and anxiety symptoms, and perceived disability. Poor quality of life was reflected in markedly low physical domains scores (PF, RP, BP) and in vitality. Participants considered their general health to be fairly good. All measures improved significantly between admission and discharge. While participants initially performed
poorly in the two physical tests, back endurance, for example, had more than doubled by
program completion. Scores on the trunk velocity test improved from 17.2 seconds
(admission) to 11.3 seconds (discharge).

Work status improved between admission and discharge, with more participants
working at program completion (73.5%) compared to admission (47.0%). Moreover, 90%
of those working on admission were still working at discharge, indicating that RTW was
sustainable, at least for the duration of the program (average three months). The
differences between the work status of “completers” and “non-completers” that were
noted on admission were no longer apparent at discharge.

When comparisons with normative data were made, as would be expected, at
program entry participants fared poorly compared to their peers in the general population.
Most of the measures, however, returned to population normative level, by the time
participants were discharged from the program. While mental/emotional health either
remained high or improved to normative level, quality of life scores in the physical
domains remained below normative data, even at program completion. The participants’
mean scores on the Sorensen back endurance test were substantially below Canadian
population norms at both pre- and post-test.
Chapter 5
Determinants of Return to Work and Perceived Disability in Workers with Subacute Low Back Pain (Objective 2)

5.1 Introduction
The second objective of the thesis was to determine factors associated with three program outcomes: return to any work, return to prior work, and perceived disability at discharge; and to compare the RTW and Non-RTW groups in terms of pain, psychosocial distress, anxiety and depressive symptoms, perceived disability, and quality of life measures. It was hypothesized that there would be significant differences in pain, psychosocial distress, anxiety, depressive symptoms, perceived disability, and quality of life measures between those who returned to work and those who failed to return to work.

5.2 Methods

5.2.1 Study Design
Details of study methods, including study design, procedures for sample selection, characteristics of participants, administration of measures, and program are described in sections 4.2.1 through 4.2.4.

5.2.2 Measures
A theoretical strategy, informed by the biopsychosocial model, was developed to facilitate the analysis (Table 5.1). The model, consisting of demographic, work, psychosocial, physical, and injury-related factors, was used to explore relationships among variables and to determine factors associated with program outcomes (return-to-
work and perceived disability). Demographic factors were age, gender and education level. “Work factors” were days worked per week and work status. Psychosocial factors (4 measures), physical factors (3 measures), and injury-related factors were grouped together as health-related factors. The individual measures are described in section 4.2.5.

Psychosocial factors included BSI-Global Severity Index, BSI-Depression, and BSI-Anxiety subscales, as well as the SF-36 Mental Component Score and its four domains (VT, SF, RE, MH). Baseline scores on perceived disability, back endurance, trunk velocity, and SF-36 Physical Component Score and associated domains (PF, RP, BP, GH) were included as physical factors. Injury-related factors included history of prior low back pain, time since onset, pain visual analogue scale, and length of stay in the program. Although some measurement tools had sub-categories that might overlap conceptually with categories from other tools, none were combined within the model. The program outcomes were the dependent measures of return to any level of work, return to pre-injury level of work, and discharge perceived disability. Each of these measures was discussed in detail in Chapter 4.
Table 5.1: Model used to determine factors associated with treatment outcomes

<table>
<thead>
<tr>
<th>Demographic and Work Factors</th>
<th>Health-Related Factors</th>
<th>Discharge Outcomes</th>
<th>Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic Factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Work Factors</td>
<td>Psychosocial Factors</td>
<td>Physical Factors</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Injury-related Factors</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dependent Variables</td>
</tr>
<tr>
<td>Gender</td>
<td>Days worked per week</td>
<td>Brief Symptom Inventory (BSI)</td>
<td>Perceived Disability (ODI) at Baseline</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>a) Psychosocial Distress (BSI-GSI)</td>
<td>Back endurance</td>
</tr>
<tr>
<td>Education</td>
<td>Work Status</td>
<td>b) Depression (BSI-DEP)</td>
<td>Trunk velocity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) Anxiety (BSI-ANX)</td>
<td>Quality of Life (SF-36: Mental Health scales)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quality of Life (SF-36: Mental Health scales)</td>
<td>Quality of Life (SF-36: Physical Health scales)</td>
</tr>
</tbody>
</table>

GSI: Global Severity Index  DEP: Depression  ANX: Anxiety  ODI: Oswestry Disability Index  SF-36: Short Form 36-item  VAS: Visual Analogue Scale  SF-36 Mental Health scales  SF-36 Physical Health scales

Vitality (VT) (0-100)  Physical Functioning (PF) (0-100)
Social Functioning (SF) (0-100)  Role-Physical (RP) (0-100)
Role-Emotional (RE) (0-100)  Bodily Pain (BP) (0-100)
Mental Health Index (MH) (0-100)  General Health (GH) (0-100)
SF-36 Mental Component Score (MCS)  SF-36 Physical Component Score (PCS)
5.2.3 Statistical Analysis

Data were recorded onto individual data sheets, transposed to and verified in a Microsoft® Excel file for storage, and analyzed using SPSS (Statistical Package for the Social Sciences) version 12.0 for Windows. The completers, the group with complete data from program entry (Time 1) and discharge (Time 2) measures, were compared to the non-completers, where there were only program entry (Time 1) data, to determine if there were statistically significant differences between the two groups. It was hypothesized that no differences would be found on the independent measures between the two groups. Bivariate relationships were explored using t-tests and chi-square tests at 0.05 level of significance. Logistic regression, backward elimination method was used to determine predictors of return to any level work and return to prior level of work. Removal of variables from the model was based on the probability of the Wald statistic. Linear regression, backward elimination was used to determine predictors of perceived disability at program completion.

5.3 Results

Demographic and work-related information were reported in Table 4.1.

5.3.1 Health-Related Factors

Health-related factors were grouped into psychosocial, physical, and injury-related factors. Information on injury-related factors, namely prior low back pain, time since back pain onset, and length of stay in the treatment program, was available for all subjects. More than half of the participants (53.1%) reported a previous episode of low
back pain. The median time post-onset at the start of the program was 30.5 days, and average length of stay (LOS) was 2.5 (2) months.

Variables included within the psychosocial factors category were pain, psychosocial distress, perceived disability, and quality of life. The average pain score reported on admission was 5.2(1.0), with scores ranging from 1-10 on a pain visual analogue scale. Three subscales of the psychosocial distress measure, the Brief Symptom Inventory®, that were used in the analyses were the Global Severity Index, and the Depression and Anxiety subscales. The mean scores for the GSI and Depression and Anxiety subscales were 0.58(0.49), 0.54(0.66) and 0.69(0.62) respectively, indicating moderately high psychosocial distress. The mean score for perceived disability was 40 (16). The ODI scores ranged from 6 to 86, and were normally distributed. Most participants reported moderate (41.8%) or severe disability (35.6%).

The eight domains and two component scores of the SF-36 (0-100) were calculated to measure health-related quality of life. Role Physical was the worst score with a mean of 9.3(26.1), which was quite low considering that the comparable population norm score is RP = 85.4(3.6). The Pain Index, which measures bodily pain, was also low with a mean (SD) of 25.1(15). The highest (best) score (mean=70.7; SD=18.5) was obtained on the Mental Health Index, which compared well with the population norm of 77.1. All domains and the Physical Component Score of the SF-36 were significantly lower than age- and sex-adjusted population norms, indicating a higher burden of illness in this group of patients on admission to the program.
5.3.2 Associations among Variables

There were statistically significant associations between primary outcomes. Perceived disability was associated with the return-to-any work (p=0.017) and return-to-prior work (p=0.003) categories. As well, significant correlations were found between a number of demographic, work-related, injury-related, and health-related predictor variables. There were no significant associations between gender, time since onset, prior back pain, and admission RTW status and any other predictor variables. Age correlated positively with LOS and perceived disability, and negatively with the number of days worked per week on admission, SF36-PF, and SF-36 PCS. The number of days worked per week also had significant correlations with pain, depression, anxiety, perceived disability, SF-36 PF, SF-36 PCS, and SF-36 MCS. Perceived disability at discharge correlated positively with pain (.431; p=.001) and LOS (.481, p=.001) and negatively with days worked on admission (.306; p=.010) and physical functioning (.396; p=.001).
Table 5.2: Significant Correlations among Predictors (*: p<0.05; **: p<0.01)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Work-Related</th>
<th>Injury-Related</th>
<th>Health-Related Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RTW (Y/N)</td>
<td>Prior LBP (Y/N)</td>
<td>LOS</td>
</tr>
<tr>
<td></td>
<td>Days worked</td>
<td>Weeks Post-onset</td>
<td>Pain BSI-GSI BSI-DEP BSI-ANX ODI SF-36 PF SF-36 PCS SF-36 MCS</td>
</tr>
<tr>
<td>Demographic Factors</td>
<td>Age</td>
<td>- .216**</td>
<td>.212**</td>
</tr>
<tr>
<td>Work-Related Factors</td>
<td>Days worked</td>
<td>1</td>
<td>- - - .217* -.176* -.263**</td>
</tr>
<tr>
<td>Injury-Related Factors</td>
<td>Prior LBP (Y/N)</td>
<td>1</td>
<td>- - - - - - - - - -</td>
</tr>
<tr>
<td></td>
<td>Weeks Post-onset</td>
<td>1</td>
<td>- - - - - - - - - -</td>
</tr>
<tr>
<td></td>
<td>LOS</td>
<td>1 .203* .203*</td>
<td>.301** .263** .207*</td>
</tr>
<tr>
<td>Health-Related Factors</td>
<td>Pain</td>
<td>1 .209* .209*</td>
<td>.553** .322** .245**</td>
</tr>
<tr>
<td></td>
<td>BSI-GSI</td>
<td>1 .865** .848**</td>
<td>.294** .247** .595**</td>
</tr>
<tr>
<td></td>
<td>BSI-DEP</td>
<td>1 .698** .182*</td>
<td>.203* .622*</td>
</tr>
<tr>
<td></td>
<td>BSI-ANX</td>
<td>1 .261* .261*</td>
<td>- .577**</td>
</tr>
<tr>
<td></td>
<td>ODI</td>
<td>1 -.666* -.534**</td>
<td>-.189*</td>
</tr>
<tr>
<td></td>
<td>SF-36 PF</td>
<td>1 .756** .756**</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SF-36 PCS</td>
<td>1 -.170* -.170*</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SF-36 MCS</td>
<td>1 -.189* -.189*</td>
<td>-</td>
</tr>
</tbody>
</table>
5.3.3 Predictors of return to any level work (any work)

Logistic regression was used to determine factors predictive of return to any work at program completion. Demographic, work-related, and health-related variables were entered in the equation. Return to any level work was determined by gender, LOS in weeks, days worked on admission, and SF-36 Mental Component Score (admission). The model could correctly predict return-to-work 92.2% of the time, and failure to return-to-work, 51.5% of the time, with the overall prediction rate of 81%. The variables that were eliminated from the model were age, psychosocial distress, depression, anxiety, perceived disability, pain, SF-36 Physical Functioning, and Physical Component Score.

Male participants were 74% less likely to return to any work than females. Patients were 5.0% less likely to return to work for every additional week (LOS) they remained in the program. For every additional day worked on admission, the odds of returning to work increased by 32%. For every unit increase in SF-36 MCS (quality of life) on admission, the odds of returning to work increased by 3.8%.
Table 5.3: Regression Model: Predictors of return to any level of work

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95.0% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS (weeks)</td>
<td>-0.050</td>
<td>0.027</td>
<td>3.451</td>
<td>1</td>
<td>0.063</td>
<td>0.952</td>
<td>0.903 - 1.003</td>
</tr>
<tr>
<td>MCS</td>
<td>0.038</td>
<td>0.020</td>
<td>3.550</td>
<td>1</td>
<td>0.060</td>
<td>1.039</td>
<td>0.998 - 1.082</td>
</tr>
<tr>
<td>Gender (male)</td>
<td>-1.256</td>
<td>0.497</td>
<td>6.384</td>
<td>1</td>
<td>0.012</td>
<td>0.285</td>
<td>0.107 - 0.754</td>
</tr>
<tr>
<td>Days worked/week</td>
<td>0.318</td>
<td>0.110</td>
<td>8.404</td>
<td>1</td>
<td>0.004</td>
<td>1.374</td>
<td>1.109 - 1.704</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.047</td>
<td>1.036</td>
<td>0.002</td>
<td>1</td>
<td>0.964</td>
<td>0.954</td>
<td></td>
</tr>
</tbody>
</table>

*Variable(s) entered on step 1: Age, LOS (wks), BSI-GSI, BSI-DEP, BSI-ANX, ODI, Pain, PF, PCS, Gender, Days worked per week
MCS: SF-36 Mental Component Score; PCS: Physical Component Score

5.3.4 Predictors of return to prior level of work

Return to pre-injury work status was determined by gender, LOS, days worked on admission, and psychosocial distress. The model correctly predicted those who returned to pre-injury work 66% of the time, and those who did not, 74% of the time, with the overall prediction rate of 70%. Age, depression, anxiety, pain, disability, and SF-36 PF, PCS, MCS were eliminated from the final model. Males were 72% less likely to return to pre-injury work than were females. The odds of returning to prior work decreased by 12% for every additional week in LOS patients remained in the program, and by 84% for each additional unit increase in psychosocial distress (GSI of the BSI) reported on admission. The odds of returning to prior work improved by 16% for every additional day worked per week on admission.
Table 5.4: Regression Model: Predictors of return to prior level of work

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95.0% C.I for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Final Step</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (male)</td>
<td>-.720</td>
<td>.433</td>
<td>2.769</td>
<td>1</td>
<td>.096</td>
<td>.487</td>
<td>.208 .1.137</td>
</tr>
<tr>
<td>LOS (wks)</td>
<td>-.119</td>
<td>.036</td>
<td>11.090</td>
<td>1</td>
<td>.001</td>
<td>.888</td>
<td>.828 .952</td>
</tr>
<tr>
<td>GSI (A)</td>
<td>-.842</td>
<td>.500</td>
<td>2.836</td>
<td>1</td>
<td>.092</td>
<td>.431</td>
<td>.162 .1.148</td>
</tr>
<tr>
<td>Days worked</td>
<td>.162</td>
<td>.087</td>
<td>3.459</td>
<td>1</td>
<td>.063</td>
<td>1.176</td>
<td>.991 .1.394</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>1.215</td>
<td>.554</td>
<td>4.812</td>
<td>1</td>
<td>.028</td>
<td>3.371</td>
<td></td>
</tr>
</tbody>
</table>
5.3.5 Predictors of short-term disability (disability at program completion)

Using linear regression, backward elimination method, the variables that best predicted perceived disability at discharge were **LOS, baseline pain, and SF-36 MCS**. These variables accounted for 41% of the variance in discharge perceived disability in the final model:

\[
\text{Perceived Disability at discharge model: } = 13.293 + 0.790(\text{LOS}) + 3.260(\text{Pain}) - 0.437(\text{MCS}) + e
\]

For perceived disability measured with the Oswestry Disability Index (0-100), higher scores indicate greater disability thus, for every additional week (1-unit increase) in length of stay, a 7.9% increase in perceived disability is expected. For a 1-unit increase in pain on admission, perceived disability is expected to increase by 3.26 units, and for every 1-unit increase in Mental Component Score, perceived disability is expected to decrease (i.e. improve) by .44 units.
Table 5.5: Predictors of short-term perceived disability

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.670(a)</td>
<td>.448</td>
<td>.350</td>
<td>13.98601</td>
</tr>
<tr>
<td>2</td>
<td>.669(b)</td>
<td>.448</td>
<td>.361</td>
<td>13.86649</td>
</tr>
<tr>
<td>3</td>
<td>.669(c)</td>
<td>.447</td>
<td>.371</td>
<td>13.75688</td>
</tr>
<tr>
<td>4</td>
<td>.666(d)</td>
<td>.444</td>
<td>.378</td>
<td>13.67714</td>
</tr>
<tr>
<td>5</td>
<td>.664(e)</td>
<td>.441</td>
<td>.385</td>
<td>13.60039</td>
</tr>
<tr>
<td>6</td>
<td>.656(f)</td>
<td>.430</td>
<td>.383</td>
<td>13.62202</td>
</tr>
<tr>
<td>7</td>
<td>.650(g)</td>
<td>.423</td>
<td>.386</td>
<td>13.59478</td>
</tr>
<tr>
<td>8</td>
<td>.640(h)</td>
<td>.410</td>
<td>.382</td>
<td>13.63460</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>(Constant)</td>
<td>13.293</td>
<td>9.198</td>
<td>1.445</td>
</tr>
<tr>
<td></td>
<td>LOS.Wks</td>
<td>.790</td>
<td>.218</td>
<td>.374</td>
</tr>
<tr>
<td></td>
<td>Pain</td>
<td>3.260</td>
<td>1.035</td>
<td>.325</td>
</tr>
<tr>
<td></td>
<td>SF36 MCS</td>
<td>-.437</td>
<td>.149</td>
<td>-.284</td>
</tr>
</tbody>
</table>

Dependent Variable: Perceived Disability (ODI) at discharge
To identify the characteristics of low back pain patients who returned to work versus those who failed to return to work, differences in pain, psychosocial distress, anxiety and depressive symptoms, perceived disability, and quality of life were determined. There were no statistically significant differences in age or time post-onset between the RTW and non-RTW groups. However, those who failed to return to work remained four weeks longer in program than their RTW peers (13.87 weeks versus 9.63 weeks, respectively). Those who were still off-work at program completion (non-RTW group) reported statistically significantly higher psychosocial distress and depression at admission, higher anxiety at discharge, greater perceived disability at both times, and greater pain severity at discharge.
Figure 5.1. Differences in time since onset of back pain and length of stay in the program between those who did and did not return to work by program completion.

Regarding quality of life (QoL), the RTW group consistently reported better QoL in all domains (SF-36). At admission, the General Health, Role Emotional, Mental Health, and Mental Component Score mean scores for the non-RTW group were significantly lower than those for the RTW group. At discharge, the differences in QoL between the RTW and Non-RTW groups were even more pronounced, with only differences in Role Physical and Vitality domains failing to reach statistical significance. Those still off work at discharge had significantly worse quality of life (t-test; p<0.05) in all domains, except Role Physical (p=0.06) and Vitality (p=0.11). Figure 5.2 shows
differences in discharge quality of life (SF-36) between those who had and those who had not returned to work at program completion.

Figure 5.2: Differences in discharge quality of life (SF-36) between those who had and those who had not returned to work at program completion.
5.3.7 Summary of Findings

Over half of the participants reported having had a previous episode of low back pain. Most were in the subacute phase of low back pain at the start of the program, and most remained in the rehabilitation program for approximately 2½ months. As is typical of patients in the subacute phase of low back pain, participants in the current study reported moderate levels of pain, perceived disability, and psychosocial distress, on admission to the program. Quality of life was greatly reduced in the physical domains while fairly good in the mental and emotional health domains. When associations between variables were explored, age, length of time in the program, and number of days participants were working per week, had significant associations with a number of variables.

Three regression models were run, one each to determine factors associated with return to work in general, return to pre-injury level of work, and perceived disability at program completion. Gender, LOS, and number of days worked on admission, a SF-36 MCS were predictive of return to any work, whereas, gender, LOS, and number of days worked on admission, and psychosocial distress (BSI-GSI) were predictive of return to prior level of work. Perceived disability at discharge was predicted by LOS, Pain and SF-36 MCS. It is an interesting observation that while most participants reported challenges in the physical domains of the SF-36, it was the Mental Component Score that consistently emerged as one of the predictors in the models.
There were a number of differences between those who returned to work and those who failed to return to work. Those who failed to RTW tended to have higher psychosocial distress, pain severity, perceived disability and quality of life. As well, the latter group remained, on average, a month longer in the program compared to their RTW counterparts.
Chapter 6
Differences in Patterns of Rehabilitation Services Utilization among Injured Workers with Subacute Low Back Pain (Objective 3)

6.1 Introduction

The third objective was to identify subgroups by extent of service use and compare their characteristics, in order to determine whether the groups were different in their experiences of the rehabilitation process.

6.1.1 Rationale

In the Ontario workers’ compensation jurisdiction, published studies evaluating outcomes associated with outpatient return to work rehabilitation programs for injured workers are limited. Furthermore, little is known about the extent of utilization of services, particularly with regards to associated clinical factors. Although it is understood that, beyond the guidelines of the specific compensation program, the patient-therapist interaction often influences how long patients remain in a given program. Limited attention has been given to exploring some of the clinical factors that may be associated with program utilization, particularly within rehabilitation programs for workers with low back pain. Even less understood are the characteristics of the participants who end up as high service users, and whether the differences from low service users are apparent at the start of the program. Therefore, the current program evaluation project was undertaken to
add to key stakeholders’ understanding of the program in relation to the profile of participants who use the program, the degree of possible change in clinical measures, and patterns of utilization, along with associated factors.

6.1.2 Research Questions and Hypotheses

The research questions were “What are the patterns of rehabilitation service utilization among injured workers with low back pain?”, and “What are the characteristics, if any, that distinguish between different patterns of service utilization?” The hypothesis was that there would be significantly distinct subgroups within the sample when participants are categorized according to service utilization; furthermore, there would be statistically significant differences in pain, psychosocial distress, anxiety, depressive symptoms, perceived disability, and quality of life measures between groups.

6.2 Methods

6.2.1 Study Design

Details of study methods including, study design, procedures for sample selection, characteristics of participants, administration of measures and program are described in sections 4.2.1 through 4.2.4.
6.2.2 Measures

A detailed description of the measures is provided in Chapter 4.

6.2.3 Statistical Analysis

Data were stored and analyzed in SPSS (Statistical Package for the Social Sciences) version 12.0 for Windows. The group that completed both Time 1 and Time 2 measures was compared to the group that did not complete Time 2 measures, to ensure that there were no statistically significant differences between the two groups. Bivariate relationships were explored using t-tests and chi-square tests at 0.05 level of significance. Pre-test to post-test analyses were conducted to determine change in measures after program completion.

Cluster analysis, which refers to algorithms and methods used for categorizing objects of similar nature into respective, previously unknown groups (StatSoft, 2004), was used. The \( k \)-means method of clustering, available in SPSS/WIN statistical package, was chosen for use in the current analysis. In this type of cluster analysis, given a set number of \( k \)-clusters, observations are assigned to each cluster such that the means within a cluster are as similar as possible, and as different as possible from the other cluster(s) (StatSoft©, 2004). Cluster analysis has recently been used in a study of patients with acute and subacute neck, shoulder, and back pain (Boersma & Linton, 2005).
In the current study, cluster analysis was used to classify participants (N=147) into two groups, based on their length of stay in the program. Independent t-tests were then conducted to examine differences between the two clusters, using both the main sample and the completers subset to examine the differences.

6.3 Results

6.3.1 Characteristics of Study Participants

A total of 147 participants were included in the cluster analysis. Of this number, seventy-two participants who were available to provide complete admission and discharge data (completers) were included in the pre-test and post-test analyses. A detailed description of the characteristics of study participants has been provided in Chapter 4.

6.3.2 Program Utilization

The objective of the current analysis was to determine whether there were differences in the extent to which participants utilized program services, in terms of how long participants remained in the treatment program. If differences in utilization were found, then what characteristics were associated with the different patterns of utilization? A related objective was to determine whether there were differences in the degree of change (pre-treatment to post-treatment) achieved by each subgroup. Service use was defined as the length of time participants remained in the rehabilitation program, in other words, length of stay (LOS), from admission to discharge.
The median LOS in the program was 8.0 weeks, and the mean (SD) was 10.8 (8.5) weeks. The frequency distribution of LOS for the sample is displayed in figure 6.1.

Figure 6.1: Frequency distribution of length of stay in the program for total sample (N=147)
When a cluster analysis was conducted on the 147 participants based on the length of their stay in the program, two distinct clusters emerged: High Service Users (HSU) (N=39; 26.5%) (Figure 6.2) and Low Service Users (LSU) (N=108; 73.5%) (Figure 6.3), based on the resulting mean LOS.

![High Service Users, Length of Stay in Program](image)

Figure 6.2: Frequency distribution of length of stay in the program for High Service Users (N=39)
Figure 6.3: Frequency distribution of length of stay in the program for Low Service Users (N=108)

The mean LOS was 22.4 weeks and 6.5 weeks, respectively, each being considerably different from the sample mean of 10.8 weeks. The two clusters were then compared on a number of key variables.
High Service Users and LSU were compared in terms of the main measures in the following areas: Psychosocial Distress, DEP, ANX, Oswestry, Pain, quality of life, and work status. There were no significant differences in time post-onset and number of worked days between the HSU and LSU at program entry. Differences in key variables between the two groups were determined using independent t-tests and chi-squares, with the level of significance at p<0.05. It is important to note that the possibility of a type II error cannot be ruled out when one of the comparison groups has a disproportionately smaller sample size.

When admission scores were considered, the HSU were older and reported greater psychosocial distress, depression, anxiety, perceived disability and pain than LSU (p<0.05). Participants in the LSU group were working significantly more days per week [3.78(2.12)] at program completion compared to the HSU group [2.63(2.31)] (p=0.02). Detailed information is provided in Table 6.1.
Table 6.1: Differences in Admission Scores between High Service Users (HSU) and Low Service Users (LSU); N=147

<table>
<thead>
<tr>
<th></th>
<th>Cluster</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days Post-Onset*</td>
<td>HSU</td>
<td>39</td>
<td>30.64</td>
<td>23.80</td>
<td>3.81</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LSU</td>
<td>108</td>
<td>34.94</td>
<td>19.70</td>
<td>1.90</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>HSU</td>
<td>39</td>
<td>42.67</td>
<td>9.29</td>
<td>1.49</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LSU</td>
<td>108</td>
<td>38.56</td>
<td>9.71</td>
<td>.935</td>
<td></td>
</tr>
<tr>
<td>Psychosocial Distress (BSI-GSI)</td>
<td>HSU</td>
<td>38</td>
<td>.764</td>
<td>.559</td>
<td>.091</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LSU</td>
<td>104</td>
<td>.525</td>
<td>.458</td>
<td>.045</td>
<td></td>
</tr>
<tr>
<td>Depression (BSI-DEP)</td>
<td>HSU</td>
<td>38</td>
<td>.738</td>
<td>.807</td>
<td>.131</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LSU</td>
<td>104</td>
<td>.478</td>
<td>.599</td>
<td>.059</td>
<td></td>
</tr>
<tr>
<td>Anxiety (BSI-ANX)</td>
<td>HSU</td>
<td>38</td>
<td>.917</td>
<td>.723</td>
<td>.117</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LSU</td>
<td>104</td>
<td>.608</td>
<td>.565</td>
<td>.055</td>
<td></td>
</tr>
<tr>
<td>Perceived Disability (ODI)</td>
<td>HSU</td>
<td>38</td>
<td>45.31</td>
<td>17.80</td>
<td>2.89</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LSU</td>
<td>106</td>
<td>38.25</td>
<td>15.14</td>
<td>1.47</td>
<td></td>
</tr>
<tr>
<td>Pain (VAS)</td>
<td>HSU</td>
<td>35</td>
<td>5.84</td>
<td>2.08</td>
<td>.351</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LSU</td>
<td>102</td>
<td>5.03</td>
<td>1.75</td>
<td>.173</td>
<td></td>
</tr>
<tr>
<td>Days Worked /Week on admission*</td>
<td>HSU</td>
<td>37</td>
<td>1.78</td>
<td>2.18</td>
<td>.358</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LSU</td>
<td>105</td>
<td>2.53</td>
<td>2.49</td>
<td>.243</td>
<td></td>
</tr>
</tbody>
</table>

*No statistically significant differences between High and Low Services Users
The two groups were also compared according to SF-36 quality of life scores. Within each of these groups, the SF-36 mean scores varied according to cluster (HSU or LSU), with the LSU generally reporting better quality of life. At admission, HSU had significantly worse Bodily Pain scores compared to LSU (N=147) (p=0.012); Social Functioning showed similar trends, but the differences did not reach statistical significance (p=0.053; 95% CI: -19.165 to 0.123). These data seem to indicate that the two groups were different from the beginning of the program. Detailed information on quality of life at program entry is provided in Figure 6.2.
Differences in Admission Quality of Life, High vs. Low Services Users; N=147

Figure 6.2: No statistically significant differences at admission between HSU and LSU except in the Pain Index domain
6.3.4 Characteristics of High versus Low Service Users – Subset with Pre-Test and Post-Test Data (N=72)

The subset of 72 individuals who were available to provide complete admission and discharge data was included in this set of analyses. A large proportion of this subset was in the Low Service User cluster (N=57), compared to High Service Users (N=15). Differences between the two clusters were examined using independent t-tests. The results of the t-tests revealed that HSUs were significantly older than LSUs, with a mean difference of 6.93 [95% CI: 1.94-11.92]. Compared to the LSUs, the HSUs also reported consistently across Time 1 and Time 2 higher psychosocial distress (BSI GSI), depressive symptoms (BSI DEP), and anxiety symptoms (BSI ANX), although the differences were not statistically significant. Furthermore, HSUs reported significantly greater perceived disability and pain at both times. Finally, while LSU within this subset had worked significantly more days on admission [0.79(1.52) vs. 2.38(2.52)], the differences were no longer significant at program completion. The mean (SD) number of days worked by the HSU and LSU groups at program completion was 2.62(2.4) days and 3.68(2.15) days, respectively.

6.3.5 Pre-test and Post-test differences by service utilization

Pre- and post-test scores for key variables were compared for both the HSU and LSU subgroups. The key variables included were pain, disability, psychosocial distress subscales, and quality of life.
6.3.5.1 High Service Users: Change in measures Pre- to Post-test

Fifteen of the participants with complete pre-post data (N=72) were classified in the High Service Users group. When the three indices representing psychosocial distress (BSI GSI, BSI DEP and BSI ANX) were examined, there were no significant differences between admission and discharge scores for this group (HSU). In other words, no demonstrable change occurred. Perceived disability, pain, and number of days worked all improved significantly between admission and discharge. Detailed information is provided in Table 6.2. However, the results of these analyses should be interpreted with caution since the results could have been influenced by the small sample size (N=15).
Table 6.2: High Service Users Pre- and Post-Test Scores on Psychosocial Distress, Perceived Disability, Pain and Days Worked; N=15

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre Mean (SD)</th>
<th>Post Mean (SD)</th>
<th>Sig. (2-tailed) p value</th>
<th>95% Confidence Interval Lower</th>
<th>95% Confidence Interval Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychosocial Distress (BSI GSI)</td>
<td>.661 (.564)</td>
<td>.535 (.620)</td>
<td>0.383</td>
<td>-.173</td>
<td>.424</td>
</tr>
<tr>
<td>Depression (BSI DEP)</td>
<td>.623 (.968)</td>
<td>.389 (.974)</td>
<td>0.370</td>
<td>-.307</td>
<td>.774</td>
</tr>
<tr>
<td>Anxiety (BSI ANX)</td>
<td>.856 (.791)</td>
<td>.521 (.766)</td>
<td>0.085</td>
<td>-.503</td>
<td>.722</td>
</tr>
<tr>
<td>Perceived Disability (ODI)</td>
<td>48.27 (16.16)</td>
<td>28.27 (20.53)</td>
<td><strong>0.001</strong>*</td>
<td>9.68</td>
<td>30.32</td>
</tr>
<tr>
<td>Pain (VAS)</td>
<td>6.14 (1.75)</td>
<td>3.11 (2.02)</td>
<td><strong>0.001</strong>*</td>
<td>1.90</td>
<td>4.17</td>
</tr>
<tr>
<td>Days Worked</td>
<td>0.85 (1.56)</td>
<td>2.45 (2.44)</td>
<td><strong>0.018</strong>*</td>
<td>-2.87</td>
<td>-.33</td>
</tr>
</tbody>
</table>

6.3.5.2 Low Service Users: Change in measures Pre-to Post-test

The majority of the participants (N =57) in the pre-and post-test subset were categorized in the Low Service User cluster. All variables examined, ranging from psychosocial distress, perceived disability, and pain to number of days worked, improved significantly between admission and discharge for this group. Table 6.3 provides a more detailed description of these data.
Table 6.3: Low Service Users Pre-Test and Post-Test Differences in Psychosocial Distress, Perceived Disability, Pain, and Days Worked; N=57

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre Mean</th>
<th>Post Mean</th>
<th>Sig. (2-tailed)</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(SD)</td>
<td>(SD)</td>
<td>p value</td>
<td>Lower</td>
</tr>
<tr>
<td>Psychosocial Distress</td>
<td>.583 (.472)</td>
<td>.331 (.376)</td>
<td>.001</td>
<td>.130</td>
</tr>
<tr>
<td>(BSI GSI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>.594 (.630)</td>
<td>.272 (.440)</td>
<td>.001</td>
<td>.163</td>
</tr>
<tr>
<td>(BSI DEP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td>.642 (.592)</td>
<td>.328 (.506)</td>
<td>.001</td>
<td>.139</td>
</tr>
<tr>
<td>(BSI ANX)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Disability</td>
<td>37.66 (13.72)</td>
<td>14.085 (14.96)</td>
<td>.001</td>
<td>19.092</td>
</tr>
<tr>
<td>(ODI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain (VAS)</td>
<td>5.12 (1.65)</td>
<td>1.55 (2.16)</td>
<td>.001</td>
<td>2.959</td>
</tr>
<tr>
<td>Days Worked</td>
<td>2.36 (2.51)</td>
<td>3.68 (2.15)</td>
<td>.001</td>
<td>-2.030</td>
</tr>
</tbody>
</table>

Comparisons of HSU and LSU pre-treatment QoL scores were conducted. Other than differences in Physical Functioning, Bodily Pain, and the Physical Component Score (p<0.05), there were no statistically significant differences in the QoL between the two groups at program entry (see Table 6.4). When post-treatment QoL scores were compared, LSU had consistently and significantly (p<0.01) better physical health (PF,
RP, BP, GH, and PCS), compared to LSU. There were no differences in the mental health domains (Table 6.5).

Table 6.4: Comparison of SF-36 Pre-Treatment Scores for High and Low Service Users

<table>
<thead>
<tr>
<th>SF-36 PRE-TREATMENT SCORES</th>
<th>High Service Users</th>
<th>Low Service Users</th>
<th>HSU vs. LSU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>SE</td>
</tr>
<tr>
<td>Physical Functioning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0-100)</td>
<td>23.00</td>
<td>16.23</td>
<td>4.19</td>
</tr>
<tr>
<td>Role Physical (0-100)</td>
<td>6.67</td>
<td>25.82</td>
<td>6.67</td>
</tr>
<tr>
<td>Bodily Pain (0-100)</td>
<td>17.13</td>
<td>7.11</td>
<td>1.84</td>
</tr>
<tr>
<td>General Health (0-100)</td>
<td>57.13</td>
<td>13.59</td>
<td>3.51</td>
</tr>
<tr>
<td>Vitality (0-100)</td>
<td>35.33</td>
<td>24.75</td>
<td>6.39</td>
</tr>
<tr>
<td>Social Functioning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0-100)</td>
<td>43.33</td>
<td>29.83</td>
<td>7.70</td>
</tr>
<tr>
<td>Role Emotional (0-100)</td>
<td>60.00</td>
<td>45.77</td>
<td>11.82</td>
</tr>
<tr>
<td>Mental Health (0-100)</td>
<td>69.33</td>
<td>18.68</td>
<td>4.82</td>
</tr>
<tr>
<td>Physical Component Score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0-100)</td>
<td>22.82</td>
<td>5.45</td>
<td>1.41</td>
</tr>
<tr>
<td>Mental Component Score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0-100)</td>
<td>49.41</td>
<td>13.51</td>
<td>3.49</td>
</tr>
</tbody>
</table>
### Table 6.5: Comparison of High versus Low Service Users’ SF-36 Post-Treatment Scores

<table>
<thead>
<tr>
<th>SF-36 POST-TREATMENT SCORES</th>
<th>High Service Users</th>
<th>Low Service Users</th>
<th>HSU vs. LSU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>SE</td>
</tr>
<tr>
<td>Physical Functioning (0-100)</td>
<td>46.88</td>
<td>27.98</td>
<td>7.00</td>
</tr>
<tr>
<td>Role Physical (0-100)</td>
<td>10.00</td>
<td>22.76</td>
<td>5.88</td>
</tr>
<tr>
<td>Bodily Pain (0-100)</td>
<td>37.25</td>
<td>18.78</td>
<td>4.70</td>
</tr>
<tr>
<td>General Health (0-100)</td>
<td>57.94</td>
<td>14.40</td>
<td>3.60</td>
</tr>
<tr>
<td>Vitality (0-100)</td>
<td>48.13</td>
<td>17.40</td>
<td>4.35</td>
</tr>
<tr>
<td>Social Functioning (0-100)</td>
<td>64.84</td>
<td>25.91</td>
<td>6.48</td>
</tr>
<tr>
<td>Role Emotional (0-100)</td>
<td>68.75</td>
<td>42.98</td>
<td>10.74</td>
</tr>
<tr>
<td>Mental Health (0-100)</td>
<td>74.25</td>
<td>21.11</td>
<td>5.28</td>
</tr>
<tr>
<td>Physical Component Score (0-100)</td>
<td>29.00</td>
<td>7.91</td>
<td>2.04</td>
</tr>
<tr>
<td>Mental Component Score (0-100)</td>
<td>51.93</td>
<td>11.66</td>
<td>3.01</td>
</tr>
</tbody>
</table>

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6.3.5.3 Work Status in High versus Low Service User Groups

On admission to the program, the proportion of participants in the entire sample who were working (52.4%) was similar to that of those who were off-work (47.6%) (N=147). However, the HSU group had a greater proportion of participants who were off work (61.5%) compared to the LSU group (49.1%) (see Table 6.6). Chi-squares revealed no statistically significant differences in work status on admission. However, when work status at program completion was analyzed, there were statistically significant differences in RTW rates between the two groups ($\chi^2; p = 0.005$) (see Table 6.7).
Table 6.6: Comparison of work status on admission between High and Low Service Users, N=147

<table>
<thead>
<tr>
<th></th>
<th>RTW</th>
<th>Non-RTW</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Service Users</strong></td>
<td>15 (38.5%)</td>
<td>24 (61.5%)</td>
<td>39 (100%)</td>
</tr>
<tr>
<td><strong>Low Service Users</strong></td>
<td>55 (50.9%)</td>
<td>53 (49.1%)</td>
<td>108 (100%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>77 (52.4%)</td>
<td>70 (47.6%)</td>
<td>147 (100%)</td>
</tr>
</tbody>
</table>

*No statistically significant differences

Table 6.7: Comparison of work status on discharge between High and Low Service Users, N=147

<table>
<thead>
<tr>
<th></th>
<th>RTW</th>
<th>Non-RTW</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Service Users</strong></td>
<td>22 (56.4%)</td>
<td>17 (43.6%)</td>
<td>39 (100%)</td>
</tr>
<tr>
<td><strong>Low Service Users</strong></td>
<td>86 (79.6%)</td>
<td>22 (20.4%)</td>
<td>108 (100%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>108 (73.5%)</td>
<td>39 (26.5%)</td>
<td>147 (100%)</td>
</tr>
</tbody>
</table>

*There were statistically significant differences
6.4 Summary of Findings

The main hypothesis of the current analysis was that, when the sample of participants was analyzed according to service utilization, statistically distinct subgroups would emerge. The results showed that, indeed, two distinct subgroups could be identified from the study sample. Furthermore, it was expected that participants in these subgroups differed in pain, psychosocial distress, anxiety, depressive symptoms, perceived disability, and quality of life.

The results revealed that although 51% of the initial sample was not available to provide Time 2 at program completion, there were no statistically significant differences in main measures between this group and the completers. The only exception was in baseline work status, where the chi-square test revealed that a significantly higher proportion of “non-completers” was working on admission compared to the “completers”. While at admission there were no differences in the number of days worked per week, LSU were working significantly more days at discharge than HSU. As well, there were significant differences in discharge work status between the two clusters, a difference that was not seen at program entry. Although these results suggest that there’s a relationship between working and the time in the rehabilitation program, it was not possible to fully explore this relationship within the current design.

The High Service Users remained in the program twice (22 weeks) as long as the mean duration the entire study sample was in the program (11 weeks). Low Service Users on the other hand, were in program 4.5 weeks less that the sample mean. Unlike the LSU,
the cluster that remained longer in the program showed no significant differences in their pretreatment and posttreatment psychosocial distress, depressive and anxiety symptoms.
Chapter 7

Pain Profiles and Psychosocial Distress Symptoms in Workers with Low Back Pain (Objective 4)

7.1 Introduction

The final objective of the thesis was to determine patient profiles according to pain in a clinic population with low back pain. Related secondary objectives were: to determine differences in depression and anxiety symptoms across time between these profiles, and to determine how the patient profiles related to RTW at program completion.

7.2 Methods

7.2.1 Study Design

Details of study methods including, study design, procedures for sample selection, characteristics of participants, administration of measures and program are described in sections 4.2.1 through 4.2.4. A detailed description of the measures is also provided in Chapter 4.
7.2.2 Statistical Analysis

Data were analyzed using SPSS®\textsuperscript{2} (Statistical Package for the Social Sciences) version 12.0 for Windows® program. First, descriptive data were determined for the sub-samples of completers and non-completers in this study. Then, independent t-tests and chi-squares were used to determine if there were statistically significant differences in Time 1 and RTW measures between completers and non-completers. This step was taken to determine if the sub-sample was representative of the whole sample.

Cluster analysis, which refers to algorithms and methods used for categorizing objects of similar nature into respective, previously unknown groups (StatSoft\textsuperscript{©}, 2004), was used. The $k$-means method of clustering, available in SPSS/WIN statistical package, was chosen for use in the current analysis. In this type of cluster analysis, given a set number of $k$-clusters, observations are assigned to each cluster such that the means within a cluster are as similar as possible, and as different as possible from the other cluster(s) (StatSoft\textsuperscript{©}, 2004). In the current study, cluster analysis was conducted using both Time 1 and Time 2 VAS pain intensity scores, and therefore the clusters that emerged were distinct in terms of scores at both times. Cluster analysis has recently been used in a study of patients with acute and subacute neck, shoulder, and back pain (Boersma & Linton, 2005).

\textsuperscript{2} SPSS is a registered trademark. © 2007 SPSS Inc. All rights reserved. SPSS Inc. Headquarters, 233 S. Wacker Drive, 11th floor. Chicago, Illinois 60606
The next stage was to conduct repeated measures multivariate analysis of variance (MANOVA) or (repeated measures MANOVA) in order to identify if the clusters were significantly different regarding depression and anxiety symptoms over time. Finally, chi-square tests were used to determine if there were significant differences in the return-to-work rates of participants in the VAS pain clusters. Only one level of the return-to-work responses, that is, “RTW: Yes/No”, was used in the current analysis.
7.3 Results

Table 7.1 provides a summary of Time 1 and RTW data for completers and non-completers. The mean age of the completers was 38.8 years (range: 18 to 64) years with thirty-eight (58.5%) being men. There were no statistically significant differences in baseline demographics, pain, and depressive and anxiety symptoms between the completers and non-completers (independent t-tests; p< 0.05).
Table 7.1: Comparisons of completers versus non-completers on demographics, program involvement, and pain and distress symptoms

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Completers</th>
<th>Non-Completers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Participants, N (%)</td>
<td>65 (44.2%)</td>
<td>82 (55.8%)</td>
</tr>
<tr>
<td>Gender - Men, N (%)</td>
<td>38 (58.5%)</td>
<td>50 (61.0%)</td>
</tr>
<tr>
<td>- Women, N (%)</td>
<td>27 (41.5%)</td>
<td>32 (39.0%)</td>
</tr>
<tr>
<td>Age (years) Mean (SD)</td>
<td>38.9 (±10.1)</td>
<td>40.2 (±9.4)</td>
</tr>
</tbody>
</table>

| Program Involvement            |             |                |
| Days since onset (Median)      | 29.0        | 32.0           |
| Days in program (Median)       | 56.0        | 56.5           |
| RTW (prior work) at discharge (Yes) | 78.5% | 69.5% |

| Time 1 Outcome Variables       |             |                |
| Pain VAS score, Mean (SD)      | 5.40 (±1.70) | 5.10 (±2.00)   |
| BSI Depression score, Mean (SD)| 0.59 (±0.72) | 0.51 (±0.62)   |
| BSI Anxiety score, Mean (SD)   | 0.66 (±0.64) | 0.71 (±0.61)   |

No statistically significant differences between completers and non-completers
The distribution of Time 1 and Time 2 pain intensity scores for the total sample were examined before the cluster analysis was conducted. The frequency distribution graphs are displayed in figures 7.1. Pain profiles were examined using cluster analysis of Time 1 and Time 2 pain intensity scores, leading to the identification of two clusters. There were 13 participants in the severe pain group and 52 participants in the moderate pain group. The distributions of pain scores for each cluster at both times of measure are displayed in Figures 7.2 through 7.5.
Figure 7.1. Frequency distribution of Time 1 and Time 2 pain intensity scores for sample, N=65
Figure 7.3: Frequency distribution of Time 1 pain intensity scores for the Severe Pain Intensity cluster
Figure 7.3: Frequency distribution of Time 2 pain intensity scores for the Severe Pain Intensity cluster
Figure 7.4: Frequency distribution of Time 2 pain intensity scores for the Moderate Pain Intensity cluster.
Figure 7.5: Frequency distribution of Time 2 pain intensity scores for the Moderate Pain Intensity cluster
Time 1 and Time mean VAS pain scores for each cluster are shown in Figure 7.6. These clusters were then used to determine whether there were distinguishable
differences in participants’ levels of self-reported depressive and anxiety symptoms. The
scores established by the pain VAS confirmed these two profiles where a score greater
than 5 indicated a high level of pain intensity. Regardless of the pain intensity profile,
mean scores for both groups improved over time. Compared to individuals with moderate
pain intensity, those in the Severe Pain cluster scored significantly higher on the
Depression subscale (Figure 7.7) and Anxiety subscale (Figure 7.8) of the BSI.

Figure 7.6: Moderate and Severe Pain Profiles at two times of measure (Time 1 = Admission and
Time 2 = Discharge) and Percentage of return-to-work
Figure 7.7: Profiles of Moderate and Severe Pain clusters according to Brief Symptom Inventory Depression subscale scores at two times of measure.
Tests of between-subject effects (repeated MEASURES MANOVA) indicated significant $F$ values, ranging from 4.12 to 7.17 ($p < 0.050$, df = 1) for the Depression and Anxiety subscales respectively (Table 2). Furthermore, tests of within-subject contrasts time effects revealed that, regardless of the pain intensity cluster, the levels of depression and anxiety were lower at Time 2 [$F (1, 63) = 15.95$ and 22.71, $p < 0.001$] for depression and anxiety subscales (Table 2). No interaction effects were found in these analyses.
Table 7.2: Repeated Measures MANOVA: Tests of Between-Subject Effects and Within-Subject Contrasts

<table>
<thead>
<tr>
<th>Source</th>
<th>Measure</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between-Subject</td>
<td>Pain</td>
<td>4.12</td>
<td>0.047</td>
</tr>
<tr>
<td>Effects</td>
<td>Cluster</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anxiety Subscale</td>
<td>7.17</td>
<td>0.009</td>
</tr>
<tr>
<td>Within-Subject</td>
<td>Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrasts</td>
<td>Depression Subscale</td>
<td>15.95</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Anxiety Subscale</td>
<td>22.71</td>
<td>0.001</td>
</tr>
</tbody>
</table>
7.4 Summary of Findings

The final objective of the thesis was to describe pain profiles in patients with low back pain, and to then determine differences in depression and anxiety symptoms, and relationship to RTW at program completion. The results showed that the two pain profiles emerging from cluster analysis namely, Severe Pain Intensity and Moderate Pain Intensity, were significantly different in terms of depression and anxiety symptoms. Patients in the Severe Pain cluster had higher depressive and anxiety symptom scores than patients in the Moderate Pain cluster. There were significant improvements over time in both depressive and anxiety symptom scores. Interestingly, however, depression and anxiety symptom scores for patients in the severe pain cluster remained higher than the moderate pain cluster scores, even at program completion. When each cluster was considered separately, only 31% in the Severe Pain cluster had returned to work at program completion compared to 90% in the Moderate Pain cluster.
Chapter 8
GENERAL DISCUSSION AND CONCLUSIONS

The purpose of the current thesis was to evaluate outcomes of a return-to-work rehabilitation program among injured workers with subacute low back pain. Significant improvements occurred in all of the measures that were recorded before and after program participation. Further analyses, however, revealed that the sample was not homogenous, and that in fact, several subgroups existed within the sample. Cluster analysis, in one instance, revealed that when pain intensity scores on admission and discharge were considered, two distinct patient clusters could be identified. Another cluster analysis revealed that when the duration of time spent in the program was considered, two distinct subgroups could be identified. An interesting, yet incidental finding that was made when completers were compared to non-completers, was that the latter group rated themselves consistently better than their counterparts who completed the program.

There were no significant associations between gender, time since onset, prior back pain, and admission work status and any other predictor variables. The lack of association was reported in a study of injured workers with subacute low back pain (Shultz et al., 2005). In that study age was also not associated with any other variables, unlike in our study where age correlated positively with LOS in the program and perceived disability, and negatively with days worked per week, SF36-PF and SF-36 PCS on admission.
In general, there were significant improvements in pain reports, perceived disability, psychosocial distress, and quality of life following treatment. The majority of participants (74% of total sample) in the current study were able to return-to-work by program completion. The overall rates of return-to-work were comparable to rates reported in other studies of patients with low back pain. For example, Kapoor et al. (2006) reported that by 12-weeks follow-up, 82% of 202 patients had returned to work while 18% were still off work. As well, 1995 data from the Ontario WSIB showed that by 4 weeks, 60% and by 12 weeks 83% of injured workers with low back pain had returned to work. Comparable rates were observed in the current study, with 47% having returned to work by four weeks post-onset and 74% by program completion, an average of 14 weeks post-onset.

Factors associated with return-to-work and perceived disability were investigated. The results of the study showed that the same variables remained in each of the final models, give or take one or two variables that seemed interchangeable. Specifically, gender, length of stay in program, and number of hours worked per week appeared in both RTW models. In addition, SF-36 Mental Component Score was important in return to any level work and in perceived disability model, but was replaced by the Global Severity Index of the Brief Symptom Inventory in the return to prior work model. These findings further identify length of time in program as an important variable in treatment outcome.
8.1 Pain Profiles and Depressive and Anxiety Symptoms

Pain intensity scores can be used to provide the clinician with valuable information in a number of ways including, for example, to document change over time, to make clinical decisions such as when to discharge a patient, as indication of level of distress, and to estimate treatment outcomes that could be expected at follow-up (Walton, 2007). The mean pain score on admission for the subset included in the pain intensity subgroup analysis was 5.40±1.70. However, the Severe Pain Intensity cluster scored considerably higher than this on admission (7.15), and nearly the same at discharge (5.46). This trend was reflected in scores for depressive and anxiety symptoms as well, where Time 2 scores for the Severe Pain Intensity cluster were either the same as or higher than Time 1 scores for the Moderate Pain Intensity cluster. The relationship between pain intensity scores and depressive and anxiety scores in patients with low back pain has been demonstrated in other studies. For example, Sullivan et al. (2006), found that in a group of injured workers with mildly and moderately severe depressed mood, although both groups improved, those in the latter group were more likely to score in the range indicating depressed mood, post-treatment, compared to the mildly depressed group.

The overall RTW rate in the two pain intensity clusters combined was fairly high (78.5%) in the current study. However, when each cluster was considered separately, only 31% in the Severe Pain cluster had returned to work at program completion compared to 90% in the Moderate Pain cluster. These RTW rates are comparable to, but slightly higher than, the RTW rates reported in Corbière et al. (2007) where 61% to 85% of participants with mild or no depression returned to work, unlike those with higher
levels of depression who had greater difficulty, with only 18% and 21% returning to work. The differences between these studies could likely be attributed to the fact that patients in the current study were in the subacute phase of LBP compared to the chronic phase in the Corbière et al. (2007) study patient group. Similarly, in a large multinational comparative study, Hansson & Hansson (2000) found that pain intensity was one health-related measure that predicted return-to-work in all countries. High baseline pain intensity scores were associated with lower probability of RTW, in a study of chronic pain patients (Sullivan et al., 2005). In another study of patients with long-term low back pain, Vowles et al. (2004) reported significant associations between pain intensity and return to work, and depression and return to work. As in the Vowles et al. (2004) study, in the current study those in the Severe Pain cluster had higher depression scores both before and after treatment, and achieved lower (31%) return-to-work rates, post-treatment. However, the relationship between anxiety (measured with the Pain Anxiety Symptom Scale) and return to work in the Vowles et al. (2004) study was not statistically significant.

The results of the pain intensity subgroup analysis confirm previous reports on associations between psychological factors (depressive and anxiety symptoms) and pain severity, and in turn, relationships with return-to-work. The perception of pain is a complex phenomenon, subject to many physical and psychological influences. It is possible that the same factors influencing pain perception could have influenced the self-rating of depression and anxiety. For instance, the influence of return-to-work on pain perception and reports of depressive and anxiety symptoms was not examined in the
current study. It is possible that individuals in the Moderate Pain cluster had more favourable reports of pain and symptoms of distress because the majority had returned to work.

8.2 Length of time in treatment program

The healthcare system represents one dimension of a dynamic interaction of multiple factors believed to determine the outcome of a back pain episode (Loisel et al., 2002). The healthcare system in general, and the actions of healthcare providers such as physicians and physiotherapists, in particular, has been implicated in the iatrogenesis of low back disability (Spitzer et al., 1993). Excessive diagnostic testing, unnecessary or excessively prolonged therapy, the use of inconsistent diagnostic labels, and other similar actions have been linked to increased disability claims rates (Deyo, 2000). While it is critical to heed this caution, the challenge for healthcare providers is finding the balance between excessive treatment and appropriate treatment. It has been suggested that shorter treatment durations (episodes of care) and early return to work are associated with better outcomes (Wasiak et al., 2004).

The duration of time spent in the return-to-work rehabilitation program in the current study was defined as the total time from admission to discharge. This measure was taken to represent the utilization of rehabilitation services. A number of studied reported in the low back pain literature have tended to use the number of visits per episode of care as a measure of use of services (Badke & Boissonnault, 2006;
Groenendijk et al., 2007). The reasons that motivated the choice of measure in this study included, the interest of the stakeholders (program administrators) in time to file closure, since this indicator represents an active caseload in that until the file has been closed, clinicians continue to be actively involved in case management. Examples of case management activities that might continue without actual patient visits to clinic include, communication with the patient and/or employer (e.g., for troubleshooting around return-to-work issues), and communication with the patient’s physician or case manager. While no clinic visits are directly associated with these activities, they still constitute time spent on the particular patient. Within the setting of the current study, communication with and about a patient does not end until the file closure has been achieved, and therefore, it was important to capture total length of stay in the program. Indeed, the current model of care for acute low back injuries (WSIB, 2000) lists supervision and monitoring as important components of treatment for injured worker transitioning into subacute phase. Care provider reassurance provides another example of a kind of communication between clinician and patient that may continue outside of actual clinic visits and may be particularly important as patients transition back to work. Indeed, recently a panel of experts reached strong consensus that care provider reassurance was one of the factors with high impact in back disability prevention (Guzman et al., 2007).

Cluster analysis that was conducted to determine if there were differences in the duration of time spent in the program, revealed that two distinct subgroups existed within the total sample. The two clusters that emerged - High Service Users and Low Service Users - exhibited different patterns of utilization of services, with the mean duration of
time in program for each being markedly different from that of the total sample (22.4 weeks and 6.5 weeks, respectively, compared to the median LOS (8.0 weeks) and mean (10.8 weeks). Although the length of time participants remained in the program was not specifically predetermined according to treatment guidelines set out by the compensation board of Ontario, 12 weeks is typically the maximum allowable duration of treatment for patients with first-claim low back pain. This limit is, however, negotiable in that an extension might be granted if the treating therapist recommends additional treatment. The findings of the current study indeed confirm that, for a small subset of individuals (26.5%), treatment was extended by an average of 10.4 weeks. The majority of participants (73.5%) completed treatment within nearly half the maximum allowable time of 12 weeks.

The duration of time in treatment for patients with low back pain has been examined in previous studies (Boersma & Linton, 2006; Groenendijk et al., 2007). In the study by Boersma & Linton (2006), cluster analysis yielded five distinct subgroups: two characterized by high pain-related fear, one by medium pain-related fear, one by depressed mood, and the final one by low scores on all included variables. When utilization of healthcare services was analyzed prospectively during a 7-month follow-up period, participants in clusters with high depressive symptoms had the highest percentage of healthcare use (70% in the “pain-related fear + depressed mood” cluster and 42% in the “depressed mood” group) (Boersma & Linton, 2006). In a Dutch study examining changes over time in the physiotherapeutic management of low back pain, the authors reported that the average number of treatment session for patients with subacute low back
pain was 10.8 sessions in the 1990s and 9.6 sessions in 2002-2003 (Groenendijk et al., 2007). Although the overall period of time in which these visits occurred was not specified, if one assumed a frequency of one visit per week, for instance, the average duration would be in a range comparable to that observed in the current study. In another study of patients with subacute occupational low back pain, a high frequency of healthcare provider visits was associated with prolonged length of disability (Pransky et al., 2006). Badke & Boissonnault (2006) found that, in a retrospective chart review of patients with acute, subacute, and chronic low back pain, the mean (SD) duration of treatment for each group was 7.7(5.3) weeks, 8.8(5.9) weeks, and 11.0(8.4) weeks, respectively, with the number of visits ranging from five to eight. However, only three of the 130 patients were receiving workers compensation for their back trouble, a factor likely to influence treatment duration.

The results suggest that there were some differences between High and Low Service Users that were apparent even at program entry, and that these differences persisted across time. For example, HSU were older, reported significantly greater psychosocial distress, depression, anxiety, perceived disability and pain than LSU. The LSU were working significantly more days per week [3.78(2.12)] at discharge compared to the HSU group [2.63(2.31)]. HSU failed to improve in the global psychosocial distress, depression, and anxiety measures, although pain and perceived disability improved and worked hours increased.
8.3 Differences between “Completers” and “Non-Completers”

One of the most striking results in the current study was an unexpected finding observed from the baseline comparison of “completers” and “non-completers”. The latter group rated themselves consistently better than the “completers” in all the clinical areas measured. Although, except for work status, the differences did not reach statistical significance, these findings were quite informative because oftentimes patients who do not adhere to treatment advice or schedules, for example, are considered non-compliant (Campbell et al., 2001). Failure to complete treatment or study protocol (or non-compliance) is usually associated with poor baseline status and expectations of poor treatment outcomes, as in a previous study of physiotherapy patients with lower back pain (67%) and neck pain (33%), where those who failed to return for or complete follow-up data collection, were found to have significantly poorer health status in several areas at baseline, including, energy/fatigue, general health perceptions, mental health, role emotional and physical functioning (Jette & Jette, 1996). In the present study the opposite was true as non-completers reported better health status at baseline. Furthermore, if one assumes that the same general trend of significant improvements by program completion observed with the rest of the study sample would be applicable to non-completers, then this latter group would be expected to continue to improve from admission to discharge.

A number of factors that seem to influence compliance (and non-compliance) with physiotherapy have been cited before. For example, lack of time and interference of exercise with daily routine were cited by participants in a physiotherapy exercise program
as reasons they were not always able to comply with the prescribed home exercise program (Campbell et al., 2001). It is likely that this factor contributed to patients self-discharging from the program, particularly as significantly more “non-completers” were working at program entry compared to “completers”. Another factor that has been linked to increased motivation to adhere to physiotherapy advice is symptom severity (Campbell et al., 2001). Patients with greater perceived severity of symptoms were more likely to continue with physiotherapy advice compared to those who considered their symptoms milder (Campbell et al., 2001). This might be one likely explanation why the “non-completers” self-discharged from the program. As well, patients with less severe symptoms who had returned to work would probably be less motivated to continue attending outpatient physiotherapy when they had to coordinate work scheduling and their physiotherapy appointments. It is quite likely also that, since the “non-completers” had less severe symptoms at baseline, the rehabilitation program soon appeared less effective as changes in their symptoms reached a plateau. While this phenomenon was not explored in this study, it would fit in with the findings reported in the Campbell et al. (2001) study that, the perceived effectiveness of an intervention, contributed to patients’ motivation to comply.

It is interesting that the one area where baseline differences between the completers and non-completers were statistically significant was work status. Although it was not possible to explore the role of work within the current study design, these findings do raise a number of important questions. In terms of clinical application, it would be important, for example, to identify whether the majority of participants who
went on to become non-completers rated better at baseline because they were working, or they were working because they were generally doing better than their completer counterparts, although, again the differences in clinical measures were not statistically significant.

8.4 LIMITATIONS OF THE STUDY
The study was, necessarily, completed within a WSIB program evaluation context in order to address the needs of the key stakeholder group who granted permission for the study within their rehabilitation program. Steps were taken to compensate for some of the methodological challenges inherent in non-experimental designs. For example, it is not possible to assign cause-and-effect using this design compared to a randomized controlled trial design. It was also not feasible to have a comparison group due to program guidelines and requirements. The compensation board of Ontario (WSIB) funds the program and expects all clients referred to the program to be seen within five business days. Furthermore, the program delivers the standard of care; to have a no-treatment comparison group would have been performing below standard of care and would have been unethical. Comparisons could have been made to low back pain patients seeking care from primary care physicians. However, that was not a feasible option in this study due to limited resources, and the likelihood that patients with low back pain who were referred to physiotherapy could have been different from those whose back pain episodes were managed by their primary care physicians. Therefore, the design used was pragmatic and adequate to fulfill the objectives of this project. To compensate for the
design include, for example, the pre- and post-treatment scores were compared with normative data from adult non-patient general population. As well, multivariate and cluster analyses were used to further strengthen the study design in terms of explanatory power of specific variables and subgroup identification.

One of the limitations is the small sample size of the subset with complete pre and post data. While this may have had an effect on the ability to detect differences, statistically significant improvements across time in reported pain severity, depressive symptoms, and anxiety symptoms were still found. Nevertheless, the results of this study may not be generalizable to other patients with low back pain due to high loss to follow-up and small sample size. Return-to-work is a complex process influenced by a number of factors including the clinical interaction between patient and provider, workplace factors such as availability of modified work, and other factors (Loisel et al, 2005). It is quite possible that return-to-work in this study was as much a function of patient-clinician interaction as other factors. Also, a third measurement point, some time post-discharge may have been able to show whether the trends observed would continue 6 or 12 months post-discharge.

Another concern is the issue of return-to-work, which in this study, was measured as ‘Yes’ or ‘No’. It is probable that the results might have been different had time to return-to-work been used instead. However, previous studies that have used similar RTW measures (Yes/No) have observed similar relationships with psychosocial distress and pain. Nevertheless, exploring pain profiles in the current study provided important information that would have been missed had a subgroup analysis not been conducted.
While pain, depressive and anxiety symptoms all improved across time and within each cluster, the pattern of improvement observed was sufficiently distinct that perhaps targeted interventions are warranted.

8.5 CONCLUSIONS

The studies reported in this thesis were structured to test the hypotheses: 1) that there will be statistically significant improvements in the measures between admission and discharge of LBP participants in a return-to-work rehabilitation program; and that, while there will be differences between admission scores and population normative data, these differences will be minimal at discharge; 2) that there will be significant differences in pain, psychosocial distress, anxiety, depressive symptoms, perceived disability, and quality of life measures between those who returned to work and those who failed to do so; and finally, 3) that there exists distinct and previously unidentified patterns of service utilization, and pain profiles among a seemingly homogenous group of participants with low back pain. The first and second hypotheses were proven to be correct similar to many low back pain studies where there were significant improvements overall in pain intensity, depression and anxiety symptoms as a function of participation in this return-to-work rehabilitation program. The third hypothesis was also proven correct in that the patterns of improvement were not uniform, in that a small subset of individuals continues to have significant problems even at program completion. Cluster analysis revealed important characteristics of patient subsets that may be helpful in providing individualized rehabilitation programs to facilitate their return-to-work.
8.6 IMPLICATIONS

The findings reported in this thesis raise some important questions for theory, practice, research, and policy. For example, assumptions about drop-outs need to be made with extra caution because, as the results indicated, and contrary to other study samples in the literature, non-completers in the current study generally reported better clinical status, and a significantly greater proportion were working, even at the start of the program. A number of lessons could be learned from this finding. For instance, it might be important to monitor patients who do not return for their follow-up appointment, in other words, document and over time, analyze the reasons why patients do not return for follow-up. This would likely contribute to changes in practice, to make sure that the program meets the needs of the various groups whom it serves. In the current study, patients who self-discharged had better self-reported health compared to the completers. While the reasons for not returning for follow-up were not determined in the current study, it is possible that the non-completers felt that they no longer required physiotherapy services, and therefore self-discharged. They may have improved sufficiently in self-efficacy that they no longer felt they needed guidance with pain management and physical exercises, and or the transition back to work or daily activities. Patients who are managing well independently of physiotherapy and are putting in increasingly more work hours may no longer see the value of regular attendance, particularly in view of balancing this with work and family demands. So, the question becomes, should clinicians be better able to tell when the
patient is ready for discharge before the patient self-discharges? Since multiple factors beyond just the clinical factors at the clinicians’ disposal, influence the decision to discontinue treatment, it may not be realistic to expect clinicians to be able to anticipate every instance this might occur. However, there might be opportunity to review and refine clinic procedures to put in proactive strategies that would allow patients more “freedom” to initiate discharge. Part of the proactive strategy could be mechanisms conduct an abbreviated discharge evaluation so that some of the discharge outcome information can be obtained. This information is important to physiotherapists, treating physician, and third party payers alike.

In terms, of implications for theory, perhaps more research effort should be directed at finding the appropriate level of intervention, beyond which no change is recorded. Studies that determine recovery trajectories represent a step in the right direction. Also, what happens when patients continue to receive an intervention beyond the point where positive change can be realized? In the case of back pain rehabilitation, one has to wonder about the detrimental effect of prolonged treatment. Workers’ compensation and motor vehicle insurance stakeholders continue to strive to find balance between adequate and excessive treatment. However, since there really is no “average” patient, it is important to keep in mind that treatment guidelines provide precisely that, and that allowances should be made for those individuals who require more treatment. In fact, there is some evidence that the adversarial nature that sometimes can be found among third party stakeholders, can do more harm than good when it comes to recovery.
The findings of the current study that relate to the utilization of rehabilitation services also raise a number of implications for theory, practice, policy, and research. The differences found between High and Low Service Users at baseline could serve as an early warning sign when clinicians are reviewing patient admission data, and allow clinicians to anticipate extended involvement in the program, when patients have high scores on psychosocial measures. While this is an important finding, even more critical to advancing theory in this area, is determining precisely what this means, which would require careful study because of the dynamic interaction of a number of factors that determine length of stay in the rehabilitation program. These multiple factors include, but are not limited to: the clinical presentation of the patient; non-verbal cues from the patient (e.g., behaviours indicating high distress); third party payer guidelines (e.g., limits to visits and length of treatment); clinic policies (such as time to file closure); and the clinician’s interpretation of this information in view of current best practice, and the role(s) they see themselves playing in the rehabilitation process. To illustrate this point, a clinician who sees himself or herself as an advocate for the injured worker, might find ways to obtain treatment extension, thus allowing the patient to remain longer than is typical, in the program. On the other hand, a clinician who truly believes that prolonged therapy might do more harm than good would likely be able to communicate in ways that reassure the patient that timely discharge from the program is an essential part to recovery.

Longer lengths of stay in the program were associated with decreased probability of returning to work and with perception of greater disability. So, what does this mean, in
theoretical terms? Are clinicians overmedicalizing the back pain condition by keeping patients too long in the program? Or, are they simply responding to injured workers’ pain complaints and distress? It is probably reasonable to suggest that they are doing both; they are responding to what they perceive as patient needs but the effect could be that of overmedicalizing the condition. Perhaps, different responses are needed that, ideally, would be applied earlier in the rehabilitation process, that perhaps provide a better linkage with the workplace in order to improve the injured worker’s confidence in their abilities to participate in some form of workplace activity, even on a modified or restricted basis. Such a response would also serve to validate patient/worker concerns without giving the wrong message. Furthermore, the current findings also seem to suggest that high service users do not require more intervention but perhaps a different kind of intervention targeted to their own specific needs, and most importantly, delivered earlier in the program. Most likely this intervention would be in the form of cognitive-behavioural approaches with a strong occupational component in order to demonstrate to the individuals that they are capable of success in their efforts to return to work. Perhaps keeping people excessively long in the program contributes to occupational disruption and loss of occupational identity.

The results of the pain intensity subgroup analysis highlight the importance of early identification of psychological factors as well as the need to focus interventions to address such factors, particularly for those at higher risk to transition from subacute to persistent pain and long-term disability. The pain, BSI depression or anxiety scales could be used upon entry into a rehabilitation program to provide an early indication of
potential outcome and whether a psychosocial intervention may be needed. Further studies with larger sample size and longer follow-up would be important in verifying these results. Other implications of failing to identify individuals who would not progress well in the program, and who end up with high pain and psychosocial distress scores at program completion are that these are the individuals who, even though being discharged from current program, are likely to go on to prolonged disability, and return to the healthcare system multiple times. Thus, this relatively smaller percentage of individuals ends up costing the compensation and healthcare systems much more in terms of wage replacement and disability costs, and use of healthcare resources.
References


30. Deyo RA, Rainville J, Kent DL. What can the history and physical exam tell us about low back pain? JAMA 1992; 268:760-5


42. Fordyce WE. *Back Pain in the Workplace.* Fordyce WE. Seattle: International Association for the Study of Pain Press. 1995


Appendix A

Ethics Certificate

Queen's University, in accordance with the "Tri-Council Policy Statement, 1998" prepared by the Medical Research Council, Natural Sciences and Engineering Research Council of Canada and Social Sciences and Humanities Research Council of Canada requires that research projects involving human subjects be reviewed annually to ensure their acceptability on ethical grounds.

The Research Ethics Board is composed of:

Dr. A.F. Clark
Head and Professor, Department of Biochemistry, Queen's University

Dr. R. Appleby
Adjunct Instructor, Department of Religious Studies, Queen's University

Dr. M. Godarts
Associate Professor, Department of Family Medicine, Queen's University

Dr. T. May
Associate Professor, Department of Community Health & Epidemiology

Dr. L. Kawrylack
Assistant Professor, Department of Medicine/Critical Care, Queen's University

Dr. S. Irving
Psychologist, St. Mary's Hospital

Mr. C. Kenny
Community Member

Ms. S. Lachinger
Assistant Professor, School of Nursing, Queen's University

Dr. J. Laverty
Post-Doctoral Research Fellow, Applied Ethics & Health Policy, Queen's Health Policy Research Unit

Dr. J. Low
Professor, Department of Obstetrics and Gynecology, Queen's University and Kingston General Hospital

Ms. F. O'Hearn
Director, Risk Management Services, Kingston General Hospital

Dr. J. Rau
Assistant Professor (Adjunct), School of Nursing, Queen's University

Dr. W. Rache
Professor, Department of Pharmacology & Toxicology, Queen's University

Dr. J. Kapin
Assistant Professor, Department of Emergency Medicine, Queen's University

Dr. L. Seynaeve
Co-Director, JD Program, NCIC Clinical Trials Group

Ms. S. Sceales
Professor, Department of Sociology, Queen's University

Dr. G. Turrill
Community Member

has examined the protocol and revised consent form for the project entitled "Evaluating the Effect of Psychological Issues in Low Back Pain" proposed by Dr. J. Stevens of the School of Physical and Health Education at Queen's University and considers it to be ethically acceptable. This approval is valid for one year. If there are any amendments or changes to the protocol affecting the subjects in this study, it is the responsibility of the principal investigator to notify the Research Ethics Board. Any adverse events must be reported to the Chair within 48 hours.

Chair, Research Ethics Board

April 5, 2007

Date

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QUEEN'S UNIVERSITY HEALTH SCIENCES AND AFFILIATED TEACHING HOSPITALS

RESEARCH ETHICS BOARD ANNUAL RENEWAL

Queen's University, in accordance with the "Tri-Council Policy Statement, 1998" prepared by the Medical Research Council, Natural Sciences and Engineering Research Council of Canada and Social Sciences and Humanities Research Council of Canada requires that research projects involving human subjects be reviewed annually to determine their acceptability on ethical grounds.

A Research Ethics Board composed of:

Dr. A.F. Clark
Head and Professor, Department of Biochemistry, Professor, Department of Pathology, Faculty of Health Sciences, Queen's University (Chair)

Dr. B. Arndt
Adjunct Instructor, Department of Religious Studies, Queen's University

Dr. I. Casper
Assistant Professor, Department of Family Medicine, Queen's University

Dr. D. Hindman
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M. S. Laackinger
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Associate Professor, Department of Oncology, Queen's University

Dr. A.N. Singh
WFO Professor in Psychosomatic Medicine and Psychopharmacology

Professor of Psychiatry and Pharmacology

Chair and Head, Division of Psychopharmacology, Queen's University

Dr. G. Trebilcock
Community Member

The renewal request for renewal of Queen's Ethics Board approval for the project entitled "Evaluating the Role of Psychosocial Factors in Low Back Pain" as proposed by Dr. J. Stevenson of the School of Physical and Health Education at Queen's University has been approved for the year, effective April 1, 2001. If there are any further amendments or changes to the protocol affecting the subjects of this study, it is the responsibility of the principal investigator to notify the Research Ethics Board. Any adverse events must be reported to the Chair within 48 hours.

Chair, Research Ethics Board
Queen's University, in accordance with the "Tri-Council Policy Statement: 1998" prepared by the Medical Research Council, Natural Sciences and Engineering Research Council of Canada and Social Sciences and Humanities Research Council of Canada requires that research projects involving human subjects be reviewed annually to determine their acceptability on ethical grounds.

A Research Ethics Board composed of:

Dr. A.F. Clark  Emeritus Professor, Department of Biochemistry, Faculty of Health Sciences, Queen's University (Chair)
Dr. S. Burke  Professor, School of Nursing, Queen's University
Rev. T. Deane  Community Member
Dr. M. Green  Assistant Professor, Department of Family Medicine, Queen's University
Mr. C. Kenny  Community Member
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Dr. H. Murray  Assistant Professor, Department of Emergency Medicine, Queen's University
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Dr. B. Schlessin  Assistant Professor, Department of Anesthesiology, Queen's University
Dr. A.N. Singh  Professor of Psychiatry and Pharmacology, Chair and Head, Division of Psychopharmacology, Queen's University
Dr. S. Taylor  Director, Office of Bioethics, Queen's University and Kingston General Hospital; Associate Professor, Department of Medicine, Queen's University
Dr. G. Tourible  Community Member

The request for renewal of Queen's Ethics Board approval for the project "Evaluating the Role of Psychosocial Issues in Low Back Pain" as proposed by Dr. J. Stevenson of the School of Physical and Health Education at Queen's University. The approval is renewal for one year, effective April 1, 2006. If there are any further amendments or changes to the protocol affecting the subject of this study, it is the responsibility of the principal investigator to notify the Research Ethics Board. Any adverse events must be reported to the Chair within 48 hours.

Chair, Research Ethics Board

Date
Appendix B  Brief Symptom Inventory

INSTRUCTIONS:
On the next page is a list of problems people sometimes have. Please read each one carefully, and blacken the circle that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE PAST 7 DAYS, INCLUDING TODAY. Blacken the circle for only one number for each problem and do not skip any items. If you change your mind, erase your first mark carefully. Read the example before beginning, and if you have any questions please ask them now.

EXAMPLE
HOW MUCH WERE YOU DISTRESSED BY:

Bodyaches

EXTREMELY
Quite a Bit
Moderately
A Little Bit
Not at All
<table>
<thead>
<tr>
<th></th>
<th>NOT AT ALL</th>
<th>A LITTLE BIT</th>
<th>MODERATELY</th>
<th>QUITE A BIT</th>
<th>EXTREMELY</th>
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</tbody>
</table>

**HOW MUCH WERE YOU DISTRESSED BY:**

1. Nervousness or shakiness inside
2. Faintness or dizziness
3. The idea that someone else can control your thoughts
4. Feeling others are to blame for most of your troubles
5. Trouble remembering things
6. Feeling easily annoyed or irritated
7. Pains in heart or chest
8. Feeling afraid in open spaces or on the streets
9. Thoughts of ending your life
10. Feeling that most people cannot be trusted
11. Poor appetite
12. Suddenly scared for no reason
13. Temper outbursts that you could not control
14. Feeling lonely even when you are with people
15. Feeling blocked in getting things done
16. Feeling lonely
17. Feeling blue
18. Feeling no interest in things
19. Feeling fearful
20. Your feelings being easily hurt
Appendix C  SF-36 Domains

SF-36® Measurement Model

<table>
<thead>
<tr>
<th>Items</th>
<th>Scales</th>
<th>Summary Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a. Vigorous Activities</td>
<td>Physical Functioning (PF)</td>
<td>Physical Health</td>
</tr>
<tr>
<td>1b. Walk Several Blocks</td>
<td>Role-Physical (RP)</td>
<td></td>
</tr>
<tr>
<td>1c. Tread one block</td>
<td>Bodily Pain (BP)</td>
<td></td>
</tr>
<tr>
<td>1d. Sit Down Time</td>
<td>General Health (GH)*</td>
<td></td>
</tr>
<tr>
<td>1e. Short-Erect</td>
<td>Vitality (VT)*</td>
<td>Mental Health</td>
</tr>
<tr>
<td>1f. Long-Erect</td>
<td>Social Functioning (SF)</td>
<td></td>
</tr>
<tr>
<td>1g. Hard to Sleep</td>
<td>Role-Emotional (RE)</td>
<td></td>
</tr>
<tr>
<td>1h. Health of Others</td>
<td>Mental Health (MH)</td>
<td></td>
</tr>
</tbody>
</table>

* Significant correlation with other summary measure.
Appendix D SF-36 HEALTH SURVEY

Instructions: This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Answer every question by marking the answer as indicated. If you are unsure about how to answer a question, please give the best answer you can.

1. In general, would you say your health is: (Circle One)
   - Excellent 1
   - Very Good 2
   - Good 3
   - Fair 4
   - Poor 5

2. Compared to one year ago, how would you rate your health in general now? (Circle One)
   - Much better now than one year ago ................................. 1
   - Somewhat better now than one year ago ........................................ 2
   - About the same as one year ago ................................................ 3
   - Somewhat worse now than one year ago ..................................... 4
   - Much worse than one year ago .................................................. 5
3. The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

<table>
<thead>
<tr>
<th>Activities</th>
<th>Yes, limited a lot</th>
<th>Yes, limited a little</th>
<th>No, not limited at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>b. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>c. Lifting or carrying groceries</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>d. Climbing several flights of stairs</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>e. Climbing one flight of stairs</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>f. Bending, kneeling or stooping</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>g. Walking more than a mile</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>h. Walking several blocks</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>i. Walking one block</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>j. Bathing or dressing yourself</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
4. 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 your physical health?

(circle one number on each line)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cut down on the <strong>amount of time</strong> you spent on work or other activities</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>b. <strong>Accomplished less</strong> than you would like</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>c. Were limited in the <strong>kind of work or other activities</strong></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>d. Had <strong>difficulty</strong> performing the work or other activities (for example, it took extra effort)</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

5. 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)?

(circle one number on each line)

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cut down the <strong>amount of time</strong> you spent on work or other activities</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>b. <strong>Accomplished less</strong> than you would like</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>c. Didn’t do work or other activities as <strong>carefully</strong> as usual</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

(Circle One)

- Not at all ................................................................. 1
- Slightly ................................................................. 2
- Moderately ............................................................. 3
- Quite a bit ............................................................. 4
- Extremely ............................................................. 5
7. How much bodily pain have you had during the past 4 weeks?

(Circle One)

None ................................................................. 1
Very Mild ......................................................... 2
Mild ................................................................. 3
Moderate ......................................................... 4
Severe ............................................................ 5
Very Severe ..................................................... 6

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

(Circle One)

Not at all ......................................................... 1
A little bit ....................................................... 2
Moderately ..................................................... 3
Quite a bit ....................................................... 4
Extremely ....................................................... 5

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

(Circle one number on each line)

<table>
<thead>
<tr>
<th></th>
<th>All of the time</th>
<th>Most of the time</th>
<th>A Good Bit of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Did you feel full of pep?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>b. Have you been a very nervous person?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>c. Have you felt so down in the dumps that nothing could cheer you up?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
d. Have you felt calm and peaceful? | 1 | 2 | 3 | 4 | 5 | 6

e. Did you have a lot of energy? | 1 | 2 | 3 | 4 | 5 | 6

f. Have you felt downhearted and blue? | 1 | 2 | 3 | 4 | 5 | 6

g. Did you feel worn out? | 1 | 2 | 3 | 4 | 5 | 6

h. Have you been a happy person? | 1 | 2 | 3 | 4 | 5 | 6

i. Did you feel tired? | 1 | 2 | 3 | 4 | 5 | 6

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

(Circle One)

All of the time.............................................................. 1
Most of the time .......................................................... 2
Some of the time ......................................................... 3
A little bit of the time .................................................. 4
None of the time .......................................................... 5

11. How TRUE or FALSE is each of the following statements for you?

(Circle one number on each line)

<table>
<thead>
<tr>
<th></th>
<th>Definitely True</th>
<th>Mostly True</th>
<th>Don’t Know</th>
<th>Mostly False</th>
<th>Definitely False</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I seem to get sick a little easier than other people</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>b. I am as healthy as anybody I know</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>c. I expect my health to get</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>worse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>d. My health is excellent</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
# Appendix E Oswestry Low Back Disability Questionnaire

**Section 1 – Pain Intensity**

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have no pain at the moment.</td>
<td>0</td>
</tr>
<tr>
<td>The pain is very mild at the moment.</td>
<td>1</td>
</tr>
<tr>
<td>The pain is moderate at the moment.</td>
<td>2</td>
</tr>
<tr>
<td>The pain is fairly severe at the moment.</td>
<td>3</td>
</tr>
<tr>
<td>The pain is very severe at the moment.</td>
<td>4</td>
</tr>
<tr>
<td>The pain is the worst imaginable at the moment.</td>
<td>5</td>
</tr>
</tbody>
</table>

**Section 2 – Personal Care (washing, dressing, etc.)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can look after myself normally without causing extra pain.</td>
<td>0</td>
</tr>
<tr>
<td>I can look after myself normally but it is very painful.</td>
<td>1</td>
</tr>
<tr>
<td>It is painful to look after myself and I am slow and careful.</td>
<td>2</td>
</tr>
<tr>
<td>I need some help but manage most of my personal care.</td>
<td>3</td>
</tr>
<tr>
<td>I need help every day in most aspects of self care.</td>
<td>4</td>
</tr>
<tr>
<td>I do not get dressed, wash with difficulty and stay in bed.</td>
<td>5</td>
</tr>
</tbody>
</table>

**Section 3 – Lifting**

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can lift heavy weights without extra pain.</td>
<td>0</td>
</tr>
<tr>
<td>I can lift heavy weights but it gives extra pain.</td>
<td>1</td>
</tr>
<tr>
<td>Pain prevents me from lifting heavy weights off the floor</td>
<td>2</td>
</tr>
<tr>
<td>but I can manage if they are conveniently positioned, e.g. on a table.</td>
<td>3</td>
</tr>
<tr>
<td>Pain prevents me from lifting heavy weights off the floor</td>
<td>4</td>
</tr>
<tr>
<td>but I can manage light to medium weights if they are conveniently positioned.</td>
<td>5</td>
</tr>
<tr>
<td>I can lift only very light weights.</td>
<td>6</td>
</tr>
<tr>
<td>I cannot lift or carry anything at all.</td>
<td>7</td>
</tr>
</tbody>
</table>

**Section 4 – Walking**

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain does not prevent me walking any distance.</td>
<td>0</td>
</tr>
<tr>
<td>Pain prevents me walking more than 1 mile.</td>
<td>1</td>
</tr>
<tr>
<td>Pain prevents me walking more than 1/4 mile.</td>
<td>2</td>
</tr>
<tr>
<td>Pain prevents me walking more than 100 yards.</td>
<td>3</td>
</tr>
<tr>
<td>I can only walk using a stick or crutches.</td>
<td>4</td>
</tr>
<tr>
<td>I am in bed most of the time and have to crawl to the toilet.</td>
<td>5</td>
</tr>
</tbody>
</table>

**Section 5 – Sitting**

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can sit in any chair as long as I like.</td>
<td>0</td>
</tr>
<tr>
<td>I can sit in my favorite chair as long as I like.</td>
<td>1</td>
</tr>
<tr>
<td>Pain prevents me from sitting for more than 1 hour.</td>
<td>2</td>
</tr>
<tr>
<td>Pain prevents me from sitting for more than 1/2 hour.</td>
<td>3</td>
</tr>
<tr>
<td>Pain prevents me from sitting for more than 10 minutes.</td>
<td>4</td>
</tr>
<tr>
<td>Pain prevents me from sitting at all.</td>
<td>5</td>
</tr>
</tbody>
</table>

**Section 6 – Standing**

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can stand as long as I like without extra pain.</td>
<td>0</td>
</tr>
<tr>
<td>I can stand as long as I want but it gives me extra pain.</td>
<td>1</td>
</tr>
<tr>
<td>Pain prevents me from standing for more than 1 hour.</td>
<td>2</td>
</tr>
<tr>
<td>Pain prevents me from standing for more than 1/2 hour.</td>
<td>3</td>
</tr>
<tr>
<td>Pain prevents me from standing for more than 10 min.</td>
<td>4</td>
</tr>
<tr>
<td>Pain prevents me from standing at all.</td>
<td>5</td>
</tr>
</tbody>
</table>

**Section 7 – Sleeping**

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>My sleep is never disturbed by pain.</td>
<td>0</td>
</tr>
<tr>
<td>My sleep is occasionally disturbed by pain.</td>
<td>1</td>
</tr>
<tr>
<td>Because of pain I have less than 6 hours sleep.</td>
<td>2</td>
</tr>
<tr>
<td>Because of pain I have less than 4 hours sleep.</td>
<td>3</td>
</tr>
<tr>
<td>Pain prevents me from sleeping at all.</td>
<td>4</td>
</tr>
</tbody>
</table>

**Section 8 – Sex Life (if applicable)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>My sex life is normal and causes no extra pain.</td>
<td>0</td>
</tr>
<tr>
<td>My sex life is normal but causes some extra pain.</td>
<td>1</td>
</tr>
<tr>
<td>My sex life is nearly normal but is very painful.</td>
<td>2</td>
</tr>
<tr>
<td>My sex life is severely restricted by pain.</td>
<td>3</td>
</tr>
<tr>
<td>My sex life is nearly absent because of pain.</td>
<td>4</td>
</tr>
<tr>
<td>Pain prevents any sex life at all.</td>
<td>5</td>
</tr>
</tbody>
</table>

**Section 9 – Social Life**

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>My social life is normal and causes me no extra pain.</td>
<td>0</td>
</tr>
<tr>
<td>My social life is normal but increases the degree of pain.</td>
<td>1</td>
</tr>
<tr>
<td>Pain has no significant effect on my social life apart from limiting my more energetic interests, e.g. sport, etc.</td>
<td>2</td>
</tr>
<tr>
<td>Pain has restricted my social life and I do not go out as often.</td>
<td>3</td>
</tr>
<tr>
<td>Pain has restricted social life to my home.</td>
<td>4</td>
</tr>
<tr>
<td>I have no social life because of pain</td>
<td>5</td>
</tr>
</tbody>
</table>

**Section 10 – Traveling**

<table>
<thead>
<tr>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can travel anywhere without pain.</td>
<td>0</td>
</tr>
<tr>
<td>I can travel anywhere but it gives extra pain.</td>
<td>1</td>
</tr>
<tr>
<td>Pain is bad but I manage journeys over two hours.</td>
<td>2</td>
</tr>
<tr>
<td>Pain restricts me to journeys of less than one hour.</td>
<td>3</td>
</tr>
<tr>
<td>Pain restricts me to short necessary journeys under 30 min.</td>
<td>4</td>
</tr>
<tr>
<td>Pain prevents me from travelling except to receive treatment.</td>
<td>5</td>
</tr>
</tbody>
</table>