UTILITY OF THE OREBRO MUSCULOSKELETAL PAIN QUESTIONNAIRE AS A SCREENING AND CLINICAL DECISION SUPPORT TOOL IN WORKERS' COMPENSATION CLAIMANTS

By

Hilda Ivania Aravena

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Science

In

Rehabilitation Science

Faculty of Rehabilitation Medicine

University of Alberta

Abstract

Patient health status questionnaires are often used as screening tools by health care professionals. The Orebro Musculoskeletal Pain Questionnaire (OMPQ) is a screening tool for patients with musculoskeletal disorders that targets not only physical impairment but also psychosocial factors. According to several authors, psychosocial factors (an example of a "yellow flags") are a key component in the transition from an acute to a chronic musculoskeletal condition, implying the importance of early and correct identification. In addition to identifying psychosocial risk factors, the OMPQ allocates patients into three different risk categories related to work absenteeism and guides potential interventions. The OMPQ has been evaluated in different clinical settings as a screening instrument, but never for its utility as a clinical decision support tool to guide treatment selection. This thesis investigates the potential usefulness of the OMPQ to allocate injured workers into different risk categories that are related to different rehabilitation programs. The goal is to gain knowledge regarding whether or not this screening tool can be used with confidence for supporting clinician decisions. A retrospective study design was used using a database previously developed from clinical and administrative information. Firstly, descriptive statistics were calculated for the injured workers based on OMPQ categorization. Secondly, the level of agreement between the OMPQ categories was examined along with clinician recommendations and the actual rehabilitation programs undertaken by the claimants. Finally, we examined whether a match between OMPQ categories, clinician recommendations and the actual rehabilitation program undertaken was related to a better return to work outcome. WCB claimants were characterized based on common measures such as pain intensity and self-reported for each OMPQ category. In this dataset, it appeared that the OMPQ had limited agreement with clinician recommendations suggesting other measures or factors are considered

when making treatment recommendations. Finally, concordance of OMPQ categorization and actual rehabilitation undertaken did not appear to favorably impact the administrative outcome time to claim closure. Our results do not support the use of the OMPQ as a clinical decision support tool for selecting rehabilitation interventions for workers' compensation claimants. The level of agreement between the recommendations made by the OMPQ and those made by clinicians was low, despite using two cut-off points widely accepted in the jurisdiction. In many cases, a good outcome resulted despite a lack of match between OMPQ recommendations and actual rehabilitation programs; by contrast, a match between clinician recommendations and the actual rehabilitation program resulted in a good RTW outcome for the majority of claimants (78.3%). However, this does not mean that this screening tool is ineffective. What may be required is further refinement of the process in order to produce a final OMPQ score that allows a classification into three different risk categories. This means that it would be useful for the OMPQ to include subscales determined by specific barriers, rather than merely expressing an overall sum of diverse factors such as pain, function, disability, and psychological and social attributes.

Keywords: Orebro musculoskeletal pain questionnaire, Clinical decision support tool, Workers compensation board of Alberta, return to work, clinician recommendations.

Preface

This thesis is an original work by Hilda Ivania Aravena. The research project, of which this thesis is part, received research ethics approval from the University of Alberta Research Ethics Board. The project name is "Development of a Triage Decision-Making Tool for the Rehabilitation of Injured Workers" and project number is Pro00016880.

Acknowledgments

This thesis could have not been conducted without the data that Dr. Douglas Gross made available at the beginning of my program of studies. This data were obtained from a previous study done at the Workers' Compensation Board of Alberta, to which I also extend my gratitude. Although most students work with one supervisor who provides knowledge, encouragement and challenges, in this journey I have had the good fortune to travel with two beautiful minds. Doug and Geoff, I could not have had better supervisors than you. I very much appreciate all the patience, professionalism and kindness that you showed.

To Dr. Susan Armijo, who was a fount of knowledge and was always there to talk and resolve questions: Su, you have been a light and an inspiration; thank you so much. I would also like to thank Dr. David Magee, who was one of the committee members and who provided insightful comments on this thesis.

I also extend my gratitude to the Department of Physical Therapy at the University of Alberta, which provided a grant for conducting this thesis.

Family and friends are a key component in life, and I have been blessed with both. My greatest thanks go to my wonderful parents Pablo Aravena and Yaneth Paez, and to my supportive and loving brother Pablo Aravena. Each of you has taught me that life is the dream that we decide to build.

"Como el sol ilumina las estrellas, tu iluminas mi vida. Vuela alto"

Table of Contents

List of Tables

List of Figures

CHAPTER 1

Introduction

1.1 Overview

This thesis evaluates the characteristics of the Orebro Musculoskeletal Pain Questionnaire (OMPQ) using a sample of Workers Compensation Board (WCB) claimants, the agreement of the OMPQ with clinical recommendations, and whether an accurate classification influences an administrative return to work (RTW) outcome. Chapter 1 provides an introduction to the challenge of RTW decision-making, the use of screening tools such as the OMPQ to assist in this process, and outlines the purpose and significance of the study. Chapter 2 is a review of the literature which covers in more detail the WCB-Alberta context and the OMPQ. In Chapters 3 and 4, the methodology, results and implications of this thesis are presented. Finally, Chapter 5 addresses an overall summary, discussion and conclusions.

1.2 Background and Context

Delay in RTW is a substantial challenge faced by workers and employers. For this reason, strategies and guidelines have been developed that focus on preventing delayed RTW(1-3). From the point of view of the employer, work absenteeism presents an economic cost. According to Kocakulah et al. (2009) "absenteeism translates into losses of over $16 billion in salary expenses, page 83"(4). From the worker perspective, being away from work affects their quality of life and also poses financial implications (5-9). One of the most common reasons for work absence are injuries to the musculoskeletal (MSK) system resulting from mechanisms such as repetitive motion, compression, falling, and overexertion (6, 7, 10-12). While many workers recover uneventfully from these injuries or conditions, a small proportion do not, leading to substantial

societal and personal burdens. Given the substantial impact facing this group of workers, much research has been directed at understanding how to predict a poor outcome and how to best manage those with RTW barriers.

In Canada, there is the Association of Workers' Compensation Boards (AWCBC) founded in 1919 with the aim of enhancing a better communication between Workers' Compensation Boards and Commissions. At first, there were six founding members: Alberta, Ontario, Nova Scotia, British Columbia, New Brunswick and Manitoba. At the present time, there are more: Newfoundland and Labrador, Prince Edward Island, Quebec, Saskatchewan, Yukon, Northwest Territories and Nunavut (13). The WCB-Alberta is an insurance system created by the government which mitigates the employer and the worker against the consequences that work-related injuries have. The primary objective of the WCB-Alberta is to obtain a safe and successful RTW, through effective rehabilitation (14). The number of claims per year is not low. In fact, in 2012, there were 148,566 number of claims reported in Alberta out of a total of 787,790 in Canada (15).

1.2.1 Screening tools

Early identification, or screening, of workers at risk for delayed RTW is one strategy used to address the personal and social costs of work absenteeism. The assumption is that if a worker is identified early as being at risk for delayed RTW, appropriate intervention can be applied to mitigate the risk. Screening has been defined by Valanis as the presumptive identification of unrecognized disease or defect by the application of tests, examinations, or other procedures that can be applied quickly and inexpensively to populations.(16) There are certain characteristics for an effective screening test, which are reliability, validity, sensitivity and specificity. Screening

tools are evaluation measures used as a strategy to help identify a potential or present health problem. Particularly, the primary aim is to distinguish those who probably have a health condition from those who do not. Common examples of screening tools are questionnaires such as the OMPQ. Advantages of these self-reported tools are that they are not time consuming, are inexpensive and are easily interpreted by clinicians. A valid method of classifying patients regarding their level of risk of delayed RTW would be helpful in order to prescribe an appropriate treatment as early as possible (17).

1.2.2 The OMPQ

The OMPQ was developed as a screening tool and has been deemed helpful in early identification of patients who may develop persistent pain and disability problems.(18) The OMPQ has items targeting social, psychological and biological factors that may influence recovery from musculoskeletal conditions. The total score is used to classify patients into three categories: low, medium and high risk. These risk categories have been linked to recommended treatment programs (low risk: conservative care/reassurance, medium risk: physical therapy/functional restoration, high risk: psychological intervention/multidisciplinary care). The OMPQ has been evaluated in several studies regarding its ability to predict recovery and is recommended to be used with patients seeking health care for musculoskeletal disorders (19).

1.3 Statement of the Problem

In Alberta, the majority of injured workers are managed by the WCB-Alberta. Within the context of the WCB-Alberta's continuum of care for injured workers, the OMPQ is used along with other assessment tools to help identify patients who are at risk of delayed RTW. Based on OMPQ and other assessment findings, different types of rehabilitation programs are available

and recommended for injured workers, ranging from single service (usually provided by a physical therapist) to complex multidisciplinary pain management programs. Currently it is unknown how well the OMPQ functions within this system to classify injured workers to an optimal rehabilitation program. In other words, there is a gap in knowledge regarding whether injured workers' OMPQ score accurately classifies them according to level of risk of recovery. Furthermore, it is not known whether an accurate classification relates to better RTW outcome.

1.4 Purpose of the Study

The general purpose of this thesis was to provide further knowledge on the role the OMPQ plays in treatment allocation decision making in the WCB-Alberta context. To achieve this goal, retrospective data from the WCB-Alberta with comprehensive demographic, clinical and administrative data for injured workers was analyzed.

1.5 Significance of the Study

There have been several studies that have evaluated the OMPQ (10, 20-24). However, not all of these are related to a workers compensation context. Despite this evidence, it is currently not known how the OMPQ functions within the WCB-Alberta. By being able to provide this information, the utility of the OMPQ in this context can be assessed and recommendations provided to WCB-Alberta clinicians. It was anticipated that this study would clarify the role of the OMPQ in recommendations made for rehabilitation for claims made for a broad spectrum of diagnoses.

1.6 Definition of Terms

1.6.1 *Orebro Musculoskeletal Pain Questionnaire:* A screening tool designed for use by clinicians to provide an early identification of those patients with risk of delay to recovery. It was created by Steven James Linton and Halldén (10).

1.6.2 *Workers Compensation Board of Alberta: A* "Statutory Corporation created by government under the Workers ' Compensation Act to administer a system of workplace insurance for the workers and employers of the province of Alberta. The organization is employer funded to provide cost-effective disability and liability insurance. Workers compensation compensates injured workers for lost income, health care and other costs related to a work-related injury, (website description)"(25)

1.6.3 *Musculoskeletal System:* The connection of a series of structures which provide protection, movement and support. This system is an integration of bones, joints, tendons, ligaments and muscles.

1.6.4 *Work-related musculoskeletal disorders:* According to the World Health Organization (WHO), these disorders stand for any health problem with the locomotor apparatus or musculoskeletal system. "Musculoskeletal disorders include all forms of ill-health ranging from light, transitory disorders to irreversible, disabling injuries. Musculoskeletal disorders are induced or aggravated by work and the circumstances of its performance. Such work-related musculoskeletal disorders are supposed to be caused or intensified by work, though often activities such as housework or sports may also be involved. (Page 1)"(26).

1.6.5 *Work Disability:* "Result of a condition that causes a worker to miss at least one day of work and includes time off work as well as any ongoing work limitations (Page 559)" (27).

1.6.6 *Return to work:* It is a process of recovery, when a worker goes back to work (27).

1.6.7 *Yellow flags:* Correspond to any personal and/or environmental psychosocial factor which may inhibit recovery (28). Examples are: coping, fear avoidance belief and job satisfaction. They are considered as barriers which could enhance the risk of delay to recovery, disability and work loss.

1.6.8 *Clinical Decision Support Tools* (*CDSTs*) have been broadly defined as all ways in which knowledge is represented in health information systems to assist health care providers with patient management decisions. CDSTs have been used in different areas of medicine including injuries to the MSK system. There are different CDST devices designed to help the clinician or health care worker to make a decision in terms of providing a diagnosis and/or treatment (29).

CHAPTER 2

Literature Review

2.1 Work-related Musculoskeletal Disorders (WRMDs)

Among work-related health conditions, WRMDs are considered some of the most common. MSK disorders involve an injury to any part of the musculoskeletal system. Injury can occur to a muscle, ligament, tendon, nerve or deeper into the skeletal tissues (6, 7, 10-12, 20). Related to workplace disorders, one of the most frequent is low back pain (LBP). A systematic analysis for the Global Burden of Disease Study 2010 showed that LBP was one of the most frequent musculoskeletal disorders worldwide ranking in the sixth position (30). In Canada, MSK disorders have generated a burden to health care systems and society by affecting individuals' quality of life (4). In addition, they have generated costs by diminishing productivity (3, 6). The absence from work has been a problem, thus optimal strategies to prevent failure to return to work (RTW) are required.

The majority of individuals with a MSK injury recover and RTW quickly, but a minority remain off work for prolonged periods of time (20). Ideally, early detection of those at risk of delayed recovery and failure to RTW would allow targeted intervention with optimal rehabilitation programs (31). A valid method of classifying patients regarding their level of risk of delayed recovery would be helpful in order to prescribe an appropriate treatment. There are several factors used to predict long-term work disability. Clinical, demographic and psychosocial issues are factors and when these are handled in an integrated way, a better prognosis regarding the patient's condition could be expected. Incorporating psychosocial variables necessitates the use of a biopsychosocial model, which from its inception in the 1990s has been gaining widespread

acceptance by health care professionals. Furthermore, most researchers conclude that a treatment considering only the compromised anatomical structure is likely to fail and have a poor outcome (32). Thus, before the application of an optimal rehabilitation program, it is essential to first identify risk factors. Screening tools used as clinical decision support tools have been developed to identify these risk factors in clinical settings.

2.2 Clinical Decision Support Tools (CDST)

CDST are another strategy used throughout the health care system to assist clinicians in decision making, often specifically in diagnosis and assessment (33). Reaching a diagnosis is very challenging because it is difficult to choose the best questions and to decide which evaluation tools are optimal. The amount of information gathered cannot be excessive; otherwise, the decision making will become complex. In addition, it is important to note that even though an effective diagnosis may be reached, the challenge of management, which involves the selection of the appropriate treatment, still remains.

CDST have been broadly defined as all ways in which knowledge is represented in health information systems to assist health care providers in patient management decisions. CDST have been used in different areas of medicine including injuries of the MSK system. There are different CDST devices designed to help the clinician or health care worker make a decision in terms of providing a diagnosis and/or treatment (29). For example, a CDST may take the form of software, a web-based system, or a questionnaire. These are valuable assets for the clinician and for the person seeking health care because they increase the speed and efficiency of treatment. Forseen et al. (2012) stated that there was in fact an improvement in clinician performance after CDST interventions. However, there is uncertainty regarding the improvement of the patient and

the final outcome in terms of recovery (33). Nevertheless, Hill et al. (2011) noted that management including a prognostic screening tool, which was able to assist treatment referral, did enhance health care efficacy for patients with LBP (34).

2.3 The OMPQ

The Orebro Musculoskeletal Pain Questionnaire (OMPQ) is a self-reported questionnaire used as a screening tool and CDST by clinicians to help identify patients in the subacute period who are at risk of developing chronicity (10, 24). From its inception in 1998 by Linton and Hallden, it has been used in different health care settings such as private clinics and workers' compensation boards to predict long term disability and failure to RTW (10). The OMPQ has 24 items which assess psychosocial variables correlated with long term function and RTW status. There is some discrepancy among authors regarding the conceptual definitions of the variables used in the OMPQ questions. Some authors refer to them as psychosocial risk factors (35). Linton indicates that OMPQ questions screen for "yellow flags" defining them as: "Factors that may inhibit recovery"(36). After OMPQ administration and scoring, the questionnaire categorized patients into one of three risk level categories: low, medium and high risk. In addition, Margison et al (2007) explained that there also appeared to be a linear relationship between OMPQ score and severity of biopsychosocial risk factors (35).

Linton and Hallden's prospective study was the first research aimed at evaluating the predictive utility of the OMPQ (10). A sample of 142 patients completed the OMPQ. Patients with multiple injury sites were enrolled, with the majority (58%) having back pain. After a follow-up period of 6 months, patients were asked to complete a follow-up questionnaire by mail. This was a shorter form with only 9 questions, which included the main outcome variable of "accumulated sick

leave". The participation rate in this study was 97%. Analysis indicated that the OMPQ identified patients with a poor prognosis for accumulated sick leave (10). After this study, several other articles evaluated the predictive validity of the OMPQ in different settings implying that it was a promising screening tool with some evidence supporting its use (10, 18, 35). For example, Hockings et al (2008) conducted a systematic review to determine the OMPQ's ability to predict long term outcome in patients with acute spinal pain (37). It was implied that the OMPQ had a moderate ability and the authors recommended its use as an assessment tool for early identification of yellow flags. Sattelmayer et al (2012) conducted another systematic review and meta-analysis evaluating how accurately the OMPQ could predict persistent problems in patients with LBP or musculoskeletal problems (38). They found that 59% of the patients developing persistent problems were correctly classified as "at risk" when the OMPQ was applied. It was concluded that the OMPQ appeared to have only weak to moderate predictive value for the development of persistent problems.

One study that was particularly interesting to consider is by Dunstan et al (2005) (20). This study was the first research to evaluate the prediction ability of the OMPQ in terms of RTW outcomes in injured workers who were being compensated by a workers' compensation board. Results showed that claimants with a high OMPQ score were more likely to fail to RTW. Although the follow-up sample was only 55 injured workers, it provided a baseline for future research. This study formed an excellent background for Margison et al (2007) who also examined a worker's compensation system (35). They evaluated the OMPQ in a broader group of claimants with any type of musculoskeletal injury in the subacute phase and also provided a version translated into French. Claimants had the choice of answering an English or French version before initiating a 6-week treatment program. After the program, physical therapists

classified the patients into fit or not fit to RTW. OMPQ scores gave a correct classification in 87% of the workers who responded in French and 84% for those who responded in English, both with a OMPQ cut-off score of 147 for 'high risk'. These results provided the evidence needed for the authors to suggest that the OMPQ was a valuable screening tool, which could be used as a supporting asset to facilitate patient triage whether they experience a back or non-back-related injury.

Kirkwood (2011) also examined the validity of the OMPQ in injured workers from a WCB (22). The Nova Scotia (NS) WCB system uses the OMPQ at intake and at follow-up periods. The OMPQ was applied at two times (Time 1 at intake and Time 2 after two weeks of treatment). The researchers assessed how well the tool flagged workers who were at risk of delayed recovery due to increased psychosocial factors. This retrospective cohort study included patients with a variety of musculoskeletal disorders and demonstrated that the OMPQ was moderately predictive. Dagfinrud, et al (2012) compared the predictive ability of the OMPQ to the clinician's prognostic assessment for identifying patients with LBP and neck pain at risk for persistent pain and disability at eight weeks follow-up (39). A functional outcome was used; results demonstrated that both the clinician's prognosis and the OMPQ for LBP patients were significant predictors of outcome. However, for the functional improvement outcome of the LBP group, the clinicians' predicted with more sensitivity and the OMPQ provided more specificity. It was concluded that both types of assessment (clinician's and the OMPQ) were useful and could be used as a screening tool to predict outcomes in LBP patients.

From the studies reviewed, many were focused on the acute or subacute phase of the injury to evaluate the OMPQ's predictive ability. However, Westman et al (2008) argued that the OMPQ was a valid tool even in non-acute pain problems (40). Another key point of this study was that

the authors compared the OMPQ with other questionnaires (Job Strain, the Coping Strategies Questionnaire, the Pain Catastrophising Scale and the Tampa Scale for Kinesiophobia) to determine if these questionnaires were better predictors than the OMPQ. The patients completed the OMPQ and the other questionnaires at baseline and at a 3-year follow-up visit. It is compelling to note that the OMPQ had better predictive power than any of the other questionnaires. Furthermore, supporting OMPQ validity even in non-acute or recurrent pain problems provides a solid strength to this questionnaire. Other studies have compared the OMPQ with other screening tools. Sivan, et al (2009) found that the OMPQ had the highest proportion of work-related questions when compared to The Oswestry Disability Index and to the Roland Morris Questionnaire (RMQ) (41). Dagfinrud et al (2012) also used the OMPQ and the Oswestry Disability Index (39). As already mentioned, this study examined predictive validity of the OMPQ along with the clinician's prediction, in which, for LBP, both were significantly predictors of functional outcome. Finally, Hill et al (2010), tested the STarT Back Tool (SBT) validity against the OMPQ, and compared the clinical characteristics of subgroups identified by each tool (42). These researchers stated that even though both instruments were adequate, the STB could be an appropriate alternative for identifying high risk LBP patients in primary care. They concluded this mainly because the SBT was shorter and easier to score than the OMPQ. However, Linton et al (2011) modified the OMPQ into a shorter form, demonstrating a correlation of 0.91 between the shorter and the long forms (43). This development may be more appropriate for clinical and research purposes since it is nearly as accurate as the longer version.

2.4 Variability in OMPQ Versions and Cut-offs

From the inception of the OMPQ, modifications and translations have been made for various research projects. These alterations have created discrepancies and generated a lack of

homogeneity especially in terms of scoring and the optimal cut-off score. For example, Margison's study used a range of scores from 0 to 220 as opposed to 0 to 214 in Dunstan's study (20, 35). Dagfinrud et al (2012) used a cut off value of <90 for low risk for prolonged disability, 90-105 for moderate risk and >105 for high risk while Linton and Boersma stated that a cut-off of 105 had a 95% accuracy to differentiate those who would recover from those who would not (24, 39). Gabel et al (2012) used a modified version of the OMPQ (the OMSQ) with cutoffs of 83 for no absenteeism, 95 for low cost and 114 as claimants likely to experience absenteeism, functional impairments, problem severity and high cost (21). Finally, Hill et al (2010) used 90 as a low risk cut-off and 105-119 as high risk of prolonged recovery from LBP (42).

According to Linton (1998), cut-off scores were related to the population studied (10). Margison (2007) supported this statement and also provided other factors that could influence setting the right cut-off score such as geographic location, compensated versus non-compensated (financial support), injury type, and injury phase. (35). Kirkwood (2011) concluded and suggested that further research was needed to establish the optimal cut-off score (22). As the numbers of items have been reduced (especially in the short-form OMPQ), the cut-off values have also diminished (43). Additionally, the range of possible scores has also been reduced (0 to 100). Results reveal that with a cut-off score of 50, 85% of those from the occupational sample at risk of developing a poor outcome were identified and 83% from the primary care sample were identified. Gabel et al (2011) performed a modification of the original OMPQ which led to the development of the Orebro Musculoskeletal Screening Questionnaire (OMSQ), followed by its validation (44). Four characteristics from the original OMPQ were retained: question number, order, scoring format and total score. The cut-off score used was 116 points. A panel and focus group feedback evaluated the content validity of the OMSQ, and results showed that the OMSQ had potential to

be a valid and reliable screening tool. In addition, according to the authors, the OMSQ could be substituted with confidence for the original OMPQ in an acute/subacute LBP working population. Translated forms have also been studied, with an example already discussed above in Margison's study of the French version (35). Another French translation and evaluation was conducted by Nonclercq et al (2012) with moderate outcomes (45). Another version that has been studied by Law et al (2012) who provided validity evidence of the predictive validity of a Chinese version of the OMPQ (23). Overall, the translations allow the generalization of this instrument and provide more validity evidence.

2.5 OMPQ Strengths and Weaknesses

Despite some promise as a screening tool, the OMPQ presents strengths and weakness. Firstly, the OMPQ enables clinicians to make an early detection of patients at risk of delayed recovery and failure to RTW. If accurate and appropriate interventions are applied, this could prevent chronicity and burden in terms of cost and quality of life. The OMPQ provides a guide to clinicians by allocating patients into different categories and as Linton states "it has to be seen as a starting point rather than an end point in the assessment"(46). Another key point is that the OMPQ can enhance better communication between the health care professional and the claimant by providing a better understanding of the issues and thus enable planning of a better treatment. Additionally, this tool is self-administered and thus can be used in various settings. It does not take too much time to be completed, and according to Linton, should not take more than 5 to 10 minutes (19). However, there are some limitations such as the diversity of the cut off scores. Another disadvantage is that respondents need basic language skills, which might not be the case with some populations such as injured workers (who often have less than grade 8 education). Sample sizes were describe by the same authors as a weakness too, for the reason that the studies

tended to have a small sample size which diminished power and could also narrow the analysis (20). Additionally, more research is needed in order to demonstrate how well the OMPQ can predict change over longer follow up periods, in other MSK populations, and the utility of the OMPQ as a CDST for selecting interventions.

2.6 Application of the OMPQ in different types of injury

As stated earlier, the OMPQ can be useful for any MSK disorder or MSK pain. Several researchers have paid attention to the use of the OMPQ in diagnoses of MSK system problems such as soft tissue injury, nonspecific low back pain (NSLBP), LBP and sprain/strain. A review of the literature revealed that there was a lack of heterogeneity related to the diagnoses reported in the different studies. Of 14 papers involving the OMPQ, six focused exclusively on LBP and NSLBP (23, 41-44, 47), four involved neck pain (22, 24, 39, 45), five specifically express that the subjects were injured workers (5, 20-22, 44), and four paid attention to other injury sites such as the upper/lower limbs, and to other kinds injury such as sprain or strain (5, 21, 22, 44). If the common recommendation is that further research is needed to provide more confidence in the use of the OMPQ, it would also be interesting to know how this tool works in different kinds of diagnoses such as those involving fractures or nerve damage.

2.7 Workers' Compensation Board of Alberta

The Workers' Compensation Board of Alberta (WCB-Alberta) manages the majority of Alberta's injured workers with the aim of obtaining optimal RTW outcomes for claimants with musculoskeletal conditions through effective rehabilitation (14). Alberta, located in western Canada, is an industrial province with high levels of work opportunities. It has one of the strongest economies in Canada with particular strengths in areas of agriculture, energy, forestry

and industrial products. It is important to note that Alberta is known as Canada's energy province; and has been estimated to provide more than 60% of the country's crude oil reserves (48). According to the 2011 *Injury Alberta Report*, the province has one of the highest injury rates in the country. However, workplace injuries have been decreasing (49). Nevertheless, WRMDs remain a problem and strategies to prevent or treat them must be taken into consideration.

The WCB-Alberta uses a Soft Tissue Continuum of Care Model developed in 1996/1997. Stephens et al. (2007) described this model as a coordinated array of settings, services, providers, and care levels in which health, medical, and supportive services are provided in the appropriate care setting(50). The WHO defines continuum of care as a complete spectrum of specialized health, including rehabilitation and services available to the frail and chronically ill (51).The model is used in Alberta with the objective of enhancing the usefulness and convenience of health care and speeding up the RTW process. A study conducted by Stephens and Gross explained that the model had three prime components: 1) staged application of different types of rehabilitation services depending on the progress of recovery; 2) case management protocols and checkpoints integrated into case planning; and 3) contracted services with 4 types of rehabilitation service providers (physical therapy, chiropractors, multidisciplinary assessment centers, and multidisciplinary rehabilitation providers)(52). Figure 1 shows the four types of rehabilitation service providers:

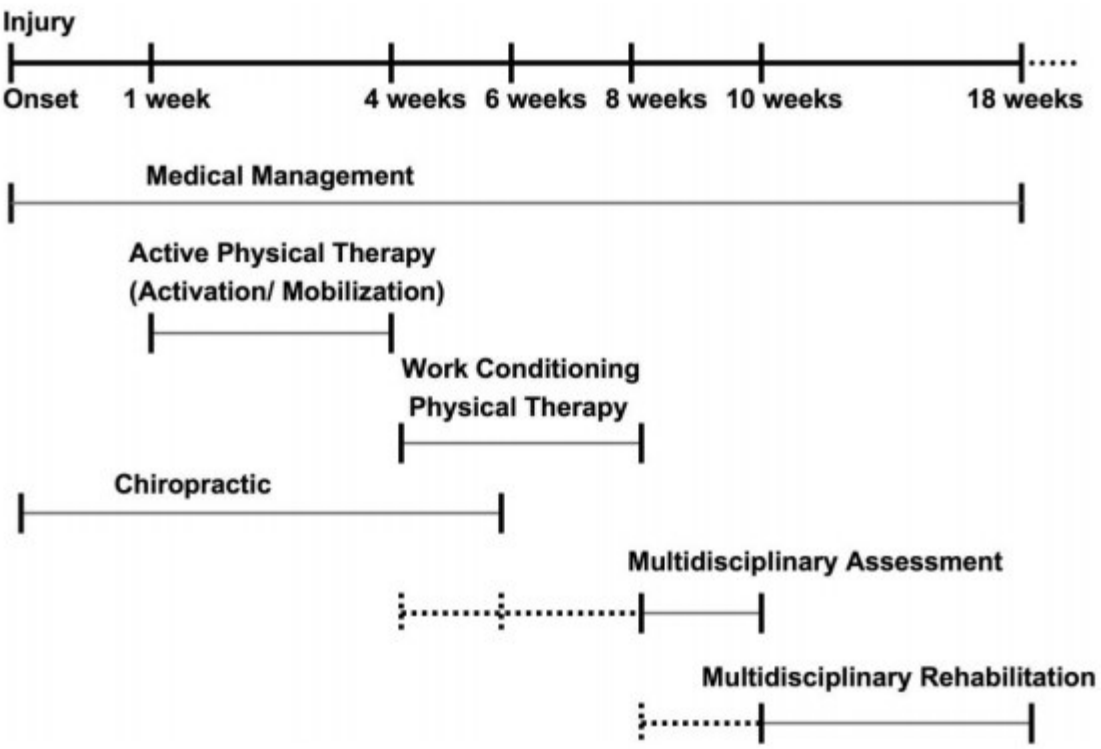


Figure 1 WCB-Alberta Soft Tissue Injury Continuum of Care Model (11)

There are specific rehabilitation programs funded by WCB-Alberta. These include (9):

1) Single service provider: Primarily community-based physical therapy treatment, but also may include treatment by a community-based chiropractor for the sub-group of claimants with neck or back pain. Typically occurs in acute and sub-acute stages of the claim, or when few barriers to RTW are identified. Evidence-based best practice guidelines for the management of injured workers have been distributed to all physical therapists in the jurisdiction. However, adherence to the guidelines, actual treatment provided, and RTW outcomes vary widely across clinics. According to previous models of targeted rehabilitation, conservative care by a single service provider is recommended only for claimants with few barriers to recovery and at "Low Risk" for prolonged work disability.

2) Return-to-Work Provider Based: Interdisciplinary rehabilitation at a designated rehabilitation centre. Treatment focuses largely on graded activity, functional restoration, and specific exercise programs, but also includes communication/negotiation with relevant stakeholders including employers. This intervention has been recommended for the sub-group of claimants categorized as "Pain-related Issues – Immobilized" including high levels of physical dysfunction, fear avoidance, and low expectations of recovery (53).

3) Return-to-Work Worksite Based: In this program, all intervention takes place at the worksite instead of at a rehabilitation centre. Treatment focuses more on maintaining linkages with the workplace, participatory ergonomics and identification of suitable duties to help claimants stay at work. This intervention is recommended for claimants categorized as having "Workplace Issues - Disemployed" including no modified duty, high physical demands, and short job tenure (53).

4) Return-to-Work Hybrid: Combination of provider and worksite based interventions. Claimants spend treatment time at both the workplace and rehabilitation centre. Commonly used for claimants with cumulative activity related disorders as opposed to traumatic injuries.

5) Return-to-Work Complex: Comprehensive pain management program for claimants with chronic pain and multiple complex barriers to RTW. Treatment includes counseling psychology sessions to improve coping, decrease stress and overcome emotional burdens, functional restoration with a cognitive-behavioural approach, and RTW planning through stakeholder negotiation. This intervention is recommended for those claimants categorized as "Multiple Complex Issues - Overwhelmed" including mood symptoms,

life adversity, fears, worries and stress which would correspond to the OMPQ 'high risk' group.

6) Other interventions: This involves either no rehabilitation or referral back to single service provider (i.e. physical therapy or chiropractic).

Within the context of the WCB-Alberta's continuum of care for injured workers, the OMPQ is used along with other assessment tools to help identify patients who are at risk of delayed RTW. The cut-off scores that the WCB-Alberta uses are: <140 indicates low risk, 140-146 refers to moderate risk and >146 corresponds to high risk. Based on OMPQ and other assessment findings, different types of rehabilitation programs are available and recommended for injured workers, ranging from single service to complex multidisciplinary pain management programs (Figure 6 in the appendix section illustrates the Triage pathways used by WCB-Alberta). Although RTW assessments are well described, there has been little research regarding the decision making and what type of rehabilitation program claimants really undergo

Currently it is unknown how well the OMPQ functions to classify injured workers to the optimal rehabilitation program within this system. In other words, there is a gap in knowledge regarding whether injured worker OMPQ scores accurately classify claimants according to level of potential for RTW. Furthermore, it is not known whether accurate classification relates to better RTW outcome. Finally, it would contribute to research to know how this measure behaves for injured workers from the providence of Alberta.

2.8 Objectives of the Study

This study had 3 main objectives. These were:

1. To describe the key characteristics (e.g. demographic, health, pain scales) of WCB-Alberta claimants:

a) In the categories of high, medium and low risk of delayed RTW, as determined by the OMPQ (using the original Linton scoring and modified WCB-Alberta scoring scheme);
b) Of the rehabilitation programs recommended by clinicians (i.e. complex, interdisciplinary RTW program, single service physical therapy, chiropractor or home program and no interventions required); and
c) Actually undergoing the rehabilitation programs (i.e. RTW complex, RTW provider based, RTW Hybrid, RTW work sited based, single service community physical therapy and no rehabilitation)

The actual rehabilitation program undertaken was always referred to as: RTW complex, RTW hybrid, RTW works sited based, RTW provider, single service community physical therapy and no rehabilitation unless specified.

The clinician recommendations were always refer to: complex, interdisciplinary RTW program, single service physical therapy, chiropractor or home program and no interventions required unless specified.

2. To determine the level of agreement between:

a) OMPQ categories of low, medium and high risk (using the original Linton scoring and modified WCB-Alberta scoring scheme) and the actual rehabilitation program undertaken; and
b) Clinician recommendation to the actual rehabilitation program undertaken.

3. To determine whether a "match" between:

a) Claimant OMPQ category using the original Linton scoring scheme scoring (low, medium or high) and actual rehabilitation program undertaken was associated with better RTW outcomes.
b) Claimant OMPQ category using modified WCB-Alberta scoring (low, medium or high) and actual rehabilitation program undertaken was associated with better RTW outcomes.
c) Clinician recommendation and the actual rehabilitation program undertaken was associated with better RTW outcomes.

2.9 Research Hypothesis

Hypotheses based on the questions of this thesis were:

1. There would be statistically significant and clinically important differences on key characteristics of WCB-Alberta claimants in the different OMPQ risk categories. Those in the low risk category would be more likely to RTW in less time than those categorized as medium and high risk, mainly because there was no need for a multidimensional approach (just the physical therapist) and they had an overall lower "risk profile" according to the OMPQ. There would also be statistically significant and clinically important differences on key characteristics

of WCB-Alberta claimants recommended to and actually undergoing the three rehabilitation programs.

2. The OMPQ classifications (using the original Linton scoring and modified WCB-Alberta scoring scheme) would have a moderate level of agreement with the actual rehabilitation program undertaken. Clinician recommendation would have more agreement with the actual rehabilitation program undertaken.

3. Patients who did not receive wage replacement benefits 90 days after RTW assessment were correctly matched. Patients who received wage replacement benefits 90 days after RTW assessment were mismatched according to the OMPQ/clinician recommendations with the actual rehabilitation program undertaken.

CHAPTER 3

Methodology

3.1 Study Design

This study was a retrospective cohort design, and a secondary analysis as it used a dataset of a previous study related to development of a clinical decision support tool (CDST) for injured workers. Data were extracted from WCB-Alberta administrative and clinical databases (54). The Health Research Ethics Committee at the University of Alberta approved this study. All the data remained located and secured in the Common Spinal Disorders Laboratory of the University of Alberta. This data did not leave the facility and was protected by passwords.

3.2 Subjects

This study used population-based data of 2046 claimants. Data were available on all WCB-Alberta claimants who were referred to RTW assessment centres throughout the province between December 2009 and November 2011. Claimants had a broad spectrum of sub-acute and chronic musculoskeletal diagnoses: fractures, dislocations, lacerations, contusions, nerve damage, joint disorders, sprains, and others (54). Since this was a secondary analysis, no claimants were directly recruited. The database had information about the claimant's conditions at the time of RTW assessment and RTW status up to 3 months post-assessment.

3.3 WCB-Alberta rehabilitation programs

As mentioned, within the WCB-Alberta continuum of care, there were different types of rehabilitation programs available for claimants ranging from a single service approach to a multidisciplinary management for more complicated cases. Although the type of treatment was

different within the programs, all of them had a unique goal of providing a safe return to work to those injured workers who, for different circumstances, had not yet returned to work. The type of rehabilitation required was determined through results of the RTW assessment (54). The RTW assessment is conducted by trained clinicians using a variety of clinical measuring tools (i.e. function, pain, yellow flags) with the purpose of obtain further knowledge regarding the claimants fitness to RTW and need for additional rehabilitation (54). Detailed information of the rehabilitation programs may be found in Chapter 2 section 2.7. For further information regarding the triage pathways that were used by clinicians for the selection of the rehabilitation program please refer to the Appendix section 3.

3.4 WCB-Alberta rehabilitation programs and the OMPQ

In addition to the information gathered at the time of RTW assessment, the claimants OMPQ score was available. This score helped clinicians to categorize patients into the appropriate type of rehabilitation. Each of the available programs was associated with a certain risk of delayed RTW. This process was known as risk-factor classification (54). Claimants with few barriers to RTW and low risk of delayed recovery typically are referred to single service provider; those with moderate risk were referred for an interdisciplinary program, while those at high risk were typically referred for complex chronic pain program or 'other' intervention. The available rehabilitation programs typically recommended for each level of risk of delayed RTW are shown in Table 3.1.

Table 3-1 Available Rehabilitation Programs Recommended for Various Levels of Risk Identified at Time of RTW Assessment

Risk level identified at time of assessment	Typical rehabilitation program indicated for this risk level
Low	Single service provider
Medium	Return-to-work Provider Based
	Return-to-work Worksite Based
	Return-to-work Hybrid
High	Return-to-work Complex

3.5 Measurements and Data collection

A wide variety of information was available within the database. These data included basic demographic and descriptive information about the claimants, information obtained at the time of RTW assessment including clinician recommendations, information on the type of rehabilitation actually undertaken and the benefits for claimants up to 3 months post-assessment. The key variables used in this study were:

3.5.1 OMPQ

The OMPQ was one of the primary variables of this study. The OMPQ is a self-administered screening tool of 24 items designed to help clinicians flag patients at risk of developing persistent pain and disability problems(18). It assessed biopsychosocial risk factors for prolonged disability (35). According to Linton, OMPQ items were related to work, coping, function, stress, mood and fear-avoidance beliefs. This tool has been studied extensively and has been suggested

as a useful tool to predict delay to recovery (10, 24). Furthermore, Linton stated that with a cut-of score of 105, 88% of injured patients could be correctly identified (19). The OMPQ was easy to be administered and interpret and does not take a long time to complete (i.e. should not take more than 10 minutes) (19). The scoring of the OMPQ is an indicator of the patient's risk of delayed recovery. Scores could range from 3 to 210 points (For further information regarding the scoring procedure please referred to Appendix section 2. OMPQ, its Scoring and Administration). According to Westman, there was a direct relationship between the score and the risk, understanding that a higher score would indicate a higher risk for long-term sick leave and the development of chronic functional problem (40). Since there was no one ultimate cut-off score used globally, the authors followed Linton's recommendation and the one used by the WCB-Alberta in order to gain deeper knowledge regarding the triage classification of WCB-Alberta claimants. Table 3.2 indicates the different cut-off scores used in this study.

Table 3. 2 OMPQ Categorization and Cut off scores Recommended by Linton and WCB-Alberta

Risk level	Linton's OMPQ categories	WCB-Alberta's OMPQ categories
Low	<90	<140
Medium	90-105	140-146
High	>105	>146

Cut off scores were used by examiners or clinicians as an extra assistant in making decisions. They were an important asset. An optimal test would have 100% sensitivity and 100% specificity. This would allow an easier designation of a cut off score. The change of the cut off scores compromise sensitivity and specificity (55, 56). For example, an injured worker with an

OMPQ score of 110 points that went through the WCB-Alberta cut off score system would be classified as a low risk instead of a high risk according to the Linton cut off score. It seems that the WCB-Alberta takes more into consideration specificity. In other words, having such a high cut off score would ensure that the specificity would be higher and did present a higher probability of correctly identifying those claimants who were not in the OMPQ high-risk category (true negative probability or low false positive rate). One reason to set the cut-scores so high was that multidisciplinary treatment is quite expensive. Another reason would be that the characteristics of injured workers were such that they were more likely to score high on the OMPQ, meaning very few would be categorized as low or medium risk using Linton's classification. An advantage of using different cut off scores was that it would provide further knowledge of the implementation and behaviour of using two different cut-off scores in the same population of injured workers.

3.5.2 Other Assessment Measures

Besides the OMPQ, there were several other variables that were included in this study. These consisted of:

1. Age in years
2. Sex: Percentage male
3. Marital status with seven categories: Single, Separated, Divorced, Widowed, Married, Common law and not specified

4. Education level with eight categories: Grade 8 or less, Partial High School, High School Diploma, Partial Technical School, Technical Diploma, Partial University, University Degree and not specified.

5. Primary Diagnosis according to ICD9 code. Nine categories: Fractures, Dislocations, Sprains/Strains, Lacerations, Contusions, Nerve Damage, Joint Disorders, Others and Unknown.

6. Comorbidity: Yes/No, indicated by a secondary diagnosis.

7. Duration of injury determined by days between accident and admission for RTW assessment

8. Number of previous claims.

9. Currently working: Yes/No.

10. Job status: Does the claimant have a job to return to?

11. Modified Work Available: Did the claimant have modified work available at time of RTW assessment? Percentage of Yes.

12. Pain Visual Analogue Scale (Pain VAS): This scale was simple and frequently used to measure pain intensity. It consisted of a 100 mm long line ranging from 0 as no pain at all to 10 as the worst pain imaginable (57). The claimant had to mark a place indicating subjectively pain intensity (54).

13. Pain Disability Index (PDI): This was a self- reported questionnaire, and was simple and quick to answer. It measured the impact of pain on daily living activities and participation

with a minimal index of 0 and a maximum of 70. The index was the sum of seven items: Family/Home Responsibilities, Recreation, Social Activity, Occupation, Sexual Behavior, Self-Care, and Life-Support Activities. The higher the index, the greater the claimant disability. The PDI has been validated and researchers have reported it to be a reliable tool (54, 58).

14. Clinician recommendation regarding rehabilitation program needed: 3 categories – low risk/ no interventions required, single service physical therapist (PT), Chiropractor or home program; medium risk/ interdisciplinary RTW rehabilitation; and high risk/ complex rehabilitation.

15. Actual rehabilitation program undertaken: 3 categories – low risk/ no rehabilitation, single service; medium risk/ RTW provider based, RTW work sited, RTW hybrid; and high risk/ RTW complex rehabilitation.

3.5.3 Outcome

The outcome was an indication of RTW after assessment. Specifically, claimants who received wage replacement benefits 90 days after the RTW assessment in percentage of "Yes" were examined. Therefore, benefits became an indirect indicator of RTW because those claimants who received "benefits" did not work. "Good outcome" was determined as those claimants who after the treatment did not receive benefits, meanwhile "Poor outcome" was determined as claimants who did receive benefits after the assessment.

3.6 Statistical Analysis

3.6.1 *Data analysis*

Objective #1:

The first step for conducting the analysis of objective one was to recode OMPQ scores according to the three Linton and WCB-Alberta risk categories (low, medium and high). These scores are showed in Table 3.2. Next, the claimant's demographics and other characteristics were analyzed. The continuous variables (i.e. total OMPQ score, age, accident to admission, number of prior WCB claims, PDI and VAS) were calculated using means and standard deviations. Ordinal and nominal data (i.e. gender, marital status, education level, diagnosis indicated by the ICD9, comorbidity, claimant working status, job attached status, modified work available, clinician triage recommendation and the actual rehabilitation program undertaken) were analyzed using percentages. Differences in means for continuous variables among Linton and WCB classification groups were determined by a MANOVA and ANOVA test followed by Bonferroni post-hoc tests to adjust for multiple comparisons. Differences in percentages for nominal and ordinal data were determined using chi-square test.

Objective #2:

For objective two, Kappa statistic was used to evaluate the level of agreement adjusted for chance between:

a) OMPQ categories of low, medium and high risk (using the original Linton scoring and modified WCB-Alberta scoring scheme) and the actual rehabilitation program undertaken.

b) Clinician recommendation and the actual rehabilitation program undertaken.

In the data set, the clinician recommendation included "Other discharge" as another recommendation. However, this data did not fit into one of the three main categories so it was coded as missing data.

Three variables were used separately to analyze the level of agreement with the variable "actual rehabilitation program taken". These three variables were: Linton's OMPQ, WCB-Alberta's OMPQ and the clinician recommendation. All four variables were coded independently, for Linton's OMPQ and WCB-Alberta's OMPQ numbers were used to assign risk categories. For the actual rehabilitation program taken and the clinician recommendation numbers were used to attribute the correspondent rehabilitation program.

Tables 3.3, 3.4 and 3.5 illustrate the different variables with the correspondent code numbers which were used to analyze objective two.

Table 3. 3 Linton's OMPQ and actual rehabilitation program undertaken

Linton's OMPQ categories	Actual rehabilitation program undertaken
Low=1	No rehabilitation/Single service community physical therapy=1
Medium=2	RTW Provider based / RTW Work sited based /RTW Hybrid=2
High=3	RTW Complex=3

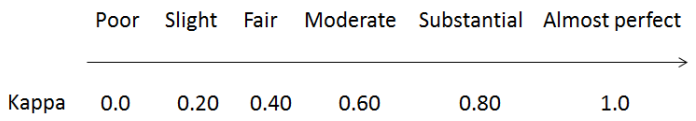
Table 3. 4 WCB-Alberta's OMPQ and actual rehabilitation program undertaken

WCB-Alberta's OMPQ categories	Actual rehabilitation program undertaken
Low=1	No rehabilitation/Single service community physical therapy =1
Medium=2	RTW Provider based / RTW Work sited based / RTW Hybrid=2
High=3	RTW Complex=3

Table 3. 5 Clinician recommendation and actual rehabilitation program undertaken

Clinician recommendation categories	Actual rehabilitation program undertaken
No interventions required/Single service PT, Chiropractor or home program=1	No rehabilitation/Single service community physical therapy=1
Interdisciplinary RTW programs=2	RTW Provider based / RTW Work sited based /RTW Hybrid=2
Complex=3	RTW Complex=3

Figure 2 shows the values that were used to the Kappa statistic interpretation.



Kappa	Agreement
<0	Less than chance agreement
0.01-0.20	Slight agreement
0.21-0.40	Fair agreement
0.41-0.60	Moderate agreement
0.61-0.80	Substantial agreement
0.81-0.99	Almost perfect agreement

Figure 2 Interpretation of Kappa (59)

Objective #3:

For objective three, Chi statistic was used to determine whether a "match" between three variables (i.e. the claimant OMPQ category using the original Linton scoring, the claimant OMPQ category using the modified WCB-Alberta scoring, and the clinician recommendation) with the actual rehabilitation program undertaken was associated with a different return to work outcome, compared to "no match".

It is important to note that even though the cut-off scores were different, the OMPQ categories had the same meaning. For the high category, the claimant was typically in need of an intensive, multidisciplinary attention; for the medium category, the claimant might have needed specialized management and an observation regarding the progress was needed; and finally for low risk, it was expected that the claimant would get better with minimal intervention (19). In theory, a low

level of risk corresponded to single service intervention, a medium level of risk corresponded to interdisciplinary rehabilitation program and finally, high risk corresponded to the complex program. We coded a "match" if the OMPQ or clinician recommendation was in concordance with the actual rehabilitation program undertaken. According to this, six variables were stipulated: Linton OMPQ match with the actual program undertaken, Linton OMPQ no match with the actual program undertaken, WCB-Alberta OMPQ match with actual program undertaken, WCB-Alberta OMPQ no match with the actual program undertaken, Clinician match with the actual program undertaken and Clinician no match with the actual program undertaken.

Secondly, the outcome was coded in terms of return to work. We had the information related to wage replacement 90 days after assessment or "benefits". Wage replacement was used as an indirect indicator of RTW. The coding used was the following: For any claimant who received any wage replace 90 days after assessment was considered as "Poor Outcome". On the other hand, any claimant who did not received any wage replace 90 days after assessment was considered as "Good Outcome". Tables 3.6, 3.7 and 3.8 illustrate these variables.

Table 3. 6 Linton's OMPQ Matching and Outcome for WCB-Alberta claimants

	Good outcome/Not receiving benefits	Poor outcome/Receiving benefits
Linton's OMPQ match with actual program undertaken		
Linton's OMPQ no match with actual program undertaken		

Table 3. 7 WCB-Alberta's OMPQ Matching and Outcome for WCB-Alberta's claimants

	Good outcome/Not receiving benefits	Poor outcome/Receiving benefits
WCB-Alberta's OMPQ match with actual program undertaken		
WCB-Alberta's OMPQ no match with actual program undertaken		

Table 3. 8 Clinicians Recommendation Matching and Outcome for WCB-Alberta's claimants

	Good outcome/Not receiving benefits	Poor outcome/Receiving benefits
Clinician recommendation match with actual program undertaken		
Clinician recommendation no match with actual program undertaken		

All analyses were performed with SPPS 21. An alpha level of 0.05 was chosen to determine statistical significance.

CHAPTER 4

Results

4.1 Data management and claimant demographics

The total number of claimants in the data set was 7,843. Of these, 5,797 did not complete the OMPQ and were excluded from the analysis. This was due to an administrative request from WCB-Alberta during the sampling time frame that recommended the OMPQ be administered on claimants with spinal conditions, reducing the number of claimants completing the questionnaire. The final number of claimants included in subsequent analysis was 2,046. Table 4.1 compares the sample characteristics for claimants with complete and missing OMPQ data. There were a number of variables that differed between those with complete data compared to incomplete OMPQ data suggesting sampling bias.

Table 4. 1 Missing data on the OMPQ of Compensation Board of Alberta's Workers

		Missing data on the OMPQ	
Mean (SD) or percentage	All claimants n=7,843	Yes	No
Age at admission (years) [S]		43.0 (11.9)	41.5 (11.9)
Accident to admission (calendar days) [S]		225.8 (439.9)	166.1 (358.8)
Number of prior claims [S]		4.3 (5.3)	3.8 (4.9)
Sex (% male) [NS]		64.4	62.5
Marital status [S]			

Single	18.6	12.5
Separated	2.9	1.3
Divorced	4.8	2.1
Widowed	1.2	0.8
Married	33.2	21.8
Common law	8.2	4.6
Not Specified	31.2	56.9
Education Level [S]		
Grade 8 or less	3.2	1.5
Partial High School	12.7	5.7
High School Diploma	18.8	12.9
Partial Technical School	5.9	2.0
Technical Diploma	13.2	11.9
Partial University	2.9	2.1
University Degree	5.1	4.9
"Not Specified"	38.2	59.1
Actual Rehabilitation Program Undertaken [S]		
No rehabilitation	19.9	14.5
Singe Service Physical Therapy	17.1	9.2
Return-to-Work Provider Based	50.2	56.8
Return-to-Work Work Site Based	1.2	2.6
Return-to-Work Hybrid	8.2	13.8
Return-to-Work Complex	3.5	3.1
Assessment Admission Job Attached [S]		
No	16.3	11.2
Yes	83.7	88.8
Comorbidity [S]		
No	66.4	84.0
Yes	33.6	16.0
Diagnosis Group at assessment [S]		
Fractures	12.8	8.3
Dislocations	2.6	1.0
Sprains/Strains	42.6	52.0
Lacerations	2.9	1.6
Contusions	5.2	3.6

Nerve damage	1.6	0.5
Joint disorders	28.0	31.3
Other	4.3	1.7
Unknown	0.0	0.1
Currently working [S]		
No	53.2	54.1
Yes	46.5	45.9
Unknown	0.3	0.0
Clinician Triage Recommendation Grouped [S]		
No intervention Required	6.5	6.8
Single Service Physical Therapy or home program	13.6	4.7
Interdisciplinary RTW Programs	63.4	80.8
Other Discharge Recommendations	13.0	4.3
Complex	3.5	3.3
	n=5,228	n=1,978
Visual Analogue Scale [S]	5.0 (2.5)	5.3 (2.7)
	n=5,193	n=2,012
Pain Disability Index [S]	46.5 (22.3)	49.2 (22.1)
	n=3,628	n=1,562
Modified work available at start of program (% yes) [S]	60.6	62.2

[S] Statistically significant differences between variables in missing data on the OMPQ.

[NS] No statistically significant differences between variables in missing data on the OMPQ.

Table 4.2 lists the characteristics of claimants identified as being at high, medium and low risk of delayed RTW, as determined by scores on the OMPQ using the original Linton scoring scheme. As shown in the Table 4.2, the majority of claimants in all 3 risk categories were male (62.9% 63% and 62%) and approximately 41 years of age. The number of calendar days between accident and admission exceeded 4 months in all 3 categories, although the specific periods differed significantly. Differences between the claimants' pain intensity (measured by VAS) and self-reported disability (measured by PDI) were significant, with claimants allocated to the higher risk category reporting higher VAS and PDI scores than those allocated to the low- or medium-risk category. However, the findings revealed that there was incongruence between (a) the clinician recommendation and the actual rehabilitation received, and (b) the OMPQ categories. The most common program recommended by clinicians was the interdisciplinary RTW program. In terms of the claimants' diagnoses, only a small percentage of injuries were related to dislocations and nerve damage (<2%). In contrast, sprains/strain (low 52.6%, medium 49.7% and high 52.6%) and joint disorder (low 28.6%, medium 34.5% and high 31.5%) accounted for the higher percentages in the three categories (low, medium and high).

Table 4. 2 Claimant Characteristics According to Linton's Orebro Musculoskeletal Pain Questionnaire Scoring Scheme for Return to Work

		Linton's OMPQ category		
	All claimants n=2,046	Low Risk Mean (SD) or percentage n=588	Medium Risk Mean (SD) or percentage n=443	High Risk Mean (SD) or percentage n=1,015

Total OMPQ score [S]	72.8 (13.9)	98.1 (4.5)	124.7 (14.2)
Age at admission (years) [S]	41.9 (12.0)	41.4 (11.5)	41.4 (11.9)
Accident to admission (calendar days) [S]	141 (291.7)	134.6 (246.4)	194.2 (427.1)
Number of prior claims [S]	3.5 (4.9)	3.8 (5.2)	3.9 (4.7)
Sex (% male) [NS]	62.9	63.0	62.0
Marital status [S]			
Single	11.4	13.3	12.7
Separated	1.5	0.7	1.4
Divorced	2.4	1.8	2.1
Widowed	0.5	0.7	1.0
Married	19.7	22.3	22.8
Common law	3.4	4.5	5.4
Not Specified	61.1	56.7	54.7
Education Level [S]			
Grade 8 or less	0.7	0.9	2.2
Partial High School	3.4	4.5	7.5
High School Diploma	9.9	14.4	14.0
Partial Technical School	1.4	2.9	2.0
Technical Diploma	13.4	10.4	11.6
Partial University	2.4	2.7	1.6
University Degree	6.1	6.1	3.6
"Not Specified"	62.8	58.0	57.5
Actual Rehabilitation Program Undertaken [S]			
No rehabilitation	18.7	12.9	12.7
Single Service Physical Therapy	11.2	7.2	8.9
Return-to-Work Provider Based	41.0	62.8	63.3
Return-to-Work Work Site Based	5.8	1.8	1.2
Return-to-Work Hybrid	23	14.7	8.1

RTW Complex	0.3	0.7	5.8
Assessment Admission Job Attached [S]			
No	5.6	8.1	15.9
Yes	94.4	91.9	84.1
Comorbidity [S]			
No	89.1	84.9	80.6
Yes	10.9	15.1	19.4
Diagnosis Group at assessment [S]			
Fractures	9.0	10.2	7.0
Dislocations	0.5	0.9	1.3
Sprains/Strains	52.6	49.7	52.6
Lacerations	3.2	0.5	1.1
Contusions	4.1	3.2	3.5
Nerve damage	0.5	0.2	0.7
Joint disorders	28.6	34.5	31.5
Other	1.5	0.9	2.1
Unknown	0.0	0.0	0.2
Currently working [S]			
No	36.6	50.6	65.8
Yes	63.4	49.4	34.2
Clinician Triage Recommendation Grouped [S]			
No intervention Required	11.6	4.3	5.1
Single Service Physical Therapy, or home program	4.9	4.7	4.6
Interdisciplinary Programs	79.8	87.1	78.6
Other Discharge Recommendations	3.7	2.7	5.4
Complex	0.0	1.1	6.2
	n=568	n=432	n=978
Visual Analogue Scale [S]	3.3 (2.3)	5.1 (2.4)	6.6 (2.2)

	n=577	n=438	n=997
Pain Disability Index [S]	30 (17.9)	47.2 (16.7)	61.3 (17.8)
	n=412	n=354	n=796
Modified work available at start of program (% yes) [S]	76.0	62.0	55.0

[S] Statistically significant differences between variables in Linton's OMPQ risk categories.

[NS] No statistically significant differences between variables in Linton's OMPQ risk categories.

OMPQ: Orebro musculoskeletal pain questionnaire

SS: single service

PT: physical therapy

Table 4.3 describes the demographic key, work-related and clinical measures for claimants in the low-, medium- and high-risk categories of the OMPQ, according to the WCB-Alberta classification. As was the case with Linton's classification, the clinical measures for pain intensity and self-reported disability differed. VAS and PDI means were lower in the low-risk category and higher in the high-risk category. In regards to rehabilitation, the interdisciplinary RTW program and RTW provider-based were most commonly used in the medium risk category (74.2% and 59.7% respectively). The number of days between accident and admission differed significantly between the risk categories. It totaled more than 5 months in each category, and the figure for the high-risk category was more than a year. Data from work-related variables revealed that most claimants were job-attached at the time of assessment, and that those in the

low and medium risk categories had modified duties to return to. However, more than 50% of claimants in each risk category were not currently working. The rates of marital status, education level and type of diagnoses reported across the risk categories were highly variable.

Table 4. 3 Claimant's Characteristics According to Workers Compensation Board of Alberta's Orebro Musculoskeletal Pain Questionnaire Scoring Scheme for Return to Work

		WCB-Alberta's OMPQ category		
	All claimants n=2,046	Low Risk Mean (SD) or percentage	Medium Risk Mean (SD) or percentage	High Risk Mean (SD) or percentage
		n=1,901	n=62	n=83
Total OMPQ score [S]		100.5 (22.9)	142.9 (1.9)	156.4 (8.4)
Age at admission (years) [NS]		41.6 (11.9)	39.8 (10.6)	41.8 (10.5)
Accident to admission (calendar days) [S]		151 (322.9)	301.6 (522.7)	398.9 (719.4)
Number of prior claims [NS]		3.7 (4.9)	4.0 (4.7)	4.1 (4.2)
Sex (% male) [NS]		62.0	71.0	69.0
Marital status [NS]				
Single		12.6	14.5	8.4
Separated		1.3	1.6	1.2
Divorced		2.1	0.0	4.8
Widowed		0.8	0.0	0.0
Married		21.9	21.0	20.5
Common law		4.4	9.7	6.0
Not Specified		57.0	53.2	59.0

Education Level [NS]			
Grade 8 or less	1.3	4.8	2.4
Partial High School	5.4	8.1	10.8
High School Diploma	12.8	12.9	15.7
Partial Technical School	2.1	1.6	0.0
Technical Diploma	12.0	11.3	8.4
Partial University	2.1	1.6	1.2
University Degree	4.9	3.2	4.8
"Not Specified"	59.3	56.5	56.6
Actual Rehabilitation Program Undertaken [S]			
No rehabilitation	14.6	11.3	13.3
Single Service Physical Therapy	9.2	9.7	9.6
Return-to-Work Provider Based	56.9	59.7	53
Return-to-Work Work Site Based	2.7	4.8	0.0
Return-to-Work Hybrid	14.7	4.8	0.0
Return-to-Work Complex	2.0	9.7	24.1
Assessment Admission Job Attached [S]			
No	10.3	24.2	22.9
Yes	89.7	75.8	77.1
Comorbidity [S]			
No	84.4	80.6	75.9
Yes	15.6	19.4	24.1
Diagnosis Group at assessment [NS]			
Fractures	8.4	9.7	4.8
Dislocations	0.9	0.0	2.4
Sprains/Strains	52.4	46.8	44.6
Lacerations	1.6	1.6	0.0
Contusions	3.6	1.6	4.8
Nerve damage	0.5	0.0	1.2
Joint disorders	30.7	37.1	41.0
Other	1.6	3.2	1.2
Unknown	0.1	0.0	0.0
Currently working [S]			
No	52.5	72.6	77.1
Yes	47.5	27.4	22.9

Clinician Triage Recommendation Grouped [S]			
No intervention Required	6.9	4.8	6.0
Single Service Physical Therapy or home program	4.5	4.8	9.6
Interdisciplinary Return-to-Work	82	74.2	57.8
Other Discharge Recommendations	4.2	6.5	6.0
Complex	2.4	9.7	20.5
	n=1,838	n=60	n=80
Visual Analogue Scale [S]	5.1 (2.6)	7.0 (1.9)	8.3 (1.4)
	n=1,870	n=60	n=82
Pain Disability Index [S]	47.3 (21.3)	69.1 (14.7)	78.9 (14.8)
	n=1449	n=49	n=64
Modified work available at start of program (% yes) [S]	63.5	57.1	37.5

[S] Statistically significant differences between variables in WCB-Alberta's OMPQ risk categories.

[NS] No statistically significant differences between variables in WCB-Alberta's OMPQ risk categories.

OMPQ: Orebro musculoskeletal pain questionnaire

Table 4.4 presents the characteristics of claimants in the various rehabilitation programs recommended by clinicians. Sixty percent or more of the claimants in all categories were males, with an average age ranging between 41 and 43. As shown in Table 4.4, there was some agreement between the OMPQ and the clinicians' recommendation. For example, there was agreement between the recommendation of clinician to follow an interdisciplinary and complex program and the suggestions made by Linton's OMPQ. However, this recommendation did not

agree with that made by WCB-Alberta's OMPQ. Conversely, the recommendation to follow a single service agreed with the WCB-Alberta's OMPQ but not with Linton's. The data also suggested a concordance between the clinician's recommendation and the actual rehabilitation program undertaken. For example, the largest proportion of clients who received "no rehabilitation," 68.3%, was given a clinician recommendation of "no intervention." The highest reported pain scores were reported by claimants in the "complex" category. Most claimants in the latter category did not have a modified job to return to and were not currently working. The longest period of time between accident and admission was reported in the "complex" category (493.9 days, or approximately 16 months). Sprains/strains were the most common in most categories (no interventions required 48.2%, single service 43.3%, and interdisciplinary return to work programs 54.3%). In the "complex" group, joint disorders were the most common (42.6%). Finally, in other discharge recommendations Sprains/strains shared the same percentage with joint disorders (36.0%).

Table 4. 4 Claimant According to Rehabilitation Programs Recommended by Clinicians

All claimants n=2,046	Clinician Recommendation				
Risk level identified at time of assessment	Low	Low	Medium	High	High
	No interventions required Mean (SD) or percentage	SS PT, Chiropractor or home program Mean (SD) or percentage	Interdisciplinary RTW programs Mean (SD) or percentage	Other Discharge Recommendations Mean (SD) or percentage	Complex Mean (SD) or percentage

	n=139	n=97	n=1,653	n=89	n=68
Total OMPQ Score [S]	93.6 (31.6)	104.4 (28.5)	103.4 (24.2)	107.8 (27.5)	134.2 (18.9)
Age at admission (years) [NS]	43.4 (13.6)	41.2 (12.8)	41.3 (11.7)	42.6 (10.8)	43.1 (11.2)
Accident to admission (Calendar days) [S]	434.3 (619.4)	138.4 (381.2)	122.7 (269.6)	331.8 (522.5)	493.9 (662.6)
Number of prior claims [NS]	5.0 (7.2)	3.4 (4.1)	3.7 (4.7)	3.5 (4.1)	3.8 (5.2)
Sex (% male) [S]	71.9	68.0	61.2	64.0	63.2
Marital status [NS]					
Single	10.8	11.3	12.8	13.5	8.8
Separated	1.4	2.1	1.1	2.2	1.5
Divorced	1.4	1.0	2.3	1.1	1.5
Widowed	0.0	0.0	0.9	0.0	1.5
Married	20.9	28.9	20.9	29.2	26.5
Common-Law	3.6	2.1	4.8	5.6	4.4
Not Specified	61.9	54.6	57.2	48.3	55.9
Education Level [S]					
Grade 8 or less	2.2	1.0	1.3	3.4	2.9
Partial High School	4.3	4.1	5.9	5.6	4.4
High School Diploma	13.7	7.2	13.1	14.6	11.8
Partial Technical School	1.4	2.1	1.9	6.7	0.0
Technical Diploma	10.8	12.4	11.7	15.7	13.2
Partial University	1.4	3.1	2.1	2.2	0.0
University Degree	2.9	8.2	4.8	3.4	8.8
"Not Specified"	63.3	61.9	59.2	48.3	58.8
Actual Rehabilitation Program Undertaken [S]					
No rehabilitation	68.3	19.6	7.9	46.1	14.7

Physical Therapy Provider Based	26.6	64.9	3.4	32.6	2.9
Worksite Based	2.2	8.2	68.7	12.4	7.4
Hybrid	0.0	1.0	3.1	2.2	0.0
Complex	2.2	5.2	16.3	3.4	1.5
	0.7	1.0	0.5	3.4	73.5
Assessment Admission Job Attached [S]					
No	22.3	13.4	8.8	20.2	33.8
Yes	77.7	86.6	91.2	79.8	66.2
Comorbidity [S]					
No	88.5	84.5	84.3	78.7	73.5
Yes	11.5	15.5	15.7	21.3	26.5
Diagnosis Group at assessment [S]					
Fractures	13.7	9.3	7.2	14.6	13.2
Dislocations	1.4	1.0	0.8	2.2	2.9
Sprains/Strain	48.2	43.3	54.3	36.0	36.8
Lacerations	3.6	4.1	1.1	3.4	1.5
Contusions	7.2	4.1	3.5	1.1	1.5
Nerve Damage	1.4	0.0	0.4	2.2	0.0
Joint disorders	23.7	33.0	31.2	36.0	42.6
Other	0.7	5.2	1.4	4.5	1.5
Unknown	0.0	0.0	0.1	0.0	0.0
Currently working [S]					
No	43.2	61.9	53.1	57.3	85.3
Yes	56.8	38.1	46.9	42.7	14.7
	n=136	n=96	n=1,592	n=86	n=68
Visual Analogue Scale[S]	4.2 (2.9)	5.5 (2.9)	5.3 (2.6)	5.1 (2.7)	7.7 (1.8)
	n=137	n=97	n=1,621	n=89	n=68
Pain Disability Index [S]	38.8 (24.5)	53.9 (24.5)	48.7 (21.1)	51.4 (20.9)	74.1 (16.0)
	n=7	n=15	n=1,465	n=19	n=56
Modified work	71.4	53.3	63.4	57.9	33.9

available at start of program (% yes) [S]	

[S] Statistically significant differences between variables in rehabilitation programs recommended by clinicians.

[NS] No statistically significant differences between variables in rehabilitation programs recommended by clinicians.

OMPQ: Orebro musculoskeletal pain questionnaire

Table 4.5 shows the characteristics of claimants according to the actual rehabilitation program they undertook. Most claimants were males, and most ranged in age between 40 and 44. It is interesting to note that OMPQ, VAS and PDI scores differed across groups, and was lower among claimants in the RTW work-site based and RTW hybrid categories than in the no rehabilitation and single-service categories. The highest OMPQ, VAS, and PDI scores were among claimants in the complex category. In addition, the largest number of days related to accident to admission (518.8), and the largest number of claims (4.5), also appeared in the "complex" category. Data regarding the claimants' working status were very diverse. Many individuals in the "work site" and "hybrid" categories were currently working, while many of those in the "single service", "provider" and "complex" categories were not. Sprain/strains and joint disorders were the most common injuries. Finally, "provider" (97.7%), "work site" (94.4%) and "hybrid" (95.7%) categories showed the highest levels of adherence to clinician recommendations. All three of those roles corresponded with the program subcategory of "interdisciplinary RTW programs."

Table 4. 5 Claimant Characteristics of the Actual Rehabilitation Programs Undertaken

All claimants n=2046	Actual Rehabilitation Program Undertaken					
	No rehabilitation	SS Community PT	RTW Provider Based	RTW Work Site-based	RTW Hybrid	RTW Complex
Risk level identified at time of assessment	Low Mean (SD) or percentage	Low Mean (SD) or percentage	Medium Mean (SD) or percentage	Medium Mean (SD) or percentage	Medium Mean (SD) or percentage	High Mean (SD) or percentage
	n=296	n=188	n=1,162	n=54	n=282	n=64
Total OMPQ Score [S]	98.5 (29.3)	102.2 (26.9)	107.9 (22.5)	85.9 (24.8)	91.2 (23.5)	136.4 (21.0)
Age at admission (years) [NS]	42.4 (12.7)	40.3 (11.5)	41.3 (11.7)	43.4 (12.7)	41.2 (11.7)	44.7 (11.5)
Accident to admission (Calendar days) [S]	323.2 (588.4)	187.3 (411.2)	120.2 (247.7)	94.8 (115.1)	109.7 (163.0)	518.8 (703.7)
Number of prior claims [NS]	4.1 (5.7)	3.5 (4.4)	3.8 (4.7)	2.9 (4.1)	3.7 (4.7)	4.5 (6.5)
Sex (% male) [S]	68.6	63.3	62.0	51.9	57.4	70.3

Marital status [NS]						
Single	10.1	16.0	13.6	3.7	9.2	14.1
Separated	2.0	2.1	0.9	1.9	1.4	1.6
Divorced	2.0	2.1	2.2	1.9	1.4	3.1
Widowed	0.0	0.0	1.2	0.0	0.4	1.6
Married	23.0	23.4	22.0	14.8	18.8	26.6
Common-Law	5.1	4.8	5.2	1.9	2.5	4.7
Not Specified	57.8	51.6	54.9	75.9	66.3	48.4
Education Level [S]						
Grade 8 or less	1.7	1.1	1.5	1.9	1.4	1.6
Partial High School	3.7	4.3	7.1	1.9	2.8	9.4
High School Diploma	13.2	9.6	13.7	5.6	12.8	14.1
Partial Technical School	2.4	3.7	2.2	0.0	0.7	0.0
Technical Diploma	11.1	16.5	11.4	9.3	11.0	15.6
Partial University	3.4	3.7	1.6	0.0	1.8	1.6
University Degree	3.7	5.9	5.5	3.7	2.5	7.8
"Not Specified"	60.8	55.3	57.1	77.8	67.0	50.0
Assessment Admission Job Attached [S]						
No	18.9	12.2	11.1	1.9	1.1	28.1
Yes	81.1	87.8	88.9	98.1	98.9	71.9
Comorbidity [S]						
No	86.1	84.6	83.4	90.7	86.9	64.1
Yes	13.9	15.4	16.6	9.3	13.1	35.9

Diagnosis Group at assessment [S]						
Fractures	12.2	7.4	8.3	5.6	3.9	14.1
Dislocations	1.4	1.1	0.9	0.0	0.0	4.7
Sprains/Strain	41.6	50	54	53.7	59.2	35.9
Lacerations	4.1	3.2	0.8	1.9	1.4	0.0
Contusions	4.4	4.3	3.3	5.6	3.5	3.1
Nerve Damage	0.7	1.1	0.2	1.9	1.1	1.6
Joint disorders	32.8	30.3	31.2	31.5	29.4	39.1
Other	3.0	2.1	1.4	0.0	1.4	1.6
Unknown	0.0	0.5	0.1	0.0	0.0	0.0
Currently working [S]						
No	47.6	54.8	64.7	20.4	17.0	81.3
Yes	52.4	45.2	35.3	79.6	83.0	18.8
Clinician Triage Recommendation Grouped [S]						
No intervention Required	32.1	19.7	0.3	0.0	1.1	1.6
SS PT, Chiropractor or home program	6.4	33.5	0.7	1.9	1.8	1.6
Interdisciplinary RTW Programs	44.3	30.3	97.7	94.4	95.7	14.1
Other	13.9	15.4	0.9	3.7	1.1	4.7
Discharge Recommendations						
Complex	3.4	1.1	0.4	0.0	0.4	78.1

VAS [S]	n=286 4.7 (2.8)	n=182 5.2 (2.8)	n=1,127 5.6 (2.5)	n=53 4.2 (2.9	n=268 4.4 (2.5)	n=62 7.7 (1.9)
PDI [S]	n=293 43.7 (23.3)	n=185 50.3 (23.5)	n=1,140 52.5 (20.1)	n=53 32.3 (22.1)	n=227 38.4 (19.6)	n=64 74.3 (16.6)
Modified work available at start of program (% yes) [S]	n=0 0	n=0 0	n=1,162 55.3	n=54 85.2	n=282 92.2	n=64 35.9

[S] Statistically significant differences between variables in the actual rehabilitation program undertaken.

[NS] Not statistically significant differences between variables in the actual rehabilitation program undertaken.

OMPQ: Orebro musculoskeletal pain questionnaire

SS: single service

PT: physical therapy

RTW: return to work

VAS: visual analog scale

PDI: pain disability index

4.2 Level of agreement

Tables 4.6, 4.7 and 4.8 present the level of agreement between (a) Linton's OMPQ categories and actual rehabilitation program undertaken, (b) WCB-Alberta's OMPQ categories and actual rehabilitation program undertaken, and (c) Clinician recommendation with the actual rehabilitation program undertaken.

Table 4. 6 Level of Agreement between Linton's Orebro Musculoskeletal Pain Questionnaire Categories and Actual Rehabilitation Programs Undertaken

		Actual rehabilitation program undertaken		
		No rehabilitation/Single service community physical therapy	Return to work Provider based /Return to work Work sited based /Return to work Hybrid	Return to work Complex
Linton's Orebro Musculoskeletal Pain Questionnaire Risk Categories	Low	176	410	2
	Medium	89	351	3
	High	219	737	59

Measure of agreement Kappa=0.06

Table 4. 7 Level of Agreement between Workers Compensation Board of Alberta's Orebro Musculoskeletal Pain Questionnaire Categories and Actual Rehabilitation Programs Undertaken

		Actual rehabilitation program undertaken		
		No rehabilitation/Single service community physical therapy	Return to work Provider based /Return to work Work sited based /Return to work Hybrid	Return to work Complex
Workers Compensation Board of Alberta's Orebro Musculoskeletal Pain Questionnaire Risk Categories	Low	452	1411	38
	Medium	13	43	6
	High	19	44	20

Measure of agreement Kappa=0.01

Table 4. 8 Level of Agreement between Clinician Recommendation and Actual Rehabilitation Programs Undertaken

		Actual rehabilitation program undertaken		
		No rehabilitation/Single service community physical therapy	Return to work Provider based /Return to work Work sited based /Return to work Hybrid	Return to work Complex
Clinician triage recommendation	No interventions required/Single service Physical therapy, Chiropractor or home program	214	20	2
	Interdisciplinary Return to work programs	188	1,456	9
	Complex	82	22	53

Measure of agreement Kappa=0.6

As reported in Tables 4.6, 4.7 and 4.8, there was a slight agreement between both OMPQ scoring schemes (Linton's and WCB-Alberta's) and the actual rehabilitation programs the claimants undertook (kappa=0.06 for Linton's and kappa=0.01 for WCB-Alberta's). Conversely, there was moderate agreement between the clinician recommendation and the actual rehabilitation program undertaken (kappa=0.6). The overall agreement between both OMPQ scoring schemes and the actual rehabilitation program undertaken was less than 30% (28.6% for Linton's and 25.2% for WCB-Alberta's). Meanwhile, the overall agreement between the clinician recommendation and the actual program undertaken was 84.2%.

These results did not support the first part of Hypothesis 2, which predicted that the OMPQ classifications (using the original Linton scoring and modified WCB-Alberta scoring scheme) would have a moderate level of agreement with the actual rehabilitation program undertaken. This was because the kappa values did not reveal a moderate level of agreement (kappa=0.41-0.6). However, the second part of Hypothesis 2, which predicted that clinicians' recommendations would have greater agreement with the actual rehabilitation program undertaken, was confirmed. Figure 3 illustrates these claims.

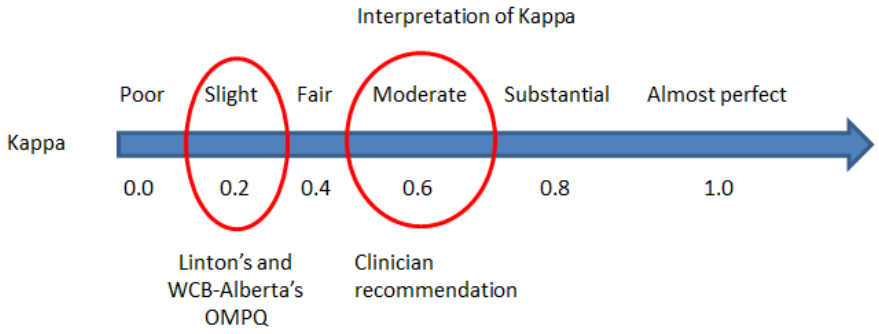


Figure 3 Level of Agreement Interpretation. Adapted from (58)

4.3 Matching and outcome

Tables 4.9 reports on the association between return-to-work outcomes and the degree of match between actual rehabilitation programs and: 1) the Linton OMPQ score; 2) WCB-Alberta OMPQ score; and 3) Clinician recommendations. The table reveals that all chi-square values fell in the critical region, therefore, the null hypothesis was rejected.

Table 4. 9 Agreement between Work Outcomes and Matching Scores of the Actual Rehabilitation Programs and: 1) Linton OMPQ; 2) WCB-Alberta OMPQ; and 3) Clinician Recommendations

	Good outcome/Not receiving benefits	Poor outcome/Receiving benefits
Linton match with actual rehabilitation program undertaken	549 (26.8%)	37 (1.8%)
Linton no match with actual rehabilitation program undertaken	1,324 (64.7%)	136 (6.6%)

$X^2(1, n=2,046) = 4.86, p<0.05$

	Good outcome/Not receiving benefits	Poor outcome/Receiving benefits
WCB-Alberta match with actual rehabilitation program undertaken	457 (22.3%)	58 (2.8%)
WCB-Alberta no match with actual rehabilitation program undertaken	1,416 (69.2%)	115 (5.6%)

$X^2(1, n=2046) = 7.00, p<0.05$

	Good outcome/Not receiving benefits	Poor outcome/Receiving benefits
Clinician recommendation match with actual rehabilitation program undertaken	1,602 (78.3%)	121 (5.9%)
Clinician recommendation no match with actual rehabilitation program undertaken	271 (13.2%)	52 (2.5%)

$X^2(1, n=2,046) = 28.9, p<0.05$

For most claimants, the OMPQ (whether Linton or WCB was used) was not associated with a good outcome when the risk category was congruent with the actual rehabilitation received. Conversely, a good outcome was much more common when clinician recommendations aligned with the actual rehabilitation received. The majority (78.3%) of claimants who were matched between clinician recommendations and the actual rehabilitation program had a good outcome. For this reason, Hypothesis 3, which predicted that patients who did not receive wage replacement benefits 90 days after RTW assessment would be correctly matched, was not supported. In fact, patients who received wage replacement benefits 90 days after RTW assessment were mismatched according to the OMPQ/rehabilitation program scores.

CHAPTER 5

Discussion

The main purpose of this study was to gain knowledge of the OMPQ's utility as a screening instrument and clinical decision support tool for use in evaluating workers' compensation claimants. To accomplish this, three specific objectives were pursued:

1. Several key characteristics of claimants related to demographics, health and pain were examined and compared. These characteristics were reported in four different groups (the three risk categories of Linton's OMPQ, the three risk categories of WCB-Alberta's OMPQ, the rehabilitation programs recommended by clinicians and the actual rehabilitation program undertaken).
2. The level of agreement between the actual rehabilitation program undertaken with the OMPQ categories using Linton's and WCB-Alberta scoring scheme and the clinician's recommendation was determined.
3. Whether a match between Linton's OMPQ, WCB-Alberta's OMPQ and the clinician's recommendation with the actual rehabilitation program undertaken was associated with better outcome was determined.

Results of our study differed with some of our initial hypotheses. For example, the level of agreement between Linton's and WCB-Alberta's OMPQ scores and the actual rehabilitation program undertaken was only slight, and not moderate as hypothesized. Meanwhile, there was a moderate level of agreement between clinician recommendations and the actual rehabilitation program undertaken. Finally, most cases in which claimants had a good

outcome were not characterized by a match between both OMPQ scoring schemes and the actual rehabilitation program. However, the majority of cases that involved a match between the clinician recommendations and the actual rehabilitation program did have a good outcome. These findings are discussed in more detail below.

5.1 Discussion of the findings

5.1.1 *Claimants' characteristics*

Various claimant demographics were surveyed, including age, gender, marital status and education level, among others. We described these characteristics in four different groups: Linton's OMPQ score, WCB-Alberta's OMPQ score, clinician recommendation and the actual rehabilitation program undertaken.

There were some findings related to these key demographic, work-related and clinical measures that are worth highlighting. As expected, the clinical measures for pain intensity and self-reported disability differed across the groups of claimants. In most cases, there was a concordance between the highest reported pain intensity and disability scores and (a) inclusion in the highest risk category or (b) involvement in complex recommendation/rehabilitation treatment. For example, in the case of both the Linton's and WCB-Alberta OMPQ measures, the highest OMPQ, VAS and PDI scores were associated with claimants in the high risk category, while the lowest scores occurred in the low-risk category.

Interestingly, the findings showed a certain agreement between OMPQ scores and the rehabilitation program recommended by clinicians. Linton's cut-off OMPQ score showed a similar recommendation to that of clinicians regarding interdisciplinary and complex rehabilitation programs. By contrast, WCB-Alberta's cut-off OMPQ score agreed with clinicians

in recommending single-service rehabilitation or no intervention at all. These findings suggest that the OMPQ might be identifying claimants with more barriers to recovery. This would be consistent with the literature. A study of Dagfinrud et al. (2012), for example, stated that both the OMPQ and the clinician's prognostic assessment could predict functional outcome (39). Lower VAS and PDI scores correspond with clinicians' recommendations for interdisciplinary support, no intervention and other discharge recommendation, while clients with higher VAS and PDI scores tended to receive single service and complex recommendations. Similarly, OMPQ, PDI and VAS claimant's scores in the actual rehabilitation program undertaken were lower among in the RTW work site and RTW hybrid forms, than among claimants in single-service community physical therapy programs and those receiving no rehabilitation at all. This may have resulted from a misclassification of meaning categories. Another reason may have been that both the RTW work site and RTW hybrid rehabilitation program typically required claimants to be job-attached, since they involved work-place based intervention. Even though scores of pain and disability were lower among claimants in these rehabilitation programs, there might have been other factors or barriers facing them in their jobs; For example, clinicians might have assigned claimants to these medium-risk categories, rather than in a lower-risk one, because they were in need of a more intense rehabilitation program.

Most claimants who underwent RTW assessment were advised by clinicians to follow an interdisciplinary RTW program. Although the interdisciplinary RTW program comes in three possible forms (the provider, work-site and hybrid variations), the program most commonly followed was the provider-based functional restoration program. It is interesting to note that, according to some authors, the work-site program is effective and has the advantage of requiring

fewer health care professionals (60, 61). However, the data showed that the work site-based program had the lowest number of claimants (n=54).

5.1.2 *Level of agreement*

We calculated the level of agreement between (a) Linton's OMPQ risk categories and the actual rehabilitation program undertaken, (b) WCB-Alberta's OMPQ risk categories and the actual rehabilitation program undertaken, and (c) the clinician recommendation and actual rehabilitation program undertaken. The results showed that only the clinician recommendation had a moderate agreement (Kappa=0.6), indicating that there was a concordance between the clinician's recommendation and the actual rehabilitation program undertaken.

There was, by contrast, only a slight agreement between actual treatment and the results of either of the two OMPQ scoring schemes (Kappa=0.06 for Linton's OMPQ and Kappa=0.01 for WCB-Alberta's OMPQ). Therefore, the treatment suggested by the OMPQ after the first assessment did not agree with the actual treatment that the claimants received. As mentioned in Chapter 3, the overall agreement using Linton's OMPQ was 28.6% and using WCB-Alberta's OMPQ was 25.2%. This is strikingly different from the overall agreement with the clinician's recommendation of 84.2%. Overall, clinicians were most likely to recommend RTW provider-based interdisciplinary programs regardless of OMPQ score. As mentioned, there may have been other factors or barriers that clinicians were using to make the final decision regarding which rehabilitation program was the most adequate. Clinicians may also have been recommending provider-based programs because of the injury phase, or because the injury was associated with higher financial costs in the more intense rehabilitation programs. It is important to note that most of the claimants involved in the RTW provider-based programs did have a good outcome.

The majority of claimants received the RTW provider based program which corresponds to an interdisciplinary assessment (1,162 out of a total of 2,046). However, according to both OMPQ cut-offs, the minority of claimants should have received this assessment. In other words, according to Linton's OMPQ classification, 443 claimants should have received the interdisciplinary treatment – and according to WCB-Alberta's OMPQ, 62 claimants should have done so. In addition, there was a high diversity between the recommendation of Linton's OMPQ and WCB-Alberta's OMPQ. For example, Linton's OMPQ recommended most claimants follow the complex rehabilitation program (1,015 out of 2,046). On the other hand, WCB-Alberta's OMPQ recommended most of claimants follow conservative care such as single service community physical therapy or no rehabilitation at all (1,901 out of 2,046).

This difference may be explained by the diversity in cut-off scores. By using a higher cut-off score, the WCB-Alberta's OMPQ allocated most claimants to the lower-risk category, and only a small minority appeared in the higher-risk category (n=83). The cut off used by Linton's OMPQ, by contrast, is not as high, so there were many claimants allocated to the high risk category and even though there was diversity in the number of claimants assigned to different risk categories, it was not as dramatic as is the case with WCB-Alberta's.

Nevertheless, because of Linton's OMPQ cut-off score, more claimants were actually assigned to the higher risk category (n=1,015). Yet only 59 received the RTW complex assessment, leaving 956 claimants who, according to how are defined the associated treatment category, did not align with their risk category. Similarly, 412 claimants who were categorized as low-risk by Linton's OMPQ did not align with how are defined the associated treatment category and were treated by receiving the interdisciplinary and the RTW complex assessment (412 and 2 respectively). This sum was not as striking as the one produced by WCB-Alberta's OMPQ cut-off, which

recommended that 1,901 claimants be offered "conservative" forms of care such as a single service community program or no rehabilitation at all. In fact, 1,449 of those claimants received an interdisciplinary or a complex program of care (1,411 and 38 respectively). As noted above, however, all the variables needed to gain a better understanding of the clinicians' decisions might not been measured. In addition, the exact knowledge about how clinicians made their decisions regarding which the most adequate rehabilitation program is was not available.

As mentioned, the clinician's recommendation showed the highest level of agreement with the actual rehabilitation program undertaken. The recommendation most frequently given by clinicians to claimants was to follow the interdisciplinary rehabilitation program. Of the 1,653 claimants who were assigned to the interdisciplinary program 1,456 actually took it. The rest undertook either no rehabilitation or a single service (n=188), or the RTW complex program (n=9).

5.1.3 *Matching and outcome*

The investigators wanted to learn more about the utility of the OMPQ as a screening tool and CDST for injured workers. For this reason, the researcher observed whether a match between Linton's OMPQ and WCB-Alberta's OMPQ with the actual rehabilitation program undertaken led to better outcomes. The results showed that only 26.8% of claimants who had a good outcome had a match between Linton's OMPQ and the actual program undertaken. Conversely, 64.7% had a good outcome even though there was not a match between Linton's OMPQ and the actual program undertaken.

An even higher percentage was shown in the category of those who had a good outcome even though there was not a match between WCB-Alberta's OMPQ and the actual program

undertaken (69.2%). In addition, only 22.3% of claimants who had a good outcome had a match between WCB-Alberta's OMPQ and the actual program undertaken. These findings cast doubt on the utility of the OMPQ as a decision support tool within this grouping. It is unlikely that basing decisions primarily on the OMPQ score would result in better clinical and RTW outcomes.

It was not clear precisely why the WCB-Alberta used such a high cut-off score, which resulted in having the majority of claimants assigned to the lower risk of disability category (n=1,901). Meanwhile, 62 claimants appeared in the medium-risk category and 83 in the high-risk category. Having such a high cut off score did ensure that the specificity would be higher and did present a higher probability of correctly identifying those claimants who were not in the OMPQ high-risk category (true negative probability or low false positive rate) (62, 63).

Another reason for using this high cut off score might have been to limit the application of the complex program, which was more expensive than others. Another reason was explained by Margison et al. (2007), who used the same cut off score as the WCB-Alberta (147). The authors explained that sensitivity could sometimes be sacrificed against specificity because case managers preferred to have a lower false positive rate. This means that they preferred to have a lower probability of erroneously categorizing a claimant in a high-risk category because that claimant could be prevented from returning to work when he was fit to do so.

These results contrasted sharply with those related to the clinician's recommendation. In a full 78.3% of cases where there was a match between the clinician's recommendation and the actual rehabilitation program, a good outcome was reported. Only 13.2% of cases where there was no such match had a good outcome.

5.2 Study strengths

One strength of this study was related to data collection: all of the data that were used came from the same worker compensation's board in Alberta, Canada. This was useful because examining data from a province-wide database allowed for a more certain generalization of the results. Thus, the results, with some exceptions, could be widely applicable to injured workers within the jurisdiction who were undergoing RTW assessment. Another strength of the study was that it used a population data set with a large sample size. Despite the missing data related to those who did not answer the OMPQ, a substantial number of claimants, 2,046, were examined. Finally, the period in which the data was collected, between 2009 until 2011, was still quite recent; hence the results were more applicable. For example, definitions of some variables or terms have not been modified since the data were collected. Due to these strengths, the information gathered in this thesis contributes to our knowledge regarding the use of the OMPQ as a screening tool and CDST in this jurisdiction. In fact, to our knowledge this was the first study to examine the utility of the OMPQ as a decision-support tool for selecting interventions.

5.3 Study limitations

A main limitation of this study was the missing data related to the OMPQ. Out of 7,843 claimants who underwent a rehabilitation program, only 2,046 had answered the OMPQ. Therefore, there was a large quantity of missing data (n=5,796). This occurred because the WCB-Alberta only required clinics to complete the OMPQ with patients with spinal conditions such as LBP and neck pain. It appears this instruction was implemented inconsistently as several non-spinal diagnoses ended up in the sample. Ideally, every claimant who presented with a musculoskeletal disorder would have filled out the OMPQ. Indeed, Linton recommended in his

book that the OMPQ should be used "with every patient who seeks care for musculoskeletal pain problems"(64). It was relevant to point out that missing data could have impacted the generalizability of this study and contributed to response bias. There were differences between claimants for whom the OMPQ data were completed and those for whom they were incomplete. All variables related to claimants whose data were complete were statistically different from those related to claimants whose data were incomplete, with the exception of gender and modified work available at the start of the program. However, since the sample size was large, it was questionable whether certain of these differences were clinically important. Examining the data qualitatively would suggest that comorbidity, diagnosis, the clinician's recommendation, the actual rehabilitation program undertaken, and the calendar days of accident to admission among others were indeed different across these two groups. Thus, these results were most applicable to claimants who (a) had moderate pain and disability with a musculoskeletal disorder and (b) had been given a recommendation to follow an interdisciplinary rehabilitation program.

Even though using the data of WCB-Alberta allowed for the generalization of results as they applied to this jurisdiction, it could limit the generalizability of the findings outside of the province. Also, the WCB-Alberta used certain pathways to applying a certain rehabilitation program which might be different from those of other compensation boards.

Another limitation was the short follow-up period (3 months). Most studies reported a longer follow-up period of 6 to 12 months (10, 20, 21, 23, 24, 42, 43). Heneweer et al. (65) used the same follow up period that this study and two studies (5, 39) examined shorter time periods of 6 and 8 weeks. Using a longer follow-up period could help to determine with more confidence the usefulness of the OMPQ in sub-acute and chronic conditions. For example, Westman et al (40),

used of a longer follow-up period (3 years) and concluded that the OMPQ was a good predictor of long-term disability.

This study had an indirect RTW outcome by using wage replacement benefits as an indicator of returning to work. Those claimants who were receiving benefits were considered to have experienced a poor outcome. Although this outcome was related to RTW, the use of an outcome more closely related to disability outcome might have produced different results.

Another limitation to consider was the manner in which the researchers derived the variables relating to the treatment received. The treatment program, which included six programs, was collapsed into a variable with three categories to align with the OMPQ risk categories. It was possible that this variable was misclassified. For example, two treatment programs associated with the medium risk category had pain and self-reported characteristics that seemed to be more similar to those common in the low-risk category. It is very difficult to ascertain whether the misclassification was made by the researchers, or whether this was a consequence of the unmeasured factors that comprised clinician decision-making.

This study used a retrospective design, which also presented limitations. By looking backward and using data already gathered, we were not able to manipulate any data (66, 67); hence some of the difficulties described in the methods section were difficult to solve. For example, in a prospective study, ideally one would not have had to deal with missing data. This problem could have been avoided by asking those claimants who did not answer the questionnaire to fill it out. In addition, this study, as a secondary analysis, required the researcher to get familiar with the data and review it in order to get to know the variables included, and their meaning, before data analysis was started.

5.4 Implications for practice

This study evaluated the OMPQ, which was, according to several authors, a promising tool that might be helpful in providing early identification of injured workers likely to have a poor RTW outcome, and in helping to identify those at risk of developing persistent pain and disability problems (10, 19, 35, 40, 44). The OMPQ considered psychosocial factors which were key barriers to RTW and targets for appropriate rehabilitation programs. These factors, also called "yellow flags," are important to consider in evaluating a claimant. Although the exact mechanisms involved were not clear, it has been reported that yellow flags can be related to the progression from acute to chronic disability (24, 39, 68).

Screening and CDSTs have a clinical significance related to clinical assessment. There were valuable contributions that these tools could provide to the health care system. Firstly, screening by itself represents another support service to the clinician. It allows him or her to narrow down the number of claimants who are in need of a more specified assessment and to concentrate resources on those claimants most in need of help. Secondly, by identifying psychosocial risk factors, it could help the clinician to focus on the claimant's specific problems and develop goals of treatment (45). Therefore, the findings of the screening might be integrated with those of the clinician, creating a complementary form of feedback which helps with the planning of the treatment. Positively, having an optimal treatment would reduce the burden on the claimant and on society. Although CDSTs cannot replace the clinician's decision making, it has potential to be a helpful tool – one that is not as time-consuming as a large-scale interview aiming to search for yellow flags (68).

Our findings have contributed further knowledge regarding the utility of the OMPQ as a screening and CDST which is used by the WCB-Alberta to assist in handling assessment. The results of this study cast doubt on the utility of the OMPQ for selecting interventions that lead to RTW. Currently, the clinician's recommendations appear more accurate for selecting interventions that lead to RTW. The results showed conclusively that a match between the clinician's recommendation and the actual rehabilitation program had the higher rate of good outcomes (78.3%). This study provided important information about the effectiveness of the OMPQ for a particular compensation board, which might be of use to other clinicians and researchers. As stated in Chapter 2, only a few studies have thus far examined the OMPQ for workers' compensation claimants (5, 20, 69).

5.5 Recommendations for further research

Further research should take into consideration the diversity in cut off scores that have been used by different authors. Linton's OMPQ cut off score has more studies supporting its use (10, 20, 24, 38, 39, 47, 69-71) than does the WCB-Alberta's (5). However, there are several authors who, for different reasons, used other cut-off scores from 50 to 130 (38, 40, 43, 45, 65, 72, 73). Studies should focus on determining the appropriate cut off score, its accuracy, and its applicability in different settings such as geography, demographics, and, compensated and non-compensated populations (37). Nevertheless, determining a single cut off score which would be useful for every single study is a very complex challenge, because such scores depend on the diverse research objectives and other characteristics of individual studies, such as outcome, time frame, geographic locations, type and time of injury, individual demographics, and different settings as compensated versus non compensated populations (5, 22, 45). It is also likely important to ascertain how decisions are currently being made. There may be other variables to

consider, resulting in new hypotheses to be tested to continue to try to standardize and optimize the accuracy and efficiency of clinical decision-making.

More studies examining the utility of the OMPQ for workers' compensation boards in different geographic regions would be of interest. Most studies have covered the predictive ability of the OMPQ in Europe (10, 24, 39, 70, 71); others have examined it in Australia, New Zealand and Asia (20, 23, 47, 69) and a few have done so in Canada (5, 22). However, there are still places, such as South America, the United States and Oceania, where it has not been validated or studied. As Hockings et al. (2008) stated, yellow flags which are one of the main factors of the OMPQ may not engage the same way in other social and cultural settings (37). Therefore, it is pertinent to conduct OMPQ research in different locations. Additionally, more studies are needed of the OMPQ as a CDST for targeting interventions.

As Kirkwood (2011) suggested, supplementary research should center on the clinical impact that the OMPQ makes (22). For example, a study involving cohorts could be conducted investigating the assessment of psychosocial factors identified by the OMPQ in addition with the regular assessment and the final return to work outcome. After all, there is a relationship between yellow flags with sick leave, recovery rates and cost-benefit.

These findings offer evidence to prove that using only the OMPQ to determine a clinical decision is not feasible. However, this does not mean that this screening tool is ineffective. On the contrary, results showed a certain agreement between OMPQ and clinician suggestions. What may be needed is more refinement of the risk categories. At the present time, the OMPQ attempts to account for several factors and barriers related to pain, function, disability, and psychological and social attributes, among others, and the final score is an overall sum. Perhaps,

if these factors were measured in different subscales, the clinician or health care professional could have a better understanding of the specific barriers facing the claimant, in addition to being able to assign him or her to an overall risk category.

Finally, researchers should pay attention to the follow up period. Most studies include a follow up of 3 to 6 months (10, 20, 21, 24, 44, 45). However, studies with a longer follow up period are needed in order to provide more evidence of the OMPQ utility in chronic stages. Interestingly, studies by Grotle et al. (40) and Westman et al. (70), which included a follow up period of 1 and 3 years respectively, reported that the OMPQ was a good predictor for sick leave and was useful in clinical settings.

5.6 Summary and conclusion

Our results did not support the use of the OMPQ as a clinical decision support tool for selecting rehabilitation interventions for workers' compensation claimants. Level of agreement with between the OMPQ and clinician recommendations was low despite using 2 cut-off points widely accepted in the jurisdiction, and in many cases, a good outcome resulted despite a lack of match between OMPQ recommendations and the actual rehabilitation programs. In fact, a match between clinician recommendations and the actual rehabilitation program resulted in a good RTW outcome in the majority of claimants (78.3%). It is doubtful that basing rehabilitation treatment decisions more fully on the OMPQ would lead to better outcomes for injured workers.

References

1. MacEachen E, Chambers L, Kosny A, Keown K. Red flags/green lights: a guide to identifying and solving return-to-work problems. Toronto: Institute for Work & Health. 2009.

2. Commission CHR. A guide for managing the return to work2007.

3. Baldwin ML. Reducing the costs of work-related musculoskeletal disorders: targeting strategies to chronic disability cases. Journal of Electromyography and Kinesiology. 2004;14(1):33-41.

4. Kocakülâh MC, Kelley AG, Mitchell KM, Ruggieri MP. Absenteeism Problems And Costs: Causes, Effects And Cures. International Business & Economics Research Journal (IBER). 2011;85p.

5. Margison DA, French DJ. Predicting treatment failure in the subacute injury phase using the Örebro Musculoskeletal Pain Questionnaire: an observational prospective study in a workers' compensation system. Journal of occupational and environmental medicine. 2007;49(1):59-67.

6. Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. Journal of Electromyography and Kinesiology. 2004;14(1):13-23.

7. Gross DP, Lowe A. Evaluation of a knowledge translation initiative for physical therapists treating patients with work disability. Disability & Rehabilitation. 2009;31(11):871-9.

8. Gross DP, Asante AK, Miciak M, Battié MC, Carroll LJ, Sun A, et al. Are Performance-Based Functional Assessments Superior to Semistructured Interviews for Enhancing Return-to-Work Outcomes? Archives of physical medicine and rehabilitation. 2014;95(5):807-15. e1.

9. Gross DP, Zhang J, Steenstra I, Barnsley S, Haws C, Amell T, et al. Development of a Computer-Based Clinical Decision Support Tool for Selecting Appropriate Rehabilitation Interventions for Injured Workers. Journal of occupational rehabilitation. 2013;23(4):597-609.

10. Linton SJ, Halldén K. Can we screen for problematic back pain? A screening questionnaire for predicting outcome in acute and subacute back pain. The Clinical journal of pain. 1998;14(3):209-15.

11. Stephens B, Gross DP. The influence of a continuum of care model on the rehabilitation of compensation claimants with soft tissue disorders. Spine. 2007;32(25):2898-904.

12. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. Bulletin of the World Health Organization. 2003;81(9):646-56.

13. Canada AoWCBo. AWCBC. Canada2013 [cited 2014 May 15]; Available from: http://awcbc.org/.

14. ("WCB-Alberta") TWCB. 2009 [cited 2013 October 20]; Available from: http://www.wcb.ab.ca/workers/wc_provides.asp.

15. Canada AoWCBo. Anual KSM Report. 2012.

16. Valanis B. Epidemiology in Health Care. 3rd ed. Stamford, Connecticut: Prentice Hall; 1999, 313p.

17. Linton SJ. Pain research and Clinical Management Understanding pain for better clinical practice A psychological perspective: Elsevier; 2005.

18. Linton SJ. Understanding pain for a better clinical practice: A psychological perspective, : Elsevier; 2005. 116 p.

19. Linton S. Understanding pain for a better clinical practice: A psychological perspective: Elsevier Health Sciences; 2005.

20. Dunstan DA, Covic T, Tyson GA, Lennie IG. Does the Orebro Musculoskeletal Pain Questionnaire predict outcomes following a work-related compensable injury? International Journal of Rehabilitation Research. 2005;28(4):369-70.

21. Gabel CP, Melloh M, Burkett B, Osborne J, Yelland M. The Örebro Musculoskeletal Screening Questionnaire: Validation of a modified primary care musculoskeletal screening tool in an acute work injured population. Manual therapy. 2012.

22. Kirkwood R. External Validation of the Orebro Musculoskeletal Pain Screening Questionnaire within an Injured Worker Population: A Retrospective Cohort Study. 2011.

23. Law RK, Lee EW, Law S-W, Chan BK, Chen P-P, Szeto GP. The predictive validity of OMPQ on the rehabilitation outcomes for patients with acute and subacute non-specific LBP in a Chinese population. Journal of occupational rehabilitation. 2012:1-10.

24. Linton SJ, Boersma K. Early identification of patients at risk of developing a persistent back problem: the predictive validity of the Orebro Musculoskeletal Pain Questionnaire. The Clinical journal of pain. 2003;19(2):80-6.

25. Board-Alberta WWC. Who we are and what we do. [cited 2014 May 15]; Available from: http://www.wcb.ab.ca/public/about_us.asp.

26. Pr Alwin Luttmann PMJ, Pr Barbara Griefahn. Protecting Workers' Health Series No. 5 Preventing musculoskeletal disorders in the workplace. [cited 2014 May 16]; Available from: http://www.who.int/occupational_health/publications/oehmsd3.pdf http://www.who.int/occupational_health/publications/muscdisorders/en/.

27. Young AE, Roessler RT, Wasiak R, McPherson KM, Van Poppel MN, Anema J. A developmental conceptualization of return to work. Journal of occupational rehabilitation. 2005;15(4):557-68, 559 p.

28. Linton SJ. Pain Research and Clinical Management Understanding Pain For Better Clinical Practice A Psychological Perspective: Elsevier; 2005.

29. Kosinski LR. Clinical Decision Support Tools. Clinical Gastroenterology and Hepatology. 2013;11(7):756-9.

30. Murray CJ, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. The Lancet. 2013;380(9859):2197-223.

31. Sullivan MJ, Stanish WD. Psychologically based occupational rehabilitation: the pain-disability prevention program. The Clinical journal of pain. 2003;19(2):97-104.

32. Haldeman SDS. Evidence-Based Management of Low Back Pain 3251 Riverport Lane St. Louis Missouri 63043: Elsevier; 2012.

33. Forseen SE, Corey AS. Clinical decision support and acute low back pain: evidence-based order sets. Journal of the American College of Radiology. 2012;9(10):704-12. e4.

34. Hill JC, Whitehurst DG, Lewis M, Bryan S, Dunn KM, Foster NE, et al. Comparison of stratified primary care management for low back pain with current best practice (STarT Back): a randomised controlled trial. The Lancet. 2011;378(9802):1560-71.

35. Margison DA, French DJ. Predicting treatment failure in the subacute injury phase using the Orebro Musculoskeletal Pain Questionnaire: an observational prospective study in a workers' compensation system. Journal of occupational and environmental medicine. 2007;49(1):59-67.

36. Linton SJ. Understanding pain for a better clinical practice: A psychological perspective: Elsevier; 2005. 100 p.

37. Hockings RL, McAuley JH, Maher CG. A systematic review of the predictive ability of the Orebro Musculoskeletal Pain Questionnaire. Spine. 2008;33(15):E494-E500.

38. Sattelmayer M, Lorenz T, Röder C, Hilfiker R. Predictive value of the acute low back pain screening questionnaire and the Örebro musculoskeletal pain screening questionnaire for persisting problems. European Spine Journal. 2012;21(6):773-84.

39. Dagfinrud H, Storheim K, Magnussen L, Ødegaard T, Hoftaniska I, Larsen L, et al. The predictive validity of the Örebro Musculoskeletal Pain Questionnaire and the clinicians' prognostic assessment following manual therapy treatment of patients with LBP and neck pain. Manual therapy. 2012.

40. Westman A, Linton SJ, Öhrvik J, Wahlén P, Leppert J. Do psychosocial factors predict disability and health at a 3-year follow-up for patients with non-acute musculoskeletal pain? A validation of the Örebro Musculoskeletal Pain Screening Questionnaire. European Journal of Pain. 2008;12(5):641-9.

41. Sivan M, Sell B, Sell P. A comparison of functional assessment instruments and work status in chronic back pain. European journal of physical and rehabilitation medicine. 2009;45(1):31.

42. Hill JC, Dunn KM, Main CJ, Hay EM. Subgrouping low back pain: a comparison of the STarT Back Tool with the Örebro Musculoskeletal Pain Screening Questionnaire. European Journal of Pain. 2010;14(1):83-9.

43. Linton SJ, Nicholas M, MacDonald S. Development of a short form of the Örebro Musculoskeletal Pain Screening Questionnaire. Spine. 2011;36(22):1891-5.

44. Gabel CP, Melloh M, Yelland M, Burkett B, Roiko A. Predictive ability of a modified Örebro Musculoskeletal Pain Questionnaire in an acute/subacute low back pain working population. European Spine Journal. 2011;20(3):449-57.

45. Nonclercq O, Berquin A. Predicting chronicity in acute back pain: Validation of a French translation of the Örebro Musculoskeletal Pain Screening Questionnaire. Annals of physical and rehabilitation medicine. 2012;55(4):263-78.

46. Linton SJ. Understanding pain for a better clinical practice: A psychological perspective: Elsevier; 2005. 115 p.

47. Maher CG, Grotle M. Evaluation of the predictive validity of the Orebro Musculoskeletal Pain Screening Questionnaire. The Clinical journal of pain. 2009;25(8):666-70.

48. Alberta Go. Alberta Economy. 2008-2014 [cited 2014 May 23]; Available from: http://www.albertacanada.com/opportunity/choosing/economic-economy.aspx.

49. Alberta LHFPHgsatUo. The Injury Alberta Report. 2011.

50. Douglas Gross BS. The Influence of a Continuum of Care Model on the Rehabilitation of Compensation Claimants With SoftTissue Disorders. Spine. 2007;32:2892. Lippincott Williams & Wilkins.

51. Organization WH. WHO Centre for Health Development Ageing and Health Technical Report Volume 5. A glossary of terms for community health care and services for older persons. 2004:19.

52. Douglas Gross BS. The Influence of a Continuum of Care Model on the Rehabilitation of Compensation Claimants With Soft Tissue Disorders. Spine. 2007;32:2899.

53. Shaw WS, Linton SJ, Pransky G. Reducing sickness absence from work due to low back pain: how well do intervention strategies match modifiable risk factors? Journal of occupational rehabilitation. 2006;16(4):591-605.

54. Gross DP, Zhang J, Steenstra I, Barnsley S, Haws C, Amell T, et al. Development of a Computer-Based Clinical Decision Support Tool for Selecting Appropriate Rehabilitation Interventions for Injured Workers. Journal of occupational rehabilitation. 2013:1-13.

55. Cook C, Cleland J, Huijbregts P. Creation and critique of studies of diagnostic accuracy: use of the STARD and QUADAS methodological quality assessment tools. The Journal of manual & manipulative therapy. 2007;15(2):93.

56. Glaros AG, Kline RB. Understanding the accuracy of tests with cutting scores: The sensitivity, specificity, and predictive value model. Journal of clinical psychology. 1988;44(6):1013-23.

57. Ohnhaus EE, Adler R. Methodological problems in the measurement of pain: a comparison between the verbal rating scale and the visual analogue scale. Pain. 1975;1(4):379-84.

58. Tait RC, Chibnall JT, Krause S. The pain disability index: psychometric properties. Pain. 1990;40(2):171-82.

59. Viera AJ, Garrett JM. Understanding interobserver agreement: the kappa statistic. Fam Med. 2005;37(5):360-3.

60. Nicholas MK, WorkCover N. Work Hardening/conditioning: Functional Restoration and Pain Management Programs for Injured Workers with Nored Flag'Conditions: Workcover NSW; 2002.

61. Franche R-L, Cullen K, Clarke J, Irvin E, Sinclair S, Frank J. Workplace-based return-to-work interventions: a systematic review of the quantitative literature. Journal of occupational rehabilitation. 2005;15(4):607-31.

62. Porta M. A DICTIONARY of Epidemiology. New York: OXFORD; 2008. 227 p.

63. Weiss NS. Clinical Epidemiology The study of the Outcome of Illness. New York: Oxford; 1986. 14-6 p.

64. Linton SJ. Pain Research and Clinical Management UNDERSTANDING PAIN FOR BETTER CLINICAL PRACTICE A PSYCHOLOGICAL PERSPECTIVE: Elsevier; 2005. 118 p.

65. Heneweer H, van Woudenberg NJ, van Genderen F, Vanhees L, Wittink H. Measuring Psychosocial Variables in Patients With (Sub) Acute Low Back Pain Complaints, at Risk for Chronicity: A Validation Study of the Acute Low Back Pain Screening Questionnaire–Dutch Language Version. Spine. 2010;35(4):447-52.

66. Norman DLSGR. PDQ PrettyDarnedQuick Epidemiology Canada: BC Decker; 1998. 33 p.

67. Watkins LGPMP. FOUNDATIONS OF CLINICAL RESEARCH APPLICATIONS TO PRACTICE. Edition r, editor. EEUU: PEARSON Prentice Hall; 2009. 288 p.

68. Linton SJ. Pain Research and Clinical Management UNDERSTANDING PAIN FOR BETTER CLINICAL PRACTICE A PSYCHOLOGICAL PERSPECTIVE

ELSEVIER; 2005. 108 p.

69. Grimmer-Somers K, Prior M, Robertson J. Yellow flag scores in a compensable New Zealand cohort suffering acute low back pain. Journal of pain research. 2007;1:15-25.

70. Grotle M, Vøllestad NK, Brox JI. Screening for yellow flags in first-time acute low back pain: reliability and validity of a Norwegian version of the Acute Low Back Pain Screening Questionnaire. The Clinical journal of pain. 2006;22(5):458-67.

71. Jellema P, van der Windt DA, van der Horst HE, Stalman WA, Bouter LM. Prediction of an unfavourable course of low back pain in general practice: comparison of four instruments. British journal of general practice. 2007;57(534):15-22.

72. Vos CJ, Verhagen AP, Koes BW. The ability of the acute low back pain screening questionnaire to predict sick leave in patients with acute neck pain. Journal of manipulative and physiological therapeutics. 2009;32(3):178-83.

73. Hurley DA, Dusoir TE, McDonough SM, Moore AP, Baxter GD. How effective is the acute low back pain screening questionnaire for predicting 1-year follow-up in patients with low back pain? The Clinical journal of pain. 2001;17(3):256-63.

74. Linton SJ. Understanding pain for a better clinical practice: A psychological perspective: Elsevier; 2005. 114 p.

Appendices

1. Acronyms

OMPQ: Orebro Musculoskeletal Pain Questionnaire

WCB-Alberta: Workers' Compensation Board of Alberta

RTW: Return to work

MSK: Musculoskeletal

WMSKDs: Work related musculoskeletal disorders

AWCBC: Association of Workers' Compensation Boards of Canada

WHO: World Health Organization

CDSTs: Clinical Decision Support Tools

LBP: Low back pain

NSLBP: Non Specific Low Back Pain

PDI: Pain Disability Index

VAS: Visual analog Scale

ICD-9: International Classification of Diseases, Ninth Revision

ODI Oswestry Disability Index

RMQ Roland Morris Questionnaire

SBT Start Back Tool

OMSQ Orebro Musculoskeletal Screening Questionnaire

PT Physical Therapist

2. OMPQ, it's Scoring and Administration

WCB-Alberta uses the following version of the OMPQ:

Örebro Musculoskeletal Pain Questionnaire (ÖMPQ) (Modified)

(Linton &Hallden, 1996)

Name _____ Date_____

1. What year were you born? _____
2. Are you: ☐ male ☐ female
3. Were you born in Canada? ☐ yes ☐ no
4. Where do you have pain? Place a (√) for all appropriate sites.

☐ arm	☐ shoulder	☐ face	☐ neck	☐ leg	
☐ upper back	☐ lower back	☐ head	☐ chest	☐ abdomen	☐

5. How many days of work have you missed because of pain during the past 18 months? Tick (√) one.

☐ 0 days [1]	☐ 1-2 days [2]	☐ 3-7 days [3]	☐ 8-12 days [4]	☐ 15-30 days [5]	
☐ 1 month [6]	☐ 3-6 months [7]	☐ 6-9 months [8]	☐ 9-12 months [9]	☐ over 1 year [10]	☐

6. How long have you had your current pain problem? Tick (√) one.

☐ 0-1 weeks [1]	☐ 1-2 weeks [2]	☐ 3-4 weeks [3]	☐ 4-5 weeks [4]	☐ 6-8 weeks [5]	
☐ 9-11 weeks [6]	☐ 2 months [7]	☐ 3-6 months [8]	☐ 9-12 months [9]	☐ over 1 year [10]	☐

7. Is your work heavy or monotonous? Circle the best alternative

0 1 2 3 4 5 6 7 8 9 10 ☐

Not at all — Extremely

8. How would you rate the pain that you had during the past week? Circle one.

0 1 2 3 4 5 6 7 8 9 10 ☐

No pain — Pain as bad as it could be

9. In the past three months, on average, how bad was your pain? Circle one.

0 1 2 3 4 5 6 7 8 9 10 ☐

No pain — Pain as bad as it could be

10. How often would you say that you have experienced pain episodes, on average, during the past 3 months? Circle one.

0 1 2 3 4 5 6 7 8 9 10 ☐

Never — Always

11. Based on all the things you do to cope, or deal with your pain, on an average day, how much are you able to decrease it? Circle one.

0 1 2 3 4 5 6 7 8 9 10 ☐

Can't decrease it at all — Can decrease it completely

10 - X

12. How tense or anxious have you felt in the past week? Circle one

0 1 2 3 4 5 6 7 8 9 10 ☐

Absolutely calm and relaxed — As tense and anxious as I've ever felt

13. How much have you been bothered by feeling depressed in the last week? Circle one.

0 1 2 3 4 5 6 7 8 9 10 ☐

Not at all — Extremely

14. In you view, how large is the risk that your current pain may become persistent? Circle one.

0	1	2	3	4	5	6	7	8	9	10	☐
No risk								Very large risk			

15. In your estimation, what are the chances that you will be working in 6 months? Circle one.

0	1	2	3	4	5	6	7	8	9	10	☐
No chance								Very large chance			10 - X

16. If you take into consideration your work routines, management, salary, promotion possibilities and work mates, how satisfied are you with your job? Circle one.

0	1	2	3	4	5	6	7	8	9	10	☐
Not at all satisfied								Completely satisfied			10 - X

Here are some of the things which other people have told us about their pain. For each statement, please circle from 0 to 10 to say how much physical activities, such as bending, lift, walking or driving affect your pain.

17. Physical activity makes my pain worse.

0	1	2	3	4	5	6	7	8	9	10	☐
Completely disagree								Completely agree			

18. An increase in pain is an indication that I should stop what I'm doing until the pain decreases.

0	1	2	3	4	5	6	7	8	9	10	☐
Completely disagree								Completely agree			

19. I should not do my normal work with my present pain.

0	1	2	3	4	5	6	7	8	9	10	☐
Completely disagree								Completely agree			

Here is a list of 5 activities. Please circle the one number that describes your current ability to participate in each of these activities.

20. I can do light work for an hour.

0	1	2	3	4	5	6	7	8	9	10	☐
Can't do it because of pain problem								Can do it without pain being a problem			10 - X

21. I can walk for an hour.

0	1	2	3	4	5	6	7	8	9	10	☐
Can't do it because of pain problem								Can do it without pain being a problem			10 - X

22. I can do ordinary household chores.

0	1	2	3	4	5	6	7	8	9	10	☐
Can't do it because of pain problem								Can do it without pain being a problem			10 – X

23. I can go shopping.

0	1	2	3	4	5	6	7	8	9	10	☐
Can't do it because of pain problem								Can do it without pain being a problem			10 - X

24. I can sleep at night.

0	1	2	3	4	5	6	7	8	9	10	☐
Can't do it because of pain problem								Can do it without pain being a problem			10 - X

Thank you for your cooperation!

OMPQ Items

The following box ilustrates the relationship between each OMPQ question and the variable name according to Linton. Taken from Linton, 2005 (19)

BOX 12.1 AN OVERVIEW OF THE ITEMS IN THE ÖREBRO MUSCULOSKELETAL PAIN SCREENING QUESTIONNAIRE

Question	Variable name
1. What year were you born?	Age
2. Are you a man/woman?	Gender
3. Were you born in Sweden (country of study)?	Nationality
4. What is your current employment status?	Employed
5. Where do you have pain	Pain site
6. How many days of work have you missed (sick leave) because of pain during the past 12 months?	Sick leave
7. How long have you had your current pain problem?	Pain duration
8. Is your work heavy or monotonous?	Heavy work
9. How would you rate the pain you have had during the past week?	Current pain
10. In the past 3 months, on the average, how intense was your pain?	Average pain
11. How often would you say that you have experienced pain episodes, on the average, during the past 3 months?	Pain frequency
12. Based on all the things you do to cope, or deal with your pain, on an average day, how much are you able to decrease it?	Coping
13. How tense or anxious have you felt in the past week?	Stress
14. How much have you been bothered by feeling depressed in the past week?	Depression
15. In your view, how large is the risk that your current pain may become persistent?	Expected outcome
16. In your estimation, what are the chances that you will be able to work in 6 months?	Expected outcome
17. If you take into consideration your work routines, management, salary, promotion possibilities and workmates, how satisfied are you with your job?	Job satisfaction
18. Physical activity makes my pain worse.	Fear-avoidance belief
19. An increase in pain is an indication that I should stop what I am doing until the pain decreases.	Fear-avoidance belief
20. I should not do my normal work with my present pain.	Fear-avoidance belief
21. I can do light work for an hour.	Function: work
22. I can walk for an hour.	Function: walk
23. I can do ordinary household chores.	Function: household work
24. I can do the weekly shopping.	Function: shopping
25. I can sleep at night.	Function: sleep

Figure 4 Items of the OMPQ

According to the OMPQ version that WCB-Alberta uses, there are some differences. Figure 5 shows the variables of WCB-Alberta's OMPQ

Question	Variable name
3. Where you born in Canada?	Nationality
4. Where do you have pain?	Pain site
5. How many days of work have you missed because of pain during the last 18 months?	Sick leave
6. How long have you had your current pain problem?	Pain duration
7. Is your work heavy or monotonous?	Heavy work
8. How would you rate the pain that you had during the past week?	Current pain
9. In the past three months, on average, how bad was your pain?	Average pain
10. How often would you say that you have experience pain episodes, on average, during the past 3 months?	Pain frequency
11. Based on all the things you do to cope, or deal with your pain, on an average day, how much are you able to decrease it?	Coping
12. How tense or anxious have you felt in the past week?	Stress
13. How much have you been bothered by feeling depressed in the last week?	Depression
14. In your view, how large is the risk that your current pain may become persistent?	Expected outcome
15. In your estimation, what are the chances that you will be working in 6 months?	Expected outcome
16. If you take into consideration your work routines, management, salary, promotion possibilities and work mates, how satisfied are you with your job?	Job satisfaction
17. Physical activities make my pain worse.	Fear-avoidance belief
18. An increase in pain is an indication that I should stop what I'm doing until the pain decreases.	Fear-avoidance belief
19. I should not do my normal work with my present pain.	Fear-avoidance belief
20. I can do light work for an hour.	Function: work

21. I can walk for an hour.	Function: walk
22. I can do ordinary household chores.	Function: household work
23. I can go shopping.	Function: shopping
24. I can sleep at night.	Function: sleep

Figure 5 WCB-Alberta OMPQ version and variables according to Linton (19)

Administering the OMPQ

The OMPQ is a self-administered tool to be completed in a quiet environment without assistance from any other person. If the claimant is not currently working, he/she should take the latest job or his/her current situation as a guideline to answer the questions. Linton provides this example of a sample patient instruction in his book (74):

"I would like you to complete this short questionnaire about your pain experience and the consequences it may have for you. It usually takes about 5 to 10 minutes to answer all of the items. This provides us with helpful information that we use as a complement to your physical examinations, clinical interview and other information in this assessment. We find that the information from this questionnaire helps us understand your problem better and it especially helps us evaluate the possible long-term consequences your pain may have. It is important that you read each question carefully and answer it as best you can. There are no rights or wrong answers. Please answer every question. If you have difficulty, select the answer that best describes your situation. Please take a few minutes now to complete it while you are waiting".

Scoring instructions

To get the total score of the OMPQ you must sum the points of questions 4 to 24. The items have different scoring procedure

- For question 4, count the numbers of pain sites and multiply by two, this is the score.
- For questions 5 and 6 the score is the number bracketed after the ticked box.
- For questions 7, 8, 9, 10, 12, 13, 14, 17, 18 and 19 the score is the number that has been ticked or circled.
- For questions 11, 15, 16, 20, 21, 22, 23, and 24 the score is 10 minus the number that has been circled.
- Write the score in the shaded area beside each item.
- Add up the scores for questions 4 to 24. This is the total OMPQ score.

Missing values diminish the validity of this instrument and for that reason, Linton pointed out that only a few questions unanswered should be accepted and those scored as the mean of the total OMPQ score (19).

3. Triage Pathways of WCB-Alberta

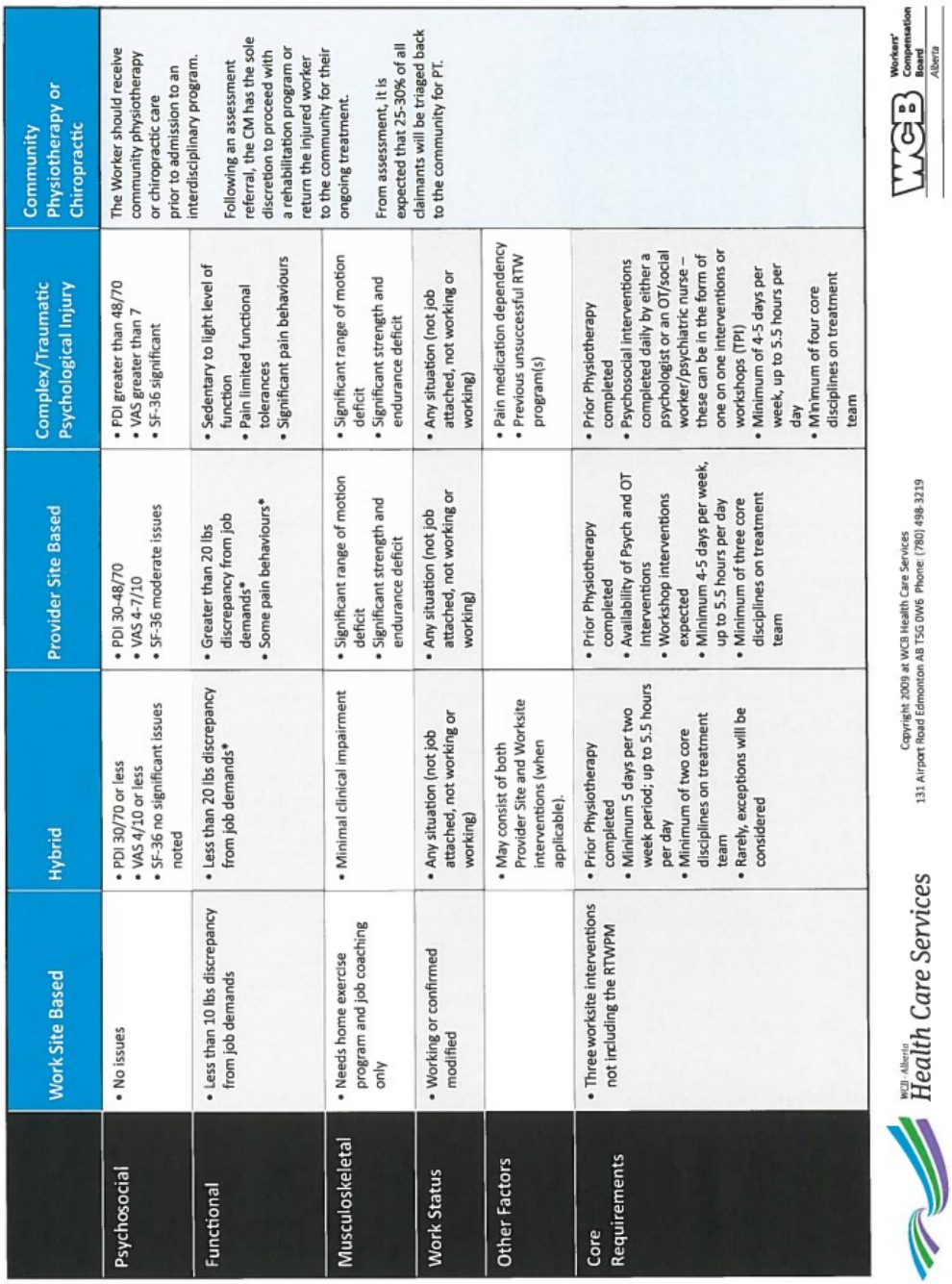


Figure 6 Triage Pathways of WCB-Alberta

4. Ethics Approval

Health Research Ethics Board

308 Campus Tower
University of Alberta, Edmonton, AB T6G 1K8
p. 780.492.9724 (Biomedical Panel)
p. 780.492.0302 (Health Panel)
p. 780.492.0459
p. 780.492.0839
f. 780.492.9429

Notification of Approval (Renewal)

Date:	July 3, 2012
Amendment ID:	Pro00016880_REN2
Principal Investigator:	Douglas Gross
Study ID:	MS4_Pro00016880
Study Title:	Development of a Triage Decision-Making Tool for the Rehabilitation of Injured Workers
Sponsor/Funding Agency:	Workers' Compensation Board - Alberta

RSO-Managed Funding:

Project ID	Project Title	Speed Code	Other Information
View RES0009782	Development of a Triage Decision-Making Tool for the Rehabilitation of Injured Workers	PT321	

Approval Expiry Date: August 13, 2013

Thank you for submitting this renewal application. Your application has been reviewed and approved.

This re-approval is valid for another year. If your study continues past the expiration date as noted above, you will be required to complete another renewal request. Beginning at 30 days prior to the expiration date, you will receive notices that the study is about to expire. If you do not renew on or before the renewal expiry date, you will have to re-submit an ethics application.

All study related documents should be retained so as to be available to the Health REB upon request. They should be kept for the duration of the project and for at least 5 years following study completion.

Sincerely,

Dr. Jana Rieger
Chair, Health Research Ethics Board - Health Panel

Note: This correspondence includes an electronic signature (validation and approval via an online system).

UNIVERSITY OF ALBERTA Alberta Health Services Covenant Health

Figure 7 Ethics Approval