What patients with low back pain received care in multidisciplinary therapy versus exercise therapy? Applying funder criteria

A thesis submitted in conformity with the requirements for the degree of Master of Science

Rehabilitation Sciences Institute
University of Toronto

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ABSTRACT

Which treatment program a patient with low back pain (LBP) should receive is a clinical conundrum. This thesis investigates the potential usefulness of examining patient characteristics at baseline assessment to understanding what patients received different programs. A retrospective study design was utilized to perform a secondary analysis that examined patient information from a clinical database of a private rehabilitation provider. Regression analysis examined the associations between patient-related factors and multidisciplinary or exercise treatment received. Lower level of functional ability (OR 0.93), duration of symptoms greater than 90 days (OR 3.8), constant pain (OR 2.2), being off work (OR 2.2) and WCB treatment funding (OR 4.3) were associated with increased odds of receiving multidisciplinary instead of exercise treatment. These results create an opportunity for stakeholders to dialogue so that treatment program admission criteria can be better aligned to who receives multidisciplinary and exercise treatment.
ACKNOWLEDGEMENTS

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Table of Contents

ACKNOWLEDGEMENTS ......................................................................................................................................... iii
Table of Contents ................................................................................................................................................ iv
List of Abbreviations ......................................................................................................................................... vi
List of Tables ....................................................................................................................................................... vii
List of Figures ..................................................................................................................................................... viii

1.0 INTRODUCTION .............................................................................................................................................. 1

2.0 BACKGROUND .................................................................................................................................................. 6
  2.1 MAGNITUDE OF BURDEN AND RELEVANCE OF LOW BACK PAIN ................................................................. 6
  2.2 CONCEPTUAL FRAMEWORKS GUIDING EVALUATION & TREATMENT IN LBP ....................................................... 7
  2.3 BIOMEDICAL FRAMEWORK DESCRIPTION AND RELEVANCE TO LBP ......................................................... 7
  2.4 LIMITATION TO USE OF BIOMEDICAL FRAMEWORK IN LBP ............................................................................. 8
  2.5 BIOPSYCHOSOCIAL FRAMEWORK DESCRIPTION ............................................................................................. 8
  2.6 BIOPSYCHOSOCIAL FRAMEWORK RELEVANCE IN LBP ................................................................................... 9
  2.7 WHAT ARE MDT/ET PROGRAMS AND CHARACTERISTICS OF MDT AND ET PATIENTS ....................................... 11
  2.8 MDT TREATMENT EFFECTIVENESS AND DESCRIPTION OF POPULATIONS STUDIED .............................................. 12
  2.9 ET TREATMENT EFFECTIVENESS AND DESCRIPTION OF POPULATIONS STUDIED ............................................ 15
  2.10 LITERATURE REGARDING TREATMENT STREAMING TO MDT AND ET ................................................................ 18
  2.11 PSYCHOSOCIAL FACTORS MAY IDENTIFY WHO REQUIRES MDT AND ET ....................................................... 18
  2.12 APPLYING THE BIOPSYCHOSOCIAL FRAMEWORK IN THIS THESIS ............................................................... 19
  2.13 PROGRAMS UTILIZED IN PRACTICE IN BRITISH COLUMBIA AND ALBERTA ...................................................... 24
  2.14 ALBERTA AND BC PROGRAM ADMISSION CRITERIA .......................................................................................... 25
  2.15 RATIONALE FOR THE THESIS ..................................................................................................................... 27

3.0 RESEARCH OBJECTIVES .................................................................................................................................. 29
  3.1 OBJECTIVE ONE .............................................................................................................................................. 29
  3.2 OBJECTIVE TWO .......................................................................................................................................... 29

4.0 METHODS .......................................................................................................................................................... 30
  4.1 OVERVIEW OF DESIGN ................................................................................................................................... 30
  4.2 STUDY SETTING .............................................................................................................................................. 30
  4.3 ETHICAL CONSIDERATIONS/ CONSENT PROCESS .......................................................................................... 30
4.4 PATIENTS .................................................................................................................. 31
4.5 DESCRIPTION OF PHYSIOTHERAPIST- BASED MECHANICAL LOW BACK PAIN ASSESSMENT OF PATIENTS .................................................................................................................. 31
4.6 PATIENTS - DESCRIPTION OF PAIN DISABILITY QUESTIONNAIRE PROVIDED AT INTAKE .......... 32
4.7 DESCRIPTION OF PRIMARY OUTCOME ........................................................................ 32
4.8 DESCRIPTION OF VARIABLES OF INTEREST .................................................................. 33
4.9 VARIABLE OF INTEREST DESCRIPTION - PAIN INTENSITY ........................................... 33
4.10 VARIABLE OF INTEREST DESCRIPTION - FUNCTIONAL ABILITY ........................................ 34
4.11 DATA COLLECTION ..................................................................................................... 34
4.12 DATA QUALITY ........................................................................................................... 34
4.13 OBJECTIVE ONE ANALYSIS STRATEGY ..................................................................... 35
4.14 MISSING DATA ............................................................................................................ 35
4.15 OBJECTIVE TWO ANALYSIS STRATEGY ..................................................................... 36
4.16 STATISTICAL PACKAGE .............................................................................................. 37
5.0 RESULTS ...................................................................................................................... 38
5.1 OBJECTIVE ONE .......................................................................................................... 38
5.1.1 DATA QUALITY ANALYSIS- MISSING DATA STRATEGY FOR THE FUNCTIONAL ABILITY VARIABLE ................................................................. 38
5.1.2 PATIENT CHARACTERISTICS IN ALBERTA OR BRITISH COLUMBIA ...................... 38
5.2 OBJECTIVE TWO .......................................................................................................... 42
5.2.1 MULTICOLLINEARITY TESTING ................................................................................ 42
5.2.2 ANALYSIS OF COMBINED PROVINCIAL COHORT OF PATIENT-RELATED FACTORS INDEPENDENTLY ASSOCIATED WITH RECEIVING MDT ................................................................. 42
5.2.3 ANALYSIS OF ALBERTA COHORT OF PATIENT-RELATED FACTORS INDEPENDENTLY ASSOCIATED WITH RECEIVING MDT .............................................................................................. 44
5.2.4 ANALYSIS OF BRITISH COLUMBIA COHORT OF PATIENT-RELATED FACTORS INDEPENDENTLY ASSOCIATED WITH RECEIVING MDT .............................................................................................. 45
5.3 SUMMARY TABLE FOR ALBERTA, BRITISH COLUMBIA AND COMBINED COHORTS ........ 46
6.0 DISCUSSION .................................................................................................................. 48
6.1 RELEVANCE OF FINDINGS FROM A BIOPSYCHOSOCIAL PERSPECTIVE ..................... 48
6.2 IMPLICATIONS OF STUDY FINDINGS ........................................................................... 55
6.3 STUDY LIMITATIONS ................................................................................................... 57
6.4 STUDY STRENGTHS ...................................................................................................... 58
List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC</td>
<td>British Columbia</td>
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<tr>
<td>BPS</td>
<td>Biopsychosocial</td>
</tr>
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<td>CBI HG</td>
<td>CBI Health Group</td>
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<td>CLBP</td>
<td>Chronic Low Back Pain</td>
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<td>ET</td>
<td>Exercise Therapy</td>
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<td>LBOS</td>
<td>Low Back Outcome Score</td>
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<td>LBP</td>
<td>Low Back Pain</td>
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<tr>
<td>MCAR</td>
<td>Missing Completely at Random</td>
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<td>MDT</td>
<td>Multidisciplinary Therapy</td>
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<td>mLBOS</td>
<td>Modified Low Back Outcome Score</td>
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<tr>
<td>NRS</td>
<td>Numeric Rating Scale</td>
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<tr>
<td>ODI</td>
<td>Oswestry Disability Index</td>
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<td>PDQ</td>
<td>Pain Disability Questionnaire</td>
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<td>PSF</td>
<td>Psychosocial Factors</td>
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<td>RCT</td>
<td>Randomized Controlled Trial</td>
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<td>RTW</td>
<td>Return to Work</td>
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<td>VIF</td>
<td>Variance Inflation Factors</td>
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<tr>
<td>WCB</td>
<td>Workers’ Compensation Board</td>
</tr>
</tbody>
</table>
List of Tables
Table 1 MDT interventions .................................................................................................................. 2
Table 2 ET interventions ...................................................................................................................... 3
Table 3 WCB-funded ET and MDT program admission criteria in Alberta ....................................... 26
Table 4 WCB-funded ET and MDT program admission criteria in British Columbia ..................... 27
Table 5 Inclusion/Exclusion Criteria .................................................................................................. 31
Table 6 Description of variables of interest ....................................................................................... 33
Table 7 Distribution of baseline characteristics among patients Acute/subacute LBP, ET and MDT programs in Alberta ........................................................................................................ 40
Table 8 Distribution of baseline characteristics among patients with CLBP, ET and MDT programs in Alberta .................................................................................................................................. 40
Table 9 Distribution of baseline characteristics among patients with Acute/subacute LBP, in ET and MDT programs in British Columbia .................................................................................................. 41
Table 10 Distribution of baseline characteristics among patients with CLBP, in ET and MDT programs in British Columbia ........................................................................................................ 41
Table 11 Combined Alberta and British Columbia cohort analysis of patient-related factors associated with receiving MDT ............................................................................................................. 42
Table 12 Observed and the predicted frequencies for the combined provinces cohort of patients who received MDT ................................................................................................................................................. 43
Table 13 Alberta cohort analysis of patient-related factors independently associated with receiving MDT .................................................................................................................................................... 44
Table 14 Observed and the predicted frequencies for the Alberta cohort of patients who received MDT and ET ......................................................................................................................................................... 45
Table 15 British Columbia cohort analysis of patient-related factors independently associated with receiving MDT ......................................................................................................................................................... 45
Table 16 Observed and predicted frequencies for the British Columbia cohort of patients who received MDT ......................................................................................................................................................... 46
Table 17 Summary table of statistically significant patient-related factors for receiving MDT ......... 47
List of Figures
Figure 1 Biopsychosocial Model Proposed by Waddell & Burton .......................................................... 9
Figure 2 Alternative Biopsychosocial Model........................................................................................................... 10
Figure 3 Patient-Related Factors within the Context of an Biopsychosocial Model of LBP ......................... 21
Figure 4 WCB Admission Criteria and Alternative Alternative Biopsychosocial Model Including Patient-Related Factors ....................................................................................................................................... 49
1.0 INTRODUCTION

Despite the breadth and depth of research in the past decade, recovery from low back pain (LBP) remains an immense problem for many individuals and for society as a whole. In Canada, LBP is a leading cause of disability and the costs associated with missed workdays and medical expenses as a result of LBP have been estimated at between $11 and $23 billion per year (Dionne et al., 2011; Vos et al., 2015).

Researchers have studied patients with LBP using a variety of different conceptual frameworks (Waddell & Aylward, 2010); two common ones are the biomedical and the biopsychosocial (BPS) frameworks (Gatchel et al., 2007; Waddell and Aylward, 2010). The biomedical framework provides a mechanistic view of the body and assumes a causal relationship between a biological aetiology and the presence and extent of a symptom (Waddell & Aylward, 2010). Under the biomedical framework, there is an expectation that treatment of the biological entity will resolve the underlying pathology. Evidence suggests that the biomedical framework can be applied successfully to the management of patients with LBP who have an identifiable physical aetiology (Kindrachuk & Fourney, 2014; Long et al., 2004).

However, a critical limitation of the biomedical framework is that it does not recognize the influence of psychosocial factors (PSF) on recovery from and management of LBP (Boersma & Linton, 2005; Sullivan et al., 2005).

Engel (1977) proposed the biopsychosocial framework, which views development and maintenance of symptoms as the result of a dynamic interaction between biological, psychological, and social factors of illness (Engel, 1981; Waddell & Aylward, 2010). Psychosocial factors such as personal beliefs, illness behaviors, and fear avoidance are known to add complexity to diagnosis, prognosis, and treatment recommendations (Sullivan et al., 2005; Waddell & Aylward, 2010). These factors can be present in individuals with either chronic LBP (i.e., LBP lasting greater than 90 days in duration) or those in the
acute/subacute timeframe, when they are at risk of developing chronic LBP (Boersma & Linton, 2005; Sullivan et al., 2005; Waddell & Aylward, 2010).

Treatment recommendations for patients with LBP often include either multidisciplinary treatment (MDT) or exercise treatment (ET), both of which are based on the biopsychosocial framework (Hayden et al., 2005; Kamper et al., 2015; Karjalainen et al., 2008). Although these programs involve different clinical team compositions, interventions and intensities of treatment, both provide education and rehabilitation that assist patients in managing their pain and recovering lost levels of functional abilities (i.e., physical abilities associated with activities of daily living and/or work) (Guzman et al., 2001; Hayden et al., 2005; Waddell and Aylward, 2010). MDT has an approach to rehabilitation that aligns with the biopsychosocial framework by providing treatment that routinely includes assessment and management of physical, psychological, and social factors associated with back pain (Maher, 2004; Momsen et al., 2012). MDT interventions usually include physical exercises, education, behavioral treatments, and workplace/ergonomic measures (see Table 1) (Guzman et al., 2001; van Geen et al., 2007).

<table>
<thead>
<tr>
<th>Table 1 MDT interventions (Guzman et al., 2001; Karjalainen et al., 2008; Momsen et al., 2012; van Geen et al., 2007).</th>
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<tr>
<td><strong>Physical exercises</strong></td>
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<tr>
<td><strong>Education</strong></td>
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<tr>
<td><strong>Behavioral treatments</strong></td>
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<td><strong>Workplace/Ergonomic measures</strong></td>
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Guzman et al. (2001) and Momsen et al. (2012) suggest that practitioners from at least three disciplines should deliver program interventions to provide different perspectives and approaches to recovery. Team members may include professionals such as physiotherapists, occupational therapists, kinesiologists, psychologists and/or physicians (Guzman et al., 2001; Karjalainen et al., 2008; Momsen et al., 2012; van Geen et al., 2007). Momsen et al. (2012) further suggest that team members deliver treatment by working collaboratively among disciplines, communicating regularly about the management of physical, psychological, and social/occupational factors associated with LBP.

Evidence suggests that physical exercise and education in ET are rooted in the biopsychosocial framework (Hayden et al., 2005). These programs challenge patient perceptions of disability by setting expectations and goals for incrementally increasing physical activity (Hayden et al., 2005; Staal et al., 2006; van der Giessen et al., 2012). ET for patients with LBP can encompass a vastly heterogeneous group of treatments, involving physical exercises as part of general physical fitness or aerobic exercise, muscle strengthening, various types of flexibility and stretching, yoga and education programs (see Table 2) (George et al., 2008; Hayden et al., 2005; Smeets et al., 2006). ET is usually provided by a physiotherapist (Hayden et al., 2005, van der Giessen et al., 2012).

<table>
<thead>
<tr>
<th>Physical exercises</th>
<th>Any type of movement based exercise performed during the treatment sessions, either under supervision or alone.</th>
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<tr>
<td>Education</td>
<td>Information or knowledge on topics related to back pain; provided on a one-to-one basis based on the patient’s needs.</td>
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The majority of research in MDT and ET has explored treatment effectiveness in the context of symptom duration, but has not consistently considered what treatment is most suitable for those patients with LBP and psychosocial challenges (Hayden et al., 2005; Kamper et al., 2015; Karjalainen et al., 2008). Many MDT and ET studies have methodological limitations, including heterogeneity of program content and low quality study design (Hayden et al., 2005; Kamper et al., 2015; Waddell & Aylward, 2010).
Despite these limitations, there is evidence that MDT or ET improve pain, functional ability and return to work (Hayden et al., 2005; Kamper et al., 2015; Karjalainen et al., 2008; van Geen et al., 2007; van der Giessen et al., 2012).

This thesis will show that there is a gap in the literature in terms of understanding whether or not there are differences in patients with LBP and psychosocial challenges who receive treatment in MDT or ET programs. Research has examined the benefit to identifying patient characteristics that are relevant to streaming patients to different treatments. For example, Hill et al. (2011) found that streaming patients with LBP with psychosocial challenges to physiotherapy that was augmented with psychosocially directed treatment strategies resulted in improved clinical outcomes. Unfortunately, their research does not shed light onto what patients with psychosocial challenges are allocated to MDT or ET for optimal treatment results. This gap is relevant in the Canadian context because practicing clinicians are faced with the task of allocating patients to programs funded by provincial workers’ compensation boards or auto insurers. Provincial rehabilitation funders (e.g. WCB and auto insurance), particularly in Alberta and British Columbia, have MDT and ET admission criteria that lack clear definition and, based on personal experience, are open to interpretation. As a result, referral and treatment funding approval is often on a case-by-case basis where triaging clinicians end up arbitrating program approval through conversation with those funders. In addition to being a time intensive process, these negotiations may lead to inconsistent or even inappropriate use of MDT or ET resources.

This thesis aims to provide a unique contribution to the body of knowledge that will aid clinicians in understanding what are similarities and differences in characteristics of patients with mechanical LBP and psychosocial challenges who receive treatment in MDT and ET. Utilizing a private rehabilitation company clinical database, this thesis will examine the following patient characteristics: age, sex, pain intensity, constancy of pain, daily pain medication use, sleep disturbance due to pain, smoking status, patient reported functional ability level, treatment funder, pre-injury job availability, work status and
duration of symptoms. In addition, this thesis will examine whether MDT and ET patients have characteristics that align with the totality of the program admission criteria, which in the context of funder admission criteria can be ambiguous and open to interpretation.
2.0 BACKGROUND

2.1 MAGNITUDE OF BURDEN AND RELEVANCE OF LOW BACK PAIN
Low back pain affects most adults, is among the most common reasons for seeking health care services, and is a leading cause of limited physical activity and disability (Vos et al., 2015). Paradoxically, despite improvements in health care services and patient-related outcomes in the general population, LBP and associated work disability continue to present substantial personal and economic challenges (Gatchel et al., 2007; Steenstra et al., 2014). Overall, health care related efforts have been ineffective at reducing the impact of LBP on individuals, and more broadly, on society (Gatchel et al., 2007; Waddell & Aylward, 2010).

The lifetime prevalence of LBP in developed countries is estimated at between 65% and 85% (Buchbinder et al., 2011; Gurcay et al., 2009). In Canada, costs associated with missed workdays and medical expenses related to LBP have increased from an estimated $9.8 billion in 1994 to $23 billion in 2007 (Dionne et al., 2011). Of all musculoskeletal conditions, LBP is the most commonly identified work related problem associated with time lost from work (Hayden et al., 2010; Helmout et al., 2010). For example, in Alberta and British Columbia respectively, LBP accounted for 22% (6 134 cases) and 23% (12 640 cases) of reasons cited for missed work time (Alberta Human Services, 2012; WorkSafe BC, 2012).

Research shows that LBP remains a common health problem that not only has physical, psychological, and social consequences for individuals, but also affects various elements of society including families, industry, and government (Guzman et al., 2001; Waddell & Aylward, 2010). Research on back pain symptom duration has resulted in three categories: acute, subacute, or chronic LBP (CLBP) (Guzman et al., 2001; Hayden et al., 2005; Lindstrom et al., 1992). Acute LBP is usually defined as pain lasting less than six weeks and subacute persists for up to 90 days (Gurcay et al., 2009; Hayden et al., 2005). Individuals who experience pain for longer than 90 days are usually deemed to have CLBP (Guzman et
al., 2001; van Geen et al., 2007). Patients who develop CLBP are the most costly and present a therapeutic dilemma (Gatchel et al., 2007; Grotle et al., 2010, Waddell & Aylward, 2010).

2.2 CONCEPTUAL FRAMEWORKS GUIDING EVALUATION & TREATMENT IN LBP
Biomedical and biopsychosocial frameworks have been utilized to crystallize thinking, improve understanding, and assist in the development of new treatments for LBP (Gatchel et al., 2007; Waddell & Aylward, 2010). How these two frameworks have been utilized to examine patients with LBP and how these frameworks have influenced LBP management is worthy of investigation. By understanding how these frameworks have been applied to patients with LBP, there is an opportunity to examine how the biopsychosocial characteristics of patients are associated with rehabilitation program referral.

2.3 BIOMEDICAL FRAMEWORK DESCRIPTION AND RELEVANCE TO LBP
By the mid-nineteenth century, research utilizing the biomedical framework suggested that there is an isomorphic relationship between pain and tissue injury (Gatchel et al., 2007; Waddell & Aylward, 2010). This framework suggests that people with similar underlying pathoanatomy have similar physical examination findings, symptoms, natural history, and response to treatments. The injury could be envisioned as an objective biological disruption of specific body structures or organ systems caused by pathological or physiological changes (Gatchel et al., 2007). As a result, aetiology could be studied independently with the aim of developing medical treatments to prevent, arrest, or even reverse the disease process (Gatchel et al., 2007; Waddell & Aylward, 2010).

The biomedical framework has been successfully applied to the study of anatomical structures that cause LBP, such as neuroplastic changes associated with prolonged LBP that occur within the central nervous system or disc herniation resulting in sciatica (Gatchel et al., 2007; Koes et al., 2007; Nijs et al., 2011; Park et al., 2010). Evidence supports the use of surgical and non-surgical methods to effectively manage sciatica pain, functional impairments, or neurological compromise (Chou et al., 2007; Smith et al., 2013).
The biomedical framework has been applied to examination and management of mechanical acute and subacute LBP (Kindrachuk & Fourney, 2014; Long et al., 2004). Kindrachuk and Fourney (2014) defined mechanical LBP as being of musculoskeletal structural origin, where symptom severity varies with movement and posture. Evidence suggests that these patients will respond to treatment and experience improved symptoms, functional improvement and, if present, reduced disability (Hall et al., 2009; Waddell & Aylward, 2010). The biomedical perspective is useful when mechanical LBP has a clear physical aetiology (Chou et al., 2007; Hall et al., 2009; Kindrachuk & Fourney, 2014; Long et al., 2004). Clinical guidelines recommend advising patients to stay active, utilizing non-narcotic medications and/or spinal manipulation treatment options (Chou et al., 2007; Qaseem et al., 2017). The prognosis for most individuals with LBP is good and return to work is likely (Grotle et al., 2010).

2.4 LIMITATION TO USE OF BIOMEDICAL FRAMEWORK IN LBP
Waddell & Aylward (2010) suggested that the biomedical framework becomes less appropriate when patients fail to follow an expected course of recovery. They suggested, that patient-related factors in addition to the physical aetiology of LBP are relevant to recovery and others agree, (Gatchel et al., 2007; Grotle et al., 2010; Sullivan et al., 2005). The biomedical framework is limited because it does not account for psychological and social factors and their interaction with pain, functional ability, and disability (Gatchel et al., 2007).

2.5 BIOPSYCHOSOCIAL FRAMEWORK DESCRIPTION
Engel (1981) suggested an expanded framework that focuses on disease and illness, with illness being viewed as the dynamic and complex interactive process of biological, psychological, and social dimensions. While Engel supported the concept of a disease as an objective biological disruption of specific body structures or organ systems caused by pathological or physiological changes, he proposed that illness is the subjective experience of a disease. Waddell and Aylward (2010) broadened Engel’s description by adding that illness refers to how a person, members of the family, and even society live
with and respond to symptoms of disease. This biopsychosocial framework considers factors that are psychosocial (predisposed personal attitudes or beliefs, emotional reactions such as fear avoidance and relational factors such as conflict or lack of support) as well as personal and/or psychological factors that can influence the experience of LBP and levels of functional ability at home, work or in society (Sullivan et al., 2005). These psychosocial factors result in pressures and constraints on the family unit, workplace and/or insurance companies and consequently impact an individual’s behavior and level of physical function abilities (Gatchel et al., 2007; Waddell & Aylward, 2010).

The biopsychosocial framework is a widely used heuristic approach to understanding LBP assessment, treatment, and outcomes (Gatchel et al., 2007; Kamper et al., 2015; Waddell & Aylward, 2010; Waddell & Burton, 2004). Waddell and Burton (2004) proposed a model of LBP based on the biopsychosocial framework whereby LBP arises from nociception in the back; however, the presentation of LBP for an individual also involves psychological and social dimensions (Figure 1). This model posits that LBP starts as a physical problem and psychosocial changes develop secondarily.

Figure 1 Biopsychosocial Model Proposed by Waddell & Burton (2004)

2.6 BIOPSYCHOSOCIAL FRAMEWORK RELEVANCE IN LBP
There is evidence in the literature that supports the Waddell and Burton conceptualization of the biopsychosocial model and the assertion that psychological and behavioral changes are secondary to the
physical causes of LBP (Sullivan & Adams, 2010). Since the model is a series of overlaid dimensions, the biological dimension is subsumed within the psychological dimension and both of these dimensions are subsumed within the social dimension (Figure 1). Albeit an interesting model, it lacks recognition of the complex and interactive nature of the three dimensions and how individuals with LBP manage and cope with pain, personal beliefs and pre-existing psychological factors that may modify and/or facilitate recovery in some patients but not others. Critics point out that the model does not recognize that psychological and social factors may both precede and follow a biological problem (Gatchel et al., 2007).

As a response to the criticism of the Waddell and Burton model, an alternative conceptualization of the interaction between the different dimensions of the biopsychosocial framework considers the three different dimensions as partially overlapping as depicted in a Venn diagram (Figure 2).

Figure 2 Alternative Biopsychosocial Model

![Venn Diagram of Biopsychosocial Model]

This model is consistent with research suggesting patient-related factors span more than one dimension of the biopsychosocial framework (Gatchel et al., 2007; Sullivan et al., 2005). This alternative
conceptualization highlights that psychosocial factors do not always follow the biological cause of LBP but rather interact in different ways.

2.7 WHAT ARE MDT/ET PROGRAMS AND CHARACTERISTICS OF MDT AND ET PATIENTS

Both treatment programs provide a biopsychosocial framework-based approach to rehabilitation of patients with mechanical LBP. MDT aligns with the biopsychosocial framework by providing an approach that routinely includes physical exercises, education, behavioral treatments, and workplace/ergonomic measures (Guzman et al., 2001; van Geen et al., 2007). What is evident when reviewing the literature is that there is heterogeneity among MDT programs because there is no consensus on the precise content or the frequency/duration of each of the four intervention components (Guzman et al., 2001; Karjalainen et al., 2008; Momsen et al., 2012; van Geen et al., 2007).

Heterogeneity also exists in treatment team composition. Although the suggestion by Guzman et al. (2001) and Momsen et al. (2012) is that practitioners from three or more different disciplines should deliver program interventions, the literature reveals that the actual composition of the treatment team varies. Studies included treatment teams of physiotherapy, occupational medicine and ergonomists while other studies involved professionals from rheumatology, physiotherapy, occupational therapy, nursing, sports therapy, and social work (Kamper et al., 2015; Karjalainen et al., 2008; Kool et al., 2007; Lindstrom et al., 1992). These diverse teams provide different perspectives and approaches to intervention resulting in reduced generalisability of the study findings.

The literature supports that ET provides a biopsychosocial framework-based approach by utilizing physical exercises and education to improve a patient’s perception of ability and improve tolerance to physical activity (Hayden et al., 2005; van der Giessen et al., 2012). ET is usually provided by a physiotherapist, or in combination with a kinesiologist (Hayden et al., 2005, van der Giessen et al., 2012). ET for patients with LBP can be substantially heterogeneous in nature and include interventions
varying from general physical fitness and education to yoga-based exercise programs (George et al., 2008; Hayden et al., 2005; Smeets et al., 2006). The lack of consensus as to what constitutes ET makes it difficult to draw conclusions of results from various ET studies (Hayden et al., 2005).

There is a paucity of studies evaluating what patients should be referred to ET or MDT. Research suggests that patients with CLBP who are off work should be considered for MDT (Kamper et al., 2015; Qaseem et al., 2017; van Geen et al., 2007). Conversely, Hayden et al. (2005) and van der Giessen (2012) have found that ET can improve levels of functional abilities and return to work in patients with CLBP, but ET is not typically recommended within the first four weeks of a LBP episode (Chou et al., 2007; Koes et al., 2010; van Tulder et al., 2006). Yet both ET and MDT may be considered for symptom durations longer than four weeks (Qaseem et al., 2017; van Tulder et al., 2006). The purpose of reviewing MDT and ET effectiveness literature as follows is to seek evidence that supports the viability of these two programs for the rehabilitation of patients with LBP and to identify patient characteristics of the sample populations in the literature.

2.8 MDT TREATMENT EFFECTIVENESS AND DESCRIPTION OF POPULATIONS STUDIED

In evaluation of treatment effectiveness, MDT literature has examined biopsychosocial framework-based outcomes such as pain, functional ability and disability. MDT may not be necessary for patients with acute LBP of a frank physical aetiology; consequently, MDT has been predominantly, but not exclusively, examined in the context of treating patients with CLBP. Three systematic reviews have evaluated the effectiveness of MDT, one for subacute LBP (Karlojalainen et al., 2008) and two for CLBP (Kamper et al., 2015; van Geen et al., 2007).

In my analysis of studies contained within these three systematic reviews, I have utilized the GRADE approach to rate the overall quality of evidence. The GRADE approach reflects the extent to which there is certainty that an estimation of treatment effect is correct. There are four possible ratings of evidence
in the GRADE approach: high, moderate, low and very low (Guyatt et al., 2008). A high rating suggests that there is confidence in the estimate of effect and that further research is unlikely to change that confidence. A rating of very low quality suggests that any estimate of effect is very uncertain. High quality ratings are given if there are not any serious limitations in design; however, there are factors that can downgrade the quality of evidence to moderate, low or very low. The degree of downgrading is based on the seriousness of factors, namely methodological flaws within the examined studies, consistency of results across different studies, generalisability of research results to a broader patient population and effectiveness of examined treatments (Guyatt et al., 2008). The examination of evidence results in two types of recommendations: strong or weak (Guyatt et al., 2008). When the desirable effects of treatment clearly outweigh undesirable effects, then a strong recommendation is offered. When the trade-offs are less certain either because of low quality evidence or desirable or undesirable effects are closely balanced, then a weak recommendation is given. The following summarizes my analysis of studies within three systematic reviews that evaluated MDT effectiveness. These systematic reviews will be examined to better understand sample characteristics of patients treated with MDT to determine what, if anything is similar among MDT patients.

A systematic review by Karjalainen et al. (2008) included two randomized controlled trails (RCTs) that compared MDT to usual care or non-exercise options. There were a combined total of 233 participants with subacute LBP. As outlined in the Summary of Findings table (Appendix A), the included studies involved a variable percentage of males in these studies from 40% to 70%, a range of mean duration of time sick listed due to back pain of 41 days to 60 days, and a range occupations of patients sampled (assorted occupations in one study and only industrial blue collar workers in the other). The heterogeneity of the study populations adds caution to the certainty of the findings. As a result, there was moderate quality evidence that MDT improves levels of functional ability and return to work outcomes and very low quality evidence that MDT reduces pain symptoms in patients with subacute
LBP. The overall interpretation is a weak recommendation for MDT improving functional ability and return to work in patients with subacute LBP. This review indicates that sex and sick leave status of working aged patients were commonly described characteristics of these study populations.

A systematic review by van Geen et al. (2007) of 10 RCTs compared MDT to no treatment, usual care, or other physical interventions in patients with CLBP. A combined total of 1958 participants were studied. Pain intensity, functional ability and return to work were compared for periods ranging from one to two years following MDT. Heterogeneity was challenging to assess among the 10 study populations because the authors provided limited details of baseline characteristic information (Appendix A). The provided characteristics included a variable percentage of males from 33% to 72%, a difference in the mean duration of episode of LBP (described as 6 months to 9.8 years), a difference in mean age from 34 to 46 years, and a range of patients being off work from 10% to 100%. Using the GRADE approach, there was moderate quality evidence that MDT improves return to work outcomes at one to two years following treatment and moderate quality evidence of no effect on pain intensity or functional ability outcomes. This is interpreted as a weak recommendation for MDT to improve return to work outcome in patients between the age of 18 and 65 years with CLBP.

Since van Geen et al.’s (2007) review, further studies have examined the effectiveness of MDT programs. Kamper et al. (2015) conducted an updated review of 41 RCTs, including seven RCTs examined by van Geen et al. (2007). The authors reviewed studies that compared MDT to waiting list, usual care, or other physical treatments (heat and electrotherapeutic modalities, aerobic exercise, stretching and strengthening exercises, manual therapies, and back school) for patients with CLBP. Once again, heterogeneity of study populations was present (Appendix A). Details of the study populations were not consistently described; however, the percentage of males ranged from 40% to 79%, the mean duration of LBP ranged from 3 months to 6.2 years, percentage of smokers ranged from 37% to 71%,
percentage of patients off of work ranged from 46% to 82%, the amount of sick leave in the year prior to the study ranged from 58 days to 138 days and mean age of the study populations ranged from 39 years to 46 years. Notwithstanding the heterogeneity of study populations, the authors’ concluded that there is moderate quality evidence that MDT reduces pain intensity (standardized mean difference 0.21, 95% CI 0.04-0.37: equivalent of 0.5 points on a 10 point scale). There is moderate quality evidence that MDT helps improve functional ability (standardized mean difference 0.23, 95% CI 0.06-0.40: equivalent to 1.5 points on a 24 point Roland-Morris Disability index) compared to usual care. Kamper et al. (2015) identified low quality evidence that MDT decreased pain intensity (standardized mean difference 0.51, 95% CI 0.01-1.04) and improved level of functional ability (standardized mean difference 0.68, 95% CI 0.16-1.19) compared to other physical treatments. Eight RCTs provided moderate quality evidence that MDT improves the odds of being at work one year after MDT (OR 1.87, 95% CI 1.39-2.53) compared with other physical treatments. Seven RCTs provided moderate quality evidence that MDT does not improve the odds of returning to work (OR 1.04, 95% CI 0.73 – 1.47) compared with usual care.

In patients with CLBP or subacute LBP these three reviews suggest that there is evidence that MDT improves functional ability and return to work rates. For patients with CLBP, there is evidence that MDT can result in pain reduction. This information provides some justification for the use of MDT in patients with CLBP.

2.9 ET TREATMENT EFFECTIVENESS AND DESCRIPTION OF POPULATIONS STUDIED
Two systematic reviews evaluated the effectiveness of ET on outcomes for patients with acute, subacute and CLBP (Hayden et al., 2005; van der Giessen et al., 2012). The following two paragraphs summarize those two systematic reviews and describe the extent of the heterogeneity of study sample characteristics.
A meta-analysis by Hayden et al. (2005) included 61 RCTs (6390 participants). The authors reviewed studies that compared ET to usual care, non-exercise interventions including manual therapies and behavioral therapies or no treatment for patients with acute, subacute or CLBP. Heterogeneity was difficult to assess between the 61 study populations because the authors provided insufficient and inconsistent baseline characteristic information (Appendix B). The details included a difference in the percentage of males (in subacute LBP studies 45% to 69%, chronic LBP studies 24% to 70%). There were data provided for percentage of smokers; subacute pain sample from 17% to 47%, one acute study documented 50% smokers and no smoking status information was present for the chronic LBP studies. There was heterogeneity in the range of documented duration of LBP; from CLBP studies of 13 weeks to 9.3 years, subacute LBP studies from 6 to 24 weeks and acute LBP studies from 7 to 49 days. The mean pain intensity differed in the studies; acute LBP studies (1-7, Numeric Rating Scale (NRS)), subacute LBP studies (4-6 NRS) and in chronic LBP studies the variability was 22-64/100 visual analogue pain scale). There was also variability in the percentage of patients off work, for CLBP study populations (44 – 83%), in subacute LBP studies (50 – 85%) and there was no information available for the acute LBP studies. There was low quality evidence that ET improves pain intensity and functional ability outcomes in patients with CLBP. The evidence that ET does improve pain intensity (pooled weighted mean difference 7.3, 95%CI 3.70 – 10.90) or functional ability (pooled weighted mean improvement 2.5 95%CI 1.04-3.91) was of low quality in patients with acute or subacute LBP. Hayden et al. (2005) suggest that even though these results are statistically significant improvements, they are not clinically significant; therefore, the overall interpretation of evidence is that there is a weak recommendation for the use of ET for pain relief and functional ability improvement in patients with CLBP. In light of the wide variety of described interventions that fall under the umbrella of ET, caution is necessary in the interpretation of these results.
Van der Giessen et al. (2012) conducted a systematic review of ten articles that described five RCTs examining ET in terms of effectiveness for outcomes related to pain intensity, functional ability level and return to work rates. ET was compared to usual care, non-exercise options or a wait list control. The combined total number of participants was 680 and included studies of working age patients who had acute, subacute or chronic LBP. Heterogeneity was difficult to assess because the five study populations did not provide details of patient characteristics. The available details of sample characteristics included a variable percentage of males (36% - 94%), differences in the duration of symptoms (1 to 24 weeks), differences in mean pain scores (4 – 7, NRS), variability in the mean duration of sick leave in the year prior to study (range from 6 to 43 days), and a range of differences in mean age (38 – 42 years). Based on my analysis of the reviewed trials, there were no or insufficient evidence for a beneficial effect of ET on pain intensity and functional ability. There was evidence of improvement on return to work in patients with subacute LBP but that study was of low quality. This result may be interpreted as a weak recommendation that ET is effective in return to work for patients with subacute LBP. van der Giessen et al. (2012) appears to conflict with the conclusions provided by Hayden et al. (2005). These researchers are divided on the evidence that ET improves pain intensity and functional ability outcomes. The heterogeneity of patient samples upon which these conclusions are based, may have contributed to the differing conclusions of the researchers.

Overall, there is paucity of information on what patients are treated in MDT versus ET. The implication is that without an understanding of what patients are treated in MDT versus ET practicing clinicians may be uncertain about who would best benefit from which type of program. Ultimately, research about streaming should help identify patient characteristics that assist with allocation decisions to MDT and ET.
2.10 LITERATURE REGARDING TREATMENT STREAMING TO MDT AND ET
Searching the literature for studies on streaming patients to MDT and ET was not successful. Despite the lack of information on MDT and ET program referrals, Hill et al. (2011) suggest that identifying prognostic factors that aid in treatment streaming is important. Their research developed a back pain screening tool for primary care settings to help triage to either physiotherapy or “psychologically informed physiotherapy” (Hill et al., 2011). Their findings revealed negative prognostic factors for outcomes such as lost work days due to pain and level of disability as measured by the Roland Morris Disability Questionnaire. The identified factors include: referred leg pain, comorbid pain, reduced functional ability, bothersomeness of pain, catastrophizing, fear-avoidance behaviors, anxiety and depression (Hay et al., 2008; Hill et al., 2011). This research suggests that prognostic factors may inform the understanding of which patients receive MDT and ET.

2.11 PSYCHOSOCIAL FACTORS MAY IDENTIFY WHO REQUIRES MDT AND ET
Psychosocial factors predictive of poor outcome may identify a group of LBP patients for treatments with a different focus such as MDT and ET. To better understand the relevance of psychosocial factors in LBP, a search of the literature based on key words ‘prognosis’, ‘psychosocial factor’ and ‘LBP’ identified four systematic reviews on psychosocial factors. Steenstra et al. (2005) completed a systematic review of 14 studies assessing prognosis of duration of sick leave in individuals with LBP durations less than six weeks. Social isolation and social dysfunction were predictors of longer duration of sick leave: having low levels of functional ability was prognostic in two high quality studies and two low quality studies. Three high quality studies revealed that an individual with LBP receiving high financial compensation for LBP was prognostic of a longer duration sick leave.

Chou and Shekelle (2010) completed a systematic review of 20 studies examining the prognostic value of factors linked to developing chronic disabling LBP for individuals with less than eight weeks duration...
of pain. Prognostic factors were maladaptive pain coping behaviors, low functional ability and the presence of depression.

Iles et al. (2008) performed a systematic review of psychosocial factors associated with return to work for those with episodes of LBP less than twelve weeks in duration. They examined 24 prognostic studies from primary care settings and conducted a secondary analysis of workers’ compensation databases. They determined that there was strong evidence from four high, one moderate and four low quality studies that patient expectations of recovery from LBP were predictive of return to work. They also identified moderate evidence in two high, one moderate and four low quality studies that fear-avoidance beliefs were negative predictors of return to work.

Ramond et al. (2011) examined, in primary care settings, the value of psychosocial factors at predicting the transition from subacute LBP to CLBP. Their systematic review defined acute and subacute LBP as less than 90 days in duration and CLBP as over 90 days. They reviewed 18 studies and found that the following factors were prognostic of transitioning from subacute LBP to CLBP: previous sick leave and compensable LBP (2 high quality studies) and the presence of depression and/or psychological distress (4 high quality studies).

Data from reviews of prognostic studies seem to support that biopsychosocial factors may be important to informing referral decisions to MDT versus ET.

2.12 APPLYING THE BIOPSYCHOSOCIAL FRAMEWORK IN THIS THESIS
It would be ideal to examine each of the prognostic factors previously identified in the literature in the context of what/which patients receive MDT and ET; however in the real world of clinical practice this breadth of data is often not available. This is exemplified by the dataset available for this study that is from a secondary data analysis of a clinical database from Alberta and British Columbia. Within this database there are no data available regarding depression, recovery expectations or fear-avoidance
behaviors. Notwithstanding the absence of those three patient-related factors, the information contained within the database includes: age, gender, pain levels, functional ability, work-related factors, and treatment funders. The examination of these existing patient-related factors is better understood within an alternate biopsychosocial model that will be used to understand what patients receive MDT and ET. Some patient-related factors in this thesis are positioned within a single dimension of the alternative biopsychosocial model whereas others are present in more than one dimension (Figure 3).

Biological Factors: Age and sex are solely within the biological dimension. McIntosh et al. (2000a) identified an association between increasing age and longer periods of disability due to LBP. This suggests that increasing age may reduce patients’ physiological ability to recover. The increasing prevalence of LBP with age suggests that there are biological degenerative aging processes involving changes in mechanical loading that influence the quality and strength of spinal tissues (Hoy et al., 2010; Stefanakis et al., 2014). There is research revealing that females remain disabled from work for longer periods than males (Hoy et al., 2010; Steenstra et al., 2014). Bartley et al. (2013) suggest that females have biologically greater pain sensitivity than males. Their work reveals evidence that there are sex-related differences in receptor expression in areas of peripheral and central nervous systems associated with nociception. The effects on pain sensitivity by estradiol and progesterone are relatively complex, exerting both pro and anti-nociceptive effects on pain; however, testosterone appears to be more anti-nociceptive, given the association between decreased androgen concentrations and chronic pain (Bartely et al., 2013). The sex-related differences in receptor expression in areas of peripheral and central nervous systems suggests that biologically, females and/or older patients may take a long period of time to recover function.
Figure 3 Patient-Related Factors within the Context of an Alternative Biopsychosocial Model of LBP

Psychological Factors: Another factor within one dimension of the alternative biopsychosocial model is smoking. From a psychological perspective, smoking is a lifestyle choice because no one is born a smoker (O’Loughlin et al., 2017). Research indicates that patients with LBP who are smokers psychologically are less satisfied with their health and have poor expectations for recovery of pre-injury status (Vogt et al., 2002).

Social Factors: The social dimension includes three patient-related factors: work status, pre-injury job availability, and treatment funder. Research reveals that where there is limited co-worker support or employer willingness to socially support patient’s return to work, there is frequently a longer timeframe for return to work (Steenstra et al., 2005; Sullivan et al., 2005). If the pre-injury job becomes
unavailable, a patient may immediately become more distant from returning to that job and returning to any work may become more complex (Waddell & Aylward, 2010). Finally, insurance systems such as workers compensation boards and auto-related injury insurance are socially organized systems designed to assist patients through various return to work and rehabilitation strategies (Gatchel et al., 2009; Guzman et al., 2001; Waddell & Aylward, 2010).

Multi-dimensional Factors: Research suggests that pain intensity has a biological component and a psychological component (Grotle et al., 2010; Gurcay et al., 2009; Steenstra et al., 2005). Gurcay et al. (2009) found that high pain intensity may have a physical cause of mechanical pain and/or the presence of psychosocial factors (differences in mood including depression, anxiety or beliefs about recovery expectations). Others indicate that patients with LBP who report high pain intensity may have a psychological fear of re-injury (Grotle et al., 2010). O’Sullivan et al. (2005) and Gurcay et al. (2009) concluded that patients who report higher pain intensity have poorer ability to control their pain. These findings provide a rationale for pain intensity contributing to both psychological and biological dimensions.

Constancy of pain has aspects consistent with biological and psychological dimensions. Research suggests that mechanical LBP can be constant due to inflammatory aspects (Hall et al., 2009; Kindrachuk & Fourney, 2014) or as a consequence of the psychological aspects of chronicity (Nijs et al., 2011; O’Sullivan et al., 2005).

Mechanical strain and poor coping elements support the factor of sleep disturbance as having both biological and psychological dimensions. There is evidence that sleep disturbance due to pain can be related to the physical strain placed on the back by sleeping in specific postures (Alsaadi et al., 2014). But others have identified that sleep disturbance in patients with back pain involves emotional distress, difficulty coping and declines in social functioning (Kerns et al., 2000).
Pain medication use includes both psychological and biological dimensions. In the LBP literature, pain medication use is frequently examined as a coping strategy related to pain reduction. While past studies have examined the biological effects of medications (Chou et al., 2007; Deyo et al. 2015), other research has examined the use of pain medication from a maladaptive behavior perspective (Gatchel & Mayer, 2008; Gatchel & Okifuji, 2006; Waddell & Aylward, 2010).

A patient’s perceived level of functional ability spans all three dimensions of the biopsychosocial framework. In the psychological dimension, fear and anticipation of pain are cognitive processes that interact with the nociceptive experience of pain and can exert a strong influence on an individual’s level of functional ability (Gatchel et. al., 2007; Waddell & Aylward, 2010). For the biological dimension, low functional ability is often a consequence of high levels of mechanical pain (Gatchel et al., 2007; Gregg et al., 2011). In the social dimension, function can be limited by lack of co-worker support and/or the return to work process (Karjalainen et al., 2008; Sullivan et al., 2005; Waddell & Aylward, 2010). Hence, the level of functional ability intersects all aspects of the biopsychosocial framework (Guzman et al., 2001; Steenstra et al., 2014; Waddell & Aylward, 2010).

Symptom duration of LBP spans all three dimensions of the biopsychosocial framework. In the psychological dimension, prolonged pain interacts with cognitive processes and can exert an influence on emotional distress and anxiety (Gatchel et al., 2007). For the biological dimension, chronic LBP results in central neuropathic pain changes (Gatchel et al., 2007). In the social dimension chronicity leads to barriers to return to work and consequences for treatment funders such as financial compensation issues (Waddell & Aylward, 2010).

The preceding summary of available patient data provides an understanding of where the various patient-related factors are positioned in the alternative biopsychosocial model. Since MDT and ET are fundamentally rooted in the biopsychosocial framework, it raises the obvious question, “What are the
similarities and differences in characteristics of patients treated in MDT and ET?” Presently, clinicians receive limited guidance from funders or the literature. As described below, information provided by treatment funders does not explicitly delineate what patients should be receive these two rehabilitation programs. The literature is insufficient to meaningfully direct clinical practice for MDT and ET (Kamper et al., 2015; Waddell & Aylward, 2010; van der Giessen et al., 2012). As a result, decisions are not a straightforward process for clinicians faced with streaming patients to MDT or ET.

2.13 PROGRAMS UTILIZED IN PRACTICE IN BRITISH COLUMBIA AND ALBERTA

In Canada, treatment funding is mandated at a provincial level. In Alberta and British Columbia, treatment funding is comprised of four options: 1) self-pay (patients fund their own care); 2) extended health coverage involving an insurance benefit package that provides specific (and limited) amounts of funds; 3) WCB for injured workers; or, 4) auto insurance for those involved in motor vehicle accidents. Both self-pay and extended health coverage do not typically cover costs of ET and MDT (personal communication, 2016); however, WCB and auto insurers provide funding for these two programs and these funders are the focus of this study (Alberta, 2012; Insurance (Vehicle) Act, British Columbia, 2015; WCB Alberta, 2013; WorkSafe British Columbia, 2013).

One private rehabilitation provider, CBI Health Group (CBI HG), has clinics in Alberta and British Columbia. At these clinics, MDT and ET services are provided and are funded by the respective provincial WCBs and auto insurers. All clinics provide similar content and treatment teams (WCB Alberta, 2013; WorkSafe British Columbia, 2013). Specifically, MDT is delivered five days per week, minimum four hours per day, for a maximum of eight weeks. Team members include professionals from physiotherapy, occupational therapy, kinesiology, and psychology. The structured treatment regimen includes: 1) active exercises completed under supervision during the treatment sessions; 2) behavioral treatments designed to modify three response systems including behavior, cognition, and/or physiological reactivity; 3) group education on topics related to back pain; and, 4) ergonomic modifications of tasks...
and environments to make them compatible with the level of functional abilities of patients. Alberta WCB requires that MDT has a physician available for medication management.

In both provinces, ET is up to eight weeks in duration but is less time-intensive than MDT. Patients are required to attend one to three sessions per week for up to 60 minutes per session. The treatment team only includes a physiotherapist (a kinesiologist is optional). A structured regimen includes active exercises and nongroup-based education (WCB Alberta, 2013; WorkSafe British Columbia, 2013). For both MDT and ET, therapists and patients have the option to conclude the program at any time that return to work is possible or when no further clinical improvement is expected. While each program is similar by province, there are differences in the admission criteria stipulated by the provincially-based treatment funders.

2.14 ALBERTA AND BC PROGRAM ADMISSION CRITERIA
Each WCB has its own specified admission criteria for entry into MDT or ET; however, the criteria are open to interpretation given their imprecision (see Tables 3 Alberta & 4 British Columbia) (WCB Alberta, 2009: WorkSafe British Columbia, 2013). For example, in Alberta, MDT patients have “significant pain behaviors” while ET patients may have “some pain behaviors” (WCB Alberta, 2009). Similarly, there is ambiguity in the scoring interpretation of the quality of life outcome measure, SF 36. The MDT admission criterion states that scoring is to reflect “significant issues” while ET admission criteria states “moderate issues” are required. The Alberta WCB stipulated admission criterion provides no definition or difference between “significant” and “moderate” levels (WCB Alberta, 2009). This lack of clarity also occurs with respect to patient work status. The admission criterion for both MDT and ET state that patients can be off work, working or not have the pre-injury job available (WCB Alberta, 2009).
<table>
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<tr>
<th>ET</th>
<th>MDT</th>
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<tr>
<td>• Pain Disability Index 30-48/70</td>
<td>• Pain Disability Index 48/70</td>
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<tr>
<td>• VAS 4-7/10</td>
<td>• VAS greater than 7/10</td>
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<tr>
<td>• SF-36 moderate issues</td>
<td>• SF-36 significant issues</td>
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<tr>
<td>• Light to medium level of function</td>
<td>• Sedentary to light level of function</td>
</tr>
<tr>
<td>• Less than 20 lbs. discrepancy from job demands</td>
<td>• Pain limited functional tolerances</td>
</tr>
<tr>
<td>• Some pain behaviors</td>
<td>• Greater than 20 lbs. discrepancy from job demands</td>
</tr>
<tr>
<td>• Significant range of motion deficit</td>
<td>• Significant pain behaviors</td>
</tr>
<tr>
<td>• Significant strength and endurance deficit</td>
<td>• Significant range of motion deficit</td>
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<tr>
<td>• Any working situation (no pre-injury job available, not working or working)</td>
<td>• Significant strength and endurance deficit</td>
</tr>
<tr>
<td></td>
<td>• Any work situation (no pre-injury job available, not working, working)</td>
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<tr>
<td></td>
<td>• Pain medication dependency</td>
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<td>• Previous unsuccessful return to work program</td>
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British Columbia’s WCB admission criteria for ET and MDT also are imprecise. For ET, injured workers are “at least three weeks post-injury” and “injured workers would benefit from active exercises” (WorkSafe British Columbia, 2013). Yet a practicing clinician recognizes that these criteria are characteristics of patients with LBP in both programs. For MDT, an admission criterion is the identification of the presence of “vocational, psychosocial and / or medical issues which require the involvement of a multidisciplinary team.” But WCB does not specifically stipulate what those issues are and as a result, admission remains open to interpretation. This ambiguity may be associated with practicing clinicians making inconsistent decisions regarding patient allocation and may result in unnecessary MDT resource utilization for patients who are appropriate for ET.
Table 4 WCB-funded ET and MDT program admission criteria in British Columbia

<table>
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<th>ET</th>
<th>MDT</th>
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<tr>
<td>• At least three weeks post-injury</td>
<td>• Functional deficit or impairment that has not responded to initial attempts to facilitate a return to work</td>
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<tr>
<td>• Injury is soft tissue</td>
<td>• Presence of vocational, psychosocial and/or medical issues which require the involvement of a multidisciplinary team to facilitate a return to work</td>
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<tr>
<td>• There are no medical contraindications to an activity-based program</td>
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<tr>
<td>• The injured worker will benefit from active exercises to improve strength, endurance and mobility</td>
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For auto insurance funding, neither province has explicitly documented MDT/ET program admission criteria; triaging clinicians provide rationale for program allocation. The result is a potential for inconsistent auto insurer approval for funding (personal communication, 2016).

2.15 RATIONALE FOR THE THESIS
The literature demonstrates that LBP remains a substantial cause of limited functional ability and work-related disability. Research examining MDT and ET has revealed that these programs are viable and effective treatments; however, it does not address who should receive each of these distinct programs. Importantly, based on the biopsychosocial framework, what patient-related factors inform who should be allocated to which program is lacking. This gap in the literature exists because researchers have not considered patient-related factors in relation to MDT and ET. Instead, research has focused on identifying prognostic factors for developing CLBP and for returning patients to work and that research has not been evaluated to determine if it informs which patients should receive MDT and ET (Steenstra et al., 2005; Sullivan et al., 2005; Waddell & Aylward, 2010).

Limitations in the Waddell and Burton (2004) biopsychosocial model create challenges in understanding how different patient-related factors are associated with patients who receive MDT and ET. The alternative biopsychosocial model (Figure 3) provides an opportunity to examine if different patient-
related factors are useful to assist clinicians interpreting which patients receive MDT and ET when explicit and/or admission criteria are lacking.

This thesis examines which patient-related factors are associated with patients with mechanical LBP and psychosocial challenges who received MDT and ET. The thesis objectives are to first determine if there are differences in biological, psychological and social characteristics between patients in MDT versus ET. The second objective is to examine what patient-related factors are independently associated with having received treatment in either of these two programs. This research provides a unique contribution to the literature with the goal of assisting practicing clinicians to understand, through the lens of the biopsychosocial framework, which patient-related factors are associated with individuals who received either MDT or ET programs.
3.0 RESEARCH OBJECTIVES

3.1 OBJECTIVE ONE
To describe, within the context of the biopsychosocial framework, the baseline characteristics of those patients with low back pain, who received MDT versus ET, in Alberta and British Columbia.

Hypothesis:
Ho = There is no significant difference in distributions of biological, psychological, and social characteristics of patients in MDT and ET. Characteristics available for examination included: age, sex, pain intensity, constancy of pain, daily pain medication use, sleep disturbance due to pain, smoking status, functional ability, treatment funder, pre-injury job availability, work status and symptom duration.

3.2 OBJECTIVE TWO
(A) To examine, when controlling for all available baseline patient characteristics, which baseline patient-related factors are independently associated with patients who received MDT versus ET.

(B) To examine whether there are any differences in baseline patient-related factors when patients in Alberta are analyzed separately from patients in British Columbia.

Hypothesis:
Ho = There are no significant patient-related factors that are independently associated with patients who received MDT versus ET (different types of rehabilitation programs). The examined factors included: age, sex, constancy of pain, daily pain medication use, sleep disturbance due to pain, smoking status, functional ability, treatment funder, pre-injury job availability, work status and symptom duration.
4.0 METHODS

4.1 OVERVIEW OF DESIGN
This is a retrospective cohort study involving a secondary data analysis of an existing database of individuals who received care in MDT or ET that was funded by either WCB or auto insurers in Alberta or British Columbia. The existing database included data that is routinely collected by practicing clinicians for the purpose of monitoring the quality of services provided to patients.

4.2 STUDY SETTING
Data were collected from November 2008 to October 2011. Data were obtained from 26 CBI Health Group, privately owned, outpatient physiotherapy clinics in communities across Alberta and British Columbia. In both provinces, these clinics operate with similar approaches to treatment programs and teams of health care professionals providing MDT and ET. There are 12 clinics in British Columbia that are located throughout the regions of Greater Vancouver, Victoria and Northern British Columbia regions. In Alberta there are 14 clinics located in the Fort McMurray, Edmonton, Red Deer and Calgary regions.

4.3 ETHICAL CONSIDERATIONS/ CONSENT PROCESS
The Health Sciences Ethics Review Board at the University of Toronto approved this study. The anonymized dataset was derived from a pre-existing database containing information that is routinely collected during the normal course of treatment. The CBI HG database steward provided the dataset to the candidate.

Written consent was obtained from the patients on the first day of attendance (Appendix F). Patients agreed to have their personal health information collected to “compile aggregate statistics for quality improvement initiatives and clinical research” (Consent to the collection, use and disclosure of personal or personal health information, Page 1). Assessing physiotherapists were responsible for explaining the consent process.
4.4 PATIENTS
There were 725 patients who received care in MDT or ET. Table 5 provides the inclusion / exclusion criteria.

Table 5 Inclusion/Exclusion Criteria

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
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<tr>
<td>Completed rehabilitation program between November 2008 and October 2011</td>
<td>Previous or current diagnosis of acute cauda equina syndrome at the time of initial assessment</td>
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<tr>
<td>Between 18 and 65 years of age</td>
<td>Reported history of malignancy</td>
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<tr>
<td>LBP, with or without associated leg pain, related to either a WCB or auto insurer claim</td>
<td>Previous spinal surgery</td>
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<tr>
<td>Mechanical LBP as determined by the Saskatchewan Spine Pathway methodology (Kindrachuk &amp; Fourney, 2014)</td>
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<tr>
<td>Pain Disability Questionnaire (PDQ) score 4 or 5 at time of initial assessment; during the period of the study the PDQ was named the “Lifestyle Questionnaire” (Appendix C) (McIntosh et al., 2000b)</td>
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</table>

4.5 DESCRIPTION OF PHYSIOTHERAPIST- BASED MECHANICAL LOW BACK PAIN ASSESSMENT OF PATIENTS
Each patient had a standardized physiotherapy assessment that included a history and physical examination focused on establishing whether the clinical presentation was consistent with mechanical LBP as determined by the Saskatchewan Spine Pathway methodology (Kindrachuk & Fourney, 2014; Wilson et al., 1999). Kindrachuk and Fourney (2014) defined mechanical LBP as being of musculoskeletal structural origin where symptoms vary with physical activity. The assessment protocol includes a history interview to determine pain location, intensity, whether the pain was intermittently or constantly present, identification of aggravating and alleviating positions (and/or movements) and mechanism of injury. The assessment includes a spinal physical examination with observation of spinal posture, range of motion, neurological status and lumbar movement testing (Hall et al., 2009). The assessment is designed to help clinicians categorize a patient’s symptoms into distinct mechanical pain syndromes of
back pain with or without neurological compromise (Hall et al., 2009; Kindrachuk & Fourney, 2014; Wilson et al., 1999). The assessment form utilized to guide the standardized physiotherapy assessment is provided in Appendix D.

4.6 PATIENTS - DESCRIPTION OF PAIN DISABILITY QUESTIONNAIRE PROVIDED AT INTAKE

The Pain Disability Questionnaire (PDQ) is part of the routine data collection at MDT and ET patient assessment (Appendix C). The purpose of the PDQ is to provide clinicians with a simple, comprehensive and easily administered questionnaire to help identify patients with psychosocial challenges. The PDQ has predictive value in determining higher prevalence of chronicity of symptoms (McIntosh et al., 2000b). The PDQ contains five questions. McIntosh et al. (2000b) found that patients answering positively to four or five of any combination of the first five questions had in excess of a 96% probability of exhibiting or being at risk of developing CLBP. The five questions are:

Question #1 “Is someone else primarily to blame for your situation?”

Question #2 “Are you having trouble at work; home; with friends (due to this injury)?”

Question #3 “Are you receiving or anticipate receiving any financial compensation for your injury?”

Question #4 “Have you contacted a lawyer about your injury?”

Question #5 “Are you having trouble sleeping because of your pain?”

McIntosh et al. (2000b) demonstrated that the PDQ is a valid tool to identify patients with psychosocial challenges. As outlined in the inclusion criteria section (Table 7) patients in this study scored either 4 or 5 out of 5 on the PDQ.

4.7 DESCRIPTION OF PRIMARY OUTCOME

The primary outcome variable in this study is program referral to MDT or ET. The two programs were mutually exclusive; a patient could only be in one program.
4.8 DESCRIPTION OF VARIABLES OF INTEREST

Variables of interest are described in Table 6 and are arranged based on the different dimensions of the alternative conceptualization of the biopsychosocial framework discussed in the Background section.

Table 6 Description of variables of interest

<table>
<thead>
<tr>
<th>Biopsychosocial Framework Dimension</th>
<th>Variables</th>
<th>Variable Type</th>
<th>Categorization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>Age</td>
<td>Continuous</td>
<td>18 – 65 years</td>
</tr>
<tr>
<td></td>
<td>Sex</td>
<td>Dichotomous</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Female</td>
</tr>
<tr>
<td>Biological - Psychological</td>
<td>Pain Intensity</td>
<td>Continuous</td>
<td>0 to 10 (average over 24 hours), NRS</td>
</tr>
<tr>
<td></td>
<td>Constancy of Pain</td>
<td>Dichotomous</td>
<td>Constant (never pain free)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Intermittent (pain free period of any duration)</td>
</tr>
<tr>
<td></td>
<td>Daily Pain Medication Use</td>
<td>Dichotomous</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Sleep Disturbance Due to Pain</td>
<td>Dichotomous</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Psychological</td>
<td>Smoking Status</td>
<td>Dichotomous</td>
<td>Yes (current smoker)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No (not current smoker)</td>
</tr>
<tr>
<td>Biological - Psychological - Social</td>
<td>Functional Ability</td>
<td>Continuous</td>
<td>6 (lowest) – 100 (highest) mLBOS</td>
</tr>
<tr>
<td></td>
<td>Symptom Duration</td>
<td>Dichotomous</td>
<td>Acute / Subacute (≤ 90 days)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chronic (&gt; 90days)</td>
</tr>
<tr>
<td>Social</td>
<td>Treatment Funder</td>
<td>Dichotomous</td>
<td>Worker’s Compensation Board</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Auto Insurer</td>
</tr>
<tr>
<td></td>
<td>Pre-injury Job Availability</td>
<td>Dichotomous</td>
<td>Yes (same job and employer)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Work Status</td>
<td>Dichotomous</td>
<td>Working (working in any capacity)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not working (off work due to LBP)</td>
</tr>
</tbody>
</table>

NRS = Numeric Rating Scale
mLBOS = modified Low Back Outcome Score

4.9 VARIABLE OF INTEREST DESCRIPTION - PAIN INTENSITY

The pain intensity variable available in the CBI HG database is the Numeric Pain Rating Scale (NRS). Pain intensity was measured at baseline from 0 (no pain) to 10 (worst pain) (Downie et al., 1978). Research suggests that the NRS is a valid and reliable tool for measurement of pain intensity in patients with LBP.
(Downie, et al., 1978; Mannion et al., 2007). George et al. (2008) opined that patients with LBP prefer NRS to other scales because of the ease of use of the scale.

4.10 VARIABLE OF INTEREST DESCRIPTION - FUNCTIONAL ABILITY
Patients’ self-reported level of functional ability was measured using a modified version of the Low Back Outcome Score (mLBOS). This tool was originally developed and published by Greenough and Fraser (1992). McIntosh (1999) altered the original version of the Low Back Outcome Score for use in the Canadian outpatient clinical setting by revising wording to North American standards and omitting a question about sex life. The modified version was validated in a Canadian sample (McIntosh et al., 2000). The questionnaire includes 18 items evaluating: current pain, employment, domestic chores, sport activities, rest, medical treatments or consultations, medication use, and daily activities (Appendix E) (Greenough & Fraser, 1992; McIntosh, 1999). Scoring the mLBOS involves adding the result of each of the differently weighted questions. There are four questions with a nine-point scale, four questions having a six-point scale, eight questions with a three-point scale and two questions use a two-point scale. The final summed score ranges from 6 to 100. Lower values represent lower perceived functional ability. The questionnaire can be completed in about five minutes and scored in less than one minute.

4.11 DATA COLLECTION
Physiotherapists provided surveys, clinical, and demographic data to administrative staff who entered the data into a computerized database upon completion of the initial physiotherapy assessment. Data were downloaded monthly to a central collection site.

4.12 DATA QUALITY
To assist with ensuring data quality, all CBI HG clinicians receive training on accurate data collection and clinical form completion. Once annually, the CBI HG medical director and senior physiotherapist lead two training courses for newly hired clinicians. Each course is 14-hours in duration. An additional strategy to achieve high data quality is the use of quality assurance audits. Audits occurred on a semi-
annual basis in each clinic during the study period and were performed by administrative staff and clinic managers. Clinic managers provided feedback specific to audits to all staff.

4.13 OBJECTIVE ONE ANALYSIS STRATEGY
Data were examined for descriptive characteristics of patients in MDT and ET and are stratified by province. Data for categorical variables (i.e., sex, smoking status, constancy of pain, daily pain medication use, sleep disturbance due to pain, treatment funder, pre-injury job availability, and work status) were summarized by using counts and percentages. Continuous variables (i.e., age, pain intensity, and functional ability) were summarized by mean and standard deviation.

Within each province, differences between programs were explored by symptom duration (CLBP > 90 days, acute/subacute LBP ≤ 90 days). Histograms and Q-Q plots were examined to test for normality of continuous variables. Independent samples t-tests were used to compare continuous variables and chi-squared statistics were used for categorical data. All tests utilized a 5% level of statistical significance.

4.14 MISSING DATA
Field (2013) stated that a straightforward method of dealing with missing data is to exclude all patients with any missing data. This approach assures that no bias is introduced but may seriously affect external validity if data are deleted for this reason. Field (2013) cautioned that the patient deletion approach should be used very sparingly to ensure that there is no major loss of patient data available for analysis and generally should only be utilized for variables for which data are missing in a very small proportion of patients. Instead of excluding data, the a priori decision for the management of missing data involved adjusting the continuous variable of functional ability (mLBOS). Cases where patients did not entirely complete all questions of the mLBOS surveys were analyzed to determine if data were missing completely at random using Little’s MCAR test (Little, 1988) and results revealed that missing data occurred randomly; hence data were re-scaled.
Data re-scaling is a suitable strategy for missing data in circumstances where patients do not answer one question of a multiple-item survey (Fairbank et al., 2000; McIntosh, 1999). An advantage of data re-scaling is that it allows missing data to be accounted for by proportional recalculation. The mLBOS survey with no missing data gives a possible range of scores from 6 to 100. To reduce the potential for introducing bias, re-scaling was performed so that those who did not answer one question had their scores re-calculated based on the same possible range (6 to 100). The new minimum value was \( \text{MIN} = 6 \) minus the lowest possible value for the total score. The new maximum total score was \( \text{MAX} = 100 \) minus the highest possible value for the missing item. The survey was then re-scaled based on the formula: 

\[
\frac{\text{original score} - \text{MIN}}{\text{MAX} - \text{MIN}} \times 100
\]

This formula transformed the adjusted score into a scale compatible with completed surveys. The re-scaled mLBOS data were examined to determine the preservation of the normal distribution that was present in the original data.

Missing data specific to the independent variable of pain intensity was not imputed because of the extent of data that were missing (34.4% and 58.4% of data in Alberta and British Columbia respectively).

**4.15 OBJECTIVE TWO ANALYSIS STRATEGY**

Patient-related factors independently associated with being treated in MDT versus ET were analyzed via logistic regression (dependent variable = treatment program, MDT or ET). Based on the research reviewed in the Background section of this thesis and the exploratory nature of this research, it was decided that all of the independent variables (patient characteristics) from objective 1 were of interest; therefore, all were included in each regression model for analysis: age, sex, constancy of pain, daily pain medication use, sleep disturbance due to pain, functional ability, treatment funder, pre-injury job availability and work status. Only the variable of pain intensity was not included due to the large extent of missing data.

Regression modelling was performed for the combined group of both provinces and then each province separately. The rationale for running three regressions was to explore any differences in biopsychosocial
characteristics of patients between those who received treatment in the different programs in each province. Collinearity diagnostics were utilized to examine the inclusion of multiple independent variables in the regression model. Field (2013) suggested that correlations > 0.8 indicate the existence of multicollinearity. Variance inflation factors (VIF) were assessed to determine levels of multicollinearity. Field (2013) recommended a VIF value cutoff of 10 for indication of high levels of multicollinearity. Regression model results were summarized by odds ratios (OR), 95% confidence intervals (95% CI) and p values. A 5% level of significance was used to determine whether the observed associations were statistically significant. The Hosmer-Lemeshow test was utilized to assess goodness-of-fit of the logistic model.

4.16 STATISTICAL PACKAGE
Statistical analyses were carried out using SPSS (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 24).
5.0 RESULTS

5.1 OBJECTIVE ONE
To describe, within the context of the biopsychosocial framework, the baseline characteristics of those patients with low back pain, who received MDT versus ET, in Alberta and British Columbia.

5.1.1 DATA QUALITY ANALYSIS- MISSING DATA STRATEGY FOR THE FUNCTIONAL ABILITY VARIABLE
Of the total 752 patients in Alberta and British Columbia, 563 patients had complete data that were available for analysis. Of the 563 patients allocated to programs, 302 were in ET and 262 were in MDT. The functional ability (mLBOS) data in the Alberta cohort revealed that 14.9% (n = 41) of data were missing for patients with acute/subacute LBP and 16.9% (n=13) for CLBP; in the British Columbia cohort the missing data was 23.8% (n=38) in the acute/subacute LBP and 33.8% (n=72) for CLBP. Cases where patients did not complete the whole 18-question mLBOS survey were analyzed using Little’s MCAR test; results determined that the missing data were random; MCAR, $\chi^2(8) = 14.89, p = 0.06$. As a result of the data being missing at random, data rescaling was performed.

The strategy of rescaling the missing data reduced the proportion of mLBOS missing data in the Alberta cohort from 14.9% to 11.6% for patients with acute/subacute LBP and from 16.9% to 11.6% for those with CLBP. In British Columbia, the rescaling strategy reduced mLBOS missing data from 23.8% to 10.6% for patients with acute/subacute LBP and from 33.8% to 11.3% for those with CLBP. For Alberta and British Columbia cohorts, the rescaled mLBOS data preserved the normal distribution that was present in the original data.

5.1.2 PATIENT CHARACTERISTICS IN ALBERTA OR BRITISH COLUMBIA
In both provinces there were patient characteristics that were distributed differently between MDT and ET (Tables 7-10). Based on the combined biological-psychological dimension the statistically significant different characteristics of patients with acute/subacute LBP between MDT and ET included pain
intensity, sleep disturbance due to pain, and constancy of pain. Patients with acute/subacute LBP in Alberta who used pain medication daily were significantly more often in MDT than ET.

The distribution of patient characteristics in terms of the combined biological-psychological dimension was different for patients with CLBP. In British Columbia, patients with constant pain were significantly more often in MDT than ET. In Alberta, the significantly different characteristic was that patients who used pain medication on a daily basis were significantly more often in MDT than ET.

Within the context of the social dimension, there were significant differences in the distribution of patient-related characteristics between MDT and ET. In Alberta and British Columbia, there were significantly more patients with acute/subacute LBP in MDT than ET who had treatment funded by their WCB. In Alberta, patients who were off work or did not have the pre-injury job available to return to were significantly more often in MDT than ET. For the biological dimension, there was only one characteristic that was significantly different. In British Columbia, male patients with CLBP were significantly more often in MDT than ET.

For the combined construct (biological, psychological, and social dimensions), the characteristic of low functional ability was significantly more often found among patients in MDT rather than ET in both provinces, regardless of chronic or acute/subacute LBP status.

In terms of the psychological dimension, the distribution of smoking status and age were not significantly different among patients in MDT or ET in either province.
### Table 7 Distribution of baseline characteristics among patients Acute/subacute LBP, ET and MDT programs in Alberta (n=275)

<table>
<thead>
<tr>
<th>Biopsychosocial Framework Dimension</th>
<th>Characteristic</th>
<th>ET Acute/subacute LBP (n=180)</th>
<th>Missing data n. %</th>
<th>ET Acute/subacute LBP (n=95)</th>
<th>Missing data n. %</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>Age, Years</td>
<td>38.4 ± 12.4</td>
<td>0 (0%)</td>
<td>41.1 ± 11.8</td>
<td>0 (0%)</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>Sex, Male</td>
<td>105 (58.3%)</td>
<td>0 (0%)</td>
<td>53 (55.8%)</td>
<td>0 (0%)</td>
<td>0.69</td>
</tr>
<tr>
<td>Biological - Psychological</td>
<td>Pain Intensity, NRS</td>
<td>6.8 ± 2.3</td>
<td>60 (33.8%)</td>
<td>7.7 ± 1.9</td>
<td>36 (37.9%)</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>Constancy of Pain, Constant</td>
<td>126 (70.0%)</td>
<td>0 (0%)</td>
<td>79 (83.2%)</td>
<td>0 (0%)</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td>Sleep Disturbance, Yes</td>
<td>146 (83.0%)</td>
<td>4 (2.2%)</td>
<td>86 (92.5%)</td>
<td>2 (2.1%)</td>
<td>0.031</td>
</tr>
<tr>
<td></td>
<td>Daily Pain Medication, Yes</td>
<td>68 (41.7%)</td>
<td>17 (9.4%)</td>
<td>55 (67.9%)</td>
<td>14 (14.7%)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Psychological</td>
<td>Smoking Status, Smoker</td>
<td>57 (33.9%)</td>
<td>11 (6.6%)</td>
<td>29 (35.8%)</td>
<td>14 (17.4%)</td>
<td>0.77</td>
</tr>
<tr>
<td>Biological - Psychological - Social</td>
<td>Functional Ability, mLBOS</td>
<td>61.2 ± 15.0</td>
<td>24 (13.3%)</td>
<td>46.5 ± 8.7</td>
<td>8 (8.4%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Social</td>
<td>Treatment Funder, WCB</td>
<td>120 (66.7%)</td>
<td>0 (0%)</td>
<td>90 (94.7%)</td>
<td>0 (0%)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td></td>
<td>Work Status, Working</td>
<td>125 (70.6%)</td>
<td>2 (1.6%)</td>
<td>28 (30.4%)</td>
<td>3 (3.2%)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td></td>
<td>Pre-Injury Job Available</td>
<td>165 (95.9%)</td>
<td>8 (4.4%)</td>
<td>83 (89.2%)</td>
<td>2 (2.1%)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

\(\alpha=0.05\), Baseline characteristic \%= n – missing data

### Table 8 Distribution of baseline characteristics among patients with CLBP, ET and MDT programs in Alberta (n=77)

<table>
<thead>
<tr>
<th>Biopsychosocial Framework Dimension</th>
<th>Characteristic</th>
<th>ET CLBP (n=29)</th>
<th>Missing data n. %</th>
<th>ET CLBP (n=48)</th>
<th>Missing data n. %</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>Age, Years</td>
<td>38.8 ± 13.8</td>
<td>0 (0%)</td>
<td>41.8 ± 11.8</td>
<td>0 (0%)</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>Sex, Male</td>
<td>18 (62.1%)</td>
<td>0 (0%)</td>
<td>36 (75%)</td>
<td>0 (0%)</td>
<td>0.23</td>
</tr>
<tr>
<td>Biological - Psychological</td>
<td>Pain Intensity, NRS</td>
<td>7.1 ± 2.3</td>
<td>7 (24%)</td>
<td>8.1 ± 1.9</td>
<td>18 (37.5%)</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>Constancy of Pain, Constant</td>
<td>23 (79.3%)</td>
<td>0 (0%)</td>
<td>40 (83.3%)</td>
<td>0 (0%)</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>Sleep Disturbance, Yes</td>
<td>28 (96.6%)</td>
<td>1 (3.4%)</td>
<td>46 (95.8%)</td>
<td>1 (2.1%)</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>Daily Pain Medication, Yes</td>
<td>13 (50.0%)</td>
<td>3 (10.3%)</td>
<td>34 (81.0%)</td>
<td>7 (14.3%)</td>
<td>0.007</td>
</tr>
<tr>
<td>Psychological</td>
<td>Smoking Status, Smoker</td>
<td>7 (28%)</td>
<td>4 (13.8%)</td>
<td>18 (40.9%)</td>
<td>4 (8.3%)</td>
<td>0.28</td>
</tr>
<tr>
<td>Biological - Psychological - Social</td>
<td>Functional Ability, mLBOS</td>
<td>50.9 ± 15.1</td>
<td>6 (20.7%)</td>
<td>39.1 ± 11.0</td>
<td>3 (6.2%)</td>
<td>0.002</td>
</tr>
<tr>
<td>Social</td>
<td>Treatment Funder, WCB</td>
<td>17 (58.6%)</td>
<td>0 (0%)</td>
<td>37 (77.1%)</td>
<td>0 (0%)</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>Work Status, Working</td>
<td>10 (35.7%)</td>
<td>1 (3.4%)</td>
<td>8 (17.4%)</td>
<td>2 (4.1%)</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>Pre-Injury Job Available</td>
<td>24 (96.0%)</td>
<td>4 (13.8%)</td>
<td>29 (70.7%)</td>
<td>7 (14.6%)</td>
<td>0.01</td>
</tr>
</tbody>
</table>

\(\alpha=0.05\), Baseline characteristic \%= n – missing data
### Table 9 Distribution of baseline characteristics among patients with Acute/subacute LBP, in ET and MDT programs in British Columbia (n=160)

<table>
<thead>
<tr>
<th>Biopsychosocial Framework Dimension</th>
<th>Characteristic</th>
<th>ET Acute/subacute LBP (n=114)</th>
<th>Missing data</th>
<th>ET Acute/subacute LBP (n=46)</th>
<th>Missing data</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>Age, Years</td>
<td>41.3 ± 11.8</td>
<td>0 (0%)</td>
<td>44.3 ± 10.7</td>
<td>0 (0%)</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>Sex, Male</td>
<td>65 (57.0%)</td>
<td>0 (0%)</td>
<td>24 (52.2%)</td>
<td>0 (0%)</td>
<td>0.58</td>
</tr>
<tr>
<td>Biological - Psychological</td>
<td>Pain Intensity, NRS</td>
<td>6.4 ± 2.2</td>
<td>58 (50.8%)</td>
<td>7.5 ± 1.3</td>
<td>27 (58.6%)</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Constancy of Pain, Constant</td>
<td>62 (54.4%)</td>
<td>0 (0%)</td>
<td>34 (73.9%)</td>
<td>0 (0%)</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Sleep Disturbance, Yes</td>
<td>98 (87.5%)</td>
<td>2 (1.7%)</td>
<td>46 (100%)</td>
<td>0 (0%)</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Daily Pain Medication, Yes</td>
<td>73 (68.9%)</td>
<td>8 (7%)</td>
<td>30 (75%)</td>
<td>6 (13%)</td>
<td>0.47</td>
</tr>
<tr>
<td>Psychological</td>
<td>Smoking Status, Smoker</td>
<td>28 (25.5%)</td>
<td>4 (3.5%)</td>
<td>9 (21.4%)</td>
<td>4 (8.7%)</td>
<td>0.61</td>
</tr>
<tr>
<td>Biological - Psychological - Social</td>
<td>Functional Ability, mLBOS</td>
<td>51.5 ± 14.0</td>
<td>13 (10.5%)</td>
<td>45.4 ± 9.6</td>
<td>5 (10.9%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Social</td>
<td>Treatment Funder, WCB</td>
<td>91 (79.8%)</td>
<td>0 (0%)</td>
<td>43 (93.5%)</td>
<td>0 (0%)</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>Work Status, Working</td>
<td>27 (23.7%)</td>
<td>0 (0%)</td>
<td>5 (10.9%)</td>
<td>0 (0%)</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>Pre-Injury Job Available, Yes</td>
<td>96 (94.1%)</td>
<td>13 (10.5%)</td>
<td>42 (97.7%)</td>
<td>3 (6.5%)</td>
<td>0.67</td>
</tr>
</tbody>
</table>

α=0.05, Baseline characteristic % = n – missing data

### Table 10 Distribution of baseline characteristics among patients with CLBP, in ET and MDT programs in British Columbia (n=213)

<table>
<thead>
<tr>
<th>Biopsychosocial Framework Dimension</th>
<th>Characteristic</th>
<th>ET CLBP (n=54)</th>
<th>Missing data</th>
<th>ET CLBP (n=159)</th>
<th>Missing Data</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>Age, Years</td>
<td>44.7 ± 11.0</td>
<td>0 (0%)</td>
<td>43.2 ± 11.0</td>
<td>0 (0%)</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>Sex, Male</td>
<td>24 (44.4%)</td>
<td>0 (0%)</td>
<td>109 (68.6%)</td>
<td>0 (0%)</td>
<td><strong>0.002</strong></td>
</tr>
<tr>
<td>Biological - Psychological</td>
<td>Pain Intensity, NRS</td>
<td>7.3 ± 1.7</td>
<td>24 (44.4%)</td>
<td>7.4 ± 2.0</td>
<td>105 (68%)</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>Constancy of Pain, Constant</td>
<td>27 (50.0%)</td>
<td>0 (0%)</td>
<td>116 (73.0%)</td>
<td>0 (0%)</td>
<td><strong>0.002</strong></td>
</tr>
<tr>
<td></td>
<td>Sleep Disturbance, Yes</td>
<td>47 (94.0%)</td>
<td>4 (7.4%)</td>
<td>152 (98.1%)</td>
<td>4 (2.5%)</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td>Daily Pain Medication, Yes</td>
<td>33 (64.7%)</td>
<td>5 (9.2%)</td>
<td>106 (70.2%)</td>
<td>9 (5.6%)</td>
<td>0.46</td>
</tr>
<tr>
<td>Psychological</td>
<td>Smoking Status, Smoker</td>
<td>17 (32.7%)</td>
<td>2 (3.7%)</td>
<td>59 (38.6%)</td>
<td>6 (3.8%)</td>
<td>0.45</td>
</tr>
<tr>
<td>Biological - Psychological - Social</td>
<td>Functional Ability, mLBOS</td>
<td>45.8 ± 10.4</td>
<td>5 (9.3%)</td>
<td>37.3 ± 9.7</td>
<td>19 (11.9%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Social</td>
<td>Treatment Funder, WCB</td>
<td>34 (63.0%)</td>
<td>0 (0%)</td>
<td>142 (89.3%)</td>
<td>0 (0%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Work Status, Working</td>
<td>9 (17.0%)</td>
<td>1 (1.9%)</td>
<td>7 (4.4%)</td>
<td>1 (0.6%)</td>
<td><strong>0.003</strong></td>
</tr>
<tr>
<td></td>
<td>Pre-Injury Job Available, Yes</td>
<td>40 (83.3%)</td>
<td>6 (11.1%)</td>
<td>107 (81.1%)</td>
<td>27 (17%)</td>
<td>0.73</td>
</tr>
</tbody>
</table>

α=0.05, Baseline characteristic % = n – missing data
5.2 OBJECTIVE TWO

(A) To examine, when controlling for all available baseline patient characteristics, which baseline patient-related factors are independently associated with patients who received MDT versus ET.

(B) To examine whether there are any differences in baseline patient-related factors when patients in Alberta are analyzed separately from patients in British Columbia.

5.2.1 MULTICOLLINEARITY TESTING

Correlations ranged from 0.000 to 0.230 for the combined cohort (Appendix G), 0.003 to 0.333 for Alberta (Appendix H) and 0.001 to 0.444 for British Columbia (Appendix I), which were below the threshold for collinearity. Additionally, all VIFs were below the recommended cutoff of 10 (Appendices J, K, L). As a result, no evidence of multicollinearity was apparent.

5.2.2 ANALYSIS OF COMBINED PROVINCIAL COHORT OF PATIENT-RELATED FACTORS INDEPENDENTLY ASSOCIATED WITH RECEIVING MDT

Logistic regression analysis was performed to describe the odds of receiving MDT compared to ET. The model was statistically significant and indicated that the covariates, as a set, reliably distinguished between patients who received MDT and ET, $\chi^2(1, N = 563) = 238.42, p < 0.0001$. Table 11 summarizes the logistic regression model of patients receiving MDT in the combined cohort. Six patient-related factors were significant, those who received MDT had 4.38 the odds of being funded by WCB, 3.80 times the odds of having CLBP, 2.21 times the odds of reporting that their pain was constant in nature, and 2.28 times the odds of being off work. For each one point increase in functional ability score, the odds of being in MDT decreased by 7%, and 2.20 times the odds of being from British Columbia.

Table 11 Combined Alberta and British Columbia cohort analysis of patient-related factors associated with receiving MDT (N = 563, missing data was 22.3%)

<table>
<thead>
<tr>
<th>Biopsychosocial Framework Dimension</th>
<th>Independent Variables</th>
<th>OR</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>Age, Years</td>
<td>1.01</td>
<td>0.99 - 1.03</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>Sex (Male)</td>
<td>0.92</td>
<td>0.60 - 1.41</td>
<td>0.70</td>
</tr>
<tr>
<td>Biological - Psychological</td>
<td>Constancy of Pain (Constant)</td>
<td>2.21</td>
<td>1.33 - 3.65</td>
<td><strong>0.002</strong></td>
</tr>
</tbody>
</table>
Sleep disturbance (Yes)  2.28  0.60 - 8.60  0.23
Daily Pain Medication (Yes)  1.41  0.86 - 2.31  0.17

Psychological
Smoking Status (Smoker)  0.92  0.59 - 1.44  0.73

Biological - Psychological - Social
Functional Ability, mLLOS  0.93  0.91 - 0.96  **0.0005**
Symptom Duration (Chronic)  3.80  2.31-6.23  **<0.0001**

Social
Treatment Funder (WCB)  4.38  2.38 - 8.07  **<0.0001**
Pre-Injury Job Availability (Yes)  1.06  0.52 - 2.16  0.88
Work Status (Off Work)  2.28  1.31 - 3.96  **0.003**
Clinic Location (BC)  2.20  1.33 - 3.63  **0.002**

Note: Indicator variable in parentheses, Odds Ratio (OR), Confidence Interval (CI), α = 0.05.

**Combined Cohort Goodness-of-Fit of the Logistic Regression Model**

The Hosmer-Lemeshow test indicated that there was no significant difference between observed and model-predicted values, $\chi^2 (8, N = 563) = 11.34$, $p = 0.18$. The goodness-of-fit of the regression model was examined by considering the proportion of cases that the model correctly classified. The null model correctly classified 53.6% of patients if all received MDT. In comparison, 73.2% were correctly classified for MDT and 76.5% for ET (Table 12). Overall, 75.0% were correctly classified. This was an improvement over the null model and suggested that the regression model with 12 covariates was a better fit than the model containing only the constant.

**Table 12 Observed and the predicted frequencies for the combined provinces cohort of patients who received MDT and ET**

<table>
<thead>
<tr>
<th></th>
<th>ET</th>
<th>MDT</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed</td>
<td>231</td>
<td>71</td>
<td>76.5</td>
</tr>
<tr>
<td>MDT</td>
<td>70</td>
<td>191</td>
<td>73.2</td>
</tr>
<tr>
<td>Overall % correct</td>
<td></td>
<td></td>
<td>75.0</td>
</tr>
</tbody>
</table>
5.2.3 ANALYSIS OF ALBERTA COHORT OF PATIENT-RELATED FACTORS INDEPENDENTLY ASSOCIATED WITH RECEIVING MDT

Of the total 352 patients in Alberta, 284 patients had complete data that were available for analysis.

Total of patients that received MDT were 115 and 169 in ET. Logistic regression analysis was performed to describe the odds of having received MDT compared to ET. The model was statistically significant and indicated that the covariates, as a set, reliably distinguished between receiving MDT or ET, \( \chi^2 (1, n = 284) = 127.62, p < 0.0001 \). Table 13 summarizes the logistic regression model. Four patient-related factors were significant: those who received MDT had 5.39 the odds of being funded by WCB, 2.30 times the odds of having CLBP, and 2.18 times the odds of being off work. For each one point increase in the functional ability score, the odds of receiving MDT decreased by 7%.

Table 13 Alberta cohort analysis of patient-related factors independently associated with receiving MDT (n = 284, missing data was 19.3%)

<table>
<thead>
<tr>
<th>Biopsychosocial Framework Dimension</th>
<th>Independent Variables</th>
<th>OR</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>Age, Years</td>
<td>1.02</td>
<td>0.99 - 1.04</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Sex (Male)</td>
<td>1.54</td>
<td>0.61 - 2.94</td>
<td>0.19</td>
</tr>
<tr>
<td>Biological - Psychological</td>
<td>Constancy of Pain (Constant)</td>
<td>2.20</td>
<td>0.95 - 5.08</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>Sleep Disturbance (Yes)</td>
<td>2.17</td>
<td>0.42 - 11.10</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>Daily Pain Medication (Yes)</td>
<td>1.07</td>
<td>0.53 - 2.15</td>
<td>0.86</td>
</tr>
<tr>
<td>Psychological</td>
<td>Smoking Status (Smoker)</td>
<td>1.27</td>
<td>0.66 - 2.45</td>
<td>0.48</td>
</tr>
<tr>
<td>Biological - Psychological - Social</td>
<td>Functional Ability, mLBOS</td>
<td>0.93</td>
<td>0.90 - 0.96</td>
<td>0.0005</td>
</tr>
<tr>
<td></td>
<td>Symptom Duration (Chronic)</td>
<td>2.30</td>
<td>1.00 - 5.27</td>
<td>0.05</td>
</tr>
<tr>
<td>Social</td>
<td>Treatment Funder (WCB)</td>
<td>5.39</td>
<td>2.20 - 13.23</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>Pre-Injury Job Availability (Yes)</td>
<td>1.70</td>
<td>0.51 - 5.65</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>Work Status (Off Work)</td>
<td>2.17</td>
<td>1.10 - 4.29</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Note: Indicator variable in parentheses, Odds Ratio (OR), Confidence Interval (CI), \( \alpha = 0.05 \).

Alberta Goodness-of-Fit of the Logistic Regression Model

The Hosmer-Lemeshow test indicated that there was no significant difference between observed and model-predicted values, \( \chi^2 (8, n = 285) = 7.44, p = 0.49 \). The goodness-of-fit of the regression model was examined by considering the proportion of cases that the model correctly classified. The null model
correctly classified 59.5% of patients if all received MDT. In comparison, 72.2% were correctly classified for MDT and 80.5% for ET (Table 14). Overall, 77.1% were correctly classified. This was an improvement over the null model and suggested that the regression model with 11 covariates was a better fit than the model containing only the constant.

Table 14 Observed and the predicted frequencies for the Alberta cohort of patients who received MDT and ET

<table>
<thead>
<tr>
<th>Predicted</th>
<th></th>
<th></th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ET</td>
<td>MDT</td>
<td></td>
</tr>
<tr>
<td>ET</td>
<td>136</td>
<td>33</td>
<td>80.5</td>
</tr>
<tr>
<td>MDT</td>
<td>32</td>
<td>83</td>
<td>72.2</td>
</tr>
<tr>
<td>Overall % correct</td>
<td></td>
<td></td>
<td>77.1</td>
</tr>
</tbody>
</table>

5.2.4 ANALYSIS OF BRITISH COLUMBIA COHORT OF PATIENT-RELATED FACTORS INDEPENDENTLY ASSOCIATED WITH RECEIVING MDT

Of the total 373 patients in British Columbia, 279 patients had complete data that were available for analysis. Total patients that received MDT were 146 and 133 in ET. The model was statistically significant and indicated that covariates, as a set, reliably distinguished between receiving MDT and ET, \( \chi^2(1, \ n = 279) = 114.59, \ p < 0.0001 \). Table 15 summarizes the logistic regression model. Four patient-related factors were significant: those patients who received MDT had 5.28 the odds of having CLBP, 2.56 the odds of reporting constant pain, and 3.76 the odds of having treatment funded by their WCB. For each point increase in the functional ability score, the odds of receiving MDT decreased by 7%.

Table 15 British Columbia cohort analysis of patient-related factors independently associated with receiving MDT (n = 279, missing data was 25.2%)

<table>
<thead>
<tr>
<th>Biopsychosocial Framework Dimension</th>
<th>Independent Variables</th>
<th>OR</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>Age, Years</td>
<td>1.01</td>
<td>0.98 - 1.04</td>
<td>0.45</td>
</tr>
<tr>
<td>Biological</td>
<td>Sex (Male)</td>
<td>1.32</td>
<td>0.72 - 2.40</td>
<td>0.37</td>
</tr>
<tr>
<td>Biological - Psychological</td>
<td>Constancy of Pain (Constant)</td>
<td>2.56</td>
<td>1.31 - 5.03</td>
<td><strong>0.006</strong></td>
</tr>
<tr>
<td>Biological - Psychological</td>
<td>Sleep Disturbance (Yes)</td>
<td>3.24</td>
<td>0.30 - 34.85</td>
<td>0.33</td>
</tr>
</tbody>
</table>
### Summary of Logistic Regression Results

<table>
<thead>
<tr>
<th>Category</th>
<th>Variable</th>
<th>Odds Ratio (OR)</th>
<th>95% Confidence Interval</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychological</td>
<td>Smoking Status (Smoker)</td>
<td>1.02</td>
<td>0.54 - 1.95</td>
<td>0.94</td>
</tr>
<tr>
<td>Biological - Psychological - Social</td>
<td>Functional Ability, mLBOS</td>
<td>0.93</td>
<td>0.90 - 0.96</td>
<td>0.0005</td>
</tr>
<tr>
<td></td>
<td>Symptom Duration (Chronic)</td>
<td>5.28</td>
<td>2.75 - 10.13</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Social</td>
<td>Treatment Funder (WCB)</td>
<td>3.76</td>
<td>1.55 - 9.11</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>Pre-Injury Job Availability (Yes)</td>
<td>1.70</td>
<td>0.68 - 4.27</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>Work Status (Off Work)</td>
<td>2.17</td>
<td>0.72 - 6.37</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Note: Indicator variable in parentheses, Odds Ratio (OR), Confidence Interval (CI), α = 0.05.

**British Columbia Goodness-of-Fit of the Logistic Regression Model**

The Hosmer-Lemeshow test indicated that there was no significant difference between observed and model-predicted values, $\chi^2 (8, n = 279) = 10.12, p = 0.26$. The goodness-of-fit of the regression model was examined by considering the proportion of cases that the model correctly classified. The null model had a correct classification percentage of 52.3% of patients if all received MDT. In comparison, 78.8% were correctly classified for MDT and 72.9% for ET (Table 16). Overall, 76.0% of cases were correctly classified. This was an improvement over the 52.8% correct classification with the null model and suggested that the regression model with 10 covariates was a better fit than the model containing only the constant.

**Table 16 Observed and predicted frequencies for the British Columbia cohort of patients who received MDT and ET**

<table>
<thead>
<tr>
<th></th>
<th>Predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Observed</strong></td>
<td><strong>ET</strong></td>
</tr>
<tr>
<td>ET</td>
<td>97</td>
</tr>
<tr>
<td>MDT</td>
<td>31</td>
</tr>
<tr>
<td><strong>Overall % correct</strong></td>
<td></td>
</tr>
</tbody>
</table>

### 5.3 Summary Table for Alberta, British Columbia and Combined Cohorts

Based on logistic regression analyses of the combined, Alberta and British Columbia cohorts, Table 17 summarizes the patient-related factors associated with patients receiving MDT in comparison to ET.
### Table 17 Summary table of statistically significant patient-related factors for receiving MDT compared to ET

<table>
<thead>
<tr>
<th>Biopsychosocial framework dimensions</th>
<th>Factor</th>
<th>Alberta</th>
<th>British Columbia</th>
<th>Combined provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td>Treatment Funder (WCB)</td>
<td>5.39</td>
<td>3.76</td>
<td>4.38</td>
</tr>
<tr>
<td></td>
<td>Work Status (Off Work)</td>
<td>2.17</td>
<td>NS</td>
<td>2.28</td>
</tr>
<tr>
<td>Biological-psychological</td>
<td>Constancy of Pain (Constant)</td>
<td>NS</td>
<td>2.56</td>
<td>2.21</td>
</tr>
<tr>
<td>Biological-psychological-social</td>
<td>Functional Ability (mLBOS)</td>
<td>0.93</td>
<td>0.93</td>
<td>0.93</td>
</tr>
<tr>
<td></td>
<td>Symptom Duration (Chronic)</td>
<td>2.30</td>
<td>5.28</td>
<td>3.80</td>
</tr>
</tbody>
</table>

Note: Not Significant (NS)
6.0 DISCUSSION

6.1 RELEVANCE OF FINDINGS FROM A BIOPSYCHOSOCIAL PERSPECTIVE
In this study, patients with LBP and psychosocial challenges were evaluated. Patient-related factors were examined that were independently associated with patients treated in MDT and ET. Researchers have utilized the biopsychosocial framework to examine LBP. Results of this study provide a unique contribution to the literature in terms of the utility of the framework as a lens to examine patient-related factors in MDT and ET samples. Regression results revealed that, although limited in number, there were differences between patients treated in the two programs and those differences represent various dimensions of the alternative biopsychosocial model (figure 4). Furthermore, those differences in patient-related factors aligned in their totality with the admission criteria provided by WCBs for what patients should be in which program. Lower functional ability, more chronic, off work patients who reported constant pain were in MDT while patients with higher functional ability, more acute, who were working, and who reported intermittent pain were in ET. Another significant difference found between patients included who their treatment funder was; MDT patients were more often funded by WCB and ET patients were more often funded by auto insurers. The findings of this study create an opportunity for clinicians, treatment funders and researchers to become more educated on and to collaborate to improve the understanding of admission criteria as they relate to treatment programming. The lack of admission criteria and imprecision of definition of admission criteria should be improved to avoid potential problems associated with not understanding what patients receive which treatment program. The findings of this study matter because clinicians collectively want to practice with an evidence-informed approach and this is the first study to provide a scientific evaluation of which patients receive MDT and ET treatments. Another important point is that the quality of clinical datasets can be less than ideal for statistical analysis and may impact the interpretation of results. The findings of this study can be utilized to provide a call to action to clinicians and researchers to engage and develop strategies to enhance the quality of clinical datasets.
**Alberta**

<table>
<thead>
<tr>
<th>ET</th>
<th>MDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pain Disability Index 30-48/70</td>
<td>• Pain Disability Index 48/70</td>
</tr>
<tr>
<td>• VAS 4-7/10</td>
<td>• VAS greater than 7/10</td>
</tr>
<tr>
<td>• SF-36 moderate issues</td>
<td>• SF-36 significant issues</td>
</tr>
<tr>
<td>• <strong>Light to medium level of function</strong>¹</td>
<td>• <strong>Sedentary to light level of function</strong>¹</td>
</tr>
<tr>
<td>• Greater than 20 lbs. discrepancy from job demands</td>
<td>• <strong>Pain limited functional tolerances</strong>¹</td>
</tr>
<tr>
<td>• Some pain behaviors</td>
<td>• Significant pain behaviors</td>
</tr>
<tr>
<td>• Significant range of motion deficit</td>
<td>• Significant range of motion deficit</td>
</tr>
<tr>
<td>• Significant strength and endurance deficit</td>
<td>• Significant strength and endurance deficit</td>
</tr>
<tr>
<td>• Any working situation (no pre-injury job available, not working or working)</td>
<td>• Any work situation (no pre-injury job available, not working, working)</td>
</tr>
<tr>
<td></td>
<td>• Pain medication dependency</td>
</tr>
<tr>
<td></td>
<td>• Previous unsuccessful return to work program²,³</td>
</tr>
</tbody>
</table>

---

**British Columbia**

<table>
<thead>
<tr>
<th>ET</th>
<th>MDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• At least three weeks post-injury²</td>
<td>• <strong>Functional deficit or impairment that has not responded to initial attempts to facilitate a return to work</strong>²,³</td>
</tr>
<tr>
<td>• Injury is soft tissue</td>
<td>• Presence of vocational, psychosocial and / or medical issues which require the involvement of a multidisciplinary team to facilitate a return to work³</td>
</tr>
<tr>
<td>• There are no medical contraindications to an activity-based program</td>
<td></td>
</tr>
<tr>
<td>• The injured worker will benefit from active exercises to improve strength, endurance and mobility</td>
<td></td>
</tr>
</tbody>
</table>

---

**Figure 4. WCB Admission Criteria and Alternative Biopsychosocial Model Including Patient-Related Factors**

- PSYCHOLOGICAL
- SOCIAL
- BIOLOGICAL

- smoking status
- functional ability²
- symptom duration³
- work status³
- pre-injury job availability
- treatment funder
- age
- sex
- daily pain medication
- sleep disturbance
- constancy of pain
- MDT
- ET
- WCB
- Admission Criteria
- Alternative Biopsychosocial Model
- Patient-Related Factors
It is important to consider the admission criteria provided by the Alberta and British Columbia WCBs and the results of this study. In terms of the combined biological – psychological - social dimension of the biopsychosocial model (figure 4) both patient-related factors (functional ability and duration of symptoms) were significantly different between patients in the MDT and ET samples. The significant finding of functional ability level reveals that patients who received MDT in both provinces have significantly lower functional ability levels than ET patients. In both provinces, for each single point decrease in the scoring of the functional ability survey (mLBOS) the odds of receiving MDT increased by 7% (Odds Ratios: Alberta 0.93, British Columbia 0.93). This functional ability finding supports the lower functional ability level admission criterion of the Alberta WCB, which outlines “sedentary to light level of function” for MDT in comparison to the higher level for ET “light to medium level of function.”

Furthermore, the Alberta MDT criterion included “pain limited functional tolerances” while the ET program did not. The British Columbia WCB admission criterion includes “functional deficit that has not responded to initial attempts to facilitate a return to work.” Although the British Columbia criterion definition is open to interpretation, one can infer that the functional ability of the patient is reduced to a low level that precludes return to work. Not only did the functional ability finding in both provinces support the WCB MDT admission criteria (WCB Alberta, 2013; WorkSafe British Columbia, 2013) it was also consistent with research indicating that patients with subacute LBP or CLBP are likely to have functional improvement with receiving MDT programs (Kamper et al., 2015; Karjalainen et al., 2008).

The finding of this study that MDT patients reported significantly lower functional levels than ET patients supports research that indicates lower functional ability levels are consistent with patients with severe problems that may involve fear of pain and movement, painful mechanical strain of the low back and difficulties with return to work (Gatchel et al., 2007; Waddell & Aylward, 2010). The MDT approach has resources that address each of those issues differently than ET programs (Hayden et al., 2005; Kamper et al., 2015).
Another biological-psychological-social dimension patient-related factor, namely symptom duration, was significantly different for patients in the two programs examined in this study. Patients with symptom durations upwards of 90 days (i.e., chronic) had greater odds of being treated in MDT rather than ET (Odds Ratios: Alberta 2.3, British Columbia 5.3). Duration of symptoms is implied in Alberta and British Columbia WCB program admission criteria. The Alberta WCB admission criterion involving duration of symptoms and program states that the patient has a “previous unsuccessful return to work program.” The implication based on the criterion is that sufficient time has passed and an attempt at return to work has failed; hence, the duration of symptoms is becoming, if not already, chronic. For ET, the British Columbia WCB admission criterion for ET includes a symptom duration of “at least three weeks post-injury;” for MDT, the criterion is indirectly referred to as the patient having “not responded to initial attempts to facilitate a return to work” and this implies chronicity (WorkSafe British Columbia, 2013). The finding that patients with CLBP more frequently receive MDT rather than ET supports the literature that suggests that patients with CLBP are likely to respond to MDT to improve: pain, functional ability and return to work associated problems with pain management, managing psychosocial factors (such as fear avoidance), and pain catastrophization (Gatchel et al., 2007; Qaseem et al., 2017). Patients in MDT may also experience return to work issues including limited supervisor or co-worker support, which act as barriers to recovery (Waddell & Aylward, 2010). Thus, these patients would benefit from a MDT approach of behavioral treatments and workplace or ergonomic measures.

In terms of the biological-psychological dimension of the alternative biopsychosocial model (figure 4) this study revealed that one of three patient-related factors was different between patients in MDT and ET samples. Constancy of pain reports was a significant patient-related factor in those who received MDT. For British Columbia the odds of reporting constant LBP and receiving MDT (Odds Ratio 2.6) was greater than patients in ET. For Alberta, constancy of pain trended toward being a significant factor for patients receiving MDT. Neither province has MDT or ET admission criteria addressing a patient’s report
of constancy of pain, nor is there research that identifies constancy of pain as a patient-related factor associated with treatment programming in terms of MDT and ET. Constant pain and receiving MDT is consistent with prior research that suggests patients with constant reports of LBP experience an ongoing issue of managing and coping with their symptoms (McIntosh et al., 2000b). The findings of the current study shed light on the association between constancy of pain and which program patients receive treatment within. This result adds to the literature because constancy of pain has not been studied in terms of MDT and ET programs.

With respect to the social dimension of the biopsychosocial model (figure 4) this study revealed that two of the three patient-related factors were significantly different between patients in the MDT and ET samples. As has been discussed, work status was a significant patient-related factor regarding which patients receive MDT. For Alberta, the odds of being off work and receiving MDT (Odds Ratio 2.2) were greater than patients in ET and this is consistent with the WCB admission criterion of a “previous unsuccessful return to work program.” For British Columbia, this study revealed that the odds of being off work and receiving MDT trended toward significance. In British Columbia there are two WCB admission criteria for MDT that involve patients who are off work: “functional deficit or impairment that has not responded to initial attempts to facilitate a return to work,” and “presence of vocational, psychosocial and/or medical issues which require the involvement of a multidisciplinary team to facilitate a return to work.” These criteria are consistent with MDT patients being off work. A reason that may have contributed to this finding is that only patients who were off work were likely available to attend MDT which is a multiple hours per day treatment program. The daily six hours duration of MDT sessions are incompatible with daily schedules of working individuals. The literature proposes that MDT should include adequate resources to address return to work for occupations with heavy physical demands and a poor ability to support workplace reintegration (Hoogendoorn et al., 2002; Sullivan et al., 2005; Waddell & Aylward, 2010). Although no data regarding occupations were collected as part of
In this study, the findings of patients who were off work receiving MDT more often than ET supports the literature in terms of MDT providing resources to address return to work. British Columbia and Alberta WCB data suggest that injuries occur in workers from male employee dominated industries such as oil/gas, forestry, agriculture and fishing (Alberta Human Services, 2012; WorkSafe British Columbia, 2012). The geographical distribution (including Vancouver Island, Prince George, Fort McMurray, Edmonton and Red Deer) of clinics associated with this study sample suggests that some patients may have been employed in those industries. Practicing clinicians from Alberta and British Columbia reported that occupations from those industries have limited opportunities to accommodate a gradual return to work (personal communication, 2015). This means that individuals receiving rehabilitation programming that work in these occupations required the ability to be fully ready to return to work by program completion and MDT supported that goal.

This study demonstrated that a significant social dimension patient-related factor associated with patients receiving MDT included the treatment funder being WCB more often than it being an auto insurer (Odds Ratios: Alberta 5.4, British Columbia 3.8). The small proportion of auto insured patients in this study suggests that these results should be interpreted with caution in the context of the auto insurer funded patient; however, the significant treatment funder finding draws attention towards results which may have suggested patients with a) lower functional abilities, b) constant pain reports, c) symptom durations greater than 90 days and d) off work were more often in MDT if the treatment funder was WCB and more often in ET if the treatment funder was an auto insurer. The significant treatment funder finding appeared to represent a mismatch where patients with more severe LBP problems who are funded by auto insurers more often receive ET instead of the more robust rehabilitation resources available in MDT. This apparent mismatch of treatment program and patients may have been the result of patients who were funded by auto insurers requiring approval of treatment programs on an individual basis as no treatment funder program admission criteria exist. This approval
process is potentially burdensome because busy clinicians who identify patients with: lower functional ability levels, more chronic durations of symptoms, report constant LBP and were off work, would have to take extra time to obtain MDT funding approval. That process may in part have contributed to reduced odds of auto insurer funded patients in MDT because clinicians did not take the time to obtain approval. Another reason that may have contributed to the significant finding of treatment funder in this study may have been that auto insurer funded patients may not all have experienced LBP that were more severe than the patients whose treatment was funded by WCB. To better understand the differences in terms of baseline patient characteristics between WCB and auto insurer funded patients a post hoc univariate analysis was completed (see Appendix M). The analysis revealed significant differences between who a patients’ treatment funder was and baseline patient characteristics of: a) mean age (WCB 42.8 years, Auto insurer 38.7 years), b) sex being male (WCB 64%, Auto insurer 45%), c) daily use of pain medication (WCB 65%, Auto insurer 52%), d) smokers (WCB 35%, Auto insurer 25%), e) mean functional ability levels (WCB 42, Auto insurer 53), and f) status of working (WCB 27%, Auto insurer 44%). The univariate analysis findings suggested that auto insurer funded patients may not have experienced as severe LBP problems as the WCB funded patients. The auto insurer funded patients having less severe LBP problems may, in part, have explained the higher odds of WBC funded patients having received MDT.

This study revealed that there were similarities between patients receiving MDT and ET. Some patient-related factors from the biological-psychological dimension (sleep disturbance and daily medication use), psychological dimension (smoking status), social dimension (pre-injury job availability) and biological dimension (age and sex) were not significantly different between patients receiving MDT and ET. These findings support the provincial WCB admission criteria where none of these patient-related factors are stipulated to be distinct admission criteria for MDT or ET (figure 4). These findings contribute
to the literature in terms of understanding which patient-related factors are similar between patients receiving MDT and ET.

6.2 IMPLICATIONS OF STUDY FINDINGS
This study revealed results that have important implications for clinicians. The first is that there are relatively few patient-related factors that were determined to be different between patients receiving MDT and ET. Univariate analysis identified nine significantly different patient characteristics in the Alberta sample and seven significantly different patient characteristics in the British Columbia sample. By utilizing regression analysis where there was controlling for baseline patient characteristics collected in this study only five patient-related factors were significantly associated with receiving MDT following regression analysis. This is important because the five patient-related factors are part of the established routine data collection during patient baseline assessment and as such they should be straightforward for clinicians to identify in each patient.

Another important implication of the findings of this study is that the results present an opportunity for treatment funders, clinicians and researchers to dialogue to consider opportunities to improve upon the precision and ease of interpretation of some program admission criteria. For example, the significant finding of the duration of symptoms patient-related factor may provide clarity to ET program patients being more often under 90 days of symptoms in light of the imprecise admission criterion of “at least three weeks post-injury” (WorkSafe British Columbia, 2013). Another example was the significant finding of the patient-related factor of work status that demonstrated that MDT patients had higher odds of being off work which raises some questions about the Alberta WCB admission criterion for both programs of “any work situation” (WCB Alberta, 2013). There are other WCB admission criteria that remain open to interpretation: for example the Alberta ET admission criterion of “some pain behaviors” and the MDT admission criterion of “significant pain behaviors” or the British Columbia ET admission criterion of “the injured worker will benefit from active exercise to improve strength, endurance and
mobility” (see figure 4). While the results of this study do not reveal what patients should be allocated to each program the results do suggest the need for collaborative dialogues with clinicians, researchers and the two provincial WCBs to determine how to improve the precision of definitions of admission criteria so that each criterion is more easily understood in terms of what patients are to be in each program.

When considering how these results fit with the current research it is clear that this study assists in understanding what is distinct about MDT and ET patient samples when addressing patients with LBP and psychosocial challenges. Results from this study add clarity to guidelines developed by Chou et al. (2007) and Qaseem et al. (2017). The clinical guidelines developed by Chou et al. (2007) and Qaseem et al. (2017) recommend that patients with LBP symptom durations greater than 90 days receive either MDT or ET; however, they do not stipulate who should receive MDT versus ET. The present study was designed to address the research question of what patients received MDT and ET; hence this study did not inform who should be allocated to each program. This study did reveal that patients with CLBP who have lower functional abilities received MDT and those patients with higher functional abilities received ET. Qaseem et al. (2017) reported that MDT is recommended to improve return to work. The Alberta result of patients who are off work being in MDT more often than ET is consistent with the recommendation by Qaseem et al. (2017) to select MDT.

The findings of this study in terms of the extent of missing data suggest that there is a need for clinics to take steps to improve the approach to data collection to improve the quality of the clinical dataset. Strategies should be put into place to increase the accountability at the clinician level for completeness of data collection. A suggested strategy to improve the completeness of data collection is to increase the frequency of clinic audits from semiannually to quarterly; having both clinic and provincial management
levels review the dataset to identify gaps in the completeness of the data collection, confirming the accuracy of the entered data followed by steps for remediation.

An important strategy to enhance clinical dataset quality is to create dialogues with clinicians and researchers about why particular types of data should be entered consistently and completely into the clinical database. This strategy should lead to consensus regarding why it is in a clinician’s and a patient’s best interests to do so; clinicians can be motivated to make changes that they view as beneficial. There is an opportunity to engage clinicians in design and evaluation of new formats for data entry, such as electronic documentation. This facilitates clinicians to shift from completing a paper data collection form and then having administrative staff do electronic data entry to a method that provides direct electronic data entry from the patient or clinician. This strategy of clinician engagement will improve data collection as it will provide clinicians more ownership of newly designed data collection formats and processes. There must be agreement not to increase the amount of time it takes for clinicians to improve completeness of data collection unless clinicians arrive at that conclusion themselves. Finally, clinical data analysis results need to be reported back to clinicians without delay. Doing so will demonstrate the value of the partnership between clinicians and researchers that is necessary to reap maximum research benefit from clinical datasets.

6.3 STUDY LIMITATIONS
A limitation of this study is the retrospective design utilizing an existing clinical database that was not designed with the intent to answer the research questions of the current study. The dataset examined in this study included data that was readily available and similar information was collected in different regions (Alberta and British Columbia). While this dataset provided a vast amount of information it did not include all provincially stipulated WCB admission criteria relevant to understanding who received MDT and ET. For example, the dataset did not provide data for program admission criteria including: Pain Disability Index, SF-36, range of motion, strength, or endurance values. Having data available to
evaluate each of the WCB admission criteria would provide an understanding as to whether other patient-related factors were significantly different in patients being treated in the two programs. The use of a clinical dataset including Alberta and British Columbia WCB and auto insurer funded patient data allowed for the generalization of results as they applied to the privately owned outpatient rehabilitation clinics in the two provinces; however, a limitation is that these findings may not be generalizable outside of these provinces and perhaps not to other treatment funders or other rehabilitation clinics even within Alberta and British Columbia. Another limitation of this study is the extent of missing data related to the pain intensity data. This study evaluated 725 patients and yet only 390 had pain intensity data available. As such this missing data resulted in the omission of the pain intensity variable in the regression analyses. Despite efforts to ensure consistent and complete data capture as part of the normal operation of clinics, this study revealed missing data is a challenge in a clinical dataset. This is problematic in the current study because research suggests that data regarding pain intensity are important to examine (Gatchel et al., 2007). In this study the impact of missing data related to pain intensity may have been mitigated by including other pain related data such as: daily pain medication use, sleep disturbance due to pain and constancy of pain.

6.4 STUDY STRENGTHS
In the literature, variation exists in definitions of MDT and ET. There is limited consistency in terms of: team composition, treatment setting, duration of a program, intensity of exercise, education, and content of these programs (Guzman et al., 2001; Hayden et al., 2005). This heterogeneity of program definitions presents a challenge to interpreting current research in the context of what patients are treated in MDT and ET (Hayden et al., 2005; Kamper et al., 2015; Karjalainen et al., 2008; van Geen et al., 2007). A strength of this study is the homogeneity of MDT and ET services provided between clinics
in Alberta and British Columbia. This homogeneity of treatment approach is the result of the treatment facilities being fully integrated outpatient rehabilitation clinics under a single corporate structure.

Another strength is the sample size of 725 patients. Studies in LBP prognosis literature typically have sample sizes under 500 (Chou & Shekelle, 2010; Iles et al., 2008; Roland et al., 2011). Hill et al. (2011) was one of few studies with larger with a sample size of 851. The sample size of this study enabled the utilization of 11 or 12 patient characteristics, depending on the specific regression analysis performed for evaluation associated with receiving MDT or ET.

Sample bias was mitigated in this study by the geographical dispersion of the involved clinics. As opposed to Lindstrom et al. (1992) where the sample was isolated to a single employer, or Smeets et al. (2008) who were limited to a confined geographical region. This study has the advantage of utilizing data from 21 clinics from various communities in northern and southern regions of each province.

6.5 FUTURE RESEARCH
This study is the first to evaluate patients with LBP and psychosocial challenges who received MDT and ET. As a result there are opportunities for future research on this topic. More studies examining patient-related factors associated with receiving MDT versus ET in other jurisdictions and include other treatment funders (e.g., long term disability insurers) would be of interest.

Future research with respect to what patients receive MDT versus ET should examine data not included in this study but that may be relevant based on the back pain literature relating to treatment triage and prognostic factors. For example, the research that involves the STarT Back tool that has examined triage to various types of physiotherapy-based treatments involving psychosocially informed interventions (Hill et al., 2011). The STarT Back tool identifies some patient-related factors associated with dimensions of the biopsychosocial framework; unfortunately not all of those patient-related factors were examined in the present study: referred leg pain, comorbid pain, and bothersomeness (Hay et al., 2008; Hill et al.,
2011). As another example, the clinical dataset utilized in this study included only one psychological dimension-based patient-related factor (smoking status). The inclusion of other psychological dimension patient-related factors examined in the prognostic back pain literature such as: psychological distress, anxiety and depression would have provided a more complete understanding of who received the two treatment programs (Hay et al., 2008; Ramond et al., 2011).

The results of the current study provide a sense of who received MDT or ET; however, without understanding treatment program outcomes we still do not know who should be allocated to each program. The results of this study suggest that future research should examine, in the context of a specific treatment funder (e.g., WCB) where sufficient funding exists for either MDT or ET, what patients should be allocated to each treatment program. This research question could be addressed in terms of a longitudinal prospective design study allowing for data to be collected to specifically understand what patients allocated to MDT and ET are able to successfully achieve outcomes such as pain reduction, or improved functional abilities or return to work. This would add clarity to decisions about treatment allocation where admission criteria are ambiguous or clinical guideline recommendations such as Qaseem et al. (2017) where both treatment programs are recommended for patients with CLBP.

6.6 CONCLUSIONS
Prior research has provided evidence that demonstrates MDT and ET are viable treatments for patients with LBP and psychosocial challenges. This study provides a unique and substantive contribution to the MDT and ET literature by assisting clinicians, researchers and treatment funders to have insight through the lens of the biopsychosocial framework and understand which patient-related factors are associated with patients receiving MDT and ET. This study revealed a limited number of differences between patients treated in the two programs and that these differences in patient-related factors align in their totality with the admission criteria provided by WCBs for what patients should be in which program. Lower functional ability, more chronic, off work patients who report constant pain are in MDT while
patients with higher functional ability, who are more acute, working and reporting intermittent pain are in ET. This study creates opportunities for clinicians, researchers and treatment funders to have newly available research findings to be educated on and collaborate to improve the understanding of admission criteria as they are associated to treatment programming. This study revealed that that clinical datasets come with data quality challenges that impact the ability to complete research, thereby providing opportunities for clinicians and researchers to engage, develop and execute on strategies to improve the quality of clinical datasets that will better enable rigorous research that is vital to evolving clinical practice.


compared with best current care. The start back trial study protocol. BMC Musculoskeletal Disorders, 9, 58, 1-9.


APPENDICES

Appendix A – MDT Summary of Findings

Appendix B – ET Summary of Findings

Appendix C – Lifestyle Questionnaire (PDQ)

Appendix D – Spinal Assessment Form

Appendix E – Intake Questionnaire – back / neck pain (mLBOS)

Appendix F – Consent to the collection, use and disclosure of personal or personal health information – Page 1 of 3. (see paragraph 5)

Appendix G - Correlation matrix for MDT program referral in combined cohort of Alberta and British Columbia

Appendix H – Correlation matrix for MDT program referral in Alberta

Appendix I – Correlation matrix for MDT program referral in BC

Appendix J – Collinearity testing: Combined Alberta and British Columbia cohort. Dependent variable program referral (MDT/ET)

Appendix K – Collinearity testing: Alberta cohort. Dependent variable program referral (MDT/ET)

Appendix L – Collinearity testing: British Columbia Cohort. Dependent variable program referral (MDT/ET)

Appendix M - Post hoc analysis, WCB versus Auto insured patients in Alberta & British Columbia
Appendix A – MDT Summary of Finding
## Appendix A – Summary of Findings MDT

<table>
<thead>
<tr>
<th>Systematic Review</th>
<th># of studies (participants)</th>
<th>Symptom duration</th>
<th>Participant characteristics</th>
<th>Comparison</th>
<th>Outcome</th>
<th>Type of evidence</th>
<th>Quality</th>
<th>Consistency</th>
<th>Directness</th>
<th>Effect size</th>
<th>GRADE</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>Karjalainen et al. 2008</td>
<td>2 (233)</td>
<td>4-12 weeks (subacute)</td>
<td>Age range (average) 39-44 years Males 40 - 70% VAS = 40-44 McGill-Melzack pain questionnaire = 22.9 - 28.5 Oswestry Disability Index = 29-33 Mean duration of sick listing 41 - 60 days</td>
<td>MDT vs. usual care or non-exercise</td>
<td>Pain intensity</td>
<td>4</td>
<td>-3</td>
<td>0</td>
<td>-1</td>
<td>Lindstrom et al. did not report pain intensity results. Loisel et al., found no statistically significant difference in pain intensity (McGill-Melzack pain questionnaire, -10.13, ( p=0.06 )).</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, unclear allocation in 1 study, and weak methods; directness points deducted for no direct statistical analysis in 1 study and wide variation of interventions between studies.</td>
</tr>
<tr>
<td>2 (233)</td>
<td>As above</td>
<td>As above</td>
<td>MDT vs. usual care or non-exercise</td>
<td>Functional ability</td>
<td>4</td>
<td>-3</td>
<td>0</td>
<td>-1</td>
<td>Subjective disability decreased significantly more in the Lindstrom study, mean difference = -1.2, 95% CI = -1.984 to -0.416. Loisel study disability decreased in Oswestry scores (10.73, ( p=0.020 ))</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, unclear allocation in 1 study, and weak methods; directness points deducted for no direct statistical analysis in 1 study and wide variation of interventions between studies.</td>
<td></td>
</tr>
<tr>
<td>2 (233)</td>
<td>As above</td>
<td>As above</td>
<td>MDT vs. usual care or non-exercise</td>
<td>Return to work</td>
<td>4</td>
<td>-3</td>
<td>0</td>
<td>-1</td>
<td>For the Lindstrom et al. study MDT group RTW significantly sooner. The average time before RTW was 10 weeks (SD=12.7) in the MDT group and 15.1 weeks (SD=15.6) in the control group. In the Loisel et al. study RTW was 2.4 times faster in the MDT group (95% CI 1.18 - 3.1)</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, unclear allocation in 1 study, and weak methods; directness points deducted for no direct statistical analysis in 1 study and wide variation of interventions between studies.</td>
<td></td>
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### Appendix A – Summary of Findings MDT

<table>
<thead>
<tr>
<th>Systematic Review</th>
<th># of studies (participants)</th>
<th>Symptom duration</th>
<th>Participant characteristics</th>
<th>Comparison</th>
<th>Outcome</th>
<th>Type of evidence</th>
<th>Quality</th>
<th>Consistency</th>
<th>Directness</th>
<th>Effect size</th>
<th>GRADE</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>Van Geen et al., 2007</td>
<td>7 (1246)</td>
<td>6 months - 9.8 years (Chronic)</td>
<td>Age range (average) 34-46 years Males 33 - 72% NRS = 25/100 VAS = 6/10 McGill Pain Questionnaire = 18.3 - 25.5 Off work 10-100%</td>
<td>MDT vs. usual care or non-exercise or other physical interventions</td>
<td>Pain intensity</td>
<td>4</td>
<td>-2</td>
<td>0</td>
<td>-1</td>
<td>Improved pain outcomes in one of the 7 studies. No effect size was provided.</td>
<td>Moderate</td>
<td>Quality points deducted for incomplete reporting of results, inconsistent use of outcomes measures, and weak methods; directness point deducted for lack of control for co-interventions, wide variation of intensity of interventions between studies.</td>
</tr>
<tr>
<td>8 (1327)</td>
<td>As above</td>
<td>As above</td>
<td>MDT vs. usual care or non-exercise or other physical interventions</td>
<td>Functional ability</td>
<td>4</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>Improved functional ability in one study. Compared MDT to home exercise program 7.7% improved Oswestry Disability Index score (95% CI of mean paired difference 3.9-11.6, p&lt;0.001).</td>
<td>Moderate</td>
<td>Quality points deducted for incomplete reporting of results, inconsistent use of outcomes measures, and weak methods; directness point deducted for lack of control for co-interventions, wide variation of intensity of interventions between studies.</td>
<td></td>
</tr>
<tr>
<td>10 (1958)</td>
<td>As above</td>
<td>As above</td>
<td>MDT vs. usual care or non-exercise or other physical interventions</td>
<td>Return to work</td>
<td>4</td>
<td>-2</td>
<td>0</td>
<td>-1</td>
<td>3 studies found a positive effect for MDT programs on return to work. No effect size was provided.</td>
<td>Moderate</td>
<td>Quality points deducted for incomplete reporting of results, inconsistent use of outcomes measures, and weak methods; directness point deducted for lack of control for co-interventions, wide variation of intensity of interventions between studies.</td>
<td></td>
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<tr>
<td>Systematic Review</td>
<td># of studies (participants)</td>
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<td>GRADE</td>
<td>Comment</td>
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<tr>
<td>Kamper et al., 2015</td>
<td>7 (821)</td>
<td>3 months - 6.2 years (chronic)</td>
<td>Age range (average) 39-46 Males 40-79% Off work 46-82% Sick - leave 58-138 days.</td>
<td>MDT vs. usual care</td>
<td>Pain intensity</td>
<td>4</td>
<td>-2</td>
<td>0</td>
<td>-1</td>
<td>Moderate</td>
<td>Quality points deducted for lack of blinding of clinicians and participants and wide variations of interventions between studies</td>
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<tr>
<td>9 (872)</td>
<td>As above</td>
<td>As above</td>
<td>MDT vs. physical treatment</td>
<td>Pain intensity</td>
<td>4</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 (416)</td>
<td>As above</td>
<td>As above</td>
<td>MDT vs. waitlist</td>
<td>Pain intensity</td>
<td>-2</td>
<td>0</td>
<td>-1</td>
<td>Low</td>
<td></td>
<td></td>
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<tr>
<td>6 (722)</td>
<td>As above</td>
<td>As above</td>
<td>MDT vs. usual care</td>
<td>Functional ability</td>
<td>-2</td>
<td>0</td>
<td>-1</td>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>10 (1169)</td>
<td>As above</td>
<td>As above</td>
<td>MDT vs. physical treatment</td>
<td>Functional ability</td>
<td>4</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>Low</td>
<td>Quality points deducted for lack of blinding of clinicians and participants and wide variations of interventions between studies; consistency point deducted for high statistical heterogeneity</td>
<td></td>
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</tr>
<tr>
<td>4 (416)</td>
<td>As above</td>
<td>As above</td>
<td>MDT vs. waitlist</td>
<td>Functional ability</td>
<td>4</td>
<td>-2</td>
<td>0</td>
<td>-1</td>
<td>Low</td>
<td>Quality points deducted for lack of blinding of clinicians and participants and wide variations of interventions between studies;</td>
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<td>8 (1006)</td>
<td>As above</td>
<td>As above</td>
<td>MDT vs. physical treatment</td>
<td>Return to work</td>
<td>4</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>Moderate</td>
<td>Quality points deducted for lack of blinding of clinicians and participants and wide variations of interventions between studies; consistency point deducted for high statistical heterogeneity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 (1360)</td>
<td>As above</td>
<td>As above</td>
<td>MDT vs. usual care</td>
<td>Return to work</td>
<td>4</td>
<td>-2</td>
<td>0</td>
<td>-1</td>
<td>Moderate</td>
<td>Quality points deducted for lack of blinding of clinicians and participants</td>
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</tr>
</tbody>
</table>
Appendix B – ET Summary of Findings
## Appendix B – Summary of Findings ET

<table>
<thead>
<tr>
<th>Systematic Review</th>
<th># of studies (participants)</th>
<th>Symptom duration</th>
<th>Participant characteristics</th>
<th>Comparison</th>
<th>Outcome</th>
<th>Type of evidence</th>
<th>Quality</th>
<th>Consistency</th>
<th>Directness</th>
<th>Effect size</th>
<th>GRADE</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hayden et al., 2005</td>
<td>11 (1097)</td>
<td>4-7 weeks (acute)</td>
<td>Age range (average) 30-41 years Males 40-80% Smokers 50% VAS = 1-7/10 Oswestry Disability Index = 26-32 Roland-Morris Disability questionnaire = 13</td>
<td>ET vs. usual care or non-exercise or no treatment</td>
<td>Pain intensity</td>
<td>4</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>No effect noted</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, poor study design; directness point deducted for uncertainty about description of exercise intervention</td>
</tr>
<tr>
<td>6 (608)</td>
<td>4-24 weeks (subacute)</td>
<td>Age range (average) 27-45 years Males 45-69% Smokers 17-47% VAS = 55/100 NRS range 4-6/10 Roland-Morris Disability questionnaire = 5.6-8.2 Off work 50-85%</td>
<td>ET vs. usual care or non-exercise</td>
<td>Pain intensity</td>
<td>4</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>No effect noted</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, poor study design; directness point deducted for uncertainty about description of exercise intervention</td>
<td></td>
</tr>
<tr>
<td>23 (1697)</td>
<td>13 weeks (chronic)</td>
<td>9.3 years</td>
<td>Sick leave 2-6 months in past year Age range (average) 33-41 years Males 24-70% VAS = 22-64/100 Oswestry Disability Index = 13-44 Off work 44-83%</td>
<td>As above</td>
<td>Pain intensity</td>
<td>4</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>Improved pain intensity ET vs. all comparisons, Pooled weighted mean improvement 7.3 (95% CI 3.7 - 10.9)</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, poor study design; directness point deducted for uncertainty about description of exercise intervention</td>
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<tr>
<td>9 (1025)</td>
<td>4-7 weeks (acute)</td>
<td>Age range (average) 30-41 years Males 40-80% Smokers 50% VAS = 1-7/10 Oswestry Disability Index = 26-32 Roland-Morris Disability questionnaire = 13 Off work 48%</td>
<td>ET vs. usual care or non-exercise or no treatment</td>
<td>Functional ability</td>
<td>4</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>No effect noted</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, poor study design; directness point deducted for uncertainty about description of exercise intervention</td>
<td></td>
</tr>
<tr>
<td>4 (579)</td>
<td>4-24 weeks (subacute)</td>
<td>Age range (average) 27-45 years Males 45-69% Smokers 17-47% VAS = 55/100 Roland-Morris Disability questionnaire = 5.6-8.2</td>
<td>ET vs. usual care or non-exercise</td>
<td>Functional ability</td>
<td>4</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>No effect noted</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, poor study design; directness point deducted for uncertainty about description of exercise intervention</td>
<td></td>
</tr>
<tr>
<td>20 (1710)</td>
<td>≥ 9 weeks (chronic)</td>
<td>Age range (average) 33-41 years Males 24-70% Smokers 60-70% VAS = 22-64/100 Oswestry Disability Index = 13-44 Off work 58-77% Sick leave 2-6 months in past year</td>
<td>As above</td>
<td>Functional ability</td>
<td>4</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>Improved RTW with ET vs. all comparisons, Pooled weighted mean improvement 2.5 (95% CI 1.04 - 3.91)</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, poor study design; directness point deducted for uncertainty about description of exercise intervention</td>
<td></td>
</tr>
<tr>
<td>Systematic Review</td>
<td># of studies (participants)</td>
<td>Symptom duration</td>
<td>Participant characteristics</td>
<td>Comparison</td>
<td>Outcome</td>
<td>Type of evidence</td>
<td>Quality</td>
<td>Consistency</td>
<td>Directness</td>
<td>Effect size</td>
<td>GRADE</td>
<td>Comment</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------</td>
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<td>---------</td>
</tr>
<tr>
<td>van der Giessen et al., 2012</td>
<td>5 (680)</td>
<td>1 week to &gt; 1 year (acute – chronic)</td>
<td>Age range (average) 38-42 years Males 36-94% NRS = 40-70/10 Roland-Morris Disability questionnaire = 13 - 15 Oswestry Disability Index=30 Off work 51 - 65% Time off work in the past year = 1-204 days. Mean duration of sick leave in the past year = 6-43 days</td>
<td>ET vs. usual care or non-exercise or other physical interventions</td>
<td>Pain intensity</td>
<td>4</td>
<td>-1</td>
<td>0</td>
<td>-1</td>
<td>One study found pain intensity improved on NRS (0-100) by 10 (95%CI 3.8-16.7). Other studies found no effect.</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, inconsistent use of outcomes measures, and weak methods; directness point deducted for lack of control for co-interventions, wide variation of intensity of interventions between studies.</td>
</tr>
<tr>
<td></td>
<td>5 (680)</td>
<td>as above</td>
<td>As above</td>
<td>As above</td>
<td>Functional ability</td>
<td>4</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
<td>One study found improved Roland-Morris Disability questionnaire of 3 (95%CI 1.8-4.3, p&lt;0.01), Other studies found no effect.</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, inconsistent use of outcomes measures, and weak methods; directness point deducted for lack of control for co-interventions, wide variation of intensity of interventions between studies.</td>
</tr>
<tr>
<td></td>
<td>4 (572)</td>
<td>as above</td>
<td>As above</td>
<td>As above</td>
<td>Return to work</td>
<td>4</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
<td>Two studies no effect. One study found improved RTW average sick leave duration (p=0.03).</td>
<td>Low</td>
<td>Quality points deducted for incomplete reporting of results, inconsistent use of outcomes measures, and weak methods; directness point deducted for lack of control for co-interventions, wide variation of intensity of interventions between studies.</td>
</tr>
</tbody>
</table>
### LIFESTYLE QUESTIONNAIRE

Name:  

DOB: MM / DD / YYYY  

Date of injury: MM / DD / YYYY  

Please answer the following questions (your responses will be kept completely confidential):

1. Is someone else primarily to blame for your situation?  
   - [ ] Yes  
   - [ ] No

2. Are you having trouble at work; home; with friends (due to this injury)?  
   - [ ] Yes  
   - [ ] No

3. Are you receiving or anticipate receiving any financial compensation for your injury?  
   - [ ] Yes  
   - [ ] No

4. Have you contacted a lawyer about your injury?  
   - [ ] Yes  
   - [ ] No

5. Are you having trouble sleeping because of your pain?  
   - [ ] Yes  
   - [ ] No

6. Is the pain constant (never goes away)?  
   - [ ] Yes  
   - [ ] No

7. Has medication and/or previous treatment helped?  
   - [ ] Yes  
   - [ ] No

8. Have you had more than 2 medical consultations for this injury?  
   - [ ] Yes  
   - [ ] No

9. Is it essential that you find out the physical source of your symptoms?  
   - [ ] Yes  
   - [ ] No

10. Has your pain spread to other parts of your body beyond your spine?  
    - [ ] Yes  
    - [ ] No
Appendix D – Spinal Assessment Form
### SPINAL ASSESSMENT

**HISTORY**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Type of assessment:</th>
<th>Assessment date:</th>
</tr>
</thead>
</table>

- **New patient**
- **Return patient**
- **DOB:** MM/ DD/ YYYY
- **Age:**
- **Reason for visit:**
  - Assessment only
  - Functional testing only
  - Assessment and treatment
- **Transferred from other CBI:**
  - Yes
  - No
- **Area assessed:**
  - Back only
  - Neck only
  - Back & neck

#### Elements of this Episode

**Site of dominant pain:**
- Back
- Leg
- Neck
- Arm
- Headache
- No pain

**Average pain rating for dominant site:** /10

**Pain location:**
- Back
- Buttock
- Groin
- Trochanter
- Thigh
- Calf
- Foot
- Neck
- Trap ridge
- Inter scap
- Arm
- Forearm
- Hand
- Headache
- Jaw

**Anterior sheet**

**Back/Leg pain:**
- Constant
- Intermittent

**Neck/Arm/Headache:**
- Constant
- Intermittent

**Pain before rising:**
- Better
- Worse
- Same

**Pain at end of typical day:**
- Better
- Worse
- Same

**Pain disturbing sleep:**
- Yes
- No

- **If Yes:**
  - Trouble falling asleep
  - Trouble staying asleep

**Date of onset of most recent episode:** MM/ DD/ YYYY

**Duration of this episode:**
- Days
- Weeks
- Months
- Years

**Was there an event that caused this episode?**
- Yes
- No

- **If Yes:**
  - How long after event did pain start?

**Mechanism:**

- **Bladder function:**
  - Unchanged
  - Changed

- **Bowel function:**
  - Unchanged
  - Changed

- **Recent unexplained weight loss:**
  - Yes
  - No

- **Valsalva:**
  - Positive
  - Negative

- **Cough:**
  - Positive
  - Negative

- **Neck assessment:**
  - Dizz
  - Dyp
  - Dz
  - Dap

- **Significant medical history:**
  - None
  - CAD
  - Hypertension
  - RA
  - Diabetes
  - Malignancy
  - COPD
  - Thyroid
  - Other:

#### Management of this Episode

**Previous Rx:**
- None
- Manip/mobilize
- Modalities
- Active exercise
- Massage
- Bed rest
- Other:

**Concurrent Rx:**
- None
- Myelo ICT AMRI
- Bone scan
- X-ray
- Bloodwork
- Electrical studies

**Investigations:**
- None
- Myelo ICT AMRI

**Employment status:**
- Homemaker
- Student
- Retiree
- Workforce

**Performance of normal activities of daily living:**
- Full time
- Part time

**Currently working:**
- Yes
- No

**Job title:**

- Full time
- Part time

**Pre-op hours:**
- Yes
- No

**Reduced hours:**
- Yes
- No

**Pre-op duty:**
- Yes
- No

**Modified duty:**
- Yes
- No

**Job available:**
- Yes
- No

**Clinician signature:**

79
## SPINAL ASSESSMENT  Page 2

**LUMBAR**

- **Back surgery**
  - ☐ Yes
  - ☐ No
- **Date of last surgery**
  - MM / DD / YYYY
  - Or ☐ > 2 years ago
- **Effect on pain**
  - Flexion
  - Extension
  - Sitting
  - Rise from sit
  - Standing
  - Walking
  - Lying

### Previous episodes
- ☐ No
- ☐ Yes
- Back dominant
- Leg dominant
- Similar to present ep
  - ☐ No
  - Yes
- Previous time off work
  - ☐ No
  - Yes
  - How long? ________
- Time since 1st episode
  - ☐ < 1 yr
  - 1-5 yrs
  - > 5 yrs
- In past year, frequency
  - ☐ Up
  - Down
  - ☐ Same
  - NIA
- In past year, duration
  - ☐ Up
  - Down
  - ☐ Same
  - NIA

### Previous treatments:

**Cognition (P.P.T.)**
- ☐ No problems
- Problems noted

**Communication barriers**
- ☐ Yes ________________
- ☐ No

### Physical EXAMINATION

<table>
<thead>
<tr>
<th>Postural observations</th>
<th>Scoliosis</th>
<th>Lateral shift</th>
<th>L</th>
<th>R</th>
</tr>
</thead>
</table>

**Postural observations**

- Sitting posture
  - Flexed/flat
  - Normal lordosis
  - Increased lordosis

- Standing posture
  - Flexed/flat
  - Normal lordosis
  - Increased lordosis

**Range of movement**

- Flexion
  - Normal
  - Reduced ________

- Extension
  - Normal
  - Reduced ________

**Notes / General observations:**

**Palpation:**

### Test Movements

**Before testing, location of distal symptom:**
- ☐ No symptoms
- ☐ Trochanter
- ☐ Back
- ☐ Thigh
- ☐ Buttock
- ☐ Calf
- ☐ Groin
- ☐ Foot

**After testing, location of distal symptom:**

**After testing, change in range/quality of movement:**

**Clinician signature:**
### SPINAL ASSESSMENT Page 3

#### CERVICAL

**Name:**

**DOB:**

**Neck surgery**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>No surgery</th>
</tr>
</thead>
</table>

If Yes, most recent type:

- Decompression
- Fusion
- Combination

**Date of last surgery:**

**Or:**

- > 2 years ago

**Effect on pain**

<table>
<thead>
<tr>
<th>Flexion</th>
<th>Extension</th>
<th>Rotation</th>
<th>Sitting</th>
<th>Standing</th>
<th>Walking</th>
<th>Lying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better</td>
<td>Worse</td>
<td>Same</td>
<td>Best</td>
<td>Worst</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Previous episodes**

- No
- Yes
- Neck dominant
- Arm dominant

**Similar to present ep**

- No
- Yes

**Previous time off work**

- No
- Yes

**How long?**

- < 1yr
- 1-5yrs
- > 5 yrs

**Time since 1st episode**

- No
- Yes

**In past year, frequency**

- No
- Yes

**N/A**

**In past year, duration**

- No
- Yes

**Communication barriers**

- Yes
- No

**Cognition (P.P.T)**

- No problems
- Problems noted

**Physical EXAMINATION**

**Neurological**

**Postural observations**

- Torticollis
- Thoracic kyphosis

**Sitting Posture**

- Head forward
- Ear over shoulder

**Standing Posture**

- Head forward
- Ear over shoulder

**Range of movement**

**Flexion**

- Normal
- Reduced

**Protraction**

- Normal
- Reduced

**Extension**

- Normal
- Reduced

**Retraction**

- Normal
- Reduced

**Side bend**

- Normal
- Reduced

**Rotation**

- Normal
- Reduced

**Conduction tests**

- Normal
- L+
- R+

- Full deltoid C5
- Anterior deltoid C6
- Bicep reflex C6
- Bicep power C6
- Ext dig long C7
- Tricep reflex C7/C8
- Tricep power C7/C8
- Plantar response Cord
- Clonus Cord

**Notes / General observations:**

**Palpation:**

**Test Movements**

**Before testing, location of distal symptom**

- No symptoms
- Forearm
- Neck
- Hand
- Trap ridge
- Headache
- Inter scapular
- Jaw
- Arm
- Anterior Chest

**After testing, location of distal symptom:**

**After testing, change in range/quality of movement:**

**Clinician signature:**

81
### SPINAL ASSESSMENT  Page 4

**Non Organic Findings**

- [ ] Not tested
- [ ] All negative
- [ ] Some positive

- [ ] Superficial tend.  
- [ ] Axial loading  
- [ ] SLR discrepancy  
- [ ] Sensory disturb.
- [ ] Non anatomic tend.  
- [ ] Acetab. Rotation  
- [ ] Double SLR  
- [ ] Cogwheel

**# of positive sets: ___/4**

**Additional Findings**

- **Hip joints**: [ ] Not tested  
  [ ] Normal  
  [ ] L+  
  [ ] R+  
  [ ] Both+  

- **S.I. Joint**: [ ] Not tested  
  [ ] Normal  
  [ ] L+  
  [ ] R+  
  [ ] Both+  

- **Shoulder joints**: [ ] Not tested  
  [ ] Normal  
  [ ] L+  
  [ ] R+  
  [ ] Both+  

- **NDT (BPT)**:  
- **Thoracic spine**:  
- **Cervical spine**: [ ] Not tested  
  [ ] Normal  
  [ ] L+  
  [ ] R+  
  [ ] Both+

**DOMINANT PATTERN**

**Lumbar**

- Pattern by history: [ ] 1  
  [ ] 2  
  [ ] 3  
  [ ] 4

- Pattern by physical exam: [ ] 1  
  [ ] 2  
  [ ] 3  
  [ ] 4

  - Unable to provoke typical pain

- Conduction loss: [ ] Yes  
  [ ] No

  - If Yes, root #: ____________

- Pattern 5: [ ] Yes  
  [ ] No

  - If Yes, + mechanical

**Cervical**

- Pattern by history: [ ] 1  
  [ ] 2  
  [ ] 3  
  [ ] 4

- Pattern by physical exam: [ ] 1  
  [ ] 2  
  [ ] 3  
  [ ] 4

  - Unable to provoke typical pain

- Conduction loss: [ ] Yes  
  [ ] No

  - If Yes, root #: ____________

- Pattern 5: [ ] Yes  
  [ ] No

  - If Yes, + mechanical

**Final Pattern diagnosis**

- Lumbar: [ ] 1F  
  [ ] 2  
  [ ] 3F  
  [ ] 4  

- Cervical: [ ] 1F  
  [ ] 2  
  [ ] 3F  
  [ ] 4  

- No mechanical pattern

**Pattern 5**

- Lumbar: [ ] Mechanical  
  [ ] Non mechanical  
  [ ] No

- Cervical: [ ] Mechanical  
  [ ] Non mechanical  
  [ ] No

**Alternative Findings** (if no dominant pattern established)

- **Alternative findings present**: [ ] Yes  
  [ ] No

- If Yes,  
  - Structural scoliosis  
  - Hip joint(s)  
  - Suspected systemic disease

- **Headache**:  
  [ ] Mechanical  
  [ ] Non mechanical  

- **WAD**: [ ] 0  
  [ ] 1  
  [ ] 11  
  [ ] 111  
  [ ] 1V

**Notes:**

**Treatment Plan**

- **Program recommended**:  
- **Problem list**:  
- **Stage**:  
- **Short term goals**:  
- **Long term goals**:  

**Predicted final outcome**:  

**Anticipated duration of treatment**:  

**Informed consent**: Treatment explained to patient and agreed upon [ ] Yes  
[ ] No

**Patient instruction**:  

**Clinician signature**:  

**CB:SM:STARTUP,OPD:2018 01.02.17**
## Appendix E – Intake Questionnaire – back / neck pain (mLBOS)

### INTAKE QUESTIONNAIRE - back / neck pain

<table>
<thead>
<tr>
<th>Name:</th>
<th>Gender:</th>
<th>Male/Female</th>
<th>Date</th>
<th>DOB</th>
</tr>
</thead>
</table>

#### General Information

- **How did you hear about our clinic?**
  - [ ] Family Physician
  - [ ] Specialist
  - [ ] Rehab management contact
  - [ ] Insurance co
  - [ ] Employer
  - [ ] Clinic affiliation
  - [ ] Walk-In
  - [ ] Friends
  - [ ] WCB / WSIB / CSST
  - [ ] Radio / TV
  - [ ] Yellow pages/newspaper/magazine
  - [ ] Other ____________

- **What do you expect from your treatment at our clinic?**
  - [ ] No more pain
  - [ ] Increased strength
  - [ ] Improvement with activities
  - [ ] Return to work
  - [ ] All of these
  - [ ] Other ____________

#### CBI Questionnaire

**Your responses will help your therapist gain a better understanding of your back / neck pain.**

1. **What caused your CURRENT episode of pain?**
   - [ ] Work accident
   - [ ] Accident at home
   - [ ] Motor vehicle accident
   - [ ] Sports injury
   - [ ] Unknown cause
   - [ ] Other

2. **How did your pain start?**
   - [ ] Suddenly
   - [ ] Gradually

3. **How long have you been in pain?**
   - [ ] Less than 3 weeks
   - [ ] 3 - 10 weeks
   - [ ] 11 weeks to 6 months
   - [ ] More than 6 months

4. **Have you contacted a lawyer about this injury?**
   - [ ] No
   - [ ] Yes

5. **Are you a smoker?**
   - [ ] No
   - [ ] Former
   - [ ] Current

6. **How well can you do your household chores?**
   - [ ] Normally
   - [ ] Can do most
   - [ ] Can do a few
   - [ ] Cannot do any

7. **Is your pain interfering with your leisure/social activities?**
   - [ ] No interference
   - [ ] Yes, is interfering
   - [ ] Yes, I am unable to participate

8. **Do you rest during the day because of your pain?**
   - [ ] Never
   - [ ] Less than 3 hours
   - [ ] 3 hours or more

9. **How often do you visit your doctor for your pain?**
   - [ ] Never
   - [ ] Occasionally
   - [ ] About once per month
   - [ ] More than once a month

10. **How often do you use pain medication?**
    - [ ] Never
    - [ ] Occasionally
    - [ ] 1 to 2 times per day
    - [ ] Several times per day

#### Please indicate how your pain currently affects these activities:

<table>
<thead>
<tr>
<th>No effect</th>
<th>Restricted</th>
<th>Severely restricted</th>
<th>Impossible</th>
</tr>
</thead>
</table>

(CB146:STAR,PH,LGJO,D:TB: IntakeCBO 8.17.317)
CONSENT to the COLLECTION, USE and DISCLOSURE OF PERSONAL or PERSONAL HEALTH INFORMATION – Page 1 of 3

Please note that a photocopy of this consent form will have the same authority as the original. The original form is not to be removed from the client’s file at CBI Physiotherapy and Rehabilitation.

Maintaining the protection of your personal or personal health information is important to CBI Health (CBI) and its affiliated and partnership organizations and is required by law. Our organization is committed to collecting, using, and disclosing personal or personal health information responsibly and only to the extent necessary for the services we provide.

Your consent must be freely given, you need to understand the purposes for which CBI will collect, use or disclose your personal or personal health information before you give your consent, and understand that you are able to withhold consent or may withdraw your consent, as discussed below.

Purposes for the collection, use and disclosure of your personal or personal health information by CBI:

- To provide assessment, treatment or other services related to your injury or illness, and/or your claim for compensation or benefits.
- To obtain payment for the assessment, treatment or other services we provide and determine any entitlement to insurance coverage or other benefits.
- To identify treatment outcomes and the extent of services provided and share this information with CBI, payers (for example your insurance company) and referral sources (for example your doctor).

CBI compiles information for its database that does not identify you (this is neither personal nor personal health information). The anonymous database is used to compile aggregate statistics for quality improvement initiatives, for example improving overall performance in different programs and clinical outcomes research.

CBI may also collect, use or disclose your personal or personal health information where permitted or required by law to do so.

Withdrawal of consent:

I understand that I may withdraw my consent, in whole or in part, at any time upon providing reasonable written notice to the manager of the clinic I am attending. The manager is responsible for informing me of any potential consequences that may result from the withdrawal of my consent, prior to my making such a decision (for example, it may limit the ability of CBI to provide my assessment, treatment or other services). If I withdraw my consent, I understand that this is not retroactive, and does not apply to personal or personal health information already collected, used or disclosed by CBI.

I understand that the manager of the clinic I am attending is required to notify the Chief Privacy Officer for CBI Health if I withdraw my consent, in whole or in part, so that any files related to me and held at another location or sent to me can be flagged to indicate my withdrawal of consent.

I have read the above authorization(s) and indicate my consent by my signature below. My consent is valid unless and until I withdraw it in the manner set out in this consent form.

Giving my consent:

I, ____________________________

consent to the collection, use and disclosure of my personal or personal health information for the purposes described above.

______________________________  ____________________________

Signature of client or duly authorized representative:  Date:
Appendix G - Correlation matrix for patients in MDT program in combined cohort of Alberta and British Columbia

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<th>Covariates</th>
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### Appendix H - Correlation matrix for patients in MDT program in Alberta

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86
Appendix I - Correlation matrix for patients in MDT program in British Columbia

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Appendix J - Collinearity testing: patients in MDT program in combined cohort of Alberta and British Columbia. Dependent variable program referral (MDT/ET)

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Appendix K - Collinearity testing: Alberta cohort. Dependent variable program referral (MDT/ET)

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Appendix L - Collinearity testing: British Columbia Cohort. Dependent variable program referral (MDT/ET)

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### Appendix M - Post hoc analysis, WCB versus Auto insured patients in Alberta & British Columbia (N=725)

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α=0.05, Baseline characteristic % = n – missing data