RISK FACTORS FOR FUNCTIONAL RESTORATION NON-COMPLETION

by

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ABSTRACT

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NON-COMPLETION

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Previous studies have shown that the one-year outcomes after an interdisciplinary functional restoration program for patients with chronic disabling occupational disorders vary significantly between those who complete the program and those who prematurely drop-out. Non-completers are 9.7 times less likely to return-to-work at any time, and are 7 times less likely to retain work at one year, relative to those who complete the program. Non-completers are also 7 times more likely to have post-rehabilitation surgery to the original injured area, while also displaying higher levels of healthcare utilization. The present study focuses on identifying the risk factors for non-completion of a functional restoration program for these chronic patients. This was a

prospective cohort study of consecutive patients undergoing functional restoration treatment in a regional rehabilitation referral center. The sample consisted of 3,052 consecutive patients, classified as either completers (C group, N= 2,367) or non-completers (NC group, N= 685), who entered a functional restoration program. The measures used included medical evaluations, demographic data, DSM psychiatric diagnoses, the MMPI, and validated questionnaires evaluating pain, depression and occupational factors. Patients were admitted to a comprehensive interdisciplinary functional restoration program which provides medical and psychosocial support, along with quantitatively-directed exercise and disability management. A logistic regression analysis was utilized to further assess the significant univariate factors found to be associated with non-completion status. The findings revealed that patients who did not complete the program had a longer duration between injury and admission to treatment, a higher score on the MVAS, and were less likely to be working at the time of admission to treatment. Furthermore, patients who were opioid dependent were 1.5 times more likely to drop out of rehabilitation, and patients diagnosed with a socially problematic cluster B Personality Disorder, especially Borderline, were 1.6 times more likely to drop out. Although some risk factors associated with program non-completion may be addressed in treatment, socially maladaptive personality disorders, long-neglected disability and chronic opioid dependence are major barriers to successful treatment completion and social re-integration.

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INTRODUCTION

Chronic pain is an expensive and life-altering state that ultimately affects productivity and quality of life for those who experience this condition. It is estimated that approximately $70 billion are spent annually on healthcare utilization and work productivity losses due to patients afflicted with chronic pain (Gatchel, 2004). Typical treatment for chronic pain, such as surgery or medication maintenance, is often found to be unsuccessful (Mayer et al., 1985; Mayer & Polatin, 2000; Glenn, 2002). Moreover, the scope of the injury evolves into a multidimensional problem involving not only the physiological aspect of the injury, but also social and psychological factors. It is proposed that a better option for patients experiencing chronic pain is functional restoration (Gatchel & Okifuji, 2006; Mayer & Gatchel, 1988) which is an interdisciplinary program focused on treating patients with chronically disabling occupational musculoskeletal disorders (CDOMD). Patients are offered physical and occupational therapy, psychological assessments and counseling, and education on various health-related factors. Furthermore, assistance with facilitating the socioeconomic dilemmas often encountered after being injured at work is another focus in this type of interdisciplinary treatment (Mayer & Polatin, 2000). Success measures are not based solely on the physical improvement to injured areas following treatment,

but also include long-term outcomes, such as returning to and retaining work, and minimizing post-treatment surgeries and excessive healthcare utilization.

Although functional restoration programs have shown great success with patients who complete their diagnosed treatment regimen, patients who prematurely drop out of the program tend to experience more negative outcomes (Mayer et al., 1987; Proctor, Mayer, Theodore & Gatchel, 2005; Proctor, 2001). Mayer et al. (1987) showed that patients who abandoned the program were not as successful at returning to, and retaining, work as those who completed the program. This groundwork study found that only 13% of the non-completers successfully returned to work, whereas, 85% of those who had completed the program were reportedly working at the one-year follow-up. As revealed in a study by Proctor et al. (2005) on the outcomes for non-completers, it was identified that non-completers were 9.7 times less likely to return-to-work than those who completed the program; and, of those who did return-to-work, non-completers were 7 times less likely to retain work at one-year post-treatment. It further showed that this group was significantly more likely to have recurrent surgeries to the same injured area, and was more likely to seek additional healthcare related treatment than completers. Knowing that positive post-treatment outcomes occur more often with those patients who complete the program, it is essential to identify, or flag, these patients *a priori* in order to determine the type of intervention necessary and sufficient to assist with completion of the program. Therefore, the current study focused on identifying the risk factors associated with non-completion of a functional restoration program aimed at patients with CDOMD. The variables considered for the risk factor

analysis included demographic, injury-specific, and occupational factors, along with measures of perceived pain, disability, and depression, and Axis I and Axis II disorders.

Research on failure to complete various treatment programs, particularly chronic pain treatment, is substantial (Spence & Sharpe, 1993; Biller, Arnstein, Caudill, Federman & Guberman, 2000; Sagula, 2000; Kerns & Rosenberg, 1999; Strong, Westbury, Smith, McKenzie & Ryan, 2002). However, studies of non-completion of functional restoration programs are limited. Proctor (2001) put forth a comprehensive study on a chronic pain population who entered a functional restoration program, and he identified key differences between completers and non-completers, both at admission and at a one-year follow-up. Based on the results from the Proctor (2001) study, non-completers were statistically more likely to score significantly higher on the Million Visual Analog Scale (MVAS), have any Cluster B Personality Disorder, and be diagnosed with a Dependent Personality Disorder. Furthermore, at one-year post treatment, non-completers were found to be more likely to undergo surgery to the same injured body part, more likely to exhibit excessive treatment-seeking behaviors, and less likely to return to work. The current study was a replication and extension of the study conducted by Proctor (2001). Although this study did not evaluate post-treatment differences between completers and non-completers, it went a step further to develop a model that would allow for prediction of the outcome status of a patient entering the treatment program based on selected key criteria. It also used a larger sample size.

1.1 Demographic Factors

Demographic variables, such as age, gender and ethnicity, have been considered as possible risk factors in research focused on failure to complete various treatment programs. However, the findings for these demographic determinants are inconclusive. For example, age is a factor that is seen to either hinder or enhance positive treatment outcomes. Younger patients may have better physical conditioning than do older patients and thus may provide an explanation for exhibiting better outcomes. Conversely, the maturity of older patients may contribute to fulfillment of prescribed treatment. Mayer, Gatchel and Evans (2001) identified older patients as having poorer work return outcomes than younger patients, and Dysvik, Vinsnes and Eikeland (2004) found older patients to be more likely to drop out of a multidisciplinary pain management program. In contrast, other studies have identified that older patients are more likely to complete a chronic pain treatment program than are younger patients (Biller et al., 2000; Proctor et al., 2005; Bendix, Bendix and Haestrup, 1998; Kerns & Rosenberg, 2000).

Many studies have also considered gender as a possible risk factor in various chronic pain studies (Gatchel, Mayer, Kidner & McGeary, 2005; McGeary, Mayer, Gatchel, Anagnostis & Proctor, 2003; Levenstein & Kaplan, 1998; Kerns & Rosenberg, 2000; Bendix, Bendix & Haestrup, 1998; Proctor et al., 2005). Bendix et al. (1988) found a gender difference in positive outcomes, showing that females were twice as likely to return to work as males in a functional restoration program. In comparing treatment completion status for chronic pain patients, Kerns and Rosenberg (2000)

found contradicting results, such that the completion group had a significantly higher proportion of males than did the non-completion group. McGeary et al. (2003) subsequently found no gender differences with completion status for functional restoration, yet did find that a higher proportion of males returned to work post-treatment than females. The Proctor et al. (2005) study did not find a significant difference in gender between the two groups considered, such that males and females were equally likely to drop-out of the functional restoration program.

Research on the differences in ethnicities with respect to treatment completion is lacking. The study conducted by Proctor et al. (2005) found ethnicity to differentiate significantly between completers and non-completers. Specifically, Caucasians and African Americans were more likely to complete the program than were those of other ethnic groups. Other studies have tied ethnicity to disability. Jordan, Mayer and Gatchel (1998) identified a difference in disability status with respect to ethnicity, such that Caucasians were more likely to be classified with long-term disability (LTD), African Americans were more likely to be classified with a short-term disability (STD), and Hispanics did not differ between LTD and STD. In back pain studies, Latino and African American patients were identified as high risk for developing chronic disability problems (Pulliam, Gatchel & Gardea, 2001).

Thus, the evidence for demographic variables relating to positive outcomes within chronic pain populations is inconclusive. Therefore, this study examined these relationships in more detail using a larger population in order to determine if age, gender and ethnicity should be labeled as risk factors.

1.2 Injury-Specific Factors

There are varying levels of treatment that correspond to the timing of the injury (Mayer & Polatin, 2000). Primary care is seen as the medical attention immediately following an injury, and it focuses on reduction of pain and symptoms associated with the injury. If the patient does not respond well to the primary care, then secondary care is afforded. Secondary care is a more integrated process that involves both prescribed exercises and activities along with educational venues to support the principle goal of overall function. A small proportion of patients that do not respond well to primary and secondary care receive tertiary care. Functional restoration is a form of tertiary care in that it takes an interdisciplinary approach to helping the patient regain physical, psychological and social functioning (Mayer & Polatin, 2000).

Various injury-specific factors may play a role in the functional restoration treatment completion process, including the type of injury (area of body and compensable body parts) and whether or not the patient had undergone surgery prior to rehabilitation. Other variables associated with workers' compensation disability, such as length of disability (time between injury and admission to treatment), retention of an attorney, and settlement of the individual's case can also factor into the outcome status.

Patients entering functional restoration typically exhibit a musculoskeletal injury, with the majority reporting lumbar injuries (Proctor, Mayer, Gatchel & McGeary, 2004; Kool et al. 2007; Proctor, 2001; Proctor, Mayer, Theodore & Gatchel, 2005). Other injured areas often include thoracic, cervical, multiple spinal, upper extremity, lower extremity, or a combination of these areas. Whereas two studies

evaluating completion status did not find a difference between patients with varying injuries (Proctor et al. 2005; Proctor, 2001), most outcome studies have not focused on area of injury as a factor (Kool et al., 2007; Bendix et al., 1998; Jordan, Mayer & Gatchel, 1998). However, whether or not a patient had undergone surgery prior to admission to a rehabilitation program has been readily examined and found to have a negative impact with respect to various outcome measures (Burnett, Cifu, Kolakowsky-Hayner & Kreutzer, 2001; Gatchel, Mayer, Kidner & McGeary, 2005; Proctor et al., 2005; Proctor et al., 2004; Proctor, 2001). In the functional restoration program, one criterion for patients being admitted is that pre-treatment surgery was either not recommended or was not successful. Patients for whom pre-treatment surgery was unsuccessful were found to be more likely to drop-out of the treatment than for those who never had surgery (Proctor, 2001). Gatchel et al. (2005) and McGeary et al. (2003) found that patients most likely to undergo surgery prior to rehabilitation were typically male. In addition, Mayer, Gatchel and Evans (2001) reported age to be linearly correlated with pre-treatment surgery, such that younger patients had fewer surgeries and were more likely to complete the treatment protocol.

Disability associated with workers' compensation injuries tends to continue, on average, 3 to 4 months post-injury for approximately 10% of this chronic pain population (Mayer & Polatin, 2000). It has been identified that patients who experience a longer duration of off-duty or part-time work following an injury are apt to display more "disability behaviors" than do those who readily return to work following an injury. The reasons for extended lengths of disability often vary from one patient to the

next; yet, most researchers concur that, regardless the reason for absenteeism, the longer the duration of the disability, the more unlikely that positive outcomes will occur. For example, Bendix et al. (1998) discovered that increased use of sick time was statistically correlated with poorer one-year outcomes. Furthermore, Jordan et al. (1998) found that patients identified as having a long-term disability (greater than 18 months) were significantly more likely to have poorer work return outcomes than did those with a short-term disability. Proctor (2001) reported that the patients who did not complete the rehabilitation program had a longer duration between injury and treatment than did those who completed the program. In an attempt to further evaluate this factor of duration of disability, Gatchel, Stowell, Wildenstein, Riggs and Ellis, (2006) implemented an early intervention program for patients experiencing chronic temporomandibular pain. Those who underwent an early intervention rehabilitation program displayed more positive outcomes at one-year post-rehabilitation. With respect to length of disability, it appears that the longer it takes for an injured patient to receive rehabilitation, the more likely he/she will experience negative outcomes.

Many chronic pain patients attribute their condition to a work-related injury. In these circumstances, legalities are often involved in the treatment and compensation processes. Depending on the individual situations, many patients settle their workers' compensation claims prior to rehabilitation; while others receive treatment before they reach a settlement. Kool et al. (2007) identified unresolved litigation to be correlated with negative one-year outcomes. In contrast, Proctor et al. (2005) determined that patients who had settled their workers' compensation cases prior to treatment were

more likely to abandon the program; whereas, those who had not settled their case were more likely to complete the program. Few studies, though, have considered actual legal representation as a factor involved in the litigation process. Proctor, Mayer, Gatchel and McGeary (2004) did find that patients who retained an attorney were more likely to have negative health-utilization outcomes, one-year post-treatment, relative to those that did not acquire legal representation. Furthermore, the Proctor (2001) and Proctor et al. (2005) studies found an association of attorney retention with non-completion of functional restoration treatment. It should also be noted that completing the prescribed rehabilitation program is not always the primary goal for a number of patients. It can be seen in some cases that patients who remain disabled have an opportunity for monetary gain (Mayer & Polatin, 2000), thus providing an incentive for not physically progressing in a rehabilitation program. The "secondary gain" option can often be regarded to offset the benefits of functional restoration (Dersh, Polatin, Leeman & Gatchel, 2004).

1.3 Occupational Factors

Occupational factors, such as the relationship between the patient and the employer, job characteristics and demand, and the availability of the current position post-injury, have been examined in outcome studies (Petersen, Larsen & Jacobsen, 2007; Shaw et al., 2007; Anderson, Schwaegler, Cizek & Leverson, 2006; Pransky, Benjamin & Savageau, 2005; Williams et al., 1998; Proctor et al., 2005). For example, Anderson et al. (2006) found higher success rates in patients who continued working up

until surgery versus those who maintained full disability status. Shaw et al. (2007) identified that job dissatisfaction was significantly correlated with impaired work status in men with sub-acute low back pain. Job dissatisfaction was also found to be a risk factor for poor post-injury outcomes (Pransky, Benjamin & Savageau 2005). Williams et al. (1998) concluded that higher ratings of job satisfaction are likely to impact whether acute pain at injury becomes chronic. When looking at completion status, Proctor et al. (2005) found that patients who completed the functional restoration program reported a greater desire to return to the same type of work, and also a desire to work with the same employer. Completers also reported a positive relationship with their employers, as compared to non-completers. In addition, completers tended to have insight that their original job would still be available after discharge from the treatment program. Thus, the evidence seems to support that patients who report more satisfactory working conditions experience positive treatment outcomes.

1.4 Pain Intensity Factors

Patients admitted to a functional restoration program have surpassed the stages associated with acute pain, such that the injury has manifested itself into a chronic pain condition. While physical pain is subjective, the varying levels of intensity of pain are often indicators of outcome status (Becker, Hojsted, Sjogren & Eriksen, 1998; Gauthier et al., 2006; Sullivan et al., 2005; McGeary, Mayer & Gatchel, 2006; Anagnostis et al., 2003; Gatchel, Mayer & Theodore, 2006). Kerns and Rosenberg (2000) focused on self-management treatments for chronic pain, but did not find a significant difference

between completers and non-completers with respect to self-reported pain severity measures. However, there are multiple studies indicating a strong relationship between pain intensity and treatment outcomes. The study by Anagnostis et al. (2003) identified that patients who reported mild-to-moderate levels of pain at admission to a functional restoration program were: more likely to complete the program; more likely to return to work; more likely to retain work at one-year; less likely to encounter an additional injury to the same area; and less likely to seek additional treatment. Similar outcomes were found in the McGeary et al. (2006) study that also revealed that patients reporting high-to-severe levels of pain were significantly less likely to complete the rehabilitation program. Along with high pain intensity levels, apprehension of movement of injured area and fear of re-injury were strong indicators of poor work return status (Sullivan et al., 2005; Gauthier et al., 2006). Self-reports of pain disability levels were also found to adequately predict poorer one-year outcomes, such as work return and retention, and healthcare seeking behavior (Gatchel, Mayer & Theodore, 2006). Of course, pain intensity is difficult to ascertain, due to the subjectivity involved. It is apparent that patients reporting high levels of perceived pain prior to treatment experience poorer treatment outcomes.

1.5 Psychosocial Factors

The association of psychopathology and pain has been readily assessed in chronic pain research. Although there have been debates about whether the injury condition causes the psychopathology or vice versa (Gatchel, 1996; Dersh, Mayer,

Theodore, et al., 2007), it is commonly noted that the prevalence of depression, substance use and personality disorders is higher in chronic pain patients than in the general population (Dersh, Mayer, Gatchel et al., 2007; Rush, Polatin & Gatchel, 2000; Fishbain et al., 1997).

Depression has often been linked to poor treatment outcomes for chronic pain patients (Fishbain et al., 1997). Evans (1999) found that depression scores, as measured on the Beck Depression Inventory (BDI), were significantly higher for the patients who had recurrence of injury as compared to those who did not. Sullivan et al. (2006) found a strong association with post-treatment measures of depression and work-return outcomes, such that 91% of those who reported no depression at the end of a cognitive-behavioral intervention program returned to work, compared to only 26% of the moderate-to-severely depressed patients returning to work.

Multiple studies have coupled depression specifically with drop-out status (Garrod, Marshall, Barley & Jones, 2006; Sullivan et al., 2006; Sagula, 2000; Kerns & Haythornthwaite, 1988; Biller et al., 2000; McGeary et al., 2003; Proctor et al., 2005). Although most studies found depression to be a risk factor of non-completion, the study by Biller et al. (2000) on cognitive-behavioral pain management identified that patients with high levels of depression were more likely to complete the prescribed treatment. In a study assessing risk factors for completion of a pulmonary rehabilitation, depression was the leading predictor for non-completion (Garrod et al., 2006). Kerns and Haythornthwaite (1988) found depression to be an indicator of non-completion of a cognitive-behavioral program for chronic pain patients. Interestingly, they reported that

depression levels did not affect outcome measures for patients who did complete the program. In this particular study, depression for the program completers was most likely effectively treated during the rehabilitation process, so that it was no longer a major problem at discharge. Although the majority of patients entering a functional restoration program report elevated levels of depression, the Proctor et al. (2005) study showed that patients who abandoned the program reported significantly higher levels of depression at admission than did those who completed the program. Oftentimes, stress and coping strategies play key roles in the rehabilitation process. With such a strong association between depression and chronic pain (Rush et al., 2000), it seems plausible that, by focusing on decreasing depression symptoms, patients will be more apt to report lower levels of pain; and, therefore, will be more likely to have successful treatment outcomes.

The Minnesota Multiphasic Personality Inventory (MMPI) (Hathaway & McKinley, 1967) is a widely used psychological tool for assessment of personal, social and behavioral problems. The MMPI is a valuable tool in chronic pain populations because it is found to be a valid instrument in assessing psychological status (Weisberg & Keefe, 1999). This Inventory includes 10 major clinical scale elevations, with specific combinations termed as "clusters." Dersh (2000) identified that functional restoration program completers were most commonly classified in the distressed cluster, followed by depressed, somatoform and defended clusters. Non-completers, on the other hand, followed the same trend except that there was a higher prevalence in the somatoform cluster than in the depressed cluster. Proctor (2001) found a significant

difference between completers and non-completers in the distressed and defended clusters, but not in the somatoform or depressed clusters.

More recent studies focusing on a chronic pain population have identified certain "disability profiles" using the MMPI for which there are at least 4 of the 10 scales elevated (Gatchel & Mayer, 2006). Although the MMPI "disability profile" was not identified as a predictor of completion status and one-year outcomes, it was highly associated with other psychological factors such as depression and pain intensity, and factors such as Axis I and Axis II diagnoses.

Other measures of psychopathology have been utilized in studies of risk factors and treatment outcomes. The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) uses a multi-axial system to classify psychiatric diagnoses (American Psychiatric Association, 1994). Of interest in this present study are the Axis I and Axis II diagnoses. Axis I diagnoses involve clinical disorders, such as Major Depressive Disorder, Anxiety Disorders, and Substance Use Disorders. Axis II diagnoses involve personality disorders (PD), which are combined into three specific clusters: Cluster A includes Paranoid, Schizoid and Schizotypal PDs; Cluster B includes Antisocial, Borderline, Histrionic and Narcissistic PDs; and Cluster C includes Avoidant, Dependent and Obsessive-Compulsive PDs. A common method of assessment of these mental health disorders is the use of the Structured Clinical Interview for DSM-IV (SCID).

Recent research has linked Axis I and Axis II diagnoses with chronic pain populations (Dersh, Mayer, Theodore, et al., 2007; Dersh, Mayer, Gatchel, et al., 2007).

Pulliam, Gatchel and Gardea (2001) reported that patients identified as high-risk for developing chronic disability problems presented with more Axis I pathology than did the low-risk patients. Dersh, Mayer and Gatchel et al. (2007) correlated Axis I diagnoses with treatment completion and one-year outcomes, concluding that chronic pain patients diagnosed with an Axis I Panic disorder were 2.5 times more likely to drop-out of a functional restoration program. Furthermore, patients with one or more Axis I diagnosis were significantly less likely to return to and retain work post-treatment.

Aside from depression and anxiety, as previously discussed, substance use is another Axis I diagnosis that is prevalent in chronic pain populations. Alcohol and substance use and abuse were found to be strong risk factors for patients with spinal cord injuries (Tate, Forcheimer, Krause, Meade & Bombardier, 2004). Dersh, Mayer and Gatchel, et al. (2007) also found that opioid dependence was strongly associated with poor treatment outcomes, such that patients identified with this condition were 2.7 times less likely to return to work, and 2.6 times less likely to retain work at one-year post-treatment. The Pain Medication Questionnaire (PMQ) has been used as an assessment of risks for opioid dependence. Through implementation of the PMQ, Holmes et al. (2006) found a correlation between patients identified as highly at-risk for opioid dependence and program non-completion. Proctor (2001) identified that there was no difference between completers and non-completers of a functional restoration program with respect to alcohol use, but drug and opioid dependence were strongly associated with program non-completion.

The prevalence of personality disorders in the general population, as assessed by the DSM-IV Axis II classification, is estimated at 9% (Lenzenweger et al., 2007). Various personality disorders have also been tied to poor treatment outcomes. Dersh, Mayer, Gatchel et al. (2007) found a relationship between Axis II diagnoses and treatment completion status. Patients with no personality disorders were significantly more likely to complete the rehabilitation program than those who were diagnosed with at least one personality disorder. However, the same study did not find a correlation between personality disorders and one-year post-treatment outcomes. Proctor (2001) determined a significant difference between those patients who completed, versus those who dropped-out, of a functional restoration program for the following personality disorders: Schizotypal, Antisocial, Borderline, Histrionic, Narcissistic, and Dependent, along with significant differences comparing Clusters A, B and C.

Although substance use and personality disorders fall into separate axes in the DSM-IV classification system, there appears to be a high level of comorbidity between these diagnostic categories (Cohen et al., 2007; Kay et al., 2002; James & Taylor, 2007; Bowden-Jones et al., 2004; Grunebaum, et al., 2006; Lenzenweger et al., 2006). Dersh, Mayer and Gatchel et al. (2007) identified that chronic pain patients who presented with both Axis I and Axis II diagnoses were significantly more likely to drop-out of treatment than those who had no diagnosis or those with single-axis disorders.

1.6 Scope of Study

The purpose of the present study was to examine patients with chronic disabling occupational musculoskeletal disorders who failed to complete a functional restoration treatment program. While treatment drop-out is relatively low (20-25%), it has been shown that patients who complete the program have substantially better post-treatment outcomes than do those who drop-out prematurely. The current study was designed to add to the literature by analyzing the risk factors of a much larger sample than previously studied. It was hypothesized that non-completion would be associated with many factors, from physical, psychological and social perspectives. It was the intent to compare the outcome groups (completers and non-completers) across four dimensions: 1) demographic and injury-specific variables; 2) work-related variables; 3) pain and depression self-reports; and 4) personality inventories and DSM-IV diagnoses. A logistic regression analysis was planned to help determine the combination of key variables amongst these levels that may be highly associated with predicting non-completion.

1.7 Hypotheses

Demographic Indicators

1. The mean age of the NC group will not differ significantly compared to the C group.
2. The gender of the NC group will have a greater portion of males compared to the C group.
3. The ethnic representation of the NC and C groups will not differ significantly.

4. The type/area of injury and the number of compensable body parts of the NC and C groups will not differ significantly.

Injury-Specific Indicators

5. The length of disability (time between injury and date of admission) will be greater for the NC group compared to the C group.
6. The temporary-total disability (time not working post-injury) will be greater for the NC group compared to the C group.
7. The number of pre-treatment surgeries will be greater for the NC group compared to the C group.
8. The percentage of patients having retained an attorney will be greater for the NC group compared to the C group.
9. The percentage of patients having settled their workers' compensation case will be greater for the NC group compared to the C group.

Occupational Indicators

10. The percentage of patients working at admission will be lower in the NC group compared to the C group.
11. The percentage of patients whose original job is still available will be lower in the NC group compared to the C group.
12. The level of satisfaction with current employer will be lower for the NC group compared to the C group.

13. There will be no significant difference in job type/demand between the NC group and the C group.

Self Report Physical and Psychological Indicators

14. The NC group will report higher levels of depression compared to the C group.
15. The NC group will report higher levels of pain intensity compared to the C group.
16. The NC group will report higher levels of perceived disability compared to the C group.
17. The percentage of patients representing the "Disability Profile" on the MMPI will be greater for the NC group compared to the C group.

Axis I Diagnoses

18. The percentage of patients diagnosed with a Major Depressive Disorder will be greater for the NC group compared to the C group.
19. The percentage of patients diagnosed with an Anxiety Disorder will be greater for the NC group compared to the C group.
20. The percentage of patients diagnosed with Substance Use Disorder will be greater for the NC group compared to the C group.

Axis II Diagnoses

21. The percentage of patients diagnosed with any Axis II Personality Disorder will be greater for the NC group compared to the C group.

22. The percentage of patients diagnosed with any Cluster A Personality Disorder will be greater for the NC group compared to the C group.
23. The percentage of patients diagnosed with any Cluster B Personality Disorder will be greater for the NC group compared to the C group.
24. The percentage of patients diagnosed with any Cluster C Personality Disorder will be greater for the NC group compared to the C group.

CHAPTER 2

METHOD

2.1 Participants

The study consisted of a consecutive cohort of 3,052 patients presenting with a chronic disabling occupational musculoskeletal disorder (CDOMD). These patients consented to, and started, treatment at a functional restoration treatment facility – the Productive Rehabilitation Institute of Dallas for Ergonomics (PRIDE). The criteria for participation in this treatment program were: 1) the duration between date of injury and treatment was at least three months; 2) primary acute care and/or secondary care failed or were determined to be unnecessary; 3) surgery was either not an option or did not produce relief from the injury; 4) severe pain and functional limitations remained; and 5) was able to communicate in English or Spanish. The participants in this study were patients discharged during the period of January, 1996 through December, 2004. This cohort was divided into the following two groups:

Non-Completer Group (NC): The NC group consisted of 685 patients who were admitted to the functional restoration program and underwent the initial evaluations (see Table 1 for demographics). Non-completion status was determined by failure to complete the full prescribed treatment regimen.

Completer Group (C): The C group consisted of 2,367 patients who successfully completed the prescribed functional restoration treatment program (see Table 1 for demographics).

2.2 Measures

Several measures were used to assess the demographic, injury-specific, and occupational factors, along with the perceived levels of pain, disability, depression and Axis I and Axis II diagnoses. Although many of these measures were administered multiple times throughout and post-treatment, the measures considered in this study were assessed at the initial phase of treatment.

2.2.1. PRIDE Demographic Information Assessment

Basic demographic data on all patients admitted to PRIDE were obtained from patient records, interviews and evaluations. Variables collected included: age, gender, ethnicity, education, length of disability, number of surgeries to injured area, and injury-specific data (area of body and other comorbid body regions).

2.2.2. PRIDE Medical Case Management Initial Evaluation and Disability Assessment

The medical case management staff at PRIDE conducted a standardized disability assessment interview with each patient upon admission to the program. The variables collected included: type of occupation; physical demands; length of employment at the job of injury; work history; current work status; pre-treatment case settlement; and legal representation status. For the type of occupation, the patient is coded with one of nine job codes:

1. Professional, Technical, and Managerial (White Collar)
2. Clerical and Sales (White Collar)
3. Service: food, housekeeping, health aides (Blue Collar)
4. Agriculture (Blue Collar)
5. Chemical and Refining (Blue Collar)
6. Machine Trade: metal/wood processing, heavy manufacturing (Blue Collar)
7. Light Manufacturing (Blue Collar)
8. Construction Trades (Blue Collar)
9. Miscellaneous: transportation, packing, heavy equipment, natural resource extraction (Blue Collar)

For the physical demand variable, the patient's lifting requirements are classified as one of the four following categories:

1. Sedentary/Light 0-15 pounds frequent / 0-25 pounds occasional
2. Light/Medium 16-25 pounds frequent / 26-50 pounds occasional
3. Medium/Heavy 26-50 pounds frequent / 51-100 pounds occasional
4. Heavy/Very Heavy 50+ pounds frequent / 100+ pounds occasional

An additional interview was conducted after treatment began that assessed the patient's relationship with his/her employer, desire to return to work with same employer, and desire to return to same type of work. The job satisfaction and desire for work return variables were each evaluated using a 5-point Likert scale. For the job

satisfaction variable, a score of 1 indicated "very satisfied" and a score of 5 indicated "very dissatisfied."

2.2.3. Quantified Pain Drawing (Pain Intensity)

Also known as the Dallas Pain Drawing (McGeary, Mayer & Gatchel, 2006), this instrument consists of two separate sections. For the first section, an outline of a person (front and back) is presented so that the participant can indicate the precise location and severity of pain symptoms. This section of the instrument is scored by superimposing a grid onto the completed figures and then counting the number of squares affected by pain for the torso, extremities, and total. For the second portion of this measure, the subject is asked to rate the severity of his/her pain along an unmarked 10cm line. Utilizing deciles, the cut-off points for interpretation of this score are as follows: less than four indicates "mild pain;" four to six indicates "moderate pain;" and scores of at least seven indicate "severe pain."

2.2.4. Million Visual Analog Scale (MVAS)

The MVAS is a self-report instrument measuring pain perception and subjective disability. It was originally developed by Million, Hall, Haavik-Nilsen, Jayson and Baker (1981) with modifications to cut-offs developed by Anagnostis, Mayer, Gatchel and Proctor (2003). The MVAS is a 15 question assessment for which each response is indicated as a point on a line marked in increments from 0 to 10. The sum of the 15 responses determines the final score on this assessment, such that: 0 = no disability; 1-40 = mild disability; 41-70 = moderate disability; 71-100 = severe disability; 101-130 =

very severe disability; and 131-150 = extreme disability. For this study, the MVAS was evaluated as a continuous variable.

2.2.5. Beck Depression Inventory (BDI)

The BDI is a self-report measure which consists of 21 questions related to physical and emotional symptoms of depression (Beck, Ward, Mendelson, Mock & Erbaugh, 1961). The responses to each question range in points from 0 to 3, and the sum of the 21 responses determines the final score on this assessment, such that: 0-9 = no depression; 10-18 = mild to moderate depression; 19-29 = moderate to severe depression; and scores greater than 29 = severe depression. For this study, the BDI is evaluated as a continuous variable.

2.2.6. Minnesota Multiphasic Personality Inventory – 2nd edition

The MMPI-2 is a self-report questionnaire containing 567 items which provided information on psychiatric symptoms and personality style (Butcher, Dahlstrom, Graham, Tellegen & Kaemer, 1989). The questions are partitioned into 10 different scales such that elevation of particular scales or combinations of scales allow for various interpretations. For a scale to be considered "elevated," the patient must have a score of at least 65 points in any particular scale. The "Disability Profile," which is of particular interest in this study, is determined by an elevation of at least four of the ten scales.

2.2.7. Structured Clinical Interview for DSM-IV (SCID-NP and SCID-II)

The SCID-NP (First, Spitzer, Gibbon & Williams, 1995) is a structured interview that yields Axis I diagnoses that correspond with the DSM-IV criteria. The

diagnoses considered in this study included Major Depressive Disorder, Generalized Anxiety Disorder and Substance Use Disorders. The SCID-II (First, Gibbon, Spitzer, Williams & Benjamin, 1997) is a structured interview that identifies Axis II Personality Disorders defined with the DSM-IV criteria. The 10 personality disorders each assessed as a dichotomous variable are grouped into three clusters (DSM-IV, 1994). Cluster A describes odd, eccentric and suspicious individuals with Paranoid, Schizoid, and Schizotypal Personality Disorders. Cluster B describes dramatic, emotional and erratic individuals with Antisocial, Borderline, Histrionic, and Narcissistic Personality Disorders. Cluster C describes anxious and fearful individuals with Avoidant, Dependent, and Obsessive-Compulsive Personality Disorders.

2.3 Procedures

All participants were chronic pain patients who were enrolled in a functional restoration program at PRIDE upon being referred by a primary care physician or specialist. The participants were patients that consented to collection of information for treatment management and research purposes at the time of admission. The medically-supervised treatment program consisted of quantitatively-directed exercise progression, which was under supervision of certified physical and occupational therapists. In addition, patients participated in other activities aimed at disability management, such as counseling, stress management, biofeedback, and coping skills training. Furthermore, education support and assistance was provided for injury prevention and occupational factors (Mayer et al., 1985; Mayer et al., 1987).

The measures considered in this study were assessed at admission. At the initial interview, demographic data were collected and physical and functional capacity measurements were performed by appropriate staff members. The psychosocial instruments administered at admission to program included the Quantified Pain Drawing, which is a self-report of perceived pain, the Million Visual Analog Scale (MVAS), which is a visual analog questionnaire measuring disability, the Beck Depression Inventory (BDI), the Minnesota Multiphasic Personality Inventory (MMPI), and the Structured Interview for DSM-IV Axis I and Axis II diagnoses.

2.4 Statistical Analyses

The initial univariate analyses were used to develop a "profile" of the typical non-completer. This was accomplished by comparing the completer group to the non-completer group on the basis of demographic, injury-specific, and occupational variables, along with self-report measures of pain, disability and depression, and Axis I and Axis II diagnoses. Following this, a multivariate logistic regression model was created based on the attributes found at the univariate level that determined the variables most associated with non-completion status.

Univariate tests.

For the categorical demographics, occupational, physical and psychosocial variables, tests of association were conducted based on the Pearson chi-square (X^2) test statistic for all analyses of the differences between the completer and non-completer groups. The effect size for dichotomous categorical variables was reported as the odds ratio. Independent t-tests were conducted on all analyses of the differences between the

completer and non-completer groups on continuous demographic, occupational, physical and psychosocial variables. Effect sizes for all significant effects were reported as Cohen's *d* for all continuous variables. A Holm-Bonferroni Step-Down method was utilized to correct for any potential Type I errors.

Logistic regression.

A sequential logistic regression analysis was performed in this study with the intent to identify the specific variables most associated with non-completion. The variables considered for the logistic regression model were based on those found significant at the univariate level. The first block contained the demographic and injury-specific variables, along with self-report measures of depression (BDI) and perceived disability (MVAS), followed by the occupational variables in block two. The third block assessed the Axis I diagnoses. Finally, Axis II personality disorders were added in block four. The total number of patients utilized in the logistic regression analysis was reduced to 1,845 due to eliminating any patient with missing or invalid data. A Pearson chi-square statistic was assessed following the addition of each block in the sequential logistic regression model to evaluate the association of each set of variables with non-completion status. The significance criterion for the logistic regression analysis was set at $\alpha = .05$.

CHAPTER 3

RESULTS

All appropriate data screening was conducted to identify possible outliers, to evaluate skewness and to ensure homogeneity of variance. For variables with missing data or values outside the accepted range, the participant was excluded from the univariate and the subsequent multivariate analysis utilizing that particular variable. Tables 1 through 4 show the descriptive statistics for all variables considered and Tables 5 through 11 detail the results of all statistical analyses performed in this study. Due to the number of multiple comparisons in this study, a Holm-Bonferroni Step-Down method was used to correct for any potential Type I errors at the univariate level.

3.1 Demographic Indicators

The basic demographic variables for the two groups are detailed in Table 1. The statistical analyses of each demographic variable are presented in Table 5. For the hypotheses related to demographic indicators, age, gender, ethnicity, type of injury and compensable body parts were considered.

Based on the findings of previous research, it was hypothesized that age, ethnicity, type of injury and compensable body parts would not be associated with completion status. As expected, there were no predictive associations between completers and non-completers with respect to age, ethnicity or type of injury (see

Table 1 for descriptive statistics and Tables 5 and 6 for analyses). As expected, completers only marginally differed from non-completers with respect to the compensable body parts (see Table 6). It was hypothesized that gender would differ significantly between completers and non-completers, such that males would be more likely to drop-out prematurely than would females. This finding was not supported in this analysis indicating that gender is not associated with completion status (see Table 5).

3.2 Injury-Specific Indicators

Several variables specific to the patients' injuries were considered in this analysis, including length of disability (time between injury and admission to treatment), temporary-total disability (time out of work), number of pre-treatment surgeries, percentage of patients retaining an attorney, and the percentage of patients who had settled their workers' compensation case prior to admission to treatment. The descriptive statistics of the injury-specific variables are located in Table 1 and the details of the statistical analyses of the injury-specific variables are depicted in Table 6.

It was hypothesized that the non-completers would have a greater length of disability compared to the completers. The Levene's test of homogeneity of variance was significant for both the length of disability and temporary-total disability variables and the degrees of freedom for the t-test were adjusted accordingly. As predicted, the results indicated that non-completers were more likely to have a significantly longer length of disability than were completers, Cohen's d = 0.228, indicating a moderate effect size (see Table 6).

It was also hypothesized that non-completers would have a greater length of temporary-total disability than would the completers. The results supported this difference, (see Table 6), Cohen's d = 0.374, indicating a moderate effect size. As hypothesized, non-completers reported being out of work for a longer period of time post-injury than did the completers. Due to the temporary-total disability variable being highly correlated with the length of disability variable, r = 0.75, the temporary-total disability variable was left out of the logistic regression analysis to prevent issues with multicollinearity. The reason this variable was chosen to be omitted rather than length of disability was because there were more missing data associated with the temporary-total disability variable than with the length of disability variable.

Previous research indicated that patients having undergone surgery prior to treatment tended to experience poorer outcomes, therefore it was hypothesized that non-completers would be more likely to undergo surgery prior to treatment than would completers. In accordance with the hypothesis, pre-treatment surgery was marginally associated with treatment non-completion than with completion (see Table 6). The odds ratio was 1.29 indicating that patients who underwent surgery prior to treatment were 29% more likely to drop-out than did those who do not have surgery.

Litigation factors, such as attorney retention and case settlement, have been linked to poor completion status. It was hypothesized that patients who retained an attorney for legal purposes tied to the injury were less likely to complete the treatment program. A chi-square test of independence did not support this finding, indicating that attorney retention was not associated with completion status (see Table 6). It was also

hypothesized that patients who settled their workers' compensation cases prior to treatment would be more likely to drop out of the treatment program prematurely. This finding was marginally significant (see Table 6). The odds ratio indicated that patients who settled their workers' compensation cases prior to admission to treatment were 1.3 times more likely to drop-out of the program than those who had not yet settled their workers' compensation cases.

3.3 Occupational Indicators

Because the majority of the patients in a functional restoration treatment program have work-related injuries, occupational factors are often considered in outcome studies. The occupational variables under consideration in this study included work status at admission, whether or not the original job was still available post-treatment, the level of satisfaction with the current employer, the type of job (blue versus white collar) and the intensity of physical demand associated with the job. The descriptive statistics for the occupational variables are outlined in Table 2 and the details of the statistical analyses for occupational variables are presented in Table 7.

Many patients continued to work post-injury, oftentimes with a modified schedule or reduced work load. It was hypothesized that patients who were working at the time of admission to the treatment program would be more likely to complete the program compared to the patients who were not working at admission. As hypothesized, patients working at admission were more likely to complete the program (see Table 7).

The odds ratio 0.46 indicated that patients not working at admission were almost half as likely to complete the treatment than were patients working at admission.

It was also hypothesized that patients admitted to the functional restoration program would be more likely to complete the treatment if they had insight that their original job was still available post-treatment. As hypothesized, patients who knew that their original job was still available were significantly more likely to complete the program than were those whose original jobs were not available (see Table 7). The odds ratio of 0.52 showed that patients who knew that their original job was not available post-injury were half as likely to complete the treatment program as were the patients whose original jobs were not available.

Patients who reported having higher levels of satisfaction with their employer prior to treatment were hypothesized to be more likely to complete the treatment protocol than were those who had lower levels of job satisfaction. Contrary to the hypothesis, there was no significant difference found in level of job satisfaction between completers and non-completers, indicating that the relationship with the employer prior to treatment had no bearing on completion status (see Table 7).

Although most patients entering the functional restoration program reported work-related injuries, it was hypothesized that completion status would not be associated with job type or level of physical demand. As hypothesized, the results of this analysis did not show an association between job type (patients who worked a "white collar" job verses those who worked a "blue collar" job) nor between completion status (see Table 7).

3.4 Physical and Psychosocial Indicators

Various self-report physical and psychosocial variables were assessed with respect to completion status. The variables under consideration for this study included a depression inventory, a pain intensity evaluation, a measure of perceived disability, and a disability classification as indicated by the MMPI. The descriptive statistics for the self-report physical and psychological variables are highlighted in Table 3, and the details for the statistical analyses for these variables are presented in Table 8.

Symptoms of depression were measured using the Beck Depression Inventory (BDI). It was hypothesized that patients that drop out of the treatment program would have scored higher on the BDI at admission than would those patients who completed the program. The mean scores on the BDI for the completer and non-completer groups were compared using an independent *t*-test. The Levene's test of homogeneity of variance was significant and the degrees of freedom were adjusted. As predicted, non-completers reported higher levels of depression symptomatology compared to completers, thus showing that symptoms of depression are associated with completion status with a moderate effect size (Cohen's $d = .33$) (see Table 8).

The patients in this study were asked to rate their level of pain intensity at admission to the program using a 10-point visual analogue scale. It was hypothesized that the patients who reported higher levels of pain at admission would be more likely to drop-out of the treatment program than would the patients who reported lower levels of pain. Contrary to the expectations, there was not a significant difference in pain levels between the two groups (see Table 8).

Disability was assessed by two different measures: the Million Visual Analog Scale (MVAS) and the Minnesota Multiphasic Personality Inventory (MMPI). As hypothesized, non-completers had significantly higher mean scores on the MVAS than did the completer group, Cohen's $d = 0.353$, indicating a moderate effect size (see Table 8). The second evaluation for assessing disability was the MMPI. The Disability Profile is indicated by an elevation of at least 4 of the 10 clinical scales in this assessment. It was hypothesized that patients in the non-completer group would be more likely to be classified with the Disability Profile than would the patients in the completer group. As predicted, the Disability Profile was more associated with the non-completer group than with the completer group. Patients classified with the Disability Profile are 1.6 times more likely to drop-out of the treatment program prematurely than those without the Disability Profile (see Table 8). Due to the collinearity between these two measures of disability, only the MVAS was integrated into the final logistic regression model.

DSM-IV Diagnoses

The descriptive statistics for the rates of DSM-IV Axis I and Axis II diagnoses for the completers and non-completers are presented in Table 4, and the statistical analyses are shown in Tables 9 and 10. The Axis I and Axis II comparisons were evaluated from the SCID-II representing the current, post-injury diagnoses. For the assessments of Axis I disorders, Major Depressive Disorder, Anxiety Disorder and Substance Use Disorder were considered for this study. Within the Substance Use Disorders, Alcohol dependency, Drug (non-opioid) dependency and Opioid dependency

disorders were considered. Of the Axis II Personality Disorders, the overall prevalence of any personality disorder was first considered, followed by the analyses of the personality disorder clusters.

Axis I Diagnoses

For this study, the Axis I disorders utilized in the comparison of completers to non-completers included Major Depressive Disorder, Anxiety Disorder and Substance Use Disorder. Contrary to the prediction, there was no significant relationship between completion status and diagnoses of Major Depressive Disorder (see Table 9). As predicted, patients with an Axis I Anxiety Disorder were 1.6 times more likely to drop-out than patients without this diagnosis (see Table 9). Although Anxiety Disorder was found to be marginally significant following the Holm-Bonferroni Step-Down adjustment, this variable was included in the final logistic regression analysis.

The last set of hypotheses within the Axis I disorders related to Substance Use Disorders, specifically alcohol dependency, drug dependency and opioid dependency. As expected, patients diagnosed with a Substance Use Disorder were found to be two-times more likely to drop-out of treatment than were patients without this diagnosis. Breaking down the specific Substance Use Disorders, it was hypothesized that non-completers would be more likely than completers to be diagnosed with an alcohol dependency disorder, a drug dependency disorder, or an opioid dependency disorder (see Table 8). The relationship with alcohol dependency and non-completion was not supported by the analysis; completers and non-completers were equally likely to develop an alcohol dependency disorder. Although there was a marginally significant

difference found between the two groups with respect to drug dependency, the actual percentage of patients within the two groups that was diagnosed with a drug dependency disorder was minimal (C = 0.3%; NC = 1.3%). Opioid dependence, on the other hand, was found to be more strongly associated with non-completion than with completion. In fact, patients admitted to the treatment program with a current opioid dependency diagnosis were two-times more likely to drop-out than were patients without this diagnosis.

Axis II Diagnoses

Because personality disorders are relatively stable over time, it was not likely that an individual would develop a personality disorder following any incidence, such as an injury. Additionally, knowing that one cannot "treat" the patient's personality disorder, it was possible only to diagnose it and provide ways to work with it. In this study, it was hypothesized that there would be a higher prevalence rate of patients with any personality disorder associated with the non-completion group than with the completion group. The overall prevalence rate for the entire cohort was 62.2%. As predicted, a chi-square test of independence demonstrated that patients with any personality disorder at admission were more associated with non-completion than those without a personality disorder. In fact, patients with any personality disorder were found to be two-times more likely to drop-out of the program prematurely than those without any personality disorder (see Table 10).

Because there were multiple personality disorders to consider, this study evaluated the 10 personality disorder diagnoses grouped into three clusters (DSM-IV, 1994).

Cluster A: Paranoid, Schizoid, and Schizotypal

Cluster B: Antisocial, Borderline, Histrionic, and Narcissistic

Cluster C: Avoidant, Dependent, and Obsessive-Compulsive

Results supported the hypotheses that the non-completion group would have a higher prevalence of any Cluster A, Cluster B or Cluster C personality disorder than would the completer group. Chi-square tests of independence were used to analyze these hypotheses. As predicted, patients entering the program with any Cluster A personality disorder were 1.6-times more likely to drop-out than were those without a Cluster A diagnosis. Patients entering the program diagnosed with either a Histrionic, Narcissistic, Borderline or Antisocial personality disorder were two-times more likely to drop-out than patients without a Cluster B diagnosis. Finally, patients entering the program with any Cluster C diagnosis were found to be 1.4-times more likely to drop-out than patients without a Cluster C diagnosis (see Table 10).

3.8 Logistic Regression

The logistic regression analysis was utilized to determine which of the univariate indicators were more associated with non-completion than with completion to be assessed for predictive purposes. The model created was a sequential logistic regression model containing four specific blocks. Table 11 shows the final step of the

logistic regression analysis. The first block entered into the model contained the following injury-specific variables: Length of Disability, Pre-Treatment Surgery, and Pre-Treatment Case Settlement along with the Beck Depression Inventory (BDI) and the Million Visual Analog Scale (MVAS). A chi-square statistic determined that these injury-specific variables attributed to the variance in program completion, X^2 (5, N = 1845) = 62.117, $p < 0.001$.

The occupational variables considered in block two included Job Availability and Work Status at Admission. The addition of this block to the model was found to be significant, X^2 (2, N = 1845) = 20.158, $p < 0.001$, showing that, in addition to the injury-specific variables, the occupational variables contributed to the variance in completion status. By including the variables in the second block, the chi-square statistic of the overall model increased from $X^2 = 62.117$ to $X^2 = 82.275$.

The psychosocial variables considered in block three of the model included two Axis I disorders: Anxiety Disorder and Opioid Dependency Disorder. The self-report measures of depression and perceived disability along with the clinical diagnoses of Anxiety Disorder and Opioid Dependency Disorder contributed to the variance in completion status above and over that of the injury-specific and occupational variables considered, X^2 (2, N = 1845) = 9.726, p = 0.008. By including the variables in the third block, the chi-square statistic of the overall model increased from $X^2 = 82.275$ to X^2 = 92.001.

The last block to be considered in the logistic regression model included the Axis II Personality Disorder clusters. The inclusion of the fourth block to the model

showed that Axis II Personality Disorder clusters were predictive of completion status over and above injury-specific variables, occupational variables, self-report measures of depression and perceived disability and clinical diagnoses of anxiety and opioid dependency, X^2 (3, N = 1845) = 21.008, $p < 0.001$. By including the variables in the final block, the chi-square statistic of the overall model increased from $X^2 = 92.001$ to $X^2 = 113.009$.

The final model found completion status to be greatly associated with the following variables: Length of Disability, MVAS, Work Status at Admission, Opioid Dependency, and Any Cluster B Personality Disorder. The results of the model showed that for each incremental increase in the Length of Disability (months), the patient was 1.01 times more likely to drop-out of the program. For each incremental increase in the rating on the MVAS, the patient was 1.01 times more likely to non-complete. For the Work Status at Admission variable, if the patient was working at admission to the program, he/she was found to be 2.5 times more likely to complete the program, or 60% less likely to drop-out. Patients entering the program dependent on opioids, as indicated by the SCID, were 1.48 times more likely to drop-out of the program prematurely compared to patients not dependent on opioids. Finally, patients admitted to the program with any Cluster B Personality Disorder (Histrionic, Narcissistic, Borderline or Antisocial diagnosis) were 1.62 times more likely to non-complete than patients without Cluster B disorder.

As each block was entered into the model, the beta coefficients along with the significance of each variable were analyzed to determine the stability of the parameter

estimates. Both the changes in directionality of the beta coefficients and whether the significance of each variable changed from one block to the next were assessed. Upon review, with the exception of the BDI variable, all other variables entered maintained the same direction and significance level. BDI, on the other hand, was found to be significantly associated with non-completion in the first three blocks of the model, but then became insignificant with the addition of the personality disorder variables in block four. This finding suggests that there may be collinearity between the depression inventory and the existence of personality disorders. However, when assessing the correlation coefficients between BDI and the Axis II personality disorder clusters, there appears to be a relatively weak correlation (Cluster A, $r = .208$; Cluster B, $r = .258$; and Cluster C, $r = .209$).

A best subset analysis was performed using a forward step-wise logistic regression. The results from this analysis showed the same five predictor variables identified in the sequential logistic regression to have significant associations with completion status, overall model X^2 (5) = 94.443, $p < 0.001$ (see Table 12). To assess the maximum likelihood estimates of the best subset model, the Nagelkerke R-squared, which is a pseudo R-squared used in logistic regression, was utilized. The results of this analysis indicate that the Cluster B Personality Disorder Diagnoses have the greatest overall predictive power of the univariate predictors of non-completion.

CHAPTER 4

DISCUSSION

The present study represents a broad comprehensive examination of patients with chronic disabling occupational musculoskeletal disorders who were admitted to a tertiary functional restoration program. The purpose of this study was to first identify key risk factors associated with non-completion of a functional restoration treatment program, followed by creating a logistic regression model that would predict patients who are less likely to complete the program based on selected criteria at admission. Because it has been shown that patients who complete a functional restoration program have much higher success rates of work return, work retention and other positive outcomes (Proctor et al, 2005), the ultimate goal would be to devise and implement appropriate interventions that would assist these pre-determined "drop-outs" in completing the prescribed treatment.

4.1 Demographic Indicators

Several factors were taken into consideration when developing this model. First, basic demographics were considered, such as age, gender, and ethnicity. Although there were contradicting results in the literature with respect to gender and positive outcomes, the only demographic variable hypothesized in this study to be associated with non-completion was gender, in that males would be more likely to drop-

out than would females. The analyses did not support this hypothesis. The previous study for which the hypothesis was determined showed that males had poorer outcomes than females with respect to work return as the outcome variable (Bendix ex al., 1998) However, other studies reporting contrary findings (Kerns & Rosenberg, 2000; McGeary et al., 2003; Proctor et al., 2005) demonstrate that gender differences may not be relevant risk factors to consider in chronic pain outcome studies.

4.2 Injury-Specific Indicators

Due to the nature of the program, the injury-specific indicators were considered in this analysis. Those variables considered in this present study included the type of injury, the number of compensable body parts, the length of disability, whether the patient had surgery prior to treatment, and whether the patient retained an attorney or settled their workers' compensation case prior to treatment. Moreover, the type of injury was divided into the following categories: cervical, thoracic/lumbar, multiple spinal, multiple musculoskeletal, upper extremity, lower extremity, upper and lower extremity (no spine), and other. When comparing the non-completers to the completers, the type of injury did not differ significantly between the two groups. The number of compensable body parts did differ, but only marginally. With the effect size being so small, Cohen's d = .088, there doesn't appear to be much predictive power in completion status with the number of compensable body parts factor.

In comparing the completers to the non-completers, it was evident that the non-completion group had a greater length of disability than did the completer group.

Although the specific reasons why there was a greater delay for treatment for the non-completer group is unknown with this sample, it can be speculated that some patients might encounter difficulties getting funding for the multidisciplinary treatment program, some patients might resist treatment due to fear of re-injury or secondary gains, or some patients may develop conditions, such as drug dependency, that could interfere with proper medical treatment. Regardless the reason, a greater the duration between injury and treatment has been associated with poor outcomes in numerous studies (Mayer & Polatin, 2000; Bendix et al., 1998; Jordan et al., 1998; Proctor, 2001; Proctor et al., 2005 & Gatchel, Stowell et al., 2006). Early intervention, as studied by Gatchel, Stowell et al. (2006), would be worth considering as a randomized controlled protocol for patients with chronic pain conditions in the functional restoration setting.

Many factors are considered when determining the proper course of action for an injured patient, such as surgery or therapy. One criterion for patients admitted to a functional rehabilitation program is that surgery was either not an option or was not successful. Therefore, it is assumed that the patients who underwent surgery prior to entering the treatment program did not initially experience successful outcomes following the surgery. It is not surprising that pre-treatment surgery was found to be associated with poor treatment outcomes, specifically non-completion.

Litigation factors, such attorney retention and case settlement, are often considered when treating work-related injuries. Previous studies (Proctor, 2001; Proctor et al., 2005; Kool et al., 2007) have identified attorney retention and case settlement prior to admission to be linked with poor outcomes. As hypothesized in the

present study, case settlement prior to treatment was more associated with non-completion status than with completion of the program. However, attorney retention did not differ between the two groups being compared.

4.3 Occupational Indicators

Since the majority of the patients in this study had experienced a work-related injury, the occupational variables taken into consideration when comparing the risk factors for non-completion included whether or not the patient was working at admission to the treatment, whether or not the patient had insight that his/her original job was still available, and whether or not the patient was satisfied with their employer. Job satisfaction was not found to be an indicator of completion status in the current study. The present analysis did, however, identify that patients working at admission, (specifically working full-time) were more likely to complete the treatment. Furthermore, those patients whose original jobs were still available were also more likely to complete the program. For employers, keeping the injured employee at work or at least keeping the prospect of allowing the employee to return to the original position post-treatment is an important consideration to increase the likelihood of positive treatment outcomes. Further research on presenteeism (reduction in hours or modified duties post-injury) would be appropriate to take into account, not only with respect to the treatment outcomes but also related to overall costs.

4.4 Physical and Psychosocial Indicators

Rather than only assessing the biological indicators of the situation, it is important to consider the patients' interpretation of their conditions. By using a biopsychosocial approach to assessing the pain condition, a better understanding of the patient as a whole can be considered when designing a proper treatment protocol. Physical and psychosocial factors that have been found to be associated with poor treatment outcomes include higher levels of depression (Fishbain et al., 1997; Evans, 1999; Sullivan et al., 2006; Biller et al., 2000; Garrod et al., 2006; Haythorntwaite, 1988; Proctor et al., 2005; Rush et al., 2000), higher levels of pain intensity (Anagnostis et al., 2003; McGeary et al., 2006; Sullivan et al., 2005; Gauthier et al., 2006), and higher levels of perceived disability (Proctor, 2001; Gatchel, Mayer & Theodore, 2006; Gatchel & Mayer, 2006).

The findings from the current study align with prior research with respect to both depression and perceived disability. Comparing the completion status in this current study, scores on the BDI varied significantly with completers being more likely to report None/Mild Depression symptoms while non-completers were more likely to report Severe/Extreme Depression symptoms. Perceived disability, as measured on the MVAS, showed that completers were more likely to rate themselves as Moderately Disabled compared to non-completers who were more likely to rate themselves as Severely Disabled. This coincides with the MMPI analysis, for which non-completers were significantly more likely to be diagnosed with "Disability Profile" than were the completers. These findings indicate that the patients' interpretations of their own

physical and psychosocial factors are essential considerations when predicting completion status.

Although several previous studies have linked poor treatment outcomes with high perceived levels of pain intensity (Anagnostis et al., 2003; McGeary et al., 2006; Sullivan et al., 2005; Gauthier et al., 2006), the present study did not find a significant difference between completers and non-completers with respect to pain intensity. A prior study by Kerns and Rosenberg (2000) also assessed measures of pain intensity and completion status and, like the current study, found no relationship. Interestingly, the differences in completion status for self-report measures are found in the psychological elements rather than with the physical factors. Psychosocial factors such as depression and perceived disability are seen to impact treatment drop-out regardless of the level of pain associated directly with the injury.

DSM-IV Diagnoses

As noted above, the psychosocial factors seem to be an integral part of determining completion status regardless of the physical condition itself. Post-injury psychopathologies (Axis I), along with personality disorders (Axis II), are found to be risk factors for non-completion of treatment.

For the Axis I Clinical Disorders, the diagnoses considered in this study included Major Depressive Disorder, Anxiety Disorder and Substance Use Disorder. Prior studies have linked these Axis I disorders to negative treatment outcomes (Dersh, Mayer & Gatchel, 2007). In this study, incidences of Major Depressive Disorder did not differ significantly between the completers and non-completers, as compared with

the depression scores acquired on the Beck Depression Inventory. However, more than 50% of the patients in the entire cohort studied (both completers and non-completers) were diagnosed with Major Depressive Disorder. Regardless that the Major Depressive Disorder diagnosis did not differ significantly between the two sub-groups compared, it is an important factor to address in treatment. With respect to Anxiety Disorders, although the prevalence rate is not very high overall, there is a significant difference between the two groups, with non-completers being 1.6 times more likely to have an Anxiety Disorder than the completer group. These psychosocial factors are important to consider when assessing and treating patients with chronic pain conditions.

Substance Use Disorders have been associated with poor outcomes in numerous studies (Dersh et al., 2007; Cohen et al., 2007; Kay et al., 2002; James & Taylor, 2007; Bowden-Jones et al., 2004). Specifically, opioid dependence is of particular interest in chronic pain populations. Although this diagnosis includes any type of opioid drug, the majority of the patients report a dependency on prescription narcotics. Considering that the patients entering a tertiary rehabilitation setting are being treated for chronic pain conditions, it makes sense that they may develop a physiological or psychological addiction to these types of pain killers. In this study, there was a strong distinction between completers and non-completers related to opioid dependence at admission. In fact, a patient entering the treatment program who was diagnosed with opioid dependency is twice as likely to drop-out of the program as one who was not diagnosed with opioid dependency. Even though attempts are made to help the patient detoxify during the program, the drug dependency is often so overwhelming that it interferes

with treatment. At the primary and secondary levels of care, practitioners should be adamant about monitoring the duration of use of prescribed opioid pain killers.

In this study, personality disorders were considered as risk factors for non-completion of the treatment program. In comparing the completers to the non-completers, it was identified that non-completers were more likely than completers to be diagnosed with any personality disorder, with a Cluster A, B, or C disorder, or with these specific personality disorders: Paranoid PD, Borderline PD, Histrionic PD, Narcissistic PD, Avoidant PD and Dependent PD. Unlike depression and anxiety, personality disorders cannot be "treated." However, knowing that a patient has a particular personality disorder may help with treatment. By identifying these disorders at admission to the treatment program, the interdisciplinary team can adopt various methods or strategies to treat these particular individuals that would work with their particular personality distinctions rather than against them.

Personality disorders are of interest in this study because they are relatively stable over time and tend to develop at adolescence. Therefore, compared to psychological factors such as depression and anxiety, the existence of these personality disorders is not a direct consequence of the injury resulting in the chronic pain condition. Yet, the fact that over 60% of the patients entering a functional restoration program for chronic pain conditions have diagnoses of personality disorders is interesting. Although this study is focused on non-completion of a tertiary care program, it would be of interest to see how the prevalence of personality disorders relates to treatment at both the primary and secondary levels of care. Moreover, do

patients with personality disorders exhibit more work related injuries than patients without these disorders? Further research is warranted to determine how various personality disorders are associated with injuries in the workplace.

4.5 Conclusions on Risk Factors for Non-Completion

The purpose of this study was to identify the key risk factors for non-completion of a functional restoration program for patients with chronic disabling occupational musculoskeletal disorders. The study started by comparing the two subgroups (completers and non-completers) on various physical, psychological and social factors at the univariate level. Those variables that were found to be distinguishable between the groups were then entered into a multivariate logistic regression in an attempt to isolate the factors that are most associated with treatment non-completion. The results from the logistic regression analysis indicated that the main risk factors for non-completion were: 1) having an extended length of disability, 2) indicating higher ratings of perceived disability on the MVAS, 3) not currently working at time of admission to treatment, 4) being diagnosed with an opioid dependency disorder, and 5) being diagnosed with any Cluster B personality disorder. It is important to note that the measurement for depression (BDI) was significant in the sequential logistic regression model until the fourth block when the Axis II personality disorder clusters were added. For practical purposes, if a proper DSM-IV evaluation is not administered at admission to a functional restoration program, then it would be appropriate to consider an elevation in the BDI as a risk factor for non-completion.

With such a low predictive ability of non-completion, the analysis shows that the model's ability to accurately predict non-completers warrants more attention. It may be that, in addition to the variables taken into account in this study, other factors should be considered as well. The emphasis of this study was based solely on the chronic pain condition related to the injury. However, it would be worth considering any other comorbid conditions a patient may have had or currently have, such as cardiovascular disease, diabetes, cancer, etc. Another consideration would be to evaluate the patient's outlook on the treatment program itself. If the patient's attitude toward the program is poor from the onset, it may be likely that he/she will exhibit poor outcomes compared to someone whose attitude about treatment is favorable.

Knowing that individuals differ on every domain, it is implausible to integrate every possible physiological, psychological, social and behavioral indicator into a single model. However, by assessing the characteristics that reliably identify a particular behavior, such as dropping-out of a treatment program, it is possible to "flag" these patients at admission and provide an intervention tailored to their specific situations that will foster positive treatment outcomes.

APPENDIX A

STATISTICAL TABLES

Table 1
Descriptive Statistics: Demographic and Injury Specific Variables

Variable	Non-Completer	Completer
n	685	2367
Age (mean/SD)	45.20 (10.48)	45.09 (9.62)
Gender (% Male)	53.6	53.7
Ethnicity (%)		
African American	24.4	23.2
Caucasian	52.7	52.7
Hispanic	19.1	20.6
Asian	1.0	1.5
Other	2.8	2.1
Length of Disability (months/SD)	21.56 (24.32)	16.56 (19.03)
Temporary-Total Disability (months/SD)	19.60 (22.98)	12.56 (13.41)
Pretreatment Surgery (%)	46.6	40.4
Case Settlement Pre-Treatment (%)	29.4	24.4
Compensable Body Parts (mean/SD)	1.52 (1.22)	1.62 (1.05)
Area of Injury (%)		
Cervical	5.1	4.3
Thoracic / Lumber	40.4	41.0
Multiple Spinal	11.2	7.9
Multiple Musculoskeletal	21.4	21.6
Upper Extremity	14.5	17.6
Lower Extremity	6.7	6.0
Upper/Lower Ext (no spine)	0.7	0.9
Other	0.0	0.7

Table 2
Descriptive Statistics: Occupational Variables

Variable	Non-Completer	Completer
Work Status at Admission		
Currently Working (%)	7.2	14.4
Working Full-Time (%)	5.4	11.7
Modified Schedule (%)	1.3	2.3
Working Part-Time (%)	0.5	0.4
Original Job Available (%)	37.5	53.6
Job Code		
Blue Collar (%)	70.1	71.7
Job Demand		
Sedentary/Light (%)	14.4	14.7
Light/Medium (%)	25.5	27.3
Medium/Heavy (%)	34.8	35.1
Heavy/Very Heavy (%)	25.3	22.9
Job Satisfaction (Pre-Treatment)		
Very Satisfied (%)	58.4	56.2
Satisfied (%)	24.6	24.9
Neither (%)	10.8	12.5
Dissatisfied (%)	2.5	3.4
Very Dissatisfied (%)	3.7	2.9

Table 3
Descriptive Statistics: Physical and Psychological Variables

Variable	**Non-Completer**	**Completer**
BDI (mean/SD)	20.85 (12.34)	17.10 (10.61)
No Depression (%)	17.9	26.6
Mild Depression (%)	17.5	21.0
Moderate Depression (%)	31.5	30.0
Severe Depression (%)	10.5	9.2
Extreme Depression (%)	22.6	13.2
Pain Intensity (mean/SD)	7.98	7.44
MVAS (mean/SD)	99.60 (25.19)	90.70 (25.24)
Mildly Disabling (%)	3.0	3.5
Moderately Disabling (%)	19.5	33.8
Severely Disabling (%)	77.5	62.7
MMPI		
Normal Profile (%)	1.9	9.8
Disability Profile (%)	56.8	45.1

Table 4
Descriptive Statistics: Axis I and Axis II Diagnoses

Variable	Non-Completer	Completer
Axis I		
Major Depressive Disorder (%)	53.5	50.7
Anxiety Disorder (%)	14.9	10.0
Substance Use Disorder (%)	27.2	15.8
Alcohol Dependency (%)	1.5	0.9
Drug Dependency (%)	1.3	0.3
Opioid Dependency (%)	25.8	14.1
Axis II		
Any Axis II (%)	74.7	59.8
Any Cluster A (%)	33.9	24.1
Any Cluster B (%)	56.3	38.8
Any Cluster C (%)	34.6	27.6

Table 5

Statistical Analyses: Demographic Variables

Gender				
Group	% Male	X^2	df	*p*
Non-Completer	53.6	0.001	1	0.971
Completer	53.7			
Age				
Group	Mean (SD)	*t*	df	*p*
Non-Completer	45.20 (10.48)	0.242	1040.37	0.810
Completer	45.09 (9.62)			
Ethnicity				
Group	%	X^2	df	*p*
Non-Completer		2.856	4	0.582
African American	24.4			
Caucasian	52.7			
Hispanic	19.1			
Asian	1.0			
Other	2.8			
Completer				
African American	23.2			
Caucasian	52.7			
Hispanic	20.6			
Asian	1.5			
Other	2.1			

Table 6

Statistical Analyses: Injury Specific Variables

Length of Disability (months)					
Group	Mean (SD)	*t*	df	*p*	
Non-Completer	21.56 (24.32)	4.933	925.51	<.001	
Completer	16.56 (19.03)				
Temporary-Total Disability (months)					
Group	Mean (SD)	*t*	df	*p*	
Non-Completer	19.60 (22.98)	6.602	615.111	<.001	
Completer	12.56 (13.41)				
Pre-Treatment Surgeries					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	46.6	8.251	1	.004	1.29 (1.08, 1.53)
Completer	40.4				
Attorney Retention					
Group	%	X^2	df	*p*	
Non-Completer	18.6	0.01	1	.920	
Completer	18.5				
Case Settlement Pre-Treatment					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	29.4	6.887	1	.009	1.29 (1.07, 1.56)
Completer	24.4				

Table 6 (continued)

Compensable Body Parts				
Group	Mean (SD)	*t*	df	*p*
Non-Completer	1.52 (1.22)	-2.076	939.212	.038
Completer	1.62 (1.05)			
Area of Injury				
Group	%	X^2	df	*p*
NC		1.212	7	.270
Cervical	5.1			
Thoracic/Lumbar	40.4			
Multiple Spinal	11.2			
Multiple Musculoskeletal	21.4			
Upper Extremity	14.5			
Lower Extremity	6.7			
Upper/Lower Ext (no spine)	0.7			
Other	0.0			
Completer				
Cervical	4.3			
Thoracic/Lumbar	41.0			
Multiple Spinal	7.9			
Multiple Musculoskeletal	21.6			
Upper Extremity	17.6			
Lower Extremity	6.0			
Upper/Lower Ext (no spine)	0.9			
Other	0.7			

Table 7

Statistical Analyses: Occupational Variables

Work Status at Admission : Currently Working					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	7.2	24.84	1	<.001	0.46 (0.34, 0.63)
Completer	14.4				
Original Job Available					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	37.5	48.37	1	<.001	0.52 (0.43, 0.63)
Completer	53.6				
Job Code					
Group	%	X^2	df	*p*	
Non-Completer	70.1	.539	1	.463	
Completer	71.7				
Job Demand					
Group	%	X^2	df	*p*	
Non-Completer		1.998	3	.573	
Sedentary/Light	14.4				
Light/Medium	25.5				
Medium/Heavy	34.8				
Heavy/Very Heavy	25.3				
Completer					
Sedentary/Light	14.7				
Light/Medium	27.3				
Medium/Heavy	35.1				
Heavy/Very Heavy	22.9				
Job Satisfaction (Pre-Treatment)					
Group	Mean (SD)	*t*	df	*p*	
Non-Completer	1.69 (1.01)	-0.639	2046	0.523	
Completer	1.72 (1.00)				

Table 8

Statistical Analyses: Self Report Physical and Psychological Variables

BDI (pre-treatment)					
Group	Mean (SD)	*t*	df	*p*	
Non-Completer	20.84 (12.34)	7.730	960.08	<.001	
Completer	17.10 (10.61)				
Pain Intensity (pre-treatment)					
Group	Mean (SD)	*t*	df	*p*	
Non-Completer	7.98 (7.46)	1.067	2996	0.286	
Completer	7.44 (12.30)				
MVAS (pre-treatment)					
Group	Mean (SD)	*t*	df	*p*	
Non-Completer	99.60 (25.19)	7.981	2964	<.001	
Completer	90.70 (25.24)				
MMPI – Normal Profile					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	1.9	17.991	1	<.001	0.18 (0.07, 0.44)
Completer	9.8				
MMPI – Disability Profile					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	56.8	12.68	1	<.001	1.60 (1.23, 2.08)
Completer	45.1				

Table 9

Statistical Analyses: DSM-IV Diagnoses (Axis I)

Major Depressive Disorder					
Group	%	X^2	df	*p*	
Non-Completer	53.5	1.002	1	.317	
Completer	50.7				
Anxiety Disorder					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	14.9	8.272	1	.004	1.58 (1.16, 2.17)
Completer	10.0				
Substance Use Disorder					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	27.2	29.668	1	<.001	2.00 (1.56, 2.58)
Completer	15.8				
Alcohol Dependency Disorder					
Group	%	X^2	df	*p*	
Non-Completer	1.5	1.367	1	.242	
Completer	0.9				
Drug Dependency Disorder					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	1.3	5.731	1	.017	3.72 (1.17, 11.78)
Completer	0.3				
Opioid Dependency Disorder					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	25.2	30.263	1	<.001	2.06 (1.59, 2.67)
Completer	14.1				

Table 10

Statistical Analyses: DSM-IV Diagnoses (Axis II)

Any Axis II Diagnosis					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	74.7	30.608	1	<.001	2.00 (1.54, 2.56)
Completer	59.8				
Any Cluster A Diagnosis					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	33.9	16.247	1	<.001	1.61 (1.28, 2.04)
Completer	24.1				
Any Cluster B Diagnosis					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	56.3	40.777	1	<.001	2.04 (1.64, 2.56)
Completer	38.8				
Any Cluster C Diagnosis					
Group	%	X^2	df	*p*	OR (95% CI)
Non-Completer	34.6	7.493	1	<.001	1.39 (1.10, 1.75)
Completer	27.6				

Table 11

Sequential Logistic Regression Analysis of Completion Status
(All variables at final block)

Variable	**B**	**SE**	**Wald**	***p***	**Exp B (95% CI)**
Length of Disability	.008	.004	4.836	.028	1.01 [1.00, 1.02]
Pre-Treatment Surgery	.069	.140	0.246	.620	1.07 [0.82, 1.41]
Case Settlement	- .189	.172	1.208	.272	0.83 [0.59, 1.16]
BDI	.009	.006	1.793	.181	1.01 [0.99, 1.02]
MVAS	.011	.003	13.075	.000	1.01 [1.01, 1.02]
Work Status	-.908	.287	10.029	.002	0.40 [0.23, 0.71]
Job Availability	-.253	.141	3.208	.073	0.78 [0.59, 1.02]
Anxiety Disorder	-.052	.194	0.071	.789	0.95 [0.65, 1.39]
Opioid Dependency	.408	.161	6.400	.011	1.50 [1.10, 2.06]
Any Cluster A Dx	.198	.151	1.731	.188	1.22 [0.91, 1.64]
Any Cluster B Dx	.502	.140	12.764	.000	1.65 [1.25, 2.17]
Any Cluster C Dx	.177	.146	1.475	.225	1.19 [0.90, 1.59]
Constant	-3.215	.327	96.952	.000	

Overall Classification Rate: 78.5%

Sensitivity: 34.3%

Specificity: 87.1%

Table 12

Best Subset Analysis:
Forward Stepwise Logistic Regression Analysis of Completion Status
(All variables at final block)

Variable	**B**	**SE**	**Wald**	***p***	**Exp B (95% CI)**
Length of Disability	.009	.003	8.734	.003	1.01 [1.00, 1.02]
MVAS	.012	.003	16.942	.000	1.01 [1.01, 1.02]
Work Status	-1.021	.281	13.236	.000	0.36 [0.21, 0.62]
Opioid Dependency	.373	.164	5.208	.022	1.45 [1.05, 2.00]
Any Cluster B Dx	.606	.134	20.392	.000	1.83 [1.41, 2.38]
Constant	-3.232	.305	112.453	.000	

Overall Classification Rate: 77.2%

Sensitivity: 29.1%

Specificity: 86.6%

Model Summary	Nagelkerke R-Squared	% of Total Association
Step 1: Any Cluster B Dx	.033	37.5%
Step 2: MVAS	.059	29.5%
Step 3: Work Status	.074	17.0%
Step 4: Length of Disability	.083	10.2%
Step 5: Opioid Dependency	.088	5.7%

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BIOGRAPHICAL INFORMATION

Krista Howard graduated from Trinity High School in 1992 and obtained a B.A. in Psychology at the University of Texas at Arlington in August, 1997. She received her Texas Teacher's Certification in 1999 and taught Secondary Mathematics for seven years before returning to graduate school in 2006. Following the award of the M.S. in Psychology based on this project, she will continue pursuing a Ph.D. in Psychology. Krista married Jeff Howard in 1995 and they have two daughters, Kyla and Kadey.