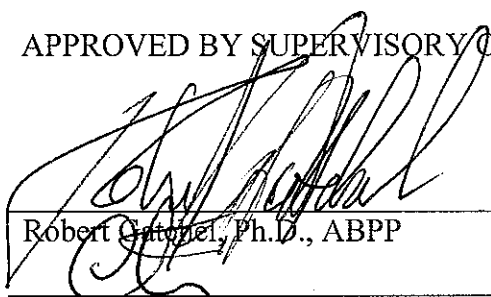



ABILITY OF THE PAIN DISABILITY QUESTIONNAIRE IN PREDICTING HEALTHCARE
UTILIZATION

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DEDICATION

I would like to thank the members of my Graduate Committee, my family, my friends, and the faculty members in the Department of Rehabilitation Counseling at the University of Texas Southwestern Medical Center at Dallas.

ABILITY OF THE PAIN DISABILITY QUESTIONNAIRE IN PREDICTING HEALTHCARE
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by

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THESIS

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Abstract

BACKGROUND: Chronic pain is one of the most expensive and prevalent healthcare problems in the United States. It affects not only the individual but also society as a whole. The Biopsychosocial Model of chronic pain is the standard model for understanding and treating the pain experience. As such, it is important to have accurate ways of predicting healthcare outcomes for the chronic pain population. Prior research has evaluated the predictive abilities of health outcome measures and healthcare utilization. However, only one study to our knowledge has evaluated the Pain Disability Questionnaire's (PDQ) ability to predict healthcare utilization.

SUBJECTS: The current study consisted of 50 [$M_{\text{age}} = 54.76$ (12.41) years] adult patients diagnosed with chronic pain who completed an interdisciplinary treatment program at the Eugene McDermott Center for Pain Management.

METHOD: The PDQ was administered at baseline and total health care cost was obtained at three-month follow-up. Participants were placed in either the high or low health care cost group depending on how they compared to a national average estimate for chronic pain patients.

Logistic and linear regression modeling, as well as receiver operator characteristic analyses were used to evaluate the predictive ability of the PDQ in determining healthcare utilization cost at a three-month follow-up time point.

RESULTS: The logistic regression analysis indicated the PDQ accurately placed participants in the respective high or low healthcare cost group [$X^2(1) = 10.67, p < .001$]. Receiver operator characteristic analysis yielded an area under the curve of .76. A PDQ cutoff score of 96 produced the optimal sensitivity (.70) and specificity (.67) for determining whether patients fall in the high

or low healthcare cost group. The linear regression established that PDQ scores at baseline statistically significantly predicted total healthcare utilization at three months following the end of their treatment program, where higher PDQ scores were related to higher healthcare cost [$F(1, 48) = 11.41, p = .001$].

DISCUSSION: These findings offer support for the use of the PDQ in predicting healthcare cost. Use of the PDQ in this context may help clinicians, caregivers, and patients in planning the cost of the chronic pain sufferers' treatment. Knowing what to expect financially could help increase the patient's quality of life.

Keywords: Chronic pain, biopsychosocial model, interdisciplinary programs, healthcare utilization, Pain Disability Questionnaire.

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LIST OF ABBREVIATIONS

AMA	--	American Medical Association
CAT	--	Computer Adaptive Test
CDMSD	--	Chronic disabling Musculoskeletal Disorders
EMCPM	--	Eugene McDermott Center for Pain Management
FSC	--	Pain Disability Questionnaire: Functional Status Component
HCCI	--	Health Care Cost Institute
HIPAA	--	Health Insurance Portability and Accountability Act
HP	--	Heterogeneous Pain
ID	--	Interdisciplinary Treatment
IRT	--	Item-Response Theory
MVAS	--	Million Visual Analog Scale
ODI	--	Oswestry Disability Index
PC	--	Psychosocial Component
PDQ	--	Pain Disability Questionnaire
PROMIS	--	Patient Reported Outcome Measurement Information System
PSC	--	Pain Disability Questionnaire: Psychosocial Component
RDQ	--	Roland-Morris Disability Questionnaire
SF-36	--	Short Form (36) Health Survey
SPSS	--	Statistical Product and Service Solutions
ROC	--	Receiver operator characteristic analysis

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AUC -- Area under the curve

CHAPTER ONE

Introduction

Chronic pain is one of the most expensive and widespread problems in the United States. Research shows that the adult chronic pain population ranges as high as 40 percent (Verhaak, Kerseens, & Dekker, 1998). Gaskin and Richard (2012) estimate that chronic pain costs the United States up to \$635 billion dollars each year. The cost of healthcare is also steadily rising. In fact, in 2009, U.S. healthcare spending grew by \$96 billion dollars (Auerbach & Kellerman, 2011). Conventional treatment for chronic pain is not only often ineffective, but also not cost-effective. Interdisciplinary Chronic Pain Management programs, based on the Biopsychosocial Model, have been created to help patients experiencing chronic pain (Lippe & Gatchel, 2013). The Biopsychosocial Model is believed to better-incorporate the psychological aspects of these disorders, an important part of the pain process for this population. Empirical research supports the cost-effectiveness and treatment of these programs (Gatchel & Okifuji, 2006). Self-report measures are an important part of these programs and are often essential in tracking patient outcomes. They also help clinicians decide which treatments might be best for individual patients (Jensen, Turner, Romano, & Fisher, 1999).

Empirical research supports the notion that the patient's perspective, or outlook on their own health, is important in tracking their progress (Ware & Sherbourne, 1992). In chronic pain populations, empirically validated self-report outcomes help provide informed care for patients (Lippe & Gatchel, 2013). The Pain Disability Questionnaire (PDQ) is an empirically validated self-report measure used to track patients' views on their pain associated with musculoskeletal

conditions (Anagnostis, Gatchel, & Mayer, 2004). Moreover, the American Medical Association's "Guides to the Evaluation of Permanent Impairment" now includes the PDQ as one of its' recommended measures (American Medical Association, 2008). The PDQ has also been shown to predict health outcomes such as depression and perceived pain intensity (Gatchel, Mayer, & Theodore, 2006). Yet, to our knowledge, only one prior study has examined the PDQ's ability to predict the cost of healthcare (Lippe et al., 2013). In this investigation, Lippe et al. (2013) found that the PDQ is useful for predicting healthcare costs of chronic pain patients. However, this study had a small sample size and a larger one is needed in order to gain a better understanding of the PDQ's ability to predict healthcare costs.

CHAPTER TWO

Review of the Literature

Costs of Chronic Pain

Research highlights chronic pain's immense impact on society (e.g., Turk, 2002; Melhorn, 2000). The adult chronic pain population ranges as high as 40 percent (Verhaak, Kerssens, & Dekker, 1998). In any given month, roughly 30 percent of adults experience low back pain (Webb et al., 2003). In fact, research suggests that as many as 2.5 million people suffer from back pain every day of the year (Elliot, Smith, & Penny, 1999). Healthcare costs associated with treating chronic pain are enormous. In the United States, 100 billion dollars is spent each year on healthcare costs, lost work wages, lost work productivity, and compensation from back pain alone (Melhorn, 2000). Moreover, 80 percent of medical costs for back pain are explained by the five to ten percent of acute back pain conditions that develop into chronic pain conditions (Gatchel & Mayer, 2000). The cost of healthcare is also steadily rising. In fact, in 2009 U.S. health spending grew by \$96 billion dollars (Auerbach & Kellerman, 2011).

Because of the chronic nature of these conditions, the financial burden placed on individuals suffering from chronic pain can be immense. Chronic pain patients spend an average of \$4,475 per year on treating their chronic pain alone (Gaskin & Richard, 2012). For example, the use of opiate medications long term can be very expensive. Not all patients can afford necessary visits to healthcare providers like psychologists, physicians, and other medical professionals.

Chronic pain sufferers are not only concerned with enormous treatment costs but also with the effect that chronic pain has on their every day life. Specifically, chronic pain can result in functional disability. For example, chronic pain causes difficulty with movements involved in everyday life such as walking, washing the dishes, and taking a shower. Chronic pain also impedes occupational functioning through missed days of work and subsequent declines in income (Gatchel, 2004).

Chronic pain affects friends and family of the sufferers as well (Turk, 2002). Family members may need to compensate for these individuals' functional disability. For example, spouses may have to work longer hours in order to compensate for lost wages or medical costs incurred as a result of their partner's chronic pain. Also, friends and family members may need to drive the patient to appointments, help administer medications, and take on more responsibility with more of the housework and childcare. And, patients may even feel guilty about placing a greater burden on their family and friends (Lippe & Gatchel, 2013).

Chronic Pain and the Biopsychosocial Model

In order to promote cost and treatment-effective chronic pain management programs, it is important to have a comprehensive understanding of patient's experience with chronic pain. Research has offered insight into the complex sequelae of chronic pain (Lippe & Gatchel, 2013). The Biopsychosocial Model of chronic pain is the standard in understanding and treating chronic pain conditions. (Gatchel, et al., 2007). The Biopsychosocial Model was developed in the 1970s by Robert Engel in order to better-account for the psychological aspects of disease (George Engel 1977). Unlike previous models (i.e. biomedical reductionistic) it included a thorough

system for explaining pain experiences. The biomedical reductionistic model explains pain solely as a function of biopsysiological mechanisms. However, chronic pain cannot be completely accounted for by biophysiological mechanisms alone. The Biopsychosocial Model accounts for psychological, environmental components, and biopsychological components (Lippe & Gatchel, 2013).

Loeser (1982) outlined the four components that make up pain: nociception, pain, suffering, and pain behaviors. Nociception is described as nerve stimulation from potentially damaged tissue. Pain is the end result of the stimulus sent out by the nerves to the brain, and it is a subjective experience. However, a person can experience nociception without pain as well. For example, someone can cut his hand in the garden and not notice until he sees blood. A person can also experience pain without nociception. This is the case with phantom limb pain. Additionally, perception of pain can be affected by genetics, psychological mechanisms, and sociocultural circumstances. Loeser describes suffering as a negative emotional response started by the nociceptive process. Lastly, behavior can communicate pain and suffering both verbally and non-verbally (Loeser, 1982).

Psychological factors can be numerous when working with chronic pain patients. These factors can include pain-related cognitions, affective experience, pain behaviors, anxiety, depression, and substance abuse (Lippe & Gatchel, 2013). Therefore, the most useful models of chronic pain capture these experiences. And, this suggests that patients with chronic pain should not only be evaluated for biophysiological damage, but also impact on sociocultural and

psychological factors. In other words, valid assessment needs account for how all of these components relate (Gatchel, et al., 2007).

Pain behaviors are a certain type of psychological factor that are a part of the patient's pain experience. Pain behaviors are parts of pain that influence a person's behavior. There are many different pain behaviors. Grimacing, using a wheelchair or a cane, and asking for pain medications are all examples of pain behaviors (Lippe & Gatchel, 2013). Certain pain behaviors can push friends and family away and others can cause problems with employment. Different cultures show different pain behaviors. Specifically, prior research indicates there are ethnic differences in chronic pain behaviors (Landrine & Klonoff, 1992).

Additionally, patients seek to find meaning in their pain condition and often come up with certain cognitions to do so. While some patients have accurate cognitions, others do not (Lippe & Gatchel, 2013). Regardless, these cognitions can affect the person's treatment. For example, patients may attribute their pain to internal or external, situational or global, and stable or unstable factors, which affects how active a role they take in seeking out, or becoming involved in, treatment (Lippe & Gatchel, 2013). A study by Graham and colleagues (2008), found that depressed mood was reconciled by meaning-making among a group of chronic pain patients. Therefore, considering the effect cognitions can have on patients is imperative when working with the chronic pain population.

Psychological difficulties are known to be associated with healthcare outcomes (Sobel, 1995). Chronic pain patients often suffer from psychiatric and emotional disorders, which may compound the complexity of the illnesses and their respective treatments (Dersh, Polatin, &

Gatchel, 2002). Somatoform, mood, and anxiety disorders are just a few conditions often found along with chronic pain. Research also suggests that personality disorders are prevalent in chronic pain patients (Dersch, et al., 2002). Identifying comorbid conditions in chronic pain patients is essential to forming improved treatment regimens (Gatchel, 1996). The previously referenced psychiatric conditions may be part of a negative cycle where treatment is less effective, the pain condition either stays the same or worsens, and the result is even more psychological distress (Lippe & Gatchel, 2013).

Interdisciplinary Chronic Pain Management

Interdisciplinary (ID) treatment for chronic pain conditions is one of the most empirically validated methods for treating chronic pain (Gatchel & Okifuji, 2006; Turk & Swanson, 2007). The approach is both treatment- and cost-effective. It incorporates conceptualization of patients from a biopsychosocial approach, and provides treatment across the biophysiological, psychological, and social spectrums. Interdisciplinary programs have many beneficial components, which include an attitude of comprehensive rehabilitation (as opposed to a symptom-based treatment approach), continual communication and incorporation of services among providers, and ongoing patient involvement. Clinicians from a wide variety of disciplines communicate with each other and integrate what they learn from one another to cover each aspect of the Biopsychosocial Model of pain (Lippe & Gatchel, 2013).

Literature sometimes fails to delineate the difference between “interdisciplinary” and “multidisciplinary” treatment for chronic pain management. They both involve multiple healthcare providers. But, in multidisciplinary treatment there is less emphasis on

communication and integration of treatment between clinicians. The clinicians are also often not located in the same facility. In ID programs, providers constantly communicate with each other, and are all located in the same facility (Lippe & Gatchel, 2013).

Usually, ID programs include at least two physicians, a clinical psychologist, and a physical therapist. Other healthcare providers such as nurses may also be a part of the clinic. Additionally, supportive personnel might be included as well, such as vocational rehabilitation counselors, research managers, nutritionists, chaplains, and case managers (Noe & Williams, 2012). All together, these professionals work together to rehabilitate patients and form the structure of ID programs.

Interdisciplinary programs vary in how patients are recruited, how staff is used, and the length of the program. However, typically, patients are screened to see if they are a good fit for the program, which usually involves a meeting with a staff physician who may suggest an evaluation by a psychologist and physical therapist. Assessments (e.g., MMPI-2, PDQ, etc) may be given to provide data about the potential patient. After the evaluations, individuals recommended for the ID program will be scheduled to start on a specific date (Lippe & Gatchel, 2013).

Some patients may interact with researchers before their first visit to collect baseline figures. They may also interact with research personnel during and after treatment is completed. In ID programs, treatment can be personalized to the particular patient's needs based on their biopsychosocial evaluation and based on any needs that may come up as the program progresses (Lippe & Gatchel, 2013).

Interdisciplinary program patients usually spend the majority of their time in the program engaged in individual therapy, group psychotherapy, which includes a psychoeducational component, and physical therapy. Staff physicians and other healthcare professionals are involved in participant treatment throughout the program. Depending on the program and the needs of the patient, ID programs have participants come in several days each week or in other cases, every workday. Programs, such as the one in the current study, usually span the course of four weeks. After participants have completed the program with sufficient attendance and participation, they may be discharged (Lippe & Gatchel, 2013).

Some difficulties have arisen in putting ID programs into practice. Sometimes ID programs are not covered as part of managed care models of treatment (Robbins, et al., 2003). Robbins (2003) explain that some features of ID programs are not completely covered and sometimes not covered at all by managed healthcare policies. Another problem is that there are differing definitions and different practices of ID programs. Perhaps this is the reason that third-party payers sometimes do not pay in full for comprehensive care (Lippe & Gatchel, 2013).

Measuring Health Outcomes

A large amount of data has been collected about the cost- and treatment-efficacy of ID programs. However, there are certain areas that have yet to be fully explored. For instance, empirically validated measurements are needed to assess health outcomes data following ID programs. Health outcome measures have been used in behavioral medicine and similar fields for many years to support things treatment decisions (Roach, 2006). While clinician or patient opinions about improvement following an ID program may be useful, the goal is to establish

empirically based treatment decisions, which require accurate and dependable measures (Ben & Lippe, 2013).

The Roland-Morris Disability Questionnaire (RDQ) and the Oswestry Disability Index (ODI) are frequently used measures that focus more on pain and functional impairment (Bombardier, 2000). These measures have shown strong reliability and validity across several pain and disability outcomes studies. However, these measures have limitations. For instance, the ODI does not take into consideration psychosocial factors (potentially related to pain) and functional impairment. Likewise, the RDQ does not incorporate a mental health aspect either. Therefore, these measures do not take into consideration significant elements of the Biopsychosocial Model and thus may not be as applicable or useful as other measures. The Pain Disability Questionnaire was created to address these limitations (Anagnostis, et al., 2004).

Researchers have focused on exploring the predictive abilities of health outcome measures and healthcare utilization. Osbourne (2003) and colleagues conducted a study to validate the predictive validity of a novel quality of life measurement against the SF-36 in a chronically ill community. Further, DeSalvo (2005) and colleagues identified one item on the SF-36 that could potentially predict mortality and healthcare utilization. They also identify the usefulness of self-reported health outcomes in predicting actual health outcomes. Most significant to the present study is that the literature suggests that self-reported functional health status scales (such as the SF-36) are valuable in predicting future medical expenses (Fan, et al., 2002; Hornbrook, & Goodman, 1996).

Pain Disability Questionnaire Overview

As mentioned above, the Pain Disability Questionnaire (PDQ) was created to aid in the evaluation of patients' pain experience. The PDQ specifically focuses on pain-related functional and psychosocial status. The basis of the PDQ is founded on conceptualizing pain experiences from a biopsychosocial perspective. The American Medical Association "Best Practice" guidelines have recently included the PDQ (American Medical Association, 2008). Because it has only been recently added to these guidelines, it is assumed that its will continue become more common. The PDQ was created to be used in conjunction with all chronic disabling musculoskeletal disorders, regardless of specific functional status or pain disorder, which is different from other measures of functional disability and pain (e.g., Oswestry Disability Index). The PDQ is a 15-item assessment that requires at least a 6th grade reading level (Anagnostis, Gatchel, & Mayer, 2004). Because the PDQ is briefer than other instruments, it is easier for patients who are experiencing pain to complete it. The items are intended to measure how much the patient functioning is impacted by pain (Lippe & Gatchel, 2013).

In its first validation study, the PDQ was tested using 446 individuals, who were separated into four groups (Anagnostis, et al., 2004). These four groups were: a Normative Population Group, an Acute Musculoskeletal Disorder Group, a Chronic Disabling Musculoskeletal Disorders (CDMD) Group, and a Heterogeneous pain (HP) group. The CDMD group had the same pretreatment PDQ scores as the HP group. The heterogeneous pain group was included because it makes for broader comparison of study results.

A 10-point likert-type scale (0=No problems, 10=Total impairment) is used on PDQ items. The scores can be summed to produce a total functional disability score ranging from 0

(optimal function) to 150 (total disability). The summed scores represent how severe the patient rated their disability. These scores may then be placed in one of three categories: Mild/Moderate (1-70), Severe (71-100), and Extreme (101-150) severity. These categories are similar to the categorical organization of the Million Visual Analog Scale (MVAS) (Gatchel, et al., 2006). In the MVAS these categories showed an ability to predict work-and health-related outcomes (Anagnostis et al., 2003).

Some researchers criticize categorical techniques because important information may be lost when using this approach. However, the literature suggests that clinical usefulness and practical application may be improved when using this method (Anagnostis et al., 2003). As related to the current study, categorization of PDQ scores was evaluated for clinical usefulness to predict healthcare cost-outcomes.

After a factor analysis, researchers discovered a two-factor structure of the PDQ (Anagnostis, et al., 2004). The Functional Status Component (FSC) subscale has 9-items and represents certain features of physical functioning and subsequent physical impairment. The FSC's items assess activities involved in daily living, work interference, and certain features of physical movement. The six-item Psychosocial Component (PC) subscale corresponds to mental health and social functioning with items that look at depression, anxiety, and interference with social relationships. Both the FSC and the PC showed strong correlations with similar and already established instruments (Anagnostis, et al., 2004).

Many studies have demonstrated the reliability and validity of the PDQ (Anagnostis, et al., 2004; Gatchel, et al., 2006). It has also shown to be generally valid among musculoskeletal

pain conditions (e.g., Annaswamy, et al., 2012). Test-retest reliability coefficients for the CDMD group were 0.94 ($P < .001$). This indicates significant consistency across administrations of the test. The researchers also found the internal consistency alpha coefficient to be 0.96 ($p < .001$), supporting the idea that the scores of each PDQ item were clustered around the mean (Lippe & Gatchel, 2013).

When the PDQ was being first being evaluated for validity, it was compared against other measures of functional disability (e.g., MVAS, Oswestry, SF-36 MCS, and SF-36 PCS). The PDQ had the largest effect size among these other instruments for the CDMD group (effect size = 1.07) and HP group (effect size = 0.85) between pre- and post-treatment (Anagnostis, et al., 2004). That is, the PDQ was more responsive to change when compared with the aforementioned measures. Therefore, the PDQ accurately shows clinical change in populations dealing with a pain condition (Lippe & Gatchel, 2013).

Pearson's coefficients for pre-treatment PDQ scores from the combined CDMD and HP groups were significantly correlated (all p-values $< .01$) with other similar measures (i.e., SF-36, the Oswestry Disability Questionnaire, the BDI, the HAM-D, the STAI, the Pain Intensity Drawing, and the Cumulative Physical Score) thereby showing that the PDQ has strong construct validity. A significant correlation between the eight SF-36 subscales (e.g., Vitality, Bodily Pain scale, etc.) and PDQ scores (e.g., Pain scale $r = -0.53$) was also found (Anagnostis, et al., 2004). Interestingly, PDQ correlations with the SF-36 scales were overall stronger than the respective correlations of the SF-36 scales and the MVAS and Oswestry. Pain Disability Questionnaire post-treatment scores were also analyzed to examine the association between the PDQ and other

similarly constructed measures. Pearson's coefficients were shown to be more strongly correlated overall than the MVAS, SF-36, and Oswestry. The PDQ has shown great validity as indicated by its test-retest reliability (effect sizes = 0.94-0.98), Cronbach's alpha coefficient ($\alpha = 0.96$), responsiveness effect sizes (effect sizes = 0.85-1.07), and validity when compared with the MVAS (effect sizes = 0.65-0.81) and Oswestry (effect sizes = 0.55-0.80) (Anagnostis, et al., 2004).

Contemporary research using the PDQ has increased dramatically across various settings and pain populations (e.g., Miciano, 2011; Annaswamy, et al., 2012). In 2011, Miciano used the PDQ to evaluate the psychosocial problems that individuals with poly-trauma and chronic pain experienced. Prior studies have also utilized the PDQ to examine the psychological profiles of impoverished individuals who had severe osteoarthritis (Howard, et al., 2011). In another example, Batysheva and colleagues (2009) adapted the PDQ in their Russian study comparing patients suffering from subacute and chronic spondylogenic dorsalgia. Another investigation by Kenny and Faunce (2004), looked at the effect of group singing on mood, coping, and perceived chronic pain at a six-month follow-up on patients in a multidisciplinary treatment program. This study included the PDQ and found that the singing group displayed improvements across pain-related variables.

On another note, researchers have translated and modified the PDQ successfully into other languages such as Brazilian Portuguese (Giordano et al., 2012). The current study explores the ability of the PDQ to predict healthcare costs.

Summary

Chronic pain is one of the most expensive and widespread problems in the United States. It affects not only the individual dealing with chronic pain, but also their family, friends and society as a whole. The Biopsychosocial Model of chronic pain is the standard model for understanding and treating the pain experience. This model has helped create the Interdisciplinary Chronic Pain Management program model for treatment and has shown to be both treatment-and cost-effective. Instruments that measure health outcomes are extremely important. The PDQ has only recently been included into the American Medical Association's (AMA) "Best Practice" guidelines for measurement of pain-related functional disability and has demonstrated good predictive validity in terms of health outcomes. Given today's environment of managed care, cost-effectiveness is extremely important. To our knowledge only two studies have touched on examining the usefulness of the PDQ in predicting healthcare costs (Lippe & Gatchel, 2013). Research by Fan and colleagues (2002) suggests that self-reported measures of functional health status can be helpful in predicting future medical expenses. The present study aimed to provide an assessment of the predictive value of the PDQ with respect to healthcare cost. The results from this study will produce empirical advancements that will help further our understanding of the efficacy of the PDQ in this context. Ultimately, this study could offer providers important information to help make empirically-based decisions about treatment for people suffering with chronic pain.

CHAPTER THREE

Method

Setting

The participants of this current study were composed of adult outpatient chronic pain patients who were treated at the Eugene McDermott Center for Pain Management (EMCPM). The EMCPM is part of The University of Texas Southwestern Medical Center, which is located in Dallas, Texas. The EMCPM has an interdisciplinary pain management program as well as various typical pain management treatments. The patients who participated in this study completed the interdisciplinary program at the EMCPM. Although they completed the program, the patients may have continued to see physicians at the EMCPM. For this current study the patients completed study measures at least three months after their treatment ended. Patients were recruited for this study by phone call at least three months following the end of their treatment. The International Review Board of the University of Texas Southwestern Medical Center at Dallas monitored the collection of data and its use.

Participants

Patients were asked to take part in the study at least three months after they had completed their treatment at the EMCPM. In order to be invited to participate patients had to be 18 years or older and able to speak English. People under the age of 18 were excluded from this study since the EMCPM usually does not treat people under the age of 18 years. Patients who did not speak English were excluded from this study, as alternative language versions of the

measurement were not yet available. Patients with pain solely from cancer-related processes were also excluded.

Measures

The data collected for this study was part of a greater data collection effort at the EMCPM. The measures utilized for this study were the Pain Disability Questionnaire (PDQ) and the Healthcare Utilization survey. Patients were given the PDQ as part of data collection before the start of their treatment. Data was also collected at least three-months following the end of their treatment to determine healthcare utilization in order to allow for calculation of treatment costs.

Pain Disability Questionnaire. The PDQ is a 15-item self-report assessment that is focused on pain-related functional and psychosocial status. Research has found the PDQ to be a valid and reliable measurement for use with many different chronic musculoskeletal disorders (e.g., Anagnostis, Gatchel, & Mayer, 2004; Gatchel, Mayer, & Theodore, 2006). The items were created to measure how much the patient's ability to function is affected by their pain. Patients rate the items on a 10-point likert-type scale (0=No impairment, 10=Complete impairment). The patient's scores can then be added up to produce a total disability score ranging from 0 (optimal function) to 150 (total disability). The summed scores indicate how severe the patient's self-rated disability is. Scores can fall in one of three categories: Mild/Moderate (1-70), Severe (71-100), and Extreme (101-150) severity. The PDQ's two-factor structure includes a Functional Status Component (FSC) and a Psychosocial Component (PSC). The average PDQ score at admission was 92.54 ($SD = 27.88$; range = 28-144).

Healthcare Utilization Survey. Data was also collected concerning each patient's healthcare utilization over a three month time period post-treatment. Items assessed the number of healthcare visits, procedures performed, medication use, and ER/hospital visits. This questionnaire specifies between pain-related healthcare utilization and non-pain-related healthcare utilization.

Pain Conditions

The current study included many different pain conditions. The population cared for at the site of data collection varied in terms of pain matters. Thus it is possible that participants were included in this study that are not part of the CDMSD population. However, the initial validation of the PDQ used a heterogeneous group of chronic pain patients. The developers of the PDQ stated, "This measure appears to have comparable utility for use with a more heterogeneous chronic pain disability population (Anagnostis, et al., 2004)." Thus in the current study the confounding effect of not using all patients that fall within the CDMSD population in the sample was negligible.

Procedure

The current study is part of a larger research project at the EMCPM. Additionally, post-treatment data was collected for the current study. Participants (outpatient adults who had finished treatment at EMCPM) were called post-treatment to complete the Three Month Follow-up Healthcare utilization survey over the phone. However, the PDQ was given pre- and post-treatment as part of a larger project and PDQ baseline data collected from this was also used for the current study. Participants in the larger project were asked to complete a HIPPA release

form and an Informed Consent form approved by the UTSW Institutional Review Board (IRB). Personnel involved in the larger project reviewed these forms with participants, answered participant questions, and then went over the instructions for CAT administration of study measures with EMCPM computers.

These measures assessed participants' perception of pain, healthcare utilization, pain medication use, and demographic and historical measures. These measures were accessed online by study personnel from the larger project using the PROMIS-based web resource "Assessment Center." The instruments utilized for this current study were the PDQ and the Three Month Follow-up Healthcare Utilization survey. The PDQ was given in an online survey format using EMCPM computers. The Three Month Follow-up Healthcare Utilization survey was given over the phone.

Statistics

The data will be analyzed using SPSS software. Specifically, regression modeling will be used, and a receiver operator characteristic curve will be generated, to evaluate the PDQ's ability in predicting healthcare utilization cost at three-month follow-up time point. Healthcare utilization will be evaluated using the Three Month Follow-up Healthcare Utilization survey. The survey will include data on healthcare provider visits, procedures/treatments, medication use, ER/hospital visits. Cost-effectiveness can be evaluated by looking at the amount of healthcare utilization and resources that an individual uses in treating their health problem (Turk, 2002). From this subsequent data, an estimate about the monetary costs of this healthcare utilization will be generated. In the current study, cost of healthcare information will be based on data collected

from the Health Care Cost Institute's (HCCI) Health Care Cost and Utilization Report: 2011 (Health Care Cost Institute, 2011). From this data, healthcare cost estimates will be generated for each participant based upon reported healthcare utilization.

A categorical approach will be used by placing participants in either a "low" or "high" healthcare cost group. The low healthcare cost group will be composed of participants reporting average or below average healthcare costs as compared to an estimate of the average healthcare costs for the overall chronic pain populations. The high healthcare cost group will be composed of participants reporting above average healthcare costs as compared to an estimate of the average healthcare costs for the overall chronic pain population. The present study's average healthcare costs of chronic pain patients will be based on reported treatment and average cost data available in the literature (e.g., National Academy of Science, 2011). Bagley, White, and Golomb (2001) indicate that logistic regression modeling is the most appropriate way to analyze data when using dichotomous outcomes variables, like the one in this analysis.

Linear regression modeling will also be used to analyze the PDQ's predictive validity in terms of summed total score. PDQ summed score at baseline will be analyzed for associations with healthcare costs at three month follow-up. The use of a continuous variable (healthcare costs in U.S. dollars) will increase the accuracy of analyses in the current study.

Baseline data will be analyzed for statistically significant between-group demographic differences.

Aim

The aim of the current study is to determine if the PDQ can predict healthcare utilization.

Hypotheses

Hypothesis One. It is hypothesized that scores on the PDQ will account for a significant amount of the variance in the classification of healthcare utilization.

Hypothesis Two. It is hypothesized that the participants' with higher PDQ scores will be more likely to fall in the "high" healthcare cost category.

Healthcare Cost Variable. As explained in the methods section, the healthcare cost variable will be examined for significance using logistic regression modeling. Primary outcome variables will include:

- Healthcare cost category (e.g., "low" versus "high" dichotomized variable) as estimated by data collected from three month follow-up Healthcare Utilization. Cost as a continuous variable was also analyzed for added accuracy.

CHAPTER FOUR

Results

All subjects ($N = 50$)

Demographics. The sample included 50 participants, who met the study criteria (see Chapter Three above). The mean age of the participants was 54.76 years ($SD = 12.41$; range = 22-77). The majority were female ($n = 41$, 82%) and Caucasian ($n = 32$, 64%). Table 1 displays demographic information. The majority of participants had a primary diagnosis of either back or neck pain. Participants' total healthcare costs in the three months following the end of the ID program were calculated. The average amount spent on healthcare was \$3,554.80 ($SD = \$6,819.55$) and amounts ranged from \$0.00 to \$34,259.00. Table 4 displays the number of participants by healthcare cost range. Participants were placed in either the low healthcare cost group or the high healthcare cost group based on the criteria described in Chapter 3. Thirty participants (60%) fell in the low health cost group and 20 (40%) fell in the high health cost group.

Preliminary Analyses. Prior to conducting regression analyses, all relevant assumptions were tested, and our data met them adequately. An independent samples t-tests for age, PDQ score and healthcare cost group, Pearson chi-square test for gender and Fisher's exact test for ethnicity were run to assess for statistically significant differences between high and low healthcare cost groups. There were no statistically significant differences between groups for age, gender or ethnicity (p 's = .14 to .65). As expected, there were statistically significant

difference found for both PDQ score and total healthcare cost between healthcare cost [$t(48) = -3.38, p = .001$; $t(19.04) = -4.25, p < .001$ respectively].

Pearson r correlations were derived between PDQ and healthcare cost to assess for multicollinearity. There was a moderate statistically significant correlation between the PDQ and healthcare cost variables [$r(50) = .44, p = .001$].

Primary Analyses. A logistic regression was performed to determine how well the PDQ predicts whether participants fall in either the high or low health cost group at three month follow up, at the end of their participation in the ID program. The logistic regression model was statistically significant, $X^2(1) = 10.67, p < .001$. The model explained 26% of the variance (Nagelkerke R^2) in healthcare cost and correctly classified 70% of cases. Participants with higher PDQ scores were more likely to fall in the high healthcare cost group (see Table 2). Neither gender, age nor ethnicity statistically significantly contributed to the analysis, and thus were not included in the final regression model (p 's = .20-.64). Tables 2 shows which PDQ scores were associated with the low healthcare cost group. Table 3 shows which PDQ scores were associated with the high healthcare cost group.

A linear regression established that PDQ scores at baseline statistically significantly predicted total healthcare utilization cost at a three month time point following the end of their ID program. [$F(1, 48) = 11.41, p = .001$]. Participants with higher scores on the PDQ at baseline were more likely to have a higher total healthcare cost at follow up. The PDQ score accounted for 19.2 % of the explained variability in total healthcare utilization cost three months later (see Table 3). The regression equation was: total healthcare utilization cost = .680 + (.008 X PDQ

score). Neither gender, age nor ethnicity statistically significantly contributed to the analysis, and thus were not included in the final regression model (p 's = .39-.99).

We also examined the sensitivity and specificity of the PDQ in accurately placing patients in either the high or low healthcare cost group using receiver operator characteristic analysis (ROC). Receiver operator characteristic analysis yielded an area under the curve (AUC) of .76. Using a PDQ cutoff score of 96 yielded the optimal sensitivity (.70) and specificity (.67) for identifying whether participants fall in the high or low healthcare cost group.

CHAPTER FIVE

Discussion

Study Findings and Implications. The current study aimed to investigate the predictive ability of the PDQ in regards to healthcare costs in a chronic pain population post participation in an interdisciplinary treatment program. The results indicate that the PDQ performed well at predicting healthcare utilization at three month follow-up. The demographic characteristics are similar to the demographic data presented in previous studies of adults with chronic pain and yield support for the generalizability of results to the chronic pain population (Gatchel, 1995; Lippe, 2013).

The results of the current study revealed that the PDQ accurately predicts healthcare utilization in our sample. For example, participants who score higher on the PDQ at baseline testing will be significantly more likely to have higher than average healthcare costs in the three months following treatment. In other words, they will be more likely to fall in the high healthcare cost group. Likewise, participants who score lower on the PDQ at baseline testing will be significantly more likely to have lower than average healthcare costs at the three months following treatment. In other words, participants with lower PDQ scores will be more likely to fall in the low healthcare cost group.

Only one other study has looked at the ability of the PDQ in predicting healthcare costs. The findings of their study were similar to the findings of the current study and part of their database was used in the present study (Lippe & Gatchel, 2013). Similar to the present study, their sample was disproportionately comprised of females (71%). Also the mean age of their

sample was 49.72 years, whereas the current study had a mean age of 54.76 years. The majority of their sample identified as Caucasian (72.4%) similar to the 64% found in the current study. The majority of subjects in the current study were found to have either back or neck problems. Similarly, Lippe & Gatchel (2013) found that the majority of their subjects (37.2 %) had back or neck problems. Both studies found that baseline PDQ predicts healthcare utilization at three-month follow-up. In other words, both studies found that the PDQ statistically and significantly predicted whether participants fell in either the high or low health cost group at three month follow-up. In the current study the model successfully classified 70% of cases. Lippe & Gatchel (2013) found that their study successfully predicted 67.3% of cases [$X^2 (1) = 7.61, p < .01$].

This study was only the second to our knowledge that examined the predictability of healthcare costs using the PDQ. Additionally, the results highlight the extent to which a patient's pain is interfering with their everyday life. This may be a particularly salient motivating factor for healthcare utilization. In other words, if a patient's pain is severe enough and is significantly interfering with their everyday lives, our results might be an indication that patients may be more likely to seek treatment and less likely to consider financial cost. The current study is also an indication that pain-related disability specifically contributes to the predictability of future healthcare cost. Thus, our results suggest that the PDQ can be utilized to help chronic pain clinicians, caregivers and patients be better prepared to incur healthcare costs. If we can better predict healthcare utilization using the PDQ then insurance companies and taxpayers can plan for these costs, which can lead to more efficiency.

Study Limitations. The current study included three month follow-up only. Thus there was a limited amount of time in which data was collected between the baseline PDQ assessment and the Healthcare Utilization survey. This relatively short length of time may limit how results of the current study are generalized when considering the longer-term predictive ability of the PDQ. Although the current study achieved sufficient power, a larger sample size would add validity.

Interdisciplinary chronic pain management programs may differ in terms length, treatment focus, and the healthcare providers on staff. In the current sample the treatment focused on non-narcotic treatment and included an evaluation by an interdisciplinary team. Not all chronic pain patients experience this kind of treatment so caution should be used when generalizing to chronic pain patients undergoing other forms of treatment. Demographic variables like gender, ethnicity, age, location of program, as well as differences in treatment may affect generalizability to other demographic variables, ID programs, and geographic regions. The data collected in current study was collected from one interdisciplinary chronic pain management program in urban Texas. These variables differ by geographic location. However, it is important to note that the ID program at the EMCPM was based on recommended ID program components that were established from empirical research (e.g., Noe, 2012). Regardless, future studies should confirm and expand the findings of the present study by testing similar hypotheses in a diversity of samples.

Another possible limitation of the current study is in regards to healthcare cost estimates. It is important to note that averages and procedural costs are estimates of total paid expenditures

by all sources including insurers, government payors (e.g., Medicare and Medicaid), and individuals. Also, the data used to create the estimations are United States averages and not local healthcare costs averages only. The current study also consisted of patients undergoing interdisciplinary treatment in between being administered the PDQ and the Healthcare Utilization survey. The ability of the PDQ to predict healthcare costs of chronic pain patients not undergoing interdisciplinary treatment should be addressed in future studies as well.

Future Directions and Recommendations. Future research should utilize longer follow-up periods than just the three month follow-up in order to evaluate the PDQ's predictive ability over longer periods of time. Also it may be beneficial for future studies to include a wider variety of psychological measures to assess their respective and combined utility in predicting healthcare cost utilization.

Future research should consider evaluating the predictive ability of the PDQ in other types of treatment settings such as inpatient treatment. Additional research should evaluate the predictive utility of the PDQ in cancer-related chronic pain conditions, as those were excluded from the current study.

Despite the limitations of the current study, the findings have clinical implications. Doctors may be able to use the PDQ as an intake screening to help patients determine their ability to afford treatment. To do this doctors may consider giving their patients the PDQ to complete out in the waiting room before their first visit. Doctors of patients who score above the optimal cutoff score of 96, mentioned in Chapter 3, may want to emphasize the possible high costs of treatment. Doing so may help patients plan ahead financially for their treatment.

Knowing the potential high cost of treatment can help family members and caregivers plan ahead as well. They may need to work more to help pay for treatment, consult a financial planner, or consider other insurance plans. Doctors can spend less time emphasizing the potential costs of treatment with patients who score below 96 on the PDQ.

Knowing what to expect financially may reduce the stress and increase quality of life in patients seeking treatment for chronic pain and their family members and caregivers as well. Furthermore, the findings of this study contributed and expanded upon the recognized utility of the PDQ as a predictive tool with regard to healthcare cost prediction.

References

- American Medical Association. (2008). Guides to the Evaluation of Permanent Impairment, Sixth Edition: Clarifications and Corrections. Publication of the American Medical Association.
- Anagnostis, C., Mayer, T., Gatchel, R., & Proctor, T. (2003). The million visual analog scale: its utility for predicting tertiary rehabilitation outcomes. *Spine*, 28: 1051–1060.
- Anagnostis, C., Gatchel, R.J., & Mayer, T.G. (2004). The pain disability questionnaire: A new psychometrically sound measure for chronic musculoskeletal disorders. *Spine*, 29(20), 2290-2302. doi: 10.1097/01.brs.0000142221.88111.0f
- Annaswamy, T.M., Bierner, S.M., Chouteau, W., & Elliott, A.C. (2012). Needle electromyography predicts outcome after lumbar epidural steroid injection. *Muscle & Nerve*, 45(3), 346-355. doi: 10.1002/mus.22320
- Auerbach, D. I., & Kellermann, A. L. (2011). A decade of health care cost growth has wiped out real income gains for an average US family. *Health Affairs*, 30(9), 1630-1636. doi: 10.1377/hlthaff.2011.0585
- Bagley, S.C., White, H., & Golomb, B.A. (2001). Logistic regression in the medical literature: standards for use and reporting, with particular attention to one medical domain. *Journal of Clinical Epidemiology*, 54(10), 979-985. doi: 10.1016/S0895-4356(01)00372-9
- Batysheva, T.T., Kamchatnov, P.R., Guseva, M.E., Zaitsev, K.A., Zhuravleva, E., Kostenko, E.V., Nesterova, O.S., Otcheskaia, O.V., & Boiko, A.N. (2009). (Translated) Results of a study of velaxin (venlafaxine) efficacy in patients with subacute and chronic

- spondylogenic dorsalgia. *Zhurnal Nevrologii i Psikhiiatrii Imeni S.S. Korsakova*, 109(5), 32-35.
- Bombardier, C. (2000). Outcome assessments in the evaluation of treatment of spinal disorders: summary and general recommendations. *Spine*, 25(24), 3100-3103.
- DeSalvo, K.B., Fan, V.S., McDonell, M.B., & Fihn, S.D. (2005). Predicting mortality and healthcare utilization with a single question. *Health Services Research*, 40(4), 1234-1246. doi: 10.1111/j.1475-6773.2005.00404.x
- Elliott, A.M., Smith, B.H., Penny, K.I., Smith, W.C., & Chambers, W.A. (1999). The epidemiology of chronic pain in the community. *Lancet*, 354, 1248–52. doi: 10.1016/S0140-6736(99)03057-3
- Engel, G. L. (1977). The need for a new medical model: A challenge for biomedicine. *Science*, 196, 129 –136. doi: 10.1126/science.847460
- Engel, C.C., Von Korff, M.V., & Katon, W.J. (1996). Back pain in primary care: Predictors of high health-care costs. *Pain*, (65) 197-204. doi: 10.1016/0304-3959(95)00164-6
- Fan, V.S., Curtis, J.R., Tu, S.P., McDonell, M.B., & Fihn S.D. (2002). Using quality of life to predict hospitalization and mortality in patients with obstructive lung diseases. *Chest*, 122(2). 429–36. doi: 10.1378/chest.122.2.429
- Gaskin, D. J., & Richard, P. (2012). The economic costs of pain in the United States. *The Journal of Pain*, 13(8), 715-724. doi: 10.1016/j.jpain.2012.03.009

Gatchel, R.J. (1996). Psychological disorders and chronic pain: cause and effect relationships. In:

Gatchel RJ, Turk DC, editors. Psychological approaches to pain management: a practitioner's handbook. New York: Guilford Publications; pp. 33–54.

Gatchel, R. J. & Mayer, T. G. Occupational Musculoskeletal Disorders: Introduction and

Overview of the Problem. In T. G. Mayer, R. J. Gatchel & P. B. Polatin (Eds.).

Occupational Musculoskeletal Disorders: Function, Outcomes and Evidence.

Philadelphia: Lippincott Williams & Wilkins, 2000.

Gatchel, R. J. (2004). Comorbidity of chronic pain and mental health disorders: The

Biopsychosocial Perspective. *American Psychologist*, 59(8), 795-805. doi: 10.1037/0003-066X.59.8.795

Gatchel, R.J., Mayer, T.G., & Theodore, B.R. (2006). The Pain Disability Questionnaire:

Relationship to one-year functional and psychosocial rehabilitation outcomes. *Journal of Occupational Rehabilitation*, 16(1), 75-94. doi: 10.1007/s10926-005-9005-0

Gatchel, R. J., & Okifuji, A. (2006). Evidence-Based Scientific Data Documenting the Treatment

and Cost-Effectiveness of Comprehensive Pain Programs for Chronic Nonmalignant Pain. *The Journal of Pain*, 7(11), 779-793. doi: 10.1016/j.jpain.2006.08.005

Gatchel, R.J., Peng, Y.B., Peters, M.L., & Turk, D.C. (2007). The Biopsychosocial approach to

chronic pain: scientific advances and future directions. *Psychological Bulletin*, 133(4), 581-624. doi: 10.1037/0033-2909.133.4.581

Gatchel, R. J., Polatin, P. B., & Mayer, T. G. (1995). The dominant role of psychosocial risk

factors in the development of chronic low back pain disability. *Spine*, 20(24), 2702-2709.

- Giordano, P.C., Alexandre, N.M., Rodrigues, R.C., & Coluci, M.Z. (2012). (Translated) The Pain Disability Questionnaire: a reliability and validity study. *Revista Latino-Americana de Enfermagem*, 20(1), 76-83. doi: 10.1590/S0104-11692012000100011
- Graham, J.E., Lobel, M., Glass, P., & Lokshina, I. (2008). Effects of written anger expression in chronic pain patients: making meaning from pain. *Journal of Behavioral Medicine*, 31, 201-212. doi: 10.1007/s10865-008-9149-4
- Health Care Cost Institute. (2012, September). *Health Care Cost and Utilization Report: 2011*. Retrieved from <http://www.healthcostinstitute.org/2011report>
- Hornbrook, M., & Goodman, M. (1996). Chronic disease, functional health status, and demographics: A multi-dimensional approach to risk adjustment. *Health Service Research*, 31, 283-307.
- Howard, K.J., Ellis, H.B., Khaleel, M.A., Gatchel, R.J., & Bucholz, R. (2011). Psychosocial profiles of indigent patients with severe osteoarthritis requiring arthroplasty. *Journal of Arthroplasty*, 26(2), 244-249. doi: 10.1016/j.arth.2010.03.002
- Jensen, M.P., Turner, J.A., Romano, J.M., & Fisher, L.D. (1999). Comparative reliability and validity of chronic pain intensity measures. *Pain*, (83), 157-162. doi: 10.1016/S0304-3959(99)00101-3
- Kenny, D.T., & Faunce, G. (2004). The impact of group singing on mood, coping, and perceived pain in chronic pain patients attending a multidisciplinary pain clinic. *Journal of Music Therapy*, 41(3), 241-258. doi: 10.1093/jmt/41.3.241

- Landrine, H., & Klonoff, E.A. (1992). Culture and health-related schemas: A review and proposal for interdisciplinary integration. *Health Psychology, 11*(4), 267-276. doi: 10.1037/0278-6133.11.4.267
- Lippe, B., Gatchel, R., Noe, C., Kennard, B., Deschner, M., & Whitfill, T. (2013). Comparative Ability of the Pain Disability Questionnaire in Predicting Health Outcomes and Healthcare Costs. (Doctoral dissertation).
- Loeser, J. D. (1982). Concepts of pain. In J. Stanton-Hicks & R. Boaz (Eds.), *Chronic low back pain*. New York: Raven Press. 109-142.
- Melhorn, J.M. Epidemiology of musculoskeletal disorders and workplace factors. In: Mayer T, Gatchel RJ, Polatin, PB, eds. *Occupational Musculoskeletal Disorders: Function, Outcomes and Evidence*. Philadelphia: Lippincott Williams & Wilkins, 2000:225– 65.
- Miciano, A. (2011). Quantitative assessment of psychosocial distress of individuals with poly-trauma and with chronic pain, according to the AMA guides sixth edition. *European Psychiatry, 26*(1), 999. doi: 10.1016/S0924-9338(11)72704-3
- National Academy of Science. (2011). Relieving pain in America: A blueprint for transforming prevention, care, education, and research. Washington D.C.: Institute of Medicine. doi: 10.3109/15360288.2012.678473
- Noe, C., & Williams, C.F. (2012). The benefits of interdisciplinary pain management. *The Journal of Family Practice, 61*(4), S12-S16.
- Osborne, R.H., Hawthorne, G., Lew, E.A., & Gray, L.C. (2003). Quality of life assessment in the community-dwelling elderly: Validation of the Assessment of Quality of Life (AQoL)

- Instrument and comparison with the SF-36. *Journal of Clinical Epidemiology*, 56(2), 138-147. doi: 10.1016/S0895-4356(02)00601-7
- Roach, K.E. (2006). Measurement of health outcomes: reliability, validity, and responsiveness *Journal of Prosthetics & Orthotics*, 18(1), 8-12.
- Robbins, H., Gatchel, R.J., Noe, C., Gajraj, N., Polatin, P., Deschner, M., Vakharia, A., & Adams, L. (2003). A prospective one-year outcome study of interdisciplinary chronic pain management: Compromising its efficacy by managed care policies. *Anesthesia & Analgesia*, 97(1), 156-162. doi: 10.1213/01.ANE.0000058886.87431.32
- Sobel, D.S. (1995). Rethinking medicine: Improving health outcomes with cost-effective psychosocial interventions. *Psychosomatic Medicine*, 57, 234-244.
- Turk, D.C. (2002). Clinical effectiveness and cost-effectiveness of treatments for patients with chronic pain. *The Clinical Journal of Pain*, 18(6), 355-365.
- Turk, D. C., & Swanson, K. (2007). Efficacy and cost-effectiveness treatment of chronic pain: An analysis and evidence-based synthesis. In M. E. Schatman & A. Campbell (Eds.), *Chronic Pain Management: Guidelines for Multidisciplinary Program Development*. New York: Informa Healthcare.
- Verhaak, P.F., Kerssens, J.J., Dekker, J., Sorbi, M.J., & Bensing, J.M. (1998). Prevalence of chronic benign pain disorder among adults: a review of the literature. *Pain*, 77(3), 231–239. doi: 10.1016/S0304-3959(98)00117-1
- Ware Jr., J.E., & Sherbourne, C.D. (1992). The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Medical Care*, 30(6), 473-483.

Webb, R., Brammah, T., Lunt, M., Urwin, M., Allison, T., & Symmons, D. (2003). Prevalence and predictors of intense, chronic, and disabling neck and back pain in the UK general population. *Spine*, 28(11), 1195–1202.

Tables

Table 1: descriptive information for all participants

	<i>n</i>	<i>M (SD)</i>	range
Age (years)	50	54.75 (12.41)	22 - 77
PDQ (raw score)	50	92.54 (27.88)	28 - 144
Total healthcare cost (U.S. dollars)	50	3,554.80 (6,819.55)	0.00 - 34,259.00
	<i>n</i>	%	
Gender (<i>n</i> female; %)	41	82	
Ethnicity			
Caucasian	32	64	
African-American	11	22	
Latino	4	8	
Other	1	2	
Not provided	2	4	

PDQ = Pain Disability Questionnaire

Table 2: logistic regression analysis predicting healthcare cost group at three month follow-up

Factor	Coefficient	S.E.	Wald
PDQ	0.04	0.01	8.08*

* $p < .01$

Table 3: linear regression analysis for healthcare cost at three month follow-up

Factor	R^2	ΔR^2	β
PDQ	.19	.19	.44*

* $p = .001$

Table 4: number of participants by healthcare cost range

Amount (US dollar)	\$0.00	\$1.00 - \$999.00	\$1,000.00 - \$10,000.00	> \$10,000.00
Participants [n (%)]	16 (32)	13 (26)	14 (28)	7 (14)

Figures

Figure 1: Pain Disability Questionnaire Receiver Operational Characteristic Curve

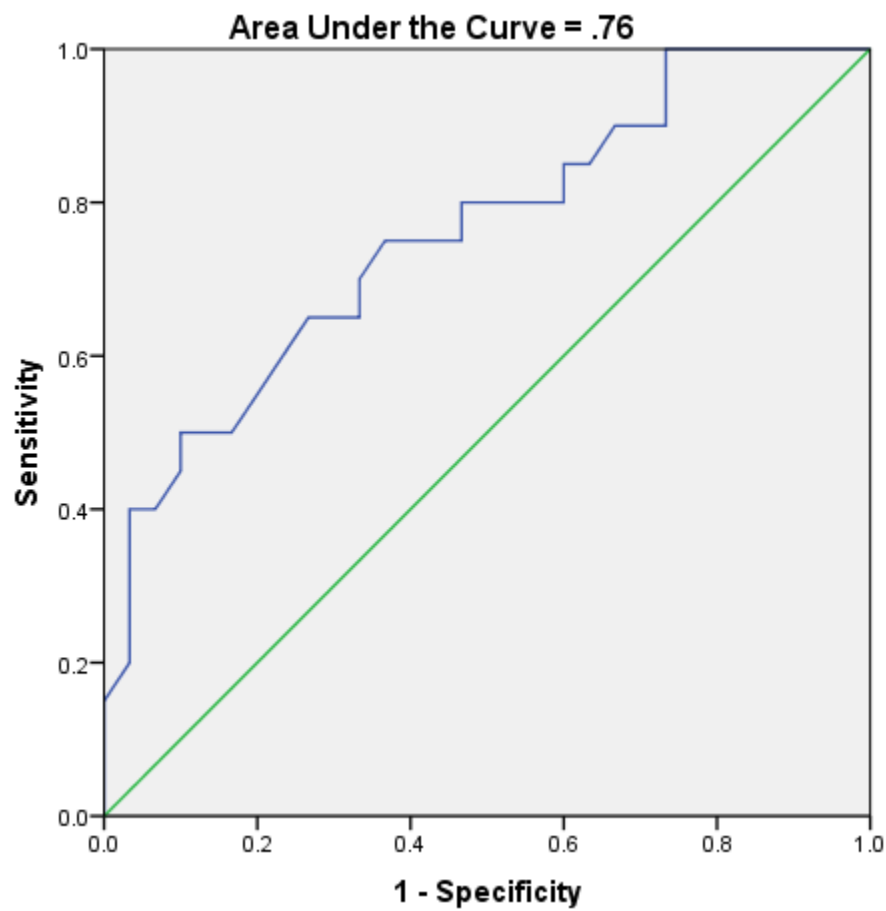


Figure 2: Low Healthcare Cost Group

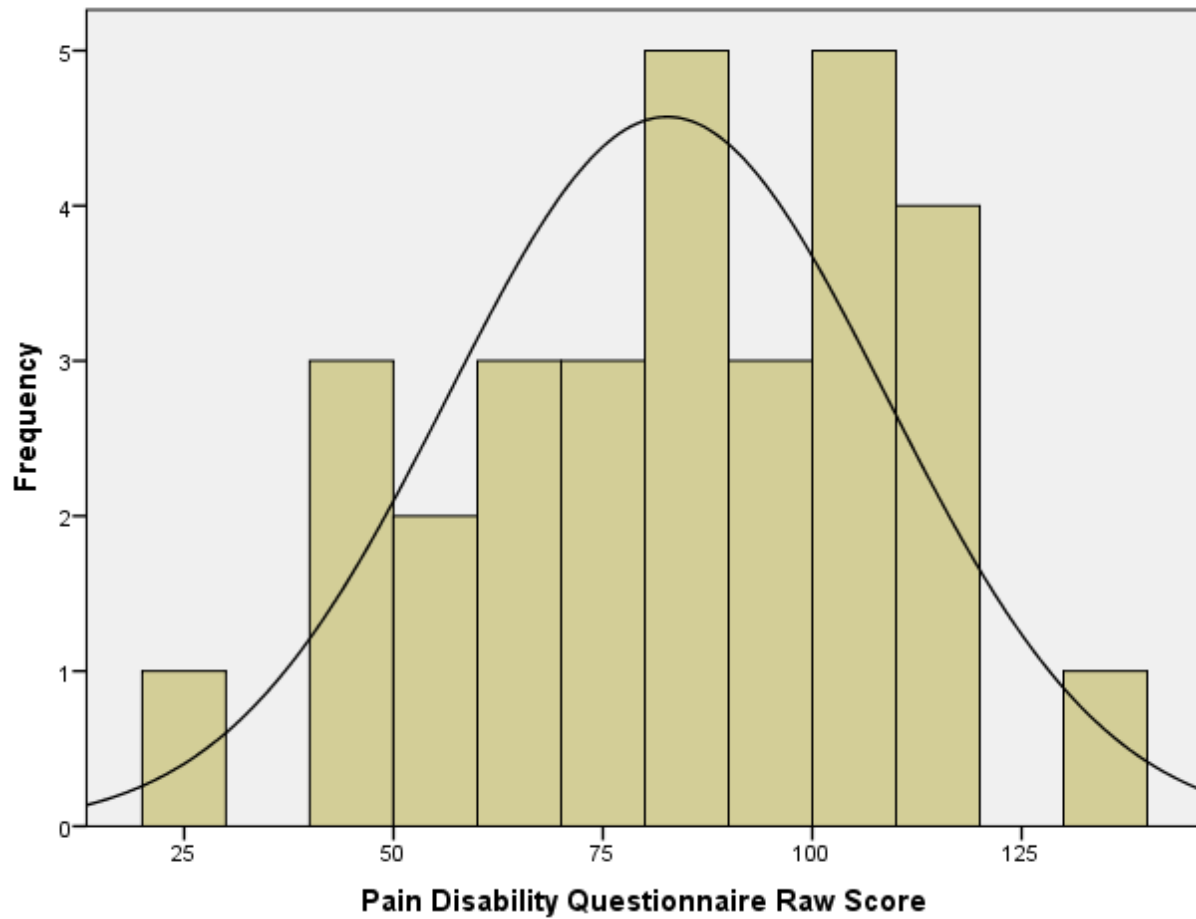
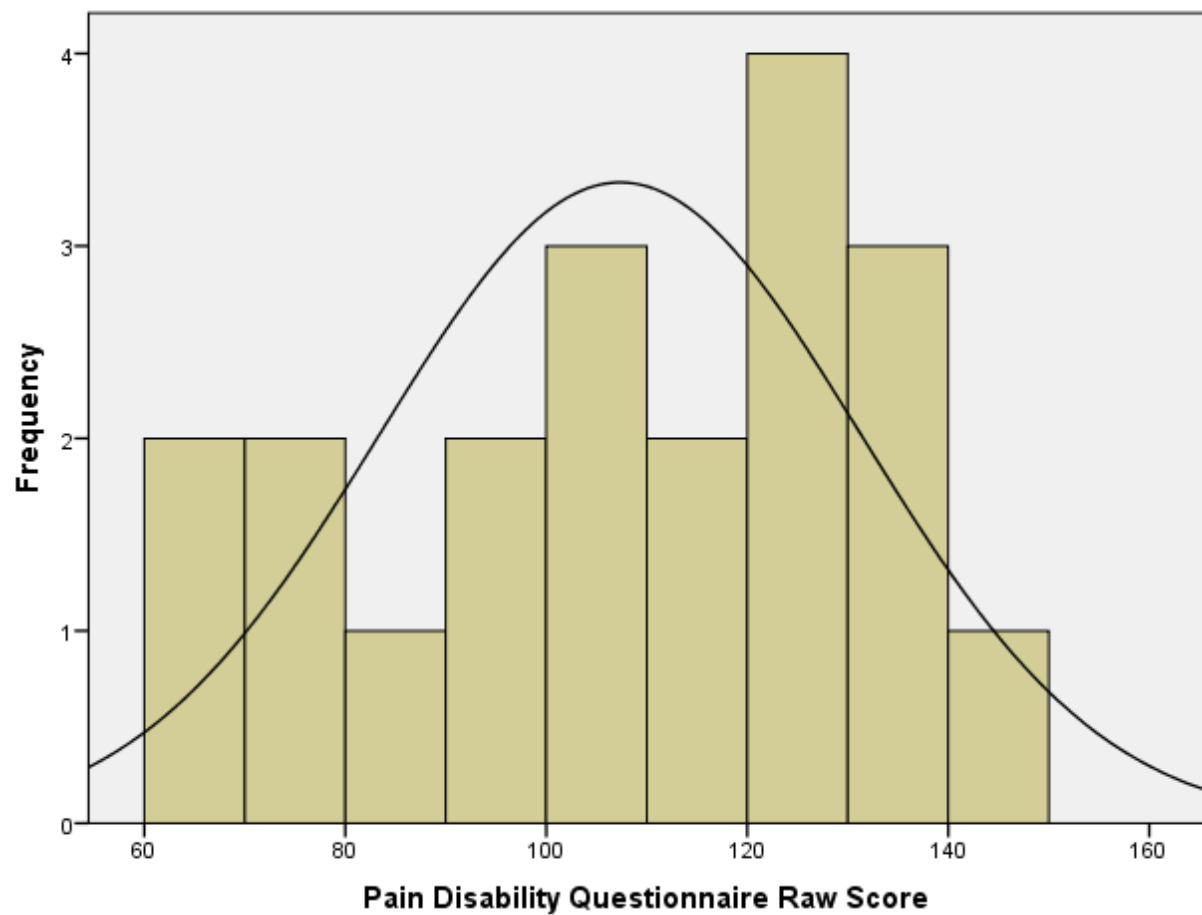


Figure 3: High Healthcare Cost Group



BIOGRAPHICAL SKETCH

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EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
The University of Texas at Dallas - Dallas, Texas	B.S., B.A.	2010	Child Learning and Development, Psychology
The University of Texas Southwestern School of Health Professions - Dallas, Texas	MRC	2014	Rehabilitation Counseling Psychology

Positions and Employment

2007 - Champion Services, Inc., Supported Home Living Specialist

2008-2010 - University of Texas at Dallas, Peer Advisor

2009-Present - Newstart, Inc., Foster Care Provider

Clinical Experience

2010 - Callier Center for Communication Disorders, Psychology intern

2012-2013 - UTSW University Rehabilitation Services Supported Employment,
Rehabilitation Counseling intern

2013 - UTSW Bariatric Surgery Clinic, Rehabilitation Counseling intern

2014 - UTSW Eugene McDermott Center for Pain Management, Research assistant

2013-Present - Dr. Matthew Housson & Associates, Coaching for Academic Success tutor

2013-Present - UTSW University Rehabilitation Services Supported Employment, Vocational
Specialist