OPIOD TREATMENT FOR CHRONIC PAIN AND INTERDISCIPLINARY CARE

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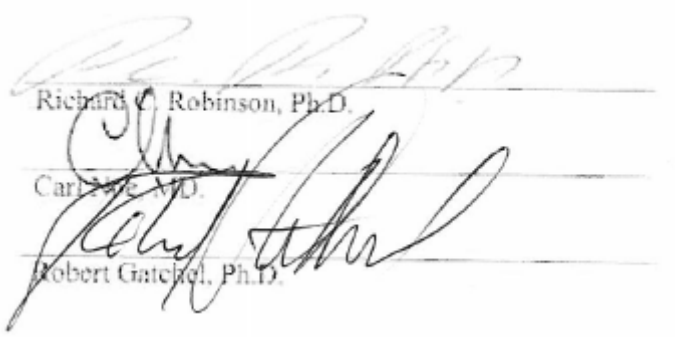

DEDICATION

I would like to thank the members of my Graduate Committee, as well as my family and friends for their support through this process.

OPIOID TREATMENT FOR CHRONIC PAIN AND INTERDISCIPLINARY CARE

by

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THESIS

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Abstract

BACKGROUND: The amount of individuals suffering from chronic pain (3 months or more) is growing. Along with this growth, the amount of money spent on medical treatment of chronic pain with or without relief is growing. A major issue that stems from this is the misuse and abuse of prescription opioid medication. This brings a massive loss of productivity and quality of life.
SUBJECTS: Patients included in the current study suffer from chronic pain, are at least 18 years of age, and are capable of providing informed consent, and reading and speaking English. EMCPM provides an interdisciplinary program including; cognitive-behavioral therapy, group cognitive-behavioral therapy focusing on psychoeducation, and physical therapy. Patients receive 8 sessions of individual CBT, group CBT, and physical therapy throughout the program. Patients receive these sessions twice a week throughout the 4 week program.
METHOD: This study used outcomes that measure ratings of pain; pain, pain interference, depression, anxiety, sleep disturbance, sleep related impairment, satisfaction with participation in discretionary social activities, satisfaction with social roles and activities, and global health. Opioid status was determined as “no,” “decreased,” or “same” for each patient after oral morphine equivalents were calculated at baseline and monitored throughout the 4-week program. One-way within-subjects ANOVAs were conducted for each opioid status as the factor and the outcome measure T scores as the dependent variable. If significant, polynomial contrasts were used to determine linear effects. One-way within-subjects ANCOVAs were then conducted for each opioid status as the factor, outcome measure T scores as the dependent variable and pre-program outcome measure T scores as the covariate to control for pre-morbid dysfunction. If significant, polynomial contrasts were used to determine linear effects. Finally, three Pearson

correlations were run between percent change of outcome measure T scores and pre-, post-, and percent change in morphine equivalents.

RESULTS: Overall, individuals with chronic pain who participated in a four-week interdisciplinary pain program maximized their results by maintaining no or low opioid dosage, or by decreasing moderate-high opioid doses throughout the program, as expected. Individuals who entered the interdisciplinary pain program with no opioid use showed significantly more improvement ($p<.01$) than those with initial opioid use over the course of the program on several outcome measures; pain (composite pain rating and pain interference), depression, anxiety, social satisfaction (satisfaction with participation in discretionary social activities and satisfaction with social roles and activities), and global health. Significant ($p<.01$) linear effects were also found on all previously mentioned outcome measures. Anxiety levels showed significantly more improvement ($p<.01$) over the course of the pain program only when a control for pre-morbid anxiety was added. A significant ($p<.01$) linear effect was also found. Individuals who entered the interdisciplinary pain program using opioid medication and decreased the dosage of opioid medication over the course of the program reported significantly more improvement ($p<.01$) in pain (both composite pain rating and pain interference) and social satisfaction (satisfaction with participation in discretionary social activities only when controlled for pre-morbid social satisfaction with participation in discretionary social activities) when compared with participants who maintained initial opioid dosage. Significant ($p<.01$) linear effects were found on all three outcome measures. Individuals who maintained a low opioid dosage over the course of the interdisciplinary pain program reported significantly more improvement ($p<.01$) on; pain (composite pain rating and pain interference), anxiety, sleep (sleep-related impairment only), social satisfaction (satisfaction with participation in discretionary social activities and

satisfaction with social roles and activities), and global health. Significant (p<.01) linear effects were found on all of the above measures except pain related impairment. Weak Pearson correlations (r=22) between pre-morphine equivalent and percent change in sleep-related impairment was found. This was again found between post-morphine equivalent and percent change in sleep-related impairment (r=29), as well as a weak negative correlation with pain interference (r=-.28). More research is indicated to determine the relationship between these correlations. Pearson correlations between percent change in morphine equivalent and percent change in outcome measure T scores did not yield any significant (r>.29) correlations.

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LIST OF ABBREVIATIONS

CDC – Center for Disease Control

FR – Functional Restoration

ST – Standard Care

PCP – Primary Care Physician

MPTP – Multidisciplinary Pain Treatment Programs

CBT – Cognitive Behavioral Therapy

OIH – Opioid-Induced Hyperalgesia

CNCP – Chronic Non-Cancer Pain

CHAPTER ONE

Introduction

Pain is experienced for several reasons for different amounts of time. Acute pain is the sensation of pain felt immediately after or during tissue damage. The purpose of this sensation is to alert individuals of tissue damage (Integrative Pain Management, 2015). Chronic pain is defined as "pain that lasts beyond the healing of an injury, continues for a period of several months or longer, or occurs frequently for at least months" (Integrative Pain Management, 2015). Chronic pain can last for weeks, months, and even years, after the original tissue damage has healed. This can be caused by infection, ongoing disease, (i.e. arthritis or cancer) or there may not be a clear cause (National Institute of Health, 2015). Chronic pain is incurable, but there are several treatment options, which will be discussed in this article (Integrative Pain Management, 2015).

More than 1.5 billion individuals are affected by chronic pain worldwide. In America, more than 100 million individuals are affected by chronic pain. This number almost doubles the amount of individuals in America that suffer from diabetes, coronary heart disease, stroke, and cancer, put together (American Academy of Pain Management). In 2010, the cost of healthcare due to pain ranged from $50 billion to $635 billion. Individuals battling a pain condition were found to lose an average 4.6 hours per week of work (American Academy of Pain Management). Because the elderly population is growing and elderly patients are more prone to chronic pain and comorbidities, a shift to an effective and affordable treatment option is necessary (American Academy of Pain Management).

Prescription opioids are a common treatment for chronic pain. Drug overdose has surpassed motor vehicle collisions in number of deaths among people from 25 to 64 years old.

The number of deaths caused by overdoses has more than doubled from 1999 to 2013 (Centers for Disease Control and Prevention, 2015). "In 2013 35,663 (81.1%) of the 43,982 drug overdose deaths in the United States were unintentional" (Centers for Disease Control and Prevention, 2015). Over half of these deaths were the result of pharmaceuticals. 71.3 % of pharmaceutical overdose deaths involved opioids. "In the United States, prescription opioid abuse costs were about $55.7 billion in 2007," including cost of; lost productivity, abuse treatment, and criminal justice (Centers for Disease Control and Prevention, 2015).

CHAPTER TWO

Review of the Literature

Traditional Biomedical Model

A working model is required in the practice of medicine. A model is simply a system or theory used to explain a certain phenomenon. In the case of medicine, the Biomedical model has explained illness and disease for decades (Gatchel, 2007).The traditionally used Biomedical Model is founded upon the scientific method with molecular biology at its base. This model has been successful in the study and treatment of disease processes, often with a single biochemical explanation or defect. According to Gatchel, "*disease* is defined as an objective biological event involving the disruption of specific body structures or organ systems caused by either anatomical, pathological, or physiological changes" (p. 582). Other factors including social, psychological, and behavioral aspects of an illness have not always been considered in the Biomedical Model. "*Illness* refers to a subjective experience or self-attribution that a disease process is present" (Gatchel, 2007, p. 582).

Descartes described pain in terms of the Specificity Theory. This theory suggests the existence of dedicated nerve pathways for individual somatosensory modalities, meaning that each type of stimulus (i.e. heat, pain, etc.) coincides with a specific type of nerve pathway to and from the brain (Moayedi & Davis 2013). Other theories of pain under the biomedical model include; the Intensity Theory, Pattern Theory, and Gate Control Theory. The Intensity Theory of Pain suggests that pain in simply an emotional response to a stimulus at a certain intensity. Therefore, when any sensation becomes too strong, pain is perceived (Moayedi & Davis 2013). The Pattern Theory of Pain "stated that any somaesthetic sensation occurred by a specific and

particular pattern of neural firing and that the spatial and temporal profile of firing of the peripheral nerves encoded the stimulus type and intensity" (Moayedi & Davis 2013).

The Gate Control Theory of Pain bridged the gap between the Specificity Theory and the Pattern Theory. Essentially, pain fibers (nociceptors) and touch fibers synapse in different regions of the brain and spinal cord. Both types of fibers can be large or small. The Gate Control Theory suggests that "large-fiber activity inhibits (or closes) the gate, whereas small-fiber activity facilitates (or opens) the gate," (Moayedi & Davis 2013). The brain perceives the sensation of pain when this gate is opened (Moayedi & Davis 2013). The opening and closing of this gate is modulated by the central nervous system. Factors that influence this system include "the amount of activity in the pain fibers, the amount of activity in the peripheral fibers, and messages that descend from the brain" (Nursing Theories: a companion to nursing theories and models, 2012). According to this theory, the gate is more likely to open not only due to physical injury, but also when the individual is suffering from anxiety or depression, or when the individual is concentrating on the injury and pain (Nursing Theories: a companion to nursing theories and models, 2012).

With the Biomedical model, psychological illness and physical illness are considered separate conditions (Engel, 1977). The need to identify psychological illness and other issues that the Biomedical model has not been successful in explaining brought upon two variations of physicians; the reductionist and the exclusionist. The reductionist believes that all illness has a single biochemical cause. In the case that the single cause is not identified, the illness is then put into a different category than "disease," such as psychological illness. The exclusionist also believes that all illness has a single biochemical cause (Engel, 1977). However, if the cause cannot be found, then the illness or category of illness does not truly exist (Engel, 1977).

Because of wide success, the Biomedical model has become socially accepted over the years. The Western culture has put this model into their belief system (Engel, 1977). Illnesses not included in this model, (such as psychological illness and chronic pain) have a stigma and patients often avoid this at all cost. Engel describes this as a "biomedical dogma." When Christians allowed science to perform autopsies with the understanding that this would not affect the deceased's soul, there became a separation. Because of this mind/body dualism, the Biomedical model grew and prospered in these beliefs. It was then reinforced with its success in treating a vast majority of disease (Engel, 1977). "The Biomedical model is clearly relevant for many disease based illnesses, has intuitive appeal, and is supported by a wealth of supporting biological findings" (Wade & Halligan, 2004). This model is useful for clear pathology and acute conditions. Prior to this model, acute conditions often resulted in death. The Biomedical model has reduced these mortality rates, proven by the survival rate of soldiers during wartime (Wade & Halligan, 2004).

The biomedical model, however, does not treat *chronic* pain effectively. The Biomedical model generally does not consider the patients' personal experiences or suffering caused by disease (Engel, 1977). Because of this, treatment from the Biomedical model does not always return the patient to baseline functioning; the level of functioning at which the patient was before the onset of the illness. Chronic pain is an example of this. Extensive scans, opioid medication, and even surgeries are used in this model. In 1977 Engel determines, "A medical model must also take into account the patient, the social context in which he lives, and the complimentary system devised by society to deal with the disruptive effects of illness" (pg. 132). Based on these ideas, another model, the Biopsychosocial model has been adopted and empirically supported in the treatment of illness, including chronic pain (Engel, 1977).

Opioid Therapy in the Treatment of Chronic Pain

Opium is produced from the seeds of poppies and has been used for thousands of years for treatment of pain and suffering (Ballantyne & Mao, 2003). In 1806, the pharmacological use of opium began. It wasn't until the 1940's that the government began controlling this substance. At that time opium, or opioid medications, could only be used after being prescribed by a physician, most of which remained extremely hesitant to prescribe these medications (Ballantyne & Mao, 2003). Opioids eventually became commonly prescribed for acute pain and pain due to cancer or terminal disease. Opioids remain the most powerful pain relievers known (Blozen, 2013).

The current standardized approach for the use of opioid medication in the treatment of chronic pain is as follows. A comprehensive medical history, as well as physical examination must be performed and documented. Proof that nonopioid therapy has failed must be provided. Collaborative goals for opioid treatment must be determined by both physician and patient, with a willingness from both to discontinue treatment if the goals are not met. An in depth discussion of the pros and cons of opioid therapy must take place. It is preferable to include a single physician and pharmacist, if possible. Comprehensive follow-up is extremely important, which includes; assessment of progress towards goals, monitoring for misuse/abuse, as well as the inclusion of other treatments (Ballantyne & Mao, 2003). Patients struggle immensely when being tapered off or discontinued from opioid treatment, even when it is indicated by lack of response to treatment or inability to fulfill the treatment agreement (Blozen, 2013).

Patients with chronic pain being treated with opioid medication can demonstrate a variety of responses (Ballantyne & Mao, 2003). Tolerance is common with prolonged opioid use. This includes associative tolerance, which is learned, and nonassociative tolerance, which is adaptive.

Nonassociative tolerance is considered physiological, and is the body's natural response to prolonged opioid use (Kalechstein & Van Gorp, 2007). The environment, however, influences associative tolerance. For example, if an opioid is given in the same environment, a tolerance is built only in that specific environment. If the environment was to change, the opioid dose previously received could result in an overdose (Kalechstein & Van Gorp, 2007).

Tolerance often results in an escalation of dosage. Escalating the dose may also occur due to the development of an abnormal sensitivity to pain, known as opioid-induced hyperalgesia (OIH) (Ballantyne & Mao, 2003). OIH is "generally thought to result from neuroplastic changes in the peripheral and central nervous system (CNS) that lead to sensitization of pronociceptive pathways" (). Complicating this matter, an abnormal sensitivity to pain can be caused by the opioid use itself, or the progression of disease (Ballantyne & Mao, 2003). The distinction between the types of tolerance is often difficult to accurately determine. OIH should be considered when opioid treatment is less effective despite the absence of disease progression (Lee, Silverman, Hansen & colleagues, 2011). This can account for unexplained pain reports, increased levels of pain despite opioid dose increases, and new reports of pain not associated with the original pain (Lee, Silverman, Hansen & colleagues, 2011).

Dose increases in opioid medications is necessary, but highlights the need for comprehensive follow-up. Ballantyne and Mao found "that many physicians take a much more liberal approach to dose increases. Some patients with chronic pain receive doses as high as 1 g or more of morphine (or a morphine equivalent) per day, which may be five or more times the doses validated by the literature" (2003, p. 1944). Patients on high doses of opioids for long periods of time rarely demonstrate improved pain or function (Ballantyne & Mao, 2003). Overall, patients tend to experience about a one third improvement in pain with opioid treatment,

however; patients also report an increased sense of wellbeing (Ballantyne & Mao, 2003). The balance between the appropriate use of opioid therapy and the prevention of misuse is imperative for the management of chronic pain. (Ives, Chelminski, Hammett-Stabler, Malone, Perhac, Potisek & Pignone, 2006). "Opioid treatment may be offered in an attempt to improve pain and functioning, and thereby reduce the burden of care, but the treatment may actually increase the burden of care, because the management of opioid therapy in patients with complex problems in time-consuming and difficult (Ballantyne & Mao, 2003, p. 1947).

Blozen (2013) suggests that "although opioid use in treating acute pain generally appears benign, long-term opioid use has been linked to clinically meaningful abuse rates." Also, a majority of people that abuse opioid medication get their opioids from physicians, rather than illicitly. This highlights the importance of comprehensive follow-up when using opioid therapy (Blozen 2013). Unfortunately, comprehensive follow-up is complicated and both financial and medical professional resources do not realistically allow long-term opioid therapy follw-up (Ballantyne & Mao, 2003). In 2010, over 12 million patients abused prescription painkillers (CDC 2015). This level of abuse continues to rise, resulting in tolerance, dependence, and finally abuse (Blozen 2013). Blozen projects that "the number of elderly persons who abuse substances will double by 2020 (Blozen 2013). Elderly people are at higher risk for chronic pain issues, which heightens their risk for opioid abuse as well. With the baby boomer generation beginning to age and enter into the elderly population, this issue will continue to grow. Most studies regarding opioid use are 16 weeks or less. Because of this, further research and education about opioid use vs. interdisciplinary approaches to the treatment of chronic pain is necessary (Blozen 2013).

High doses of opioid medication for extended periods of time can also result in hormonal changes, including changes in testosterone/estrogen. Common symptoms from this imbalance include; decreased libido, aggression, drive, amenorrhea, and galactorrhea (Ballantyne & Mao, 2003). Ballantyne & Mao found testosterone depletion in the majority of men receiving intrathecal opioid therapy for chronic pain. Impairments in immune function are also common in patients that receive high doses of opioid medication for treatment of chronic pain (Ballantyne & Mao, 2003).

Misuse of prescription opioid medications is commonly in the form of the concurrent use of stimulants such as cocaine. The amount of chronic pain patients that develop or are at risk to develop an opioid use disorder is difficult to assess due to the criteria used to diagnose this disorder in the DSM-5, which uses symptoms of tolerance and withdrawal as indicators. Tolerance is expected and withdrawal is not present in the medical use of opioid medications (Ives, Chelminski, Hammett-Stabler and colleagues, 2006). According to their study, "The strongest predictors of misuse in the study population were self-reported histories of previous alcohol or cocaine abuse, or previous criminal drug or alcohol-related convictions" (Ives, Chelminski, Hammett-Stabler & colleagues, 2006). " Patients receiving higher doses of prescribed opioids are at increased risk of opioid overdose, underscoring the need for close supervision of these patients" (Dunn, Saunders, Rutter, Banta-Green, Merrill, Sullivan & Von Korff, 2010). Despite the above concerns with opioid treatment for chronic pain, the use of opioids for chronic pain has been increasing. This topic remains controversial. (Ballantyne & Mao, 2003).

The Biopschosocial Model

Based upon Systems Theory, the Biopsychosocial model is designed to consider "all the levels of organization pertinent to health and disease, from subatomic particles through molecules, cells, tissues, organs, organ systems, the person, the family, the community, the culture, and ultimately the biosphere" (Engel, 1977, p. 183). Within the biopsychosocial model are different approaches. This model builds upon the Biomedical model, but encourages more patient/professional, as well as professional/professional communication in the formulation of treatment. This describes multidisciplinary and interdisciplinary treatments, which are similar but separate approaches (Engel, 1977).

In current practice, the Biopsychosocial model calls for caregivers to respond to the patient in a particular way. The physician must discover the concern of the patient and describe the specific goal of the chosen medical treatment. They must discover other aspects of illness as well, which may include behavioral, psychological, social, etc (Borrell-Carrió, Suchman & Epstein, 2004). The physician must also demonstrate the following; attentive observation, critical curiosity, informed flexibility, and presence. In doing this, the physician will establish rapport and trust and remain open-minded regarding the patient, the care of the patient, and the illness itself (Borrell-Carrió, Suchman & Epstein, 2004). They must monitor biases; race, sex, complexity of case, etc. Also, using the Biopsychosocial model, physicians are encouraged to listen to their own professional artiste or intuition. All of these behaviors include open, effective communication with the patient that must be tailored to each patient; education level, culture, belief system, etc (Borrell-Carrió, Suchman & Epstein, 2004).

The Biopsychosocial Model and Treatment of Chronic Pain

The Gate control of pain theory was the beginning of the shift towards a biopsychosocial model in the treatment of chronic pain (Moayedi & Davis 2013). As discussed previously, this

theory suggests that peripheral sensory input is regulated by a gate in the dorsal horn of the spinal cord. If this gate is open, sensory input is then transmitted via the spinothalamic tract to the brain (Nelson & Weir, 2001). This explains how pain can be felt, regardless of tissue damage and how psychological factors can influence this (Nelson & Weir, 2001).

Currently, pain is defined in a multidimensional fashion. "These dimensions include the sensory-discriminative (intensity, location, quality, and duration), the affective-motivational (unpleasantness and the subsequent flight response), and the cognitive-evaluative (appraisal, cultural values, context, and cognitive state) dimension of pain," (Moayedi & Davis 2013). These dimensions interact with and modulate one another. This theory and standard treatment of pain, specifically chronic pain, continues to evolve as new information is discovered about the brain and spinal cord (Moayedi & Davis 2013).

The biomedical model and two distinct approaches in the biopsychosocial model have been established. Going forward, this review discusses which approaches are preferred in the treatment of chronic pain.

Interdisciplinary approaches. Interdisciplinary programs include a team of healthcare providers who work together to achieve a common goal. This team often includes, but is not limited by, a physician, psychologist/psychiatrist, physical therapist, nurse, and case manager working in a single treatment facility. Other characteristics of an interdisciplinary approach consist of the team having face-to-face meetings, team conferences, and providing comprehensive assessment and care to the patients (Gatchel, Peng, Peters & Turk, 2007).

In a controlled study comparing an intense interdisciplinary pain program to standard care of chronic pain (by highly qualified and respected anesthesiologists), the following results were found. The group in the interdisciplinary pain program, receiving functional restoration (FR

group) displayed immediate psychosocial and physical improvement compared with the standard care group (ST) (Gatchel and colleagues, 2009). The FR group also demonstrated immediate improvement in the intensity of self-reported pain, perceived disability, and emotional distress. There were few immediate changes in psychosocial functioning noted in the ST group (Gatchel and colleagues, 2009). Of significant importance is that people in this program had chronic pain for a mean of five years with relatively stable symptomatology. The noted immediate changes found in the FR group were noted within the length of the 3-week program (Gatchel and colleagues, 2009). Upon termination of the program other changes found in the FR group compared with the ST group included the following. The sense of control over pain and concern about the impact of physical activity on pain had improved. The amount of functional disability and self-reported pain intensity was improved. Also, physical functioning was improved. At 6-month follow-up, symptoms continued to improve. Less use of the medical system was noticed, as well as less reliance on pain medication (Gatchel and colleagues, 2009). Individuals that had undergone the interdisciplinary program were also more likely to seek behavioral health services at 6-month follow-up. At 1-year follow-up, the FR group had maintained the benefit of interdisciplinary treatment (Gatchel and colleagues, 2009).

Individuals who complete an interdisciplinary pain program show an annual savings of $2404.80 per person due to reduced opioid use. Also, individuals whose primary care physician (PCP) is included in the interdisciplinary care show enhanced benefits (Noe & Williams, 2012).

Robbins and colleagues (2003) compared individuals who completed an interdisciplinary pain program with individuals who dropped out of the program. Individuals who completed the program showed improvements in both physical and psychosocial functioning and were more likely to return to work. These individuals were half as likely to be using opioid medication for

pain, as well as more likely to be taking anti-depressant medications (Robbins and colleagues, 2003). Half of the individuals with chronic pain have comorbid depression which can influence their prognoses. This shift from opioid medication use to anti-depressant use is viewed as positive. Individuals who dropped out of the program showed a shift in the opposite direction, (from anti-depressant use to opioid medication use) (Robbins and colleagues, 2003). Another significant finding is that individuals that completed the program attended half as many healthcare visits after the end of the program in comparison to individuals who dropped out of the program (Robbins and colleagues, 2003).

Oslund and colleagues found that "Consistent with prior studies (5–10), measures of pain, emotional distress, and function all showed significant improvement after 4 weeks of comprehensive interdisciplinary care" (p. 9). At 6-month follow-up levels of emotional distress was found to be close to pre-treatment levels, however; at one year follow-up emotional distress levels had improved by 21% indicating an adjustment period post treatment (Oslund and colleagues, 2009).

"We hypothesize that for chronic pain patients it is obviously more difficult to individually manage psychiatric and psychosocial dysfunctions over time (e.g. anxiety, depression, catastrophizing), as compared with predominantly physical disorders (e.g. osteoarthritis, hypertension, diabetes)" (Angst, Verra, Lehmann, Brioschi & Aeschliman, 2009, p. 574). Because of this individuals severely affected by chronic pain benefit from interdisciplinary programs and further outpatient individualized care (Angst, Verra, Lehmann, Brioschi & Aeschliman, 2009). Neilson and Weir, however, note that individuals respond best to personalized care regardless of the working model being used.

Multidisciplinary approaches. Although similar to interdisciplinary approaches, multidisciplinary approaches include a couple to a few specialists leading a team of healthcare providers, all of which have different goals (Gatchel, Peng, Peters & Turk, 2007). Face-to-face meetings are not as common in multidisciplinary programs, and care is not as succinct. This is partially due to the lack of a common treatment facility for the multidisciplinary team (Gatchel, Peng, Peters & Turk, 2007).

According to a meta-analysis of multidisciplinary pain treatment centers Flor, Fydrich, and Turk found the following. The meta-analysis described a multidisciplinary team consisting of medical treatment, physical therapy, and psychological treatment. Overall, multidisciplinary pain centers were found to be efficacious with long-lasting effects (Flor, Fydrich & Turk, 1992). Individuals that participated in these centers have long-term effects that are better than 75% of non-treated individuals or those treated unimodally, (consisting only of medical treatment, physical therapy, *or* psychological treatment.) Also, physical therapy alone was found to yield better results than medical treatment alone (Flor, Fydrich & Turk, 1992). Physical therapy alone, however, is less beneficial than a multidisciplinary program which includes medical and psychological treatment as well (Flor, Fydrich & Turk, 1992).

An important difference demonstrated in this article is the inclusion of objective measures of improvement, such as returning to work and use of the medical system (Flor, Fydrich & Turk, 1992). Individuals that go through a multidisciplinary pain program are twice as likely to return to work as those who are not treated or who receive unimodal treatment. Also, these individuals save 43% on costs related to use of the medical system (Flor, Fydrich & Turk, 1992).

Guzman and colleagues (2001), however, suggests that pain and function of individuals with chronic back pain are most benefitted by an "intense multidisciplinary biopsychosocial rehabilitation with functional restoration." *Intense* is defined by a program which provides over 100 hours of therapy (Guzman, Esmail & Karjalaninen, 2001). These intense programs are more beneficial than less intensive multidisciplinary, non-multidisciplinary, or traditional (strictly medical; surgical, opioid, etc.) care for chronic pain (Guzman, Esmail & Karjalaninen, 2001).

Jensen and colleagues (1994) states three findings from researching *The Correlates of Improvement in Multidisciplinary Treatment of Chronic Pain.* Findings suggest that changes in the beliefs about pain and cognitive coping strategies in response to chronic pain indicate improvement of symptoms of Depression and improvements in physical functioning (Jensen, Turner & Romano, 1994). Also, individuals who render feelings of hopelessness throughout the pain program in turn have fewer doctor visits relating to chronic pain. Jensen and colleagues also finds, however, that changes in behavioral coping strategies do not yield significant change. Behavioral coping strategies include physical exercise and stretching, distraction, relaxation techniques, and opioid medications (Jensen, Turner & Romano, 1994).

Patrick and colleagues (2004) completed a study of the long term effects of multidisciplinary pain treatment programs (MPTP) 13 years post-treatment. This study finds that individuals that undergo a MPTP show maintained or improved functioning at 13-year follow-up. This result is noticed despite the sample group aging 13 years. During the MPTP, the group did not improve significantly from medical interventions and/or from MPTP until short-term follow-up, at which point pain interference and pain intensity was improved (Patrick, Altamaier & Found, 2004). Also, at 13-year follow-up half of the sample was employed. The work of a majority of those employed was not affected by chronic pain (Patrick, Altamaier & Found,

2004). The sample does not differ from norm groups in general health or psychological health despite higher reporting of pain. Pain was not completely alleviated but health-related functioning was improved compared with pretreatment levels (Patrick, Altamaier & Found, 2004). The sample group did not differ from the normative sample in psychological health; social interaction, emotional well-being, and feelings of vitality. However, medical health was lower and level of self-reported pain was higher in the sample group initially. At 13-year follow-up, however, the sample group did not differ from the normative sample in general health including; psychological health, medical health, and pain levels (Patrick, Altamaier & Found, 2004).

Interdisciplinary treatment with opioid cessation. Townsend and colleagues (2008) studied the effects of opioid use status at admission to an interdisciplinary program for treatment of chronic non-cancer pain (CNCP) on treatment outcomes. Participants in the study experienced pain for years, which was not successfully treated with traditional methods; surgery and pharmacology (Townsend, Kerkviliet, Bruce & colleagues, 2008). Regardless of entrance opioid status, (none, low-dose, or high-dose) participants "reported high levels of pain, depression, and pain catastophizing" (Townsend, Kerkviliet, Bruce & colleagues, 2008, p. 186). Participants taking low to high-dose opioids upon entrance, however; reported experiencing more severe pain and depression than those not taking any opioids at entrance. Tolerance and OIH is suspected to account for the differences in severity reported (Townsend, Kerkviliet, Bruce & colleagues, 2008).

Participants who were taking opioids upon admission were also found to be on various other drugs to treat symptoms such as; pain, insomnia, fatigue, and mood. Along with this

polypharmacy, participants taking opioids were also more likely to be taking benzodiazepines, muscle relaxants and anticonvulsants (Townsend, Kerkviliet, Bruce & colleagues, 2008).

Overall, this study found that participants "with longstanding CNCP who choose to participate in an interdisciplinary rehabilitative program that incorporates opioid withdrawal experience significant improvement in pain severity, functioning, mood, and pain catastrophizing immediately posttreatment and six months following treatment" (Townsend, Kerkviliet, Bruce & colleagues, 2008, p. 186). Another finding included significant improvements from all participants, regardless of opioid status upon entrance into the program (Townsend, Kerkviliet, Bruce & colleagues, 2008).

Chronic Pain and Mood Disorders

According to Turk & Okifuji (2002), "pain is a complex perceptual experience influenced by a wide range of psychosocial factors, including emotions, social and environmental context, sociocultural background, the meaning of pain to the person, and beliefs, attitudes, and expectations, as well as biological factors" (p. 678). Chronic pain refers to pain that persists for months to years and influences all aspects of a person's functioning (Turk & Okifuji, 2002). Beliefs about pain are important in chronic pain management. For example, if a person believes that physical activity will worsen the original injury, they will likely avoid such activity, and actually experience fear related to physical activity, causing more avoidant behavior. Avoidant behaviors due to fear of further injury or pain is referred to as fear avoidance. This inactivity may lead to what is known as deconditioning, or weakening of muscles and physical endurance. Deconditioning often worsens pain and maintains disability (Turk & Okifuji, 2002).

The fear avoidance response described above is actually adaptive for acute injury and pain. After an acute injury, rest and inactivity for healing is recommended. These activities

generally lessen the pain related to such an acute injury; however, when referring to chronic pain, this response becomes maladaptive (Turk & Okifuji, 2002). Chronic pain persists after the physical damage of injury is done and healed. Therefore, this pain, which in acute injury alerts the brain to damage, is not functional (Turk & Okifuji, 2002). Truama often changes patients' interpretation of sensation, causing increased anxiety and lower pain thresholds/tolerance. This is in comparison with patients whose detectable physical pathology is no different from the patients who gained injury from trauma (Turk & Okifuji, 2002).

Doctors prescribe opioid medications for pain to trauma patients five times more often than to patients with other origins of injury resulting in chronic pain. Waddell and colleagues explain that "fear of pain and what we do about it is more disabling than the pain itself" (1993, p. 164). As stated previously, fear avoidance generally increases perception of sensation, which is more likely to be perceived negatively (Turk & Okifuji, 2002). Exposure-based counterconditioning can be used to prevent or lesson chronic pain. This process gradually exposes patients to the activities they are fearful of and provides accomplishments in order to change perceptions (Turk & Okifuji, 2002).

Self-efficacy also plays an important role in fear avoidance and pain perception. Self-efficacy is the belief that one can be successful in certain activities. Self-efficacy determines whether a patient will initiate the activity, the effort they put forth, as well as the effort they sustain throughout the activity (Turk & Okifuji, 2002). Experiencing mastery of activities has a strong impact of self-efficacy. The level of performance can be determined by the anticipation of pain and how it interacts with self-efficacy. The higher the self-efficacy, the more improved pain, disability and mood. Avoidance of feared activities and behaviors will not provide the

corrective feedback (mastery experience) or information that can improve an individual's sense of self-efficacy (Turk & Okifuji, 2002).

Recovery versus continued disability is predicted by; attitudes/beliefs, social support, emotional reactivity, job satisfaction/dissatisfaction, substance abuse, compensation status, pain behaviors, and psychiatric diagnoses. Physical factors do not contribute as much as the factors listed in predicting outcome (Turk & Okifuji, 2002). Because the vast majority of factors on this list are psychosocial, a technique known as Cognitive-Behavioral Therapy is often utilized to prevent chronic disability due to pain and will be discussed in more detail later in this review (Turk & Okifuji, 2002).

Chronic Pain and Depression. According to Turk, Okifuji, and Scharff, significant levels of depression are found in roughly 50% of patients with chronic pain. After disease severity and health conditions are under control, this co-morbidity remains. Diagnosis of depression is found to be an important predictor of disability, as well as a predictor of motivation for treatment, in chronic pain patients. Cognitive appraisal is described as "the ways in which an individual interprets his or her situation, future prospects, and resources available to cope with the problems he or she confronts," which "will greatly influence thoughts about their plights, behavioral responses, and emotional states" (Turk, Okifuji & Scharff, 1995 p. 94).

Perceived pain impact and the ability to control one's life mediate between chronic pain and depression. Perceived pain impact includes self-efficacy, or the belief about one's own abilities. Arnstein, Caudill, Mandle, Norris, and Beasley found that self-efficacy mediates the relationship between pain intensity and disability (Arnstein, Caudill, Mandle, Norris, Beasley, 1998). This suggests that a person's belief in their own abilities, rather than the extent of their disability, contributes to how or why they become depressed. Pain intensity was found to be

indirectly related to depression through the above mediating factors; perceived pain impact and ability to control one's life (Arnstein, Caudill, Mandle, Norris, Beasley, 1998). "The more intense the pain, the greater it interferes with home or family responsibilities, recreation, social activities, occupation, sexual behavior, self-care and life-support activities" (Arnstein, Caudill, Mandle, Norris, Beasley, 1998, p. 487.) Another finding stated that, "for the elderly pain patient, the burden of the symptom of chronic pain coupled with normative age-related changes in physical status and social support availability might be expected to magnify depressive symptomatology" (Turk, Okifuji & Scharff, 1995, p. 94.)

Chronic Pain and Anxiety. Casten, Parmelee, Kleban, Lawton, and Katz found that depression and anxiety both distinctly relate to chronic pain. McWilliams, Cox, and Enns (2003) conducted a study on mood and anxiety disorders associated with chronic pain. The study found co-morbid depression with chronic pain in 20.2% of the sample, similar to other studies. Anxiety spectrum disorders co-morbid with chronic pain were found in 35.1% of the sample, suggesting that co-morbid anxiety is also a contributing factor in the treatment of chronic pain. This subject has been studied considerably less than depression and chronic pain (McWilliams, Cox & Enns, 2003).

Another study found that the fear of movement/re-injury is negatively correlated with behavioral performance, suggesting that chronic pain patients suffering from anxiety will be less likely to engage in activities that could improve coping and quality of life with chronic pain. Co-morbid anxiety increases functional impairment and disability among chronic pain patients (Vlaeyen, Kole-Snijders, Boeren & Van Eek, 1995).

Cognitive Behavioral Therapy

Cognitive Behavioral Therapy, known as CBT, is based off of a model in which cognition, behavior, and mood all affect and interact with one another (Dobson 2009). Changes in cognition and behavior (which patients can alter) mediate changes in mood. Because patients have some control over thoughts and behavior, CBT attempts to find healthier, more adaptive reactions (both thoughts and behaviors) to life situations in order to gain some control over mood (Dobson 2009).

Cognitive Therapy versus Behavioral Therapy

Prior to the creation of the cognitive behavioral model, cognitive therapy and behavioral therapy were distinct therapeutic approaches. Cognitive therapy is based off of the theory of schemas. According to Dobson, a schema is defined as "cognitive structures that organize and process incoming information." Faulty schemas may result in distortion of perceptions, issues with problem-solving, as well as psychological disorders. Therefore, the goal of cognitive therapy is to replace a patient's distorted schemas with more realistic and adaptive appraisals of life events (Dobson, 2009).

Behavioral therapy focuses on the principles of classical and operant conditioning of behaviorism. The goal of behavioral therapy is to alter a patient's behavior in order to affect mood (Dobson, 2009). Together, CBT has been empirically supported in the literature as an effective intervention for a variety of disorders. According to a meta-analysis conducted by Morley, Eccleston, and Williams, CBT was found to be effective in the treatment of chronic pain in adults relative to waiting list control conditions. Significant changes from CBT in adult chronic pain patients include; improved pain experience, improved mood/affect, reduction of negative coping and increase in positive coping, improved pain behavior with increased activity

level, and improved social role function (Morley, Eccleston & Williams, 1999). CBT showed significant improvement in a patient's pain experience, positive coping, and social role function, when compared to other methods of treatment of adults with chronic pain (Morley, Eccleston & Williams, 1999).

Aims and Hypotheses

This review of the literature suggests that interdisciplinary programs for the treatment of chronic pain yields the best outcomes and is the most cost-effective. More research is indicated to determine the extent to which opioid status at admission, as well as throughout an interdisciplinary program affects outcomes.

The current study aims to investigate these questions with the following hypotheses:

1. Patients that admit to the interdisciplinary pain program with no opioid use will have significantly improved ratings of pain, depression, anxiety, sleep, social activity, and global health, and will report significant improvement in pain interference upon discharge from the program.

2. Patients who decrease their entrance opioid dosage throughout the program will have significantly improved ratings of pain, depression, anxiety, sleep, social activity, and global health, and will report significant improvement in pain interference upon discharge.

3. Patients who maintain a low opioid dosage throughout the program will have significantly improved ratings of pain, depression, anxiety, sleep, social activity, and

global health, and will report significant improvement in pain interference upon discharge.

CHAPTER THREE

Method

Study Design

Setting

Patients were recruited for the current study that were considering or receiving care from the Eugene McDermott Center for Pain Management (EMCPM). EMCPM is an interdisciplinary outpatient program that provides pain management services for patients suffering from chronic pain. Measure included once recruited were; demographic, personal history, psychiatric, psychosocial, and pain-related data (Harding, 2014). This data was collected at baseline, midpoint, discharge, follow-up, and at 3-month intervals up to 12 months after completion of the program. The collection and use of data was overseen by the Institutional Review Board of the University of Texas Southwestern Medical Center (Harding, 2014).

Participants

Inclusion Criteria

Patients included in the current study suffer from chronic pain, at least 18 years of age, capable of providing informed consent, and reading and speaking English (Harding, 2014).

Exclusion Criteria

Because the EMCPM does not generally treat the pediatric population for chronic pain, patients under the age of 18 years old were excluded from the current study. Patients were also excluded from the current study that were unable to read or speak English, or that were unable to provide informed consent for any reason (Harding, 2014).

Demographic Data

The majority (72.9%) of patients in this study are female (94). The sample is 129, leaving 35 males. Age of patients ranges from 20 years to 82 years. The mean age of patients in this study is 53.84 years with a standard deviation of 13.62. Table 1 demonstrates ethnicity.

Intervention

EMCPM provides an interdisciplinary program including; cognitive-behavioral therapy, group cognitive-behavioral therapy focusing on psychoeducation, and physical therapy. Patients receive 8 sessions of individual CBT, group CBT, and physical therapy throughout the program. Patients receive these sessions twice a week throughout the 4 week program (Harding, 2014). Because the EMCPM does not manage or prescribe narcotic pain medication, patients who have prescription opioid medication upon entrance into the program are monitored while these medications are tapered (Harding, 2014).

Measures

Measures from "Assessment Center," a NIH-funded web-based program were completed by patients participating in the current study. This study uses outcomes that measure; ratings of pain, depression, anxiety, sleep, social activity, and global health. These were administered to participants at baseline, midpoint, and discharge from the 4-week program (Harding, 2014). Opioid status was determined as "no," "decreased," or "same" for each patient after oral morphine equivalents were calculated at baseline and monitored throughout the 4-week program (Harding, 2014).

Composite Pain Rating

This rating is a self-reported rating of pain from 1 (no pain) to 10 (worst pain imaginable) adapted from the Glasgow Coma Scale. For the current study the Composite Pain Rating was

used to determine the average perceived pain for the past week prior to administration, but it is also a measure of current perceived pain (Harding, 2014).

PROMIS Bank v1.0-Pain Interference

The PROMIS Bank v1.0 – Pain Interference measures the consequences of pain on everyday life. The extent to which pain "hinders engagement with social, cognitive, emotional, physical, and recreational activities is measured" (PROMIS Scoring Guide, 2011). Some questions regarding life enjoyment and sleep are also included in this measure. For the purpose of the current study, this measure was used to determine the average pain interference for the past week prior to administration (Harding, 2014).

PROMIS Bank v1.0-Depression

The PROMIS Bank v1.0-Depression measures; "self-reported negative moods (sadness, guilt), views of self (self-criticism, worthlessness), and social cognition (loneliness, interpersonal alienation) … decreased positive affect and engagement (loss of interest, meaning, and purpose)." This measure does not include any somatic symptoms, which eliminates compounding effects with comorbid physical conditions. This measures depression over the past seven days (PROMIS Scoring Guide, 2011).

PROMIS Bank v1.0-Anxiety

The PROMIS Bank 1.0-Anxiety measure "self-reported fear (fearfulness, panic), anxious misery (worry, dread), hyperarousal (tension, nervousness, restlessness), and somatic symptoms related to arousal (racing heart, dizziness)" (PROMIS Scoring Guide, 2011). This is a self-report measure including 29 questions with 5 choices ranging from "never" to "always." For the current study, this measure was used to determine the average anxiety level for the past week prior to administration (Harding, 2014).

PROMIS Bank v1.0-Sleep Disturbance

The PROMIS Bank v1.0-Sleep Disturbance measures "self-reported perceptions of sleep quality, sleep depth, and restoration associated with sleep." This does not focus on symptoms of specific sleep disorders, and measures sleep disturbance over the past seven days (PROMIS Scoring Guide, 2011).

PROMIS Bank v1.0-Sleep-Related Impairment

The PROMIS Bank v1.0-Sleep-Related Impairment measures "self-reported perceptions of alertness, sleepiness, and tiredness during usual waking hours, and the perceived functional impairments during wakefulness associated with sleep problems or impaired alertness." This measure does not focus on cognitive, affective, or performance impairment, and measures sleep-related impairment over the past seven days (PROMIS Scoring Guide, 2011).

PROMIS Bank v1.0-Satisfaction with Participation in Discretionary Social Activities

The PROMIS Bank v1.0-Satisfaction with Participation in Discretionary Social Activities measures, "self-reported contentment with leisure interests and relationships with friends" (PROMIS Scoring Guide, 2011). This does not focus on social roles and measure social satisfaction over the past seven days (PROMIS Scoring Guide, 2011).

PROMIS Bank v2.0-Satisfaction with Social Roles and Activities

The PROMIS Bank 2.0-Satisfaction with Social Roles and Activities measures, "satisfaction with performing one's usual social roles and activities" for ages 18 and up, (PROMIS Scoring Guide, 2011).

PROMIS Bank v1.0-Global Health

The PROMIS Bank v1.0-Global Health measures the sum of Global Mental Health and Global Physical Health components, (PROMIS Scoring Guide, 2011).

Oral Morphine Equivalents

A medication list was obtained during each patient's first visit, and a chart review was conducted to determine each patient's opioid dose level upon entrance to the program. An anesthesiologist in EMCPM converted each dose to an oral morphine equivalent (OME) for comparison. As stated above, the EMCPM does not prescribe or manage opioid pain medications. Patients who entered the program were monitored as opioid medications were tapered and decreases in OME were documented. Patients who chose not to taper off of opioids were also noted as having the same opioid dose throughout the program.

Procedure

Pre- and post-intervention assessments are included in the current study. Patients considering or receiving care from the EMCPM for treatment of chronic pain were recruited. Patients were recruited and provided with HIPPA and UT Southwestern IRB forms. Study personnel explained the process of test administration and remained available to participants to answer questions and provide support. This process took place prior to meeting with EMCPM healthcare providers.

Many questions regarding pain experience were answered by participants by completing online measures. These questions regarding pain experience included but were not limited to; pain perception, healthcare utilization, pain medication use, and historical information. "Assessment Center," an online web-based tool was used by study personnel to access PROMIS measures in an online survey format. The current study included ratings of pain, depression, anxiety, sleep, social activity, and global health. This data was collected though "Assessment Center" throughout the 4-week program at baseline, midpoint, and discharge.

Statistical Analysis Plan

A one-way within-subjects ANOVA was run to compare the initial difference among four groups on outcome measures. These four groups consisted of; no opioid use, maintained low dose opioid use, maintained moderate to high dose opioid use, and decreased opioid use. The outcome measures included; pain (composite pain rating and pain interference), depression, anxiety, sleep (sleep disturbance and sleep-related impairment), social activity (satisfaction with participation in discretionary social activities and satisfaction with social roles and activities), and global health. If significant, polynomial contrasts were used to determine linear effects. A repeated-measures ANCOVA was then run to compare the differences among the four groups on outcome measure, with covariates to control for pre-morbid dysfunction. If significant, polynomial contrasts were used to determine linear effects. Also, three Pearson correlations were run to determine significant correlations between pre-, post- and percent change in morphine equivalents, and percent change in outcome measures.

CHAPTER FOUR

Results

Composite Pain Rating

Opioid vs No Opioid

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the composite pain rating T scores. The results indicated a significant time effect, Wilk's $\lambda = .81$, $F(1, 113) = 27.01$, $p < .01$, multivariate $\eta^2 = .19$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 60) = 27.01$, $p < .01$, partial $\eta^2 = .19$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the composite pain rating T scores, and the covariate being pre-program composite pain ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\lambda = .78$, $F(1, 112) = 32.39$, $p < .01$, multivariate $\eta^2 = .22$.

Opioid Decrease

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the composite pain rating T scores. The results indicated a significant time effect, Wilk's $\lambda = .81$, $F(1, 51) = 11.71$, $p < .01$, multivariate $\eta^2 = .19$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 31) = 11.71$, $p < .01$, partial $\eta^2 = .19$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the composite pain rating T scores, and the covariate being pre-program composite pain ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\lambda = .78$ $F(1, 50) = 14.31$, $p < .01$, multivariate $\eta^2 = .22$. Follow-up polynomial contrasts did not indicate a significant linear effect.

Opioid Maintenance

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the composite pain rating T scores. The results indicated a significant time effect, Wilk's $\Lambda = .85$, $F(1, 104) = 18.42$, $p < .01$, multivariate $\eta^2 = .15$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 42) = 18.42$, $p < .01$, partial $\eta^2 = .15$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the composite pain rating T scores, and the covariate being pre-program composite pain ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .82$, $F(1, 103) = 22.22$, $p < .01$, multivariate $\eta^2 = .18$. Follow-up polynomial contrasts did not indicate a significant linear effect.

PROMIS Bank v1.0 Pain Interference

Opioid vs No Opioid

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-pain interference T scores. The results indicated a significant time effect, Wilk's $\Lambda = .76$, $F(1, 113) = 36.07$, $p < .01$, multivariate $\eta^2 = .24$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 677) = 36.07$, $p < .01$, partial $\eta^2 = .24$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-pain interference T scores, and the covariate being pre-program pain interference ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .73$, $F(1, 112) = 40.58$, $p < .01$, multivariate $\eta^2 = .27$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 153) = 9.03$, $p < .01$, partial $\eta^2 = .08$.

Opioid Decrease

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-pain interference T scores. The results indicated a significant time effect, Wilk's $\Lambda = .82$, $F(1, 51) = 11.18$, $p < .01$, multivariate $\eta^2 = .18$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 251) = 11.18$, $p < .01$, partial $\eta^2 = .18$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-pain interference T scores, and the covariate being pre-program pain interference ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .81$, $F(1, 50) = 12.10$, $p < .01$, multivariate $\eta^2 = .20$. Follow-up polynomial contrasts did not indicate a significant linear effect.

Opioid Maintenance

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-pain interference T scores. The results indicated a significant time effect, Wilk's $\Lambda = .82$, $F(1, 104) = 22.94$, $p < .01$, multivariate $\eta^2 = .18$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 438) = 22.94$, $p < .01$, partial $\eta^2 = .18$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-pain interference T scores, and the covariate being pre-program pain interference ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .80$, $F(1, 103) = 25.38$, $p < .01$, multivariate $\eta^2 = .20$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 130) = 7.48$, $p < .01$, partial $\eta^2 = .07$.

PROMIS Bank v1.0-Depression

Opioid vs No Opioid

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-depression T scores. The results indicated a significant time effect, Wilk's $\Lambda = .89$, $F(1, 114) = 13.93$, $p < .01$, multivariate $\eta^2 = .11$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 354) = 13.93$, $p < .01$, partial $\eta^2 = .11$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-depression T scores, and the covariate being pre-program depression ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .87$, $F(1, 113) = 16.43$, $p < .01$, multivariate $\eta^2 = .13$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 290) = 13.15$, $p < .01$, partial $\eta^2 = .12$.

Opioid Decrease

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-depression T scores. The results did not indicate a significant time effect. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-depression T scores, and the covariate being pre-program depression ratings. The results for the ANOVA did not indicate a significant time effect.

Opioid Maintenance

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-depression T scores. The results did not indicate a significant time effect. A one-way within-subjects ANOVA was then

conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-depression T scores, and the covariate being pre-program depression ratings. The results for the ANOVA did not indicate a significant time effect.

PROMIS Bank v1.0-Anxiety

Opioid vs No Opioid

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-anxiety T scores. The results did not show a significant difference in anxiety levels throughout the program for individuals using opioids vs those not using any opioids. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-anxiety T scores, and the covariate being pre-program anxiety rating. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .78$, $F(1, 113) = 31.18$, $p<.01$, multivariate $\eta^2 = .216$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 113) = 31.18$, $p < .01$, partial η 2 = .22.

Opioid Decrease

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-anxiety T scores. The results did not indicat a significant time effect. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-anxiety T scores, and the covariate being pre-program anxiety ratings. The results for the ANOVA did not indicate a significant time effect.

Opioid Maintenance

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-anxiety T scores. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .91$, $F(1, 105) = 11.00$, $p<.01$, multivariate $\eta^2 = .10$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 323) = 11.00$, $p < .01$, partial η 2 = .10. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-anxiety T scores, and the covariate being pre-program anxiety rating. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .91$, $F(1, 104) = 10.95$, $p<.01$, multivariate $\eta^2 = .10$. Follow-up polynomial contrasts did not indicate a significant linear effect.

PROMIS Bank v1.0-Sleep Disturbance

Opioid vs No Opioid

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-sleep disturbance T scores. The results did not indicate a significant time effect. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-sleep disturbance T scores, and the covariate being pre-program sleep disturbance ratings. The results for the ANOVA did not indicate any significant findings.

Opioid Decrease

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-sleep disturbance T scores. The results did not indicate a significant time effect. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS

bank v1.0-sleep disturbance T scores, and the covariate being pre-program sleep disturbance ratings. The results for the ANOVA did not indicate any significant findings.

Opioid Maintenance

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-sleep disturbance T scores. The results did not indicate a significant time effect. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-sleep disturbance T scores, and the covariate being pre-program sleep disturbance ratings. The results did not indicate a significant time effect.

PROMIS Bank v1.0-Sleep Related Impairment

Opioid vs No Opioid

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-sleep related impairment T scores. The results did not indicate a significant time effect. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-sleep related impairment T scores, and the covariate being pre-program sleep related impairment ratings. The results for the ANOVA did not indicate a significant time effect.

Opioid Decrease

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-sleep related impairment T scores. The results did not indicate a significant time effect. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the

PROMIS bank v1.0-sleep related impairment T scores, and the covariate being pre-program sleep related impairment ratings. The results for the ANOVA did not indicate a significant time effect.

Opioid Maintenance

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-sleep related impairment T scores. The results did not indicate a significant time effect. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-sleep related impairment T scores, and the covariate being pre-program sleep related impairment ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\lambda = .91$, $F(1, 103) = 10.42$, $p < .01$, multivariate $\eta^2 = .09$. Follow-up polynomial contrasts did not indicate a significant linear effect.

PROMIS Bank v1.0-Satisfaction with Participation in Discretionary Social Activities

Opioid vs No Opioid

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-satisfaction with participation in discretionary social activities T scores. The results indicated a significant time effect, Wilk's $\lambda = .79$, $F(1, 113) = 30.71$, $p < .01$, multivariate $\eta^2 = .21$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 843) = 30.71$, $p < .01$, partial $\eta^2 = .21$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0- satisfaction with participation in discretionary social activities T scores, and the covariate being pre-program social satisfaction ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\lambda = .75$, $F(1, 112)$

= 36.97, $p < .01$, multivariate $\eta^2 = .25$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 828) = 36.26$, $p < .01$, partial $\eta^2 = .25$.

Opioid Decrease

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-satisfaction with participation in discretionary social activities T scores. The results did not indicate a significant time effect. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0- satisfaction with participation in discretionary social activities T scores, and the covariate being pre-program social satisfaction ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .86$, $F(1, 50) = 8.31$, $p < .01$, multivariate $\eta^2 = .14$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 450) = 20.60$, $p < .01$, partial $\eta^2 = .30$.

Opioid Maintenance

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-satisfaction with participation in discretionary social activities T scores. The results indicated a significant time effect, Wilk's $\Lambda = .85$, $F(1, 104) = 18.13$, $p < .01$, multivariate $\eta^2 = .15$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 484) = 18.13$, $p < .01$, partial $\eta^2 = .15$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0- satisfaction with participation in discretionary social activities T scores, and the covariate being pre-program social satisfaction ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .83$, $F(1, 103)$

= 21.68, $p < .01$, multivariate $\eta^2 = .17$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 608) = 24.50$, $p < .01$, partial $\eta^2 = .21$.

PROMIS Bank v2.0-Satisfaction with Social Roles and Activities

Opioid vs No Opioid

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v2.0-satisfaction with roles and activities T scores. The results indicated a significant time effect, Wilk's $\Lambda = .80$, $F(1, 113) = 29.01$, $p < .01$, multivariate $\eta^2 = .20$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 664) = 29.01$, $p < .01$, partial $\eta^2 = .20$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v2.0-satisfaction with roles and activities T scores, and the covariate being pre-program satisfaction with social roles and activities ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .78$, $F(1, 112) = 31.23$, $p < .01$, multivariate $\eta^2 = .22$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 381) = 17.94$, $p < .01$, partial $\eta^2 = .14$.

Opioid Decrease

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v2.0-satisfaction with roles and activities T scores. The results did not indicate a significant time effect. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v2.0-satisfaction with roles and activities T scores, and the covariate being pre-program satisfaction with social roles and activities ratings. The results for the ANOVA did not indicate a significant time effect.

Opioid Maintenance

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v2.0-satisfaction with roles and activities T scores. The results indicated a significant time effect, Wilk's $\Lambda = .85$, $F(1, 104) = 18.65$, $p < .01$, multivariate $\eta^2 = .15$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 406) = 18.65$, $p < .01$, partial $\eta^2 = .15$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v2.0-satisfaction with roles and activities T scores, and the covariate being pre-program satisfaction with social roles and activities ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .84$, $F(1, 103) = 19.72$, $p < .01$, multivariate $\eta^2 = .16$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 278) = 13.53$, $p < .01$, partial $\eta^2 = .16$.

PROMIS Bank v1.0-Global Health

Opioid vs No Opioid

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-global health T scores. The results indicated a significant time effect, Wilk's $\Lambda = .84$, $F(1, 77) = 14.77$, $p < .01$, multivariate $\eta^2 = .16$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 304) = 14.77$, $p < .01$, partial $\eta^2 = .16$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-global health T scores, and the covariate being pre-program global health ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\Lambda = .80$, $F(1, 76) = 19.00$, $p <$

.01, multivariate $\eta^2 = .20$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 464) = 27.83$, $p < .01$, partial $\eta^2 = .27$.

Opioid Decrease

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-global health T scores. The results did not indicate a significant time effect. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-global health T scores, and the covariate being pre-program global health ratings. The results for the ANOVA did not indicate a significant time effect.

Opioid Maintenance

A one-way within-subjects ANOVA was conducted with the factor being opioid use over time and the dependent variable being the PROMIS bank v1.0-global health T scores. The results indicated a significant time effect, Wilk's $\lambda = .91$, $F(1, 73) = 7.23$, $p < .01$, multivariate $\eta^2 = .09$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 142) = 7.23$, $p < .01$, partial $\eta^2 = .09$. A one-way within-subjects ANOVA was then conducted with the factor being opioid use over time, the dependent variable being the PROMIS bank v1.0-global health T scores, and the covariate being pre-program global health ratings. The results for the ANOVA indicated a significant time effect, Wilk's $\lambda = .90$, $F(1, 72) = 7.96$, $p < .01$, multivariate $\eta^2 = .10$. Follow-up polynomial contrasts indicated a significant linear effect with means decreasing over time, $F(1, 408) = 27.00$, $p < .01$, partial $\eta^2 = .27$.

Pre-Program Morphine Equivalent

Item analyses were conducted on the nine outcome measures with pre-program opioid dosage (morphine equivalent). Initially, only one item was correlated with the pre-program

morphine equivalent; sleep-related impairment (r=.22). This indicates that the greater the initial dosage of opioid morphine equivalent, the greater the report of sleep-related impairment, however; this was a weak correlation (r<.30) and could be due to error. Table 2 shows descriptive statistics of pre-program morphine equivalent doses in mg.

Post-Program Morphine Equivalent

Item analyses were conducted on percent change of the nine outcome measures with post-program opioid dosage (morphine equivalent). Initially, two items were correlated with the post-program morphine equivalent; sleep-related impairment (.29) and pain interference (-.28). This indicates that as post-program opioid dosage rises, report of sleep-related impairment rises and the report of pain interference decreases. Again, these correlations were weak and could be due to error or other unseen factors. Table 3 shows descriptive statistics of post-program morphine equivalent doses in mg.

Percent Change in Morphine Equivalent

Item analyses were conducted on percent change of the nine outcome measures with percent change in opioid dose (morphine equivalent). No items were significantly correlated with the percent change in morphine equivalent.

CHAPTER FIVE

Discussion

Opioid vs No Opioid

Individuals who entered the interdisciplinary pain program with no opioid use showed significantly more improvement than those with initial opioid use over the course of the program on several outcome measures; pain (composite pain rating and pain interference), depression, anxiety, social satisfaction (satisfaction with participation in discretionary social activities and satisfaction with social roles and activities), and global health. Anxiety levels showed significantly more improvement over the course of the pain program only when a control for pre-morbid anxiety was added. Individuals who entered the interdisciplinary pain program with no opioid use did not show significantly more improvement in sleep (sleep disturbance and sleep-related impairment). When pre-morbid sleep disturbance and sleep-related impairment was controlled for, still no difference in improvement was found. Table 4 shows descriptive analysis of the opioid vs no opioid ANOVAs. Table 5 shows descriptive anylysis of the opioid vs no opioid ANCOVAs.

Opioid Decrease

Individuals who entered the interdisciplinary pain program using opioid medication and decreased the dosage of opioid medication over the course of the program reported significantly more improvement in pain (both composite pain rating and pain interference) and social satisfaction (satisfaction with participation in discretionary social activities only when controlled for pre-morbid social satisfaction with participation in discretionary social activities) when compared with participants who maintained initial opioid dosage. No significant difference in improvement was found between participants who decreased opioid dosage when compared with

participants who maintained initial dosage on the following outcome measures; depression, anxiety, sleep, satisfaction with social roles and activities, and global health. Table 6 shows descriptive statistics of opioid decrease ANOVAs. Table 7 shows descriptive statistics of opioid decrease ANCOVAs.

Opioid Maintenance

Individuals who maintained a low opioid dosage over the course of the interdisciplinary pain program reported significantly more improvement on several outcome measures than participants who maintained a moderate to high opioid dosage or increased opioid dosage. This difference was apparent on the following outcome measures; pain (composite pain rating and pain interference), anxiety, sleep (sleep-related impairment only), social satisfaction (satisfaction with participation in discretionary social activities and satisfaction with social roles and activities), and global health. Participants who maintained a low opioid dosage throughout the program did not show significantly more improvement than participants who maintained a moderate-high or increased opioid dose on the following measures; depression and sleep (sleep disturbance only). Table 8 shows descriptive statistics of the opioid maintenance ANOVAs. Table 9 shows descriptive statistics of the opioid maintenance ANCOVAs.

Morphine Equivalent

Higher pre-program and post-program morphine equivalents were correlated with reports of higher sleep dysfunction and pain. Specifically, pre-program morphine equivalents were correlated only to sleep-related impairment. Post-program morphine equivalents were positively correlated with sleep-related impairment and negatively correlated to pain interference. These correlations, however, were weak and could due to a number of things, including error. Tables

10-12 show Pearson correlations run between Pre-, Post-, and percent change in morphine equivalents and outcome measures.

General Findings

Individuals who participated in an interdisciplinary pain program showed improvements on several outcome measures, including but not exclusively; pain (pain composite rating and pain interference), depression, anxiety, sleep (sleep disturbance and sleep-related impairments), social satisfaction (satisfaction with participation in discretionary social activities and satisfaction with social roles and activities), and global health. More improvement is reported on several measures when participants enter the pain program without opioid medication and do not begin taking opioid medication. More improvements are reported when participants decrease the initial opioid dosage or maintain a low dose, rather than maintain a moderate-high dosage, or increase opioid dose. Finally, participants who maintain moderate-high opioid doses, or who increase opioid dose throughout the four-week pain program report more difficulty with sleep-related impairment.

Overall, individuals with chronic pain who participated in a four-week interdisciplinary pain program maximized their results by maintaining no or low opioid dosage, or by decreasing moderate-high opioid doses throughout the program, as expected.

Limitations

N for this study was 112 for outcome measures, however; not all participants gave data for both the midpoint of the program and discharge from the program, which may skew time effects. Also, not all participants' opioid dosage/use was known, which required exclusion from this specific study.

Considerations for Future Research

Future studies on this topic with a higher N and more accurate time data are indicated. Also, more information about the positive correlation between pre- and post-program morphine equivalents and sleep-related impairment, as well as the negative correlation between post-program morphine equivalents and pain interference is needed. Implications regarding long-term (4-6 weeks) low dose opioid use should also be studied more thoroughly to determine potential positive and negative effects for individuals, as well as when this is indicated per individual characteristics.

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Table 1

Ethnicity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not provided	31	24.0	24.0	24.0
	Not Hispanic/Latino	87	67.4	67.4	91.5
	Hispanic/Latino	11	8.5	8.5	100.0
	Total	129	100.0	100.0	

Table 2

Pre-Program Mophine Equivalent in mg

		Frequency	Percent	Valid Percent	Cumulative Percent
	.00	44	34.1	49.4	49.4
	7.50	1	.8	1.1	50.6
	10.00	1	.8	1.1	51.7
	13.50	1	.8	1.1	52.8
	15.00	1	.8	1.1	53.9
	18.00	1	.8	1.1	55.1
	20.00	10	7.8	11.2	66.3
	30.00	3	2.3	3.4	69.7
	32.00	1	.8	1.1	70.8
	33.75	1	.8	1.1	71.9
Valid	37.30	1	.8	1.1	73.0
	40.00	10	7.8	11.2	84.3
	45.00	2	1.6	2.2	86.5
	48.30	1	.8	1.1	87.6
	49.00	1	.8	1.1	88.8
	60.00	5	3.9	5.6	94.4
	96.00	1	.8	1.1	95.5
	100.00	1	.8	1.1	96.6
	240.00	2	1.6	2.2	98.9
	300.00	1	.8	1.1	100.0
	Total	89	69.0	100.0	
Missing	System	40	31.0		
Total		129	100.0		

Table 3

Post-Program Morphine Equivalent in mg

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	65	50.4	73.9	73.9
	3.00	1	.8	1.1	75.0
	4.15	2	1.6	2.3	77.3
	7.50	1	.8	1.1	78.4
	8.30	1	.8	1.1	79.5
	10.00	1	.8	1.1	80.7
	20.00	5	3.9	5.7	86.4
	30.00	1	.8	1.1	87.5
	40.00	4	3.1	4.5	92.0
	45.00	2	1.6	2.3	94.3
	49.00	1	.8	1.1	95.5
	60.00	3	2.3	3.4	98.9
	300.00	1	.8	1.1	100.0
	Total	88	68.2	100.0	
Missing	System	41	31.8		
Total		129	100.0		

Table 4

Opioid vs No Opioid ANOVA

	Opioid Usse	Mean	Std. Deviation	N
Pre-Anxiety	No Opioid	57.474	8.1154	39
	Opioid	56.738	8.0306	77
	Total	56.985	8.0314	116
Post-Anxiety	No Opioid	54.715	7.3464	39
	Opioid	55.795	7.5345	77
	Total	55.432	7.4574	116
Pre-Depression	No Opioid	54.751	8.6166	39
	Opioid	55.283	8.2333	77
	Total	55.104	8.3304	116
Post-Depression	No Opioid	51.092	8.6724	39
	Opioid	53.710	8.7368	77
	Total	52.830	8.7659	116
Post-Global Health	No Opioid	31.87	6.516	30
	Opioid	29.55	7.495	49
	Total	30.43	7.186	79
Pre-Global Health	No Opioid	28.50	6.022	30
	Opioid	27.20	7.692	49
	Total	27.70	7.092	79
Pre-Pain	No Opioid	5.21	2.166	39
	Opioid	5.21	2.473	76
	Total	5.21	2.364	115
Post-Pain	No Opioid	4.23	2.454	39
	Opioid	4.03	2.422	76
	Total	4.10	2.424	115
Pre-Pain Interference	No Opioid	64.333	6.7366	39
	Opioid	64.758	6.5190	76
	Total	64.614	6.5671	115
Post-Pain Interference	No Opioid	60.121	6.4847	39
	Opioid	61.721	7.7840	76
	Total	61.178	7.3796	115

	Opioid Use	Mean	Std. Deviation	N
Pre-Sleep Disturbance	No Opioid	58.882	7.6457	39
	Opioid	56.749	8.1141	75
	Total	57.479	7.9879	114
Post-Sleep Disturbance	No Opioid	56.469	9.1611	39
	Opioid	55.308	9.3165	75
	Total	55.705	9.2396	114
Pre-Social Satisfaction	No Opioid	39.608	6.3526	39
	Opioid	39.584	8.4643	76
	Total	39.592	7.7837	115
Post-Social Satisfaction	No Opioid	45.021	7.1979	39
	Opioid	42.261	8.6792	76
	Total	43.197	8.2795	115
Pre-Social Role Satisfaction	No Opioid	37.277	7.1217	39
	Opioid	37.303	8.0630	76
	Total	37.294	7.7251	115
Post-Social Role Satisfaction	No Opioid	41.646	7.9988	39
	Opioid	40.113	9.0878	76
	Total	40.633	8.7288	115
Pre-Sleep Related Impairment	No Opioid	58.023	7.0456	39
	Opioid	58.217	7.6440	76
	Total	58.151	7.4159	115
Post-Sleep Related Impairment	No Opioid	55.859	7.5181	39
	Opioid	56.888	9.2409	76
	Total	56.539	8.6753	115

Table 5

Opioid vs No Opioid ANCOVA

	Opioid Use	Mean	Std. Deviation	N
Pre-Anxiety	No Opioid	57.474	8.1154	39
	Opioid	56.738	8.0306	77
	Total	56.985	8.0314	116
Post-Anxiety	No Opioid	54.715	7.3464	39
	Opioid	55.795	7.5345	77
	Total	55.432	7.4574	116
Pre-Depression	No Opioid	54.751	8.6166	39
	Opioid	55.283	8.2333	77
	Total	55.104	8.3304	116
Post-Depression	No Opioid	51.092	8.6724	39
	Opioid	53.710	8.7368	77
	Total	52.830	8.7659	116
Pre-Global Health	No Opioid	28.50	6.022	30
	Opioid	27.20	7.692	49
	Total	27.70	7.092	79
Post-Global Health	No Opioid	31.87	6.516	30
	Opioid	29.55	7.495	49
	Total	30.43	7.186	79
Pre-Pain	No Opioid	5.21	2.166	39
	Opioid	5.21	2.473	76
	Total	5.21	2.364	115
Post-Pain	No Opioid	4.23	2.454	39
	Opioid	4.03	2.422	76
	Total	4.10	2.424	115
Pre-Pain Interference	No Opioid	64.333	6.7366	39
	Opioid	64.758	6.5190	76
	Total	64.614	6.5671	115
Post-Pain Interference	No Opioid	60.121	6.4847	39
	Opioid	61.721	7.7840	76
	Total	61.178	7.3796	115
Pre-Sleep Disturbance	No Opioid	58.882	7.6457	39
	Opioid	56.749	8.1141	75

	Opioid Use	Mean	Std. Deviation	N
	Total	57.479	7.9879	114
Post-Sleep	No Opioid	56.469	9.1611	39
Disturbance	Opioid	55.308	9.3165	75
	Total	55.705	9.2396	114
Pre-Social	No Opioid	39.608	6.3526	39
Satisfaction	Opioid	39.584	8.4643	76
	Total	39.592	7.7837	115
Post-Social	No Opioid	45.021	7.1979	39
Satisfaction	Opioid	42.261	8.6792	76
	Total	43.197	8.2795	115
Pre-Social	No Opioid	37.277	7.1217	39
Role	Opioid	37.303	8.0630	76
Satisfaction	Total	37.294	7.7251	115
Post-Social	No Opioid	41.646	7.9988	39
Role	Opioid	40.113	9.0878	76
Satisfaction	Total	40.633	8.7288	115
Pre-Sleep	No Opioid	58.023	7.0456	39
Related	Opioid	58.217	7.6440	76
Impairment	Total	58.151	7.4159	115
Post-Sleep	No Opioid	55.859	7.5181	39
Related	Opioid	56.888	9.2409	76
Impairment	Total	56.539	8.6753	115

Table 6

Opioid Decrease ANOVA

	Opioid Dose Change	Mean	Std. Deviation	N
Pre-Depression	No change	56.827	8.8437	22
	Decreased	54.319	7.4455	32
	Total	55.341	8.0599	54
Post-Depression	No change	55.936	9.8918	22
	Decreased	52.663	6.8257	32
	Total	53.996	8.2859	54
Pre-Anxiety	No change	57.682	7.4844	22
	Decreased	56.659	7.9153	32
	Total	57.076	7.6875	54
Post-Anxiety	No change	56.964	8.1625	22
	Decreased	54.222	7.1068	32
	Total	55.339	7.6019	54
Pre-Global Health	No change	25.94	8.628	17
	Decreased	26.83	6.355	18
	Total	26.40	7.445	35
Post-Global Health	No change	26.41	7.425	17
	Decreased	31.06	6.557	18
	Total	28.80	7.279	35
Pre-Pain	No change	5.36	1.840	22
	Decreased	5.58	2.460	31
	Total	5.49	2.207	53
Post-Pain	No change	4.64	2.237	22
	Decreased	4.10	2.548	31
	Total	4.32	2.416	53
Pre-Pain Interference	No change	65.341	7.6966	22
	Decreased	64.987	4.1594	31
	Total	65.134	5.8254	53
Post-Pain Interference	No change	62.845	8.3666	22
	Decreased	61.239	6.6053	31
	Total	61.906	7.3539	53

		Mean	Std. Deviation	N
Pre-Sleep Disturbance	No change	54.318	8.4968	22
	Decreased	57.873	7.3741	30
	Total	56.369	7.9871	52
Post-Sleep Disturbance	No change	51.645	9.2226	22
	Decreased	57.820	7.8537	30
	Total	55.208	8.9210	52
Pre-Social Satisfaction	No change	38.355	7.8273	22
	Decreased	39.197	7.1587	31
	Total	38.847	7.3813	53
Post-Social Satisfaction	No change	40.459	8.3497	22
	Decreased	42.481	6.8670	31
	Total	41.642	7.5081	53
Pre-Social Role Satisfaction	No change	36.200	7.8533	22
	Decreased	37.335	7.6747	31
	Total	36.864	7.6946	53
Post-Social Role Satisfaction	No change	36.777	9.7107	22
	Decreased	40.816	8.3847	31
	Total	39.140	9.0927	53
Pre-Sleep Related Impairment	No change	56.964	5.2637	22
	Decreased	58.297	7.0891	31
	Total	57.743	6.3736	53
Post-Sleep Related Impairment	No change	53.755	9.2997	22
	Decreased	58.687	7.2566	31
	Total	56.640	8.4455	53

Table 7

Opioid Decrease ANCOVA

	Opioid Dose	Mean	Std. Deviation	N
Pre-Anxiety	No change	57.682	7.4844	22
	Decreased	56.659	7.9153	32
	Total	57.076	7.6875	54
Post-Anxiety	No change	56.964	8.1625	22
	Decreased	54.222	7.1068	32
	Total	55.339	7.6019	54
Pre-Depression	No change	56.827	8.8437	22
	Decreased	54.319	7.4455	32
	Total	55.341	8.0599	54
Post-Depression	No change	55.936	9.8918	22
	Decreased	52.663	6.8257	32
	Total	53.996	8.2859	54
Pre- Global Health	No change	25.94	8.628	17
	Decreased	26.83	6.355	18
	Total	26.40	7.445	35
Post- Global Health	No change	26.41	7.425	17
	Decreased	31.06	6.557	18
	Total	28.80	7.279	35
Pre-Pain	No change	5.36	1.840	22
	Decreased	5.58	2.460	31
	Total	5.49	2.207	53
Post-Pain	No change	4.64	2.237	22
	Decreased	4.10	2.548	31
	Total	4.32	2.416	53
Pre-Pain Interference	No change	65.341	7.6966	22
	Decreased	64.987	4.1594	31
	Total	65.134	5.8254	53
Post-Pain Interference	No change	62.845	8.3666	22
	Decreased	61.239	6.6053	31
	Total	61.906	7.3539	53

	Opioid Dose	Mean	Std. Deviation	N
Pre-Sleep	No change	54.318	8.4968	22
Disturbance_T	Decreased	57.873	7.3741	30
score	Total	56.369	7.9871	52
Post-Sleep	No change	51.645	9.2226	22
Disturbance	Decreased	57.820	7.8537	30
	Total	55.208	8.9210	52
Pre-Social	No change	38.355	7.8273	22
Satisfaction	Decreased	39.197	7.1587	31
	Total	38.847	7.3813	53
Post-Social	No change	40.459	8.3497	22
Satisfaction	Decreased	42.481	6.8670	31
	Total	41.642	7.5081	53
Pre-Social	No change	36.200	7.8533	22
Role	Decreased	37.335	7.6747	31
Satisfaction	Total	36.864	7.6946	53
Post-Social	No change	36.777	9.7107	22
Role	Decreased	40.816	8.3847	31
Satisfaction	Total	39.140	9.0927	53
Pre-Sleep	No change	56.964	5.2637	22
Related	Decreased	58.297	7.0891	31
Impairment	Total	57.743	6.3736	53
Post-Sleep	No change	53.755	9.2997	22
Related	Decreased	58.687	7.2566	31
Impairment	Total	56.640	8.4455	53

Table 8

Opioid Maintenance ANOVA

	Opioid Change	Mean	Std. Deviation	N
Pre-Anxiety	No or Decrease	52.389	8.5672	81
	Same or Increase	52.846	8.5907	26
	Total	52.500	8.5346	107
Post-Anxiety	No or Decrease	55.138	7.2293	81
	Same or Increase	55.827	8.1489	26
	Total	55.306	7.4292	107
Pre-Depression	No or Decrease	55.116	8.1624	81
	Same or Increase	55.519	8.7373	26
	Total	55.214	8.2655	107
Post-Depression	No or Decrease	52.269	8.5754	81
	Same or Increase	54.696	9.7932	26
	Total	52.859	8.9002	107
Pre-Global Health	No or Decrease	28.00	6.628	56
	Same or Increase	26.58	8.878	19
	Total	27.64	7.225	75
Post-Global Health	No or Decrease	31.79	6.806	56
	Same or Increase	27.26	7.759	19
	Total	30.64	7.279	75
Pre-Pain	No or Decrease	5.29	2.345	80
	Same or Increase	5.19	2.350	26
	Total	5.26	2.335	106
Post-Pain	No or Decrease	4.04	2.467	80
	Same or Increase	4.38	2.368	26
	Total	4.12	2.437	106
Pre-Pain Interference	No or Decrease	64.521	6.1134	80
	Same or Increase	64.350	8.0801	26
	Total	64.479	6.6083	106
Post-Pain Interference	No or Decrease	60.867	7.0284	80
	Same or Increase	61.323	8.8955	26
	Total	60.979	7.4864	106

	Opioid Change	Mean	Std. Deviation	N
Pre-Sleep	No or Decrease	58.592	7.3109	79
Disturbance	Same or Increase	53.854	8.4545	26
	Total	57.419	7.8417	105
Post-Sleep	No or Decrease	56.992	8.8055	79
Disturbance	Same or Increase	51.142	9.3062	26
	Total	55.544	9.2417	105
Pre-Social	No or Decrease	39.489	6.9891	80
Satisfaction	Same or Increase	40.019	9.8089	26
	Total	39.619	7.7274	106
Post-Social	No or Decrease	43.656	7.3713	80
Satisfaction	Same or Increase	42.873	10.9034	26
	Total	43.464	8.3248	106
Pre-Social	No or Decrease	37.065	7.7548	80
Role	Same or Increase	36.992	8.4134	26
Satisfaction	Total	37.047	7.8804	106
Post-Social	No or Decrease	41.156	8.2503	80
Role	Same or Increase	39.335	10.7411	26
Satisfaction	Total	40.709	8.9052	106
Pre-Sleep	No or Decrease	58.561	7.1639	80
Related	Same or Increase	55.777	7.0814	26
Impairment	Total	57.878	7.2112	106
Post-Sleep	No or Decrease	57.544	7.7856	80
Related	Same or Increase	52.335	9.9653	26
Impairment	Total	56.266	8.6210	106

Table 9

Opioid Maintenance ANCOVA

	Opioid Dose Change	Mean	Std. Deviation	N
Pre-Anxiety	No or Decrease	52.389	8.5672	81
	Same or Increase	52.846	8.5907	26
	Total	52.500	8.5346	107
Post-Anxiety	No or Decrease	55.138	7.2293	81
	Same or Increase	55.827	8.1489	26
	Total	55.306	7.4292	107
Pre-Depression	No or Decrease	55.116	8.1624	81
	Same or Increase	55.519	8.7373	26
	Total	55.214	8.2655	107
Post-Depression	No or Decrease	52.269	8.5754	81
	Same or Increase	54.696	9.7932	26
	Total	52.859	8.9002	107
Pre-Global Health	No or Decrease	28.00	6.628	56
	Same or Increase	26.58	8.878	19
	Total	27.64	7.225	75
Post-Global Health	No or Decrease	31.79	6.806	56
	Same or Increase	27.26	7.759	19
	Total	30.64	7.279	75
Pre-Pain	No or Decrease	5.29	2.345	80
	Same or Increase	5.19	2.350	26
	Total	5.26	2.335	106
Post-Pain	No or Decrease	4.04	2.467	80
	Same or Increase	4.38	2.368	26
	Total	4.12	2.437	106
Pre-Pain Interference	No or Decrease	64.521	6.1134	80
	Same or Increase	64.350	8.0801	26
	Total	64.479	6.6083	106
Post-Pain Interference	No or Decrease	60.868	7.0284	80
	Same or Increase	61.323	8.8955	26
	Total	60.979	7.4864	106
Pre-Sleep Disturbance	No or Decrease	58.592	7.3109	79
	Same or Increase	53.854	8.4545	26
	Total	57.419	7.8417	105
Post-Sleep Disturbance	No or Decrease	56.992	8.8055	79
	Same or Increase	51.142	9.3062	26

	Opioid Dose Change	Mean	Std. Deviation	N
	Total	55.544	9.2417	105
Pre-Social	No or Decrease	39.489	6.9891	80
Satisfaction	Same or Increase	40.019	9.8089	26
	Total	39.619	7.7274	106
Post-Social	No or Decrease	43.656	7.3713	80
Satisfaction	Same or Increase	42.873	10.9034	26
	Total	43.464	8.3248	106
Pre-Social	No or Decrease	37.065	7.7548	80
Role	Same or Increase	36.992	8.4134	26
Satisfaction	Total	37.047	7.8804	106
Post-Social	No or Decrease	41.156	8.2503	80
Role	Same or Increase	39.335	10.7411	26
Satisfaction	Total	40.709	8.9052	106
Pre-Sleep	No or Decrease	58.561	7.1639	80
Related	Same or Increase	55.777	7.0814	26
Impairment	Total	57.878	7.2112	106
Post-Sleep	No or Decrease	57.544	7.7856	80
Related	Same or Increase	52.335	9.9653	26
Impairment	Total	56.266	8.6210	106

Table 10

Correlations of Pre-Morphine Equivalents

		Pre-Morphine Equivalent
% Change in Pain	Pearson Cor.	-.035
	Sig. (2-tailed)	.742
	N	89
% Change in Anxiety	Pearson Cor.	-.114
	Sig. (2-tailed)	.289
	N	89
% Change in Depression	Pearson Cor.	-.046
	Sig. (2-tailed)	.667
	N	89
% Change in Pain Interference	Pearson Cor.	-.158
	Sig. (2-tailed)	.139
	N	89
% Change in Sleep Disturbance	Pearson Cor.	.084
	Sig. (2-tailed)	.434
	N	89
% Change in Sleep Related Impairment	Pearson Cor.	.222*
	Sig. (2-tailed)	.036
	N	89
% Change in Social Satisfaction	Pearson Cor.	-.046
	Sig. (2-tailed)	.670
	N	89
% Change in Social Role Satisfaction	Pearson Cor.	.147
	Sig. (2-tailed)	.169
	N	89
% Change in Global Health	Pearson Cor.	.154
	Sig. (2-tailed)	.150
	N	89

Table 11

Correlations of Post-Morphine Equivalents

		Post-Morphine Equivalent
% Change in Pain	Pearson Cor.	-.115
	Sig. (2-tailed)	.288
	N	88
% Change in Anxiety	Pearson Cor.	-.140
	Sig. (2-tailed)	.194
	N	88
% Change in Depression	Pearson Cor.	-.150
	Sig. (2-tailed)	.163
	N	88
% Change in Pain Interference	Pearson Cor.	-.283
	Sig. (2-tailed)	.008
	N	88
% Change in Sleep Disturbance	Pearson Cor.	.145
	Sig. (2-tailed)	.177
	N	88
% Change in Sleep Related Impairment	Pearson Cor.	.292
	Sig. (2-tailed)	.006
	N	88
% Change in Social Satisfaction	Pearson Cor.	.079
	Sig. (2-tailed)	.466
	N	88
% Change in Social Role Satisfaction	Pearson Corr.	.109
	Sig. (2-tailed)	.313
	N	88
% Change in Global Health	Pearson Corr.	.153
	Sig. (2-tailed)	.155
	N	88

Table 12

Correlations of Change in Morphine Equivalents

		% Change in Morphine Equivalents
% Change in Pain	Pearson Cor.	.133
	Sig. (2-tailed)	.379
	N	46
% Change in Anxiety	Pearson Cor.	.230
	Sig. (2-tailed)	.123
	N	46
% Change in Depression	Pearson Cor.	.065
	Sig. (2-tailed)	.668
	N	46
% Change in Pain Interference	Pearson Cor.	.257
	Sig. (2-tailed)	.085
	N	46
% Change in Sleep Disturbance	Pearson Cor.	-.172
	Sig. (2-tailed)	.252
	N	46
% Change in Sleep Related Impairment	Pearson Cor.	-.179
	Sig. (2-tailed)	.235
	N	46
% Change in Social Satisfaction	Pearson Cor.	-.212
	Sig. (2-tailed)	.157
	N	46
% Change in Social Role Satisfaction	Pearson Cor.	-.122
	Sig. (2-tailed)	.419
	N	46
% Change in Global Health	Pearson Cor.	-.201

BIOGRAPHICAL SKETCH

Lacy Warrington
lacywarrington@gmail.com

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional*			
Angelo State University	B.A.	2011	Psychology
The University of Texas Southwestern School of Allied Health Sciences	M.R.C.	2015	Clinical Rehabilitation Counseling

Clinical Experience

2015-2015 Intern Vocational Rehabilitation Counselor at PATE Rehabilitation, Anna, TX
Report to Amy Gorham, LPCS; Jennifer Featherston, Ph.D
PATE Rehabilitation is a CARF accredited post acute brain injury rehabilitation facility. The focus of the integrated team is on the patient and their family. The goal is to reduce, to the greatest degree possible, the degree of the impact of injury. PATE does this through specialty-designed brain injury programs; transitional post-acute rehabilitation program, outpatient day program, community-based program, vocational rehabilitation program, neuropsychological evaluations, and long-term residential program..

2014-2015 Intern Counselor at UT Southwestern, Dallas, TX
Report to Karen Brewer-Mixon; Ph.D; Al Vreeland, Ph.D; Amy Gorham, LPCS
Students in the Masters of Clinical Rehabilitation Counseling program participate in outpatient counseling services provided by UT Southwestern Clinic. These services include supervised; outpatient individual counseling, full psychological evaluations and report writing, as well as correspondence with DARS counselors as appropriate.

2014-2015 PM&R Intern at Parkland Memorial Hospital, Dallas, TX
Report to Kimberly Roaten, Ph.D; Steve Krebaum, LPC
Consult Liaison Psychiatry is a campus-wide behavioral medicine service to meet the mental health needs of medically and/or surgically ill patients in a hospital setting. The multidisciplinary nature of the CL service at UT Southwestern encompasses a blending of psychological evaluation and treatment in collaboration with physicians, nursing, physical therapy, occupational therapy, and social work disciplines. The CL service on the PM&R Service is focusing on addressing the emotional needs of patients admitted for inpatient rehabilitation services. A specific emphasis is on assisting with adjustment challenges, providing psychoeducation for survivors of catastrophic injury/illness, and initiating the vocational and psychological rehabilitation process.