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Comparison of a Numeric and a Descriptive Pain Scale in the Occupational Medicine Setting

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ABSTRACT

COMPARISON OF A NUMERIC AND DESCRIPTIVE PAIN SCALE IN THE OCCUPATINAL MEDICINE SETTING

Pain is a universal phenomenon. The assessment of a patient's pain is difficult to objectively obtain because the perception of the pain by the patient is influenced by many subjective perception variables. These variables can inflate or deflate the patient's self-reported pain level which can adversely affect the medical provider's ability to accurately create a treatment plan for the patient. This study compared the patient's response to a self-rating of their pain on a numeric pain scale with the response given by the patient on the Mankoski pain scale. Comparison of the numeric pain scale to the Mankoski pain scale indicated a significant relationship between the two scales, $r(218) = .83$, $p < .05$, validating the Mankoski pain scale with acute pain patients. Although not statistically significant, the Mankoski mean score was lower compared to the numeric scores of 3, 4, 5, and 6 and was statistically significantly lower for the numeric scores of 7, 8, and 9.

George F. McMahon III

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George Francis McMahon III

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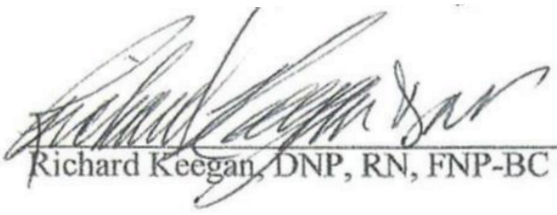

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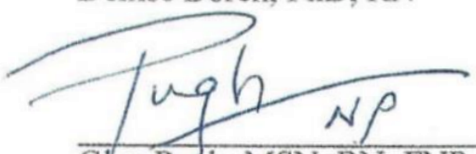

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CHAPTER 1: INTRODUCTION

> Putting pain to paper. When I experience pain, its reality is insistent and self-evident to me. But only to me. To others, my pain can be nothing more than my account of my pain. Not only can my account of my pain never capture fully my experience of it; my account can be neither verified nor disconfirmed by others. We attempt to defy pain's privacy by defining it, measuring it, theorizing about it and analyzing the accounts of the one in pain. But representations of pain – definitions, measurement, body language, theories – are not equivalent to pain itself. Only representations of pain are public objects; pains themselves are not. Pain can only be said to exist insofar as an individual feels it, and that individual's feeling can only be represented to others, never experienced by them. Even if we learn to apply the same words to describe our pains, it does not follow that our pains are the same. Pain is ineffable and elusive; it confounds the grasp of language and objectification. As an experience, pain is utterly private and subjective, and, consequently, it creates a divide between sufferer and observer. (Whelan, 2003, pp. 463-464)

Pain is a universal phenomenon. The assessment of a patient's pain is difficult to objectively obtain because the perception of the pain by the patient is influenced by many subjective variables. The concept of pain is multi-dimensional which encompasses physiological, psychological, cognitive, cultural experiences and social aspects. These dimensions are interrelated and present to some degree during the perception of pain by the patient and the manner in which it is expressed. Identifying the variables and understanding the relationship between them is a complex undertaking but is crucial to determining the appropriate treatment strategies for the patient.

Significance in Occupational Medicine

Work related injuries in the United States are significant in the number of occurrences and monetary liability. In 2017, approximately 2.9 million people sustained a work-related injury and 5190 people died as a result of a work-related injury. The cost in terms of lost work time, medical expenses, lost productivity and disability is estimated at 200 billion dollars annually (BLS, 2018). The majority of these injuries are musculoskeletal in nature and are usually associated with pain, which requires some level of treatment. The injured worker population is unique with multiple variables that may affect their recovery, one of which is the perception of pain (Lai, Szeto, & Chan, 2017).

In the occupational medicine setting, there is no tangible way to determine the severity of pain the patients are experiencing other than to have them subjectively rate their pain on a pain scale. The most common scale used for this determination is a simple numeric scale that is efficient to use, especially in busy clinics or when there is a language barrier. The difficulty with these scales is that they are limited by the patient's perception of their pain.

The confounding influences in perceived pain make it difficult for the healthcare provider to appropriately treat the patient's pain. An inflated pain score can result in the over treatment with opioid medications. Death from an opioid overdose surpassed all other causes of death for the adult population under the age of 50 in 2016. The Center for Disease Control (2017) reported that 64,070 people had died from a drug overdose. The healthcare profession has been scrutinized for its part in the opioid epidemic for over prescribing opioid medications. Treatment guidelines have been developed that recommend the use of opioid medications only in cases where the pain is extreme (Mai, Franklin, & Tauben, 2015). The difficulty healthcare providers have in complying with these guidelines is the

ability to accurately and expeditiously assess the patient's level of pain. A numeric pain scale does not allow the healthcare provider the clarity to accurately assess the pain without the perception bias. The healthcare providers objective is to treat current, point in time pain, not future perceived pain that may be influenced by situational prejudices.

Problem

There is a need for an instrument that will provide a quick and accurate assessment of the patient's level of pain that would decrease the perception variables and bias.

Purpose

The purpose of the project was to compare the responses of injured workers with acute pain on the Mankoski pain scale to the responses on the established numeric pain scale. Because the Mankoski pain scale has not been validated against other validated pain scales for acute pain, a second objective was to determine the validity of the Mankoski scale.

Research Question

The research is focused on answering the question, is there a correlation between the patient's self reporting of their perception of pain between a Numeric Rating Scale and the Mankoski Pain Scale? The null hypothesis is, that there is no correlation between the scores of the numeric pain scale and the Mankoski pain scale. The alternate hypothesis is, that there is a correlation between the scores of the numeric pain scale and the Mankoski pain scale.

Conceptual Framework

The development of nursing theories and models has provided a method of categorizing and conveying key ideas about the essence of nursing practice. There are many different conceptual models of nursing theory that guide nurses in research, education, and practice. These models provide a framework, based on a nursing philosophical perspective, for the symbiotic relationship between the role of the nursing process and an explanation of the responses to human phenomena and the environment. One such model is the Roy adaptation model (RAM) of nursing.

Roy Adaptation Model

The Roy adaptation model was first published in 1970 and was based on Bertalanffy's general systems theory and Helson's adaptation level theory (Roy, 1988). Roy, in 1992, stated "the adaptation model assumes the universal importance of promoting adaptation in states of health and illness" (cited in Fawcett, 1995, p.439). The model is further described as "the responses of the adaptive system to a constantly changing environment" (cited in Fawcett, 1995, p. 445). The adaptive theory is explained in terms of the way the person adapts to environmental stimuli, the needs that are created because of the adaptation and the nursing interventions required because of the nursing assessment, based on the need.

Assumptions. The philosophical assumptions of the RAM are broadly categorized by the principles of veritivity and humanism. Roy (1988) defined veritivity as "a principle of human nature that affirms a common purposefulness of human existence" (p. 30). She further assigns four specific assumptions to this meaning, noting that "the individual is viewed within the context of (a)

purposefulness of human existence, (b) unity of purpose of mankind, (c) activity and creativity for the common good, and (d) value and meaning of life" (p. 32).

Humanism is defined by Roy (1988) as "recognizing the person and subjective dimensions of human experience as central to knowing and to valuing" (p. 29). Four specific assumptions are also assigned to this principle, observing that "the individual (a) shares in creative power, (b) behaves purposefully, not in a sequence of cause and effect, (c) possesses intrinsic holism, and (d) strives to maintain integrity and to realize the need for relationships" (p. 32). Roy summarizes her assumptions by stating that "life has value and meaning" (Roy, 1988, p. 32).

Concepts. The RAM relates to the concepts of person, environment, health and nursing within the theme of adaptation. The person, the recipient of nursing care, is an adaptive system that is in constant flux with the environment. The environment is all stimuli that may affect the person and cause a need to adapt. Health is based on the person's position on the health continuum, ranging from peak wellness to extreme illness or impending death, which is dependent on the level of adaptation. The nurse and nursing care are external forces that assist the person in adapting to the environment when the person is unable to do so independently (Roy, 1976).

Roy further delineates the environment into three levels of stimuli: (a) focal, which is the most prominent stimuli, (b) contextual, which is other stimuli that may present but not to the degree-of the focal stimuli, and (c) residual, which is beliefs, attitudes or experiences (Roy, 1976). The Roy model perceives the nurse as a facilitator in the adaptive process who manipulates the stimuli when the

patient cannot. The goal of nursing then is the promotion of adaptation and a positive coping response to stimuli by the patient.

Adaptive modes. To organize assessment data, patient behaviors were organized into four categories of adaptive modes: physiologic, self-concept, role function, and interdependence. Within these adaptive modes it is the manifestation of the coping mechanisms that can be observed and measured. The physiologic mode is for physiologic integrity and addresses needs in oxygen, nutrition, elimination, activity and rest, and protection.

The self-concept mode, one of three psychosocial modes, reflects a person's self-esteem. Calvillo and Flaskerud (1993) state "it is the composite of beliefs and feelings that one holds about oneself at a given time" (p. 121). It is formed from perceptions particularly of others' reactions and influencing behavior. Self-concept is categorized into physical self and personal self.

The role function mode assumes the need for social integrity, essentially that people need to know who they are in relation to others and what are the expected behaviors. Roy divides the mode into three categories: primary, which is determined by age, gender, and developmental stage; secondary, which are roles that people assume, i.e. wife or nurse; and tertiary, which are usually temporary, freely chosen, and associated with the secondary roles, i.e., hobbies.

The interdependence mode is based on the need for affectional adequacy. It is the close relationships of people that involve the willingness and ability to love, respect, and value others, and to accept and respond to love, respect, and value given by others (Calvillo & Flaskerud, 1993). The interdependence mode is divided by two distinct behaviors: receptive and contributive.

Relationship between concepts. The relational statements in the Roy model are very clearly linked to the metaparadigm concepts. Concisely stated, the relationships are as follows: (a) the person and the environment are linked as the person is an adaptive system that demands adaptive responses to a constantly changing environment, (b) health can be added to the linkage because the person's adaptive response to the changing environment will result in the person's state of health, (c) the goal of nursing is to assist and promote positive adaptation and therefore can be linked to the person and health, and (d) all four concepts are linked because as the environment produces stimuli that affects the person, the person will need to adapt to maintain a high level of wellness. Failure to adapt adequately will provide an opportunity for nursing intervention (Roy, 1976). The goal of nursing by Roy is promoting adaptive behaviors to enhance health.

Roy adaptation model research. The Roy adaptation model was first published 52 years ago and was presented, as above, from the perspective of the individual person and adaptation. It has been expanded sequentially from the person to groups, to communities, and to global society as adaptive systems (Roy, 2011b). The model has been researched extensively. A review of the literature during the period of 1976 - 2015 produced close to 450 studies from 17 countries across 5 continents that utilized the model as the theoretical framework for the research (Roy, 2016). Numerous other articles have been written incorporating the RAM as the framework for nursing practice.

In the early 1990's Roy formed a group called the Boston Based Adaptation Research in Nursing Society which later became the Roy Adaptation Association. The purpose of the group was to review and critically analyze RAM based research to determine the quality of the research. Three hundred and fifty studies

were reviewed that established further support of future theory development and research (Clarke, Barone, Hanna, & Senesac, 2011; Roy, 2011a).

Additionally, a study was done on research instruments that were used to specifically measure the concepts of the RAM. Within the 231 studies that were reviewed, 123 instruments were identified. The inclusion criteria for the study judged the instruments based on its usefulness in measuring RAM concepts. This reduced the number of studies to be analyzed to 21. Of the 21 instruments, 14 were considered to have high usefulness, 3 had moderate usefulness, 1 had limited usefulness and 2 were not recommended for use with the RAM (Barone, Roy, & Frederickson, 2008).

Roy adaptation model and pain. Roy (1976) defines pain as a "noxious stimuli" and requires the nurse to assess the person's entire response to the stimuli based on the physical, mental, and emotional meaning of the stimuli (p. 134). Roy would direct nursing interventions to be based upon the first and second level assessments. The first level assessment would entail identification that pain existed by either subjective or objective methods. The second level assessment would entail assessing and then classifying the pain based on the influencing factors which may be focal, contextual or residual. The focal factor is the injury and the pain associated with the injury. The contextual factors that influence the pain may be related to anxiety, the patient's perception of what the pain should be, the pain site, or social interaction patterns. The residual factors that may influence the pain may be age, cultural orientation, or the gender of the patient (see Table 1).

Injured Worker and the Perception of Pain

The injured worker, covered under a worker’s compensation benefit, imposes special consideration for a healthcare provider assessing the worker’s

Table 1

Examples of Stimuli that May Contribute to the Pain Experience.

Contextual	Residual
1. Anxiety	1. Genetic endowment
2. Environment	2. Age
3. Social interaction patterns	3. Ethnicity
4. Perception of pain	4. Gender
5. Knowledge regarding pain	5. Coping mechanisms
6. The pain site	6. Past pain experiences
7. General body condition	7. Religious beliefs
8. Presence of trusted person	

Roy, 1976 p.146

pain level associated with an injury. The first level assessment is the establishment that there is an injury and that there is pain associated with the injury. This is usually a straight forward decision. It is in the secondary assessment wherein multiple variables, within the focal, contextual and residual stimuli, will influence the patients' perception of their pain and their reported pain level.

The focal stimulus is the pain the patient is experiencing from the injury, which the healthcare provider is obligated to treat. It is the pain to a specific body part. The level at which the pain is reported is influenced by the contextual and residual stimuli. It is here that the healthcare provider must discern the influences of these stimuli to validate the pain rating.

The contextual stimulus contains additional influences that are specific to the injured worker's situation. Anxieties maybe associated with having to return

to a task at work that caused the injury initially and the fear that there will be an exacerbation of the injury. For example, a repetitive use musculoskeletal injury may not be painful if the affected area is in a neutral position, but the pain may quickly increase if the repetitive motion is reinstated. This anticipated pain may be what is reported instead of the actual pain at that moment in time.

Social interactions at the worksite may also influence the pain perception. If the worker does not get along with coworkers or does not like their job or employer, this may influence their desire to return to work which may influence their perceived level of pain. Support from the employer, healthcare provider and insurance companies may positively or negatively affect the pain perception. Financial gain is another factor as an injured worker may be entitled to a compensatory monetary settlement as a result of their injury. The more dramatic or debilitating the medical consequences of the injury, the greater the possibility of a settlement. As with the case of repetitive use injuries and some low back injuries, there may not be any objective findings and the settlement may be based on pain and suffering alone (Lai, Szeto, & Chan, 2017).

Residual stimulus can influence the reported level of pain by both under reporting and over reporting the level of pain. Studies have demonstrated that pain perception is different between genders (Aufiero, Stankewicz, Quaiz, Jacoby & Stoltzfus, 2017), ethnicity and generation (Chan, Hamamura, & Janschewitz, 2013), age and income (Wood, Morrison, & Macdonald, 1993). Previous injuries or experiences with pain may influence the perception as well (Roy, 2008).

Summary

In this chapter, the purpose of the study is introduced by addressing the issues associated with the perception of pain, the special issues associated with

treating injured workers and the conceptual framework for the study. Chapters II through V are presented in the following manner: Chapter II reviews the literature relevant to the use of opioids in occupational medicine, the perception of pain and the use of the Mankoski pain scale. Chapter III describes the methodology for this study including an account of the research design, population and sample, data collection and data analysis used in this study. Chapter IV provides a narrative of the findings. Chapter V summarizes the study, clinical implications and recommendations for future research are provided.

CHAPTER 2: LITERATURE REVIEW

Much has been written about the perception of pain and the use of pain scales, a few of those studies will be reviewed in this chapter. There have only been two studies that have used the Mankoski pain scale. There has been one study that specifically examined the use of opioids in the occupational setting.

Perception of Pain

Aufiero, Stankewicz, Quazi, Jacoby, and Stoltzfus (2017), conducted a quasi-experimental, prospective clinical trial with a convenience sample selected from two different emergency departments and one medical clinic, to determine if there was a difference in the perception of pain between genders and between ethnicity. The sample consisted of 50 Caucasians (M = 22, F= 28, average age 48) and 50 Latinos (M=19, F=31, average age 39). A standard painful stimulus of a blood pressure cuff inflated to 20 mmHg above the participants resting systolic pressure was applied and left in place for 3 minutes. At 2 min 50 sec, they were asked to rate their level of discomfort on a 10 cm Visual Analog Scale (VAS) and a 5-point Likert pain scale. The cuff was then deflated and then at 1 min and 2 minutes post deflation they were again asked to rate their discomfort on the scales. The researchers performed a non-parametric Mann-Whitney (M-W) rank sums test on all data. Results were expressed as mean ranks, z-scores and significance values. The VAS was reanalyzed with the independent samples t-test for statistical comparisons of the means between gender and ethnic groups (males and females, Latinos and Caucasians), as these groups' scores demonstrated normally distributed data. The results showed that between the Caucasians and Latinos, the 5-point Likert scale was statistically significant, 4.35 vs 5.75 ($p<0.01$), but on the VAS, although it trended in the same direction, it was not statistically significant

4.69 vs 5.41 ($p<0.255$). The cohort of females had a much higher perception of pain than the males with the VAS showing 5.88 vs 3.85 ($p<0.01$) and the Likert showing 5.63 vs 4.21($p<0.01$), both statistically significant. A study strength was the statistical comparisons between the groups which showed that the t-tests were analogous to the M-W test proving that the significant and nonsignificant outcomes for each group were the same. A limitation to the study was the convenience sampling which did not account for age, medical history or use of pain medications.

Another quasi-experimental, prospective clinical study was done by Chan, Hamamura, and Janschewitz (2013) which was also to determine if there was a difference in the perception of pain between ethnicity and immigrant generations. This study had a different focus in that it sought to determine if there was a difference between generations of the same ethnicity. The study had 57 participants, all healthy college students from the same university with an average age of 20.5 years. The study had three groups, those of European ethnicity, of which there were 24 total, 15 females and 9 males. The second group was of Asian ethnicity, of which there were 33 total, 21 females and 12 males. Of this second group, 21 were second generation immigrants that were born in the United States, while 12 of them were first generation immigrants having been born outside the United States and had been living here for an average of 8.4 years. The painful stimulus experiment was to have the participants first placed their non-dominant hand, up to their wrist, in a tub of with room temperature water for 2 minutes. When the time period ended they were instructed to place the same hand in a tub with cold water that was maintained at 0.5’ C- 1.0’C water. A time sequencing was used for measurement. Pain threshold was measured by the participants indicating when they first experienced pain after the cold water

emersion. Pain tolerance was measured when they removed their hand from the water. The participants then subjectively rated their pain intensity and pain unpleasantness on two different visual analog scales (VAS) of 15 centimeters. The researchers used a mean score to analyze the differences in time and the VAS. There was no significant difference between the European ethnic group and the 2nd generation Asian group in pain threshold, 10.62 vs 8.48 seconds, p = .19, pain tolerance, 69.40 vs 75.35 seconds, p = .83, pain intensity, 9.94 vs 10.62 cm, p = .34, or pain unpleasantness, 10.39 vs 10.22 cm, p = 2.37. There was a difference between the 1st generation and 2nd generation Asians with the 2nd generation demonstrating a higher pain threshold, 10.62 vs 6.69 seconds, p = .08, a higher pain tolerance, 75.35 vs 26.10 seconds, p = .02, a lower pain intensity rating, 10.62 vs 12.19 cm, p = .06, and no statistical difference in pain unpleasantness, 10.22 vs 12.03 cm, p = .17. The study demonstrated that individuals in the process of acculturation to a new cultural environment, 1st generation participants, tend to have heightened pain responses than those of second generation participants. The study was limited by the population size, using only one type of pain modality, and with using the healthy college students of the same age.

A qualitative study to examine how patients assign a pain scale number to their currently experienced post-operative pain and which considerations influence this process was presented by Van Dijk, Vervoort, Van Wijck, Kalkman, and Schuurmans, (2015). The eligibility for the study included non-complicated surgery the day prior with a current pain rating of at least 4. Twenty-seven participants were selected by the researcher. They started with a homogeneous sample of patients and as themes emerged with the data collection, a heterogeneous sample was selected to study if the themes were maintained under different conditions. The setting was a university hospital over an 8-month period.

Data were collected using a semi structured, in-depth interview method. The questions were all open ended and included having the patient rate their pain on a numeric rating scale and then asking questions about how they derived at that number. The data analysis was directed by two researchers by applying a constant comparison analysis. Three main themes emerged regarding the process of scoring one's pain experience: score related factors, intrapersonal factors, and anticipated consequences of rating one's pain. The consequence theme had two major subthemes: expected judgement by professionals and anticipation of analgesic administration. A study strength was that they generalized their findings going from a homogeneous sampling to a heterogeneous sampling to test the themes that had emerged. This could also be a limitation to the study as the results from a qualitative study are only applicable to the homogeneous sampling that they studied.

Pain Scales

The reliability and validity of self-reporting pain scales is of primary importance when assessing a patient's level of pain. Bahreini, Jalili, and Moradi-Lakeh, (2015, p. 11), presented a "cross sectional study designed to compare the results of pain assessment using three different self-reported" pain scales, the VAS, the color analog scale (CAS), and the numeric rating scale (NRS). A convenience sample of 150 patients that presented to two different emergency departments with acute pain, regardless of etiology of pain or current pain treatment, were recruited. The researcher would select the patient for inclusion, approach them to be in the study and then collected the data. The patients rated their pain severity on each scale at presentation and then again 30 and 60 minutes later. A two tailed Spearman p correlation coefficient was used to assess the

correlation between the instruments. There was a strong correlation coefficient between NRS and CAS, 0.95, between NRS and VAS, 0.94, and between CAS and VAS, 0.94, $p<0.001$. Thirty eight percent of the sampling had no preference of use between the pain scales while 32% preferred the CAS. The three pain scales were strongly correlated at all time periods. The study's strength is the detailed demographics of the study participants that included education level, pain location and the type of pain (traumatic vs non-traumatic). The main weakness associated with this study is that the patient was handed all three of the scales simultaneously which may have caused bias with the second and third scale. One fifth of the responses were a second and third assessment by the patient at different time intervals.

In a similar study, Douglas, Randleman, Delane, and Palmer, (2014) presented a descriptive correlational comparative study design to determine the test-retest reliability and validity between the Mankoski pain scale and the VAS, NRS, and the faces scale (FC). The four pain scales were given to each participant at two different times which were one week apart. A convenience sample from a VA medical center and a VA surgical specialty care outpatient clinic in the Midwest was the setting to select 200 participants. The study sought to determine the reliability and validity of the Mankoski pain scale and to determine a preference of pain scales by the participants. Calculations for the reliability and validity were conducted using the Spearman's rho coefficient. "Preferences were evaluated by calculating significant differences between pain scales based on age and by comparing the number of veteran's preferences on each scale" (Douglas, Randleman, Delane, & Palmer, 2014, p. 628). The Mankoski scale correlated well with the other three scales: NRS (r=.84, p <.001), VAS (r=.83, p <.001) and FC (r=.78, p <.001). The findings of the study indicate that the Mankoski pain scale

is a reliable and valid instrument for assessment of pain in veterans. A majority of the sample (46.5%) preferred the scale over the other three pain scales. No other study had been done on the reliability or validity of the Mankoski scale and the research proved the scale to be valid with a moderate test – retest reliability. The limitations in the study come from the study sample, predominantly Caucasian male patients that were all veterans with chronic pain. Generalizing this study to other populations may be limited.

In 2014, Randleman, Douglas, Delane and Palmer used the same data, pain scales and methodology as the previous study. The difference in this study was that an additional variable was introduced, a history of substance abuse and / or post-traumatic stress disorder (PTSD). The research proposed the question, is there a difference in perceived pain between veterans with chronic pain and a history of substance abuse and / or PTSD and veterans with chronic pain and no history of substance abuse and / or PTSD? Descriptive analysis was used to determine difference in groups in age, gender, and ethnicity. A 2x4 multiple analysis of variance was used to determine the difference between the two groups and the pain scales. The mean score of the chronic pain vs chronic pain plus a history on the Mankoski scale was 3.57 and 5.27. The pain plus history was further divided into sub groups of pain plus history of alcohol abuse which had a mean score of 4.28; pain plus a history of drug abuse which had a mean score of 5.63; pain plus a history of alcohol abuse and PTSD which had a mean score of 5.47; pain plus a history of drugs and PTSD which had a mean score of 5.50; pain plus a history of alcohol and drug abuse and PTSD which had a mean score of 6.42; and pain plus a history of alcohol and drug abuse which had a mean score of 5.68. The conclusions demonstrated a “considerable difference in terms of which group of veterans perceived a higher rate of pain even with the use of the same

four pain assessment scales" (Randleman, Douglas, Delane & Palmer, 2014, p. 74). Veterans with chronic pain, substance abuse and/or PTSD tended to have a higher perception of chronic pain compared to those without substance abuse or PTSD diagnosis. The limitations in this study are the same as in the previous study and come from the study sample, predominantly Caucasian male patients that were all veterans with chronic pain. Additionally, it is unclear if the patients with just chronic pain were more effectively treated for their pain which is why they reported a lower score.

Injured Workers and Opioid Use

Bernacki, Yuspeh, Lavin, and Tao, (2012) presented a retrospective review of all worker compensation claims that were opened during the time period 1999 to 2009 in the state of Louisiana. The purpose of the research was to determine if there had been an increase in the use of opioid medications in the treatment of acute and chronic worker compensation injuries. The total number of claims that were reviewed was 80,159 and the total opioid prescriptions that were reviewed were 210,413, of which, 67.7% were men with a median birth year in 1964 and 32.3% were women with a median birth year of 1962. The data was divided into 2 groups, claims that were closed during the first year (0-1 year) that were regarded as acute injuries and claims that were closed from year 1 to 7 that were regarded as chronic injuries. These groups were further divided into 2 groups, those that received short acting (immediate release) medication and those that received a long acting (controlled release) medication with or without a short acting prescribed also. All medications were converted to a morphine milligram equivalent (MME) for comparison. Descriptive statistics were used for analysis and the results showed a cumulative MME for 0-1 years of claim, short acting

only, significantly increased to 36 mg per claim per year (p=0.0084). A cumulative MME for 1-7 years of claim receiving long acting with or without short acting for break through pain, increased from 22,386 MME in 1999 to 54, 396 in 2004 (p=0.01069). The study does demonstrate that the dose of opioids increased over the study period and this seems to be primarily due to the long acting opioids prescribed for chronic pain. A study strength was that it reviewed all claims during the ten-year period. The study was limited as it was only conducted in Louisiana, which is a wage loss state, which may bias workers perception of healing.

Summary

A review of the literature has indicated that opioid use among injured workers has risen significantly and this is due to the patients' reported perception of their pain. The literature has also indicated that one's perception of their pain may be biased by gender, ethnicity, score related factors, intrapersonal factors, and anticipated consequences of rating one's pain. The Mankoski pain scale was shown to be a reliable and valid pain scale. The Mankoski pain scale was developed to describe the subjective experience of pain in more concrete terms and thereby possibly eliminating some of the perception bias. The scale has only been researched with chronic pain among veterans. There is no literature to support its use with acute pain or with a more heterogenous population. The proposed project will address this gap in the literature by studying a heterogeneous population with acute pain in a smaller medical practice.

CHAPTER 3: METHODOLOGY

The purpose of this study was to determine if there was a difference in the injured worker's self-reported response on a numerical rating scale for pain and the Mankoski pain scale. Data was retrospectively abstracted from the medical records and then analyzed. This chapter describes the methods used in the study.

Sample

Population

The sampling for the study is patients being treated for an acute work-related injury at an occupational medicine clinic. The sampling method is a convenience sampling of all patients that meet the inclusion criteria for the study. The inclusion criteria consist of the following; (1) the encounter must be a follow up visit, not an initial injury visit, (2) the encounter must be for a non-surgical musculoskeletal injury (3) the treatment time period from the initial injury cannot have exceeded 6 months, and (4) the patient must be 18 years or older, (5) the patient must be able to understand English, and (6) the patient cannot be on total temporary disability status. There will be no restrictions as to gender, ethnicity or type of employment.

The sample characteristics differ significantly in this study than previous studies. Previous studies consisted of a relatively homogeneous population of Caucasian male veterans with chronic pain. This study's population will be heterogeneous with respect to age, ethnicity and employment. This study will be focused on acute pain versus chronic pain.

Recruitment

No recruitment was done.

Research Setting

The organization for the project implementation is *WorkPartners Occupational Health Specialist ©,* a privately owned, for profit, occupational medicine practice that consists of two free standing clinics in southern California. The practice opened its first clinic in 2012 and then grew to opening a second clinic in 2016. The chief medical officer provides clinical leadership and supervision to seven nurse practitioners and physician assistants who provide 95% of the clinical workload.

The settings used in previous research with the Mankoski pain scale were clinics within the Veterans Administration. There has been no published research on the Mankoski scale other than this large medical system. The setting for this research is a small private practice. The results from this study will add to the literature as it will demonstrate the applicable use of the scale from the very large medical systems to the very small practices.

Length and Duration of the Study

The data collection began after permission was granted from the *WorkPartners* administration and approval was granted from the California State University, Fresno, Institutional Review Board. Data was collected from the medical records of the first 200 patients that met the inclusion criteria. The study period was from 24 October 2018 to 12 December 2018.

Procedure for Data collection

All medical records meeting the inclusion criteria were reviewed. Abstraction from the medical record was performed solely by this researcher and entered first into a data collection tool (see Table 2) and then into a computer database for analysis. Sample demographics that were collected were age and

gender. Two pieces of information were collected in addition to the sample demographics, the score of the numeric pain scale and the score of the Mankoski pain scale.

Table 2

Data Collection Tool

Sequential Number	Age	Gender	Numeric Pain Scale Score	Mankoski Pain Scale Score
1.				
2.				

Instrumentation

The research setting began using the Mankoski pain scale in 2018. The Mankoski scale was copyrighted in 1995, 1996 and 1997. All rights are reserved but the scale may be freely used with attribution. The instrument used is a reprinting of the Mankoski pain scale which consists of 3 columns (see Table 3). The first column is left blank and used for the patients to select their responses. The second column describes functional impairment they may be experiencing in concentration, sleep, work, and physical activity. The third column describes medication usage and effectiveness of the medication. The patient's choice is marked on the scale and the scale then becomes part of the medical record.

Data Analysis

The study is a retrospective analysis comparing injured worker's self-reported response on a numerical rating scale for pain and the Mankoski pain scale. The Statistical Package for the Social Sciences (SPSS) version 24.0 for

Table 3

Mankoski Pain Scale

Numeric Score	Description	Treatment
0	Pain Free	No medication needed
1	Very minor annoyance, occasional minor twinges	No medication needed
2	Very minor annoyance, occasional strong twinges	No medication needed
3	Annoying enough to be distracting	Mild painkillers are effective (Aspirin, Ibuprofen)
4	Can be ignored if you are really involved, but still distracting	Mild painkillers relieve pain for 3-4 hours
5	Cannot be ignored for more than 30 min	Mild painkillers reduce pain for 3 – 4 hours
6	Cannot be ignored for any length of time, but you can still go to work and participate in activities	Stronger painkillers reduce for 3 - 4 hours (Codeine, Vicodin)
7	Pain makes it difficult to concentrate, interfering with sleep. You can still function with effort.	Stronger painkillers are only partially effective. Strongest pain killers relieve pain.
8	Physical activity severely limited. You can read and converse with effort. Nausea and dizziness set in as factors of pain.	Stronger painkillers are only minimally effective. Strongest painkillers reduce pain. (Oxycontin, Morphine)
9	Unable to speak. Crying out or moaning– near delirium.	Strongest painkillers are only partially effective.
10	Unconscious. Pain makes you pass out.	Strongest painkillers are only partially effective.

Dynda, 2001.

Windows was used for data analysis. Using SPSS, the paired T-test will be used to determine if there is a significant difference between the numeric pain scale and the Mankoski pain scale. The sample was described using descriptive statistics. The Spearman's rho was used to determine correlation between the two scales. The level of significance was set at $p = 0.05$.

Internal and External Validity

The threat to internal validity is the injured worker's knowledge of medications that were prescribed to them as part of their treatment plan. This may cause an in accurate low rating of pain even though they are taking stronger medications or an inaccurate high rating of pain even though they are not taking a stronger medication.

External validity is determined by the generalizability of the research findings to other populations. This could be affected by the homogeneity of the research setting, an occupational health clinic, and the population, injured workers with acute injuries. The generalizability of the results may be hindered when applied to other settings or with chronic pain.

Potential Benefits

As a result of this national opioid epidemic many agencies have introduced quality initiatives aimed at pain assessment, pain management and opioid addiction. In 2011 The Institute of Medicine (IOM) published "IOM: Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research" aimed at promoting evidence-based practice in the treatment of pain and the use of opioids. The Agency for Healthcare Research and Quality Opioid Initiative was released in 2016 and is focused on implementing evidence-based approaches to reduce opioid overdoses and overdose-related mortality and the

prevalence of opioid use disorder, of which pain assessment is an integral factor. In 2018 The National Quality Forum (NQF) published “Managing the Nation's Pain: NQF Issues Essential Guidance on Opioid Stewardship” aimed at promoting healthcare leadership’s commitment and implementation of organizational policies that support opioid stewardship as well as advancing clinical knowledge, expertise, and practice in pain assessment, management and opioid prescribing guidelines. In April 2018, the National Institute of Health launched the HEAL (Helping to End Addiction Long-term) Initiative, an aggressive, trans-agency effort to speed scientific solutions to stem the national opioid public health crisis, again accurate pain assessment is an integral factor for research.

The significance of having all these initiatives points to the growing national opioid epidemic and the need for solutions from the healthcare industry. The starting point of these initiatives is an accurate pain assessment that can guide appropriate treatments. The Mankoski pain scale provides an optional pain scale that reduces the perception bias with reporting.

Precautions to Minimize Risk

The risk associated with doing a retrospective chart review is the compromise of protected health information. Confidentiality was maintained during the data collection phase of the study by sequentially numbering the patients. There were no patient identifiers taken from the medical record and listed on the data collection tool. There was no list kept that identifies a patient record associated with the sequential numbering.

The information from the data collection tool was entered into SPSS and then the data collection tool sheets were shredded. The SPSS file was kept on a single thumb drive and accessed only be the researcher. The thumb drive was kept

in a locked desk when not in use. There were no patient identifiers associated with any of the data. The electronic file of SPSS data will be deleted after the study is completed.

Summary

This chapter has reviewed the sampling, setting and data collection procedures. It identified the inclusion criteria and the method of analysis. The following chapter will present the results obtained form the study.

CHAPTER 4: RESULTS AND DISCUSSIONS

This chapter presents the findings of the study. Detailed information on the demographics and specific data elements that applied to each of the pain scale indicators was collected. Results of the pain scale evaluation are presented and discussed.

Baseline Data

Data was obtained from 242 patients that presented for evaluation and treatment during the elected time period and that met the inclusion criteria. The information was obtained from a retrospective record review. Twenty-four of those records were excluded because the forms were not properly completed. A total of 218 records were used for the final data analysis.

Demographic Data

In the final data analysis there were 130 females (59.7%) whose ages ranged from 18 years to 85 years (M = 42.88, SD = 16.68). There were 88 males (40.3%) whose ages ranged from 19 years to 68 years (M = 40.26, SD = 12.69). Ethnicity of the sample was primarily Caucasian (47.7%), followed by Hispanic (33.5%), and then African American (5.5%), Asian (5%), and other (8.3%).

Results

Comparison of the numeric pain scale to the Mankoski pain scale was conducted with calculations of correlation using the Spearman's rho. The calculation indicated a significant relationship between the numeric scale and the Mankoski scale, r (218) = .83, $p < .05$. This demonstrates that the Mankoski scale has a strong validity with another validated pain scale.

Item Analysis

An item analysis was done between the response given on the numeric pain scale and the different responses given on the Mankoski scale. The raw data responses can be found in Appendix A. Descriptive statistics were used to show the frequency distribution of the Mankoski responses to the numeric response (see Table 4). Although only considered a trend, as compared to the numeric scores of 3 – 10, the Mankoski reported scores were more often reported lower than the scores equal to or greater than the numeric scores.

Table 4.

Frequency Distribution of the Mankoski Responses to the Numeric Response.

Numeric Score	Mankoski Response		
	% < numeric score	% = numeric score	% > numeric score
0	0%	70%	30%
1	9%	71%	20%
2	26%	59%	15%
3	45%	31%	24%
4	56%	16%	28%
5	48%	6%	46%
6	47%	15%	38%
7	45%	43%	12%
8	93%	7%	0%
9	100%	0%	0%
10	100%	0%	0%

A two tailed t-test was conducted to test for the differences in the mean numeric pain scale rating and the Mankoski pain scale ratings for each of the individual scores on the numeric scale (see Table 5). The responses of the Mankoski scale had a significantly higher mean than for the numeric score of zero. There was not a significant difference between the Mankoski mean compared to the numeric scores of 1, 2, 3, 4, 5, and 6. The responses of the Mankoski scale had a significantly lower mean for the numeric scale of 7, 8 and 9. A correlation for

the numeric scale of 10 could not be computed because there was only one response.

Table 5.

Two Tailed t-test to Compare the Numeric Scores with the Mankoski Scores

Numeric score of 0						
Numeric		Mankoski				
M	SD	M	SD	df	t	*p*=
.00	.00	.41	.83	28	-2.70	.01*
Numeric score of 1						
1.00	.00	1.21	.73	33	-1.65	.11
Numeric score of 2						
2.00	.00	2.09	1.20	31	-.44	.66
Numeric score of 3						
3.00	0.00	2.93	1.68	29	.22	.83
Numeric score of 4						
4.00	0.00	3.64	1.87	24	.96	.35
Numeric score of 5						
5.00	0.00	4.65	2.00	16	.73	.48
Numeric score of 6						
6.00	0.00	4.92	2.14	12	1.82	.10
Numeric score of 7						
7.00	0.00	5.88	1.75	15	2.58	.02*
Numeric score of 8						
8.00	0.00	6.40	.99	14	6.29	.00*
Numeric score of 9						
9.00	0.00	6.50	1.23	5	5.00	.005*

* indicates statistically significant with $p \leq .05$

Summary

This chapter has reported the data and data analysis of the study. The data analysis showed a significant correlation between the numeric pain scale and the Mankoski pain scale. An item analysis of the scores showed that the mean scores of the Mankoski responses to be significantly lower for the numeric scores of 7, 8, and 9. The following chapter will present a discussion of the study results, limitations, and implications for practice obtained from the study.

CHAPTER 5: SUMMARY AND CONCLUSIONS

Discussion of Results

Comparison of the numeric pain scale to the Mankoski pain scale indicated a significant relationship between the two scales, r (218) = .83, $p < .05$. Since there was a correlation, the null hypothesis was rejected and the alternate hypothesis was accepted. Although not statistically significant, the Mankoski mean score was higher compared to the numeric scores of 1 and 2, but was lower in the numeric scores of 3, 4, 5, and 6 and, as stated previously, was statistically significantly lower for the numeric scores of 7, 8, and 9. There were 37 patients in this study that rated their pain on the numeric rating scale as either 7, 8 or 9. Fourteen of those rated their pain as 6 or less on the Mankoski scale. This would have accounted for a 38% reduction in the use of opioids according to the treatment guidelines.

This study was restricted to patients with acute pain. The only previous study related to the Mankoski scale was done with patients being treated for chronic pain. In that study, the numeric scale and the Mankoski scale also had a significant correlation where r = .84, $p < .001$ (Douglas, Randleman, Delane, & Palmer, 2014). Together, these two studies demonstrate that the Mankoski scale is a valid pain scale for use with either acute or chronic pain.

A limitation to the previous study by Douglas, Randleman, Delane, and Palmer, (2014), was that the study group was predominantly male (94.5%) and Caucasian (88.0%). In this study, the demographics were more distributive with the male gender comprising 40.3% of the population. The ethnicity distribution had Caucasians comprising 47.7% of the group.

Limitations

The main limitation associated with this study was that it was conducted at a practice that was limited to occupational injuries. As noted previously, occupational injuries can have associated contextual and residual influences that may bias the patient's perception of pain. A second limitation is that the pain scales were not discussed or reviewed with the patient to ensure that the patient had a complete understanding of the description noted in the Mankoski scale. This omission may have influenced the patient's selection, especially in the lower numeric scores that received much higher Mankoski scores. An example of this would be noted in the numeric score of 3 and a corresponding Mankoski score of 6 and 7.

Implications for Practice and Research

The accurate assessment of pain is the crucial first step in appropriately treating pain. The Mankoski scale has now been shown to be a valid pain scale with chronic pain and with acute pain in the occupational medicine setting. Future research should be directed towards validating the use of the scale with acute pain in the primary care setting. Additional consideration could be given to reviewing the response on the Mankoski scale with the patients to ensure the patient understands the descriptors. A final consideration for future research could be given to expanding the research done by Douglas, Randleman, Delane, and Palmer, (2014), as to patient preference for a scale that assesses their pain.

Conclusion

The results of this study identified that the Mankoski pain scale is a valid pain scale to be used in the assessment of patients with acute pain. The scale provides another instrument that provides a quick and accurate assessment of the

patient's level of pain. Future research is warranted to demonstrate the clinical usefulness of this scale in practice.

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APPENDICES

APPENDIX A: RAW DATA RESPONSES

Appendix A: Raw Data Responses

This Appendix contains the raw data of Mankoski responses to each of the numeric scales.

Numeric Scale	Mankoski Scale	Mankoski Response *n*=
0 *n = 30*	0	21
	1	6
	2	1
	3	2
1 *n = 34*	0	3
	1	24
	2	4
	3	3
2 *n = 32*	0	1
	1	7
	2	19
	3	1
	4	2
	5	1
	6	1
3 *n = 29*	1	5
	2	8
	3	9
	4	3
	6	2
	7	2
4 *n = 25*	1	3
	2	4
	3	7
	4	4
	5	2
	6	2
	7	3

5 *n = 17*	2	4
	3	2
	4	2
	5	1
	6	4
	7	4
6 *n = 13*	2	3
	3	1
	4	2
	6	2
	7	5
7 *n = 16*	3	3
	5	4
	7	7
	8	2
8 *n = 15*	5	4
	6	2
	7	8
	8	1
9 *n =6*	4	1
	7	5
10 *n = 1*	7	1