# Transforming Acute Pain Experience Into a Pain Score: The Challenges

By

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## ABSTRACT

### Background

The assessment of acute pain due to trauma (APT) in adults is pivotal to clinical decision-making for optimal pain management. Clinicians are expected to employ validated measurement tools, such as the Numerical Rating Scale (NRS), to examine the complex and unique phenomenon of pain of each patient they encounter in practice. Although we currently know much more about the lived experience of pain, we need to continue to refine and broaden our collective understanding of pain assessment. Ensuring that pain assessment accurately and effectively reflect the patient's experience is an important component of pain assessment. By exploring how the experience of pain is transferred into a pain score, this exploratory study may provide clinicians with a deeper and richer understanding of the patient's experience. In so doing, this exploration could possibly reveal clinical insights for clinicians to consider for pain management. Specifically, a preliminary exploration and analysis would provide a better conceptual understanding of how patients take their complex, lived experiences and reduce them to a single data point for the NRS. Closely related to a person's experience of pain is the meaning they attribute to their pain. Exploring how meaning interacts with lived experience of pain and the subsequent scoring of it in a pain assessment could also extend our understanding of the pain experience. Therefore, the research questions are How do people with acute traumatic injuries determine their NRS pain score? and What meanings do people with acute traumatic injuries associate with their pain experiences?

### Methods and Results

Interpretive description (ID) was the approach employed for this qualitative study. Individualized one-on-one interviews of a semi-structured format were completed with 13 adult participants in

the Edmonton, Alberta area. Each adult had sustained acute traumatic injuries accompanied with pain sustained in an accident for which they were hospitalized for a minimum of one day. The digital recordings and their transcribed data were analyzed using latent content analysis to organize the raw data into contextual derived meaningful categories. Three experiential themes known in ID as conceptual descriptions, were identified for how some patients may reduce their complex, unique lived pain experience into a single data point: (a) receiving the injury, (b) sensing the imminent loss of consciousness, and (c) grasping the immediate context. Regarding the determinants of meaning of APT three themes were also identified including: (a) permanence of injuries, (b) incongruent care, and (c) personal responses.

The conceptual descriptions of the first research question are published in *the Journal of Pain Management* (2018) while the dissertation contains these findings in Chapter Four entitled “The underlying framework of how an acute pain score is determined: An interpretive description.” It provides an exploratory but detailed account of how people use pertinent referents in their lived pain experience to provide clinicians with a numeric rating of their pain. Chapter Five contains the conceptual descriptions of how people attribute meaning to their pain and is entitled “The determinants of meaning of an acute traumatic injury.” This paper provides the contextual characteristics of participants values and beliefs regarding their expectations of care given their injuries. It was published in the *Scandinavian Journal of Caring Sciences* (2017). An application of the above exploratory conceptual descriptions to practice settings forms Chapter Six. This paper, entitled “A biopsychosocial approach to pain assessment using the NRS” is currently being prepared for submission for publication.

## Conclusion

These exploratory conceptual descriptions provide important insights into how we might understand the reduction of APT experiences into an NRS score for some people. Likewise, these findings have the potential to enhance the clinical utility of the NRS tool employed for pain assessment in certain contexts. The phrase *meaning of pain* loses some of its vagueness by providing some conceptual descriptions for how personal meaning is formed in these circumstances. Additionally, three higher-level themes that are intertwined through the dissertation are highlighted: (a) context plays a significant role in clinical practice, (b) clinicians control the administrative process of the pain assessment, and (c) clinicians can only work within the limitations of the NRS tool. Collectively, the conceptual descriptions and themes, although from an exploratory study, potentially offers insights that may provide further insights into understanding of the challenges of assessing a complex phenomenon: APT.

# PREFACE

This thesis is an original work by Flo Slomp. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Health Research Ethics Board, Health Panel on October 3, 2013. The title of the research project that received ethics approval was "How do participants attribute meaning to and self-rate their acute pain event?" and the study identification data was: Study 10: Pro00038310. Please see Appendix B for the full approval letter.

# DEDICATION

I dedicate this dissertation to big mama who gave me the gifts. To my parents who taught me the value of many things including, ethics, work, faith, morality, and perseverance. I also dedicate this disseration. Mom’s dying words were to “keep going, keep going, keep going”. I did mom. I think both mom and dad are doing a happy dance in heaven. Finally, I dedicate this dissertation to those who suffer with inadequate pain management and suffer unnecessarily.  It was for you people that I went on this journey.

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## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

## GLOSSARY OF TERMS

**Person/individual/people/patient.** These terms are used interchangeably to reflect who is being assessed.

**Pain assessment.** Assessment is a process that ranges from administering the measurement tool (NRS) to a pain management decision on any clinical actions to be taken to relieve pain further or continue with treatment as pain is currently managed.

**Pain measurement.** Measurement of pain refers to the collection of pain data via a validated tool used in the pain assessment process.

**Health care provider/clinician.** These terms are used interchangeably to describe all professionals involved in the assessment or treatment of people with pain.

**Pain experience.** This phrase refers to the moment in which the NRS is administered (current pain).

**Nociceptive**. Refers to the neurophysiological mechanisms that collectively act as a stimulus to the experience of pain that is not accessible to our sensory perception.

**Meaning of pain.** This phrase is defined as the contextual and consequential components pertaining to the experience of acute pain due to trauma (APT).

**Findings.** This term refers to the findings in this study as conceptual descriptions that are probable truths that could potentially be applied in clinical settings.

**Anchor.** This term refers to the maximal end point of the NRS whether administratively provided or operationalized.

**Referent.** When this term is used, it is referring to one of three identified conceptual descriptors in this research, and used by participants to help determine their NRS score.

**Epistemic.** The term refers to knowing or knowledge.

**Epistemological.** This term refers to the nature of knowledge and the ways of knowing and learning and of evaluating that knowledge.

**Methodological coherence.** This phrase refers to the process of examining the coherence or congruence between the method, research questions, and research strategies as well as the ontological/epistemological /theoretical perspectives within the dissertation.

# CHAPTER 1 - OVERVIEW OF THE PROJECT

This chapter introduces the topic of how lived pain experiences for adults with traumatic injuries might be transformed into a pain score during pain assessment. It begins with the general experience of pain and its significant challenges to convey accurately what the experience represents for the purpose of pain assessment. The impact of pain assessment challenges is discussed as a significant public health issue. Historical pain theories are then discussed followed by the current theory. The ubiquitous pain tool, the numerical rating scale (NRS) is introduced and followed by its challenges. The problem statement, research question, and significance are then addressed and finally, the organization of the dissertation is described.

## The Lived Experience of Pain

Pain has an element of blank;
It cannot recollect
When it began, or if there were
A day when it was not.

It has no future but itself
Its infinite realms contain
It's past, enlightened to perceive
New periods of pain.
(Dickinson, 1924, p. 13)

This famous poem by Emily Dickinson was written about her experience with unrelenting chronic pain. In this poem Dickinson describes how *It* both dominates her life and steals her identity. *It* has a life and a power of its own that overtakes and entraps her, with no future but itself. Although the experience of pain is typically viewed as aversive, unpleasant and powerful, it has a very important role in human life. In serious accidents (trauma) that result in injury, the acute pain sensations serve as a signal to people to seek medical assistance. However, as Dickinson's poem implies, often pain management can be challenging leaving the person ensnared by the power of a painful experience. These challenges of pain management point to concerns as to why suboptimal pain management exists. As management of pain is based on the outcome of its assessment a logical place to begin is to thoroughly explore how the acute pain due to trauma (APT) experience is translated into a score. We know pain is a universal human experience. The commonality of pain suggests that it should be relatively easy to understand and communicate about our own and others' experience of pain. Unfortunately, this is not usually the case. Although pain is something we all have in common it is unique experience for each person and the pain events they experience. In everyday language, pain is defined as the "physical suffering or discomfort caused by illness or injury" (Merriam Webster, 2018). A clinical definition of pain from the International Association for the Study of Pain (IASP) is that pain is "an unpleasant sensory and emotional experience associated with actual or potential tissues damage or described in terms of such damage" (International Association for the Study of Pain, 2017). This definition acknowledges that the experience of pain is both emotional and sensory. Whether current pain assessment tools, such as the numeric rating scale, capture the full breadth of the definition is not apparent.

## Pain is a Significant Public Health Issue

Pain is a global problem with enormous consequences. According to the International Association for the Study of Pain (IASP), acute pain resulting from serious accident and surgery is the most common type of pain (2018). Up to 78% of people seeking medical care at emergency rooms (ER) report complaints of pain (Todd et al., 2007). Authors of the 2012 *National Health Survey* found that 126.1 million adults in the United States experienced some pain in the previous 3 months (based on an international pain coding system) and 25.3 million adults (11.2%) reported daily pain (Nahin, 2015); the trends in Canada are similar (Canadian Pain Society, 2010).

In response to the burden of global pain multiple pain organizations have individually and collaboratively advocated for the human right to access pain management. In 2004 the European Federation Chapter of the International Association for the Study of Pain, the World Health Organization, and the International Association for the Study of Pain (IASP) collaboratively sponsored the inaugural Global Pain Day the theme of which was that “pain relief should be a human right” (Brennan, Carr, & Cousins, 2007, 2016). *The Declaration of Montreal* was ratified by IASP in 2010 and extended pain-related human rights to having access to adequate pain assessment and management by qualified health care professionals without discrimination. In addition they state that individuals have the right to have their pain acknowledged. (Brennan et al., 2016). The challenges of managing pain optimally is considered a public health problem (Carr, 2016; Goldberg & McGee, 2011).

Although we have the technology and expertise to treat acute pain, satisfactory management of it continues to be a concern in Canadian institutions and elsewhere around the world (Cousins & Lynch, 2011; International Association for the Study of Pain, 2018). Multi-factorial issues associated with suboptimal pain management include the depth of clinicians’ pain knowledge (Canadian Pain Society, 2005), pain assessment (Dihle, Bjolseth, & Helseth, 2006; Layman Young, Horton, & Davidhizar, 2006), some deficits in patient education or complinance of analgesics administered (Eberhart, Morin, Wulf, & Geldner, 2002; Tanabe & Buschmann, 1999), communication, attitudes and biases of clinicians (Dunwoody, Krenzischek, Pasero, Rathmell, & Polomano, 2008; Meissner et al., 2015; Sinatra, 2010; Willens, 2018), and poor documentation of pain (Sikorskii, Tamkus, Victorson, Rahbar, & Ahn, 2012).

In hospitals, estimates of a moderate to severe pain experience are common (Apfelbaum, Chen, Mehta, & Gan, 2003). When acute pain is not controlled optimally it can become problematic. Some of the possible consequences include hormonal, immunological, psychological, and socio-economical impacts to individuals and by extension to their families (Bair, Robinson, Katon, & Kroenke, 2003; Baratta, Schwenk, & Viscusi, 2014; Willens, 2018). Specifically, when post-operative acute pain is not optimally controlled it may lead to numerous complications resulting in possible discharge delays, re-admission, a poor rating of satisfaction and risk of developing persistent post-operative pain (Apfelbaum et al., 2003; Willens, 2018).

Of growing concern is suboptimal pain relief in hospital that may lead to the development of chronic pain. The risk of developing chronic pain is accompanied by consequences leading to a lifetime of disability, pain, and poor quality of life (Fine, 2011). Collectively, the economic costs of this burden need to be addressed by minimizing any factors that might lead to the onset of chronic pain.

Persistent postoperative pain (PPOP) can occur with any surgery and is receiving growing concerns as a significant clinical challenge (Joshi & Ogunnaike, 2005; Kehlet, Jensen, & Woolf, 2006; Niraj & Rowbotham, 2011). Incidence rates vary dependent on reporting methods employed in the particular investigation and cutoff values for NRS scores (Niraj & Rowbotham, 2011) ranging from five to eight percent (Joshi & Ogunnaike, 2005). Importantly, PPOP is recognized as a potential covert contributor to the development of chronic pain (Joshi & Ogunnaike, 2005). The annual incidence of new people being diagnosed with chronic pain is estimated to be 10% and is now considered a public health priority (Goldberg & McGee, 2011). Psychosocial factors in both pre-operative and post-operative settings are believed to be factors in the development of PPOP and chronic pain (Niraj & Rowbotham, 2011). There is growing interest in somehow capturing these psychosocial factors as part of ongoing strategies to assess and manage these aspects in acute pain.

Severe trauma often includes surgical intervention as part of the treatment for injuries sustained. To reduce the risk of developing PPOP or chronic pain an important consideration is to continue learning and enhancing our understanding of how the experience of acute pain is translated into a pain score. Conceivably, from this new knowledge pain assessments could be refined and different pain management strategies could be employed. that reflect this new knowledge. Possibly, these enhanced pain assessment and management tools could decrease the risk of developing chronic pain. As pain assessment is key to the clinical pain management decision-making for APT an in-depth examination of the assessment process and related tools used is warranted.

Individuals who suffer from persistent and a high degree of pain severity report worse health status, more disability, and that they utilize health care systems more frequently, (Nahin, 2015); they also have a lower quality of life (Wu et al., 2003). According to Goldberg (2011), the individual impact of ongoing pain experiences can include the inability to work, increased suicide risk, depression, and disrupted relationships. The estimated economic cost of chronic pain to American society is $600 billion annually in lost productivity, disability, and health care systems expenses (Gaskin & Richard, 2012; Rice, Smith, & Blyth, 2013; Stewart, Ricci, Chee, Morganstein, & Lipton, 2003); this figure is more than the combined costs of diabetes, heart disease, and cancer (Gaskin & Richard, 2012). In Canada, the estimated financial costs of chronic pain to society is approximately $60 billion annually (Canadian Pain Society, 2010). These estimates are expected to increase with gentrification and longevity in the next 20 years as more individuals are likely to use health care systems.

## Pain Theory

Understanding the challenges of pain assessment require a brief introduction to pain theory. According to Moayedi and Davis (2013) beginning in the 17th century, theories of Pain Specificity, Pain Intensity, and Pain Pattern were postulated by European neurophysiologists and psychologists. These theories continue to shape current thinking in pain research and practice.

Specificity Theory states that specialized pain receptors (nociceptors) and their dedicated pathways carry pain messages to the spinal cord, thereby, relaying pain messages to a specific pain center in the brain. Descartes' famous diagram of pain depicts this theory (see Appendix A). The premise of this theory is the existence of two specialized pain functions: transduction pathways for pain from the injury site and a brain receptacle for pain perception.

A group of theories collectively called Pattern Theory refuted the Specificity Theory. A group of Oxford anatomists had strong opposition to the Specificity Theory from what is known as the Oxford challenge (Perl, 2011). According to Pattern Theory, noxious and innocuous afferent nerve firings are encoded by their stimulus type and intensity (Melzack & Wall, 1965). It is the specific spatial and temporal arrangements of sensory nerves firing together that produce pain (Melzack & Wall, 1965). Intensity Theory dates to Plato and resurfaced again with Darwin. This theory views pain as an emotional response to an unusually strong stimulus (Moayedi & Davis, 2013). It was believed that the stimuli's summation of neural firings separated subthreshold sensations from painful experiences (i.e., the threshold from normal sensation to pain was crossed) (Moayedi & Davis, 2013). These theories are biomedical or mechanistic in nature and involve only the peripheral nervous system.

The failure of these theories to adequately explain the physical and emotional components of pain pointed to the need for further pain theory development (Moayedi & Davis, 2013). As one example, Melzack's (1971) early work with people who experienced phantom limb pain following an amputation could not be accounted for in these theories It raised questions about the adequacy of the existing pain theories as these theories were unable to explain why these people continued to feel phantom pain without innervation to their amputated limb. Thus, a major paradigm shift away from the mechanistic/biomedical perspective of pain occurred when Melzack and Wall (1965) introduced the *Gate Control Theory* (GCT) five decades ago. Their theory posited that in addition to the brain, gating mechanisms in the spinal cord were central to an understanding of both the physical and psychological aspects of pain. Melzack and Wall theorized that gates located in the spinal cord control noxious signals from small fiber neurons and innocuous (touch, pressure) neural signals from large fiber neurons coming from the injury site to modulate the pain at the spinal cord level. In addition, some injury signals could bypass the inhibitory and transmission functions of the gates by travelling directly to the brain to potentially inhibit cell activity modulating the pain intensity.

The *Neuromatrix Theory (NMT)* of pain evolved from GCT. NMT proposes that the experience of pain involves the neuromatrix comprised of multiple parts of the brain (e.g., prefrontal cortex, motor cortex, somatosensory cortex, insular cortex, brain stem, thalamus, and the limbic sytem) and the spinal cord (McAllister, 2017; Melzack, 2001). This neuromatrix produces a neurosignature for each pain experience, which helps to explain why each person's pain experience is both unique and complex. The neurosignature is thought to be an atlas of event space in the brain that is constantly coding events through massive neural systems (Dudai, 1989). NMT characterizes pain as a multidimensional phenomenon and provides some early understandings of the enigma of chronic pain where no organic explanation can be found for the pain experience. Furthermore, it posits that both genetics and past experiences produce a neurosignature through which subsequent pain experiences are perceived and sculpted (Melzack, 2001).

### Current theory

These theories provide a substanial understanding of the complex nociceptive processes but according to some authors, these theories lacked a satisfactory integration of the pain experience with this neurophysiology (Moayedi & Davis, 2013), particularly the cognitive and attentional processes (Kucyi & Davis, 2015). The entire anatomical brain network, known as the connectome, is acknowledged as a fluid and dynamic system that changes frequently. It essentially is a spatial-temporal signature that integrates most of the features known to be part of the pain experience The connectome is a dynamic system that fluctuates on multiple time scales (Kucyi & Davis, 2015). For example, functional magnetic resonance imagining (fMRI) demonstrates that attentional states seem to fluctuate with various interventions(Bantick et al., 2002). Importantly, these attentional states did not accompany a change in the nociceptive output that attenuates or increases the perception of pain. The practical implications of the Dynamic Pain Connectome are the potential to reduce pain experience via modulating "attentional" states through non-pharmacological pain treatments. These findings pave the way for the potential of personalized pain therapy theory.

The connectome has several implications for our understanding of pain perception. Firstly, it suggests that a person interprets their current APT experience through a neurosignature template that has been sculpted both genetically and experientially over their lifetime. The antecedents to a new pain event may include various personal factors such as history of pain, cultural factors, as well as personal beliefs and values (Turk & Okifuji, 1999) These factors continue to modify the new pain experience. Secondly, the connectome infers an indirect relationship between the degree of tissue damage and the intensity of pain experience . The current injury serves as the stimulus but the pre-existing dynamic pain connectome produces the pain experience.

In light of this theory, it is believed that when a person reports their pain they must reduce a complex and multi-faceted experiencethrough a complex neurosignature into a word or a single number. This raises the question whether we have sufficient understanding of how this process occurs. The challenge for the clinician is to accurately deconstruct and interpret the pain score.

## Use of the *Numeric Rating Scale* (NRS) for Pain Assessment

The clinical assessment of pain is central to pain management, yet the complexity and uniqueness of the pain experience present significant challenges for health professionals trying to assess pain. Despite these challenges, the Australian and New Zealand College of Anesthetists (2014), the International Association for the Study of Pain (2014), the Canadian Pain Society (2005), and other organizations endorse the use of validated measurement tools for pain assessment. The *Numeric Rating Scale* (NRS) is a psychometrically robust tool that is simple, practical, and valid and is widely employed in the clinical assessment of pain (Ferreira-Valente, Pais-Ribeiro, & Jensen, 2011; Jensen & Karoly, 1992). The NRS is an 11-point scale anchored at the low end by zero (*no pain*) and at the high end by ten (*worst pain imaginable*) with higher scores indicating higher levels of pain.

### Challenges Associated with the NRS

During a clinical assessment individuals are asked to rate their pain using the NRS; however, concerns have been raised about whether the NRS is sufficient on its own to adequately capture the pain experience or what the score means (deWilliams, Davies, & Chadury, 2000; Hodgins, 2002; Kenny, Trevorrow, Heard, & Faunce, 2006; Sellinger, Wallio, Clark, & Kerns, 2010). Although the NRS is a validated tool, its clinical utility has been questioned (deWilliams et al., 2000; Hodgins, 2002). It is important to recognize that assessment tools interact within the setting in which they are administered (McDowell, 2006b). The self-report of pain occurs within the confluence of several factors namely “the administrator,” “the scale,” “the respondent,” and “the context” (deWilliams et al., 2000; Streiner & Norman, 2008).

Underlying concerns about the NRS’s validity relate to multiple assumptions regarding the pain assessment process. The first concern is whether a simple tool captures and represents a complex, dynamic experience of pain (Clark, Yang, Tsui, & Clark, 2002; deWilliams et al., 2000; Gordon, 2015; Kenny et al., 2006; Knotkova, Crawford, Mokrejs, Padour, & Kuhl, 2004; Linton & Shaw, 2011; McGrath, 1994; Montali, Monica, Riva, & Cipriani, 2011).

The second assumption is that clinicians have a full understanding of how individuals produce an NRS, recall a score or understand what an NRS score means (Broderick, Stone, Calvanese, Schwartz, & Turk, 2006; deWilliams et al., 2000; Hodgins, 2002; Nakamura & Chapman, 2002). To produce an NRS score, the person experiencing pain must process present circumstances, motives, and physical sensations; along with their past experiences with pain; in conjunction with their social values and cultural expectations. With the myriads of information occurring during an APT it is plausible that some of the pain experience data could be missing from the assessment. If that is the case, it may mean that pain management may not address those unidentified aspects of the patient’s experience.

The third assumption pertains to the way in which scale administrators, the clinicians, ask about pain intensity. Some clinicians ask individuals to use the NRS to rate their worst pain, while others might ask something else. This could be problematic in practice. For example, if one clinician asks the person to rate their *average* pain intensity and the next clinician asks about his *worst* pain intensity there is the potential for pain management decisions to be miscommunicated via the chart and or impact the patient's direct pain management.

A fourth assumption is the validity of the terms used to describe the NRS anchors. Anchors appear to function as an independent variable (Seymour, Simpson, Charlton, & Phillips, 1985). For example, investigators have demonstrated statistically that scoring on the pediatric Wong-Baker FACES Scale is altered when the low-end anchor face is a neutral face versus a smiling face (Chambers, Giesbrecht, Craig, Bennett, & Huntsman, 1999). The authors suggest that a smiling face as the low-end anchor (i.e., *no pain*) confuses affective states with pain and therefore, affects children's' pain scoring. A controversy ensued with the developers of the scale (Wong & Baker, 2001) arguing that the statistical methods used by the investigators were not appropriate. The scale developers conceded that there may be a subtle difference in pain reports using the two different facial expressions (Wong & Baker, 2001). However, the important argument is that the anchor terms (high-end) for the NRS may need further investigation and development. The high-end anchor for the NRS is commonly presented as the "worst pain imaginable" or "worst pain experienced" (Hjermstad et al., 2011); it is uncertain if these terms have been studied to determine if they yield similar scores. A dental pain investigation demonstrated that when the high-end anchor terms are experimentally manipulated this could result in scores clustering at the high-end if the term was not sufficiently sensitive (Seymour et al., 1985). Collectively, these challenges and assumptions point to some gaps in our knowledge regarding how pain scores are produced from a pain experience. Whether the NRS adequately captures the pain experience and whether the administered pain anchor is employed by patients' self-report using the NRS score are important elements to understand in APT assessment.

## Problem Statement

There are gaps in our knowledge and understanding of how individuals respond to a clinicians' request to rate their APT using the NRS. Addressing these gaps would likely contribute to a more in-depth understanding of current pain assessment practices and perhaps either further development of pain assessment tools or lead to the revision of current ones to reflect this new knowledge and understanding.

## Purpose

The purpose of this research was to explore and describe how individuals with acute traumatic injuries use the NRS to determine a pain score.

### Research Questions

The questions motivating this study are the following: "How do people with acute traumatic injuries determine their NRS pain score?" and "What meanings do people with an acute traumatic injury associate with their pain experiences?"

### Significance

This research will contribute to the literature on the clinical assessment of APT and how adults with APT process the complex and dynamic pain experience to produce an NRS score. It will also bring some clarity to the meaning of pain and its relationship with pain scoring. In the complex and challenging field of pain medicine, these conceptual descriptions may begin to address knowledge gaps in the pain assessment process and clinical limitations of the NRS.

## Organization of the Dissertation

Chapters One, Two, and Three are the Introduction, Review of the Literature, and Methodology respectively. The first published paper, Chapter Four, entitled "The underlying framework of how an acute pain score is determined: An interpretive description" describes the referents employed by participants to determine a pain score for the NRS: receiving the injury, sensing the imminent loss of consciousness, and grasping the immediate context. The second published paper, Chapter Five, entitled "The determinants of meaning of an acute traumatic injury" reveals the central elements of how the meaning of pain is determined in an acute trauma context. The third paper, entitled "A biopsychosocial approach to pain assessment using the NRS" forms Chapter Six and is a potential clinical application of the research findings for clinicians. It is suggested that an extended usage of the NRS to include biopsychosocial approach to the assessment process could feasibly be applied in practice. A general Discussion and Conclusion is presented in Chapter Seven.

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# CHAPTER 2 - LITERATURE REVIEW

This chapter presents the literature reviewed on how people reference their APT for the purpose of a pain assessment and how they attribute meaning to this event. The pain literature will be reviewed across health care domains specifically providing the background for the existing gaps in acute pain management. The chapter is organized into four sections: (a) theory of pain (b) conceptual framework of the meaning of pain (c) pain measurement in cognitively intact adults, and (d) summary of the gaps in pain assessment.

## Theory of Pain

In this section, the literature is reviewed pertaining to pain perception, nociception and the theory of pain.

The perception of pain occurs through a complex network of millions of neurons in the brain where the pain experience is produced. Perception can be conceptualized as the confluence of diverse sensory signals with past events, contextual data and future consequences that are concrete and or abstract (Coghill, 2010; Dionne, Bartoshuk, Mogil, & Witter, 2005). Perception at its most rudimentary level is the experience of an individual in her world and (McGrath, 1994) involves information processing that includes wide facets of perception including memory, attention, and expectation (McGrath, 1994). Compared to the perception of vision and hearing, describing the perception of pain can be much more elusive (Melzack, 2005a; Moayedi & Davis, 2013). Moderators of pain perception are complex and numerous, which may explain at least in part, the wide variance in pain scores across all pathologies (Dione, Bartoshuk, Mogil, & Witter, 2005; Snyder, Scheuerman, Gregg, Ruhnke, & Eten, 2016). Clinically, within a given pathology, there is no average pain score (Awolola, Campbell, & Ross, 2015; Melzack, Wall, & Ty, 1982; Snyder et al., 2016). The significant number of variables, ranging from neurophysiological to contextual seem to differ as evidenced in pain scores between and within individuals (Dionne et al., 2005).

## Nociceptive Phases of Acute Trauma

In this section, the underlying neurophysiological mechanisms that are activated when an individual sustains a injury are reviewed. When a traumatic injury is sustained, the nociceptive signaling of the damaged tissue is initiated whether the injury is of a somatic (skin, muscle, tendons), or visceral (kidneys, liver, lung) nature, or both, and occurs through a five-phase process. Transduction is the depolarization of the peripheral receptors of the nociceptive fibers, C and A-delta from mechanical, thermal or chemical noxious energies (Fishman, Ballantyne, & Rathmell, 2010). These changes in the peripheral nociceptors result in the conduction phase of the signals along the peripheral nervous system via the primary afferent to central processing in the spinal cord stimulating the presynaptic terminal (Dubin & Patapoutian, 2010). From this presynaptic location, a network of interneurons and second-order neurons are accessed in the dorsal horn of the spinal cord. The transmission phase occurs next with the release of various neurotransmitters that send ascending signals along specialized ascending pathways including contralateral spinothalamic, spinoreticular, spinomesencephalic, and spinohypothalamic tracts (Brooks & Tracey, 2005). The modulation phase is an important adaptive feature of nociceptive function whereby the signaling can be suppressed or facilitated dependent on numerous factors (Fishman et al., 2010). Modulation is a complex system of multiple sites and neurotransmitters that can occur peripherally or centrally. Perception is the last phase of the nociceptive processes. The various ascending tracts of neural transmission are pain decoding in multiple sites within the brain including, but not limited to: thalamus, sensorimotor cortex, insular cortex and the anterior cingulate. All of these functioning aspects of nociceptive mechanisms are not accessible to the senses; rather, it believed that the experience of pain is formed in the pain connectome.

**Neuromatrix Theory (NMT)**

The NMT specifies that these specified brain locations known as the connectome are involved in determining the pain experience. The limbic and insulas appear to be involved with the affective dimension of pain as well as the intensity of pain (Price, 2000; Rouwette, Vanelderen, Roubos, Kozicz, & Vissers, 2012) whereas the prefrontal area of the brain is associated more with how people process and make sense of their pain (Apkerian, Bushnell, Treede, & Zubleta, 2005; Atlas & Wagner, 2012). The location and quality of the pain seem to be associated with the somatosensory parts of the brain (Haggard, Iannetti, Domenico, & Longo, 2013). The affective, sensory, and cognitive dimensions of pain are interconnected with these various areas. For instance, sensory messages are received in the somatosensory cortices and insula (Hofbauer, Rainville, Duncan, & Bushnell, 2001), while the affective dimension is associated with the insula, limbic, and cingulate structures of the brain (Uddin, Kinnison, Pessoa, & Anderson, 2013), and finally cognitive processing is associated with the prefrontal, cingulate and insula areas of the brain (Davis & Moayedi, 2013).

Explaining a single dimension of nociception in isolation from other factors related to the experience of pain is believed to be insufficient (Moayedi, 2014). The complexity of neurophysiology circuitry attests to its *neuromatrix* label but some have contested that it does not incorporate the cognitive and affective dimensions that occur in the networking centre. (Davis & Moayedi, 2013; Melzack, 2005a). Although there has been a substantial mapping of the neurophysiological process involved in creating the experience of pain (Perl, 2007), it remains elusive as to how these cerebral areas transform the raw neurophysiological data into this experience with some early evidence pointing to the insula (Moayedi, 2014).

Therefore, the simple summation of the frequency of neural firings in the dorsal horn is not directly related to how pain is experienced. Neurophysiology explains many aspects of nociception but what seems to be is missing is an adequate explanation of the full pain experience with all its sensory, affective and cognitive dimensions. Rather it is postulated that all of these neurophysiological interactions, nociception, and experiential (psychological and environmental) factors are postulated to sculpt the pain experience (Dionne et al., 2005; Turk & Melzack, 1992). How these neurological messages are transformed into the experience of pain has not been established. The experience of pain is defined by the International Association for the Study of Pain (2017) as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage”.

NMT has been challenged as being inadequate (Iannetti & Mouraux, 2010). Such arguments are pertaining to the suggestion in NMT that brain locales are specific only to pain, when in fact these anatomical regions share multiple functionalities including the processing of other sensory information (Iannetti & Mouraux, 2010). It has been argued that painful stimuli begins the nociceptive process and through neural transmission signals all three primary dimensions of the pain experience (affective, sensory and cognitive) that involve the brain network (Davis, Kucyi, & Moayedi, 2015).

## Dynamic Pain Connectome (DPC)

Building on NMT the new working theory DPC defines the entire brain network as the connectome and the spatial-temporal signature as the circuitry that involves all aspects of the pain experience (Davis et al., 2015; Kucyi & Davis, 2015). The DPC importantly includes the significant roles of attentional states and cognition to the pain experience that have significant practice implications. The dynamic properties of pain experiences over time, particularly cognitive and attentional, draws attention to the central role of nonpharmacological interventions in pain management (Davis & Moayedi, 2013; Kucyi & Davis, 2015) and providing personalized pain management.

## Conceptual Framework of the Meaning of Pain

Theories pertaining to meaning are plentiful, existing across professional fields including health psychology (Molden & Dweck, 2006). The concept of meaning pertains to beliefs, values, feelings, and expectations; and it is a key component of the human experience (van der Klok, 2014). Meaning is important because it brings understanding to behaviours exhibited in certain situations (contexts) and, specifically, illness behaviours (Baumeister, 1991; Neuman, 2006; Park, 2010). Foundational to personal meanings is the significance of an individual's beliefs of things, events, or people, and their interrelationship with each other (Baumeister, 1991). In traumatic experiences, such as with an acute injury, existing personal meaning can be shattered (Janhoff-Bulman, 1992; van der Klok, 2014). Renegotiating meaning can occur after trauma through a psychological and intentional process called meaning-making (Park & Folkman, 1997).

Beecher (1947), a surgeon in a World War II field hospital, noticed that some soldiers with horrific injuries complained little about their pain; he attributed this counterintuitive finding to their perception of the *meaning of pain*. The phrase *meaning of pain* is believed to be one of many influencers on the perception of pain and has received little scholarly discussion in the literature. Authors of an investigation into how the meaning of pain is constructed within a group of workers with English as their second language is an excellent example of meaning when viewed through the lens of values, beliefs, and expectation in experiences with pain (Cervantes & Lechuga, 2004; van der Klok, 2014). In a recent investigation, incongruent care and whether the individual's injury was temporary or permanent factored into the level of meaning for that acute pain event (Baumeister, 1991; Slomp, Mayan, Lasiuk, & Dick, 2017).

Other studies use the phrase *meaning of pain* to mean something other than viewing the event through a lens of values, beliefs, and expectations. Some of these studies focus on the use of metaphors (Jairath, 1999) and sense-making (Bullington, Nordemar, Nordemar, & Sjöström-Flanagan, 2003). It is plausible that when conceptual borders defining the phrase *meaning of pain,* are vague, the phrase might be employed in diverse ways and potentially incongruent ways. Consequently, this could result in limitations to the conceptual development and advancement of the phrase in pain research. We argue for the merits of using an existing meaning model to enhance an in-depth examination of the phrase *meaning of pain* and to systematically analyze how meaning directly impacts how a pain score is determined.

## Pain Measurement in Conscious Adults

Adults who are conscious and can communicate with clinicians about their pain are often assessed using several different types of unidimensional and multidimensional, validated measurement tools. The term unidimensional refers to the stated objective of the tool: measurement of sensory or pain intensity. In contrast, multidimensional tools assess multiple domains of the pain experience, however, in APT unidimensional tools are conventionally employed. Due to the subjective nature of pain, these tools are self-reported by the user.

### Unidimensional Tools

Clinicians often employ unidimensional, validated tools that are designed to measure the intensity of pain (Thong, Jensen, Miró, & Tan, 2018). Although the three most common single dimension tools to measure acute pain are the *Verbal Rating Scale* (VRS), the *Visual Analogue Scale* (VAS) and the *Numeric Rating Scale* (NRS) (Hjermstad et al., 2011; Phan et al., 2012; Williamson & Hoggart, 2005), the NRS is used in approximately three quarters of articles published (Hjermstad et al., 2011).

The VRS is a scale that requires patients to choose from a list of words that describe gradients of pain intensity. Sometimes the VRS is also referred to as the *Verbal Pain Scale*, *Verbal Descriptor Scale*, or the *Simple Descriptor Scale and Graphic Rating Scale* (Hjermstad et al., 2011). Response choices with the VRS vary from four to fifteen adjectives (Kenny et al., 2006). Older individuals and those with less education prefer the VRS (Clark, Lavielle, & Martínez, 2003; Herr & Mobily, 1993; Peters, Patijn, & Lame, 2009). Although individuals seeking medical attention typically verbalize their pain, due to idiosyncratic word usage, clinicians' sole reliance on this scale to measure pain is likely not ideal (Breivik, Bjornsson, & Skovlund, 2000; Breivik et al., 2008; Hjermstad et al., 2011; Kenny et al., 2006). As well, the sensitivity of the VRS to detect treatment differences is also lower than its metric counterparts, the VAS and NRS (Breivik et al., 2000; Hjermstad et al., 2011; Reading, 1980).

The VAS is one of two unidimensional tools that asks individuals to rate their pain using numbers. Typically, the VAS is presented on a paper containing a 100 mm horizontal or vertical line (Downie & Leatham, 1978; Herr, Spratt, & Mobily, 2004); plastic rulers and electronic versions have also been used (Ahlers et al., 2008; Daoust, Beaulieu, Manzini, Chauny, & Lavigne, 2008; Jamison et al., 2002). In the paper version, individuals mark the line where they rate their pain, after which a ruler is used to measure the distance from the left side or the bottom to where the individual scored themselves. Sometimes, the VAS is presented with evenly spaced numbers from the low to high end. Although the VAS is highly correlated with the NRS, it is less practical to use as it is a physical tool that requires resources (pen, paper, ruler, electronic) and fine motor skills to complete (Holdgate, Asha, Craig, & Thompson, 2003). Because of this inconvenience, reports claim that up to 11% of individuals in various pain populations are unable to complete the VAS (Downie & Leatham, 1978; Kremer, Hampton, & Ignelzi, 1981).

The NRS tool, sometimes referenced as the verbal NRS, is the most popular tool cited in the literature (Hjermstad et al., 2011). Typically, the NRS is presented as either a numeric rating from zero to ten (NRS-11) or one to ten (NRS-10) that is anchored on the low-end and high end by terms defining the limits of the scale. Variations of the NRS exist including NRS-6 (Carpenter & Brockopp, 1995; Huber et al., 2007), NRS-7 (Svensson, 2000), NRS-20 (Herr et al., 2004; Williamson & Hoggart, 2005), NRS-21 (Herr & Mobily, 1993), and NRS-101 (Ekblom & Hansson, 1988; Jensen & Karoly, 1992; Williamson & Hoggart, 2005).

**APT Assessment**

Effective pain management begins with the accurate assessment of pain via a valid assessment tool regardless of pain population or pathology. Psychometrically robust, the NRS, one of the most commonly used pain scales both in research and clinically for assessment of pain intensity is an 11-point rating scale, in which from 0-10 is anchored by *no pain* for zero and some variant of *most pain* for ten (Ferreira-Valente et al., 2011; Todd, 2005). The NRS has been endorsed as an appropriate assessment tool for APT by numerous organizations such as the Australian and New Zealand College of Anaesthetists (2014), the Canadian Pain Society (2005) and the American Society for Pain Management Nursing (2010).

Pain is a complex multidimensional phenomenon and its assessment is equally complicated. Assumptions and gaps in our knowledge regarding how people with APT reduce the enormous amount of data of their experience into a single number contribute to this complexity. Pain knowledge could be advanced by investigating how people reference their pain in different pain contexts. In APT events, where urgent medical care is required, there is a multitude of events to which the injured person is exposed, many of them beyond their control. For instance, an individual has sustained an injury and her immediate future maybe uncertain. Additionally, she may experience various sensory data that may or may not include various qualities of pain. This might be her first visit to an ER for a traumatic injury, which is possibly an overwhelming experience for her. All of this information is somehow processed during a stressful situation, yet little is known about how all this information is used to generate a pain report (de Williams, Davies, & Chadury, 2000; Kenny et al., 2006; Nakamura & Chapman, 2002). It is assumed that a person can take all of this information and provide a score that indicates the intensity of their pain accurately. (deWilliams et al., 2000; Kenny et al., 2006; Nakamura & Chapman, 2002).

Based on the above, context might have the capability to affect an individual's response to pain but it is difficult to categorize every possible contextual situation. When a score is provided, perceptions, meanings, and intuitions regarding that immediate context somehow factor into this process suggesting a pain score can be moderated by these contextual factors (Slomp et al., 2017). For instance, hospital experiences are influenced by many factors contextual to that event (Di Blasi, Harkness, Ernst, Georgiou, & Kleijnen, 2001). Fear of acquiring nosocomial infection (Burnett, Johnston, Kearney, Corlett, & MacGillivray, 2013), quality of roommate interactions (Kulik, Moore, & Mahler, 1993), lack of sleep (Dogan, Ertekin, & Dogan, 2005), and possible unsatisfactory clinical interactions (Kelley, Kraft-Todd, Schapira, Kossowsky, & Riess, 2014; Slomp et al., 2017) are just some of the psychosocial aspects potentially affecting pain perception and therefore, can be reflected in pain scores. Although these examples are for hospitalized people in general, there is no evidence to suggest people with acute pain would experience anything different. To what degree each factor singularly or in combination has the potential to change pain outcomes as reflected in a changed pain score requires further investigation (Dionne et al., 2005).

## Psychometrics of the NRS Tool

Psychometrics is the field of study concerned with theory and the method of assessing psychological constructs (Psychometrics Canada, 2018). Self-reports of subjective attributes such as pain, are developed, standardized, and then tested for their psychometric robustness. Statistics, such as reliability and validity, are given as evidence that the tool is measuring the attribute it is designed to measure, and that it consistently measures that attribute accurately (Lowenthal, 2001).

Reliability is essentially concerned with the consistent measurement (accuracy) of the construct being measured (e.g., pain intensity). Test-retest consistency and internal stability are typically used to estimate reliability (Kline, 1993) and are measured between two administrations of the NRS within a specified time gap between administration of the tests (Todd, 2005). Historically, the NRS has been considered to have adequate estimates of reliability (Ferreira-Valente et al., 2011; Todd, 2005). However, questions have arisen recently as to whether the reliability discussions have been closed prematurely due to concerns over potential false-negative scores in RCT analgesic trials (Dworkin, Burke, Gewandter, & Smith, 2015; Smith et al., 2016; Stone, Schneider, Broderick, & Schwartz, 2014).

The United States Food and Drug Administration now requires proof of instrument validity during the approval process of new products (Burke, Kennedy, Msikala, Papadopoulos, & Trentacosti, 2008). This means validity questions will need to be addressed because they are key to all new analgesic trials in which the NRS is used. However, with increasing pressure on health care systems, among other endeavours, both reliable and effective tools might be required to reduce the costs associated with pain management (Goldberg & McGee, 2011; Green, 2008).

Validity is defined as the extent to which a tool measures the attribute that is meant to be measured (Lowenthal, 2001). On the surface, it appears that the NRS captures something about pain, but it is unclear if it is meeting its stated objective of measuring pain intensity (deWilliams et al., 2000; Hodgins, 2002; Thong et al., 2018). This is a particular challenge as sensory, affective, and cognitive aspects of pain seem to be intertwined within the concept of pain intensity. A recent validation study revealed that pain unpleasantness and pain interference appeared to be enmeshed within the pain intensity scores (Thong et al., 2018), which raises questions as to what is being measured with the NRS. Additionally, other factors such as pain quality, the environment in which pain is being assessed and, importantly, which pain anchor is studied in the psychometric analysis may be important validity concerns. Without directly asking people how they reference their pain it is difficult to know what factors affect the NRS score. Collectively, these factors could be analyzed more thoroughly as they might impact NRS validity.

An additional problem is that the validity studies were frequently determined by comparing one pain instrument to another, sometimes referred to as the *gold standard,*with one tool measuring a similar construct as evidence of criterion validity (Ferreira-Valente et al., 2011; Williamson & Hoggart, 2005). However, the practice of comparing one pain measurement tool to another pain to estimate validity has been questioned (Twycross, Voepel-Lewis, Vincent, Franck, & von Baeyer, 2015) and is considered by some to be a misinterpretation of validity (Knapp, 1985). Messick (1989) believes that evidence should guide tool development and enhance understanding of the collective meaning of scores. He also argues that validity research should be expanded to include the meanings of the self-reporter's scores, but also (a) the relevance and clinical utility of the scores, (b) clinical implications for decision-making and (c) functionality of scores as evidenced by their consequences. Exploring how pain scores are determined could perhaps be one concrete step perhaps that could assist clinicians in obtaining a fuller understanding of what the single data point provided in a pain score means clinically.

### Scale Anchors

What remains elusive in the literature are discussions of the critical role that the NRS's maximum anchor has on its reliability and validity (Hjermstad et al., 2011). The purpose of the anchor in a subjective assessment tool is to direct the individual in answering the question posed to them (Berk & Theall, 2006). Anchors should be congruent with the question and, according to Berk and Theall (2006), the attribute measured equals the statement (or question) plus the anchors. The purpose of the NRS is to measure current pain intensity during the pain experience.

This point of reference, or anchor, may have considerable sway in how a self-report is determined (Seymour et al., 1985; von Baeyer & Pasero, 2017). In their investigation of dental pain, Seymour (1985), produced five scales with variants of the high-end anchor and then asked participants to respond to them given their current pain. Their findings revealed that as the anchors became more extreme, the more pain scores tended to decrease because they were considered not sufficiently sensitive. On the other hand, if the anchors were not as discriminating, the scores tended to drift towards the anchor. The implications of that investigation (Seymour et al., 1985) are twofold. One, the anchor influences how pain scores are determined and two, the anchor is an independent variable. The potential remains for the anchor to be a source of systematic error implicitly impacting inadequate pain management.

By examining the anchors used in the literature, or those that emerge from qualitative studies, we can determine if the NRS statement and anchors are congruent. According to Hjermstad and colleagues (2011), their systematic review found over 24 anchors related to the NRS in the literature. Currently, we are challenged by agreement in standardization of pain anchors. Furthermore, the variations in anchors make comparative analysis difficult between various investigations. The two most common NRS pain anchors in the literature--*worst pain experienced* and *worst pain imagined*--at first glance seem to be appropriate anchors. These most common anchors, however, either ask individuals to use (Farrar, Young, Lamoreaux, Werth, & Poole, 2001). a historical reference or about a futuristic unknown. On one hand, there is evidence that pain memory is unreliable (Erskine, Morley, & Pearce, 1990; Puntillo, Max, Chaize, Chanques, & Azoulay, 2016; Redelmeier & Kahneman, 1996; Redelmeier, Katz, & Kahneman, 2003) and on the other hand, how can a person rank an experience based on something they have yet to experience? Regardless, these two common anchors are different constructs. Vague and indiscriminate anchors conceivably could contribute to the challenges of the pain assessment process. The individual's capacity to rate a very complex phenomenon might be affected if they consider an anchor term vague or confusing (Bergh, Kvalem, Aass, & Hjermstad, 2011). Furthermore, these types of anchors may contribute to the questions some clinicians may have pertaining to the utilization of the NRS tool and the interpretation of scores provided from the NRS tool. (deWilliams et al., 2000; Hodgins, 2002; Kenny et al., 2006; Knotkova et al., 2004; Sinatra, 2010). Current anchors are potentially problematic for pain assessment.

## NRS Administration

When it comes to assessing a subjective phenomenon, it is critically important to administer this assessment in a uniform manner regardless of the pain population or how many dimensions of pain are being assessed (Hjermstad et al., 2011). First and foremost, the dimension (e.g. the sensory dimension) that is being measured must be clearly stated. For instance, before a clinician administers the NRS, they should explain that their aim is to assess pain intensity. Assessment methodology should be standard across repeated pain assessments. Therefore, the same wording, scale, format, and anchor should be used (Hjermstad et al., 2011). The specific instructions and steps to administer the measurement tool are infrequently reported in the published literature (Smith et al., 2015b). Pain quality, location, and circumstances may vary substantially by pain population, but if the NRS or its anchors are not provided in a standardized manner, any investigations comparing pain outcomes are compromised to some degree.

### Documentation of the Clinical Pain Assessment

The aim of documentation is to chronologically and accurately record all relevant assessments, treatments, and findings in a timely manner. Quality documentation is essential for effective individualized care (Potter, Perry, Ross-Kerr, & Wood, 2009) and is a practice standard for most health care professionals. For instance, in Alberta, nurses are required to follow both Alberta and Canadian practice guidelines on documentation regardless of the setting (College and Association of Registered Nurses of Alberta, 2013, 2018). In addition, specific guidelines developed by several pain societies state that regular pain assessment with thorough documentation is important (Gordon et al., 2005; International Association for the Study of Pain, 2018b).

Despite these guidelines and standards, pain assessment documentation continues to be a challenge for clinicians (Manias, Bucknall, & Botti, 2005). Although it is plausible that pain is assessed but not documented, deficits in charting could be problematic for continuity of care and for the essential clinical communication among health care professionals (HCPs) . Poor charting practices might be an implicit contributor to some of the challenges in pain management, particularly in postoperative situations (Rafati, Soltaninejad, Aflatoonian, & Mashayekhi, 2016).

It is also plausible that when incomplete documentation occurs, it is implicitly linked to concerns of the NRS (deWilliams et al., 2000; Kenny et al., 2006) or evidence regarding how individuals employ the NRS to provide a score (Slomp, Mayan, Lasiuk, & Dick, 2018) However, charting standards require that pain be assessed and documented (College and Association of Registered Nurses of Alberta, 2013) and without this record, the challenges of treating pain may be compounded. Quality assurance initiatives need to be implemented to ameliorate this challenge (Heikkilä, Peltonen, & Salanterä, 2016) as it might undermine the clinical utility of both the working record and the NRS.

## Clinical Utility of the NRS

Narrowly speaking, the phrase “clinical utility” is commonly understood to mean how effective a tool, technique, or procedure is for utilization in a clinical setting. Moreover, the tool must be valid, have content validity, and provide the HCP with practical information regarding the individual’s experience of pain, as well as the outcome of the clinical decisions (Smart, 2006). The degree to which practitioners find the tool to be useful/suitable and/or whether it has shortcomings may well contribute to its clinical utility (Smart, 2006). Cost-effectiveness or risk-benefit ratios are at times included in what is understood as clinical utility (Smart, 2006). Although the NRS has some possible limitations, the tool has been widely accepted in clinical practice. Increasingly, various health care stakeholders are looking at the health outcomes of tests administered that could add another layer to what constitutes clinical utility (Neumann & Tunis, 2010).

Clearly, there appears to be benefits to using the NRS to assess an individual's pain. It might be simple and imperfect but it currently is the best unidimensional tool (von Baeyer, 2006) to assess pain, analgesic effectiveness, and pain relief. What is more, using the NRS as the assessment tool is a common and recommended practice (Breivik et al., 2008; Todd, 2005; Turk & Melzack, 1992). However, despite these endorsements and the tool's robust psychometrics, it is important not to view tool validity and clinical utility synonymously (Kendell & Jablensky, 2003; Smart, 2006).

Given the global questions and concerns surrounding pain assessment, the clinical utility of the NRS needs to be questioned. Whether the growing demand for better health outcomes will be applied to policies pertaining to pain assessment is not certain. Unquestionably, a case could be made to include pain outcomes given the enormous economic costs associated with inadequate pain management that surpass the combined treatment costs associated with diabetes, cancer and cardiac diseases (Gaskin & Richard, 2012; Stewart et al., 2003).

## Current Gaps of Knowledge in APT Assessment

Providing a pain intensity score is better conceptualized as a task of reducing numerous, complex, subjective data that are vaguely defined into a single score (deWilliams et al., 2000; Seymour & McClure, 2008; Slomp et al., 2018). Whether this task is routinely accomplished in a systematic manner has not been established (Slomp et al., 2018). Therefore, the processes underlying the interpretation of various information components into a pain score is an assumption. Integral to clinical decision-making is evidence of this process that could instill more clinical confidence in the NRS's utility. Understanding why and how an individual provides a specific pain rating is an important aspect of the pain assessment process.

When NRS scores are produced it appears that some contextual information is used in addition to some of the physical data of the injury (deWilliams et al., 2000; Slomp et al., 2018). Authors of a behavioural experiment manipulated expectations (context) of pain by randomly changing the visual cue provided prior to invoking a pain stimulus (Brown, Seymour, Boyle, El-Deredy, & Jones, 2008). Also, a recent clinical, exploratory investigation indicated context (including psychosocial factors) affected scoring (Slomp et al., 2018). These findings suggest that the some of the complexity of the pain experience is possibly being captured within the pain score. Growing scholarly work in brain processing during general self-reporting identified involvement of various cortical networks (Brown et al., 2008; Seymour & McClure, 2008) suggesting a complex and intricate processing when generating simple self-reports. Involvement of complex cortical networks conceptually aligns with these early exploratory findings. What remains unknown is how all the circumstantial and sensory information is reduced into one score. Investigating this could provide insights into the potential moderators of the pain experience such as memory of previous pain experiences. Additionally, it could provide further understanding of the meaning of pain and how contextual factors might influence pain. Collectively, with new evidence, it could increase the clinical confidence of the NRS.

Secondly, when pain scores are provided, they are based on the assumptions of the NRS's validity in discriminating between dimensions of pain reported in the literature (Gracely, McGrath, & Dubner, 1978; Jensen, Karoly, O'Riordan, Bland, & Burns, 1989). Messick's argument of construct stability is that the meaning of the self-reporter's scores and the score's functionality have not been validated by the various anchor terms currently employed (1989). As the meaning of the self-reporter's scores and functionality appear to be dependent on the anchor administered further exploration of the validity of pain anchors could bring more understanding to how pain scores are produced. Iimportantly, current pain anchors may not be appropriate descriptors of what the scale's objective is, to measure pain intensity (Berk & Theall, 2006) which could potentially destabilize the scale.

Early experimental work of involving the manipulation of pain scale anchors provides insights into how the scores are interpreted via the encryption of that anchor definition (Dannecker, George, & Robinson, 2007; Seymour et al., 1985). If a score can be manipulated by the anchor descriptor experimentally, it would be reasonable to assume that the two primary anchors reported in the literature might independently impact a pain score. Conversely, it is also plausible that the anchor administered with the scale is not used, but rather a personalized anchor is substituted (Dannecker et al., 2007; Slomp et al., 2018; Smith et al., 2016). Although it is important to understand which anchor is best used to best reflect an individual's clinical pain intensity, it is important to acknowledge that clinical pain management decisions are sometimes based on a potential unknown. In scenarios, whereby, an individual operationalizes her pain anchor, that anchor definition is not known to the clinician unless they ask for it or the person volunteers such information.

A third assumption is based on the previously mentioned assumptions. In each type of pain, the quality, context, and meaning are distinct, which could affect the perception of pain, thereby in turn potentially impacting how pain scores are determined (Turk, 1989). Currently, unidimensional tools and typical anchors are used in many pain situations whether it be fractures or cancer (Awolola et al., 2015; Caraceni, Brunelli, Martini, Zecca, & De Conno, 2005). Given pain's complexity and multifaceted dimensions, and considering the above concerns regarding validity, it raises the question of whether the same anchor descriptor used with NRS can measure pain intensity accurately regardless of pathology.

Considering the gaps and assumptions made within the construct of pain assessment, its plausible that the most rudimentary building block of furthering pain knowledge and understanding is to understand how subjective information becomes *objective* through a pain score.

## Summary

This overview of the pertinent literature on pain assessment provides a review of the factors and challenges in assessing pain across various health domains. The following areas were addressed: (a) the theory of pain, (b) a conceptual framework of the meaning of pain, (c) pain measurement in cognitively intact adults, and (d) a summary of the gaps in pain assessment.

In recognizing these knowledge gaps, the review clarifies the critical importance of sound conceptual frameworks of APT assessment that underpin important clinical practices. Notably, the knowledge gap regarding how the numerous aspects of pain experience data are transformed into a single pain score upon which clinical decisions are based warrants exploratory investigation.

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# CHAPTER 3 - METHOD

This chapter, describing the methods I used in my study, is divided into the following sections: situating the research, background and a rationale for the choice of interpretive description (ID) approach, research design, data collection, and analysis, ensuring qualitative quality, ethical considerations, and a chapter summary.

## Situating the Research

My clinical experience underpins my ontological and epistemological position in this research. It is important to understand my disciplinary orientations as it is the lens underpinning this ID study. According to Chenail,(1997), clinical researchers tend to formulate research questions that resonate from their practice experience. Constructions of questions and concepts made in practice, termed sense-making, need to be deconstructed and through the qualitative research process a new sense-making needs to be developed based on a clinical's research (1997). The challenges surrounding pain assessment are of concern to many groups of people, such as nurses, physicians, exercise physiologists, patients, and families. As an exercise physiologist, I am interested in the rehabilitation of an individual with pathology that is muscular, neurophysiological and skeletal in nature and that is typically accompanied by pain. The over- or under-reporting of pain could theoretically impact rehabilitation outcomes. I have noticed cases where pain, whether it be under or over reported, has the capacity to delay or limit patients' from achieving their maximal rehabilitative potential. These delays and the inability to reach maximal rehabilitative potential, may lead to chronic pain, lowered functional outcomes, and poorer quality of life (Bayer, Magnusson, & Kjaer, 2017)

A more in-depth understanding of the pain experience will assist an exercise physiologist in providing more effective therapeutic interventions that more closely address patients' unique pain experience. My extensive interdisciplinary clinical experience as an exercise physiologist and its social mandate (helping others) has shaped my way of thinking and reflecting on how pain and meaning are created in different contexts.

Pain assessment is a concern for most health care disciplines and therefore, is pan professional. I have worked in public and private health care as an exercise physiologist in rehabilitation. My early career introduced me to interdisciplinary work with other health care professionals including occupational therapists, physical therapists, psychologists, nurses, physicians, and physiatrists. I took full advantage of the many in-house educational forums including a significant amount in the growing field of pain medicine, led then by a clinician who later became an active member of the International Association for the Study of Pain's (IASP) Education Committee of which I also am a member.

I have worked with persons who have experienced numerous types of injuries, pathologies, and mental health diagnosis that included acute, chronic and breakthrough pain in both the public and private sectors. For the last two decades, I have had my own private practice of active rehabilitation, including medical-legal opinions on litigation issues pertaining to injuries sustained through motor vehicle accidents. The Queen's Bench in the Province of Alberta has qualified me as an Expert Witness. In recent years, I have been retained to give expert witness opinion on several civil lawsuits pertaining to questionable therapeutic exercise practices that resulted in increased pain and an exacerbation of the pre-existing conditions.

In January 2017, my colleague and I spearheaded a strategy to bring provincial attention to the IASP 2018 global year of "Excellence in Pain Education". We embarked on gathering a non-partisan pan-professional group of individuals across academic, regulatory and member organizations to collectively work towards a provincial strategy for much-needed work across the province pertaining to the many challenges surrounding pain management. We were amazed as we watched this endeavour flourish and take form. Soon, Alberta Health Services's (AHS) Strategic Clinical Networks, became involved along with other professional organizations and regulatory bodies. Currently, I am one of the senior planners of the revised initiative with AHS and we are now in the process of building a comprehensive and sustainable pain strategy across the lifespan for acute, chronic, and palliative pain populations for Albertans.

Collectively, this time in the field and my educational background forms the disciplinary orientation from which my research began to take shape. Thorne refers to this as the initial scaffolding of an ID study (2008). I had so many questions about why people "presented" so differently, yet, their pain ratings could be the same. I needed to begin with an exploratory study as I could find little research in the literature addressing this specific aspect of pain assessment. Secondly, embarking on the research journey meant I needed to sort out my thinking on pain assessment and what the integral issues were with this subjective assessment of the pain phenomena as I moved forward into the research. Importantly, I would need to listen to the voices of those who not only experienced pain but had to provide an NRS score for clinicians.

## Background and Rationale for Choice of Interpretive Description

The ID approach which draws on naturalistic inquiry (Lincoln & Guba, 1985) was used in this research project. Developed for the nursing discipline by nurses, Thorne, Kirkham, and Emes (1997), it has been employed by numerous applied disciplines. The modus operandi of ID is its flexible approach from which to make methodological research decisions; thus, it is not a prescriptive approach (Thorne, 2008) regarding, for example, sampling, and analytic strategies. The objective of ID is to identify patterns and themes (understandings) of clinical challenges to develop possible understandings of a phenomena. This is not theory building *per se,* and in that sense,it is a circular approach; clinical challenges researched are applied back to the clinical situations (Thorne, 2008; Thorne et al., 1997). The foundation of ID is its position regarding reality. Reality is dynamic, multifaceted and subjective in nature therefore, great value is placed in ID on how the individual experiences their world (Thorne, 2008). Another defining feature is that the researcher interacts with the data to actively formulate findings. Furthermore, qualitative research embraces the researcher's disciplinary orientations as part of the inductive process (Finlay, 2016; Sandelowski & Barroso, 2002; Thorne, 2008; Thorne, 2016).

I chose ID for several reasons. As an exercise physiologist I am relying on my disciplinary orientations to inform methodological decision-making (Thorne, 2016). First, the unique individual experience of APT is consistent with the principle that pain is what the individual expresses it to be (McCaffery & Beebe, 1989). ID is congruent with this pan clinical underpinning as it requires the research to come from practice settings where clinical judgments are made (Thorne, 2008). Pain crosses most clinical settings and my research findings might be applied in other practice settings. Second, the research question and the purpose of my study are congruent with ID endorsement of multiple realities. ID acknowledges that despite pain being an unique experience, patterns might be employed to reference a pain event, that may enhance clinical knowledge and understanding (Thorne, 2008). Third, the flexibility of ID allowed me to design and employ interview questions that could contextually probe the specific situation of what was being conveyed in the interview. Additionally, it allowed me to select an appropriate analysis that is consistent with a "hard to articulate" research question (Thorne, 2008). Lastly, if sufficient data is obtained for clinically relevant patterns to emerge from the analysis and the research question has been answered analysis ceases. This approach is suitable when "certain phenomenon occurs commonly within clinical" practice when more indepth experiential knowledge is needed for exploratory qualitative research projects (Thorne, 2008, p. 94). As outlined in the literature review, there are many investigations into the lived experience of pain;.however, I used this approach because there are gaps in our knowledge and understanding pertaining to how the experience of pain is translated into a pain score for the purpose of pain assessment. Exploring how people reference their APT and then produce a pain score could provide clinicians with additional insights into how the NRS is being employed. The role of the NRS anchor could also provide insights into how the pain experience is possibly operationalized. If it is the case that individuals operationalize their anchor, this information could provide clinicians with additional data and insights from which to make pain management decisions.

## Research Design

This section is a detailed description of the following areas of research design, including setting, sampling strategies and recruitment, data collection and analysis, credibility, and ethical considerations.

### Setting

The study was situated in a major urban city in Western Canada. Participants were recruited from various facilities in this area. Tertiary care centers provide an extensive variety of services that are provided by a range of health care providers.

### Sampling Strategies and Recruitment

The contextually dependent nature of human experience requires sampling and sampling strategies whereby individuals who experience similar situations (traumatic injury) and yet can provide sufficient variation can be selected (Morse & Field, 1995; Patton, 1990; Thorne, 2008). The sampling strategy must also be congruent with both the research question and purpose (Thorne, 2008). I employed a purposive sampling strategy, in which I sampled people who were most likely to provide information on the phenomenon of interest. People who were 18 years or older and had sustained some type of acute traumatic injury (i.e. fracture, burns, lacerations) were eligible to participate. Please see participant subsection for details of inclusion criteria. I also used the strategy of snowball sampling (Patton, 1990) with the targeted population whereby I asked participants if they knew anyone who had a serious trauma injury that led to their admission to a hospital (Given, 2018). Two participants revealed they knew someone who had a similar traumatic injury. Interested in the research and meeting the inclusion criteria, they became participants.

In ID, there is no ideal sample size. Rather, the size of the sample is dependent on the quality of the information provided by participants and yet should have sufficient variation to capture the scope of potential experiences in a clinical situation (Thorne, 2008). In other words, there should be sufficient data to see a pattern that could be applied to clinical practice. Financial and temporal components also factor into the choice of sample size as sometimes budget constraints or project deadlines limit more time or money invested in the investigation (Patton, 1990). Importantly, saturation is not a term ID endorses, as all potential variations of practice cannot possibly be captured and which is incongruent with the value statements that multiple realities exist in practice (Thorne, 2008). When the research question has been answered with themes and patterns emerge that could “make sense” and be relevant to practice settings within a specific context and the research question has been answered, in ID collection and analysis ceases; however there is a caveat that further studies might uncover more variations and complexities within this phenomenon (Thorne, 2008). Upon completion of the 13th participant’s data analysis, I believed I had sufficient clinically related patterns that the research questions had been answered.

Approved posters were used to invite individuals to contact the researcher if they wished to participate in the research project. These invitations were posted in the orthopaedic examination rooms of the Kaye Edmonton Clinic associated with the University of Alberta Hospital. One primary care network clinic placed the posters in their examination rooms. Three City of Edmonton leisure facilities also displayed the poster on their general information bulletin board. Finally, digital copies were distributed through my professional networks.

## Participants

Eighteen individuals were screened by telephone to determine their eligibility for participation in the study; 13 people met the inclusion criteria and were enrolled in the study. The inclusion criteria were as follows: 18 years of age or older and having sustained a traumatic injury which required admission to a tertiary care facility for at least one night and could read and speak English. Additionally, participants were interviewed between 6 and 52 weeks post discharge. As the nature of the injury was a result of trauma and there was an admission to a hospital, both events that are unusual for the average individual, it was felt that the memory of these events would remain intact over that period. No hospital length of stay was used in the inclusion criteria.

Exclusion criteria for this research project included persons whose injury occurred due to an assault by another person and individuals who experienced an acute episode of pain due to a pathological medical condition. People with pain due to an assault or disease were excluded because they might have very different meaning and understanding of their pain. In the case of pain due to an assault, an element of injustice is introduced. Individuals with disease progression accompanied by sudden pain may have either a genetic component or lifestyle factors that could alter the meaning of their pain.

The final group of participants who were eligible for this study consisted of 13 individuals. (Please refer to Table 3.1 for details). Five men and eight women participated with a range of age from 20-76 years and a mean of 45.8 years. Ten participants had fracture injuries, one participant had a hip dislocation, one participant had burn injuries, and one participant had polytrauma. All participants experienced pain with the mechanism of injury and postsurgically with the vast majority conveying they had moderate to severe pain. The most frequent mechanism of injury was a fall (n=10), and the others were an object falling on an individual (n=1) and vehicular accident (n=2). The location of the injury was most commonly a recreational facility/field (n= 5), and then home and workplace (were both an n=3) and motor vehicle (n=2). The occupational categories for the participants and the number of participants in each category are as listed: labour – three; trades –two; office – three; professional -three, and;other -two. Participants arrived at ERs in various ways: land ambulance, air ambulance, or arrived independently. Some participants underwent surgical intervention immediately while others had to wait on the ward (up to four days) for a surgical appointment. Table 3.1 identifies the participant's characteristics and variation of the sample size with respect to age, gender, type of acute injury and vocational background. The above information provides general characteristics of the participants in this study, which is merely useful for contextual information and is not meant to be descriptive as one would expect from a quantitative perspective.

Table 3.1

*Participant Characteristics*

| ID # | Gender | Age | Type of injury | Accident site | Occupation |
|---|---|---|---|---|---|
| 3301 | M | 20 | Dislocation | Home | Labourer |
| 3402 | M | 52 | Polytrauma | MVA* | Labourer |
| 3503 | F | 65 | Fracture | Recreational | Office |
| 3604 | F | 46 | Fracture | Home | Professional |
| 3605 | F | 76 | Fracture | Home | Retired |
| 3706 | F | 31 | Fractures | Recreational | Office |
| 3807 | F | 50 | Fractures | Work | Office |
| 3908 | M | 55 | Fracture | Work | Trades |
| 4109 | F | 32 | Fracture | Recreational | Professional |
| 4210 | M | 54 | Fractures | Work | Trades |
| 4311 | F | 59 | Burns | MVA * | Labourer |
| 4212 | M | 36 | Fracture | Recreational | Student |
| 4313 | F | 20 | Fracture | Recreational | Professional |

*MVA denotes motor vehicle accident

## Data Collection and Analysis

In this section, the details on the entire process of collecting and analyzing data are described. Some of the data handling was guided by Thorne's approach (Thorne, 2008; Thorne, 2016) and the methodological decisions related to research procedures were guided by Mayan's approach (2015).

## Interview Format

According to Rubin and Rubin (2011) the purpose of the interview is to gain insights, meanings, and perspectives of people who have experienced the research phenomenon being investigated. In ID, the semi structured interview is the most common form of interviewing (Bryman, 2004; Thorne, 2008) and was the form used in this research. This source of data collection was appropriate as the best way to determine how people introspectively determine their pain score and attribute meaning to the event as access to their introspective and cognitive processes would be the best technique to elicit this data. For example, an observational data collection strategy would be unlikely to produce data that reflect their inner thoughts on determining a pain score. The guiding questions used for the interview are designed to elicit a broad range of responses to the questions posed. These types of questions need to be sufficiently flexible to allow the researcher to adjust to the context of the actual interview (Thorne, 2008). This adaptability ensures that a flow of conversation can occur rather than follow a rigid, sequential line of questioning.

I encouraged eligible participants to choose the place of the interview in which they would feel most comfortable discussing their trauma and pain. Four participants invited me to their homes, I interviewed two participants at their places of work and the remaining participants had interviews completed at mutually agreed public spaces such as a coffee house, a meeting room in a library or a recreational facility. Although I had explained the purpose of the research at length with participants by telephone previously to determine their eligibility, I spent some time during each interview building rapport (up to 30 minutes), after which I proceeded with explaining the purpose of the research and obtained their signed consent forms. Building rapport with the participants was important because of the traumatic nature of their injury (or injuries) and helped build a trusting and ethical relationship in order to deconstruct their traumatic experiences while still feeling safe with me (Austin, 2008). Interviews were digitally recorded and were immediately uploaded to the Health Research Data Repository. The interviews ranged in length from 50 to 70 minutes, but the time spent with them often exceeded a 100 minutes. The transcription of each interview occurred on the secure repository through a virtual portal; the transcription time took approximately 6 -8 hours/participant. As I required time to not only transcribe the data but to iteratively collect and analyze the data, I would only interview participants after I had completed these steps for the previous interviews. During this time, I would also review the interview questions and modify them based on the ongoing collection and analysis of data following Thorne's recommendations (2008).

## Interview Questions

In attempts to capture how pain was referenced for an NRS score during the acute pain experience from the onset, questions needed to be tailored to the scene of the accident when that was possible and then progressed to the how participants referenced their acute pain assessments in tertiary care and potentially rehabilitation. Therefore, the questions given to participants varied somewhat according to their specific experiences. For instance, one person lay in a dark cold field until the rural ambulance arrived while others walked into the ER for medical assistance. Questions for the rural participant in part dealt with the length of time waiting for the ambulance and how the wait affected her pain perception. Please see Figure 3.1 for the potential sequence of events when a person has had a traumatic injury. Questions focused on the four major areas: the acute pain event itself (mechanism of injury), formal pain assessments, interactions with clinicians administering the NRS and meaning-making. See Appendix E for an example of guiding interview questions I used early in the data collection process.

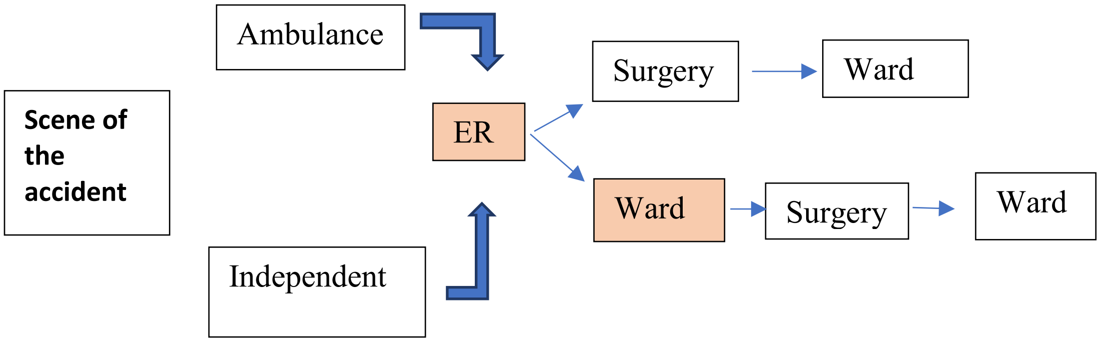

*Figure 3.1* Sequence of acute trauma events

In qualitative research, data collection and analysis is an iterative process. Therefore, as some themes began to take shape through the analytical process, these themes were verified with consecutive participants with more targeted questions to confirm what I thought I was seeing but also to determine if there were areas I had not yet captured. The objectives of these probing questions were not just to verify themes but also to obtain evidence of varied descriptions elicited for that theme, as Thorne argues that differences are clinically just as relevant as similarities. Identifying themes and clinically relevant patterns demonstrates the “how” and “why” of an ID clinically relevant phenomenon that merits investigation. Adjustments were made to the semi structured interview questions that reflected the ongoing data collection and analysis (Morse, Barrett, Mayan, Olson, & Spiers, 2002; Richards & Morse, 2007). The process of verification of emerging themes resulted in some initial ideas being dropped but also explored nuances of themes, and at times, previously unidentified themes were discovered. For instance, the first woman interviewed felt that labour pain should not be called pain because the reason she was pregnant was her choice; therefore, labour pain was a choice. This idea was tested on subsequent females who denied that unique interpretation so that the idea of labour pain being a choice was dropped from the interview questions.

## Analysis of Data

Iterations of collecting and analyzing data inform each other in a systematic way (Thorne et al., 1997) as the researcher collects data and continues analysis until the research question has been answered with rich description (Thorne, 2008) The data analysis of each data collection point helps inform the researcher about what remains to be understood about the phenomenon. This understanding then influences decisions about subsequent data collection. This iterative and concurrent process also enables the researcher to be actively engaged in the data (immersion) which helps ensure that design logic is achieved (Thorne, 2016). Throughout this process, the evaluation criteria and more subtle critiques termed *Beyond Evaluation* were iteratively examined to ensure credible research (Thorne, 2016). Verification strategies were also used in the analytical process. Unlike other qualitative methods, ID does not prescribe what analytical strategy to use. Rather, it requires the researcher to apply a strategy that is congruent with both the research question and how data is collected (Mayan, 2009; Thorne et al., 1997).

### Analysis phases

I employed the latent (conventional) content analysis strategy described by Hseih and Shannon (2005) as they recommend this strategy when little is known about the phenomenon. Although there is substantial data on the experience of living with various types of pain in the literature, there is little known of how people have used their lived experience of pain in determining their NRS pain scores. For my analysis, I followed the recommendations of Hseih and Shannon (2005) and Thorne (1997) by initially spending time immersed with the raw digital and textual data. Content analysis organizes the content and context of the data into similar meanings. These similar meanings can reflect “explicit communication or inferred communication” (Hsieh & Shannon, 2005, p. 1278). In the data analysis potentially important themes or meanings were identified. This procedure is endorsed as being more reliable and dependable with inductive processes of ID “than are the more formal coding systems” (Thorne, 2008, p. 147)

The theme “imminent loss of consciousness” is an example of inferred communication whereby not all participants used the term but rather inferred that their pain had progressed to such a point that their capacity to cognitively function and be aware of the sensory data around them had significantly decreased yet they had not reached the point of “imminent loss of consciousness.” In severe pain, participant’s lived world experience is narrowed to “a world that is pain only,” unable to respond to, or nearly unable to respond to, other sensory information. This feeling led them to think or infer that they were at the brink of consciousness. In other words, because they felt they were no longer able to cognitively or physically take in any more sensory information, they felt as though their experiential end-point would be “passing out.” It is important to note that no participant actually lost consciousness due to severe pain rather this could potentially be a metaphorical representation. As this research study examined how people rated their pain from the initial accident to their rehabilitation, in some of the more severe injuries, NRS scores, reflected the changing dynamics of pain. Once pain management strategies had brought relief, and as healing continued, participants seemed to maintain the use of their initial or postoperative pain frame of reference with consecutive pain assessments. When participants were cited as having low pain or discomfort, this may not have reflected their original pain scores. In citing patients with the lower score or having discomfort I was trying to distinguish that sometimes participants use the NRS to describe soreness, achiness or discomfort.

During the immersion phase I listened to the digital recording and reread the transcript multiple times to get a sense of the whole but also to observe my questioning style for biases and whether my probing questions adequately addressed the content I wanted the participant to elaborate on. As I transcribed the digital recordings myself, I wrote some of my initial thoughts reflexively. This step proved to be helpful in the next phase of analysis. Typically, the transcription process and the cleaning of the data took about six hours per participant. Transcribing the data provided me with a thorough understanding of the text data. The cleaning of the data involved verification of the transcript with the digital recording and the removal of verbal pauses.

By the fourth participant, I felt I had remained relatively immersed in the data without coding what I was hearing and thinking. At this time, I wrote memos about the broad strokes of the data. Similarly, I questioned what these broad strokes and impressions could possibly mean conceptually, in terms of how they were related and how they were different. The next step I took in this initial phase was that I re-read the four participants' text data word by word and identified key concepts and gave them labels as recommended (Hsieh & Shannon, 2005; Mayan, 2009; Thorne, 2008) for each of the transcripts. In the initial phase of the analysis, I labeled the hard copy of the transcripts themselves using coloured self-adhesive "stickies" and then transferred the tagged relevant data, through the cut and paste options in Micorosoft Word, into columns in a new document. This more visual and active approach also helped me to stay absorbed with my data. Finally, I then sorted through the themes and patterns based on the relational aspects and linked meanings (Hsieh & Shannon, 2005). This conventional analysis approach kept me in the inductive process by creating themes and patterns directly from the text, which was an important aspect of the process required for conventional analysis (Hsieh & Shannon, 2005; Thorne, 2008).

I then moved to more advanced themes. This strategy involved iteratively comparing (I used “constantly” in the thesis presentation to describe what I did iteratively) the themes and patterns to determine if they were independent of each other or could be nested together under a different category as the data collection and analysis continued. I then began iteratively examining the themes between participants’ data. For example, the themes “pain is the only thing of my mind,” “room is spinning,” “cannot focus on anything,” “feeling light-headed,” “going crazy with pain,” and “going to pass out” collapsed into two patterns of “loss of cognitive function due to pain” and “passing out.” These then formed the conceptual description of “imminent loss of consciousness.” This is conceptually different from actual loss of consciousness. Consciousness is defined as having the capacity to respond to sensory stimuli and a state of being aware (Dorland, 1980). Definitions of the themes were formed concurrently; in the case of the last example this was defined as “approaching maximum pain”.

If loss of consciousness had occurred NRS could not be used because it is designed for conscious adults. Clinicians would have to choose a more appropriate pain measurement tool in such cases. Although people can lose consciousness for various medical reasons, if comorbidities exist, clinicians would factor that into their interpretation of the person’s medical status. For instance, in a traumatic event if there was sufficient blood loss and the person had lost consciousness, clinicians using their critical thinking would not assume pain to be the reason for this loss of consciousness.

Importantly, participants were using the ILC as a guide from which to reference their score like other pain anchors (worst pain imaginable or worst pain experienced) and not because they would reach or had reached actual loss of consciousness. Rather, their sensory and cognitive capacities had diminished substantially enough that they were no longer aware of what was going on in the room around them. The operationalization of the pain anchor replaced the anchors, if administered, such as “worst pain imaginable.” They argued that it is not possible to measure pain against something imaginable.

In discussions with Dr. Mayan, the wording of some complex themes was refined to some specific theme labels. See Appendix H for an example of my theming phases. Please see Appendix F for other examples of coding phases and Appendix G and I for theme development. Reflexive notes and or memos (data) were also incorporated into the analysis which can be viewed in Appendix H and I. For example, I wrote about the fear of participants not knowing when they would receive pain medication in the ER as a factor contributing to their perceived pain and the meaning of the pain. Pain perception is further impacted during this time when the tissue damage has not been treated while swelling and inflammation are continuing to progress.

By the seventh participant, I felt the themes and patterns were strong enough to construct a tentative analytical framework which I introduced to the consecutive participants once the interview was completed. The aims of this step were twofold: a) to introduce the concepts of the framework once they had already completed the interview so as not to lead them, and b) to identify whether the analytical framework resonated with participants or whether I needed to refine the process or add other elements to the framework. As the consent did not cover this aspect of the research, I did not record this information digitally. However, reflexive notes were written after the interviews. It was in this process that it became very clear that when the NRS was administered to them, they were living the pain and did not reference historical pain events despite the directions (if given) by the clinician to compare their current pain to the “worst pain experienced.” Please see Appendix G for an example of the preliminary conceptual framework.

Once themes and patterns clearly emerged and this analysis demonstrated that the research questions had been richly answered (Thorne, 2008), I entered the final phase of analysis by writing the findings into a coherent manuscript which adequately reflected the data collection and analysis. I found this last phase particularly challenging as a new researcher.

This analysis phase reflects the researcher (as instrument) who makes judgements and chooses what constitute conceptual descriptions (findings) (Bergman & Coxon, 2005) based on their epistemological and ontological orientations (Carter & Little, 2007). Thus, my findings "reflect an interpretive maneuver" whereby I considered what "the pieces might mean individually and in relation to one another" and how they might apply to practice (Thorne, 2008, p. 163).

## Ensuring Qualitative Quality

Markers of quality pertaining to qualitative research have undergone many adaptations in the last quarter century (Mayan, 2009). Thorne and associates (2004) argued that what we label these qualities to evaluate research projects, in the final judgment is determined "largely from the way the specific analytical decisions are presented and contextualized within the larger picture" (Thorne, Reimer Kirkham, & O'Flynn-Magee, 2004, p. 15).

### Interpretive Description Evaluation Criteria

Evaluation of ID studies ascribes credibility by the following criteria: "epistemological integrity, representative credibility, analytical logic, and interpretive authority" (Thorne, 2008, p. 223). Collectively, these criteria give the confidence that the findings are an accurate representation of the data (Finlay, 2016).

The epistemological integrity of the research process requires methodological consistency from forming the research question to the data collection and analysis (Thorne, 2008; Thorne et al., 1997). For ID , this requires that the research question comes out of a practice setting and through the research process, returns findings to practice that are not only descriptive but also interpretive (Thorne, 2008). My research questions came out of clinical settings and were “How do people with acute traumatic injuries determine their NRS pain score?” and “What meanings do people with acute traumatic injuries associated with their pain experience?” These questions reflect the values of ID including the acknowledgment that multiple realities exist in practice and that the researcher and participant coconstruct the data in how knowledge is obtained and created (Carter & Little, 2007; Koch, 1995; Thorne, 2008). ID also focuses on differences as much as similarities as in the case of the question “How do people determine their pain score?” Data collected and analyzed iteratively were constructed by open ended questions through a semi structured interview and analyzed inductively through the lens of a clinical researcher.

The criteria of representative credibility require that the “theoretical claims they purport to make are consistent with the manner in which the phenomenon under study was sampled” (Thorne, 2008, p. 224). The theoretical phenomenon in this study is the determination of an NRS score. Although there is substantial literature on the lived experiences of pain under various conditions, there is a gap in our knowledge and understanding of what factors are used to determine NRS pain scores. The population selected was individuals with acute traumatic injuries and the participants in this study were from this population.

Analytic knowledge “makes explicit the reasoning of the researcher” demonstrating the transparency of the decision-making (Thorne, 2008, p. 224). Assurance that an inductive process has been employed throughout the research is important. The researcher’s underlying assumptions and values have been stated (see Situating the Research earlier in this chapter) and examples of how themes and patterns have been made transparent are in this chapter as well as in the published peer reviewed manuscripts. Additional examples of my inductive process can be found in the following Appendices: Guiding Interview Questions, Theme Phases, and Pattern Development.

Interpretive authority requires the need for “assurance that the researcher’s interpretations are trustworthy” (Thorne, 2008, p. 225). This requires a reflective process by the researcher to check for biases in the analytical and interpretive stages of the research. Throughout the iterative data collection and analysis reflective notes and memos were written, studied and used to construct data or provide examples of the inductive processes at work. Furthermore, the analysis of how codes, categories, and themes were produced was presented to peers and committee members to review and critique for potential pitfalls of logic or bias.

## Beyond Evaluation

In this section, a critique of the research study as outlined by (Thorne, 2016) is described in order to consider the wider disciplinary relevance, social, and epistemological influences on the study.

**Moral defensibility.** Moral defensibility means that there are convincing reasons why we need to do the research and what possible benefits the findings might have for clinical practice (Thorne, 2008). Pain assessment has been identified as a potential contributor to the challenges of pain management. Increased understanding and knowledge pertaining to how people use their pain experiences to form an NRS score is integral to discovering how we can better understand the overall pain assessments and where the gaps lie so that practical solutions can be found in the pan clinical problem of inadequate pain management.

**Disciplinary relevance.** Disciplinary relevance pertains to the importance of the study in generating knowledge that contributes to an applied discipline (Thorne, Joachim, Paterson, & Canam, 2002). The challenges surrounding pain assessment and the consequential management decisions were identified about four decades ago and continue to be a significant problem that impacts society, families, and persons (Gaskin & Richard, 2012; Goldberg & McGee, 2011; Nahin, 2015; Stewart et al., 2003; Wu et al., 2003). Therefore, understanding how people use their entire pain experience to transform it into a single data point (NRS score) is relevant to applied health care disciplines.

**Pragmatic obligation.** The credibility of a research study can also be viewed from its pragmatic obligation to its discipline (Thorne, 2008). While acknowledging that multiple realities exist in practice, studies can be considered by their potential pragmatic application in the clinical setting. Qualitative researchers should, therefore, consider that their findings might be applied to their field before they can be verified through other scientific evidence without inducing harm. In addition, the conceptual findings of this study could not only be applied to practice but also to pre-licensure pain education courses without inducing harm to students or patients.

**Contextual awareness.** This aspect of credibility draws attention to the researcher's awareness of her own biases that may influence the analytical process and consequentially the conceptual descriptions that are returned to practice settings (Thorne, 2008). The researcher is the instrument of the investigation and analyzes the data and thus it is conceivable that blocking one's bias would be challenging for most researchers. To monitor and mitigate the effect of my biases throughout the iterative data collection and analysis, my thoughts, beliefs, and values were repeatedly noted in memos, reflexivity writings and journaling. Although attempts to mitigate these historical contexts were made, it is nonetheless acknowledged that the researcher is strongly influenced by these very values due to the social nature of qualitative research as “no science… is neutral, objective or value free” (Mayan, 2009, p. 19).

### Probable Truths.

This criteria “demands a reverence for the ambiguous zone of validity and shared reality” known as a probable truth (Thorne, 2008, p. 229). Research findings cannot fully account for every potential clinical situation and claim representation for all situations. Rather some knowledge can be seen as probable truths for the population studied or the best knowledge and meaning we have currently (Thorne, 2008). Thus, it is plausible that future research may provide evidence to the contrary of the conceptual findings described in this study. My research is exploratory in nature and designed to gain insight into a very specific area within pain research. The conceptual descriptions generated in this study could be viewed as new clinical insights into how people score their pain. One of the ways I attempted to establish this study’s relevance was presenting my study in professional venues; clinicians provided constructive feedback as to how the presented concepts could be relevant. Although there are limitations in what can be claimed by my conceptual descriptions, they have potential to be applied in clinical situations involving f APT. It remains to be seen how helpful these conceptual descriptions are when applied to practice.

## Verification Strategies

Verification is defined as “the process of checking, confirming, disconfirming and accounting for variability” (Mayan, 2009, p. 108) and is meant to ensure that the inductive process is followed (Thorne, 2008) with the aim to keep the project methodology consistent , employ theoretical thinking, and concurrently engage researcher responsiveness (Morse et al.,

2002) in order to ensure the results are credible. I employed strategies of data immersion and reflexivity to check that I was on the right track as well as incrementally check and correct for possible threats to credibility throughout the scientific process (Thorne, 2008). These strategies provide a robust layer of accountability to safeguard that the study demonstrates credibility in that it retains transparent and inductive logic. Likewise, the study's findings should demonstrate how knowledge is verified, has credible results from the raw data, demonstrates analytical logic and is constructed with interpretive authority (Thorne, 2008).

## Data Immersion

A premature closure is one pitfall identified (Thorne, 2008) which involves making conclusions too quickly regarding themes and patterns before a broader interpretation can evolve. Spending a significant amount of time with the raw data is integral to the trustworthiness of the findings. I avoided premature coding, as advised (Thorne et al., 1997) by listening to the digital file many times, and concurrently making notes on what was emphasized, what was tone used, and what was implied. When I could recollect facial expressions or body postures, I noted them. Because the written word comes to our consciousness in a different manner than what we hear, I also read through each transcript multiple times. I noted observations of these readings compared to what and how it was said on the audio file or what I visually recollected. Spending time with the raw data built an important platform on which I could base my interpretations confidently.

Thorne also warns about other potential pitfalls when using ID (Thorne, 2008) that could affect the credibility of the investigation. A priori theories should be avoided when exploring the research question, primarily because theories would limit the ability to produce accurate findings that reflect the context in which the phenomenon occurred and result in trying to find the data that match the theory. I tried to avoid theories by reminding myself of the uniqueness of each individual and by staying both open and curious. Heeding Thorne's advice, I avoided this challenge by trying to suspend my early thoughts on codes with reminders to myself to "let us see what develops over time" and "it's too early to see design yet".

Another pitfall is giving the frequency of data too much relevance, or conversely, concluding that something was not relevant because it was not said in the interview. This challenge was dealt with by repeatedly listening to the digital interviews of the participants by carefully listening to the tone used (quality) and simultaneously suppressing the frequency of words in the data bits I heard (quantity). An example of this was the identification of imminent loss of consciousness in the findings. Many participants implied it but only a few inferred to *passing out* as a guide to how they scored their pain. This important finding could have been lost without looking deeper into the complexity of the data of what was not said.

### Participant Checks

This verification strategy is the process by which feedback is sought from participants (Mayan, 2009)**.** The traditional strategy to return findings to participants for their agreement or "check" has come under critical comment as it could interfere with the analytic process (Thorne et al., 1997). The primary rationale for this argument is that findings are co-created by the researcher and the participant at the time of the interview and not retrospectively (Thorne, 2008). Rather, as advised by my supervisors, I developed a preliminary conceptual framework from the data at about the halfway point of data collection. This conceptual framework was presented to the remaining participants after the formal interview was completed (Thorne et al., 1997) and used as an informal participant check. See the analysis section for the details of this verification strategy. See Appendix G for an example of the preliminary conceptual framework and the final rendition.

**Reflexivity**

This strategy is captured well by “to be reflexive is to have an ongoing conversation all about the experience while simultaneously living in the moment” (Finlay, 2002, p. 532). Although an imperfect tool, reflexivity provides a window into the integrity of the analysis (See Appendix I: Reflexivity and Memoing). It is an evaluation of the researcher’s thoughts and decisions. It was through this strategy that I finally found my eureka regarding the labelling of the third referent pertaining to the research question “How do people reference their pain?” I wrestled with the concept that, I termed, “imminent loss of consciousness” for over six months. Here are a few excerpts from my reflexivity notes:

> “February 21, 2015
>
> My codes and categories base on my data is pointing me to something about the high end of pain that people are using to decide where their pain experience fits on the scale. I have the codes “pain is central”, “room is spinning” “cannot focus on anything”, “feeling light-headed,” “going crazy with pain,” and “going to pass out.” The spinning, lack of focus and being light-headed seem to be associated with loss of an awareness of oneself to do some degree in that these aspects are in the forefront of their minds. But there also seems to be an element of not being aware of sensory data in their environment at that time unrelated to their body as in what’s happening in the room or what people around them were doing.”

Months later it finally dawned on me. Although the conceptual finding of the *imminent loss of consciousness* may be part of the initial sensory experiences at the time of the trauma, what the participants was referring to be a “pre-reflective moment.” Here is another excerpt demonstrating closure on the matter.

> “August 29, 2015.
>
> I have collapsed the codes into two categories of “loss of cognitive function due to pain” and “passing out”. Participants with severe pain at the time of the injury or postsurgically seem to be referencing the high end of the scale. These codes are implicitly reflecting the function of the maximal anchor term for the NRS which is to contain the range of responses by defining the end-point (anchor). Participants seem to be using their own idiosyncratic way of determining how much more pain they could endure based on their body’s and mind’s ability to be fully present in the moment (consciousness). These two categories then formed the theme of “imminent loss of consciousness” a frame of reference from which participants employed to provide a pain score.”

Generally, people are likely to understand and agree with the NRS’s minimum anchor of “no pain” but the concept of “worst imaginable pain” has been described as more difficult to understand by patients (Rafii, Buckingham, McGrath, & Price, 1983; Wewers & Lowe, 1990). Attempts to label the maximum limitations have resulted in over 24 different terms reported in research articles (Hjermstad et al., 2011). Likewise describing the term “worst pain imaginable” is complex in part due to the multidimensionality of pain experience and its linguistic challenges. For the maximum anchor “pain as bad as it can be” it has been argued that it “has no absolute value and could be argued to be unmeasurable” (Wewers & Lowe, 1990, p. 234). The anchor usage seems to be dependent on what the person’s unique interpretation of this maximal value is (Wewers & Lowe, 1990). This bring the problem of pain assessment full circle and back to the conundrum stated in the literature review by what it means for a clinician to interpret the pain score when they do not know what the person's unique interpretation is of maximum pain and which dimension of pain is being reported or conflated into the score (Bergh et al., 2011; Kenny et al., 2006; Wewers & Lowe, 1990). Studies with nursing and midwifery students (Bergh, Jakobsson, & Sjöström, 2008; Martensson, Ek, Ekstrom, & Bergh, 2014) demonstrate the conceptual difficulty of trying to define a maximum pain anchor. Nursing students included the following themes: condition related pain, overwhelming pain, experiences of losses, deliberately inflicted pain, psychological pain, vicarious pain, and accidents. These themes are not only diverse they are elusive in nature. The authors suggest that students imply the worst imaginable pain includes hope or pain relief, grief, control of the situation, powerlessness, empathy

## Ethical Considerations

This section contains the details of the university ethical approval for human study protection, confidentiality, the collection of consent, security of data and relational ethics.

The University of Alberta Human Research Ethics Board (HREB) follows the Tri-Council Policy statement on ethical conduct for research on human subjects (Government of Canada, 2014). Documentation of ethical approval of my research, Study 10: Pro00038310, can be found in Appendix B. The information sheet and consent form for participants were approved by the same board and can be found in Appendix C. As the recruitment poster also required approval it can be found in Appendix D.

I screened potential participants by telephone and if they were eligible, I would then provide basic information on the purpose of the study, and the amount of time it would require.If the participant was interested, we would then decide where to meet. All participants confirmed they had a traumatic injury that was accompanied by pain. Prior to the collection of data (interview), the information sheet was reviewed. I made it very clear that they could withdraw from the research project anytime up to 7 days after the interview was completed but after the seventh day, the analysis would have commenced. They were assured of their confidentiality and anonymity. The primary risk of potentially experiencing a negative emotional response due to the narration of their traumatic experience was identified.

When the information sheet had been reviewed and written consent had been given, the interview began. Each participants were assigned a code number. At the completion of the interview, they were offered an information card from the Support Network in Edmonton, a 24-hour call center available for distressed people to call for assistance. All participants declined the offer.

The interviews were digitally uploaded through a secure online portal to the Health Research Data Repository housed in the Faculty of Nursing, University of Alberta. Prior to deletion of the digital file from the recorder, the audio file that was imported to the repository and was checked for its completed upload. From this secure repository, data transcription was completed in a verbatim manner and all transcripts were stored.

Relational ethics is an integral part of completing research on people. This type of ethics deals explicitly with the relationship and contextual nature of the researcher’s and participant’s interaction/communication (Austin, 2008). It deals with being morally responsible for the situation. There were several participants who became weepy or cried in their interviews. I asked them if they would like to stop the interview,and all declined. However, in treating them with dignity and respect meant showing empathy to them in the specifics of what they shared with the researcher. For instance, one woman’s injury resulted in permanent disability and left her unable to “care adequately” (her words) for her husband in palliative care. She wanted, indeed needed to tell her story. Giving her the space to share this aspect of her narrative was important to her and not necessarily the research. Providing an empathic ear seemed to be the morally correct response in that situation.

## Summary

This chapter provides a detailed description of the research design, ethical considerations, situating the research, data collection, and analysis, as well as strategies to ensure qualitative quality. Interpretive description, an inductive approach, was used which served as a framework for making methodological decisions. Strict adherence to avoid dangers to the meaningful interpretation of the data was accomplished by the employment of guidelines for qualitative quality.

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# CHAPTER 4 - A FRAMEWORK OF HOW AN ACUTE PAIN SCORE IS DETERMINED

## Introduction

Pain assessments are likely the cornerstone for clinical pain management decisions. Self-rated pain scales that offer reliable and valid conveyance of pain intensity (McDowell, 2006c; Todd, 2005) are integral to the assessment of pain. Pain's complexity makes it very challenging to assess by clinicians. Estimated annual ER visits in Canada and the United States are 10 and 130 million respectively (Canadian Institute for Health Information, 2014; National Center for Health Statistics, 2014). The 11-point numerical rating scale (NRS) is the most widely accepted self-reported pain measurement tool employed in the ER (American Society for Pain Management Nursing, 2010; Australian and New Zealand College of Anaesthetists, 2014; Canadian Pain Society, 2005). The NRS uses a scale from zero to ten: zero is represented by "no pain" and ten is defined as some variation of maximum pain.

When using pain measures clinicians are capturing pain scores, but it is not clear what precisely is being transmitted in these scores (Hodgins, 2002; Kenny et al., 2006). Given the uncertainty as to what is being captured when an NRS score is provided, some clinicians may question what that score means. If there are concerns regarding how to interpret an NRS score it is plausible that some pain management decisions are made despite these concerns (Hodgins, 2002). Challenges also face research examining the outcome measures in randomized control analgesic trials (Dworkin et al., 2015; Smith et al., 2015a); pain intensity scores might be contributing to systematic error. These are some of the elements of the assessment could be contributing to the challenges surrounding pain management (Hodgins, 2002; Kenny et al., 2006; Montali et al., 2011).Given the importance of the NRS, coupled with the challenges of pain assessment and management, we sought to answer the research question, “How do adults who have experienced an acute pain event (APE) determine their NRS pain score?"

## Function of Pain Tools

Tools to assess pain function as a bridge between the person experiencing pain and the clinician who makes treatment decisions based on the scores that patients provide. These tools vary from measuring one to several dimensions of pain in adults (Hjermstad et al., 2011; Melzack, 1975; Todd, 2005). Commonly used clinically and in research, the NRS has demonstrated robust psychometric properties (Ferreira-Valente et al., 2011; Todd, 2005). Notwithstanding the critical role of assessment in adequate pain management, the multidimensional and complex nature of pain makes this subjective phenomenon challenging to measure. As the primary dimensions of pain—cognitive, affective, and sensory—can all be experienced simultaneously (Melzack, 1975), it raises the question of whether these multiple dimensions are being captured within an NRS score. There is fairly strong evidence that the response to, expression of, and perception of pain are posited to be shaped by genetic, familial, environmental, social, cultural, and psychological factors (Craven, Cinar, & Madsen, 2013; Davidhizar & Giger, 2004; Hsieh, Tripp, & Ji, 2011; Huguet, Stinson, & McGrath, 2010; McGrath, 1994). With a myriad of factors potentially affecting the perception of pain, it becomes critically important that clinicians understand how pain scores are determined.

Currently, clinicians conventionally believe that a person’s score is what the patient says it is and that an individual can interpret and extrapolate their sensory experiences to determine a pain score. What is not apparent is whether other aspects of the pain experience are being employed to reference an individual’s pain experience (deWilliams et al., 2000; Nakamura & Chapman, 2002). Some, individuals who suffer from chronic pain are aware that they are using specific factors to gauge their pain and this is a confirmation that multiple pieces of information are used to provide a pain score (deWilliams et al., 2000). However, without verification as to how individuals in acute pain engage in the process to provide a pain score, confidence in the assessment process to measure pain intensity specifically versus the pain experience may be undermined (Montali et al., 2011). Feasibly, the gaps in our knowledge of how pain scores are determined could potentially contribute to the challenges of assessing pain adequately (deWilliams et al., 2000). Therefore, investigating how a pain score is determined is an important step in bridging this knowledge gap.

## Methods

This inquiry was approved by the University of Alberta's Human Research Ethics Board. Thorne's ID approach was used (2016) to answer the research question, "How do adults who have experienced an acute traumatic injury determine their pain score?" Originally developed to address clinical nursing questions, it is now used widely in a variety of health care practice disciplines. The goal of ID is to explore, describe, and explicate human experiences. ID acknowledges the existence of multiple realities that are context dependent, experientially based, and co-constructed by both researcher and participant through an inductive and iterative process (Thorne, 2016).

### Eligibility Criteria

Individuals were eligible to participate in the study if they spoke and read English, were 18 years or older, and had sustained a painful injury or injuries through an accident for which they were admitted for a minimum of one night to a tertiary care centre. Individuals with either acute pain arising from endogenous events such as pancreatitis or because of a physical assault were excluded from the study.

### Recruitment

Approved recruitment posters were displayed in the orthopedic examination rooms of a community tertiary care hospital, a primary care clinic, and community bulletin boards of two city leisure facilities. Digital copies were also sent to other community providers. Interested individuals were screened for eligibility by the first author. Eighteen people responded to the recruitment. Five of these individuals did not meet eligibility criteria. Participants included five men and eight women of Euro-Canadian decent; and they ranged in age from 18 to 76 years of age. Their employment categories were labour, trades, skilled, professional, business owner/manager, or in retirement. The injury diagnosis varied significantly and included: fractures, burns, polytrauma, and a dislocation. Injuries occurred in various settings: work-related, motor vehicle accident, recreational, and daily life.

## Data Collection and Analysis

Data collection occurred between November 2013 and June 2014. Semi structured, open-ended questions were asked of participants regarding various aspects of the acute traumatic injury experience. They were purposefully asked whether an NRS that included the use of a pain scale anchor was administered by a clinician. Initially, questions were general in nature to uncover a wide range of possible scenarios (Morse & Field, 1985). As data collection progressed, interview questions became more probing to test out initial ideas arising from the data analysis. The interviews were digitally recorded, uploaded, and stored in the Health Research Data Repository, Faculty of Nursing, University of Alberta. The digital interviews were transcribed by the first author within two to three days of the interview and were listened to multiple times (Thorne, 2008). The transcript was then cleaned by comparing the audio file to the written transcription. While the data collection and analysis were iterative, data analysis extended for some time after data collection was completed. Qualitative content analysis (Mayan, 2009) was completed manually to stay close to the data.

Comments regarding the context of the interview were documented in interview notes. Notes contained information regarding the tone and depth of the interview, including trying to "hear" what perhaps what was implied or not said. Reflections and questions on both the data and the interview notes (Mayan, 2009) were documented in a separate file and included some preliminary interpretations of what was evolving out of the data. To respect the necessity of not coding prematurely, the preliminary development of themes and patterns took place after four interviews were completed (Thorne, 2008). There was a tremendous amount of overlap in the deep, diverse, and complex data that were collected. Not only were various concepts identified and examined, but once they retained stability amongst new data being collected, initial analysis began on the relationships of these concepts to each other (Morse & Field, 1985). When concepts did not continue to occur in consecutive texts, they were discarded from the analysis.

Following the analysis of the first eight interviews, a preliminary conceptual framework was drafted for capturing how patients determined a pain score. The remaining five participants were asked to comment on this framework once the formal research interview was completed. After the 13th participant was interviewed, no new themes or patterns emerged. There was sufficient data to apply the patterns as conceptual descriptions that could plausibly be applied in practice; additionally, the research question had been answered,therefore, recruitment ceased (Thorne, 2016).

## Results

This exploratory investigation suggests that individuals determine their pain score by drawing on three experiential referents, namely *receiving an injury, grasping the immediate* *context, and sensing the imminent loss of consciousness* (ILC). The referent ILC, seemed to be the most common anchor participants used to generate a pain score. People use multiple signals in that specific moment of pain to interpret, consolidate, and then translate these signs into a numeric pain score. Although these experiential referents are discussed individually, there may be more referents that have yet to be identified, as this is an exploratory study. While referents discussed below are separated into three conceptual descriptions, it is important to bear in mind that each referent is inextricably bound to the others.

## Receiving the Injury

The first experiential referent, receiving the injury, appears to initiate the APE when the accident takes place; it seems to be fundamental in guiding adults in assessing their pain using the NRS and pain anchor as administered. This referent only contains sensory information such as intensity, location, and quality. Of the multiple sensory signals the individual receives, it is the intensity of pain that figures primarily in generating a pain score. Pain intensity for some participants at the time of the injury was very low. These participants commented "I wasn't feeling much pain," "It wasn't really hurting," and "I didn't think about pain at that moment, but it was minimal." In contrast, other participants reported that they had instantaneous, intense pain. One participant stated: "I screamed at the top of my lungs because of the force that I hit the mound and I knew instantly that I had broken my arm." Some participants rated similar feelings such as "soreness" or "discomfort" as their pain score. "It was a two, a bit of discomfort," said one participant while others described their score of five as "sore," suggesting that they "could deal with it." These unpleasant feelings were reported in such a way that they appeared distinct from pain intensity. Overall, many participants experienced moderate to severe pain either in hospital or in rehabilitation.

The location of the injury was often identified by seeing, hearing, or feeling their body part fracture (burn, dislocate). One participant described the fear associated with visualizing the injury: “I think it was more the sight of it than physical pain. Seeing my leg all messed (dislocated) [was] probably the scariest thing,” implying that seeing the injury and the resulting fear impacted the pain score she provided. However, the location of the injury was not always evident. One participant was able to walk without pain or location signals to alert her to the injured leg. Later, at a tertiary care center, the participant had to undergo significant instrumentation to stabilize the leg bone.

The third sensory signal that participants identified was the quality of pain, typically defined with descriptors such as “sharp,” “dull,” and “burning.” Some participants could elaborate on this quality: “I felt this electricity coming through my arm…times 1000,” and “pain in the bone is so different.” For most participants, the quality of their pain was difficult to describe.

During the chaos of an unintended injury, the sensory signals might not present simultaneously. Location of the injury is often identified before the intensity and quality of pain appear. However, as time progresses, intensity of pain for some individuals may become the most salient sensory information by which individuals gauge and determine their pain scores.

## Grasping the Immediate Context

The third referent, grasping the immediate context is unique in that it employs more of the psychological, contextual, and emotional components of the experience of pain. The context of each assessment potentially can affect perceptions, meanings and intuitions that complete the process of providing a pain score. Interaction with various clinicians, roommates (strangers), stages of care (pre- versus postoperative), other unpleasant sensations (catheter, drawing of blood), observing others suffer, and the hospital atmosphere (machines beeping, odd smells) all inform the individual when they provide a pain score and is processed each time the pain is assessed.

Fear and or anxiety were the most prominent emotions identified. These emotions varied substantially by their context. A 76 year old participant with three arm fractures had to wait four hours in the ER for medical treatment without being administered pain medications and feared she would no longer be able to cope and she recalled saying: “I am going to pass out. I am going to pass out.” Fear also figured prominently for several participants who assumed that their fractures might be set without anesthetic. One stated that: “[The Nurse says] ‘You have a break in this place and we need to snap the bone into place. The specialist is going to come and do that’ and I remember thinking ‘You have to put me down for this!’ Like that would be hell.” Another situation that involved both fear and anger occurred postoperatively when a participant who was in severe pain was, for some reason, refused additional pain medication. I am already in pain, my feelings have been hurt, I am pissed off, which just amplifies everything…because everything gets combined, because there is no alleviation to it.”Clearly, this participant could identify and separate her emotions from the pain but was also aware of how the interaction with the nurse resulted in an emotional response that made her pain worse. Regarding certain pain medications and or anesthetic, the fear of unknown side effects was a factor; as one participant stated: “It was really scary, because I don’t like these drugs because you never know how your body is going to react.” Anxiety was demonstrated by some participants in a variety of ways, such as that they had to relinquish control while under medical care, being terrified of undergoing surgery, and generalized anxiety related to the long-term consequences of their injuries.

Among the new experiences in a health care facility, participants spoke of being affected by their roommates or other individuals receiving care, particularly if their interactions with clinicians were negative experiences. These experiences with complete strangers ranged from the inability to escape the offensive odours of someone's bowel incontinence to individuals with dementia who were shouting and cursing constantly, leaving the participant unable to sleep for extended periods. Negative experiences with others ranged from hearing someone screaming all night to witnessing a family receiving notification of a death. These new and sometimes stressful experiences also formed part of the context used in determining a participant's pain score.

The last component in grasping the immediate context pertains to the cognitive aspects of pain, particularly the concept of time and the meaning of the situation. The knowledge that the pain would end and that the injury would heal in due time constituted a personally significant meaning for all participants and was expressed through comments such as: "it was not long term," "there's a mental set to it because it would end," "I could deal with it because it was temporary," "in my psyche, there's an endpoint," and "[it] was something that was going to pass." These statements reflected participants' attitudes, and therefore, seemed to factor into how they determined their pain scores. Collectively, through this referent, the individual takes the "other" elements in the specific context of a single pain assessment (fear of setting a fracture without anesthetic) into consideration by filtering and funneling them against the sensory information of the injury and the ILC. Although it is unclear how the "other" elements are used specifically in grasping the immediate context (GIC), these components nevertheless seem to contribute to how individuals experiencing an acute pain event provide a pain score.

Pain scores are generated in a specific context and capture the sensory, pre reflective components of the pain experience at the time of its assessment. Participants seemed to use the

three experiential referents, which are depicted in the conceptual framework in a nonlinear process, to provide a pain score. While the experiential referents appear to be sound, the proportional extent of each of these processes used in determining a pain score remains abstract and obscure. Using these referents seems to assist the individual through a process of reducing and consolidating an array of experience
to determine a number on the NRS.

**Sensing the Imminent Loss of Consciousness (ILC)**

The second experiential referent in generating a pain score is *sensing the imminent loss of consciousness*. The key aspect to this referent is participants using *sensing* to metaphorically describe and demark their pain score against an endpoint.This does not mean that physiological loss of consciousness was inevitable but rather that participants seemed to have used the sense of being cognitively overwhelmed to the point that they also sensed they might be near to passing out. For instance, a participant involved in a motor vehicle accident with multiple traumas asserted that “my idea of a 10 is you can’t stand it, so you black out.” Similarly, another participant stated: “I don’t think I could stay conscious if I experienced pain worse than this.”

In the iterative process of data collection and analysis several patterns emerged such, as “pain is the only thing of my mind,” “room is spinning,” “cannot focus on anything,” “feeling light-headed,” “going crazy with pain,” and “going to pass out.” Through the analytical process, these patterns became two themes of “loss of cognitive function due to pain” and “passing out.” Eventually they formed the conceptual description *sensing the imminent loss of consciousness*.

The ILC appeared to be used to gauge an individual’s initial injury pain, but also during treatment in the hospital. One participant described a painful medical procedure during which 33 staples were removed without pain medication as evidence that she was still not at this metaphorical threshold. “Even with as much pain as he was giving me, I was still, ‘Hey, what are you doing there?’ looking to see how these things were coming out. [It was] still not unbearable, but enough to make me squeeze that bed railing real hard. You are still thinking, so you are not at the point of almost fainting.” Another participant in the post nesthesia care unit revealed that when he awoke from anesthesia that he was “ was sleepy and tired, but I wasn’t losing consciousness because of the pain.”

Although the ILC seems to demark the upper anchor of the pain scale tool in this exploratory study, it seems to be experienced as a more complex and imprecise phenomenon. In the actual moment of acute traumatic pain, the ILC presents more like a transitional zone, where the toleration of severe, acute, traumatic pain is near its limits. An individual might feel that he is near the threshold of the ILC, however, he is likely using the ILC in a metaphorical sense to define his endpoint and consequently how he is using the scale.

Participants reasoned that such terms as *maximum pain* or *worst pain experienced* were poorly defined and vague. “How am I supposed to remember every pain I have had in the last 30 years?” quipped one participant. So, they did what many might do when confronted with unclear questions and operationalized the scale’s anchor to fit their interpretation of what they thought the clinician wanted. Likewise, the anchor descriptor “maximum pain” was redefined as the most pain participants had during their entire APE, implying it was an inappropriate anchor descriptor. This is evidenced by “[A pain score of 6] was the maximum pain I had, but it was not the most I could endure.”

These examples are one of many demonstrating the enormous challenges that plague the pain assessment process. The arbitrary and vague pain anchors provided by clinicians were not employed or were not employed consistently by participants. Instead they re-defined the *end* *point* of intense pain (pain scale anchor) to be the ILC, a more concrete and definable physiological state.

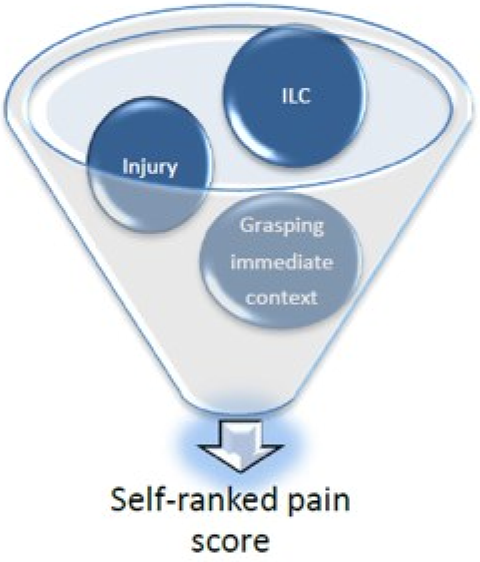

*Figure 4.1* Conceptual framework of the three referents used to gauge an acute pain event

## Discussion

A clinician's request for a pain score is based on the assumption that individuals can interpret various kinds of internal information and translate these experiences to an external pain measurement instrument (deWilliams et al., 2000; Nakamura & Chapman, 2002). Receiving the injury, sensing imminent loss of consciousness, and grasping the immediate context were three experiential referents identified in this exploratory research, suggesting that internal pain information can be interpreted and translated into an NRS score. Identifying the critical role of the scale anchor in how pain is gauged may be a salient discovery in this research.

## Revisiting Pain Scale Anchors

Numerous pain anchors have been identified (Hjermstad et al., 2011) and developed perhaps out of the quest to respect that "pain is whatever the patient says it is" (McCaffery & Beebe, 1989). Clearly, the integrity of believing the patient's report must be valued and maintained. However, respecting and believing the person's pain as reported is not the same as providing conceptually stable anchors for the NRS. Scale anchors appear to function as an independent variable and, ideally, should be precisely defined phrases or descriptions. Current scale pain anchors, such as "worst pain experienced" and "worst pain imaginable," could potentially hinder the function of pain assessment because they potentially obfuscate what individuals measure their pain against. These terms seem to lack precision in their meaning and also appear to focus patients on historical or futuristic events rather than the current pain experience. To examine whether anchors are precise (i.e., contained), a concept analysis could be completed to determine what is contained within and what is exclusive to the boundary of, for instance, "unbearable" pain (Morse, Hupcey, Mitcham, & Lenz, 1996). A rudimentary examination suggests that many conventional anchors could benefit from stronger conceptual development.

Understanding that the pain anchor likely functions as an independent variable (Seymour et al., 1985; Verhagen, van den Heoff, & Meents, 2015), the anchor descriptor is pivotal to the systematic method used in gauging pain;Iit appears that each person unlocks their encrypted pain information via the code provided: the anchor (Seymour et al., 1985; Verhagen et al., 2015). Conveying a score, therefore, depends on what the individual interprets the anchor to mean and what data they employ to translate it into a score or whether a person operationalizes her anchor.

Based on our conceptual descriptions, we contend that the ILC could be employed as the NRS's anchor descriptor for individuals with acute traumatic pain. However, it is also conceivable that individuals idiosyncratically use the other identified experiential referents or other as yet unidentified referents. These conceptual descriptors (referents) have the potential to enhance the clinician's knowledge platform from which to make pain management decisions. One reason to consider using the ILC as an ATP anchor term for the NRS is that the ILC is an appropriate and reasonable anchor that an individual might experience in trauma cases, as loss of consciousness is one factor assessed in emergent and post–operative care. As an anchor term that could be associated with trauma cases, the ILC could provide a common conceptual base from which to make clinical decisions regarding pain management. Additionally, utilizing ILC as the pain anchor has the potential to reduce the idiosyncratic interpretations used by some people in pain but this would need to be investiaged (deWilliams et al., 2000; Hodgins, 2002; Seymour et al., 1985).The ILC conceptual description could be signalling that people with acute pain may benefit from anchor terms that reflect their specific pain experience as the use of such terms provides them with more precise constructs from which to gauge their pain.

Other pain populations may also use specific experientially defined anchors to provide a pain score, a possibility which could provide a future research opportunity. In practice, at times individualized conditions may not fit the usual pattern seen in pain assessments; these situations require clinical wisdom and knowledge to ascertain what can be done (Thorne, 2016). Given the exploratory nature of this study, clinicians could consider asking an individual if she is defining her *ten* as the ILC. In the case where the individual does not use the ILC, it is plausible that another anchor could be incorporated into how they are referencing their pain, so a clinician could ask her how she is defining his *ten* on the NRS. These clinical follow up questions could be particularly useful when the presented score does not seem to fit what the clinician is interpreting in that pain assessment.

## Gauging Pain via the Remaining Experiential Referents

The other two referents, receiving the injury and grasping the immediate context, also seem to be involved in determining a pain score. It is from this conceptual platform that the remaining coordinates, or experiential referents, seem to be determined. This aligns with the functional role of the anchor as being an independent variable. Scale usage, therefore, seems to be dependent on the individual’s constructed anchor definition. The individual’s anchor may or may not be congruent with the prescribed anchor of the NRS.

Terminology uncovered in the analysis of receiving the injury suggests that two possible scenarios might be occurring when people provide a pain score. If the concepts of soreness and discomfort are indeed distinct entities from pain intensity, then it is plausible that some individuals are only employing a portion of the NRS to provide a pain score thereby conflating two similar concepts. If an individual provides a pain score and then qualifies it to mean they are sore, then it is conceivable that they are rating how sore they are, as opposed to pain they are experiencing; they are not the same concepts. If these concepts are better understood as part of the pain intensity vocabulary, as suggested by Kenny (2006), then our findings confirm that pain descriptors may be an inherently flawed method to accurately gauge pain. A concept analysis of these terms would help clarify the distinctions and further enhance the NRS’s function.

Finally, of all the referents used to make a pain score, grasping the immediate context seems to be the most complicated as it appears to capture aspects of the emotional and cognitive experience as well as the contextual aspects of the environment. Emotional responses to pain are normal (McGrath, 1994). Therefore, experiencing pain with some anxiety (state-based, not trait anxiety) is understandable. Whether emotional responses have a causative role has not been resolved (Tan, Jensen, Thornby, & Sloan, 2008). What is often implied in these discussions, however, is that this relationship is direct (LaMontagne, Hepworth, & Salisbury, 2001; Walding, 1991). Being in pain may cause the individual's anxiety to increase. Conversely, experiencing anxiety, may increase a person's perception of pain. There are many factors that might increase a person's anxiety when they have been hospitalized that might not be directly associated with the sensory aspect of pain.

Factors affecting an individual's anxiety while hospitalized include powerlessness (Fagerdahl, Boström, Ottosson, & Ulfvarson, 2013; Walding, 1991), contracting an infection (Burnett et al., 2013), medical procedures, and potential side effects of analgesics/anesthesia (Burkle et al., 2014). In addition, fear or anxiety in the hospital is also associated with personal interactions with other patients and clinicians (Aman, 2013; Birkelund & Søndergaard, 2012; Carr, Brockbank, Allen, & Strike, 2006; Kulik et al., 1993). Admission to a hospital is therefore, considered by many to be a stressful event for many people (Hom, Stanley, & Joiner, 2015).

Our findings of people's fears or anxieties that occurred during a clinical encounter, signal the importance of the quality of that relationship, whether it be called "personal care" or "the therapeutic relationship" (Fuentes et al., 2014b; Phillips, 2015; Stewart et al., 2015). Negative interactions with medical staff have the potential to increase the perception of pain (Fuentes et al., 2014b). These situations could be viewed as a reminder to clinicians to be equally attentive to both personal and technical care. Ideally clinicians could attend to fears as well as giving clear instruction on medical procedures giving patients sufficient time to process this knowledge.

Another component of grasping the immediate context involves the cognitive dimension of pain, specifically the temporary nature of the acute injury. This knowledge pertains to how a pain score is referenced. People who experience difficult health situations progress through several stages of knowledge. Acceptance is the last of the identified levels in altered health states (Morse & Penrod, 1999). It is this acceptance of knowing that the injury and its consequence will be experienced for a short time that transforms the unknowns of the acute traumatic injury into hope (Morse & Penrod, 1999). Without the expectation of complete healing within a relatively short time, many of the emotional responses could potentially be altered. Instead, hope makes the pain bearable for people experiencing an acute traumatic injury.

Sufferers of chronic pain, in direct contrast, report relatively little hope (Ballantyne & Sullivan, 2015). Therefore, in this research, acceptance that the injury is short-term in the broader perspective of living is important because it changes the level of personal significance, or meaning (Ballantyne & Sullivan, 2015; Baumeister, 1991) regarding the situation and therefore, the individual’s gauging of their pain score (Ballantyne & Sullivan, 2015; Baumeister, 1991).Time is strongly associated with meaning, and when situations have a short-term impact they evoke a low order of meaning (Baumeister, 1991). Acute injuries with short-term consequences are generally experienced at a low level of meaning. In contrast, situations that have permanent and complex outcomes, evoke higher level meanings. We contend that this knowledge pertains to the meaning of the situation for individuals and factors into providing a pain score (Baumeister, 1991).

Grasping the immediate context, as a referent, seems to be a complex referent as it captures many subjective factors. Clinicians may want to explore this referent for more specific details as this conceptual descriptor could potentially impact a person’s pain score. When practical and feasible, a clinician could try to alleviate or reduce environmental factors such as excessive noise and crowding. Communication with the patient on these matters may, at minimum, inform the patient on what can be done about the situation. If negative emotions, such as anxiety, are identified the clinician could provide multimodal treatments (Chou et al., 2016) or use a therapeutic approach which has shown promise in reducing the perception of pain (Fuentes et al., 2014a).

## Conclusion

In summary, conventionally it is accepted that pain assessment is integral to the pain management process. The use of various referents to determine a score illustrates the complexity of trying to capture pain experiences with an 11-point measurement tool. In addition, these conceptual descriptors seem to signal that various psychosocial and contextual factors are used to in the production of an NRS score. Contextual aspects of the immediate moment when the NRS is administered factors into the scoring process and involves many potential scenarios including meaning. Gauging pain appears to occur within the micro and macro context of pain's etiology and prognosis of the medical situation. Although it is not clear how these elements directly guide the individual to provide a pain score, they seem to be informing the individual in an orderly fashion as to where their experience fits within the 11-point NRS. It is plausible that experiential referents might be population and context specific.

In this exploratory study, the ILC seems to be the operationalized anchor from which the other experiential referents are used to create a pain score. In stark contrast, sufferers of chronic pain gauge their pain using more of the emotional and cognitive aspects of pain (Ballantyne & Sullivan, 2015; deWilliams et al., 2000). Discovering the potentially critical role of the ILC as a potential anchor in this framework may be indispensable. Practically, implementing an upper pain anchor for the NRS that could be common across individuals has considerable potential to benefit patients. The ILC as an anchor could also help standardize APT measurement for clinicians and researchers, providing them with a more concrete yet metaphorical anchor that might be easier to interpret than the unknown personal historical pain events or some futuristic unknown event in the mind of each patient. However, given the small sample size and exploratory nature of the investigation caution is advised in employing this phrase as an anchor term until more research is completed These conceptual descriptions may suggest that each pain population uniquely references their pain and uses a different anchor, as the context of pain's etiology and prognosis is discrete for each group but once again caution is warranted given the limitations of this study. While additional research is warranted and encouraged to determine if there are yet to be identified operationalized anchor terms used for APT, we posit that the use of the ILC has merit to potentially test out in clinical situations.

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# CHAPTER 5 -THE DETERMINANTS OF MEANING OF AN ACUTE TRAUMATIC INJURY

## Introduction

Meaning is an integral component of the human experience (van der Klok, 2014) linked to core beliefs, goals, values and feelings (Baumeister, 1991; Park & Folkman, 1997). Defined as "shared mental representations of possible relationships among things, events and relationships," (Baumeister, 1991, p. 15) meanings are constructed by individuals based on personal significance, including the expectations associated with these things, events and relationships. Behaviours, actions and emotions are guided by these expectations (Baumeister, 1991). Thus, meaning is linked to an individual's responses and reactions to various situations that occur in life.

Understanding how meaning is ascribed to events provides more comprehensive knowledge to providing interventions, education, and/ or treatment. With respect to health care how meaning is linked to serious illness or trauma has been established (Janhoff-Bulman, 1992; Lachman & Agrigoroaei, 2010; Maes & Karoly, 2005; Park & Folkman, 1997). Pain often accompanies illness and trauma. Unfortunately, to the best of our knowledge, little research has been conducted on the meaning of pain per se. Given that meaning can influence illness behaviors, it is important to investigate how meaning is linked to the experience of pain.

## Meaning of pain

Health care literature suggests that what pain means to individuals can modify their perceptions of that complex experience (Burton & Ludwig, 2015; Ramont, Nedringhaus, & Towle, 2010; Turk & Melzack, 1992; Wall, 2000). This has led to use of the phrase *meaning of pain;* however, it is not clear what exactly is meant by this phrase as it is used in various ways in the literature. For instance, Bullington (2003) references this phrase to mean reconstructing life to find meaning. This context of *meaning of pain* is about sense making which is in stark contrast to guided imagery used to elicit changes in how pain is described (Lewandowski, Good, & Draucker, 2005). Among individuals with pain associated with a myocardial infarction, Jairath (1999) referenced *meaning of pain* to examine pain metaphors used by these individuals. While there are merits to these investigations the phrase could be enhanced with conceptual clarity as there are no boundaries to what is included or excluded with this concept (Morse, Hupcey, & Mitcham, 1996).

It is difficult to synthesize knowledge and discuss the phrase *meaning of pain* when it is employed in such diverse ways. Structuring *meaning of pain* within an existing meaning model may help to encourage a consistent use of the phrase and to provide a dependable basis from which to analyze what factors are used to attribute meaning across illness and trauma contexts. Clearly, this argument does not pertain to the personal meaning attributed to experiences of pain but rather to how we investigate topics pertaining to this phrase.

Park and Folkman (1997) condensed the existing myriad of models used to investigate meaning-making in health and produced a “meaning-making model.” The first phase of the model is referred to as the appraisal phase while the second part pertains to the reconstruction of meaning. During stressful events, an individual appraises the meaning of a situation through the lens of their personal expectations for that particular experience.

In Western public health care services, it is reasonable to assume expectations that include autonomy, respect, professionalism, as well as adequate and timely pain relief. When the person’s expectations match the actual outcome, cognitive congruency is likely to result which means that the event is normal. When incidents do not align with an individual’s expectations, the meaning of the event is appraised as incongruent. These individuals would then enter the second phase of the Park and Folkman's model where they reconstruct their initial appraisals (i.e. meanings). To date, that phase has not yet been investigated from the perspective of meaning associated with painful events.

The purpose of this investigation was to identify the determinants of meaning of an acute pain event (APE) employing the appraisal part of the Park and Folkman's model as a framework. The research question is "What are the determinants of meaning in an APE?"

## Materials and Methods

### Participants

Individuals were eligible to participate in this investigation if they met the following criteria:18 years or older; read and spoke English; experienced an acute, traumatic, physical injury; and required an admission to a hospital for a minimum of one night in the local health region. Individuals were excluded from participation if their acute injury was due to an assault or stemmed from a non-traumatic medical problem (e.g. pancreatitis). The University of Alberta's Human Research Ethics Board approved this research. Data collection occurred between November 2013 and June 2014.

The participants were primarily of Euro-Canadian background, ranging in age from 18 to 76 years, and included 5 men and 8 women. The method of injury was varied and included: dislocation, polytraumas, burns, and fractures. These injuries occurred in a wide variety of settings, ranging from recreational to vocational.

### Selection of Participants

The recruitment of participants occurred in a tertiary care hospital, a primary care clinic and in the community via approved posters with tear away strips containing the researcher's contact information. Digital posters were also sent to professionals in the community to distribute to potential participants. Eighteen individuals expressed interest in the study and were screened. Thirteen of these individuals met inclusion criteria and were enrolled in the inquiry.

### Study Design

The inquiry followed Thorne's (1997) ID approach, which functions as a structure from which to make methodological decisions on matters ranging from sampling to analytical strategies. This flexible approach, developed in nursing and now commonly used in other practice disciplines, is an approach that recognizes not only the complex illness experiences between psychosocial and biological factors in clinical phenomena but also acknowledges the multiple realities of people. Theme and pattern identification are the goals of ID, and this approach is particularly helpful for challenging clinical investigations (Thorne, 2008). ID acknowledges that there also many shared patterns of these experiences that are central to clinical practice. This method accepts and embraces assumptions held by the researcher with the aim of extending knowledge in practice.

## Data Collection and Analysis

Digitally recorded, semi structured interviews were used to elicit data from the 13 participants. Probing questions were used to explore how participants attributed meaning to their pain, their situation, their injury, and the consequences of their injury.

Data collection and analysis occurred concurrently. All data were transcribed verbatim and the accuracy of transcription was compared to the digital recording. Latent content analysis was the strategy used to identify the structures and themes from the data (Hsieh & Shannon, 2005; Mayan, 2009). During the collection of data, information about how participants appraised meaning to their pain was tested in consecutive interviews. If a specific idea was not verified, it was dropped from the researcher's questions. Recruitment ceased after the 13th participant as no new meaning patterns or themes emerged. Park and Folkman's (1997) appraisal phase of the meaning-making model was adapted to account for expectations in an APE. This model was used as a framework to identify the determinants of meaning for acute pain. The strength of this process of analysis lies within its systematic and iterative nature of data collections and analysis. Various strategies were incorporated within the iterative process of data collection and analysis, which is itself the first step. Ensuring that the data is credible requires at a minimum epistemological integrity, representative credibility, analytic logic, and interpretive authority evaluation (Thorne, 2016). Various verification strategies were also used in this analytic process (see Chapter 3).

## Findings

The data analysis yielded three major determinants of meaning, known in ID terms as conceptual descriptions: perceived injury permanence, incongruity of care quality, and personal responses to the injury and or care received. The second determinant is subdivided into two categories: the quality of interactions with health care providers (HCP) and the challenges of pain management. When participants expressed that their experience with pain was congruent with their expectations for their acute traumatic injury, they appeared to attribute little meaning to their pain. There was, however, one exception. When pain management was perceived to be inadequate, that specific pain incident was considered a key determinant of meaning. At a theoretical level, there is a complex relation between the determinants of meaning and the overall meaning of the event. In other words, the more determinants of meaning that the participant experienced, the greater the personal meaning of the overall event.

## Perceived Permanence of Injuries

Perceptions regarding the randomness and permanence of injuries are key factors influencing the ways individuals ascribe meaning to an APE. These are integrally related to expectations that although the world is an orderly place, occasionally randomness exists and sometimes injuries do occur. In ascribing meaning to an APE, participants weighed the permanence of their injury against these expectations.

Most participants did not appraise an injury as distressing in the broad context of their lives. Such APEs were unanimously seen as random events because sometimes "things just happen, that's all," and "sometimes even when you do your best to be safe, sometimes accidents happen anyway." This was explained well by a participant who stated, "I don't make sense of it [accident]. I just accept it. It is what it is. It is something I obviously can't change You do not have any more choices. You are going down for the count, for right now."

Although each APE was viewed as a random event, the accident did impact participants' lives. The participants frequently implied that their lives were not only interrupted, but also disrupted by the consequences of their injury, as shared by these two participants: "I was angry that I was out of the game, tournament and unable to play nationals," and "I was frustrated. I didn't have time to be injured. I had plans!" Having surgical hardware in their bodies gave rise to some consequences for a few participants. One person maintained "If I had sprained my wrist rather than broke it, there wouldn't have been a plate in my wrist and scars." Some consequences took longer to resolve as this participant shared"I got really depressed. I gained a lot of weight and that was really depressing and you feel gross. I am used to exercising."

Overall, the temporariness of the injury affected the significance of this determinant of meaning in an APE. Most participants clearly articulated that knowing that the disruptions of their lives would have an end point was an important factor in terms of the meaning of the event. Captured in the following statements are the meanings attached to the short-term impact of the injury on their lives. “I could deal with because [the situation] was temporary,” and “there’s a mental set to it, because it would end.” Therefore, the temporariness of the consequences mediated how the overall meaning of the APE was derived.

In contrast, permanent consequences of injuries sustained from an APE changed the meaning entirely. This participant revealed that her husband was dying from a neuroblastoma and due to the consequences of her injury she would not be able to care for him in the way she intended to prior to her injury.“It [is a neuroblastoma] will not go away and when the time comes, then I need to be able to look after my home and be independent and stay here. And with a husband that [can do] less and less, there’s more and more for me to do.” Another participant who sustained a permanent injury due to alleged incompetent care now lives with a deformed limb and dysfunction of that leg. She stated, “if they would have treated my leg properly, I would not have been gone a month [and I] wouldn’t be in this [chronic] pain.”

In summary, all participants declared that the temporary consequences of having sustained an injury were personally significant to them but were not perceived as stressful when appraised against their expectations in the broad picture of life. They repeatedly stated that such random situations are normal, albeit with a temporary disruption of their normal lives. For the few people with permanent injuries, the long-term consequences of the injury would have a profound impact on multiple aspects of their lives; therefore, the meaning of their APE was incongruent with their general set of expectations. Overall, temporary injuries appeared to impart relatively little meaning, whereas individuals with permanent injuries ascribed significant meaning to that APE.

## Incongruence of Care Quality

Expectations regarding health care management reported by participants included being treated with respect and dignity, having competent technical and personal care, and having one's pain managed in an adequate and timely fashion. These expectations are relational in nature and pertain to both the quality of participants' interactions with HCPs and the challenges of HCPs' pain management of these individuals. Participants noted several interpersonal interactions with HCPs that were not congruent with their expectations.

**Incongruence of personal care.** On the hospital ward, good clinical care, for participants, meant "just good bedside manners, good attention. They made me feel like I was cared for," which was important, because it "helped your ability to cope with it." When medical procedures were explained to them, this participant stated: "You feel informed and know what's going on." However, when their expectations were not met, participants appraised their interactions with HCPs as negative, regardless of whether the HCPs were acting in accordance with hospital practice standards and associated protocols, because this information would not have been available to the participant. These negative experiences involved physicians, surgeons in particular, and some nurses, and how these HCPs spoke with participants. One person revealed: "The resident was kind of aggressive and every time I had a question, he just made me feel like an idiot," and "[the] surgeon comes in and he basically tells me my quality of life from here on in is done…. he was really aggressive; he didn't have any bedside manners."In the following conversation, the perceived inappropriateness of the surgeon's opinion regarding short-term disability was the issue. "I have my contract. I have 90 sick days. And he goes, 'Well, we're going to avoid that… that's taxpayers' money and I hate when people take advantage of the system.' And he sent me for another tizzy."

Although some of these perceived negative interactions might have occurred within the standard of care or scope of practice, importantly, participants still perceived these incidents to be related to the quality of personal and technical care. This participant recalled waiting for some time in a parked ambulance, “They decided they were off duty. So, they called another ambulance in.” Or in this situation, where the participant was involved in a motorcycle accident and was discharged in the middle of the night “They cut all your clothes off, I had no clothes and they said ‘okay, you can leave’.” In another situation, a participant had to wait several days for surgery because presurgical procedures were not followed. This participant stated, “[The surgeon] says ‘I can’t do the surgery on you. You are on birth control and you flew [in an airplane] with this injury. Like you might have a blood clot somewhere. Like we need to put you on blood thinners immediately’.”

While the experiences above might have occurred due to institutional policies and procedures, participants also revealed incidents related to professional practice. For example, one participant reported “When I had the opportunity to tell them morphine was not going to work and they tried it anyway. The nurse said ‘so maybe it will work this time’.”Another participant reported “I had a quite bad road rash I had to ask them to clean them out twice. she didn’t want to do it. She finally wiped a bit of it.” This injury later became severely infected, resulting in the limb becoming deformed. Plastic surgery repaired the injury but the deformity, disability and chronic pain resulting from the infection remained with the participant.

Encounters with HCPs regarding personal and technical aspects of care were determinants of meaning for participants. Organizational and professional inconsistencies that did not align with participants’ expectation as to how to be treated by HCPs were included in these exceptions and resulted in distress often experienced as anxiety and sometimes anger.

Participants who appraised their care to be congruent with their health care expectations appraised little meaning to the overall event, whereas participants who believed their care to be incongruent with their expectations (a determinant of meaning), appraised more meaning to their time spent in the hospital.

**Incongruence of Being in Severe Pain While in a Hospital**. The participants expected that their pain management would be adequate and timely, that HCPs were aware of the latest pain management protocols and that HCPs would believe their ratings of pain. The timely and adequate management of pain aligned with most participants' expectations, as described by this participant "they [nurses] were very good about keeping up with the pain meds. Kept them consistent." Exceptions were noted in the ER, postsurgically, and with some painful but necessary medical procedures. The latter highly influenced determinants of meaning for participants. Each of these contextual situations was appraised as being incongruent with their expectation of adequate administration of analgesics. This 74 year old had sustained three longitudinal fractures to her humerus and waited four hours in the ER in excruciating pain shared that "By the time 4 hours is up [I said to my daughter] 'I am going to pass out' I was exceeding a ten."Sometimes participants were treated in ER for hours. One woman described the following event that was both frightening and incongruent with her expectations of adequate pain management. "I [had] just passed out when they gave me a shot of Dilaudid. My blood pressure just dropped completely and so then 4 – 5 hours later, the doctor wants to give me twice the dose, but the nurse says "No, no. I think we should give her ½ the amount"' and thank heavens she was there, because if I had the full dose, who knows."

While on the hospital ward after surgery some participants experienced excruciating pain for hours that they appraised as being incongruent with their expectations of timely and adequate administration of analgesics. For these participants, their suffering was unnecessary. This participant recalls how postoperative procedures had not been followed. “I buzzed the nurse and she’s like ‘you have your nerve catheter in, so I don’t why it’s hurting you.’ They were not giving me Dilaudid [in addition to the nerve catheter] that was the issue.”Clearly, that situation was concerning to the participant as was the following example. Although, it is not clear what exactly transpired the first night postoperatively. This participant stated: “I wanted to beat the face off that little bitch. I was in so much pain, I spent the night holding on to the chain [trapeze bar] I am already in pain. My feelings have been hurt. I am pissed off, which just amplifies everything.”The aforementioned examples pertain to the complexity of the HCP interactions whereby participants felt they were not given the personal and technical care they expected.

Many participants spoke of the side effects of various analgesics which they appraised as being incongruent with their expectations of adequate pain management. The expectation was that when a person is under an HCP’s care, pain management should be adequate andefficacious, and the side effects of medications were considered to be part of this pain management. Analgesic side effects for some participants made them feel either queasy, *off,* or stoned, all of which frightened them. The following statements reflect this. “I don’t like pain killers because then my body and I are disconnected,” and “the pain was uncomfortable, but the other feeling of being drugged was even more uncomfortable.” Hallucinations were particularly frightening for the two participants who experienced them. They appraised these experiences as incongruent with their expectations of adequate pain management (determinant of meaning).

Overall, expectations of care were met, but when they were not it affected the participants’ determination of the meaning of their painful injury.

## Personal Responses to Injury and Care Received

The appraised meaning of the event was linked to the participant’s response. When expectations were met the response was typically of a stoic fashion. In direct contrast, the response to incongruent events frequently was anxiety, or for some of these participants, they either reported an increase in their perception of pain or difficulty dealing with the stress.

**Importance of stoicism.** Being stoic meant participants had to find a way through their journey with at least some bravery. This behavioural response was a personal value that they had of themselves learned early in their childhood. This participant shared “I didn’t grow up with my mom saying ‘suck it up’ or something [like that]. She was a single mom. She sucked it up a lot.” Provided the participants' expectations were met, the meaning appraised was congruent for the specific situation and stoicism was the response. These expectations include the following: “sometimes accidents happen,” “when seriously hurt you probably will have pain,” “if the injury is temporary, life will be back to normal soon,” and “we have good health care and pain medicines”. Whether discomfort or inconvenience associated with the APE was related to eating hospital food, putting up with having a catheter, wearing a hospital gown, or experiencing pain, the personal response was along these lines: “I didn’t want to make a fuss,” “you don’t want to be a pain about it,” “[stoicism] was about not being a sissy,” “not being a fuss pot,” “not being a baby,” “suck it up,” and “I’m not squawking about it”. Similarly, “Like you had to stop the game for me because I had a sprain? And I’m thinking ‘I am such a wimp’.”

Stoicism was also linked to patience. Regarding having to face an ER wait time, this participant stated: “I am quite prepared to be patient. Why should I go to the front of the line?

Somebody else might be worse off. So, I'll just wait." Other participants had to sometimes wait days for their surgeries for various reasons."Three days waiting for surgery. There had been some sort of major accident. I wasn't in pain. I wasn't going anywhere. I was okay in bed."

**Anxiety over inadequate pain treatment**. Incongruence of participants' expectations with the perceived quality of care received showed a strong pattern of anxiety as their personal response. For many, the anxiety resulted in an increase in their perception of pain. Again, the personal response is linked to the meaning appraised to those incongruent incidents. Many participants talked about their fear of having to wait in the ER while in a great deal of pain, particularly when pain medication administration plans were unclear. For instance: "I am experiencing some fear at that point because I thought if this gets any worse how can I possibly cope because I am at the upper end of coping right now."

Other participants described increased anxiety due to postoperative pain because they had no knowledge regarding when their pain would be alleviated. Also, when procedures were unexpectedly painful such as in the previously mentioned case of the nerve catheter displacement, anxiety increased. The next example is integrally related to both interactions with HCPs and the challenges of pain management. This participant underwent an excruciating medical procedure without additional analgesics. She revealed, "This thing [burn dressing] went around my whole leg. Like the whole leg is raw;.the skin is healed right to it and they tried to take it off without putting me out. I thought I was going to pass out." He reported being considerably more anxious during subsequent dressing changes. Another participant, who experienced severe pain during the removal of 33 staples without additional analgesics, was able to negotiate for some "breathers" after several staples were removed. Although she negotiated for these "breathers," this painful experience created anxiety for her. She decided that when that painful procedure would be repeated for hardware removal, she would self medicate so as not to experience such severe pain again.

Anxiety was also demonstrated when either HCPs' interactions were distressing or when organizational policies and procedures did not align with participant's expectations regarding treatment. These were associated with either perceived poor bedside manners or the perceived inappropriateness of an HCP's opinion, subsequently increasing either their anxiety or anger.

In summary, the aforementioned findings demonstrate a strong trend where by the meaning appraised to an incident during a participant's APE resulted in personal responses. Stoicism is linked to the meaning that the incident is normal given the circumstances, while anxiety ensued incongruent meanings appraised to situations.

## Discussion

The primary aim of this investigation was to identify what determines meaning in an APE. Our findings suggest that in traumatic accidents, the permanence of the injury and quality of care influences the constructed meaning of an APE. This aligns with others from a more global perspective, whereby situational factors could influence meaning (Burke, Mohn-Brown, & LeMone, 2007; Hinds, Chaves, & Cypess, 1992; Pearson, Vaughn, & FitzGerald, 2005; Poirier & Sossong, 2015). High quality of care is a tenet for HCPs. The behaviour of providers of care have the potential to alter perceptions and meaning for individuals experiencing an APE. Please see Figure 5.1 for more details of the determinants of meaning.

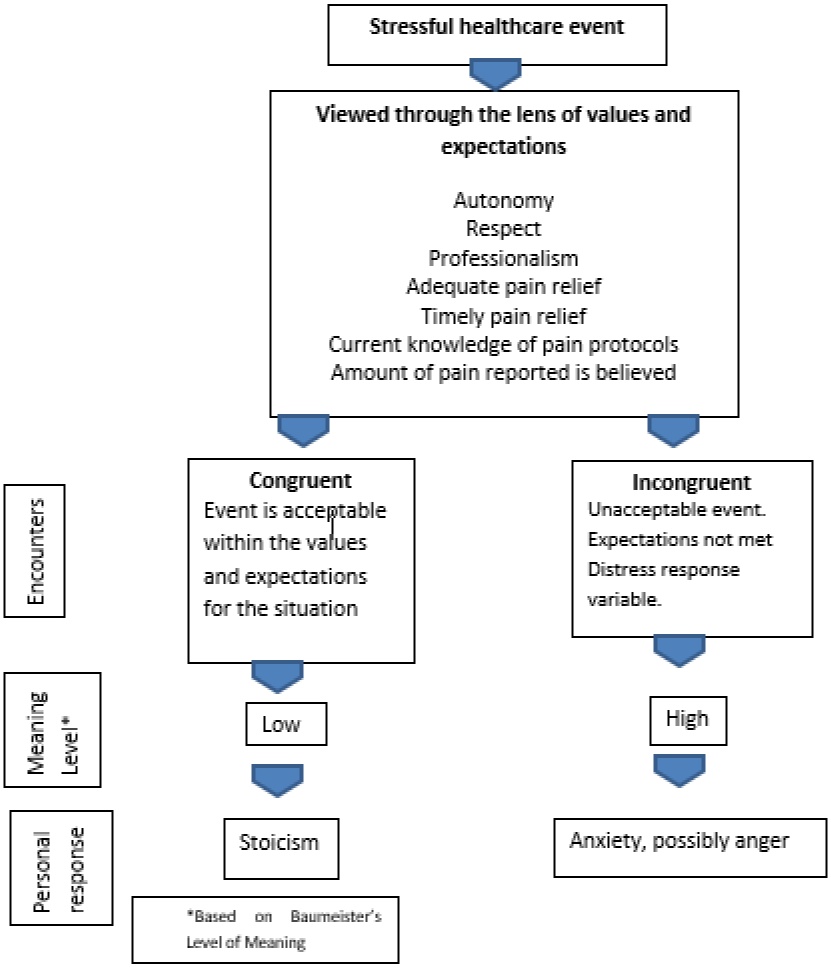

*Figure 5.1* Determinants of meaning with acute trauma pain

Increasingly, consideration has been given to the experiences of individuals during their interactions with HCPs. The hallmark of care is patient centreed (Berghout, van Exel, Leensvaart, & Cramm, 2015) and is contextually and culturally determined (Clark & Reeves, 2015; Patiraki et al., 2012; Poirier & Sossong, 2015). The final decision on the meaning of care and whether there is satisfaction with the care provided remains with the individual who receives care (Clark & Reeves, 2015; Kelley et al., 2014; Patiraki et al., 2012).

There is strong agreement on the fundamentals of providing adequate health care, which include: dignity, respect, autonomy, whole person care, pain management, care coordination, and emotional support. It is important to remember that the quality of care provided by HCPs has the potential to influence anxiety, comprehension of information, and management of pain. These therapeutic relationships all have the potential to affect individual outcomes (Di Blasi et al., 2001; Fuentes et al., 2014b; Wessel, Lynöe, Juth, & Helgesson, 2014), in particular the perception of pain (Aman, 2013). When poor quality of care is a result of organizational, professional and personal HCP attitudes (Simmonds, Finley, Vale, Pugh, & Turner, 2014) various action plans may be required to remedy the situation. These interactions also demonstrate how difficult it is to provide high quality health care. Pain education pertaining to the influence of caregiving on the perception of pain should not only occur in training institutes but be ongoing in health care facilities given the substantial potential individual HCPs have on direct and future individual pain outcomes.

Especially salient in our findings is how personal responses change with the quality of interactions with HCPs. The clinical interaction pertains to personal or technical care; for example in the case of perceived inadequacy of pain management, stoicism can succumb to anxiety. When the perception of the clinical situation might conflict with an individual's expectations this could result in anger regardless of whether it was conveyed to the clinician. Investigations have shown that anxiety is not necessarily a result of the sensory experience of pain, but rather a result of the *entire* experience of care received, ranging from the individual's loss of control over their own affairs (Simmonds, Finley, Vale, Pugh, & Turner, 2015) to the environment in which care is given as well as the professionalism and interactions of HCPs (Fuentes et al., 2014b; Kelley et al., 2014; Vallacher & Wegner, 1985). These strong emotional responses may be directly linked to an individual's expectations (Baumeister, 1991). The result of perceived poor health care includes a change in the emotional response of the sufferer as well as the meaning of the nature and context of care. All of these factors have the potential to exert long-term implications.

Given that poor perceived quality of care might affect long-term outcomes, extending the discussion on meaning of pain to include that the determinants of meaning in an APE are likely important and are not necessarily weighted equally. Lower-order meanings are typically associated with short term, or immediate impacts, whereas higher-order meanings typically have greater complexity and long-term impact (Baumeister, 1991; Clark & Reeves, 2015). In light of this definition, temporary injuries and good quality of care are considered a low-order meaning because, in that context, the APE is a short-term situation with time limited impact. In pointed contrast, the degree of the permanence of the injury and or perceived poor quality of care is a higher-ordered meaning in an APE. Furthermore, unintended trauma events that result in a permanent injury illustrate how trauma might shatter an individual’s assumptions and meanings about life (Janhoff-Bulman, 1992). While a permanent injury is irreversible, quality of care, including personal care and technical pain management can be better managed in order to avoid negative long-term consequences.

In this discussion regarding the determinants of meaning of an APE, it is important to look at how pain might evolve and merge with the dimension of suffering due to anxiety and/or perceived poor quality of health care. Although pain and suffering are often used interchangeably, they are distinct concepts. Severe pain certainly resembles suffering in some aspects when suffering is defined as an experience of potential life change that is comprehended as a threat to oneself (Berglund, Westin, Svanström, Johansson, & Sundler, 2012; Clarke, 2011) . Clarke states that pain might or might not be accompanied by suffering and that suffering is often not accompanied by pain (2011). Pain is more likely to become suffering when it is not optimally treated and there is no assurance of pain relief. In such situations, the phrase *meaning of pain* becomes relevant. This may be particularly true with individuals who are experiencing severe pain while awaiting emergency care, when analgesics are not effective or unavailable, or during brief painful medical procedures when there is no assurance of when pain will be relieved. Furthermore, when excruciating pain is not acknowledged or addressed by HCPs, we contend that an even higher level of meaning may be perceived by that individual. If HCPs who provide inadequate pain management objectify the individual in their care, that individual might feel powerless and suffering then occurs (Clarke, 2011; Gadow, 1991). Objectification of an individual in the midst of a community of clinicians results in additional suffering if the experience occurs in isolation (Gadow, 1991). Therefore, suffering constitutes a higher order meaning than mere pain given that the experience of pain, as noted in our findings, is interconnected with multiple determinants of meanings. Suffering from excruciating pain while in a health care facility has significant personal meaning to those who unfortunately experience it and might also have ethical implications regarding “primum non nocere”(do no harm).

## Conclusion

Both the perceived permanence of injury and the perceived quality of care were the conceptual descriptions identified as the determinants of meaning (conceptual descriptions) within an APE. These conceptual descriptions may resonate with clinicians, and could be applied to practice, but it is important to bear in mind several factors. This study consisted of 13 participants and therefore, is considered a small sample size reflecting their experiences only. In practice settings, clinician may encounter other yet unidentified determinants of meaning. Qualitative research may reveal aspects of how people attribute meaning to an APE, however, it cannot make claims greater than the conceptual descriptions identified. Another factor is that this investigation was exploratory in nature and, therefore, more research is required.

Most contextual meanings were aligned with expectations associated with painful incidents and subsequent health care provision as reported by some participants in this research. Situations that were incompatible with individuals' expectations altered their meaning of the APE and their personal response to that meaning. Increased anxiety was the most common personal response to the incongruent incidents and had the potential to increase participants' perception of pain. What is particularly poignant is that the phrase *meaning of pain* may not necessarily pertain to the pain directly but might reference the global experience of pain that includes the treatment of the injury. It may also refer to when pain management is perceived to besuboptimal. The perception of inadequate pain management can transform current pain experience into suffering. Finally, when an acute injury becomes a perceived permanent injury, the meaning of the APE can be altered.

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# CHAPTER 6 - A BIOPSYCHOSOCIAL APPROACH TO APT ASSESSMENT USING THE NRS

This chapter contains a review of common pain assessment tools and their primary limitations in conscious adults. A brief discussion follows on recommendations for comprehensive pain assessment and multidimensional tools including the limitation of their applications. Notwithstanding the exploratory nature of this research, I will demonstrate that the NRS may have the potential to be a better clinical tool for people with APT than previously thought. Its primary challenges of providing a single data point and vague anchors could conceivably be reduced in view of the findings of this research project. Then based on the conceptual findings described in Chapter 4 and Chapter 5 , a biopsychosocial approach is suggested as an extension to the NRS for pain assessment. The chapter finishes with a hypothetical case study and a discussion.

## Introduction

The ongoing challenges of pain assessment is suspected of contributing to the very problem they are trying to solve,--specifically accurate assessment of the pain experience--potentially making it a circular problem. However, this challenging problem has the capacity to produce significant economic, societal, and familial consequences (Bair et al., 2003; Baratta et al., 2014; Carr, 2016; Gaskin & Richard, 2012; Stewart et al., 2003; Willens, 2018). Suboptimally treated postoperative pain may lead to poorer outcomes such as delayed discharge, poor satisfaction rating, patient education, and perceptions of postoperative pain (Apfelbaum et al., 2003; Dequeker, Van Lancker, & Van Hecke, 2017; Willens, 2018). A significant growing concern is the risk of developing persistent postoperative pain (Joshi & Ogunnaike, 2005; Kehlet et al., 2006; Niraj & Rowbotham, 2011) that can lead to the development of chronic pain; huge socioeconomic burdens that are associated with the development of this condition (Gaskin & Richard, 2012; Phillips & Schopflocher, 2008).

The immense challenges pertaining to pain assessment test our collective capacity to do a better job of this important task. When we move beyond the current attempts to measure pain intensity and embrace the fact that we need to try to capture the patient's pain experience, clinicians may need to consider alternative approaches to assess this experience. Pain's inherent subjectivity may require a more intentional clinical interaction that is primarily devoted to understanding the complexity of each person's unique experience with pain.

## Review of the NRS

Arguably, the primary and most consequential limitation of the NRS is the production of one data point to capture a complex, multidimensional experience. (Gordon, 2015; Kerns & Ebert, 2010; Registered Nurses' Association of Ontario, 2013; Sellinger et al., 2010; Topham & Drew, 2017). In response to the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) in 2001, many institutions mandated staff to use the NRS scores to assess and document pain along with vital signs each time the patient was assessed (Vila et al., 2005b). However, increased adverse effects were noted when this mandate along with the Numeric Pain Treatment Algorithm was implemented together,signalling perhaps that the pain assessment challenges were more complex than merely ensuring that pain was assessed. Acknowledging the multiple dimensionality of pain might raise a clinical question about whether the interpretation of the NRS is likely to be dependent on a single score. Assessing pain without further "appreciation of the covert, subjective and idiosyncratic experience of pain" pertaining to the psychosocial factors (Kerns & Ebert, 2010, p. 469) limits the application and treatment options available. Notably absent from most pain assessments is the emotional component that is stated in the widely accepted definition of pain an "unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" (International Association for the Study of Pain, 2017). Psychological factors both individually and in combination are part of the pain experience and include fears about the injury or pain itself, and distressed affect (despondency, depression, anxiety) (Berube, Choiniere, & Gelinas, 2017; Linton & Shaw, 2011; Nicholas, Linton, Watson, & Main, 2011). These factors, that could potentially impact a patient, could be viewed as data points if they were measureable.

Importantly, these factors are linked to postoperative outcomes as well as the development of a chronic pain diagnosis (Berube et al., 2017; Joshi & Ogunnaike, 2005; Kehlet et al., 2006; Niraj & Rowbotham, 2011). Consistent evidence suggests that targeting these psychological factors seems to produce more reliable experiential data points in both acute and chronic pain populations (Burton, Tillotson, Main, & Hollis, 1995; Linton, 2000; Macfarlane, 2007; Nicholas et al., 2011). Various tools and assessments are available that provide more than one data point, but they also have their challenges in that they may not address one important aspect of pain: the psychosocial aspect.

Another potential limitation of the NRS is the vague phrases used as anchors for the scale. Arguably, the most commonly used anchors "worst pain experienced" and "worst pain imaginable" may not help orient the patient to focus on his current pain experience. The "worst pain experienced" anchor encourages patients to reference historical pain events while the "worst pain imaginable" anchor references a hypothetical event. In traumatic injury situations, acute pain continues to change with various medical interventions and healing. Each assessment needs to capture the experience of the patient in the moment at various specific point of care. This could be an important limitation to the NRS given that pain anchors seem to function as independent variables (Seymour et al., 1985) Therefore, the clinical interaction could perhaps play an important role in determining the context in which people are using the scale's anchor (Slomp et al., 2018).

## Comprehensive Acute Pain Assessment

Various practice guidelines advocate for comprehensive pain assessment including the mnemonics: QISS-TAPEP (Herr, 2004), PQRST (Kernicki, 1993), MNOPQRSTUV (Registered Nurses' Association of Ontario, 2013), SCOARES (Clayton, Reschak, Gaynor, & Creamer, 2000) and discipline textbooks on pain assessment (Willens, 2018). These are, however, not validated tools but part of an assessment process (Gordon, 2015). Importantly, the primary focus each of these comprehensive assessments is on the physical aspects of the injury, such as quality, timing of pain (consistent versus intermittent) sleep, and precipitating factors. These are very important factors to consider for the care of the injury and, in some cases, assist with the diagnosis. Comprehensive assessments capture similar factors to a recent study where "receiving the injury" was identified as a referent (conceptual description) used in providing an NRS score (Slomp et al., 2018).

Two of the mnemonics mentioned above (QISS-TAPED, MNOPQRSTUV) encourage clinicians to explore the beliefs and values of the individual pertaining to pain and pain management. Addressing myths and barriers are important in pain management but do not appear to factor into how an NRS pain score is derived (deWilliams et al., 2000; Slomp et al., 2018). Importantly, they, like other comprehensive assessments, do not seem to address the psychosocial facet as an important part of the pain experience. The emotional or psychological aspects of the pain experience referenced in the IASP definition of pain are conventionally accepted as part of the biopsychosocial experience of pain.

Regardless of the advocation for the employment of these comprehensive assessments, the pain literature continues to cite the NRS as the most commonly utilized tool (Ferreira, Pais-Ribeiro, & Jensen, 2011; Jensen & Karoly, 1992) and the most recommended tool (Australian and New Zealand College of Anaesthetists, 2014; Canadian Pain Society, 2005; International Association for the Study of Pain, 2014). It is likely that comprehensive assessments are not completed because of the constraints in busy, clinical settings where time, expense, and expertise factor into the equation on what type of pain assessment to employ (Kerns & Ebert, 2010). As Kerns and Ebert state, "it is virtually impossible in busy" practices to pursue the recommendation of these types of assessments" (2010, p. 470).

Patients' and staff's frustrations with trying to equate the pain experience to an NRS score (Gordon, 2015) resulted in researchers developing and validating a tool named the clinically aligned pain assessment (CAPA) tool, replacing the NRS completely. It functions as a conversational guide to obtain further contextual information on what they term "domains" (Topham & Drew, 2017). Like other comprehensive assessments, CAPA explores additional information regarding the injury giving more data points, albeit all physical, but does not seem to address the psychosocial aspects of the pain experience. A quality improvement investigation showed improved satisfaction for both staff and inpatients (Topham & Drew, 2017). CAPA was commended as a tool that "helps translates the patient's experience into more than a number" (Gordon, 2015, p. 568). Although, staff and patients liked the tool, this does not necessarily mean that the entire pain experience was appraised nor that pain outcomes were improved.

While there are numerous tools and assessment approaches available for clinicians, what remains a challenge is that they seem to lack the ability to accurately measure multiple dimensions of pain experiences, such as psychosocial. This potential lack of capacity might be impacting the patient’s pain experience and therefore could potentially effect pain scoring. There remains the practical concern of time to administer these comprehensive assessments in busy practices.

## Biopsychosocial Assessment

Biopsychosocial assessments cover a class of assessments and tools that include appraisal of the multidimensions of pain. This class of assessments could include interdisciplinary and integrated approaches, as well as various tools such as the McGill Pain Questionnaire (Melzack, 2005b) and the Brief Pain Inventory (Daut, Cleeland, & Flanery, 1983). Many of the assessments and tools were originally designed decades ago for assessing chronic pain, but there are calls to utilize in other pain populations such as acute pain (Turk & Okifuji, 1999; Turk et al., 2005). These assessments should try to capture a wide spectrum of elements related to the uniqueness of both the person and the pain event. At a minimum they should include some of the psychosocial factors a person in pain might be experiencing (Pereira, Sobey-Fawcett, Slomp, King, & Wasylak, 2018). Importantly, these tools may be able to tap into the fuller experience of the accepted definition of pain (International Association for the Study of Pain, 2017).

Expert consensus and ongoing research point to the integration and coordination of biopsychosocial assessment and management of pain as best practice in rehabilitation (Haldorsen et al., 2002; Wijma, van Wilgen, Meeus, & Nijs, 2016).Increasingly, there are calls for this type of assessment in acute pain conditions (Pereira et al., 2018). Unfortunately, like comprehensive assessments, this class of pain assessment, the biopsychosocial class, is difficult to implement in busy tertiary practice settings (Kerns & Ebert, 2010) primarily due to the length of time it takes to complete these written assessment tools. In conclusion, in spite of these increased calls for biopsychosocial assessment in acute pain situations and the fact that most clinicians are trained to do comprehensive and biopsychosocial pain assessments, the NRS is the most common tool employed regardless of the competing tasks and the time required to complete these types of assessments. There is a great need to develop or modify an existing tool that can be completed in tertiary care and other busy practice settings that is quick, simple, and effective and has the potential to assess the biopsychosocial aspects of the pain experience. (Chou et al., 2016; Schiavenato & Craig, 2010)

### Using the NRS With a Biopsychosocial Approach (BPSA).

The challenge of developing a tool or modifying an existing tool for busy practices could be addressed if the NRS is modified to incorporate rudimentary aspects of the conceptual findings of this research. Despite the NRS's challenges, it is simple and easy tool to use clinically (McDowell, 2006a; Todd, 2005), has robust psychometrics requirements (Ferreira et al., 2011; Jensen & Karoly, 1992).and is endorsed by multipe leading organization such as the American Society for Pain Management Nursing (2010), Australian and New Zealand College of Anesthetists (2014), Canadian Pain Society (2010). Notwithstanding the NRS challenges, I argue that the implications of the conceptual descriptions suggest that perhaps more information is embedded within the NRS score than currently appears with one data point. The conceptual descriptions have provided a potential opportunity to develop a quick, simple, and effective tool that provides more than the single data point of the currently used NRS;the NRS itself could be used with a biopsychosocial evaluation that is defined here as the biopsychosical approach (BPSA).

It appears that three experiential referents (conceptual descriptions) are used to determine an NRS score (Slomp et al., 2018). These conceptual descriptions could be viewed as the components forming the NRS or stated another way, the NRS score is likely a composite of referents. Although three referents in this study were identified, it is plausible that there are other unidentified referents or operationalized pain anchors yet to be discovered. These referents are sensing the injury, grasping the immediate context and sensing the imminent loss of consciousness. In review, sensing the injury, are most of the components currently used in comprehensive assessments (elements pertaining specifically to the pathology), while grasping the immediate context includes environmental, social, meaning, cognitive and psychological elements of the pain experience. Sensing the imminent loss of consciousness became a contextualized anchor for participants. These referents could be summarized as information about the injury, context and anchor.

Rather than discard the tool, the findings (conceptual descriptions) could be applied to the NRS in a manner that extends it usage. These conceptual descriptions roughly mirror the biopsychosocial dimensions, namely the physical, psychological, and social dimensions and is why the suggested approach is labeled BPSA. Theoretically, a clinician could obtain some of this same information by deconstructing the patient's score, thereby, potentially obtaining more nuanced information across his pain experience. Accompanying this additional information, or data points, clinicians could possibly receive more insights, into what the patient is experiencing at a specific pain assessment. As acute pain changes over time, this additional data at each pain assessment could provide the clinician with an assortment of pain management strategies also known as multimodal strategies.

Extending the NRS usage with additional purposeful clinical questioning, the BPSA,would seem to be less disruptive than trying to develop, validate, and begin to change policy and procedures in practice settings. Extending the usage of the NRS with additional questions pertaining to the psychosocial aspects of the patient's pain experience is reasonable and suggested. A hypothetical case study is provided to examine what a BPSA might look like in a clinical setting.

## Hypothetical case

The following scenario is provided to illustrate the differences between the current pain assessment process using the NRS and the BPSA. Keith (RN) has just started his shift and reads the chart notes of a new patient and then administers the NRS. Priya provides an NRS score of eight out of ten.

**Case Report**

**Name:** Priya Anthram

**AHS #:** 12345-6789

**Height:** 1.5 m

**Weight:** 59 kg

**Date of Birth:** 1970.02-25

**Sex:** Female

**Diagnosis:** two fractures R humerus and R anterior shoulder dislocation

**Medications:** Altace (10 mg), warfarin (2.5 mg)

**History:** two previous right shoulder dislocations

**Clinical notes:** surgery scheduled in 48 hours with Dr. Bones

*Figure 6.1* Case Report

The assessment process currently employed on Keith's unit supports his choice of an opioid analgesic. (See the steps for pain assessment outlined in Table 6.1). When Keith reassesses Priya's pain after giving her hydromorphone hydrochloride, she rates her pain as a *seven*. The NRS provided Keith with two data points (first and second pain score) but gave Keith no context about Priya's pain, its meaning to her, or its relevance to the circumstances of her life.

Keith would not know whether the prescribed analgesic was ineffective or if other factors contributed to Pryia's score remaining elevated after taking hydromorphone hydrochloride. This illustrates some limitations of the NRS using the current assessment process.

Table 6.1
*Current Assessment Process versus BPSA*

| Pain Assessment Steps | Current | BPSA |
|---|---|---|
| Administer the NRS | ■ | ■ |
| Interpret the pain score | ■ | Using critical thinking assess the potential for biopsychosocial, contextual (emotional) and environmental factors that could be elevating the pain score. |
| Action plan for pain management | Review the analgesic ladder and doctor's orders on the chart. Administer appropriate analgesic. | Review multimodal solutions that include nonpharmacological approaches to address the factors identified as contributing to the NRS score.<br>Review doctors order on the chart.<br>Administer an individualized multimodal pain management strategy. |
| Reassess effectiveness of clinical decision | ■ | If pain score remains elevated reexamine the factors potentially modifying the pain score and apply a different strategy and or pharmacological alternative |

Using the BPSA Keith might start by determining how Priya is defining the ten on the NRS. He might find that she has operationalized her maximum anchor as the ILC or some other yet to be identified operationalized scale anchor. On the other hand, she could be using the anchor term as administered. Functioning as an independent variable, the anchor usage would likely be an important first question, as in either case, Keith would have more nuanced information and insights as to how she is first and foremost using the NRS.

Keith could ask Priya about biopsychosocial factors of her pain experience and their potential impact on her pain score. He would discover that this is the third time that Priya has dislocated her shoulder and that the consequences mean two things to Priya: reconstructive surgery of her shoulder and the end of her career as a professional violinist. All three future events (the immediate surgery, upcoming reconstructive surgery, and the end of a career) are factors that could certainly be seen as distressing and anxiety provoking. Additionally, she is unable to perform at an upcoming weekend performance. As a professional musician, this fact alone could create a lot of stress and anxiety.

Keith might discover that Priya was up most of the night in the ER waiting for diagnostic tests and specialist consultations. Like many people, she could be quite anxious about being in the hospital; she could be afraid of contacting an iatrogenic infection as well as of the upcoming surgery (Aman, 2013). Keith's clinical analysis of Priya's contextual factors associated with Priya's injury and her pain would take into consideration her exhaustion and stress, paying attention to the psychosocial factors that might be modifying her pain perception. He could also consider various multimodal interventions to address her exhaustion, stress, and anxiety and along with an analgesic to address the nociceptive aspects of her injury and give pain relief to Priya.

Keith would keep in mind that injuries have short- or long-term consequences impacting how Priya is interpreting the meaning of what is transpiring, as the context of the injury drives meaning (deWilliams et al., 2000; Hinds et al., 1992; Park & Folkman, 1997). Meanings attributed to the injury often involve the patient's job, short-term disability funding, family responsibilities, paying the bills, and ongoing medical and rehabilitation demands. These concerns can increase the emotional response to the pain experience and can result in increased anxiety (Powell et al., 2016; Pritchard, 2011). Clearly, Priya's career ending injury will have significant meaning to her. Keith might also help her to identify resources to help understand and process this loss and to adapt to her new reality. The meaning and consequences of the pain experience are uniquely linked to the patient's circumstances in conjunction with their global belief/value system and are also linked to anxiety (Park & Folkman, 1997; Slomp et al., 2017).

In keeping with BPSA, Keith's first choice of a multimodal intervention might be educating Priya about the complexity of pain, the impact of anxiety on pain experiences, and the low risks of acquiring an infection or complications by giving her some facts. He might also help her to problem solve ways that her ensemble might find a solution to her inability to perform. Encouraging her to sleep and to try to calm herself by listening to some music, Keith could be attending to more of her pain experience. If needed, Keith could then provide Priya with an appropriate analgesic to address the nociceptive component of her pain and reassesses the multimodal interventions previously implemented.

## Discussion

Relying solely on the NRS single data point to assess the intensity of APT can miss important psychosocial contextual factors known to influence the experience of pain. Heightened anxiety, the *meaning of pain* and lack of sleep are all associated with higher reports of pain experiences (Powell et al., 2016; Pritchard, 2011), and yet, these psychosocial factors are not apparent in a simple, single data point: the NRS score. However, the potentially significant information gaps unidentified in the current pain assessment process could be captured with the BPSA by deconstructing the single data point provided in an NRS score.

The primary reason to apply the BPSA to practice is to identify the hidden composites of the NRS score, identified in this research as conceptual descriptions, that potentially modify pain scores. Adoption of the BPSA would require a conceptual shift for clinicians to view the NRS not as a score per se. Rather, the clinician would need to deconstruct the score in order to provide themselves with more in-depth data than just the face value of the NRS score. The BPSA could also be an ongoing reminder to clinicians of pain's complexity and the endless permutations of pain experiences that exist in practice. This approach addresses and validates the patient's entire pain experience that includes both the sensory and the emotional. This, in turn, enables an important patient/clinician interaction known as the therapeutic effect which has been shown to be an effective pain management strategy (Ferreira et al., 2013; Fuentes et al., 2014b).

The BPSA may be more relational in nature as it recognizes the expertise of a patient's experience and **a** clinician's clinical knowledge and understanding. Importantly, this provides the clinician an opportunity to delve into more of the contextual (biopsychosocial) aspects of the pain experience that is salient to the experience and included in the accepted definition of pain. The BPSA also allows for a more selective use of pain management strategies that are multimodal in nature. This is important, as sole reliance on an NRS score to determine analgesic choices have led to an increased incidence of adverse effects (Vila et al., 2005a). Some have suggested that usage of NRS scores in this manner are "poor indicators of analgesic requirements" (Clark et al., 2002, p. 241). As the NRS may capture some of the psychosocial aspects of the pain experience, alternative medications might be considered. For instance, anxiolytic medications or nonpharmacological strategies can be used to reduce the anxiety present, thereby reducing the experience of pain rather than using an analgesic that is designed primarily to block nociceptive mechanisms and not anxiety (Edmunds & Mayhew, 2013).

## Moving Beyond the Single Data Point of the NRS

Recently, investigators have questioned the use of one data point, with an NRS score, to measure pain intensity from which to make clinical care decisions. The possible application of the BPSA in practice could give clinicians multiple data points from which to make pain management decisions rather than depending on a single data point. Although, the data obtained through this process is unlikely to be numeric in its characteristics, it could provide clinicians with important insights that might be missed with a single metric score.

Acknowledging that pain is a complex multidimensional phenomenon may require a conceptual shift for practitioners away from a single data point as the primary assessment tool. (Carr, 2016; Gordon, 2015; Slomp et al., 2018; Topham & Drew, 2017; von Baeyer & Pasero, 2017). The capacity to shift conceptually will likely mean more than just having clinicians regularly assess and document pain as was attempted by JCAHO in 2002, as these attempts to mandate pain assessment as the "fifth vital sign" did not resulted in improved pain management (Mularski, White-Chu, Overbay, Asch, & Ganzini, 2006). The over reliance on a single data point in conjunction with pain treatment algorithms have been associated with adverse events including opioid over sedation rising from 11 to 24 incidents per 100,000 hospital in-patients (Gordon, 2015; Vila et al., 2005b).

Although it is well known that psychosocial factors are part of the pain experience, the assessment of biopsychosocial factors remains a practice challenge (Kerns & Ebert, 2010; Linton & Shaw, 2011). The concerns around comprehensive assessment and multidimensional tools produce a clinical conundrum. On the one hand, the NRS is the standard validated tool recommended for APT assessment as being a quick and easy tool to use, but it only provides one data point. On the other hand, multidimensional tools and comprehensive assessments provide a more thorough assessment of pain, but they require a substantial amount of time and therefore, are impractical in busy practice settings.

In examining how people score their acute pain, evidence suggests that grasping the immediate context, which includes elements of the psychosocial, may play a more substantial role in how people reference their pain to produce an NRS score (Clark, Lavielle, & Martínez, 2003b; Thong et al., 2018). De Williams's (2000) seminal work highlights the highly idiosyncratic processes people use to provide a pain score and cites contextual factors such as level of distress, anticipating what a clinician may think of their score, and level of fatigue. Although this investigation examined individuals with chronic pain, it underscores how complex providing a pain score is for the individual generally. Multidimensional affect and pain surveys given to postoperative patients concluded that emotional qualities were likely reflected in the pain score (Clark et al., 2002). Scoring of pain might be best summarized as "an attempt to construct meaning and is influenced by and with reference to a range of external and internal factors and private meanings" (deWilliams et al., 2000, p. 457).

In a recent investigation into how people with APT determined their NRS score, grasping the immediate context was identified as one of the three referents employed to provide that score (Slomp et al., 2018), aligning with de Williams' investigation (2000). As one element of grasping the immediate context, psychosocial factors were believed to be employed to reference their pain and ranged from visitors encroaching on personal space to various types of anxiety including obtaining a hospital infection, the surgery itself, pain medications/anesthesia fear of the immediate future and negative interactions with clinicians (Slomp et al., 2018). It is also important to note that anxiety can be induced by a painful event (Gerrits, van Oppen, van Marwijk, Penninx, & van der Horst, 2014) and may not have to be a pre existing condition. The conceptual findings demonstrate that the NRS score seems to capture psychosocial factors, which aligns with other findings (Clark et al., 2002; Knotkova et al., 2004; Slomp et al., 2018). “It may be concluded that patient scores on unidimensional pain intensity scales reflect the emotional qualities of pain much more than its sensory intensity or other qualities” (Clark et al., 2002, p. 241) thereby suggesting that the NRS is measuring more than the sensory aspects of pain. Neither comprehensive pain assessment,or the NRS do not appear to fully address the biopsychosocial contextual factors that seem to influence the determination of a pain score, or if they do, have not been examined for this capacity. Given that contextual (psychosocial) factors appear to guide pain scoring and that these factors are inherently idiosyncratic it is important for clinicians to explore what contextual psychosocial factors are at play in an NRS score. Adding *grasping the immediate context*, a potential referent used to by some individuals to provide a pain score(Slomp et al., 2018), might enhance existing tools, such as the NRS, and better align them within the accepted definition for pain.

Due to the inherent limitations of the NRS coupled with the time constraints of busy clinicians, what is being proposed is that the NRS continue to be used but also extended to include informal questioning by the attending clinician. The aim of these inquires would be to capture the referent, grasping the immediate context, that includes the emotional aspects of the pain experience. Adding more formal assessments to access these aspects is ideal, but the reality of busy clinical practices means that it is unlikely to occur. By providing opportunities for clinicians to ask more specific psychosocial contextual questions pertaining to the individual’s pain experience, this approach focuses on factors that have been shown to affect pain scores. These factors would include meanings attributed to the pain event and is in keeping with recommendations by the Canadian Association of Emergency Physicians to include pain management strategies to reduce stress, and anxiety (Ducharme, 1994). “Empathy, reassurance, and proper explanation of pain…will help decrease anxiety and pain for most patients” (Ducharme, 1994, p. 855).

The increased calls to find better tools than a single data point scale such as the NRS, along with the conceptual findings that the NRS might be providing more information than a single data point as previously thought (Slomp et al., 2018), point to a possible solution. Since the NRS is currently viewed as the best unidimensional tool (von Baeyer, 2006) for various pain management aspects such as assessment, analgesic effectiveness, and the amount of pain relief provided, retaining it as a pain tool for APT seems reasonable. The use of experiential referents to determine a pain score suggests that multiple data points are used to reduce the pain experience into a single metric score or data point. If clinicians attempted to obtain these multiple data points used to form the score (experiential referents) this information could provide clinicians with more data, more insights, and consequently more choices in multimodal pain management as currently recommended (Chou et al., 2016). Since the NRS score appears to be a composite of experiential referents, it is feasible to retain the NRS by extending its usage. In extending the NRS usage, not only is a valid tool kept in practice, it might provide more in-depth information of the patient’s pain experience that includes more than the sensory dimension alone (Chou et al., 2016; Schiavenato & Craig, 2010). The additional data could possibly enable clinicians to use multimodal pain management practices concurrently with the analgesic options presently available. It is suggested that employing the NRS with additional questioning pertaining to a patient’s pain experience be called a biopsychosocial approach to using the NRS.

The BPSA differs from the conventional and standard methods to pain assessment in that it explicitly considers the emotional, cognitive, and contextual aspects of the APT experience, thereby possibly addressing the gaps and limitations not identified in the NRS or comprehensive scores alone. Pain assessment is complex and is better conceptualized as providing a “proxy” of the pain experience (von Baeyer, 2006). Improving the current pain assessment process with a BPSA requires the need to understand that the underlying modifiable factors (such as anxiety) are potentially part of the composite score that reflects the experience , but always remains a proxy of the actual pain experience ; (deWilliams et al., 2000; Slomp et al., 2018; von Baeyer, 2006). The empirical evidence suggests that APT scores are influenced by similar factors to what is observed with chronic pain (Melzack, 2005b; Slomp et al., 2018; Topham & Drew, 2017; Wijma et al., 2016).

The complexity of the interaction between the biological, psychological and social realms of an individual’s pain experience (Carter, Sendziuk, Eliott, & Braunack- Mayer, 2016; Knotkova et al., 2004; Sellinger et al., 2010) signals that this interaction may need to be captured through a more comprehensive pain assessment. However, current comprehensive pain assessment seems to be impractical in many busy practice settings. Adopting a BPSA could address the need to measure pain in a more comprehensive fashion, yet, theoretically be administered in relatively little time.

Employing BPSA in acute trauma care is an important conceptual shift in health care practice, as it requires viewing pain assessment relationally rather than procedurally. It may require explicitly tapping into the psychosocial factors that might be modifying the pain score. Implementing the BPSA in the clinical setting is logical for several reasons ranging from aligning practice with theory to reducing the incidence of more complex problems due to suboptimal pain management. Such an approach begins with the recognition that the NRS score conceivably is a composite of many experiential referents. The BPSA also acknowledges that both the patient (experience) and the clinician (clinical knowledge and judgment) are experts.

### Aligning Assessment to the Pain Definition

Importantly, the proposed BPSA aligns assessment with current theory and definition as well as with pain management practices. Continuing to treat pain as if the NRS were a direct measure of the sensory component of the experience may blur our understanding of the purpose of pain assessment (Boris-Karpel, 2011; Sellinger et al., 2010). Many investigators emphasize multimodal and or biopsychosocial methods in treating pain (Gatchel, 2005; Gatchel & Okifuji, 2006). Arguably, suggesting alternative treatments is difficult to reconcile without at least a preliminary examination of what specific factors are present; the BPSA can accomplish this rudimentary assessment.

Although the NRS is a simple measurement tool, it can feasibly be employed in many pain assessment situations as a part of BPSA. Although many multidimensional pain measurement tools exist, these more extensive tools do not need to be employed in acute trauma situations, adding to heavy case loads unless the situation warrants it (Sellinger et al., 2010; Todd, 2005). The key to applying the BPSA is to deconstruct the pain score to find the other, potentially, relevant date embedded in the NRS score. Questioning could focus on common psychosocial themes associated with having painful acute traumatic injuries. Clinicians' responses could validate and educate the patient to help them understand their own pain experience minimally by sharing the conventional definition of pain. Another response that clinicians could explain is that pain is a complex experience and that the pain they feel (perceive) is not completely related to the amount of tissue damage but to due to many of other factors.

After conducting further research into the feasibility of employing the BPSA versus the NRS alone,it can be concluded if a BPSA is adopted, it would become more apparent that the intention is to measure the pain experience (Slomp et al., 2018). The BPSA has the potential to empower clinicians to include probing, purposeful questions to determine the presence of these experiential factors that are subjective in nature (emotions). Due to their subjectivity they are also potentially thereby modifiable via multimodal strategies.

In practice situations, it is imperative that clinicians use their critical thinking expertise. This becomes particularly important when pain scores provided do not fit a clinician's observations of a patient; this situation can result in the clinician experiencing some cognitive dissonance and, in turn, has consequences for his pain management decisions (Carter et al., 2016; Pasero & McCaffery, 2004). For clinicians who experience cognitive dissonance with the current NRS assessment process, the BPSA provides an opportunity to dissipate some of their concerns through the questioning process. Moreover, the BPSA provides clinicians with a basis from which to consider alternative pain management decisions that reflect the insights of their in-depth queries. Nonpharmacological options for the management of pain are currently promoted, making a more biopsychosocial assessment to determine other factors imperative (Boris-Karpel, 2011; Chou et al., 2016).

Another reason to transform acute pain assessment to include the use of a BPSA is that clinicians collectively share an objective to purposefully address the alleviation of suffering (Stiller, 2000; Straughair, 2013). Compassionate care acknowledges and validates the patient's pain (Straughair, 2013) and aligns with the current health care standard to provide patient centered care. Incorporating a BPSA signals to the clinician to direct their assessment to better reflect the person's unique and silent pain experience in a specific clinical context. We posit that a BPSA is an acknowledgment of the patient as a person and embraces an ethical relationship that fosters trust, respect, and dignity. Evidence suggests this type of therapeutic practice itself potentially enhances recovery and decreases pain (Fuentes et al., 2014b). Conversely, the objectification of pain into a single unidimensional score without delving into the experiential aspects of pain keeps pain assessment in a narrow framework and increases the risk of impeding adequate care because the context is stripped from the assessment (Hodgins, 2002; Pasero & McCaffery, 2004).

The economic impact of the undertreatment of pain is another rationale for why a BPSA could be applied to APT assessment needs to be incorporated into practice (Boris-Karpel, 2011; Goldberg & McGee, 2011; Green, 2008). If BPSA has the capacity to provide a more in-depth pain assessment it is plausible that pain management could be improved. As a result of more thorough assessments, it is feasible that outcome measures could be improved reducing health care costs. There is a great need particularly for public health planning to manage acute pain effectively and efficiently to reduce the enormous costs associated with prolonged hospital lengths of stay, complications or the risk of developing persistent postoperative chronic pain (Gatchel & Okifuji, 2006; Kehlet et al., 2006; Neil & Macrae, 2009). The confluence of increased life spans, chronic disease prevalence, and the aging of the population has created a bubble that will increase the incidence and need for medical intervention with significant consequences for health care systems. Efforts to deal with capacity issues start with effective assessments, protocols, treatments, and outcomes that can be improved upon: pain assessment certainly fits that criteria. A BPSA may constitute a more comprehensive examination of pain assessment that could lead to improved clinical outcomes.

Conventionally, we know that disseminating knowledge alone is not effective at changing clinicians' practice. A recent systematic review provides some evidence that a combination of intentional knowledge translation interventions, good methodology, various tools, and strategies appear to be more effective at making changes to the practice setting (Yamada, Shorkey, Barwick, Widger, & Stevens, 2015). Adopting a BPSA may requires a conceptual shift in pain assessment for APT experiences including concerted efforts to address clinical guidelines, inform policy, and provide training as well as measure the effectiveness of the intended practice changes. Effective changes ideally will impact clinical outcomes reflected in optimal pain relief, increased patient satisfaction and reduced health care costs.

Adopting a BPSA to APT could be an important step in acknowledging the complexity of APT experiences. Specifically, such an approach identifies and addresses the psychosocial modifiers of the pain experience that can be attended to with more selective pain management strategies. Giving clinicians the permission to explore the pain score using a BPSA allows them to use their clinical expertise to address contextual concerns that arise in each unique practice situation and to theoretically improve pain management.

## Summary

Treating pain based on a single data point based on the current NRS tool seems to be ineffective at capturing the complexity of the pain experience and might confound pain management. Using a biopsychosocial assessment with the NRS, (i.e. BPSA) conceivably provides clinicians with the opportunity to probeinto the unique experience of pain, its complexities and idiosyncrasies (Gordon, 2015; Manworren, 2015; Sellinger et al., 2010; Twycross et al., 2015; Willens, 2018). By extending the validated NRS tool with the BPSA, clinicians can employ purposeful questions to delve into the deeper psychosocial contextual factors that might modify the person's experience with pain. The application of the NRS within the BPSA could better reflect theory, which includes a broader understanding of the multiple dimensions s of the pain experience. This approach could conceivably result in more in-depth engagements with the person during pain assessment, allowing for psychosocial or contextual factors to be appraised along side of the nociceptive aspect of pain management. As this approach requires more communication with the patient to addresses the person's experience, it may provide patients with more agency during their hospitalized time typically that is typically experienced as having little independence. We can see from Priya's situation that understanding the underlying factors that contribute to a patient's pain experience changes how clinicians view her pain, the approaches to pain assessment, and pain management decisions. The BPSA might be a shift for clinicians moving from a process oriented pain assessment to one that is potentially more relational for understanding the in-depth pain experience of the patient. Employing a BPSA in the hospital setting could be an important first step in achieving optimal pain management because in the words of one study participant: "each pain experience belongs to a certain trauma." Each pain assessment should reflect that pain experience.

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# CHAPTER 7- GENERAL DISCUSSION AND CONCLUSION

In this chapter, I review the dissertation by recalling the research questions and their outcomes. After reviewing the analysis of these themes, the strengths and limitations of this dissertation will be discussed, and I then close with future practice, policy, and research implications.

## Review of the Dissertation

The research questions of this dissertation were “How do people with acute traumatic injuries determine their NRS pain score?.” and “What meanings do people with an acute traumatic injury associate with their pain experiences?.” Three experiential referents regarding the production of an NRS score identified through the analysis addressed the first question. These referents or conceptual descriptions were (a) *receiving the injury* that captures the many facets of the physical aspect of the injury, (b) *imminent loss of consciousness* (ILC) as the operationalized NRS anchor, and (c) *grasping the immediate context* that encapsulates the contextual experiences. Through the analysis the three determinants could be attributed to the meaning of an acute traumatic injury to answer the second question. These conceptual descriptions were (a) *permanence of injuries*, (b) *incongruent care*, and (c) *personal responses*. A synopsis of the key findings identified and described will be provided in this chapter along with an application of these findings to practice. The findings to these questions were published in two international peer reviewed journals and the application of the findings is in preparation for submission to another peer reviewed journal.

The first paper, which forms Chapter 4, “The underlying framework of how an acute pain score is determined: An interpretive description” (Slomp et al., 2018), explained the referents adults employed to produce their NRS scores. Three experiential referents--receiving the injury, , sensing the imminent loss of consciousness, and grasping the immediate context --accounted for the process of constructing an NRS score. The findings were presented as factors and are meant to represent ID's conceptual descriptions. Myriads of experiential data occur in the dynamic experience of an acute traumatic injury and each pain score is sculpted by the dynamic context and the sensory information that exist when the NRS is administered each time pain is assessed. A complex interplay occurs between these identified experiential referents that are affected by the changing nature of treatment, clinicians, and time. These findings provide more knowledge to our understanding of how pain scores are formed through the various stages of APT(Slomp et al., 2018).

The second paper, forming Chapter 5 and entitled "The determinants of the meaning of pain following an acute pain event" (Slomp et al., 2017), gave an account of the contextually determined elements that contribute to the construction of the meaning of pain within the dynamics of an acute traumatic injury. The findings were presented as three determinants in this published paper--permance of injury, incongruence of care, and personal responses to injury and care given--represent the conceptual descriptions. The permanence of injury, ranging from temporary to permanent, seemed to impact the meaning of pain. Incongruence of care contained two subthemes, namely incongruence of personal care, and incongruence of being in severe pain while in the hospital. The third determinant, personal responses to injury and care received, also identified two subthemes namely the importance of stoicism, and anxiety over inadequate pain management. The determinants identified reflect the expectations, values, and beliefs that individuals have regarding the interaction between sustaining an injury and their personal interactions with health care professionals. Moreover, individuals also judged themselves in terms of their own responses to their injury and how they behaved when care was perceived to be suboptimal. These determinants, in turn, affected the individuals' construction of their NRS score (Slomp et al., 2017).

These conceptual descriptions might offer important insights and information for clinicians' interpretation of a person's NRS score that is dynamically sculpted by her acute trauma pain experience throughout the stages of care. It is important to note that these conceptual descriptions are not exhaustive as there may be many variations of how pain could be experienced may not yet been identified. These conceptual descriptions highlight that patients rarely have experiences that mirror textbook cases and instead are uniquely situated in their circumstances.

A third paper, which is entitled "A biopsychosocial approach to pain assessment using the NRS,"and is being prepared for publication, constitutes Chapter 6, and is a proposal that applies the findings of the first two papers to practice settings. In retaining the NRS as a measurement tool, this biopsychosocial approach (BPSA) incorporates clinical questions to obtain more experiential pain information (data) that is essentially contextual in nature. It proposes to identify modifiable psychosocial factors that might be managed by alternate or adjuvant pain management strategies. The proposed BPSA would likely change the more protocol driven administration of the NRS that is currently employed (Gordon, 2015; Vila et al., 2005a) to a more relational administered tool. It would mean that clinicians would need to engage with the patient to determine what other factors could be impacting the NRS score.

Gordon's (2015) call for assessments that generate more data points is important and provides an example, the CAPA tool, in achieving multiple data points. However, more data alone may not be sufficient to capture the pain experience. It might be more important to ask what type of data would provide more insight into the pain experience. CAPA is essentially a comprehensive assessment of the injury and not the pain experience. The BPSA suggests that clinicians thoroughly explore the NRS score with purposeful inquiries. This approach could feasibly provide an assessment platform that contains multiple data points providing more evidence for sound pain management (Gordon, 2015) and alternative pain management decisions other than administrating analgesia only as the first line of intervention. In this approach, at various points of care, including the pain assessment, clinicians probe for potential psychosocial factors that might be contributing to the NRS score provided to them. It is conceivable that this approach is a more comprehensive assessment with less limitation than the current usage of the NRS. Employment of this approach based on the findings could provide insights for practice guidelines and education. However, given the exploratory nature and methodological limitations of this research further research is warranted in appraising its clinical feasibility.

## Common Themes

This section provides three overall themes of this project's conceptual descriptions. It provides "a rich description … enabling a higher-level, more abstract description of the concepts" that were identified in this study (Morse, 2008; 2018, p. 178). These themes afford a broader conceptual framework from which to understand the particulars involved in assessing a complex pain experience that often accompanies trauma. In addition, these themes may extend our knowledge and understanding of the NRS's limitation when used solely, which may significantly restrict what clinicians can ascertain from the score. There are three themes that are woven through the entire findings: (a) the contextual component, (b) the clinician controls the administration of the NRS and, (c) NRS: limitations and a possible new opportunity.

## Contextual Component

A central theme running through the dissertation is the need to recognize the contextual nature of pain, its assessment, and its management. Each pain event is unique and complex, sculpted by the many elements associated within the context of that event as well as historical events. Consequently, this necessitates an assessment method that can capture the contextual uniqueness of multiple elements of the pain event including how the person defines her *ten* or anchor on the NRS. The proposed BPSA might provide clinicians with a pain management approach in their use of multimodal strategies that addresses pertinent psychosocial contextual factors.

In APT events, the contextual nature of the different phases of care may change multiple times from the scene of the accident to active rehabilitation. Accordingly, pain experiences associated with trauma fluctuate depending on the context at the time when an NRS tool is administered. Practically, this means that each assessment may have different situational elements that need to be fully explored to provide optimal pain management. This could theoretically mean that other referents including an operationalized anchor could change over the course of treatment.

The changing context would also include the multiple clinicians that a patient might encounter during her admission to a tertiary care centre. As clinical interactions might impact a patient's perception of their pain and therefore her score, (Schiavenato & Craig, 2010; Slomp, Mayan, Lasiuk, & Dick, 2018b) a contextual approach may lead to more consistency in scoring. Theoretically, having multiple data points from which to manage a patient's pain, might result in fewer discrepancies in scores between treatments or settings (Reyes-Gibby, McCrory, &

Cleeland, 2003). As a single data point could reflect changing conditions, multiple data points of a BPSA may reveal the contextual components that may underlie a changing score.

This strong contextual theme provides a robust link between the three dissertation papers, and importantly, reflects the components described as key to understanding the pain experience as posited by the DPC (Kucyi & Davis, 2015). Experiences are the interactions of an individual with the people, things, and environment in which an event occurs. An immense complex network of neurons in the brain cooperatively and integratively generate all subjective experiences, including pain. Both genetic and environmental factors over a lifespan form the spatial-temporal signature through which new pain experiences are filtered (Kucyi & Davis, 2017). The generation of a pain score appears, therefore, to be sculpted through the lens of cognitive, affective, and sensory dimensions of the pain experience or the spatiotemporal signature. These dimensions are in a complex interplay with each other.

The primary dimensions involved in the experience of pain (physical, cognitive, and affective) may not be equally affected by the context in which the pain occurs. For instance, a person hit by the mirror of a passing car may have sustained a minor injury but the realization that she could have sustained serious injury or death may impact the cognitive and affective dimensions more than the sensory. Simply put, context appears to have the potential to modify the experience, particularly if pain is anticipated (Arntz & Claassens, 2004).Accordingly, the changing context or changing expectation could affect pain scores.. All three papers emphasize the contextual nature of APT experiences. Both the meaning and scoring of pain experiences are not only unique to an individual's spatiotemporal signature and each trauma experience (Moayedi & Davis, 2013), but importantly, they seem to be related to the context in which pain is assessed. It appears that not only are the meaning and scoring determined personally when in the moment of pain, these constructs seem to be modified according to the concrete context and situation at that time.

The salience of context as an experiential referent in determining a pain score is congruent with the literature. Many factors within the context of pain assessment can impact NRS scores including institutional cultural or regulatory norms (National Institute for Clinical Studies, 2003; Reyes-Gibby et al., 2003), interactions with clinicians (Schiavenato & Craig, 2010), instructions (Smith et al., 2015b), and crowding (Hughes, Cabilan, & Staib, 2017; Pines & Hollander, 2008) as well as endogenic changes such as analgesic side effects, stress, delirium, cognition and so forth (Burke et al., 2007; Willens, 2018). Pain perception, the communication of it, and actions as a result of it are shaped by many factors including genetic, familial, social, and cultural (McGrath, 1994). Who performs the assessment and how a tool is administrated may also possibly impact pain scoring (Bruera, 2005; Reyes-Gibby et al., 2003). For instance, the dissimilar scores charted when different clinicians assess the same individual could be accounted for by interactive relational qualities of pain assessment between the person and the clinician (Bruera, 2005; Sikorskii et al., 2012). Importantly, the changing context and dissimilar pain scores reflect current theory that posits that new pain events are sculpted through the template of the connectome as well as through the circumstances in which the new event is situated.

In a similar vein, most life encounters are framed by the context of the event (Mishler, 1979). The clinicians' role is to bridge the world of lived experiences and biomedical sciences (Thorne, 2008) regardless of the patient's context or complexity of injury or illness. Engaging patients to help extract more in-depth information that reflects the conceptual descriptions of their pain experience or their pain scores may provide valuable insights to inform their practice. Clinicians conventionally use their critical analytical skills to integrate what they know, extract meaning from the situation, and then convey these understandings to the people under their care (Hinds et al., 1992). The resulting clinical interpretation and management decisions could then be conveyed to these patients, perhaps helping them find meaning in their pain situations (Morse & Field, 1985).

Whether clinicians have the necessary skills or time required to examine biopsychosocial contextual factors present in APT assessment remains to be seen. However, "failure to address the psychosocial dimensions of a patient's pain and suffering …represents a major socio-economic problem" as these dimensions seem to impact surgical outcomes (Lavand'homme, 2011, p. 572). These skills seem to be important in obtaining a more in-depth understanding of the presented NRS score and then critically interpreting key information for treatment decisions.. The complex experiential (contextual) referents used to score and attribute meaning to pain could potentially be captured by the BPSA for pain management decisions. Assessing pain without such an approach may deprive the assessment of critical context, resulting in providing pain management solely on the NRS score provided.

The conceptual descriptions of this dissertation are congruent with Hinds, Chaves, and Cypess (1992) who conceptualized a clinical contextual model of four strata that interplay with each other. These strata are defined by the temporal, the amount of shared meaning (personal to universal), and the speed of movement between the strata. The hub of the strata is the *immediate* context that exists during pain assessment, including all things and people present. Importantly, study participants were aware that when they were providing their pain scores the rating did not compare their historical pain events to their current pain but contextualized to their immediate situations; this conceptual description is similar to Hinds'(1992) immediate strata of all things and people present.

On the other hand, when participants referenced their past pain events, this was typically in a retrospective manner and not in the immediate context when the assessment took place. This reflects Hinds' (1992) *specific* strata, where context theoretically links through the pain connectome template of past relevant pain experiences, forming the current experience. Moving further out from Hinds' concentric circle model of context is the *general* context that begins to evaluate the current pain experience with life experiences in general, and is where beliefs, values, and meaning are located.

Finally, the *metacontext* could be viewed as those universal values that frame how events are interpreted at a societal level (Hinds et al., 1992). Participants who felt that their care was suboptimal are conveying information at a metacontext level as a shared universal meaning. In this study, those with permanent injuries placed higher meaning on their injury than those with temporary injuries correlating to Hinds and colleagues' (1992) fourth strata: metacontext of the personal and universal meanings. The meaning of pain for these people had both a deeply personal implication as well as a meaning that could be viewed as important to the public.

Together, the conceptually nested stratum for context demonstrates the clinical necessity to explore pain experiences beyond the obvious pathology and vital signs. Specifically, exploring the contextual environment reveals the rich realm of psychosocial factors that seem to heavily influence the perception and reports of pain (Sellinger et al., 2010).

## Clinicians Administer the NRS

A further theme that informs this dissertation is the centrality of the clinician in administering the NRS for pain management purposes. When administering subjective scales, it is important to follow standardized steps in their administration. Standardization helps ensure that reliable pain assessment directions is first given by the clinician and then interpreted by the patient to mean the same thing. This standardization theoretically reduces the likelihood of prospective idiosyncratic interpretation of the NRS.

In the research literature, little evidence of the steps used in pain assessment was found except for that provided for by Smith and colleague (2016). Although the NRS is considered a self-report tool, the findings (conceptual descriptions) of clinicians' influential role in administering the NRS corresponds with those of others (Schiavenato & Craig, 2010). Interactions with patients potentially changed the pain score depending on whether the interaction was positive or negative (Slomp et al, 2017). This theme interacts significantly with the contextual theme previously mentioned in this section, whereby the clinician patient interaction can play out into a circular type of feedback loop. For instance, if a clinician is suspicious of the amount of pain a patient is reporting, and the patient senses their concern, that may result in the patient displaying more overt pain behavior to prove they need more analgesics which in turn raises the clinician's level of concern. Schiavenato and Criag (2010) draw attention to the fact that the interaction between the clinician and the person is affected by the patient's demographics and socioeconomics in addition to the clinician's beliefs and attitudes (Burton & Ludwig, 2015; Layman Young et al., 2006). Although these factors were not investigated in this study specifically Chapter Five suggests that the perception of incongruent clinical interactions seemed to impact participants' meaning of pain, particularly when they viewed it as inconsistent with their health care expectations.

The BPSA addresses some the limitations of the NRS scale that were revealed in the first two chapters of this dissertation. This approach gives clinicians additional control of pain assessment, as they are encouraged to ask more in-depth questions of the context of pain. In contrast, the adage "pain is whatever the patient says it is" may keep clinicians from asking questions in part because a pain score has already been given by the patient. Additionally, pain often "is rapidly assessed, physiologically rooted, potentially objectively assessed and easily obtainable in the clinical environment" (Schiavenato & Craig, 2010, p. 669). Collectively, clinicians may have implicitly accepted this adage and method of assessing pain, thereby minimizing their control of pain assessments.

A clinician's role and control of the pain assessment are therefore expanded on with the proposed BPSA. It allows the clinician to address some potential missing contextual factors in the NRS when administered in its current form. The immediate contextual factors when pain is assessed could range from anxiety regarding being in the hospital to worry about future implications of the injury. As some of these identified gaps seemed to be hidden within the NRS, the BPSA, conceivably gives the clinician an opportunity to probe the person's pain experience for these potential missing elements that might affect pain scoring.

As with most assessments, the BPSA is controlled by the clinician. In using their critical thinking skills, clinicians could purposefully examine the multitude of factors associated with the context of each pain assessment. As the contextual elements cannot be known precisely in each situational reality, the BPSA enables clinicians to use their clinician judgment to determine what specific element requires further probing rather than using a prescriptive approach. In contrast, the new clinically aligned pain assessment (CAPA) tool, designed to overcome some of the limitations of the NRS, requires five conversational prescriptive questions (Topham & Drew, 2017). On one hand, the CAPA tool focuses in on the pathology and could be considered a comprehensive tool, while on the other hand, the BPSA focuses the assessment on a broad range of factors affecting the person's APT experience, specifically, the biopsychosocial factors.

Importantly, the BPSA retains a validated tool, the NRS, but includes examining the various dimensions of pain beyond the sensory.

## NRS: Limitations and a Possible Opportunity

The limitations of the NRS are a fundamental theme throughout the dissertation. Institutions likely rationalize their choice of scale to measure the construct of pain intensity based on limited time resources. The NRS is a logical choice in time-restrained locations like busy practice settings. However, a challenge of the NRS is the claim of construct and criterion validity. Construct validity concerns whether the NRS achieves its stated goal: measuring pain intensity (Ferreira-Valente et al., 2011; Robinson-Papp, George, Dorfman, & Simpson, 2018; Topham & Drew, 2017; Younger, McCue, & Mackey, 2009). In claims of construct validity, a common practice is a correlative analysis to an existing tool and then, if adequate validity is claimed (Rutjes, Reitsma, Coomarasamy, Khan, & Bossuyt, 2007). Crellin and colleagues (2015) argue that comparing one tool to another tool from which it was likely developed is a form of circular logic. On the other hand, criterion validity is how well the NRS score predicts pain and demonstrates the strength of the relationship of the NRS and pain. When measuring subjective matter such as pain, there can never be a correct answer (von Baeyer, 2006); therefore, psychometrically, the best we can claim is test reliability and construct validity. The concerns over what NRS measures raises the question of whether a conceptual analysis or a qualitative analysis might help to assess what construct is being measured.

Within this theme of NRS limitations, Chapter Four’s findings imply a concern with the construct validity of what the NRS measures; this is particularly important when measuring subjective constructs. Our findings are congruent with those of other investigators of the chronic pain population. Bunzli and associates (2015) investigation revealed that the Tampa Scale of

Kinesiophobia’s (TSK) claim to measure a specific construct, namely “fear of movement,” may instead have been measuring beliefs about increasing damage to the injury and or increasing suffering or disability. Similarly, the conceptual descriptions (findings) in this study suggest that pain intensity appears to be one part of several pain experience constructs that seems to be captured with the NRS score. Like the TSK, it is plausible that the NRS is indeed measuring a different construct from its initial design; the conceptual descriptions suggest that pain experience is being captured within the NRS rather than pain intensity. The NRS could be reexamined to determine what it is specifically measuring.

The conceptual findings suggest the NRS is capturing emotional aspects of the experience and not just sensory factors, aligning with other evidence (Clark et al., 2002; Knotkova et al., 2004). Despite the NRS’s limitations, it can be retained clinically albeit with a slight change in approach. By attending to the conceptual descriptions of this research, the BPSA proposes that consideration of the contextual aspects might improve the utility of the NRS. as it seems to be measuring experience rather than intensity. Sensing the injury, grasping the immediate context, and sensing the imminent loss of consciousness, which are some of the conceptual descriptors of this research, signal that more than sensory information is potentially used to generate a pain score. This is important, because implied with pain intensity is its association with sensory or nociceptive pain in contrast to pain experience. Experiences of pain might be better captured through the BPSA.

The findings suggest that the NRS can potentially measure pain experience within changing contexts if used with a BPSA. The pain assessment process could purposely explore the context of the experience for the possibility of finding experiential factors that contribute to the APT and may be reflected in the NRS score.

Another limitation of the NRS pertains to the production of one data point. Regardless of the unidimensional tool used, people select one word or number to convey the rating of their pain; this means that currently, pain management decisions are based on the single data point (word or number) reported. This singular data point could significantly restrict the information attained in the current pain assessment process (deWilliams et al., 2000; Gordon, 2015; Schiavenato & Craig, 2010; Slomp et al., 2018a; Topham & Drew, 2017; von Baeyer, 2006). Attempting to measure a very complex experience with a single decontextualized data point might not be adequate.

Advocating to remove the NRS completely from the pain assessment process because of its limited clinical utility of one data point, Topham and Drew (2017) replaced the NRS with a new tool, CAPA, that provided more data points. Steiner and colleagues (2015) advocate for attempting to work with existing scales when possible rather than developing yet another scale that requires a significant investment of resources. CAPA seems to provide a more comprehensive assessment of pain experiences than the NRS, however, importantly it does not seem to capture the pain experience and rather focuses on the pathology.

Whether using the NRS or CAPA, others caution against relying on all existing tools, as all tools are an oversimplification of pain; therefore, scores need to be interpreted within a larger context (Sellinger et al., 2010; von Baeyer, 2006). While complete reliance on a subjective measurement tool may not be ideal, the assessment of pain does require a valid tool to measure pain. This means that pain assessment should be comprehensively obtained (multisourced) in its approach. Administrators would need to be vigilant for the presence of the primary dimensions that affect pain perception, including the psychosocial dimension. The BPSA which is advocated in Chapter 6, aligns with the recommendations for a comprehensive pain assessment with a valid tool. Additionally, it keeps the practical goal of minimizing administration time while standardizing the process via a validated tool.

Anchors of pain scales may potentially be another limitation of the NRS. Current anchor usage of the “worst pain imaginable” and the “worst pain experience” may not be as effective as independent variables. People in the lived moment of APT are being asked to compare to some historical event that depends on biased memories or to compare their pain to some unknown experience. According to Berk and Theall (2006), the anchor and the statement given in the administration of the test need to be congruent with the purpose of the scale. There are five types of anchor terms typically used in scale development: intensity, evaluation, frequency, quantity, and comparison (Berk & Theall, 2006). Comparing these types of anchors to the most common anchor terms used with pain scales, the “worst pain imagined” and the “worst pain experienced,” demonstrates the possible difficulties these anchors pose to the limitations of the NRS. The scale claims it measures intensity, but these common anchors suggest that the scale is comparative or perhaps evaluative. These challenges may add unnecessarily to the confusion and difficulty of the pain assessment process for both the clinician and the patient.

The findings (conceptual descriptions) in this study regarding anchor usage concerns are consistent with other investigations (Chambers & Craig, 1998; Seymour et al., 1985; von Baeyer & Pasero, 2017). Seymour’s (1985) work clearly identifies the anchor as an independent variable when scoring dental pain. Importantly, with the BPSA, whether anchors are used as administrated or are operationalized can be addressed by clinicians specifically asking the patient how they define their number ten score. Future research into how various pain populations operationalizes their upper anchor, might enhance our understanding of how the NRS and its anchors are used in scoring various types of pain.

In summary, the common themes in this dissertation elevate the findings to a broader level that provides more depth to our knowledge and understanding of the pain assessment process. It also highlights the potential limitations and opportunities of the NRS that subsequently might impact the pain score as well as the clinical interpretation of that score. These themes provide an increased rationale for a more in-depth and comprehensive use of NRS scores when assessing acute pain resulting from traumatic injury.

## Strengths and Limitations

I will discuss the strengths and limitations of this study in this section ranging from study design to findings.

### Strengths

The study exhibited various strengths, ranging from the richness of the raw data to its potential to be a probable truth for practice. Collectively, these strengths contribute to the study's credibility. One strength is that the participants enrolled in this study were very articulate and discerning in their experiences of a complex phenomenon. Although a few had previous experiences with significant trauma, most did not. Through the iterative process of data collection and analysis, rich information was revealed, providing potential insights into a long-term clinical conundrum. Subsequently, these valuable findings could be used for educational purposes in both pre-licensure and practice settings by linking theory, the patient's experience and the clinician in the assessment process. The application of these findings to a BPSA aligns with theory and patient centered care. Collectively, the strength and credibility of ID enabled exploration of an phenomenon within a complex and challenging field.

Another strength was the diversity of the mechanism of injury. Although injuries were primarily orthopedic in nature, they occurred in a variety of settings ranging from recreational to motor vehicle accidents. The implication of these diverse mechanisms of injury is that pain due to traumatic injuries appears to be relatively stable in how it is referenced in the environment in which occurs. It also appears to be relatively stable regarding the location of the fracture, bearing in mind that this is an exploratory investigation. Even patients with injuries that could become litigious in nature,appeared to be referencing their pain in similar patterns to those who were injured at the job site, recreational site or home.

One more strength is the demographic diversity of the participants (see Table 3.1). Although there seems to be good diversity, the sampling was not intentionally seeking maximum variation as a strategy. The ages of the participants ranged from 20 to 74 years of age. Gender was represented by three more females than males. Vocationally there was also good diversity, ranging from academic to blue collar. Again, this could be a helpful insight, as socioeconomic determinants often factor into many health related circumstances. Although this study is exploratory, the preliminary findings indicate that traumas do not seem to favour one group over another suggesting that trauma is equally distributed amongst socioeconomic groups because *it is just an accident* and therefore, could happen to any person or group. The broader implication is that regardless of socioeconomics, how the score was referenced and produced seems to have a stable pattern within this exploratory study.

Yet another strength is that the finding that the NRS scoring is potentially using experiential referents may be foundational to our understanding of the NRS objective. The claim that the NRS measures pain intensity (sometimes referred to as sensory pain) is not supported by the findings of this study, as key experiential and not just sensory factors figure into the scoring of pain. The implications of these findings may be pivotal to how APT assessment is practiced, as it calls for a more comprehensive approach encompassing the person’s experience. The findings align with a generally held definition of pain (International Association for the Study of Pain, 2017).

The finding that the imminent loss of consciousness (ILC) was employed as the scale's high-end anchor for this study group is another strength. This salient outcome is important conceptually. The ILC usage demonstrates that contained within the complexity of pain are aspects that may reflect the experiences that are specific to the subgroups of pain populations. Specifically, the ILC conceptual description suggests that not all people are using the anchor description provided in the administration of the NRS. As the anchor could be the frame of reference from which a person is using the scale, asking people how they define their *ten* may provide insightful clinical information for the attending practitioner.

Ideally, the NRS anchor should provide a directive to the respondent on how to answer the question given to them. It should also be congruent with the question provided when the NRS is administered (Berk & Theall, 2006; Streiner et al., 2015). The two most used anchor phrases in the literature, "worst pain imaginable" and "worst pain experienced" (Hjermstad et al., 2011), may not help the patient answer the question, "On a scale of zero to ten with zero being no pain and ten being 'worst pain experienced' what is your pain now?" The above two anchors do not seem to be congruent with the question. Rather, these phrases seem to be asking patients to compare their pain to a historical or a hypotethical pain event, when the question provided in the administration of the NRS asks them to rate their current pain. This anchor phrasing might result in obfuscating the purpose of the NRS to measure current pain. The clinical utility of an anchor phrase for the NRS for people with APT may be enhanced because it is a contextualized phrase relevant to this acute trauma pain population. Employment of an anchor phrase relevant to the pain population context could enhance clarity for both the patient and the clinician which could be important from both a conceptual and practical perspective. Whether other anchor terms are also employed with this pain population (acute trauma) would seem to be a worthy research topic to explore in the future.

## Limitations

This study has several limitations. Participants who were eligible and enrolled in the study were primarily of European descent and were also urban dwellers. Cultural influences are believed to influence the experience of pain; therefore, it would have been ideal to have had individuals of different ethnocultural backgrounds participate. For instance, aboriginal individuals and/or refugees from war-torn countries may interpret their pain and its meanings differently.

Another limitation is that the type of injuries participants sustained was primarily limited to a single orthopedic site. Individuals sustaining polytraumas may not reference their pain experience using the same experiential referents identified in this study as they could have multiple sources of pain, potentially with different qualities of pain. As a result, obtaining a pain score might be more complex with individuals suffering from polytraumas.

The unintended underrepresentation from people who have sustained trauma burns or exposure to hazardous material may be another limitation of this study. The inclusion of participants with these types of traumatic injuries could have provided more in-depth insights into both how pain scores and meaning are determined with vastly different types of injuries.

Although the aim of the sampling strategy was not *maximum variation*, the objective was to obtain a good variation of participant experiences as possible; this may not have been fully achieved. While gender, age, occupation and mechanism of injury demonstrated good diversity, several elements were not sampled: cultural background, injury type, polytrauma, permanent injury and life threatening injuries. Each of these elements could potentially change either how pain is rated or meaning attributed. Future studies could employ maximum variation sampling strategies to intentionally capture variation in these elements.

The researcher's novice experience is also a limitation. Essentially, I was learning as I was doing the research which may have affected the logic of decision making during the iterative data collection and analysis.

Another important limitation to consider is that pain as a phenomenon is very complex. It is difficult to articulate the lived experience of pain, and the difficulty is augmented when an individual must try to retrospectively articulate the pain experienced during the trauma specifically as it pertains to determining an NRS pain score. Therefore, it is plausible that a full accounting of the phenomenon of determining a pain score and its meaning may not have been fully accessed.

The lack of a second interview to follow up with participants could be a limitation. Similarly, a focus group may also have been beneficial. However, at the time I stopped data collection and analysis, at that time, I felt that I had enough rich conceptual descriptions that could be clinically applicable and I felt I had answered my research question.

## Future Directions

### Policy and Practice

The conceptual findings, specifically the potential role of psychosocial factors used to determine an NRS pain score and how meaning pertaining to pain is attributed, could be included in pre-licensure clinical courses for all clinicians. The NRS appears to capture contextual psychosocial information that is pertinent not only to the experience of pain but importantly, may also be factored into the NRS score. Also, the conceptual findings link the importance of the therapeutic role on the perception of pain with previous research (Ferreira et al., 2013; Fuentes et al., 2014b). The clinician's role of attending to the person being treated for their injury and pain (therapeutic role) could be highlighted as one of the multimodal therapies immediately available to assist in reducing the perception of pain (Craig, 2015; Fuentes et al., 2014a). The conceptual descriptions in this study provide a potential platform from which to explore the central importance of a more biopsychosocial approach to pain assessment. Deconstructing the pain score would enable clinicians to probe for potential psychosocial factors that are modifiable. The challenges surrounding pain assessment and management compel us to investigate this matter with greater priority, as pain potentially impacts every individual at some point across an individual's lifespan. As the NRS seems to form a functional bridge between the person in pain and the clinician it is, therefore, a critical communication point.

## Research

**Pathology specific assessment.** One area to explore in more depth is whether subgroups of people suffering from different types of pain such as labour pain or palliative pain, may inherently reference their pain uniquely from one another due to the complexity and multiple dimensions of pain experiences. This practice seems to be counterintuitive to what is stated in theory and IASP's definition that includes the emotional components of pain. Importantly, the usage of one tool for all conditions may not be ideal given that pain is complex and multidimensional. Using one tool might remain plausible however, the contextual nature of each pathology suggests that the anchor terms used to reference the experiential pain may not be identical to the exploratory findings of this study.

**Environmental settings.** Another aspect to explore is how athletes, incarcerated individuals, and victims of terrorism or war reference their pain. Athletes (amateur and professional) often play with painful injuries. Whether they tap into expectations, or motivations or use some other experiential referent, could provide further knowledge and understanding of how people reference their experience of pain to determine a score. Likewise, individuals who are in settings where they fear for their lives, such as in terrorism or war situations may have dramatically different perspectives on how they would experience pain and consequently score their pain. Providing further understanding of how the context of the environment potentially changes how pain scores are determined would provide insight into the experiential references employed. Finally, in settings where forensic care is provided for the incarcerated, how an individual's pain scores are determined may provide environmental clues into how a pain score is derived and the meaning attributed to it.

**Formalizing the assessment process.** If, a more comprehensive conceptual model of pain assessment is developed and implemented (BPSA), it would be important to reach consensus on what this approach is and then determine the appropriate anchor for that measurement. For example, are we asking people to compare, evaluate, or rate their pain? Scale anchors should be congruent with the measurement objective and the question given in the administration of a tool. Without this, the process may continue to be vague and ambiguous. It is plausible, that pain anchors might be derived from the experiential referents used to form a score. For instance, if fear was the overriding experiential referent, the anchor phrase might contain some aspect of being very afraid. However, this speculation would need further investigation. Additionally, it is imperative that the steps of the assessment process be followed as well as documented in the research literature in a similar fashion to what was advanced by Smith and colleagues (2016). Establishing consistency of measures within and between individuals is important clinically but also for transparency in research outcomes. In time, an investigation could explore the outcomes of nonstandardized and standardized pain assessment steps.

**Evaluating the BPSA.** A clinimetric investigation of the BPSA versus current practices would provide evidence for its potential clinical usage in terms of its efficacy, responsiveness and clinical utility. These investigations would need to examine what psychosocial factors were identified in the assessment along with the pain management strategies employed to address them. These could be nonpharmacological (e.g., bedside consulting to music therapy) or pharmacological in nature which are collectively referred to as multimodal therapy. The next step might be to examine the use of the BPSA in postoperative conditions where surgical processes result in acute pain. Determining the efficacy of this approach would provide insights into whether more effective pain assessment/treatment reduces the incidence of persistent postoperative pain (PPOP), as it is a growing clinical concern for the genesis of chronic pain. Horn-Hofmann and colleagues (2018) recently identified that general psychological factors were not significant predictors of PPOP; however, pain specific psychological factors such as anxiety and vigilance were the best predictors of it. This work aligns with the current study, demonstrating the importance of identifying and treating important contextual factors in acute pain.

**Evaluating the effectiveness of the ILC.** A prospective study examining the scoring of APT using current pain scale anchors versus the ILC could provide important knowledge on which anchor is better suited for people with APT. Furthermore, it could provide knowledge on whether scoring is skewed using current anchors versus the ILC, which would be in line with the empirical evidence provided by Seymour (1985) on how anchor terms affect the scoring of pain. Additionally, people with APT could be interviewed on whether the current most common anchor terms used or the ILC help them reference their pain better. Clinicians could provide their perspectives on which anchors assist them in better understanding the person's pain experience. In future follow up research, there could be potential for a second interview or a focus group of participants. This might provide opportunities to probe into whether there are other unidentified experiential referents or operationalized anchors employed to arrive at a pain score. There are opportunities for new research arising out of this study that would potentially benefit from qualitative methods as they explore the *how* and *why* of pain assessment challenges.

## Conclusion

I set out to answer and have systematically explored the research questions of how people score and attribute meaning to their acute pain event. Three experiential referents are employed by individuals with acute trauma to produce an NRS score: sensory, contextual, and ILC. The determinants of meaning include the permanence of an injury, incongruent care and personal responses to the previous determinants. Two subcategories identified for the determinant incongruent care were incongruence of personal care, and incongruence of being in severe pain while in the hospital. The third determinant also contained two subpoints: the importance of stoicism, and anxiety over inadequate pain management in the hospital. Additionally, I have incorporated these findings by providing a potential application (BPSA) to practice settings focusing on a more biopsychosocial pain assessment, yet retaining the use of the NRS. This approach could conceivably capture some of the contextual factors that the NRS as used currently is unable to provide. This study contributes to advancing knowledge to fill the gaps of understanding pertaining to the current pain assessment process and measuring the complex phenomenon of pain by employing a simple measurement tool. Findings provide clinicians with insight into interpreting pain scores and the required caution needed for providing optimal pain management to people with APT. In doing so, the potential for positive outcomes might assist in reducing the challenges surrounding effective pain management.

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# APPENDICES

# APPENDIX A

## Descartes' Concept of a Pain Pathway

Fig. 1. Descartes' *(76)* concept of the pain pathway. He writes: "If for example fire *(A)* comes near the foot *(B)*, the minute particles of this fire, which as you know move with great velocity, have the power to set in motion the spot of the skin of the foot which they touch, and by this means pulling upon the delicate thread *CC*, which is attached to the spot of the skin, they open up at the same instant the pore, *d.e.*, against which the delicate thread ends, just as by pulling at one end of a rope one makes to strike at the same instant a bell which hangs at the other end."

Copy from p.972

Melzack & Wall (1965) Pain mechanism: A new theory. Science. 150 (3699), 971-978

## APPENDIX B

## HRB Ethics Approval Letter

**Health Approval - HIA Consent**
Date: October 3, 2013
Study 10: Pro00038310
Principal Investigator: Maria Mayan
Study Title: How do participants attribute meaning to and self-rate their acute pain event?

Approval
Expiry Date: October 2, 2014

RSO-Managed
Funding:
Project 10 Project Title
There are no items to display
Speed Code Other Information
Thank you for submitting the above study to the Health Research Ethics Board - Health Panel. Your application, including revisions received September 3 and October 2, 2013, has been reviewed and approved on behalf of the committee.
The Health Research Ethics Board assessed all matters required by section 50(1)(a) of the Health Information Act.
Subject consent for access to identifiable health information is required for the research described in the ethics application, and appropriate procedures for such consent have been approved by the HREB Health Panel. In order to comply with the Health Information Act, a copy of the approval form is being sent to the Office of the Information and Privacy Commissioner.
A renewal report must be submitted next year prior to the expiry of this approval if your study still requires ethics approval. If you do not renew on or before the renewal expiry date (October 2,2014), you will have to re-submit an ethics application.
Approval by the Health Research Ethics Board does not encompass authorization to access the patients, staff or resources of Alberta Health Services or other local health care institutions for the purposes of the research.
Enquiries regarding Alberta Health approval should be directed to (780) 407-6041. Enquiries regarding Covenant Health approvals should be directed to (780) 735-2274.
Sincerely,
Carol Boliek, Ph.D.

Associate Chair, Health Research Ethics Board - Health Panel
*Note: This correspondence includes an electronic signature (validation and approval via an online system).*

# APPENDIX C

## Participant Information Sheet and Consent Form

Interview Participant and Chart Review INFORMATION LETTER

**Study Title:** How do participants attribute meaning to and self-rate their acute pain injury?

| **Supervisors:** | **Researcher** |
|---|---|
| Dr. Bruce Dick<br>Anesthesiology and Pain Medicine<br>8th floor Clinical Sciences Building<br>University of Alberta<br>Edmonton, Alberta<br>bddick@ualberta.ca<br>780.407.1097<br><br>Dr. Maria Mayan<br>Assistant Director of Women and Children's Health<br>2-281 Enterprise Square<br>10230 Jasper Avenue<br>Faculty of Extension<br>University of Alberta<br>Edmonton, Alberta T5J 4P6<br>mmayan@ualberta.ca<br>780.492.9209 | Flo Slomp, PhD Candidate in Medicine<br><br>c/o Dr. Maria Mayan<br>Assistant Director of Women and Children's Health<br>2-281 Enterprise Square<br>10230 Jasper Avenue<br>Faculty of Extension<br>University of Alberta<br>Edmonton, Alberta T5J 4P6<br>fslomp@ualberta.ca |

*Background*

- Pain is often undertreated. We want to know why this happens. Pain is often measured on scales that ask you to rate your pain from 0 – 10; however, there is evidence that this may not capture your experience or the meaning of your pain. Therefore, the objective of this research is to understand how people self-rank their pain and how this ranking is related to the meaning of pain.
- You have been asked to be part of this research because you responded to a Recruitment poster in a healthcare location. By interviewing you I wish to understand how you ranked your acute pain event during your recent hospitalization, as well as how you attributed meaning to that pain.
- The results of this research will be used in support of my dissertation in the Faculty of Medicine and Dentistry. There are no sponsorships involved in this research.

*Purpose*

- By learning how participants rank their acute pain event, it is hoped clinicians may be better informed how to assess and treat pain.

*Study Procedures*

- There will be one interview approximately sixty minutes in length. The interview will be somewhat informal and we will meet in a mutually agreed upon quiet location. It is possible that a second interview may be required to clarify points after analysis has occurred.
- In addition, I will ask for your consent to obtain your hospital record in order to compare your experience of pain with what was documented on your hospital chart specific to the assessment of your pain while you were hospitalized. All procedures for obtaining and returning the hospital chart will follow the Alberta Health Services, Health Information and Records Management Guidelines.
- About half way through my research I will ask the participants who I have interviewed (and had previously indicated they would be willing to sit in on a Focus Group) whether they would still consider attending this one time, one hour Focus Group meeting. There is a separate Information Sheet and Consent form for that stage of the research.
- During the interview I will digitally record our conversation. I will also take some notes during the interview to better help me recall my thoughts or questions on perhaps something you have talked about in the interview.

*Benefits*

- You may or may not benefit from this research. However, the further development of clinical knowledge about how people rank and determine their pain ratings and meanings may benefit clinical practice. There are no costs associated with participating in this research and no compensation is provided for participating in the interview.

*Risk*

- There are no known risks with this research study.

*Voluntary Participation*

- You are under no obligation to participate in this study in whole or in part including not answering certain questions even if you participate in the study. Your participation is completely voluntary. You may choose to withdraw from this research project up to one week from the date of the interview, as the data will be analyzed after seven days and then cannot be withdrawn. You can withdraw freely without penalty or any impact on your ongoing health care; all information collected up to that time will be destroyed while insuring privacy and confidentiality at the time of withdrawal from the study.

*Confidentiality & Anonymity*

- The intended use of this research is for the support of my dissertation in the Faculty of Medicine and Dentistry. In addition, the research findings will be published in academic journals, and/or poster/paper presentations at academic conferences. In order to share the knowledge locally presentations in local media may take place.
- All data will be kept confidential. You will not be asked to disclose your acute injury event, however if you would like to that is fine.
- If you wish to have the digital recorder turned off for any reason and at any time you may do so.
- Once the digital recording of the interview has been written up, all information which can identify you will be removed (anonymized) and your data will be given a pseudonym when the research is published.
- The raw data will be uploaded directly to a confidential and secure virtual site at the Health Research Data Repository in the Faculty of Nursing at the University of Alberta for a minimum of five years after which the data will be destroyed ensuring privacy and confidentiality in the process. The only persons who may see your name are my dissertation committee members, including: Dr. Bruce Dick, Dr. Gerri Lasiuk and Dr. Maria Mayan, who may wish to verify a recording.
- Should you wish to receive a copy of the published findings of this research, please let me know and arrangements will be made.
- By signing this consent form you are saying it okay for the study team to collect, use and disclose information about you from your personal health records as described above.

*Your information*

- After the digital recording has been written up exactly how it was recorded, it will be analyzed numerous times and compared to other participants' experiences with the intention of drawing out different themes as to how people rank their acute pain and attribute meaning to that pain. Some aspects of this interview's results may be used for my dissertation thesis and published in relevant medical/health care journals. It is also possible that aspects of this interview may be presented at conferences both locally and internationally.

*What will I be asked to do?*

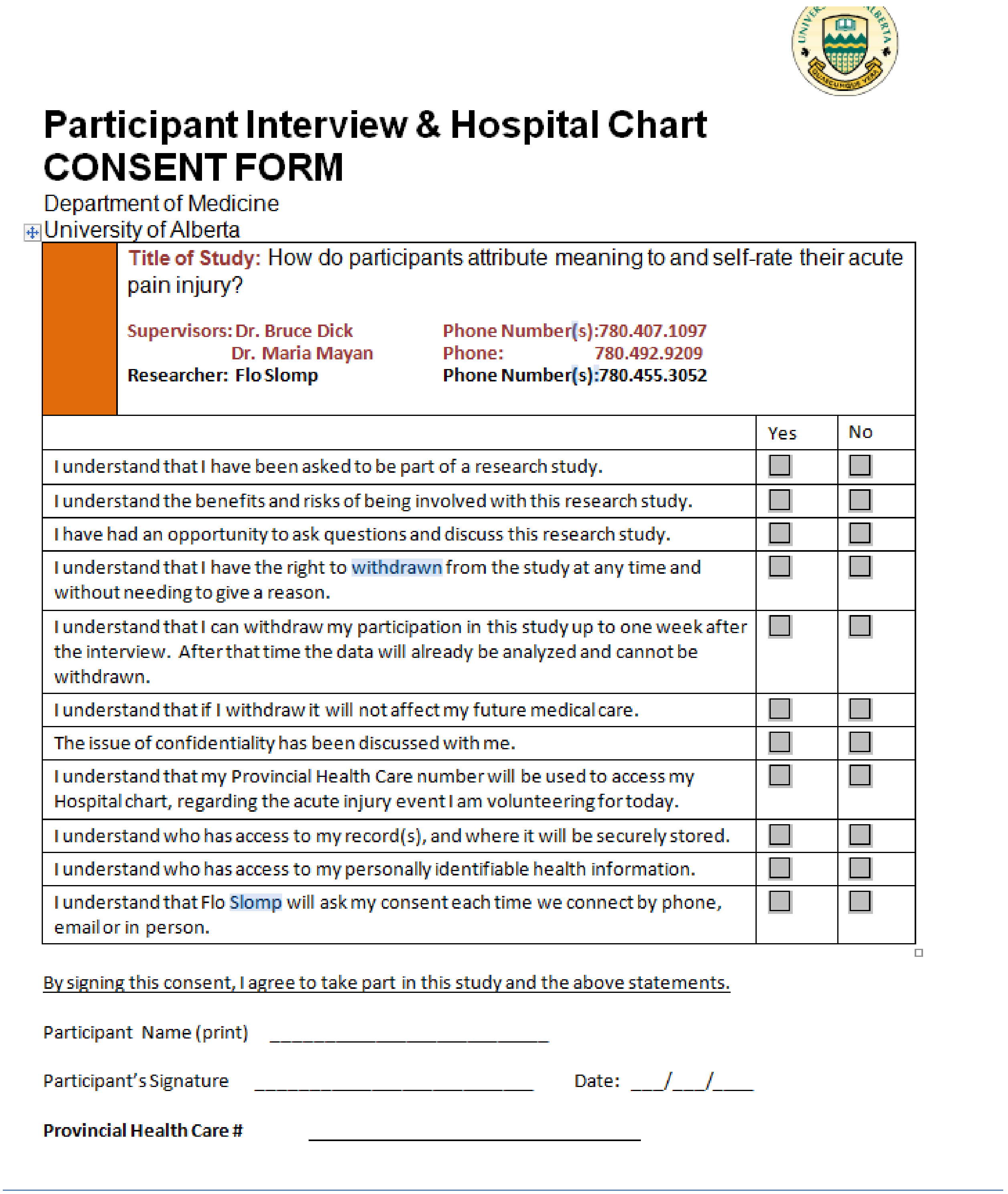
- You will be asked to respond to questions that I raise and provide specific and concrete answers to these questions. I may at times ask you to elaborate on your answers. I will help guide you with this by giving you specific topics to discuss.

*What if I have questions?*

- If you have any questions regarding your rights as a participant you may contact the **Health Research Ethics Board @ 780.492.2615**. Their office is not affiliated with this research. You may also contact Flo's supervisors: Dr. Maria Mayan 780.492.9209 or mmayan@ualberta.ca and Dr. Bruce Dick 780.407.1097 or bddick@ualberta.ca .

**No agencies have contributed funding for this project. This project has been reviewed and met the adherence to ethical guidelines by a Research Ethics Board at the University of Alberta.**

(con't)



# Participant Interview & Hospital Chart CONSENT FORM

Department of Medicine
University of Alberta

**Title of Study:** How do participants attribute meaning to and self-rate their acute pain injury?

**Supervisors: Dr. Bruce Dick** **Phone Number(s):780.407.1097**
**Dr. Maria Mayan** **Phone: 780.492.9209**
**Researcher: Flo Slomp** **Phone Number(s):780.455.3052**

| | Yes | No |
|---|---|---|
| I understand that I have been asked to be part of a research study. | ☐ | ☐ |
| I understand the benefits and risks of being involved with this research study. | ☐ | ☐ |
| I have had an opportunity to ask questions and discuss this research study. | ☐ | ☐ |
| I understand that I have the right to withdrawn from the study at any time and without needing to give a reason. | ☐ | ☐ |
| I understand that I can withdraw my participation in this study up to one week after the interview. After that time the data will already be analyzed and cannot be withdrawn. | ☐ | ☐ |
| I understand that if I withdraw it will not affect my future medical care. | ☐ | ☐ |
| The issue of confidentiality has been discussed with me. | ☐ | ☐ |
| I understand that my Provincial Health Care number will be used to access my Hospital chart, regarding the acute injury event I am volunteering for today. | ☐ | ☐ |
| I understand who has access to my record(s), and where it will be securely stored. | ☐ | ☐ |
| I understand who has access to my personally identifiable health information. | ☐ | ☐ |
| I understand that Flo Slomp will ask my consent each time we connect by phone, email or in person. | ☐ | ☐ |

By signing this consent, I agree to take part in this study and the above statements.

Participant Name (print) ______________________________

Participant's Signature ______________________________ Date: ___/___/____

**Provincial Health Care #** ____________________________________

## APPENDIX D

## Recruitment Poster

PAIN

**Have you experienced pain due to an accident that resulted in you being admitted to the hospital for at least one day?**

**VOLUNTEERS** are needed for a research study at the University of Alberta in the Department of Medicine. The research is being led by a PhD student, Flo Slomp. The research will focus on how people find meaning in their pain and how people figure out how to rank their pain on a scale of 0 – 10. You need to be discharged from hospital at least 6 weeks but not more than 12 months to be eligible to participate. If you have experienced the above situation, live in the Edmonton region, you are at least 18 years of age and would like to speak about the details of pain and how you found meaning in your pain, then you would be eligible.

**Title of the Research:** How do participants attribute meaning to and self-rate their acute pain injury?

**What would you need to do?** Meet the researcher at a mutually agreed upon quiet place, to participate in a one-to-one interview for about 60 to 90 minutes.

We will ask your permission to obtain your hospital chart to review any comments written down regarding your pain while being hospitalized. You may be asked to be part of a small Focus Group (about 60 minutes) later in the project to determine whether the analysis of the data makes sense to you or not.

**What if I have questions?** You may contact Flo's supervisors: Dr. Maria Mayan @ 780.492.9209 or mmayan@ualberta.ca and Dr. Bruce Dick @ 780.407.1097 or bddick@ualberta.ca.

**Flo's info:**
**fslomp@ualberta.ca**
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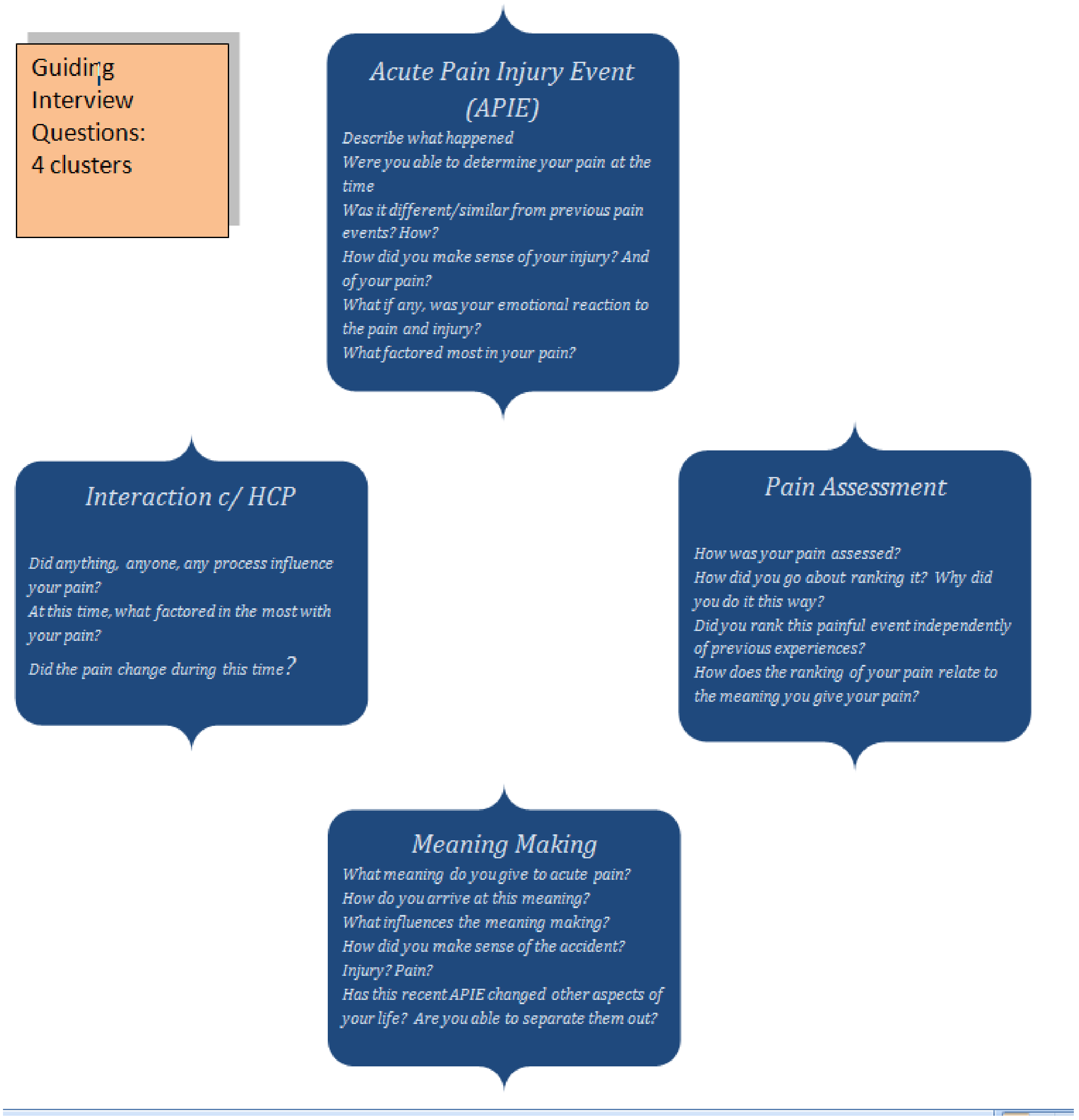
## APPENDIX E

## Guiding Interview Questions



Guiding Interview Questions: 4 clusters

*Acute Pain Injury Event (APIE)*

*Describe what happened*
*Were you able to determine your pain at the time*
*Was it different/similar from previous pain events? How?*
*How did you make sense of your injury? And of your pain?*
*What if any, was your emotional reaction to the pain and injury?*
*What factored most in your pain?*

*Interaction c/ HCP*

*Did anything, anyone, any process influence your pain?*
*At this time, what factored in the most with your pain?*
*Did the pain change during this time?*

*Pain Assessment*

*How was your pain assessed?*
*How did you go about ranking it? Why did you do it this way?*
*Did you rank this painful event independently of previous experiences?*
*How does the ranking of your pain relate to the meaning you give your pain?*

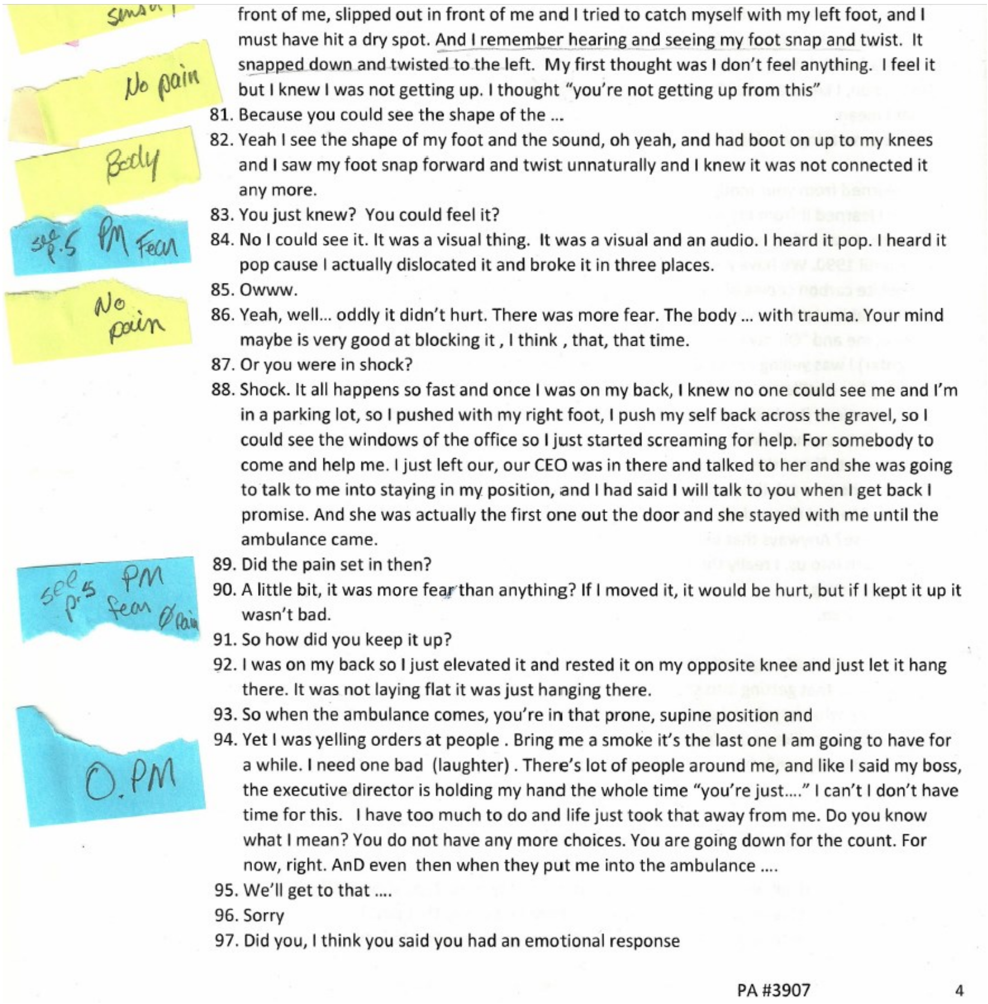
*Meaning Making*

*What meaning do you give to acute pain?*
*How do you arrive at this meaning?*
*What influences the meaning making?*
*How did you make sense of the accident? Injury? Pain?*
*Has this recent APIE changed other aspects of your life? Are you able to separate them out?*

# APPENDIX F

## Patterns

### Phase I: Initial patterns



front of me, slipped out in front of me and I tried to catch myself with my left foot, and I must have hit a dry spot. And I remember hearing and seeing my foot snap and twist. It snapped down and twisted to the left. My first thought was I don't feel anything. I feel it but I knew I was not getting up. I thought "you're not getting up from this"

No pain

81. Because you could see the shape of the …

Body

82. Yeah I see the shape of my foot and the sound, oh yeah, and had boot on up to my knees and I saw my foot snap forward and twist unnaturally and I knew it was not connected it any more.
83. You just knew? You could feel it?

see p.5 PM Fear

84. No I could see it. It was a visual thing. It was a visual and an audio. I heard it pop. I heard it pop cause I actually dislocated it and broke it in three places.
85. Owww.

No pain

86. Yeah, well… oddly it didn't hurt. There was more fear. The body … with trauma. Your mind maybe is very good at blocking it , I think , that, that time.
87. Or you were in shock?
88. Shock. It all happens so fast and once I was on my back, I knew no one could see me and I'm in a parking lot, so I pushed with my right foot, I push my self back across the gravel, so I could see the windows of the office so I just started screaming for help. For somebody to come and help me. I just left our, our CEO was in there and talked to her and she was going to talk to me into staying in my position, and I had said I will talk to you when I get back I promise. And she was actually the first one out the door and she stayed with me until the ambulance came.
89. Did the pain set in then?

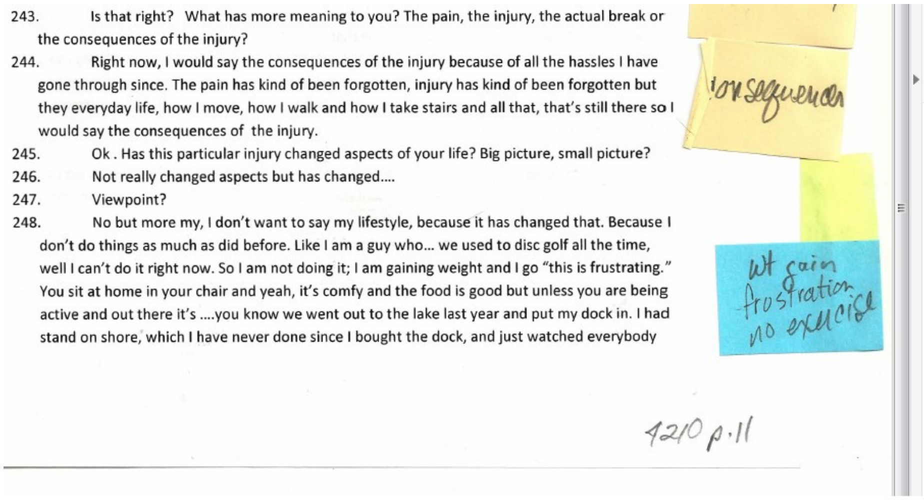
see p.5 PM fear 0 pain

90. A little bit, it was more fear than anything? If I moved it, it would be hurt, but if I kept it up it wasn't bad.
91. So how did you keep it up?
92. I was on my back so I just elevated it and rested it on my opposite knee and just let it hang there. It was not laying flat it was just hanging there.
93. So when the ambulance comes, you're in that prone, supine position and

O.PM

94. Yet I was yelling orders at people . Bring me a smoke it's the last one I am going to have for a while. I need one bad (laughter) . There's lot of people around me, and like I said my boss, the executive director is holding my hand the whole time "you're just…." I can't I don't have time for this. I have too much to do and life just took that away from me. Do you know what I mean? You do not have any more choices. You are going down for the count. For now, right. AnD even then when they put me into the ambulance ….
95. We'll get to that ….
96. Sorry
97. Did you, I think you said you had an emotional response

PA #3907 4



243. Is that right? What has more meaning to you? The pain, the injury, the actual break or the consequences of the injury?

244. Right now, I would say the consequences of the injury because of all the hassles I have gone through since. The pain has kind of been forgotten, injury has kind of been forgotten but they everyday life, how I move, how I walk and how I take stairs and all that, that's still there so I would say the consequences of the injury.

245. Ok . Has this particular injury changed aspects of your life? Big picture, small picture?

246. Not really changed aspects but has changed....

247. Viewpoint?

248. No but more my, I don't want to say my lifestyle, because it has changed that. Because I don't do things as much as did before. Like I am a guy who... we used to disc golf all the time, well I can't do it right now. So I am not doing it; I am gaining weight and I go "this is frustrating." You sit at home in your chair and yeah, it's comfy and the food is good but unless you are being active and out there it's ....you know we went out to the lake last year and put my dock in. I had stand on shore, which I have never done since I bought the dock, and just watched everybody

onsequences

wt gain
frustration
no exercise

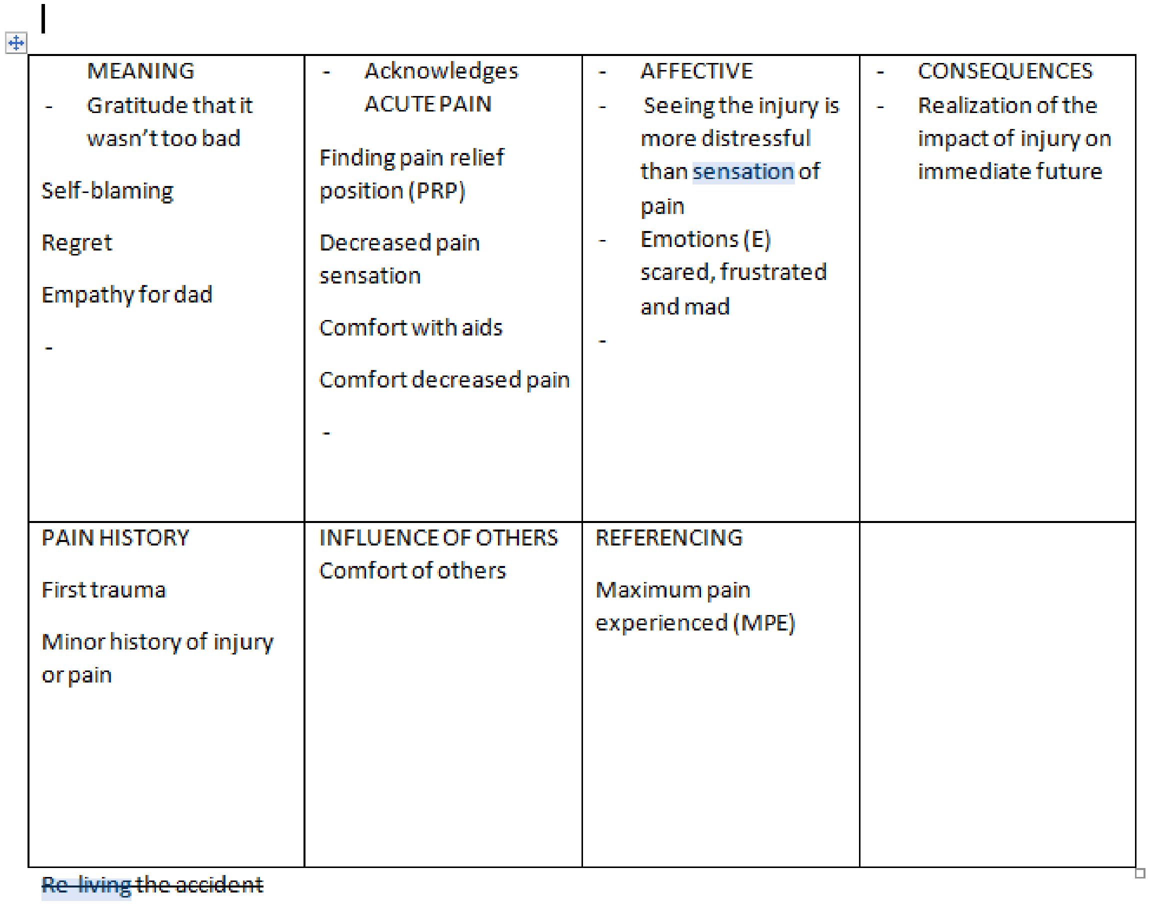
4210 p.11

(con't)

Phase II Early Patterns

| PAIN HISTORY | INFLUENCE OF OTHERS | REFERENCING | CONSEQUENCES |
|---|---|---|---|
| First trauma | Comfort of others | Maximum pain experienced (MPE) | Realization of the impact of injury on immediate future |
| Minor history of injury or pain | HCP confirm serious injury | MP but still not ten | Meaning of consequences |
| High tolerance to pain | Active care? | Evaluative dimension | Meaning of anxiety of consequences |
| Pain influenced by E | Distraction from pain | Knowing MPE was not the worst possible one could endure | No hand function |
| Stoic when alone? | Confidence | Hypothetically bear more? | Short term problem |
| Pain means healing | Orients self to ward | Pain IS your life | Doesn't help to worry |
| Tubal pregnancy pain | Orients self to other ward | Pain IS distracting | Short term problem |
| History of ignoring pain? | Concern for others | Referencing, SRP | Side effects of meds |
| Passing out | Others in distress | Each pain experience belongs to a specific trauma | High tolerance to pain |
| Previous recent injury | Altercation with HCP regarding pmeds | Passing out | Too much pmed |
| Accounting of injuries | Informal pain assess | Previous recent injury | Altercation with HCP regarding pmeds |
| Discretionary use of PM | Pain influenced by E | Accounting of injuries | Rehab of injury |
| Little trauma history | Stoic when alone? | MP but not MPE | Good pain management means increased function |
| Little previous trauma | Good pain management pre-op | "off charts" means endured too long | MPE + no sleep |
| Witnessed many fatal MVA | Finished PM | Length of time in pain | Pain IS your life |
| Mother's intuition on child's pain | Poor access to GP | Unsure if pain is sensory or emotional | Pain IS distracting |
|  | Seeking advice | Realization of loss may impact SRP | Single mom |
|  | Regrets not calling 911 |  | Good pain management pre-op |
|  | No regular PM schedule |  |  |
|  | Psychosocial |  |  |
|  | Good p. management |  |  |

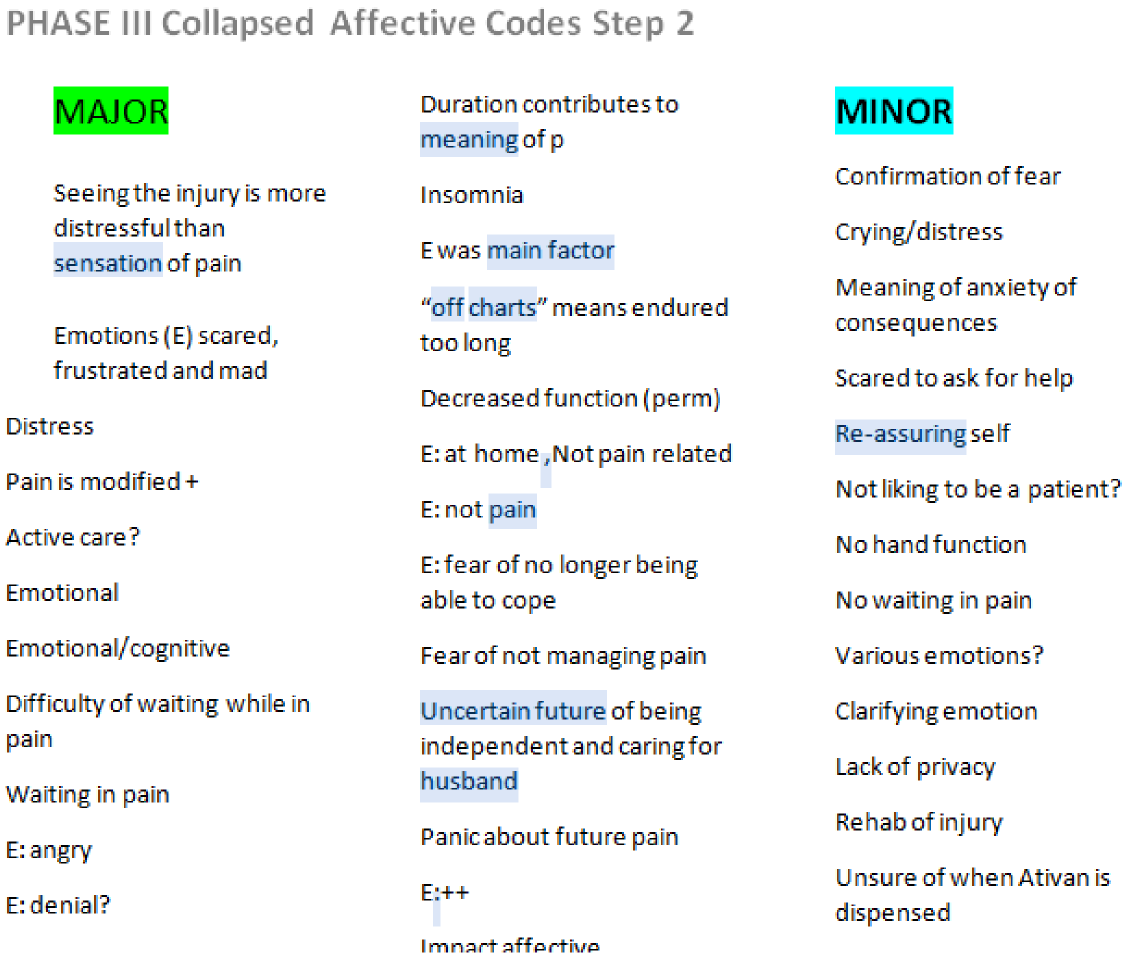
(cont')



| | | | |
|---|---|---|---|
| MEANING<br>- Gratitude that it wasn't too bad<br>Self-blaming<br>Regret<br>Empathy for dad<br>- | - Acknowledges ACUTE PAIN<br>Finding pain relief position (PRP)<br>Decreased pain sensation<br>Comfort with aids<br>Comfort decreased pain<br>- | - AFFECTIVE<br>- Seeing the injury is more distressful than sensation of pain<br>- Emotions (E) scared, frustrated and mad<br>- | - CONSEQUENCES<br>- Realization of the impact of injury on immediate future |
| PAIN HISTORY<br>First trauma<br>Minor history of injury or pain | INFLUENCE OF OTHERS<br>Comfort of others | REFERENCING<br>Maximum pain experienced (MPE) | |

~~Re-living the accident~~

(con't)



## PHASE III Collapsed Affective Codes Step 2

**MAJOR**

Seeing the injury is more distressful than sensation of pain

Emotions (E) scared, frustrated and mad

Distress

Pain is modified +

Active care?

Emotional

Emotional/cognitive

Difficulty of waiting while in pain

Waiting in pain

E: angry

E: denial?

Duration contributes to meaning of p

Insomnia

E was main factor

"off charts" means endured too long

Decreased function (perm)

E: at home ,Not pain related

E: not pain

E: fear of no longer being able to cope

Fear of not managing pain

Uncertain future of being independent and caring for husband

Panic about future pain

E:++

Impact affective

**MINOR**

Confirmation of fear

Crying/distress

Meaning of anxiety of consequences

Scared to ask for help

Re-assuring self

Not liking to be a patient?

No hand function

No waiting in pain

Various emotions?

Clarifying emotion

Lack of privacy

Rehab of injury

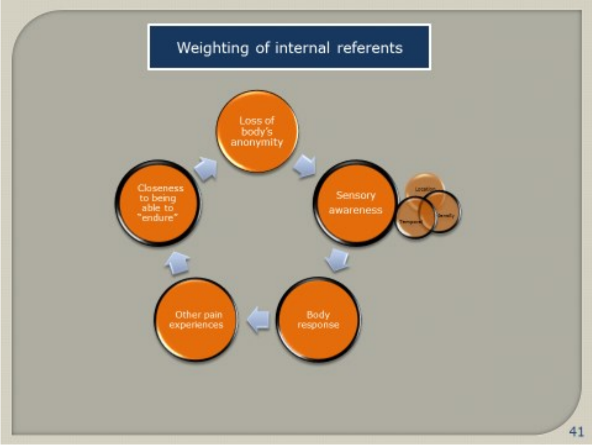
Unsure of when Ativan is dispensed

Con't

# APPENDIX G

## Theme Development

Early Phase



Weighting of internal referents

Loss of body's anonymity

Sensory awareness

Location

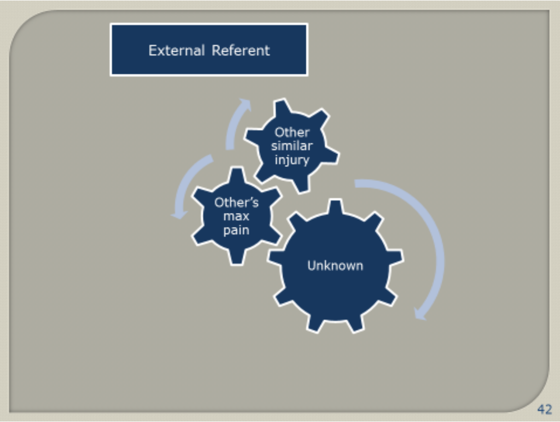
Temporal

Severity

Body response

Other pain experiences

Closeness to being able to "endure"

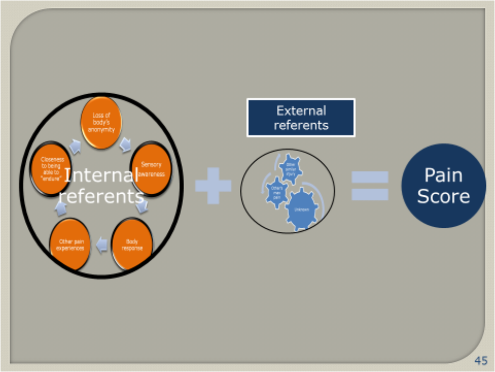


External Referent

Other similar injury

Other's max pain

Unknown



Loss of body's anonymity

Sensory awareness

Body response

Other pain experiences

Closeness to being able to "endure"

Internal referents

External referents

Unknown

Pain Score

The above 3 slides represent the **preliminary conceptual framework** of how people rank their pain score.

(cont'd next page)

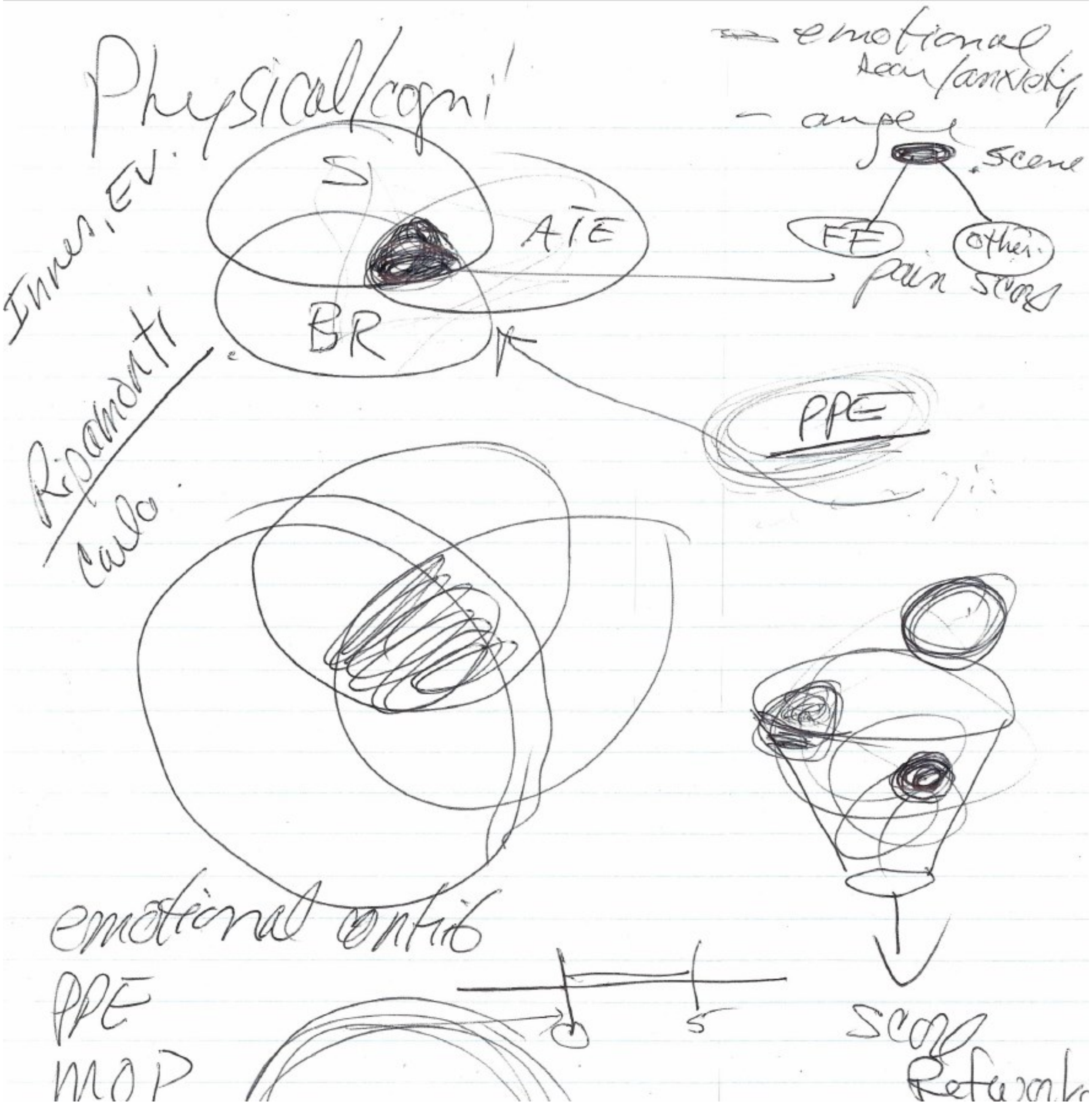
Final Phase of Theme Development

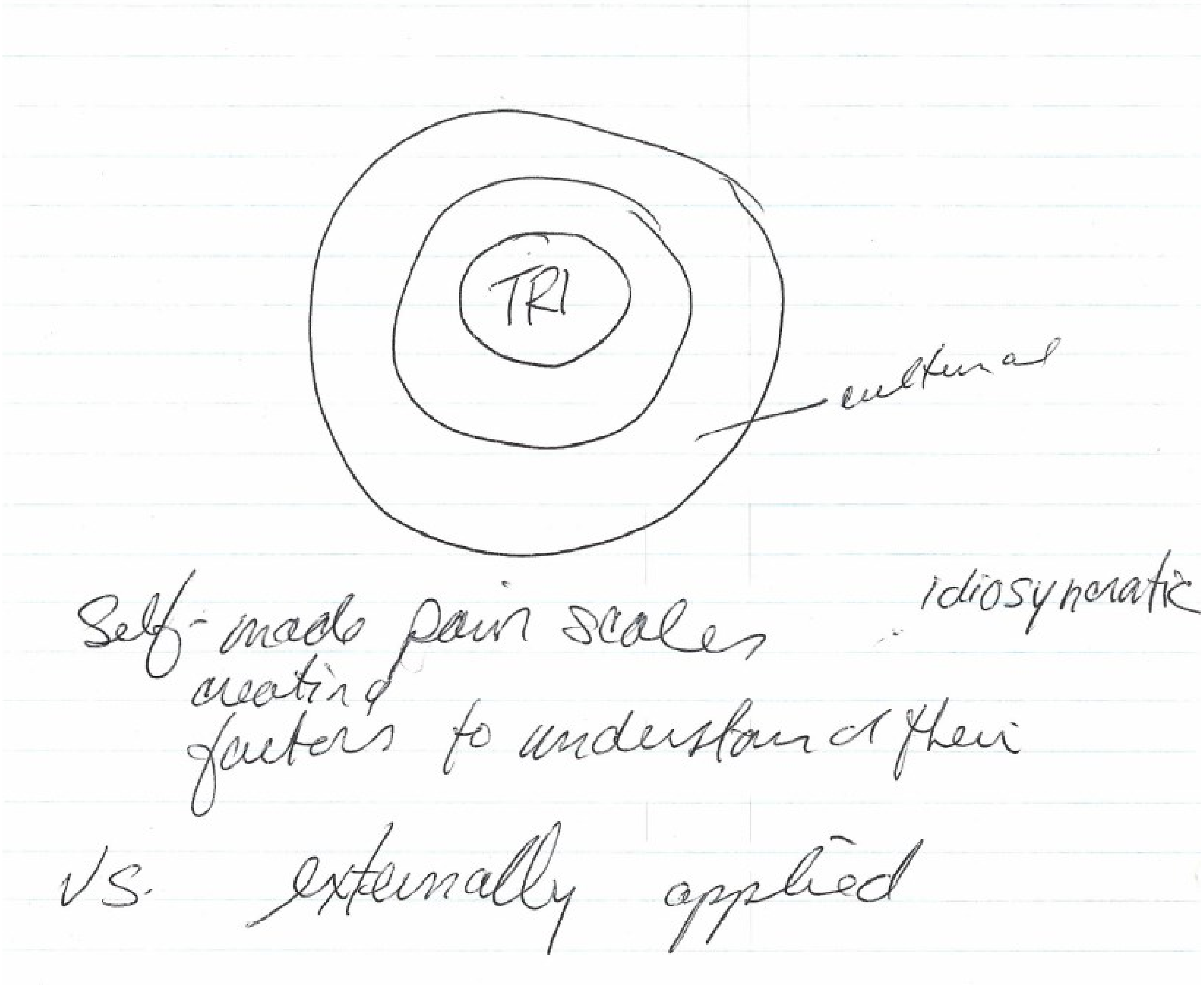
The **final** conceptual framework.

Through the analysis my interpretive decisions changed. Various verification strategies including these visuals document this process

# APPENDIX H

## Other Data & Verification Strategies





Self-made pain scales idiosyncratic

creating

factors to understand their

vs. externally applied

# APPENDIX I

## Reflexivity and Memoing

11.15.13

Arrived in plenty of time on the farm. Reviewed cluster questions and focused on NON value comments/questions to use for interview. Talked about accident – very much in his head – cognitive/factual. I felt a bit awkward as he was not talking so much ….probably a bit shy. Do I need to re-consider how to "enter into" the accident? Once recorders were shut off, started talking more freely. Should I try to hide the recorders? I turned recorder on again (Unit A) and caught most of it. Participants had some interesting insights. Didn't like talking 'bout it, yet found that it "cleaned it up" for him. To do: re-think prepping interview. Somewhat reticent. "We are originals so much more than copies where did all our wonder go?" Justine Vander Kraats CD recording "So far…"

11.21.13

McNare, 2008 "using reflexivity and reciprocity to overcome inadequacies". In the interview I need to show more curiosity … they're the expert. It seems to me that the experience of pain may be framed by the facts, but it is the "soft data" of feeling, emotions, judgments and interpretations which create the painting. So the facts are the frame and all the subjective of the pain experience is that painting of the experience. Avoid inside assumptions. Pain is ontological.

12.7.13

Pain is not a #, age is just a # so it BP, HR and myriad of biological markers. When we use the pain scale of 0 – 10. Because we're always working w/ metrics in health care, do we as clinicians tend to see the pain literally as a #? WHERE HAS ALL THE WONDER GONE ABOUT EACH UNIQUE PERSON? Thus w/o context, pain data could be misleading

People are linked to their K of pain, by their experiences w/ it. It does not necessarily hold, that those who are older have more pain experiences. Some young adults have had many pain experiences.

12.9.13

How do you attribute meaning to pain? Is this a –ve event, blip on the road of life, life changing? Last 2 participants suggest that pain has no meaning and not the injury really either.Consequences seemed to be more meaningful. First PA the acute pain event, messed up first big trip abroad and with his brother. Seemed to suggest that this would have been a bonding sort of trip??? See Recker, 2011 article. In 1998 Recker and Wong proposed a model of sources of meaning (personal) consisting of 4 levels: self pre-occupation w/ hedonistic pleasure and comfort (self pre-occupaton), devotion of time and energy to the realization of personal potential (individualism), service to others and commitment to a larger societal or political cause (collectivism) and entertaining values that transcend individual and encompass cosmic meaning and ultimate purpose (self-transcendence). Should I be delving into aspects of this theory or is this topic yet another research project? Probably need to think a bit more about it and then seek MMBD advice. Although at this early stage do not see signs of this in the interview… hmmm. Is this source of meaning theory linked to meaning of pain? I think it is a different definition of meaning than what is typically meant by meaning of pain, in that it is a significant event.

Do people even know how to translate an experience or meaning of an experience in a #? When you think of it this way, it almost seems to be an absurd exercise. How would you rank the meaning of your trip to Italy? How would you rank the meaning of the relationship to your mother? But using pre-given pain descriptors to rate pain is not much better as the clinician/researcher then is the translator.

The interpretative, qualitative researcher embraces the outliers, outriders and tails of the bell curve. The values and bias are necessary for a fuller understanding of a concept. See Packer and Addison, ’89 and Slife ’03.

“All methods, all the time are interpreters of reality. Methods are more like a prism to reality. p. 730”

1.20.2014

Looking back at the entry of 11.21.13 I don’t know what I meant by “avoid inside assumptions”. Forgot to write in AT as I had to get to the parking meter. PA #4 clearly v. intelligent. When we started to talk about pain her pain rankings seem to go up. I wondered at the time if there could be some psycho/social issues in her background. By the time we got to the last 1/3 of the interview she had 2 crying bouts when I asked questions regarding stoicism and where that came from and what was good about it. I asked several times if she was OK during/after each bout. She insisted that she was fine and would I excuse the “taps”. I recall her laughing at some of her recollections of the injury event too. Relatively straight forward.

2.23.14

Interviewed PA #6 in Strathcona library. Sound not bad; even recorded magpies “yakking” through the window. PA spoke v.quickly and didn’t always enunciate, so missed a few phrases in transcribing interview.

Themes are becoming clearer. PAs continue to be able to separate out affective from sensory, and do not attribute meaning to pain. Regarding referencing the pain, a vague and sometimes strong pattern is becoming clearer. Some PAs don’t like the NRS. Also some PAs in referencing their pain may look at previous painful events but contextualize it within the immediate injury event. Treat most pain events differently (separately). Easily separate emotion from sensation. So far they seem to be cognitively aware of how they referenced pain when they were asked NRS. This acute pain event might be the worst, but necessarily their maximum anticipated pain. Meaning of pain again doesn't seem to be relevant. Need to explore "meaning" more. Rather consequences of injury and not even the pain in their convalescence.

3.6.2014

I realized that I am getting a head of myself a bit and need to step back and rely less on the informal analysis and trends and be more intentional in the detail and in-depth analysis. My focus has been on getting the PAs and transcribing accurately and less on analysis. MM was right to suggest postponing of data collection for a while and immerse myself only in the data already collected. Have done a bit already in the initial coding document. Coding is a challenge primarily in the labelling of categories. What really is the conceptual framework: meaning making, subjective assessment or context? …guess it really is all three. The other challenge in coding is how else could I re-code or re-categorize a tightly scripted sample. What other level of analysis can I do? The pathology, gender type analysis is not relevant here.

The seamless communication of the cognitive and non-cognitive is clearly at work.

The coding challenges continue. There are numerous examples where the coded text could be in several categories at once. Not sure if that is permitted. It maybe that when pain is both intense and continuous that there seems to be some meaning to it. Strikes me that one difference between chronic and acute pain is the presence of those two factors. Usually acute pain is rather transient and changing as one convalesces and rehabilitates.

3.16.14

Spending the w/e coding, cut n paste more and analytical writing. I can see that the next PAs to be interviewed will likely need a new set of questions specifically targeting my analysis thus far.

3.18.14

Meaning of pain doesn't resonate with most people it seems unless the pain is intense and constant. I wonder again if this is because as a society we have the knowledge both cognitively and non-cognitively that adequate pain medication is available and will effectively manage the sensation. If you look at those who had intense pain and had to wait for medical intervention it seems that their pain was front and center and I would suggest quite meaningful. So in a sense the pain medicine availability and efficaciousness is the fulcrum in meaning making, giving no leverage to the meaning of pain?

I also wonder if the “I don’t want to be a baby” attitude is a leftover of the protestant work ethic or part of the intense pioneer spirit still prevalent in Alberta. Would stoicism collectively capture these situations?

Or is there some sort of “entitlement” attitude that the PA have to accidents?

When looking under the hood as it were, it difficult to know what to look for particularly because these subjective factors are not facts… they all remain amorphous.