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Los Angeles

Pressure Injury Pain Among Nursing Home Residents

A dissertation submitted in partial satisfaction of the requirements for the degree
Doctor of Philosophy in Nursing

by

Angela Trennet Williams

2018

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ABSTRACT OF THE DISSERTATION

Pressure Injury Pain Among Nursing Home Residents

By

Angela Trennet Williams

Doctor of Philosophy in Nursing

University of California, Los Angeles, 2018

Professor Barbara M. Bates-Jensen, Chair

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University of California, Los Angeles

2018

Dedication Page

This dissertation is dedicated to my husband, Willie Smith who I have the utmost gratitude for being so tolerate and supportive of my educational journey. You have been affected in every way possible by this quest, yet you made this a very special and memorable occasion for me. You never cease to amaze me! Thanks Honey, I Love You.

To my mother Rosetta Brenda Hughley, who inspired me to become a nurse and to continue to achieve. To my mother-in-law Leona Moody for your love and support. To my family and friends who cheered for me every step of the way. A very special thanks to Sylvia Coleman, Robbin Brenson, and Elonda Stewart for assisting in more ways than one.

To Dr. Gloria J. McNeal, it would be impossible to count all the ways that you've helped me in my career. Thanks for all that you've done and for being an exemplary mentor. To Dr. Lisa Jones, thank you for being a wonderful mentor, boss, and friend. Last, but not least, to my dear friend Dr. Arnetta Finney-Beverly whom I had the pleasure of completing this educational journey with. Thanks for your support and always keeping me on track. I couldn't have done it without you!

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Williams, A., Arciaga, P., Finney, A., (2011). Interdisciplinary simulation to foster team training skills and collaboration for undergraduate medical and nursing students. California Institute for Nursing and Health Care Magic in Teaching Conference. California, July.

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Chapter One

Introduction to Dissertation

Pain is one of the most distressing symptoms reported by individuals with pressure injuries (PrI). The pain experienced with PrI inevitably has an overwhelming impact on quality of life. Effective pain management for individuals with a PrI begins with an adequate pain assessment, which is an important nursing responsibility. Several instruments are used to assess pain, however, no instrument has been validated to assess PrI pain. In addition, the lack of an algorithm to guide nursing practice in the treatment of PrI pain further hinders pain assessment and treatment. The proposed study develops a knowledge base surrounding PrI pain assessment and management among nursing home (NH) residents. Study results will provide information useful for nursing care and can provide invaluable information in the development of a pain assessment algorithm to guide nursing care for NH residents presenting with PrI.

Background

Pressure injuries also known as pressure ulcers or bedsores are localized damage to the skin and tissues usually over a bony prominence such as the sacrum and heels or related to a medical or other device (National Advisory Pressure Ulcer Panel [NPUAP], 2016). The injury can present as intact skin or an open ulcer. The injury occurs as a result of mechanical forces of pressure and shear and can be influenced by the microclimate, nutrition, perfusion, co-morbidities and soft tissue condition of individuals (NPUAP, 2016). Pressure injuries are classified according to the visible level of tissue damage. The National Pressure Ulcer Advisory Panel/European Pressure injury Advisory Panel (NPUAP/EPUAP) classifies PrIs into eight categories based on visible tissue damage. The PrI categories and definitions are listed in Table 1-1.

Pressure injuries have been identified as a significant health problem, due to increased risk of infection and co-morbidity, particularly among those who are hospitalized or who are placed in institutional care such as NHs (Ahn, Stechmiller, & Horgas, 2013; Gorecki, Closs, Nixon, & Briggs, 2011). The mortality rate for NH residents with PrI is reported to be two to six times higher than NH residents without PrIs (Bair et al., 2003).

Pressure injuries affect more than one million patients in acute and long-term care settings in the United States annually. As a result of related complications, PrI claims the lives of 60,000 people each year (Sullivan & Schoelles, 2013). The treatment of PrIs is a huge burden to healthcare with costs ranging from \$20,900 to \$151,700 per injury (Agency for Healthcare Research and Quality, 2014). In 2009, the national cost to treat PrI among an estimated three million adults with PrI was \$11 billion per year (Padula et al., 2011).

In 2012, there were 1,383,700 individuals residing in NH in the US, in which 85 percent were 65 years old and older, and nearly half were diagnosed with Alzheimer's disease or other dementias (U. S. Department of Health and Human Services Centers for Disease Control and Prevention Long-Term Care Services, 2013). It is projected that this number will increase expeditiously over the next few years as the baby boomers become older (Henry-Newton, Einstein, & Tulp, 2016). Given this projection and the prevalence of dementia and PrI in NH, it is likely that NH residents will continue to have PrI in the future.

Statement of the Problem

The prevalence of PrI in the US remains consistently high over the past century affecting 10 percent of hospitalized patients and five percent of community dwelling patients (Gorecki et al., 2009). Moreover, approximately 10 to 33 percent of NH residents have PrI (Baumgarten et al., 2004). NH residents are at an increased risk for PrI due to several associated conditions to

include impaired mobility, old age, factors affecting tissue perfusion, and elevated levels of comorbidity and mortality (Gorecki et al., 2009; McGinnis et al., 2014). The prevalence rates in NHs range from 2.3 to 28 percent and incidence rates range from 2.2 to 23.9 percent (Cuddigan et al., 2001). The wide range in prevalence and incidence is due to the data source, methodology, definition of PrI and PrI stages included in the studies. Despite being largely preventable, in 2012 more than five percent of NH residents had a stage 2 or higher PrI (NH Compendium, 2013). Pressure injuries remain to be a significant and costly problem in NH despite the changes in guidelines to prevent and treat them. Consequently, the occurrence of PrI is an important outcome measurement for assessing the quality of care in NHs (Berlowitz, Bezerra, Brandeis, Kader & Anderson et al., 2000). Nursing homes with a higher occurrence of PrIs are considered to be providing inadequate quality of care (Baumgarten et al., 2004).

As many as 83 percent of NH residents have diminished quality of life (QoL) due to pain and immobility related to pain (Teno, Kabumoto, Wetle, Roy, & Mor, 2004). Pain in this vulnerable population is frequently unrecognized and/or inappropriately treated (Teno et al., 2004). The impact of general pain as well as PrI pain on ambulation, socialization, and sleep in older adults makes it an important issue that needs to be addressed (Drwecki, Moore, Ward, & Prkadachin, 2011). Investigators have shown that NH residents with PrI were more likely to report persistent pain compared to those without PrIs (Teno et al., 2004). Importantly, NHs must improve the way PrI pain is assessed and treated.

The association between pain intensity and PrI stage is not fully understood by health care providers and/or researchers; however, pain has been reported with all stages of PrIs (Ahn, Stechmiller, Fillingim, Lyon, and Garvan, 2015). Regardless of the severity of the PrI, pain associated with PrIs is an unpleasant experience and can be acute or chronic (Gorecki et al.,

2011). Individuals with PrI have described their pain experiences as constant “endless pain”, resulting in them having to keep still minimizing the impact of the pain. The pain is intensified during treatments to include wound irrigation, dressing changes, and positioning devices (Hopkins et al., 2006).

There is a dearth of research on PrI pain in NH residents. Several small landmark studies, which have documented that PrIs are painful, were in the acute care setting (Dallam et al., 1995) or included only four NH residents (Szor and Bourguignon, 1999). However, two large studies examined pain in NH residents with PrI using secondary data analysis of the Minimum Data Set (MDS) assessment, a multi-domain assessment conducted for all NH residents in Medicare and Medicaid certified NHs. Ahn et al. (2013) examined PrI related pain in 56,577 NH residents with MDS documented PrI and cognitive impairment. In a later study, Ahn et al. (2015) examined MDS documentation of bodily pain intensity in 41,680 NH residents with PrI (Ahn et al., 2015). Both of these studies are discussed later in the chapter.

Significance

Pain in general, is a common problem among adults age 65 and above. The prevalence rate for persistent pain of older adults residing in NHs is 45 to 85 percent (Herr, 2011). A reported 26 to 29 percent of NH residents report having daily pain that is sometimes excruciating (Tarzian & Hoffman, 2005). A large cross-sectional study on daily pain in 2,138,442 NH residents in 14,745 NHs in the US found associations between PrIs and other selected medical diagnosis daily pain that was categorized as excruciating some time during the previous week. Nursing home residents with PrIs (adjusted odds ratio (AOR) = 1.6) were found to most likely complain of this level of pain along with NH residents with cancer (adjusted odds ratio (AOR) = 2.0) and hip fractures (adjusted odds ratio (AOR) = 1.4) compared to NH residents with diabetes

mellitus, heart disease, Alzheimer's disease, bipolar or depressive disorders (Teno et al., 2004).

Pain assessments of residents are complicated by the fact that pain is subjective and there are no available objective biological markers (Hadjistavropoulos et al., 2014). Consequently, inadequate pain assessments result in poor management of pain in older adults (Kamel et al., 2001; Teno et al., 2004). Pain is best assessed using self-reported measures, however, there are several barriers to adequate pain assessments in older adults. For instance, memory or sensory impairment, depression, and cognitive impairment all complicate pain assessments in older individuals (Kamel et al., 2001). In individuals who are unable to self-report pain, other measures must be taken to assess pain and evaluate interventions (Herr et al., 2006).

The Pain Assessment In Advanced Dementia (PAINAD) is a commonly used behavioral observation tool to assess pain in NH residents with dementia. Several self-reporting pain assessment tools such as the Verbal Response Scale (VRS), Faces Rating Scale (FRS), and the Numerical Rating Scale (NRS) have been validated in older adults with various levels of cognitive impairment (Jones et al., 2005). Yet, no single tool has been identified as the best method for pain assessments in older adults with cognitive impairment or PrI. However, in a study measuring pain intensity in 1182 NH residents who were asked to choose one of three pain intensity scales to quantify their pain level, the VRS was preferred two to one over the FRS and the NRS by NH residents with cognitive impairment and was completed by residents with severe cognitive impairment (Jones et al., 2005). The researchers did not explore the reasons why the preferred tools were selected, but made some general observations. Men seem to prefer the NRS to women. Nonwhites (Hispanics/Latinos) were more comfortable using tools with a pictorial display of pain levels. Whereas, older adults over age 85 with dementia were more comfortable with words rather than pictures.

Pain in Pressure Injuries

The NPUAP (2016) reports tissue trauma resulting from unrelieved pressure, inflammation, infection, nerve damage, dressing changes, debridement, and operative procedures are the major causes of PrI pain. A number of studies have assessed PrI pain in various settings. Pressure injury prevalence has been measured in several epidemiological studies of adults 24-100 years of age. Settings for prevalence studies include acute care, long-term care, hospice and palliative care, and the community (Pieper, Langemo, & Cuddigan, 2009). Individuals with spinal cord injuries (Langemo et al., 2000; Quiniro et al., 2003), bed bound or wheelchair bound, cancer patients (Flock, 2003), hospice or palliative care patients (Zeppetella et al., 2003) are among the groups that have been studied with PrI pain (Pieper et al., 2009). PrI pain specifically in NH residents has not been studied. However, one study, which was conducted in various settings, was the only study that included four NH residents (Szor and Bourguignon, 1999). In a study of 32 patients in acute care, long-term care, and home care settings, Szor and Bourguignon (1999) compared the pain experienced by patients with PrI at rest and during dressing change. The researchers found 28 (87.5%) patients experienced pain during dressing change and 27 (84%) patients had pain at rest. However, the Szor and Bourguignon study only included four NH residents.

Dallam et al. (1995) measured the perceived pain intensity and patterns of PrI pain in 132 hospitalized patients 24 to 100 years old. The researchers used two instruments (FRS and VAS) that required the patients to self-report their pain. Of the 132 patients, only 44 were able to communicate their responses to the pain assessments, whereas 88 were unable to respond due to cognitive impairment. More than half (59%) of the patients responding to the pain assessments reported PrI pain. The researchers found a significant positive correlation between PrI pain and

maximum stage of PrI among those who responded to the pain assessment ($r = 0.37, p < 0.01$). A major limitation of this study was the lack of a validated instrument to assess pain in patients with cognitive impairment. The researchers concluded that the patients who were unable to self-report pain most likely experienced PrI pain because those individuals had more advanced stages of PrI. However, the researchers did not use a validated observational tool to identify pain experienced by individuals with cognitive impairment.

A growing body of research has examined PrI pain in various settings. However, except for one study, which included only four NH residents, none of the clinically based studies included NH residents. Ahn and colleague's two studies among NH residents were limited by secondary data analysis of the MDS. The weight of the evidence suggests PrI are extremely painful and debilitating, exists with all PrI stages, and occur during interventions to treat and prevent them. Several researchers reported advanced stages of PrI were associated with increased severity of pain (Ahn et al., 2015; Dallam et al, 1995; Gunes, 2008; Langemo et al., 2000). Though, one study reported that pain intensity was not related to the severity of PrI (McGinnis et al., 2014). The researchers speculated that those who did not report pain might have sensory impairment (e.g. spinal cord injury or have sufficient analgesia to mask any PrI pain). Some researchers found patients with PrI rarely receive analgesics for PrI pain or during painful procedures such as dressing changes or repositioning (Briggs et al., 2013; Szor & Bourguignon, 1999; Dallam et al., 1995). In addition, prior studies have limited discussion regarding the effect of specific characteristics on PrI pain. Characteristics related to the PrI including infection, stage, size, location, duration, and BWAT score (ulcer characteristics) and resident characteristics such as functional impairment, cognitive status, comorbidities, BMI, urinary/fecal incontinence, age, gender, and ethnicity/race were rarely discussed in prior studies.

Additionally, with the exception of Ahn et al. (2015), which was secondary data analysis of the MDS, prior studies have been limited by small sample sizes. Very few studies included resident characteristics in the demographics of the sample. As found in two studies, functional impairment, cognitive status, comorbidities, age, gender, and ethnicity/race were reported (Ahn et al., 2013; Ahn et al., 2015). However, resident characteristics such as BMI and urinary/fecal incontinence were not included. Furthermore, there was no discussion on how resident characteristics affect PrI pain. It is unclear if any of these characteristics are related to PrI pain, specifically in NH residents. In fact, no studies explored the relationship between any characteristics and PrI pain.

Most of the studies on PrI pain used either a single self-reporting instrument, or compared two self-reporting instruments. None of the studies used instruments for individuals with and without dementia. All of the studies included a single pain assessment, a pain assessment before and after dressing changes, or used secondary data from the MDS. None of the studies evaluated PrI pain over time to examine if it is stable or not; therefore it is unclear if PrI is stable over a period of time. According to Herr (2011), there is a significant burden to the individual, their family and society due to the under treatment of pain in the elderly. By obtaining a better understanding of the stability of PrI pain in elderly residents through repeated assessments over time will improve the understanding of PrI pain and allow for more suitable and prompt treatment, thereby improving the quality of their lives. The elderly residents living in NHs at times present with pain at various times of the day. Previous studies on PrI pain in NH residents have assessed the presence of pain before and after dressing changes, or used secondary data from the MDS, which is related to pain in general and not specific to PrI pain. Therefore, it is unclear whether PrI pain in NH residents was captured accurately in prior studies. Exploration

of the PrI pain in NH residents over time will improve the accuracy of the pain assessments. There are several limitations found in the literature on PrI pain. First, there is a lack of evidence related to the extent of PrI pain in NH residents. One small study, which was conducted in various settings, included four NH residents (Szor and Bourguignon, 1999). Two large studies examined PrI pain in NHs however, both studies were secondary analysis of the MDS. Second, the lack of a validated pain measure specific to PrI pain. Prior studies have used several instruments to assess PrI pain, but no instrument has been validated for PrI pain assessments. Third, the relationships between PrI pain and any key variables or characteristics have not been examined. For instance, impaired mobility is a common problem among NH residents, which increases the risk for the development of PrIs. However, no study has examined activity level or the effect of immobility on PrI pain. In addition, more than half of those residing in NHs are incontinent of urine and or stool, which make them more susceptible to the development of PrI due to excessive moisture (Van Rijswijk and Lyder, 2005). No study has examined if there is a relationship between urinary or fecal incontinence and in PrI pain. Several other risk factors for PrIs including nutritional status, number of comorbidities, gender, and race/ethnicity have not been examined in relation to PrI pain. Finally, the stability of PrI pain over time has not been examined and is not understood.

Purpose of the Study

The purpose of this study is to develop a knowledge base about factors associated with PrI pain among NH residents. The results of the study will provide information that may be used to develop a pain assessment algorithm to guide nursing care for NH residents with PrI. This study will specifically identify factors that contribute to PrI pain in NH residents. The proposed study examines the pain experienced by NH residents diagnosed with a PrI. Investigator-

administered pain assessments of a minimum of 28 NH residents in the Greater Los Angeles area diagnosed with a PrI will be conducted to identify the extent and duration, and resident perception of pain, the impact of ulcer characteristics (e.g., infection, stage, size, location, duration, and BWAT score), resident characteristics (e.g., functional impairment, cognitive status, comorbidities, BMI, urinary/fecal incontinence, age, gender, and ethnicity/race) and time (e.g., over a day, over a week) on pain in NH residents with PrI. The specific aims and research questions follow.

Specific Aims and Research Questions

Specific Aim #1: To describe the level of pain among NH residents with PrIs.

Research Questions:

- 1.1 What proportion of NH residents with PrIs have no pain, mild, moderate, or severe pain based on the VRS, PAINAD and pain class (a calculated score based on both tools) over one week?
- 1.2 What is the mean pain level for NH residents with stage 1, 2, 3, 4, unstageable PrI, or DTI based on three measures of pain (VRS, PAINAD, pain class) over six pain assessments in a one week time period?
- 1.3 Is there a relationship between the PrI pain level and stage of PrI among NH residents with PrI?
- 1.4 Is there a relationship between VRS and PAINAD scores across stage 1, 2, 3, 4, unstageable PrI, or DTI?

Specific Aim #2: To examine the stability of PrI pain over 1 day (morning, mid-day, and/or afternoon), over 1 week (Day 1, Day 2), and as compared to the Minimum Data Set (MDS) quarterly assessment.

Research Questions and associated hypothesis:

2.1 Is there a difference in PrI pain over time (e.g., course of a day: morning, mid-day, and/or afternoon, course of a week: Day 1, Day 2)?

H2A: NH residents with PrIs will show higher levels of pain during the mid-day than in the morning or afternoon at rest based on pain class. Does current PrI pain relate to pain documented on the MDS Pain Severity Scale?

Specific Aim #3: To examine the relationship of ulcer characteristics (e.g., infection, stage, size, location, duration, and BWAT score) and PrI pain level based on the pain class.

3.1 Research Question and associated hypothesis: What ulcer characteristics (e.g., infection, size, location, and duration BWAT score) are associated with higher pain levels experienced by NH residents with PrIs?

H3A: NH residents with more advanced ulcer characteristics (e.g., presence of infection, higher stage, larger size, longer duration, higher BWAT score) will show higher levels of pain than NH residents with less advanced PrI characteristics (e.g., non-infected, lower stage, smaller size, shorter duration, lower BWAT score).

Specific Aim #4: To examine the relationship of NH resident characteristics (functional impairment, cognitive status, comorbidities, BMI, urinary/fecal incontinence, age, gender, ethnicity/race) and PrI pain level based on the pain class.

Research Question and associated hypotheses:

4.1 What NH resident characteristics (functional impairment, cognitive status, comorbidities, BMI, urinary/fecal incontinence, age, gender, ethnicity/race) are associated with higher pain levels experienced by NH residents with PrIs.

H4A: NH residents with higher PrI pain levels will be more functionally dependent, have more comorbidities, have lower BMI (underweight or obese BMI ≤ 18.5 or ≥ 30 kg/m²), be incontinent of stool and or urine, be older, more cognitive impairment, and be non-Caucasian.

H4B: NH residents with the presence of painful comorbidities (e.g., cancer, arthritis, and osteoporosis) will show higher PrI pain levels than NH residents without painful comorbidities based on the VRS, and/or PAINAD pain scales.

Specific Aim #5: To describe PrI pain relief measures (e.g., oral pain medication administration, topical analgesics, topical wound dressings, repositioning and support surface use, family members pain relief measures (i.e. massage) for stage 1, 2, 3, 4, unstageable PrI and DTI in NH residents.

Research Question:

5.1 What is the current treatment for PrI pain in NH residents with stage 1, 2,3, 4, unstageable PrI and DTI at various PrI pain levels?

Summary

The prevalence rate of PrI pain has been reported as high as 66 percent in hospitalized patients (McGinnis et al., 2014). Pressure injuries and interventions to prevent and treat them have been identified as contributing factors to pain experienced by individuals with PrI (Pieper et al., 2009). The impact of PrI pain can severely compromise all levels of function for older adults (Gorecki et al., 2013).

An accurate pain assessment is essential for effective pain management. Several tools are used to assess pain in NH residents. However, no single tool is likely to capture the pain experienced by all residents. There is not a clear understanding of the best methods for pain assessments among NH residents (Herr, 2011). In particular, no well-validated method has been identified as a specialized pain measure specific to PrIs in this population. Thus, the use of more than one pain assessment tool will improve the accuracy of the pain assessment and increase the likelihood of obtaining a pain measurement for NH residents with various levels of cognitive impairment. Better understanding of the characteristics and factors associated with PrI pain among NH residents may help inform the development of a specialized PrI pain measure.

To address these gaps in knowledge, this dissertation focused on the stability of PrI pain among NH residents over a two-day period, and the relationship of ulcer and NH resident characteristics and PrI pain for this longitudinal descriptive study. The International Classification of Functioning, Disability, and Health (ICF) model guided this study and all manuscripts (Biering-Sørensen et al., 2006). The ICF model identifies and categorizes disease consequences in a structured manner and is used to classify the level of functioning in persons with various conditions and illnesses. The first manuscript focused on analyzing available literature related to PrI pain, which included NH residents. The second manuscript examined PrI pain among NH residents over the course of two days. The third manuscript examined the relationship between ulcer and NH resident characteristics and PrI pain. All manuscripts will be submitted for independent publication.

The sample consisted of 33 participants with 49 PrIs and a mean age of 82 years old from four NHs in the county of Los Angeles with various stages of PrI. Participants were English speaking and had a documented Minimum Data Set (MDS) on file.

Chapter two, the first manuscript, entitled, “Pressure Injury Pain Among Nursing Home Residents: A Review of the Literature” aimed to identify and synthesize literature examining PrI pain among NH residents. The objectives were to describe the prevalence of PrI pain, methodologies used to assess PrI pain, and characteristics associated with PrI pain among NH residents. The review was performed of English language literature, limited to human research, age 65 years and older, 1992 to 2017, using PubMed and the Cumulative Index in Nursing and Allied Health Literature.

Chapter three, the second manuscript, entitled, “Pressure Injury Pain Over Time Among Nursing Home Residents” examined PrI pain among participants at three different times during the day, over two days using the Verbal Response Scale (VRS) and Pain Assessment in Advanced Dementia (PAINAD) to assess PrI pain. Proportions of participants with different levels of PrI pain were calculated. T-tests were conducted to examine differences across time.

Chapter four, the third manuscript, entitled, “Pressure Injury and Nursing Home Resident Characteristics Associated with Pressure Injury Pain” examined ulcer and resident characteristics associated with pressure injury (PrI) pain among nursing home (NH) residents. The BWAT was used to assess the PrI and PrI pain was assessed using VRS and the PAINAD.

Overall, these manuscripts contribute knowledge on the stability, severity, and characteristics associated with PrI pain among NH residents. Information exposed should prompt PrI pain assessment and nurse led interventions to alleviate pain. Findings from this study can assist in the development of a pain assessment algorithm to guide nursing care for NH residents with PrI.

Table 1-1 Pressure Injury Staging Guidelines

<p>Category/Stage 1 Pressure Injury: Non-blanchable erythema of intact skin: Intact skin with a localized area of non-blanchable erythema, which may appear differently in darkly pigmented skin. Presence of blanchable erythema or changes in sensation, temperature, or firmness may precede visual changes. Color changes do not include purple or maroon discoloration; these may indicate deep tissue pressure injury</p>
<p>Category/Stage 2 Pressure Injury: Partial-thickness skin loss with exposed dermis: Partial-thickness loss of skin with exposed dermis. The wound bed is viable, pink or red, moist, and may also present as an intact or ruptured serum-filled blister. Adipose (fat) is not visible and deeper tissues are not visible. Granulation tissue, slough and eschar are not present. These injuries commonly result from adverse microclimate and shear in the skin over the pelvis and shear in the heel. This stage should not be used to describe moisture associated skin damage (MASD) including incontinence associated dermatitis (IAD), intertriginous dermatitis (ITD), medical adhesive related skin injury (MARS), or traumatic wounds (skin tears, burns, abrasions).</p>
<p>Category/ Stage 3 Pressure Injury: Full-thickness skin loss: Full-thickness loss of skin, in which adipose (fat) is visible in the ulcer and granulation tissue and epibole (rolled wound edges) are often present. Slough and/or eschar may be visible. The depth of tissue damage varies by anatomical location; areas of significant adiposity can develop deep wounds. Undermining and tunneling may occur. Fascia, muscle, tendon, ligament, cartilage and/or bone are not exposed. If slough or eschar obscures the extent of tissue loss this is an Unstageable Pressure Injury</p>
<p>Category/ Stage 4 Pressure Injury: Full-thickness skin and tissue loss: Full-thickness skin and tissue loss with exposed or directly palpable fascia, muscle, tendon, ligament, cartilage or bone in the ulcer. Slough and/or eschar may be visible. Epibole (rolled edges), undermining and/or tunneling often occur. Depth varies by anatomical location. If slough or eschar obscures the extent of tissue loss this is an Unstageable Pressure Injury.</p>
<p>Unstageable Pressure Injury: Obscured full-thickness skin and tissue loss in which the extent of tissue damage within the ulcer cannot be confirmed because it is obscured by slough or eschar. If slough or eschar is removed, a Stage 3 or Stage 4 pressure injury will be revealed. Stable eschar (i.e. dry, adherent, and intact without erythema or fluctuance) on an ischemic limb or the heel(s) should not be removed.</p>
<p>Deep Tissue Pressure Injury (DTPU): Persistent non-blanchable deep red, maroon or purple discoloration Intact or non-intact skin with localized area of persistent non-blanchable deep red, maroon, purple discoloration or epidermal separation revealing a dark wound bed or blood filled blister. Pain and temperature change often precede skin color changes. Discoloration may appear differently in darkly pigmented skin. This injury results from intense and/or prolonged pressure and shear forces at the bone muscle interface. The wound may evolve rapidly to reveal the actual extent of tissue injury, or may resolve without tissue loss. If necrotic tissue, subcutaneous tissue, granulation tissue, fascia, muscle or other underlying structures are visible, this indicates a full thickness pressure injury (Unstageable, Stage 3 or Stage 4). Do not use DTPU to describe vascular, traumatic, neuropathic, or dermatologic conditions.</p>

Source: National Pressure Ulcer Advisory Panel (2014) <http://www.npuap.org/resources/educational-and-clinical-resources/npuap-pressure-ulcer-stagescategories>

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Chapter Two

Pressure Injury Pain Among Nursing Home Residents: A Review of the Literature

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Running Head: PRESSURE INJURY PAIN AMONG NURSING HOME

RESIDENTS

Keywords: Pressure injury, Pain, nursing Home residents

Abstract

Objective: To identify and synthesize research studies examining pressure injury (PrI) pain among nursing home (NH) residents.

Background: Pain is a common problem for older adults residing in NHs, especially those with PrIs. Indeed, PrI are painful, however, very little research on PrI pain has been done in NHs. The two largest studies done in NHs were secondary analysis of the Minimum Data Set (MDS). No prospective studies have examined PrI pain among NH residents.

Methods: A systematic review was performed of English language literature, limited to human research, age 65 years and older, 1992 to 2017, using PubMed and the Cumulative Index in Nursing and Allied Health Literature.

Results: Nine papers were found that met the inclusion criteria of NH or long-term care settings. Studies had small sample sizes, included very few NH residents, or were secondary data analysis of the Minimum Data Set (MDS). The literature identified 1) two pain assessment instruments that has been used in PrI pain research in NHs; the Visual Analogue Scale (VAS), and the McGill Pain Questionnaire (MPQ); 2) secondary data from the MDS or Short Form Survey (SF-36) is commonly used to identify pain; 3) PrI pain was assessed one time during study periods, or in conjunction with PrI dressing change; 4) Higher pain intensity is associated with higher PrI stages; and 5) cognitive impairment was reported in most studies. **Conclusion:** The VAS, MPQ, and data from the MDS or SF-36 are commonly used to assess PrI pain among NH residents. Most studies included few NH participants (N= 4-33) or used secondary data to assess pain. No studies provides multiple pain assessments or report the stability of PrI pain over time

Keywords: Pressure ulcer pain, Pressure sore pain, Pressure injury pain, Bedsore pain, combined with Nursing homes, Nursing home residents, and long-term care.

Introduction

Older adults admitted to nursing homes (NH) are at risk for a range of adverse outcomes, including pressure injuries (PrI) and pain. PrI are a significant problem in all health settings particularly in NHs. Prevalence estimates of PrI range between 2% to 24% in NHs (Cai, Mukamel, & Temkin-Greener, 2010; Park-Lee & Caffrey, 2009; Reddy et al., 2008). Pain is one of the chief complaints of individuals with PrI as it is one of their most distressing symptoms (Herr, Coyne, McCaffery, Manworren, & Merkel, 2011). The prevalence of persistent pain in older adults living in NHs range from 45% to 85% (Herr et al., 2011). Daily pain described as excruciating at some time during the previous week has been reported by 26% to 29% of NH residents (Hoffmann & Tarzian, 2005). Despite the high prevalence of PrI among NH residents, and the emerging research on PrI pain, there remains a dearth of information on PrI pain among NH residents.

PrIs are a huge burden to the US healthcare system with costs of treatment between \$9.1 and \$11.6 billion annually ((Padula, Mishra, Makic, & Sullivan, 2011). The cost to treat PrIs in NHs is \$3.3 billion annually (Centers for Medicare & Medicaid Services [CMMS], 2010; Olsho et al., 2014). Treatment costs for a single PrI case range between \$20,900 and \$151,900 (Agency for Healthcare Research and Quality, 2014). The cost is attributed to an extended length of hospital stay (LOS), which includes nursing, medical, non-clinical salaries (Whitty et al., 2016), support surfaces, medical devices, debridement, wound dressings, assessment and treatment of infection and biofilms, electrical stimulation, negative pressure wound therapy, and surgery (NPUAP, 2014). PrI affect more than one million patients in acute and long-term care settings in the US annually. As a result of related complications, PrI claim the lives of 60,000 people each year (Sullivan & Schoelles, 2013).

Background

PrIs are painful wounds of the skin and deeper soft tissue that occur primarily over bony prominences resulting from pressure or pressure in combination with shear (National Pressure Ulcer Advisory Panel and the European Pressure Ulcer Advisory Panel [NPUAP/EPUAP], 2014). PrI are classified into eight categories based on visible tissue damage. They range from non-blanchable erythema of intact skin (Stage 1), and partial thickness skin loss with exposed dermis (Stage 2), to more severe wounds that involve fat, muscle, and bone (Stage 3 /4) (NPUAP, 2016). PrIs are debilitating, chronic wounds, which occur specially in individuals with advanced age, multiple comorbidities, and physical or cognitive impairments (White-Chu, Flock, Struck, & Aronson, 2011). A broadly accepted definition of pain originates from the International Association for the Study of pain (IASP). The IASP defines pain as a sensory and emotional experience that is unpleasant and associated with tissue damage that could be actual or potential (International Association Study in Pain, 1994). In addition, pain has been defined as an individual experience that is subjective as it is described as whatever the person verbalizes they are experiencing and whenever they say it occurs (McCaffery, Ferrell, & Pasero, 2000). McCaffrey's definition of pain establishes the patient's self-report as a reliable indicator of the level of pain experienced (Rodriguez, 2015).

The most reliable indicator of pain existence and intensity is the patient's self-report by use of a validated instrument (Herr et al., 2011). In a systematic literature review on PrI pain, the National Pressure Ulcer Advisory Panel presented a white paper to synthesize available literature on PrI pain (Pieper, Langemo, & Cuddigan, 2009). Pieper et al. (2009) reported three pain rating scales used to measure PrI pain: the McGill Pain Questionnaire (MPQ), the Faces Rating Scale (FRS), and the Visual Analog Scale (VAS). However, none of the pain rating scales has been

validated for PrI pain assessment.

In a prior literature review on the symptom of pain with PrI, Girouard et al. (2008) identified the VAS and versions of the Verbal Rating Scale (VRS) as the most commonly scales out of the 26 studies reviewed (six studies each) (Girouard, Harrison, & VanDenKerkof, 2008). The Numeric Rating Scale (NRS) was used in four studies, and the FRS and Present Pain Intensity Scale (PPI) were used in one study each. Some studies used more than one tool to measure PrI pain. Two studies used tools developed by the authors, or a combination of tools. Two out of the nine studies reviewed used the VAS to assess PrI pain in NH residents. One of the studies used the MPQ, three studies used secondary data of the Minimum Data Set (MDS) or the Short Form Health Survey (SF-36), and two of the studies used non-validated instruments such as questionnaires.

Pieper and colleagues (2009) reviewed 15 relevant papers related to PrI pain in which the researchers examined pain assessment tools, topical analgesic for pain management, and/or descriptions of persons with pressure ulcer pain. Most of the studies took place in hospitals, inpatient hospice, or community settings. The review did not include any studies in NHs and little or no research on PrI pain has been done in NHs. Also, no prospective studies exist examining PrI pain among NH residents. In fact, there has been very little research in particular on PrI pain that include NH residents. To better understand the impact of PrI pain among NH residents, a review of the literature was conducted to identify and synthesize research on PrI pain that includes NH or long-term care residents. This paper examines the research findings specific to PrI pain in NH or long-term care residents found in the literature. This includes PrI pain prevalence, intensity of pain, pain assessment scales and instruments used.

Aim

The aim of this literature review is to identify and synthesize research studies examining PrI pain among NH residents. The specific review objectives were to describe:

1. The prevalence of PrI pain among NH residents
2. Methodologies used to assess PrI pain among NH residents (i.e.; pain assessment instruments, timing of assessment)
3. Characteristics associated with PrI pain among NH residents

Methodology

An initial literature search was carried out in August 2013 on health care and scientific databases. PubMed and Cumulative Index in Nursing and Allied Health Literature (CINAHL) was searched with the following key words: pressure ulcer pain, pressure sore pain, pressure injury pain, bedsore pain, combined with nursing homes, nursing home residents, and long term care. The search was limited to English language, human research, and age 65 years or older. In addition, auto-alerts were set up within the databases until April 2018 for notification of any additional relevant papers added to the database following the original search. To supplement the original search, the reference lists and bibliographies of retrieved articles were reviewed to discover potentially relevant articles not identified in the electronic search. In addition, related work published by the researchers was analyzed for relevance. A description of the search methodology is further detailed in Figure 1.

Inclusion/Exclusion Criteria

Studies were included in the literature search if the study sample included participants from a NH long-term care setting, with adult patients with any stage of PrI, and included findings regarding PrI pain. Studies using various healthcare settings were included only if any of the

participants were from long term care (LTC) or NH with a PrI and reports of PrI pain. Studies using secondary data analysis were included if the study sample was from long term care or NH and included participants with PrI and reported pain levels. Studies were excluded if the setting did not include NHs or LTC facilities. Hospital, hospice, palliative care, home care, community, and clinic settings were among the exclusions. No studies were found in assisted living homes. Several studies excluded participants with cognitive impairment or too ill to respond to the pain assessment instruments used (Szor and Bourgoignon, 1999; Dallam et al., 1995). This is likely the reason NH residents have been studied less due to the probability of having some level of cognitive impairment.

The initial search identified 360 articles (see Figure 2.1). After review of the abstracts 324 articles were excluded. These 324 articles were excluded because they were either related other chronic wounds and conditions such as nerve pain, or other conditions not related to wounds at all. Articles that were reviewed and abstracted included 36 potentially relevant studies. Of these, 27 did not meet eligibility criteria. Major portions of them, 17 of 27 were excluded because they did not include NH or long-term care setting. None of the 27 excluded articles included an assessment or discussion of pain related to PrI. Next, hard copies of relevant articles were reviewed for references and bibliographies to identify additional manuscripts. No additional articles were identified from the review.

To begin the appraisal process, studies were reviewed to capture general information about the study in terms of author/year, type of study, sample and setting, purpose, methods, and findings. Specific aspects relevant for this review, such as the setting, sample, documented prevalence and incidence of PrI pain, how pain was measured, and treatment of PrI pain were also included.

General Results

A total of nine articles met final inclusion criteria for this review (Ahn, Stechmiller, Fillingim, Lyon, & Garvan, 2015; Ahn, Stechmiller, & Horgas, 2013; de Souza et al., 2015; McGinnis et al., 2014; Newland, Wipke-Tevis, Williams, Rantz, & Petroski, 2005; Rondas, Schols, Stobberingh, & Halfens, 2015; Stern et al., 2014; Szor & Bourguignon, 1999; van Leen, Rondas, Neyens, Cutting, & Schols, 2014); Of these, the two studies with the largest sample sizes of more than 137 participants were secondary data analysis from the Minimum Data Set (MDS) (Ahn et al., 2015; Ahn et al., 2013). These studies examined how pain is reported in NH residents with PrI (Ahn et al., 2013) and the relationship between PrI stage and bodily pain intensity (Ahn et al., 2015). The remainder of the articles included in this review comprised samples between 11 and 137 participants (McGinnis et al., 2014; Newland et al., 2005; Rondas et al., 2015; Stern et al., 2014; Szor & Bourguignon, 1999; van Leen et al., 2014).

Pressure Injury Pain Prevalence in Nursing Homes

Of the nine studies reviewed, two included PrI pain prevalence (McGinnis et al., 2014; Szor & Bourguignon, 1999). In one of the larger studies with more than 100 participants (n=176), McGinnis et al (2014) reported a 66% prevalence of PrI pain. Szor and Bourguignon (1999) reported a PrI pain prevalence of 84% (n=28) at rest and 88% (n=28) at dressing change. No study reported the incidence of PrI pain among NH residents.

Pressure Injury Pain Assessment

Two pain assessment scales have been used in PrI pain research that included NH residents: the VAS was used in two of the studies review and the MPQ was used in one study. Several of the studies used secondary data from the MDS or Short Form Health Survey (SF-36).

The use of these pain assessment instruments in the nine studies will be reviewed.

Van Leen et al (2014) conducted a study to evaluate the response of patients with chronic wounds to the hydrokinetic fibres wound dressing. They used the VAS to assess wound pain in 31 patients in NHs or community clinic settings. The sample included 11 patients with PrIs and the remaining patients had leg ulcers ($n = 20$). The settings where the 11 patients with PrI were recruited from were not discussed or included in the demographics of the sample. However, eight of the patients had stage 3 PrI and three of them had stage 4 PrI so it is likely these participants were recruited from NH and not community clinic settings. The researchers evaluated the use of the HF dressing and found an overall downward trend in pain over an eight-week period.

Stern et al (2014) used the VAS to assess PrI pain in 137 LTC residents. This multi-method was a pragmatic cluster randomized stepped-wedge trial, ethnographic observation and in-depth interviews, and an economic evaluation study was conducted to determine the clinical and cost effectiveness of enhanced multidisciplinary teams vs. usual care for the treatment of PrI in LTC facilities. PrI pain was one of nine secondary outcome measures. The researchers reported an estimated mean VAS PrI pain specific score to be 0.39 units higher in the control group during the intervention period; however the difference was not significant ($p = .42$, 95% CI = -55, 1.34). The intervention consisted of training and education of LTC staff on prevention and treatment of PrI and establishing a multidisciplinary wound care teams.

Szor and Bourguignon (1999) used the MPQ to measure PrI pain intensity at rest and during dressing change in 32 patients, four (12.5%) of whom were NH residents. The mean age of the participants was 74.7 years, (SD = 12.8). Eighty-four percent of subjects ($N = 27$) reported PrI pain at rest and 88% ($N = 28$) reported pain at dressing change. The researchers found the MPQ was difficult for some, especially participants who were acutely ill.

The three studies that used the MDS include two of the largest studies (N = 56,577; N = 41,680) (Ahn et al., 2013; Ahn et al., 2016). The MDS is a comprehensive questionnaire used to assess NH residents in Medicare or Medicaid certified skilled nursing facilities in the United States. Pain assessment measurements were collected from the MDS data subscale. A measurement of the residents' worst bodily intensity of pain over the previous five days is recorded the MDS coordinator at the NH. This measure includes one of two recognized, validated self-report pain measures, the numeric rating scale (NRS), or verbal descriptor scale (VDS). The scores of the NRS and VDS are summarized in a four-point ordinal scale, 1 (mild or no pain), 2 (moderate pain), 3 (severe pain), and 4 (excruciated pain). These are the only two studies that included 100% of the samples from NHs.

Newland et al (2005) used the MDS in an exploratory retrospective study of 41,208 LTC residents. The researchers compared residents with and without multiple sclerosis (MS) in terms of admission status of pain, PrI, physical disability depression and cognitive performance. The researchers reported the presence of a PrI 90 days after admission was associated with initial PrI status ($P < .001$) and initial pain status ($P < .001$). Residents with pain on admission had approximately 30% greater odds of having a PrI than residents without pain (OR = 1.3, 95% CI = 1.2 – 1.5). Pain prevalence was slightly higher ($p = .08$) in residents with MS (56.3%) than those without MS (50.7%). The pain intensity was similar for both groups, those with MS (mild 30.2%, moderate 58.3%) and without MS (mild 32.1%, moderate 58.5%).

De Souza et al. (2015) compared health-related quality of life (HRQL) in elderly patients with PrIs living in LTC facilities, hospitals, or at home. In a cross-sectional study, the researchers recruited a sample of 110 elderly patients with ($n = 36$) and without ($n = 74$) PrIs. Of the 110 participants, 31 (11 with and 20 without PrIs) were recruited from 10 LTC facilities. The

remaining participants were recruited from hospitals and community health centers where elderly patients living at home were included. The researchers used the SF-36 to evaluate bodily pain in patients with and without PrI. Surprisingly, patients with PrI reported higher scores on the SF-36 bodily pain subscale than those without PrI, indicating less pain than expected ($p = .655$) vs. ($p = .007$) respectively.

McGinnis et al (2014) examined the prevalence of unattributed pressure area related (UPAR) pain within the community population ($n = 176$). The mean age of the participants was 72.6 years (SD 15.31). The researchers used a two-question survey imbedded into a routine annual PrI prevalence audits. Participants were asked the following questions:

1. Do you currently have any pain, soreness, or discomfort, either all the time or on and off in any areas exposed to pressure (e.g. sacrum, buttocks, heels)?

2. Do you think your pain, soreness, or discomfort is related to either your PU or pressure/rubbing due to being in bed/chair?

The researchers found 75.6% ($n = 133$) of the participants had UPAR pain. Of these participants, 27.8% ($n = 37$) consented for a detailed PrI pain assessment, in which 16.2% ($n = 6$) were NH residents. PrI pain was measured using the NRS and the Leeds Assessment Neuropathic Symptoms and Signs (LANSS) Pain Scale, a validated instrument to assess neuropathic and inflammatory pain. Participants reported inflammatory and neuropathic pain at all PrI sites. Neuropathic pain was greater in PrI located on the limbs. Participants reported painful PrI of all stages on all PrI locations. Pain intensity was not related to the number or severity of PrI.

Rondas et al (2015) conducted a cross-sectional point prevalence study. The researchers used a standardized questionnaire to measure the prevalence of infected chronic wounds in NHs

and explore which signs and symptoms are used to diagnose infected chronic wounds. The sample included 63 patients 21 NHs had a total of 72 with chronic wounds. Of the 72, 46% of the wounds were PrI. Sixteen of these chronic wounds were infected with pain as a symptom in 56.3% of these wounds. The wound care nurse or elderly care physician filled in the questionnaire about each chronic wound, which included a yes or no answer to pain presence. The type of pain assessment included in the questionnaire is not discussed. The researchers did not report if the pain was self-reported or by clinician evaluation.

Few instruments have been used to assess PrI pain in NH residents. However, none of these instruments have been validated specifically for PrI pain. One of the major issues with pain assessments of frail older NH residents is cognitive impairment. Cognitive impairment creates a major challenge in using any of the pain assessments scales with NH residents. Cognitive impairment has been associated with PrI pain among NH residents and is one of the few characteristics statistically associated PrI pain.

Timing of Pressure Injury Pain Assessment

Timing of pressure injury pain assessment varied across the nine studies reviewed. Of the nine studies, four used secondary data such as the MDS or SF-36 to examine bodily pain measures (Ahn et al., 2015; Ahn et al., 2013; de Souza et al., 2015; Newland et al., 2005); Two studies assessed PrI pain in relation to time of PrI dressing change (Szor & Bourguignon, 1999; van Leen et al., 2014). Other two studies assessed PrI pain at different times during the study (Stern et al., 2014; van Leen et al., 2014). One study did not specify when or how PrI pain was assessed (Rondas et al., 2015). There is no gold standard or best time to assess PrI pain identified in the literature.

The two studies by Ahn and colleagues (Ahn et al., 2015; Ahn et al., 2013) were analysis

of MDS data. Pain assessment data from the MDS was not specific to PrI pain or any particular part of the body. MDS assessments were completed quarterly and pain assessment is related to pain experienced over the last five days prior to the pain assessment. Timing of the MDS pain assessment was random and not related to PrI dressing change. Others have also used this approach. Newland (2005) used the MDS to assess bodily pain in LTC residents with and without multiple sclerosis. Likewise; de Souza et al. (2015) used secondary data of the SF-36 to measure bodily pain in their participants.

Szor and Bourguignon (1999) measured PrI pain at rest (for a minimum of 20 minutes) and again 10 minutes after the PrI dressing change. The researchers found an increase in the proportion of persons with pain at dressing change compared to persons at rest (84% vs. 88%) respectively. However, it should be noted that the difference in these results represents only one subject. This is a critical limitation of this study.

McGinnis et al. (2014) measured pain during a routine PrI prevalence audit across a variety of settings. Participants with UPAR pain were recruited to participate in a sub study related to PrI pain. The participants were seen in their usual setting (NH, hospital, home, intermediate or long term care facility) with no specific time reported for when pain was assessed.

Stern et al. (2014) assessed PrI pain every two weeks for the duration of the 12-week study. The pain assessments were done in conjunction with PrI dressing change. However, there was no report of when pain assessment was done. Similarly, van Leen et al. (2014) assessed PrI pain over an 8-week period. Pain was assessed at the beginning of the study, week four, and week eight. Patients were assessed for PrI (background) pain and pain at dressing change. Rondas et al. (2013) did not report how PrI pain was assessed. The wound care nurse or geriatric

physician completed a questionnaire about the chronic wound and documented the presence of pain in 56.3% of infected wounds. The researchers did not discuss if the PrI pain assessment was done routinely or in relation to PrI dressing change, or how many times pain was assessed.

Pressure Injury Pain Intensity

PrI pain intensity was noted and described in several of the studies reviewed (Ahn et al., 2015; Ahn et al., 2013; McGinnis et al., 2014; Szor & Bourguignon, 1999). Some of the studies described pain intensity and provided details for the various pain levels, whilst others did not. Szor and Bourguignon reported that of the 28 participants, who reported PrI pain, 75% (N = 21) rated their pain as mild, discomforting, or distressing and 18% (N = 5) rated their pain as horrible or excruciating. McGinnis et al. (2014) reported a prevalence of pain associated with PrI in 75.6% (N = 133) of the patients who consented to a detailed pain assessment of their PrI and associated pain. They found pain was associated with all stages of PrI, however pain intensity was not related to the number or severity of PrI. Pain intensity was similar across all stages using a zero to ten (0-10) nominal rating scale.

Ahn et al. (2013) reported bodily pain intensity of NH residents with PrI according to the MDS data. Of the participants, 72.6% (N = 15,139) had mild pain, 25.1% (N = 5,227) had moderate pain, and 2.4% (N = 492) had excruciating pain. Ahn et al. (2015) found the most frequent category of bodily pain intensity was moderate (50%), and frequencies of mild and severe pain were similar, 23% and 21%, respectively. Newland et al. (2005) also reported bodily pain according to documentation in the MDS, however, they reported the presence or absence of pain in participants. They did not report the intensity of pain for those participants experiencing pain. Likewise, de Souza et al. (2015) reported the SF-36 bodily pain subscale of participants and did not include the intensity of pain. However, the researchers reported higher scores on the SF-

36 bodily pain subscale in patients with PrI than those without PrI, but the intensity of pain on this subscale was not described.

Van Leen et al. (2014) reported mean PrI pain VAS scores between 3.69 before dressing change and 3.23 at PrI dressing change. These scores decreased to 0.67 before dressing change and 0.75 at PrI dressing change over an eight-week period of using the HF dressing. The VAS pain intensity score range from 0 equals no pain and 10 being the worst imaginable pain.

Similarly, Stern et al (2014) used the VAS but they did not report the intensity of pain. However, they estimated an increase in mean VAS pain scores during the intervention period but were not significant ($p = .42$). Rondas et al. (2015) did not describe pain intensity. They reported the proportion of participants with pain based on a questionnaire completed by the wound nurse or physician.

Several studies reviewed have identified the associated between pain intensity and stage of PrI, however, this relationship is not fully understood (Ahn et al., 2013). Some studies show an increase in pain intensity with increased severity of PrI (Ahn et al., 2015; Dallam, 1995; Gunes, 2008). In contrast, others have shown that there is no association between the two (McGinnis et al., 2014).

Characteristics Associated with PrI pain

Of the nine studies reviewed, five included information about cognitive status in some fashion. Three of the five studies used the cognitive performance subscale of the MDS (Ahn et al., 2015; Ahn et al., 2013; Newland et al., 2005); one of the studies used the Mini Mental State Examination to assess cognitive performance (de Souza et al., 2015), and one study mentioned the proportion of participants who were not alert and oriented (Rondas et al., 2015). Four of the studies did not include information about cognitive status (McGinnis et al., 2014; Stern et al.,

2014; Szor & Bourguignon, 1999; van Leen et al., 2014).

In their three-group, cross-sectional, comparative design to examine bodily pain among NH residents with PrI, Ahn, Stechmiller, and Horgas (2013) determined groups by cognitive status. They reported 28.2% (N = 15,955) with mild cognitive impairment, 38.3% (N = 21,657) with moderate cognitive impairment; and 33.5% (N = 18,931) with severe cognitive impairment based on the MDS Cognitive Performance Scale. They found NH residents with any stage of PrI who also had severe cognitive impairment had more severe pain compared with those NH residents with mild or moderate cognitive impairment. Based on Ahn et al (2013) results, in a second study, Ahn et al (2015) adjusted for cognition as one of the predictors in an exploratory cross-sectional study that examined the relationship between PrI stage and bodily pain intensity. They found greater bodily pain intensity was associated with advanced stages of PrIs. The likelihood of increased bodily pain intensity in NH residents with stage 4 and DTI was 24% and 22% greater compared to those with stage 1 PrI respectively.

Szor and Bourguignon (1999) did not discuss cognitive ability of the participants. But whilst they did not discuss it, they had more difficulty using the MPQ with more acutely ill patients, which implies the likelihood they had some cognitive impairment or decreased level of consciousness McGinnis et al (2014) excluded subjects who were unconscious, confused or had communication difficulties. The fact that they excluded these subjects implies they did not include the typical type of NH resident with cognitive impairment.

De Souza and colleagues (2015) used the Mini Mental State Examination to assess cognitive status of participants. They found patients living in LTC facilities had lower Mini-Mental State Examination scores, indicative of higher cognitive impairment than elders residing in acute or home care ($p = .001$).

Newland et al (2005) used the cognitive Performance Scale (CPS), a subscale of the MDS to measure cognitive performance. They reported 22.3% of LTC residents with MS with pain and 28.7% of those without pain were moderately cognitively impaired. Initial cognitive performance ($p < .001$), age ($p < .001$), and initial pain status ($p < .001$) were associated with cognitive performance 90 days after admission.

Stern et al (2014) did not report how cognitive status was measured. However, the study reported the proportions of participants in the control and intervention groups as either not alert or not oriented 77.6% vs. 83%, respectively. Rondas et al. (2015) and van Leen et al. (2014) did not report any measurements of cognitive status.

Pressure Injury Stage

PrI stage was tracked in some of the studies (Ahn et al., 2015; Szor & Bourguignon, 1999); classification tools included variations of the NPUAP/EPUAP staging classification systems. Szor and Bourguignon (1999) found participants with higher stage PrI had higher Present Pain Intensity (PPI) scores and used more word descriptors to describe their pain. They reported 92% (N = 11) participants with stage 2 PrI, 100% (N = 8), with stage 3 PrI, and 75% (N = 9) with stage 3 PrI experienced pain. No statistical significance on the intensity of PrI pain was found for the stage of PrI ($F = .95$ $p = .40$), or for PrI pain at rest or for PrI dressing change across stages of PrI ($F = .07$, $p = .93$). Although not statistically significant, the researchers reported participants with stage 4 PrI tended to report more severe pain than those of lower stages. Szor and Bourguignon (1999) did not provide any statistical data for these findings. In contrast, McGinnis et al. (2014) did not find a difference in PrI pain across stages. This was explained by the possibility of individuals who did not report PrI pain may have had sensory impairment (e.g. spinal cord injury) or sufficient pain medication to mask PrI pain. The pain

intensity range from 1 – 10, with a mean of 6.4 (SD 2.53).

Ahn et al. (2015) found that greater bodily pain intensity was associated with advanced stages of PrI. In the bivariate relationships between bodily pain intensity and PrI stage, compared to individuals with stage 1 PrI, the likelihood of increased bodily pain intensity in individuals with stage 2 PrI was 14%, with stage 3 PrI was 21%, with stage 4 PrI was 38%, and with DTI was 23%. Likewise, Ahn et al. (2013) found the stage of PrI and pain severity to be significantly correlated ($X^2_{12} = 775.74, p < .001$).

Van Leen et al. (2014) and de Souza et al. (2015) described the samples in terms of stages of PrI. Van Leen et al. (2014) reported of the 11 NH residents with PrI, eight had stage 3 PrI, and three had stage 4 PrI. De Souza et al. (2015) reported 11 of 11 NH residents had a stage 3 PrI. However, these researchers did not discuss the stage of PrI and the relationship between PrI pain and stage of PrI. There was no discussion of PrI stage in the studies by Stern et al. (2014), Rondas et al. (2015), and Newland et al. (2005).

A small number of factors have been found to be associated with PrI pain in NH or LTC residents. As previously discussed, stage of PrI and PrI dressing change are commonly associated with PrI pain. In addition to these findings, only one of the studies reviewed added to this finding. Rondas et al. (2015) reported gender, age, and BMI as common characteristics of the patients who participated in the study. However, it is unclear if these characteristics are common for those with pain or infection. No statistical data was presented. They also reported of the 16 infected wounds, 56.3% (n = 9) had pain, 68.8% (n = 11) had erythema, and (81.3%) (n = 13) had an increase in purulent exudate. However, no statistical correlations of these variables were described.

Discussion

Findings from this review evaluating PrI pain in NH residents identified nine relevant studies. The studies identified for this review confirmed PrI pain is a significant problem for NH and LTC residents. Of the studies analyzed, two documented PrI pain prevalence estimates between 66% and 88% (McGinnis et al., 2014; Szor & Bourguignon, 1999). However, it should be noted that these studies included participants from various settings and included very few NH residents (n = 6; n = 4, respectively). Only a few studies related to PrI pain exist that include NH or LTC residents and two of the largest studies were secondary analysis data (Ahn et al., 2015; Ahn et al., 2013). Other studies had relatively sample sizes between 11 and 137 participants.

Two instruments have been primarily used to assess PrI pain in NH residents; the VAS and MPQ. Both instruments are reliable and valid instruments to assess pain. However, neither instrument had been validated in the assessment of PrI pain. Two of the nine studies analyzed use the VAS, one used the MPQ, two used non-validated instruments or questionnaires, and four studies used secondary data from the MDS or SF-36. The literature suggests using a pain assessment tool appropriate for patient's cognitive level and medical challenges (Pieper et al., 2009). Freeman et al. (2001) used the VAS and the FRS with hospitalized elderly patients with PrI. They reported the feasibility of permitting elderly patients to select the pain assessment scale that they are most comfortable using. Szor and Bourguignon (1999) reported difficulty in using the MPQ with more acutely ill patients and McGinnis et al. (2014) did not include those unable to respond in their study. The lack of using a pain assessment scale that could be used with those unable to respond is a significant limitation in the literature. Edelen and Saliba (2010) used item response theory (IRT) methods to identify correspondence between the verbal descriptor scale (VDS) and the numeric rating scale (NRS) in a survey on pain presence among 3,676 NH

residents. Findings from this study provided a crosswalk between the two instruments so that either can be used according to the preference of the clinician or respondent. Future research that includes similar mapping of common pain assessment techniques such as the faces pain scale, pain thermometer, and PAINAD may improve pain assessments among NH residents. Of the nine studies reviewed, one pain assessment scale was used. None of the researchers used more than one pain assessment scale in the studies analyzed. Pain was assessed once or around PrI dressing change, before or during, or afterwards. None of the studies analyzed associated factors related to PrI pain in NH residents. There is also a gap in knowledge related to the association of any contributing factors to PrI pain. One study reported age, gender, and BMI as common characteristics among participants and representative of NH residents (Rondas et al., 2013). However, no statistical analysis compared the relationship between these characteristics and PrI pain.

Findings from several studies support higher pain intensity with more severe stages of PrI (Ahn, et al. 2014; Ahn et al., 2016; Girouard et al., 2008; Szor & Bourgorginon, 1999). Except for one study, these studies have assessed PrI pain one time during the study period. Szor and Bourguignon (1999) assessed PrI pain before and during PrI dressing change. Their study is the only study that provided PrI pain level based on more than one assessment.

Limitations

A major limitation to this literature review is the inclusion criteria of only NH or LTC settings. Often studies on PrI pain include samples from various settings. By limiting the inclusion criteria to NH and LTC settings, additional studies including NH residents may have been missed. Another limitation to this literature review is that we examined only studies related to PrIs. There is a growing body of research related to pain in chronic wounds, which often

include PrIs. We did not explore any articles related to pain in chronic wounds. Moreover, this review was confined to papers published in English language. Even given the limitations of this literature review, a significant gap exists in the understanding of the relationship between PrI pain among frail and older NH residents.

Future Research and Best Practices

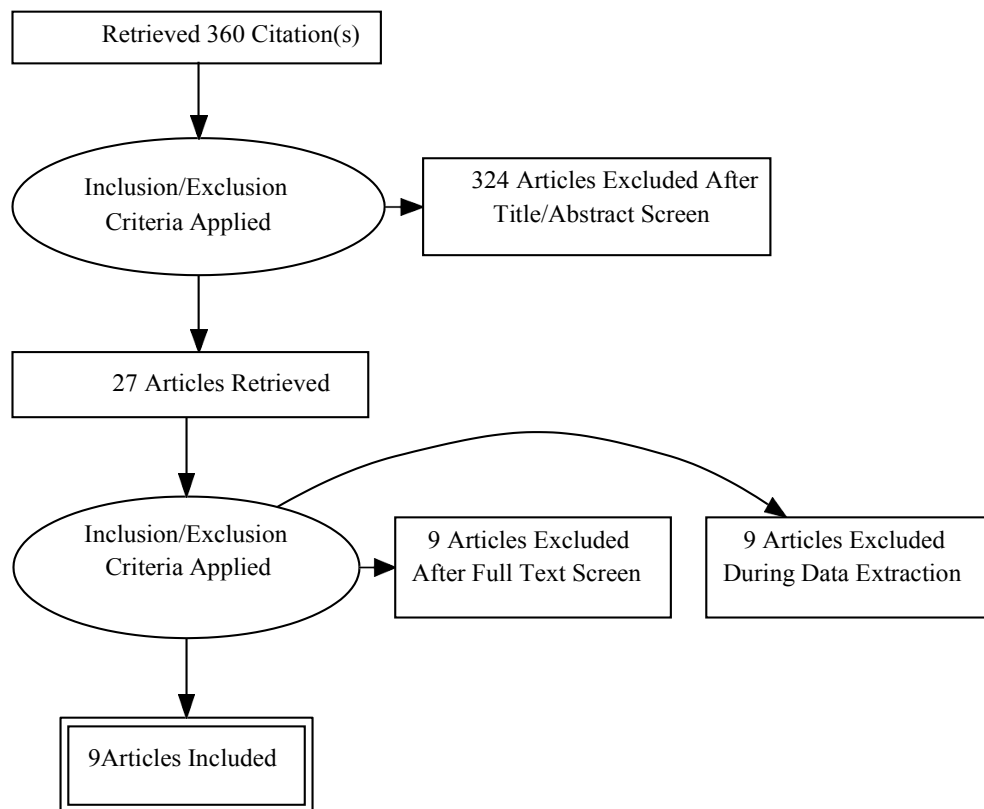
In general, research regarding PrI pain among NH residents is scant. However, the results of this review highlight apparent facts. Almost all of the studies suggest that PrI are painful and individuals with PrI should be assessed for pain. Various pain assessment scales have been used to assess PrI pain. However, no pain assessment scale has been validated for PrI pain assessment. Furthermore, due to the challenges with pain assessments in frail older adults, mostly due to cognitive impairment, a validated instrument to assess PrI pain in NH residents must be identified. PrI pain assessment scales should be appropriately matched with cognitive level of the individual being assessed. Self-report is the gold standard measurement for pain and should be used preferentially (Herr et al., 2006; Ngu et al., 2014). Researchers suggest using an observational pain assessment when cognitive impairment is present and the individual is completely unable to communicate, where self-reported pain is not possible (Herr et al., 2006; Ngu et al., 2014; While & Jocelyn, 2009).

Future research should examine PrI pain in NH residents who are vulnerable to pain and PrI. More research is needed on the best pain assessment scales to be used with older NH residents. Self-report pain assessment tools such as the VRS, VAS, FRS and NRS have been validated for use with NH residents (Closs, Barr, Briggs, Cash & Seers, 2004). The PAINAD, Non-communicative Patient's Pain Assessment Instrument (NOPPAIN), and the Abbey Pain Scale have effectively recognized the presence and severity of pain in older adults with cognitive

impairment (Lukas, Barber, Johnson, & Gibson, 2013). Further research in the assessment of PrI pain among NH residents using these instruments should be considered. In addition, due to the complexity of pain assessments with older adults, a single pain assessment may not be reliable. More information on the stability of PrI pain based on multiple pain assessments is needed to determine the accuracy of PrI pain levels among NH residents. Moreover, factors related to, contribute to, or predict PrI pain in NH residents needs to be examined.

Prisma Flow Diagram

Figure 2-1



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Chapter Three

Pressure Injury Pain over Time Among Nursing Home Residents

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Running Head: PRESSURE INJURY PAIN OVER TIME

Keywords: Pressure injury, Pain, nursing Home residents

Abstract

Objective: Examine pressure injury (PrI) pain severity, stability, and current treatment of PrI pain among nursing home (NH) residents using two assessment tools and a descriptive cohort study design.

Background: PrI pain affects quality of life of NH residents yet, best assessment methods, stability of PrI pain, and how to take care of the pain are not well known.

Methods: Data collected from 33 residents with PrI (stages 1-4) from 4 NHs. All PrI were staged and assessed using the Bates-Jensen Wound Assessment Tool (BWAT) to determine severity. Verbal Response Scale (VRS) and Pain Assessment in Advanced Dementia (PAINAD) were used to assess general and PrI pain 3 times a day for two days within one week. Data classified as: no, mild, moderate, or severe pain. Proportions of participants with different levels of PrI pain were calculated. T tests were conducted to examine differences across time; VRS and PAINAD were examined for agreement.

Results: Participants' were 74% female, 49% white, 58% cognitively intact, 58% functionally dependent, and had mean age of 82 years old. The majority (52%; n=17) were full thickness PrI, stage 3 (n=5), stage 4 (n=7), unstageable (n=5). The majority of participants (82%; n=27) reported PrI pain on at least one of six assessments over the two days; with 57% mild, 26% moderate and 16% severe pain. More pain occurred in afternoon. No differences existed across days. VRS correlated with PAINAD ($r=0.38$, $P<.05$) and showed poor agreement ($K= 0.19$, $p=.28$). Of those with PrI pain, 22% had pain documented in the Minimum Data Set (MDS). Only 42% of participants who reported PrI pain received pain medication within 12 hours of initial pain assessment. Most participants who received general pain medication reported no PrI pain.

Conclusion: VRS and PAINAD scores were related but with limited agreement. PrI pain was

not well documented on the MDS. PrI pain reported by most participants and was greater in afternoon, perhaps a time for PrI pain assessment and management. In our study, participants who received pain medication for general pain did not complain of PrI pain. Thus, treatment of general pain may be effective for PrI pain.

Keywords: Nursing home residents, Pressure injury, Pain

The cost to treat pressure injury (PrI) is reported to be \$3.3 billion annually in United States (U.S.) nursing homes (NH) (Olsho et al., 2014) and ranged between of \$9.1 to \$11.6 billion across all health settings (Padula, Mishra, Makic, & Sullivan, 2011). Yet, it is unknown if the reported cost data includes any costs for management of PrI pain even though pain is a common problem associated with PrI (Pieper, Langemo, & Cuddigan, 2009). A small body of scientific knowledge about PrI pain has emerged over the past 25 years. The literature has established that PrIs are painful, particularly during dressing changes (Gorecki, Closs, Nixon, & Briggs, 2011) and that PrI pain occurs with PrI of various severity (Dallam, 1995). The unceasing presence or burst of pain in NH residents with PrI may cause serious interference with their daily activities and mobility, and diminishes quality of life (Teno, Kabumoto, Wetle, Roy, & Mor, 2004). A patient verbal report of PrI pain is always a crucial issue for patients with PrI (Gorecki et al., 2011). Other researchers have examined PrI pain at rest (Szor & Bourgorginon, 1999; Quirino et al., 2003), after dressing changes (Szor & Bourgorginon, 1999), or at random single assessments (Briggs et al., 2013). Yet, little data exists regarding PrI pain among NH residents.

Pain, in general, is a common problem among older adults, especially those residing in NHs. (Herr, 2011). NH residents with PrI are more likely to have excruciating pain similar to NH residents with cancer and hip fractures (Teno et al., 2004). Thus, PrI pain is substantial among

NH residents. The field has relied on a study in 1999 by Szor and Bourguignon (1999) as one of the major sources of data on PrI pain. The classic PrI pain study measured PrI pain among individuals at rest (for a minimum of 20 minutes) and again 10 minutes after PrI wound dressing change. The researchers found an increase in pain from 84% at rest to 88% following dressing change, but did not report if this was statistically significant. This classic study provided some of the first data related to PrI pain. However, the participants were recruited from acute, extended, and home care settings; only four participants were NH residents. While there were multiple assessments, the study design did not allow for inferences about the stability of PrI pain over time. There is a paucity of data about the stability and variation of PrI pain among NH residents over time, and little is known about the stability of PrI pain over the course of a day or throughout a week. If there were a change in PrI pain level over the course of a day or week, it would be important to know so interventions to manage PrI pain could be tailored appropriately. Very little scientific knowledge is known about PrI pain in NH residents. It is unknown what interventions NH staff should implement for PrI pain.

As noted in the literature, PrI pain does not respond well to oral analgesic medication such as, acetaminophen, non-steroid anti-inflammatory medications, or opioids (Flock, 2003). Interventions such as pressure-relieving devices (i.e., cushions and mattresses), types of dressing (i.e. moisture retentive), and topical Diamorphine gel have been found to help in the management of PrI pain (Pieper et al., 2009). However, studies on the use of any interventions for PrI pain management among NH residents were not found.

Another issue related to PrI pain assessment among NH residents is the identification of the most appropriate pain assessment tool is most appropriate for use. Accurate general pain assessment is a major challenge in older adults, especially those with dementia

(Hadjistavropoulos et al., 2014). Despite limitations, self-report of pain is deemed the gold standard for pain assessment and is recommended by the American Pain Society and American Geriatric Society. However, the ability to self-report pain diminishes with increasing severity of cognitive impairment (Hadjistavropoulos et al., 2014). Fifty percent of adults 85 years and older have cognitive impairment (Herr, Bjoro, & Decker, 2006). NH residents with PrI are more often functionally and cognitively impaired and this, as noted above, hampers assessment strategies.

Even though validated assessment tools exist for use with cognitively impaired persons, the detection of pain in NH residents with cognitive impairment often still relies on the subjective impression of health care providers. Further, there is no consensus or guidelines related to best methods of assessing general pain in the NH population nor are there guidelines for PrI pain assessment. The American Geriatrics Society guidelines suggest using the same pain scale for each assessment of a single patient (Freeman, Smyth, Dallam & Jackson, 2001). In the present study, two pain assessment tools, the Verbal Response Scale (VRS) and Pain Assessment In Advanced Dementia (PAINAD) were used with all participants for every PrI pain assessment. The VRS has been used in studies to assess PrI pain (vanRijswijk, 1993). It has also been used successfully for pain assessment in NH residents with cognitive impairment (Closs, Barr, Briggs, Cash & Seers, 2004). The PAINAD has also been used with NH residents with dementia (Malara et al., 2016). However, it has not been tested in the assessment of PrI pain.

This study used two instruments to assess pain: the VRS and PAINAD. The VRS is one of the most commonly used scales for patient self-report (Briggs & Closs, 1999). The VRS is a simple pain rating scale that consists of a list of adjectives used to describe levels of pain intensity. A 4-point VRS scale consists of common words: no pain; mild pain; moderate pain; and severe or intense pain. The test-retest reliability has been reported as good for use with older

adults with kappa-statistics between 0.68 – 0.75 (Bech, Lauritsen, Ovesen, & Overgaard, 2015). In a multi-site study examining patient and healing characteristics, VanRijswijk (1993) used a three-point VRS to assess PrI pain among 119 patients with 153 full-thickness PrIs, which included some NH residents. In all PrIs, Van Rijswijk found 21 PrI (37.5%) were not painful at all during the study. However, 14 (25%) PrI were rated as “very painful” at least once during treatment with hydrocolloid dressing change based on the VRS. In a study with NH residents, Closs et al. (2004) compared the VRS with other pain assessment instruments and found 80% (n=90) of the 113 NH residents with all levels of cognitive impairment and 36% of residents with severe cognitive impairment completed the VRS.

The PAINAD has been used to measure pain in individuals with advanced dementia (Warden, Hurley, & Volicer, 2003) and also with NH residents (Malara et al., 2016). The PAINAD is based on five behavior items. Each item is rated on a scale from zero to two according to the severity of behavior exhibited, giving a total score of all behaviors of 10. The categories and definitions of scores are presented in Figure 3. Internal consistency of the PAINAD ranges from $\alpha=0.50$ to $\alpha=0.65$. Inter-rater reliability assessed with six observers of 19 residents with dementia resulted in coefficients ranging from $r=0.97$ to $r=0.82$ (Warden, Hurley & Volicer, 2003). The PAINAD is sensitive in pain detection and has been used in various clinical settings (Lints-Martindale et al., 2012).

Given the importance of understanding PrI pain among NH residents, and the gaps in the literature, the purpose of this study was to describe and examine PrI pain and PrI pain care among NH residents over the course of one week. The specific aims were to:

1. Describe the level of pain severity among NH residents with PrI.
2. Examine PrI pain assessment as measured with two pain assessment tools.

3. Examine the stability of PrI pain among NH residents over 1 day (morning, mid-day, afternoon), and over 1 week (two days within a week).
4. Describe pain management strategies used for PrI pain in NH residents.

Methods

A prospective cohort descriptive correlational design was used to evaluate PrI pain at three different times of day on two days among 33 participants from four NHs in the county and city of Los Angeles, California. Figure 3-1 details the flow of participants through the recruitment process.

Subjects and Setting

The University of California, Los Angeles, Office of Human Research Protection IRB approved the study protocol. Each NH administration also reviewed and approved the study. The principle investigator (PI) obtained written informed consent and HIPAA consent to participate in the study and abstract medical records from residents who were able to provide informed consent or from their designated representatives (for residents unable to provide consent) with assent obtained from the resident. Figure 3-1 shows the flow of participants for this study.

Thirty-three residents were recruited from 4 NHs in the greater Los Angeles area. Eleven NH residents were recruited from one NH (125 beds), eight from two NHs (144 and 104 beds), and six from the fourth NH (90 beds). NHs were chosen for inclusion based on publically reported PrI quality measures (QM) scores. The QM, which reports the percent of long-stay high-risk residents with PrIs, was used to choose NHs for possible study inclusion. NHs participating in the study had a mean of 9.5% for this QM. NH residents were eligible for inclusion if they had a PrI of any severity on any anatomic location according to NH wound treatment nurses' caseload. Inclusion criteria for the study were NH residents 21 years or older

with an existing PrI documented in the medical record and MDS, ability to understand English, cognitively able to consent or have an available proxy, an anticipated minimum length of stay of seven days. Exclusion criteria were NH residents with a non-PrI wound, or without a PrI, or non-English speaking.

Medical Record Data

At baseline, the PI extracted medical and demographic information from all participants' medical records and their most recent Resident Assessment Instrument Minimum Data Set (MDS), which is required for most NH residents in the U.S. The MDS is a multi-domain assessment tool that is completed on admission and at quarterly intervals for residents in Medicare and Medicaid accredited NHs. The MDS includes several subscales including the Pain Severity Scale. The MDS Pain Severity Scale consists of four categories related to pain; presence, frequency, effect on function, and intensity. Presence of pain is rated over the previous five days and pain frequency ranges from rarely to almost constantly. Pain effects on function are assessed related to sleep and activity. Pain intensity is measured on a 4-point ordinal scale: 0 (no pain), 1 (mild pain), 2 (moderate pain), and 3 (excruciating pain) to assess pain severity.

Pressure Injury Assessment

At baseline, the PI assessed and staged the PrI of each study participant according to the National Pressure Ulcer Advisory Panel/European Pressure Ulcer Advisory Panel (NPUAP/EPUAP) 2016 classification system. The PrI assessment was coordinated with NH staff based on PrI dressing changes and was completed in the early morning while the participant was still in bed on the first day of the study. Clothing and or undergarments were removed and hygiene provided if the resident was soiled with urine and/or feces. If the PrI was covered with a dressing, it was removed to allow visualization of the PrI. A penlight was used to inspect the skin

to better stage the PrI.

Pressure Injury Pain Assessment

In this study the PAINAD and the VRS scores were combined to establish four classifications of pain based on both tools and used in analyses in the present study. The four classes of pain severity based on the VRS and PAINAD were defined as follows:

- a) Pain Class 1: VRS = none, PAINAD = 0
- b) Pain Class 2: VRS = mild, PAINAD = 1-3
- c) Pain Class 3: VRS = moderate, PAINAD = 4-6
- d) Pain Class 4: VRS = severe, PAINAD = 7-10

Participants were assigned to a Pain Class based their PAINAD and VRS pain intensity scores. Participants who were unable to respond to the VRS were assigned to the Pain Class corresponding to the PAINAD score. In cases when the VRS and PAINAD class did not agree, the Pain Class was determined based on the self-reported VRS. Pain assessment occurred with the same procedure regardless of participant's cognitive status. First, the researcher observed the participant for five minutes for general pain prior to the completion of the PAINAD. Second, an explanation of how to rate pain intensity using the VRS was provided to the participant and the explanation was repeated up to two times as necessary. The VRS score was obtained using an 8 X 11 inch paper with the adjectives (none, mild, moderate, severe) displayed in large size 36 font print. In addition to showing the participant the VRS paper, the pain categories (none, mild, moderate, severe) were read out loud by the researcher. The participants were asked to point to the category of pain (none, mild, moderate, severe) on the paper or verbally state the category of pain that best describes their pain at the time of the assessment. General pain was then assessed using the VRS. If the participant was unable to respond to the VRS, nonresponsive was recorded.

Third, the researcher described the location of the PrI to the participants and/or pointed to the area of the PrI and assessed PrI pain in the same manner as the general pain assessment.

Statistical Analysis

Descriptive statistics were used to evaluate the proportion of participants with different PrI pain levels based on the VRS, PAINAD, and Pain Class over two days. Descriptive statistics were also used to describe pain management prescribed for participants with PrI.

Analysis of variance (ANOVA) was conducted to evaluate the difference between PrI pain level and PrI stage. Paired sample t-tests were used to determine the difference between PrI pain and time of the day, PrI pain on two different days, and PrI pain level and the most recent MDS pain intensity score. PrI pain level was evaluated using the Pain Class for all sample t-tests.

Bivariate correlation was used to test the relationship between VRS and PAINAD scores across PrI stages. Spearman's Rho correlation coefficients were computed between VRS and PAINAD scores across PrI stages.

Results

Demographic information

Table 3-1 presents demographic data on the participants. The participants were mostly female (74%), White (49%) with a mean age of 82 years (standard deviation (SD) 9.72 years). The majority of participants (58%) was cognitively intact, incontinent of urine (58%), and extensively assisted for bed mobility (58%). The body mass index (BMI) of participants indicated just under half were normal weight with a BMI of 18.5 to 30 (46%).

Level of pain severity among NH residents

Participants had a total of 33 PrI that varied across the eight NPUAP/EPUAP classification groups. Most of the PrIs were located on the sacrum (n=18), heels (n=6), or ischial

tuberosity (n=5). Table 3-1 presents the proportion of PrI for each stage and anatomical location. Upon admission to the NH, 94% (n=31) of participants were at risk for PrI and 70% (n=23) had a PrI.

The prevalence of PrI pain was 82% (n=27) for all participants who reported some level of pain on at least one of the six assessments conducted over two days. Of those who reported PrI pain, 59% (n=16) reported minimal pain, 19% (n=5) reported mild pain, 15% (n=4) reported moderate pain, and 7% (n=2) reported severe pain. The two participants with Pain Class 4 (severe pain), had more severe stage PrI (stage 4 and deep tissue injury [DTI]). Participants with Pain Class 2 (mild pain) had PrIs of varied stages with most having full thickness PrIs (n=7 with stage 3, 4, unstageable or DTI PrIs) and only 2 participants had partial thickness or stage 1 PrI.

Of the 33 participants, 10 had general pain present at the time of the MDS pain assessment. One of the participants experienced general pain *almost constantly*, according to the MDS and was classified as Pain Class 2 (mild PrI pain) in this study. Three participants experienced general pain *frequently* based on the MDS. Surprisingly, these three participants were classified as Pain Class 1 (no PrI pain) in this study. Those who had general pain occasionally (n=4) or rarely (n=1) based on the MDS were classified as Class 1 in this study, indicating no pain.

Pain Assessment as measure with two pain assessment tools

Descriptive statistics were used to evaluate the proportion of participants with PrI who have different pain levels based on VRS, PAINAD, and the Pain Class at three different times of the day on two days. The mean VRS score for all six assessments (n=173 assessments) across all PrI stages was 0.13 (SD 0.35) with a range from 0–2. Of these 173 pain assessments, participants reported PrI pain on 31% of the assessments (n=54 assessments). Pain level was reported as mild

on 51% of the pain assessments (n=28 assessments), moderate on 30% (n=16 assessments), and severe on 18% (n=10 assessments). These 54 reports of PrI pain were related to 19 participants, with six participants being responsible for reports of moderate or severe pain.

Mean PAINAD score for all assessments (n=198) across all PrI stages was 0.12 (SD 0.33) with a range from 0-1. On 68 assessments, the PAINAD score was greater than or equal to two and thus, indicative of pain. These 68 PAINAD scores were related to nine participants. The PAINAD scores indicated on 44% of the pain assessments, pain levels were reported as mild (n =30 assessments), 37% moderate (n=25 assessments), and 19% severe (n=13 assessments).

The mean Pain Class scores after all assessments (n=198 assessments) across all PrI stages was 1.45 (SD 0.79) with range 0 - 2. Similar to the PAINAD, the Pain Class score was greater than one and thus, indicative of pain on 68 assessments. The Pain Class scores indicated that on 57% of the assessments, pain was reported as mild (n=39 assessments), 26% moderate (n=18 assessments), and 16% severe (n=11 assessments).

VRS mean scores were positively and significantly related to PAINAD and Pain Class mean scores ($r = .38$; $r = 0.52$, both $p < .05$). Table 3-3 shows the prevalence of pain in participants with PrI pain based on VRS, PAINAD, and Pain Class mean scores over all assessments.

The mean score of the VRS, PAINAD, and Pain Class was calculated for each PrI stage. Across the different PrI stages the mean score of pain was generally higher for stage 4 and DTI compared to stage 1, 2 and 3 PrI with all instruments. Stage 1 PrI demonstrated the lowest pain level based on the Pain Class and VRS assessments compared to other PrI stages. DTI showed the highest pain level based on Pain Class and PAINAD assessment compared to other PrI stages. Table 3-3 displays the results of PrI pain levels based on VRS, PAINAD, and Pain Class.

There was no significant relationship between PrI stage and PrI pain level based on Pain Class (Spearman's Rho correlation coefficient $r=0.184$; $p=.304$). Spearman Rho correlation coefficients were computed to test the relationship between VRS and PAINAD scores across PrI stages. Unlike the Pain Class, the PAINAD mean score and VRS mean score were moderately correlated across PrI stages, ($r=0.44$, $p=.01$).

Stability of PrI pain among NH residents

Paired sample t-tests were conducted to evaluate the difference in mean PrI pain level from day one to day two and from morning to mid-day, morning to afternoon, and mid-day to afternoon based on the VRS, PAINAD, and Pain Class scores. There was no significant difference in day one versus day two for either morning, mid-day, and afternoon based on the VRS, PAINAD, or Pain Class. In terms of time of day, pain was generally higher in the afternoon based on Pain Class and VRS. There was a difference between mid-day (1.50) and afternoon (1.60) PrI pain levels with Pain Class but this was not significant ($p=.15$). Based on the VRS, PrI pain levels were also higher in the afternoon (0.75) than mid-day (0.61), but not significant ($p=.31$). Thus, there was not a significant difference in pain levels by time of day in this sample.

Paired sample t-tests were conducted to evaluate the difference in mean PrI pain level from morning to mid-day, morning to afternoon, and mid-day to afternoon based on the Pain Class for only those participants with reported pain on at least one pain assessment ($n=27$). As with the full sample there were no significant differences by day or time of day between the scores. In terms of time of day, higher pain levels were reported in the afternoon (1.74) compared to morning (1.64) and mid-day (1.61). However, this was not significant ($p=.15$; $p=.42$, respectively). The analyses conducted using VRS and the PAINAD were similar to the

findings with the Pain Class.

Independent t-tests were used to evaluate the mean difference between PrI pain based on mean VRS, PAINAD, and Pain Class compared to the MDS pain assessment. The most recent MDS data for participants was used in the analysis. The mean number of days between study data collection and the most current MDS Data was 32.3 days (SD = 52.91 days; range 1--78 days). Of the participants who reported some level of pain based on the average mean Pain Class over six assessments in two days (n=27), 22% (n=6) had pain documented in the MDS. Of the six participants with pain documented on the MDS, five (15%) had numerical rating scale (NRS) pain levels documented and one had indicators of pain documented. The mean NRS was 6.20 (SD = 1.64; range 4-8). One of the participants with pain documented in the MDS was unable to respond to the NRS and had nonverbal indicators of pain documented in the MDS.

Pressure Injury Pain Treatment

A small number of participants (n=4) had combination acetaminophen/narcotic pain relief medications prescribed to treat for PrI pain. Two of the participants with prescribed PrI pain treatment were classified as Pain Class 1, and two were classified as Pain Class 2. Fourteen participants (42%) received general pain medication within 12 hours of the initial study pain assessment. Of the 14 who received general pain medication, 71% had Pain Class 1 (n=10) and 27% (n=4) had Pain Class 2. A majority of participants (n=28) also had Acetaminophen or Acetaminophen/Narcotic analgesic medications prescribed for general pain on an as needed basis. Of the 28 participants with general pain medication prescribed, 64% (n=18) were classified as Pain Class 1, 29% (n=8) as Pain Class 2, and 7% (n=2) as Pain Class 4. No non-pharmacologic pain relief interventions were present for any of the participants and 27% (n= 9) of participants had moisture-retentive PU dressings in use.

Discussion

In this sample of 33 participants with PrIs we described and reported PrI pain using two pain assessment instruments across time. A major finding of this study showed that PrI pain among NH residents is not stable over the course of a day. Although no statistical significance existed between PrI pain levels in the morning, mid-day, and afternoon, 40% of participants reported higher pain levels in the afternoon compared to morning and mid-day over the two days based on the Pain Class ($p = .15$) and VRS ($p = .31$). This finding is clinically meaningful because this is the first study to examine PrI pain over multiple assessments over the course of a day, which may be vital in the management of PrI pain among NH residents. The closest study to examine PrI pain over time is Szor and Bourguignon's (1999) study of 32 primarily hospitalized adults with PrI. They assessed PrI pain using a 5-point Present Pain Intensity (PPI) scale after participants were at rest for 20 minutes then changed the wound dressing and re-assessed PrI pain 10 minutes after the dressing change. Of participants reporting PrI pain after dressing change, they found nearly all also reported PrI pain at rest (84%) and 75% of the reported pain was mild (Szor and Bourguignon, 1999). Our findings that 40% ($n=11$) of participants who reported PrI pain on at least one of the six assessments reported increased pain levels in the afternoon compared to morning do not support the stability shown in the Szor and Bourguignon (1999) study.

In the present study, based on six pain assessments over a two-day period, 82% ($n=27$) of participants reported PrI on at least one of the six pain assessments. This proportion is also similar to Szor and Bourguignon (1999) who reported 84% ($n=27$) of their participants experienced PrI pain at rest. Likewise, McGinnis et al.'s (2014) prevalence survey of PrI pain in community populations ($n=176$) included 44 NH residents. McGinnis and colleagues reported a PrI pain prevalence rate of 75.6% ($n=133$) slightly lower than our finding of 82%.

This is the first prospective study to examine PrI pain solely among NH residents. Our findings that participants with stage 4 and DTI PrI reported higher pain levels with VRS and PAINAD compared to participants with lower stage PrI is similar to results by Ahn and colleagues' two secondary data analyses examining MDS data of NH residents with PrI. Ahn et al. (2015) found advanced PrI stages were associated with increased general bodily pain intensity and more severe general pain was associated with stages 3 and 4 PrI in moderately or severely cognitive impaired NH residents (Ahn et al., 2013). Dallam et al. (1995) reported similar findings among 132 hospitalized adult patients in which higher VAS pain scores were related to PrI stage ($r=0.37, p < 0.01$). Interestingly, McGinnis and colleagues (2014) reported that pain intensity was not associated with the severity of PrI among 37 patients who agreed to a detailed PrI pain assessment.

There was no clear relationship between pain assessments from this study and the MDS. The MDS does not appear to capture PrI pain levels at the same severity as measured by the VRS or PAINAD administered in this study. Only six participants in this study who reported some level of pain based on the average mean Pain Class over six assessments in two days had any general pain documented in the MDS. Further, in this study we did not find a relationship between general pain scores and PrI pain scores over the six assessments across the two days. There is a disconnect between the general pain assessment included in the MDS and PrI pain. The discrepancy may be that there are differences associated with specific wound pain or general bodily pain. PrI pain is specific for an open wound site, and the presence of PrI pain does not constitute general pain. Future research should support a revision of the MDS to include a pain assessment specific to PrI pain.

Both pain instruments, VRS and PAINAD detected a similar amount of PrI pain among

participants in this study. Ninety-one percent ($n = 30$) were capable of responding to the VRS and the PAINAD was administered to measure pain in all participants. Both instruments provided pain assessment data for participants in this study. The VRS scores were positively and significantly related to PAINAD scores ($r = 0.38, p < .05$). The use of two different pain assessment instruments was to ensure participants were not excluded if they were unable to respond to the VRS. Prior studies excluded participants who were unable to respond to the pain assessment instruments used (McGinnis et al., 2014; Dallam et al., 1995) or reported a substantial number of participants unable to respond to the instruments (Dallam et al., 1995). Dallam and colleagues (1995) evaluated the perception of PrI pain in 132 hospitalized patients and reported 66.7% ($n=88$) of the patients were unable to respond to the Faces Pain Rating Scale (FRS) and VAS pain assessment instruments. Prior studies on PrI pain did not use the VRS or PAINAD. However, these pain assessment instruments have been effectively used with NH residents and individuals with cognitive impairment for general pain assessment, and we report the first use of these instruments for PrI pain among NH residents.

Despite the fact that PrI have been found to be extremely painful, especially during dressing change (Szor & Bourguignon, 1999), we found only 12% ($n=4$) of the participants in this study had pain medication ordered to treat PrI pain and received PrI pain medication. Our findings are consistent with Szor and Bouguignon who reported 6.3% ($n=2$ of 32) patients received pain medication for PrI pain in 1999 and Dallam and colleagues (1995) who reported medication was seldom administered for pain in their study of 132 hospitalized patients with PrI in 1995. Both of these studies are more than 20 years old; yet, treatment of PrI pain remains problematic. We found that pain medication was ordered as a routine daily medication to be given prior to dressing change for the four participants with PrI pain medication. However, it

should be noted that on two occasions, these four participants were given pain medication routinely with daily medications and dressing changes were not completed until several hours later. We found that of the participants with general pain medication ordered and received within 12 hours of the PrI pain assessment, 71% (n=10) reported no PrI pain and 27% (n=4) reported mild PrI pain. This finding may suggest that NH residents with PrI pain may be treated in general for pain, and, consequently, for PrI pain.

The findings from this study have clinical relevance for NH staff and nurses caring for older adults or individuals with cognitive impairment with PrI. It is likely NH residents with PrI will experience pain at some time over the duration of the PrI. In this study, the use of two different instruments facilitated an assessment of pain in all participants in the study regardless of cognition. Nurses caring for NH residents with all stages of PrI need to assess for pain at various times during the day for the duration of the PrI with particular attention to afternoons. The use of non-pharmacological general pain interventions such as electrical stimulation as with transcutaneous electrical nerve stimulation (TENS) units or cold or hot packs and PrI pain interventions such as moisture retentive dressings, may improve PrI pain in NH residents (ref). In this study, only four of the 33 participants had moisture retentive dressings. Interestingly, we found 85% (n=28) of the participants were given routine pain medication for general pain. Most of them were classified as Pain Class 1 (n=18) or Pain Class 2 (n=8) in this study. Two of the 28 participants were classified as Pain Class 4. This finding suggests that NH residents with PrI pain should have pain medications administered routinely to effectively manage their pain.

Limitations

This study has several limitations including a small sample size and inability to control

for potentially confounding variables such as timing of administration of pain medication and dressing changes. The use of convenience sampling to select participants may affect the external validity of our findings. Due to the small sample size, we may not have had adequate variability to do robust analyses across PrI stages or to see if other conditions associated with pain influenced PrI pain. In addition, secondary analysis of the MDS assessment data may have had some variability across the facilities dependent on the MDS coordinator's skills and data collection styles.

Conclusion

This is the first study to report the prevalence of PrI pain among a sample of only NH residents, which was found to be 82%. In addition, this is the first study to examine the stability of PrI pain over time, which provided relevant information about NH residents with PrI. The results demonstrated that PrI pain in NH residents is generally more severe in afternoons. Therefore, pain should be assessed and reassessed at various times during the day regardless of PrI stage. The VRS and PAINAD were shown to be effective in the assessment of PrI pain among NH residents with different levels of cognition. Nurses should consider use of two different instruments to assess pain in NH residents with PrI. At least one of the instruments should be validated for use with cognitively impaired individuals. The use of two pain assessment instruments will prevent pain from being unrecognized in NH residents unable to report their pain and, thus, improve treatment. Improvement is needed in the treatment of PrI pain among NH residents. NH residents with PrI should have routine pain medication given for effective management of PrI pain. This study has provided important information on PrI pain among NH residents and will inform future studies.

Table 3-1 Demographic Characteristics of Participants (N=33)

Characteristics	Mean ± SD or N (%)
Age	81.76 ± 9.72
Female	27 (72.7)
Race/Ethnicity	
American Indian or Alaska Native	1 (3)
Asian American	2 (6.1)
Black	5 (15.2)
Hispanic	9 (27.3)
White	16 (48.5)
Body Mass Index Underweight BMI = < 18.5 kg/m ² Obese = or > 30 kg/m ²	24.9 ± 4.96
MDS** Bed Mobility-Extensive assistance + Total dependence	29 (87.8)
MDS** Transfer assessment-Extensive assistance + Total dependence	29 (87.8)
MDS** Activities of Daily Living (ADL) Assistance Bed mobility-Extensive assistance + Total dependence	29 (87.8)
Transfer-Extensive assistance + Total dependence	29 (87.8)
Locomotion on Unit -Extensive assistance + Total dependence	26 (78.8)
Dressing-Extensive assistance + Total dependence	22 (66.7)
Eating-Extensive assistance + Total dependence	24 (72.8)
Toilet Use -Extensive assistance + Total dependence	32 (97)
Person Hygiene -Extensive assistance + Total dependence	29 (87.8)
MDS Functional Impairment total score (range 0-28)	22.03 ± 4.59

MDS* Urinary Incontinence-Frequent incontinence + Always incontinent	22 (66.7)
MDS Bowel Incontinence* Frequent incontinence + Always incontinent	26 (78.8)
MDS 3.0 Brief Interview Mental Status (BIMS) summary score** (range 0-15)	10.30 ± 4.61
MDS Pain Assessment items:#	
Pain Presence	10 (30.3)
Pain Effect on Activity	23 (69.7)
Pain Intensity VDS * Not Used	33 (100)
Pain Intensity NRS * Not Used	24 (72.7)
Indicators of Pain or Possible Pain in Last 5 Days * Not Used	30 (90.9)
Stage 1	5 (15.2)
Stage 2	5 (15.2)
Stage 3	5 (15.2)
Stage 4	7 (21.2)
Deep Tissue Injury	6 (18.2)
Unstageable	5 (15.2)
Pressure Injury location	
Sacral/coccyx	18 (54.5)
Trochanter	2 (6.1)
Ischial tuberosity	5 (15.2)
Lateral malleolus	2 (6.1)

Heels	6 (18.2)
Duration of Pressure Injury in Days	32.24 ± 28.40
Bates-Jensen Wound Assessment Total Score ⁺	25.67± 9.3
PrI Wound Size in Centimeters	40.94 ± 167.95

Values are mean ± **standard deviation (SD) or number (%)** participants; N = number of participants; * MDS=Minimum Data Set; MDS Bed Mobility, Transfer score where 1= independent, 4= dependent; MDS Urinary Incontinence, Bowel Incontinence scores where 1=continent,4=incontinent all the time; MDS-ADL, MDS-Activities of daily living impairment (possible range = 0-28, with higher scores indicating more functional impairments); MDS ADL Self-Performance Transfer & Bed Mobility (possible range = 0-4, with higher scores indicating total assistance required).

** MDS BIMS- Brief Interview for Mental Status (range = 0-15) where higher scores indicating greater cognitive ability; MDS Pain assessment-VDS = verbal descriptor scale; NRS = numerical rating scale; Staging according to NPUAP/EPUAP 2016 guidelines; Bates-Jensen Wound Assessment Tool total score range 13-65; where 13= minimal damage, 65= profound tissue damage.

Table 3-2 *Pressure injury pain level with Pain Class, Verbal Response Scale (VRS), Pain Assessment in Advanced Dementia (PAINAD), and Pressure Injury Stage by time of day (n =33)*

Pressure Injury Stage	Morning	Mid-day	Afternoon
	Pain Class	Pain Class	Pain Class
	VRS	VRS	VRS
	PAINAD	PAINAD	PAINAD
	Mean (SD)	Mean (SD)	Mean (SD)
Stage 1 (n=5)	1.10(0.224)	1.10(0.224)	1.30(0.447)
	0.00(0.00)	0.00(0.00)	0.25(0.500)
	1.50(1.225)	0.50(0.866)	.0.50(0.354)
Stage 2 (n=5)	1.50(0.353)	1.10(0.224)	1.30(0.447)
	0.40(0.223)	0.10(0.224)	0.200(0.447)
	0.30(0.671)	0.00(0.00)	0.20(0.447)
Stage 3 (n=5)	1.40(0.418)	1.60(0.418)	1.60(0.894)
	0.38(0.479)	0.75(0.500)	0.75(0.957)
	0.90(0.894)	0.60(0.418)	0.30(0.447)
Stage 4 (n=7)	1.79(0.951)	1.78(0.859)	1.71(0.906)
	0.833(1.032)	0.75(0.935)	0.67(0.983)
	0.571(0.450)	0.78(0.570)	0.43(0.607)
Unstageable (n=5)	1.30(0.447)	1.40(0.418)	1.40(0.418)
	0.37(0.478)	0.37(0.478)	0.50(0.408)
	0.40(0.418)	0.40(0.652)	0.20(0.273)
DTI (n=6)	1.91(1.20)	1.83(1.032)	2.16(0.983)

	0.90(1.34)	0.80(1.151)	1.10(1.083)
	1.08(1.24)	0.91(1.15)	1.00(0.775)

n = number of participants; SD = standard deviation; VRS = Verbal Response Scale; PAINAD = Pain Assessment in Advanced Dementia; Pain Class = Pain Class = classification of pain severity based on PAINAD and VRS scores; Pain Class 1 = VRS=none, PAINAD = 0; Class 2 = VRS = mild, PAINAD = 1-3, Class 3 = VRS = moderated, PAINAD = 4 -6, Class 4 = VRS = severe, PAINAD = 7-10; DTI = deep tissue injury

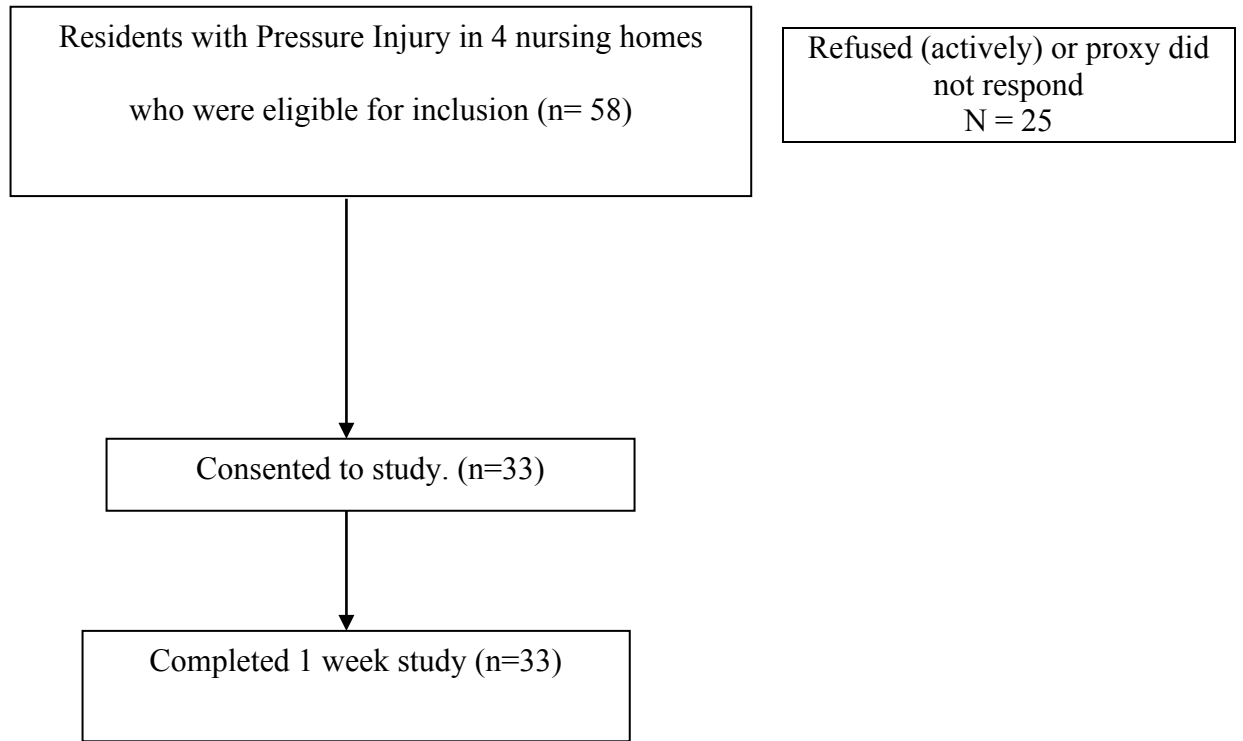
Table 3.3 Pain Level based on Verbal Response Scale (VRS), Pain Assessment in Advanced Dementia (PAINAD) and Pain Class* over six pain assessments in 2-days. (n=33)

PrI Stage	VRS Range 0-3 Mean (SD) n = 30	PAINAD Range 0-1 Mean (SD) n = 33	Pain Class Range 0-2 Mean (SD) n = 33
Stage 1	0.08 (0.17)	0.83 (0.73)	1.16 (0.24)
Stage 2	0.23 (0.10)	0.17 (0.37)	1.30 (0.22)
Stage 3	0.62 (0.55)	0.60 (0.42)	1.53 (0.52)
Stage 4	1.50 (2.16)	0.59 (0.39)	1.76 (0.86)
Unstageable	1.26 (1.93)	0.33 (0.35)	1.37 (0.38)
DTI	0.93 (1.18)	1.00 (0.96)	1.97 (1.05)

*ANOVA across stages with each instrument NS $p > 0.05$

n = number of participants; PrI = pressure injury; NS = not significant; VRS=Verbal Response Scale; PAINAD= Pain Assessment in Advanced Dementia; SD = standard deviation; Pain Class = classification of pain severity based on PAINAD and VRS scores; Pain Class 1 = VRS=none, PAINAD = 0; Class 2 = VRS = mild, PAINAD = 1-3, Class 3 = VRS = moderated, PAINAD = 4 -6, Class 4 = VRS = severe, PAINAD = 7-10; pressure injury, DTI = deep tissue injury

Figure 3-1: Flow of Participants through Study



Legend: 58 residents in 4 nursing homes approached for recruitment into study, 33 consented for a consent rate of 56.9%. 33 completed the one-week study.

Figure 3-2 National Pressure Ulcer Advisory Panel/ European Pressure Ulcer Advisory Panel (NPAUP/EPUAP) Pressure Injury Staging Guidelines

<p>Stage 1 Pressure Injury: Non-blanchable erythema of intact skin</p> <p>Intact skin with a localized area of non-blanchable erythema, which may appear differently in darkly pigmented skin. Presence of blanchable erythema or changes in sensation, temperature, or firmness may precede visual changes. Color changes do not include purple or maroon discoloration; these may indicate deep tissue pressure injury.</p>
<p>Stage 2 Pressure Injury: Partial-thickness skin loss with exposed dermis</p> <p>Partial-thickness loss of skin with exposed dermis. The wound bed is viable, pink or red, moist, and may also present as an intact or ruptured serum-filled blister. Adipose (fat) is not visible and deeper tissues are not visible. Granulation tissue, slough and eschar are not present. These injuries commonly result from adverse microclimate and shear in the skin over the pelvis and shear in the heel. This stage should not be used to describe moisture associated skin damage (MASD) including incontinence associated dermatitis (IAD), intertriginous dermatitis (ITD), medical adhesive related skin injury (MARSI), or traumatic wounds (skin tears, burns, abrasions).</p>
<p>Stage 3 Pressure Injury: Full-thickness skin loss</p> <p>Full-thickness loss of skin, in which adipose (fat) is visible in the ulcer and granulation tissue and epibole (rolled wound edges) are often present. Slough and/or eschar may be visible. The depth of tissue damage varies by anatomical location; areas of significant adiposity can develop deep wounds. Undermining and tunneling may occur. Fascia, muscle, tendon, ligament, cartilage and/or bone are not exposed. If slough or eschar obscures the extent of tissue loss this is an Unstageable Pressure Injury.</p>

Stage 4 Pressure Injury: Full-thickness skin and tissue loss

Full-thickness skin and tissue loss with exposed or directly palpable fascia, muscle, tendon, ligament, cartilage or bone in the ulcer. Slough and/or eschar may be visible. Epibole (rolled edges), undermining and/or tunneling often occur. Depth varies by anatomical location. If slough or eschar obscures the extent of tissue loss this is an Unstageable Pressure Injury.

Unstageable Pressure Injury: Obscured full-thickness skin and tissue loss

Full-thickness skin and tissue loss in which the extent of tissue damage within the ulcer cannot be confirmed because it is obscured by slough or eschar. If slough or eschar is removed, a Stage 3 or Stage 4 pressure injury will be revealed. Stable eschar (i.e. dry, adherent, intact without erythema or fluctuance) on the heel or ischemic limb should not be softened or removed.

Deep Tissue Pressure Injury: Persistent non-blanchable deep red, maroon or purple discoloration

Intact or non-intact skin with localized area of persistent non-blanchable deep red, maroon, purple discoloration or epidermal separation revealing a dark wound bed or blood filled blister. Pain and temperature change often precede skin color changes. Discoloration may appear differently in darkly pigmented skin. This injury results from intense and/or prolonged pressure and shear forces at the bone-muscle interface. The wound may evolve rapidly to reveal the actual extent of tissue injury, or may resolve without tissue loss. If necrotic tissue, subcutaneous tissue, granulation tissue, fascia, muscle or other underlying structures are visible, this indicates a full thickness pressure injury (Unstageable, Stage 3 or Stage 4). Do not use DTPI to describe vascular,

traumatic, neuropathic, or dermatologic conditions.

Medical Device Related Pressure Injury:

This describes an etiology.

Medical device related pressure injuries result from the use of devices designed and applied for diagnostic or therapeutic purposes. The resultant pressure injury generally conforms to the pattern or shape of the device. The injury should be staged using the staging system.

Mucosal Membrane Pressure Injury: Mucosal membrane pressure injury is found on mucous membranes with a history of a medical device in use at the location of the injury. Due to the anatomy of the tissue these ulcers cannot be staged.

Source: National Pressure Ulcer Advisory Panel (2016).

<http://www.nPrIap.org/resources/educational-and-clinical-resources/nPrIap-pressure-injury-stages/>

NPUAP/EPUAP = National Pressure Ulcer Advisory Panel/European Pressure Ulcer Advisory Panel

Figure 3-3

Pain Assessment in Advanced Dementia Scale (PAINAD)

Instructions: Observe the patient for five minutes before scoring his or her behaviors. Score the behaviors according to the following chart. Definitions of each item are provided on the following page. The patient can be observed under different conditions (e.g., at rest, during a pleasant activity, during caregiving, after the administration of pain medication).

Behavior	0	1	2	Score
Breathing Independent of vocalization	<ul style="list-style-type: none"> Normal 	<ul style="list-style-type: none"> Occasional labored breathing Short period of hyperventilation 	<ul style="list-style-type: none"> Noisy labored breathing Long period of hyperventilation Cheyne-Stokes respirations 	
Negative vocalization	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Occasional moan or groan Low-level speech with a negative or disapproving quality 	<ul style="list-style-type: none"> Repeated troubled calling out Loud moaning or groaning Crying 	
Facial expression	<ul style="list-style-type: none"> Smiling or inexpressive 	<ul style="list-style-type: none"> Sad Frightened Frown 	<ul style="list-style-type: none"> Facial grimacing 	
Body language	<ul style="list-style-type: none"> Relaxed 	<ul style="list-style-type: none"> Tense Distressed pacing Fidgeting 	<ul style="list-style-type: none"> Rigid Fists clenched Knees pulled up Pulling or pushing away Striking out 	
Consolability	<ul style="list-style-type: none"> No need to console 	<ul style="list-style-type: none"> Distracted or reassured by voice or touch 	<ul style="list-style-type: none"> Unable to console, distract, or reassure 	
TOTAL SCORE				

(Warden et al., 2003)

Scoring:

The total score ranges from 0-10 points. A possible interpretation of the scores is: 1-3=mild pain; 4-6=moderate pain; 7-10=severe pain. These ranges are based on a standard 0-10 scale of pain, but have not been substantiated in the literature for this tool.

Source:

Warden V, Hurley AC, Volicer L. Development and psychometric evaluation of the Pain Assessment in Advanced Dementia (PAINAD) scale. *J Am Med Dir Assoc.* 2003;4(1):9-15.

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Chapter Four

Pressure Injury and Nursing Home Resident Characteristics Associated with Pressure Injury Pain

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Running Head: PRESSURE INJURY PAIN CHARACTERISTICS

Keywords: Pressure injury, Pain, Nursing Home residents, Characteristics

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Abstract

Objective: Examine ulcer and resident characteristics associated with pressure injury (PrI) pain among nursing home (NH) residents.

Background: PrI pain has been recognized as problematic issue for over past 20 years, yet, specific data on ulcer and resident characteristics associated with PrI pain are not well known.

Methods: Data were examined from 33 NH residents with 49 PrIs from four NHs who had a Minimum Data Set (MDS) assessment completed. Resident characteristics (age, gender, ethnicity/race, Brief Interview for Mental Status score, cognitive status, functional status, urinary and fecal incontinence, and Body Mass Index) and ulcer characteristics (stage, size, location, duration, infection, and Bates Wound Assessment Tool [BWAT] score) were obtained from the MDS, medical records and ulcer assessments. Ulcer assessments were completed using the BWAT. PrI pain was assessed using a four-point (none, mild, moderate, severe) Verbal Response Scale (VRS) and the Pain Assessment In Advanced Dementia (PAINAD) tool. Pearson correlations, independent t-tests, one-way analysis of variance and multiple linear regressions were used to analyze the data.

Results: Participants had an average age of 82 years and were mostly female (74%) and Non-Hispanic White (49%, n=16). Forty-two percent of the participants (n=13) had mild to severe cognitive impairment, 58% (n=19) were functionally dependent and required extensive assistance for activities of daily living. The majority of PrIs were sacral (55%) and 21% were stage 4 (n=7) with full-thickness tissue damage. The mean size of PrIs was 41 cm² (standard deviation (SD) = 168 cm²). The mean duration of PrI was 32days (SD = 28 days, ranged 2-90 days). There was a positive relationship between PrI located on the sacrum and PrI pain level ($r=1.0$, $p=.23$), but not significant. Advanced stage PrIs (stage 4 and DTI) had higher mean PrI pain

levels (1.76, SD = 0.86; 1.97, SD 1.05, respectively) compared to less severe PrI. Infection, BWAT score, cognitive status, functional status, and urinary incontinence were significantly related to higher PrI pain levels ($p < .05$). PrI pain presence was predicted by higher infection scores ($\beta = 0.11, p < .01$), whilst shorter duration of PrI in the number of days was a negative predictor of the presence of PrI pain ($\beta = -.001, p = .02$).

Conclusion: This is the first study to examine PrI pain among NH residents. Findings from this study contribute to the growing body of knowledge related to PrI pain, particularly among NH residents. Nurses can recognize and treat PrI pain among NH residents with higher PrI BWAT scores, infection, cognitive and functional impairment, and urinary incontinence, which should prompt a PrI pain assessment.

Keywords: Nursing home residents, Pressure injury, Pain

Pressure Injuries (PrIs) are painful, debilitating, costly wounds, which occur especially in individuals with advanced age, multiple comorbidities, and physical or cognitive impairments (White-Chu, Flock, Struck, & Aronson, 2011). The scientific knowledge about PrI pain is growing, however, there remains a shortage of studies on PrI pain among nursing homes (NH) residents. Pain is a common problem among NH residents, and improvement in pain management should be a high priority for healthcare professionals (Lukas, Bruce, Johnson & Gibson, 2012). A requirement for improvement of PrI pain is to understand the factors that may influence the onset and severity of pain. Research has shown an association between PrI pain and advanced stages of PrI (Ahn, Stechmiller & Horgas, 2013, Dallam et al, 1995; Gunes, 2008), infection (Rondas, Schols, Stobberingh, & Halfens, 2015), and cognitive impairment (Ahn et al., 2013). Yet, the association of these characteristics or other factors with PrI pain is unknown and information on characteristics associated with PrI pain is scant. Understanding PrI pain more completely is important, as PrI is a common finding in NHs.

In the most recent International Pressure Ulcer Prevalence (IPUP) Survey of 918,621 participants from a variety of settings, ten years (2006 – 2015) of U.S. PrI prevalence was reported. Of the participants surveyed in long term (LTC) facilities (n=36,115), 11% had PrI (n=3962). The overall prevalence of PrI in LTC facilities ranged from 9.5% in 2012 to 12% in 2010. The facility acquired prevalence ranged from 3.3% in 2007 to 5.6% in 2006 and 2011 (VanGilder, Lachenbruch, Algrim-Boyle, & Meyer, 2017).

NH residents are at an increased risk for PrI due to several associated conditions including impaired mobility, age, factors affecting tissue perfusion, and multiple comorbid disease (Gorecki et al., 2010); McGinnis et al., 2014). Despite being preventable, in 2012, more than five percent of NH residents had a stage 2 or higher PrI (NH Compendium, 2013). The

vulnerable NH population is also at risk for unrecognized and inappropriately treated pain (Teno, Kabumoto, Wetle, Roy, Mor, 2004). NH residents with PrI and severe cognitive impairment have been found to have more severe bodily pain compared to NH residents with mild cognitive impairment (Ahn et al., 2013). There are no other data related to characteristics associated with PrI pain found in the literature.

Given the importance of these issues, the need for understanding the association between PrI and resident characteristics and PrI pain is great. The purpose of this study was to examine the association between PrI and resident characteristics and PrI pain among NH residents. The specific aims for this study were:

1. Describe what ulcer characteristics (stage, size, location, duration, infection, and BWAT score) are associated with levels of pain experienced by NH residents with PrIs.
2. Describe what NH resident characteristics (age, gender, ethnicity/race, Brief Interview for Mental Status (BIMS) score, cognitive status, functional status, urinary and fecal incontinence, BMI) are associated with levels of pain experienced by NH residents with PrIs.

Methods

A prospective cohort descriptive design was used to evaluate the relationship between PrI pain and ulcer characteristics (stage, size, location, duration, infection, and BWAT score) and NH resident characteristics (age, gender, ethnicity/race, BIMS, cognitive status, functional status, urinary and fecal incontinence, BMI) among 33 NH residents from four NHs in Southern California in 2017-2018.

Subjects and Setting

The protocol and methods for this study, approved by The University of California, Los Angeles, Office of Human Research Protection was reviewed and approved by NH

administration in accordance with facility guidelines, have been reported elsewhere (Williams, Bates-Jensen, Hodge, Lee, Levy-Storms, 2018) but are provided here in brief for ease of understanding. Written informed consent to participate in the study and Health Insurance Portability and Accountability Act (HIPAA) consent was obtained from participants by research staff from residents or designated representatives for those who were unable to provide informed consent with assent obtained from the resident. The flow of participants for the study is presented in Figure 4-1.

Recruitment

Four NHs in the greater Los Angeles area served as recruitment sites for 33 NH residents who consented to participate in the study. NHs were selected and approached to participate in the study based on the reported quality measures (QM) scores from the NH Compare Public website ([medicare.gov/nursinghomecompare/search.html](https://www.medicare.gov/nursinghomecompare/search.html)). The specific QM, which reports the percent of high-risk residents with PrI, was considered for inclusion criteria for NH selection. NHs with more than 9% of long stay residents with PrI were approached to participate in the study. NH residents eligible for inclusion were those with any stage PrI located on any anatomic location based on the treatment nurses' assignment to perform wound care and dressing changes at each facility. NH residents without a PrI documented in the medical record, or with other types of chronic wounds were excluded from the study. In addition, NH resident who were unable to self-consent, or have an available proxy were also excluded.

Procedures

One research staff at baseline assessed participants' PrI, using the Bates-Jensen Wound Assessment Tool (BWAT) (Bates-Jensen & McNeese, 1996). Research staff according to the NPUAP 2017 classification system staged the PrI. The PrI assessment was coordinated with NH staff based on PrI dressing changes and was completed by research staff in the early morning while the participant was still in bed. Undergarments and clothing were removed, and personal hygiene was provided if required due to incontinence of urine and/or stool. If the PrI was covered with a dressing, it was removed to visualize the PrI. A penlight was used to inspect the skin to better stage the PrI and assess ulcer characteristics using the BWAT.

Pain assessments using the VRS and PAINAD were completed in the morning (7:00am—10:00am), at mid-day (11:00am—1:00pm), and late afternoon (4:00pm—7:00pm) on two different days within a seven-day period. Pain assessment occurred with the same procedure regardless of participant's cognitive status. First, the researcher observed the participant for five minutes for PAINAD assessment of general pain. Second, an explanation of how to rate pain intensity using the VRS was provided to the participant and general pain was then assessed using the VRS. If the resident was unable to respond to the VRS, nonresponsive was recorded. Third, the researcher described the location of the PrI to the resident and/or pointed to the area of the PrI and assessed PrI pain using the PAINAD and VRS in the same manner as the general pain assessment. For participants with more than one PrI, a PrI pain assessment was completed separately for each PrI using the same process. However, the PrI with the highest pain score was recorded and used for statistical analysis. Pain was defined in two ways based on; 1) VRS rating of mild pain or higher, and 2) PAINAD scores greater than two. We also categorized participants

as having no PrI pain versus any PrI pain. No PrI pain participants were those with no level of reported pain on the VRS on any of the six assessment times. All analyses were done using the VRS unless otherwise noted with PAINAD assessment.

Measurements

Medical Record Data

Medical, demographic information, and the most recent Resident Assessment Instrument Minimum Data Set (MDS) from all considered participants were extracted from research staff at baseline. The MDS is a multi-domain comprehensive assessment tool completed on admission and at quarterly intervals by the MDS coordinator at each facility. The MDS is required for all residents in Medicare and Medicaid accredited NHs in the U.S. The MDS includes the Pain Severity Scale, which assesses pain over previous five days on a 4-point ordinal scale: 0 (no pain), 1 (mild pain), 2 (moderate pain), and 3 (excruciating pain). The Brief Interview Mental Status (BIMS) summary score documented in the MDS was used to determine cognitive status. The total score ranges from 0 – 15 with lower scores indicating greater cognitive impairment. A score of 99 was severe cognitive impairment, 0 – 7 was moderate impairment, 8 – 12 was moderate impairment, and 13 – 15 was cognitively intact or no cognitive impairment. Seven calculated self-performance MDS items determined functional status: bed mobility, transfer locomotion on unit, dressing, eating, toilet use, and personal hygiene. Functional score ranges from 0 – 28 with higher scores indicating more functional impairment and more assistance required.

Bates-Jensen Wound Assessment Tool

The BWAT addresses 13 wound characteristics and scores each on a 5-point scale with 5 being the most serious rating and 1 being the least serious rating for the characteristic being

assessed. The items of the BWAT include; wound size, depth, edges, undermining, necrotic tissue type, amount of necrotic, granulation and epithelialization tissue, exudate type and amount, surrounding skin color, edema, and induration. The content validity of the tool was established using a nine-member expert judge panel (average content validity index for tool $r = 0.91$). Interrater reliability was established with two wound care nurses observing ten adult patients with 20 PrIs in an acute care hospital at two times 2 hours apart and resulted in correlation coefficients of $r = .91$ for first observation and $r = .92$ for the second observation (both $p < .001$) (Bates-Jensen, Vredevoe, & Brecht, 1992). An additional study examining reliability in the NH setting with a wound care nurse and licensed treatment nurses across 304 assessments of stage 1 through 4 PrIs found a percent agreement of 97% for BWAT total score with high percent agreement across individual items (all items above 92% agreement) (Bates-Jensen & McNees, 1996). All PrIs were classified using the NPUAP/EPUAP's 2017 system (NPUAP, 2017). Figure 4-2 provides the NPUAP/EPUAP staging classifications used in this study.

The BWAT was also used to determine infection. Infection was calculated based on the sum of four BWAT item scores: exudate type, exudate amount, peripheral tissue edema, and skin color surrounding the wound. The combined score of these items range from 4 –20. PrIs with an infection score of eight or above were considered infected.

Pressure Injury Pain Assessment

PrI pain was assessed using the VRS and PAINAD. A four-point VRS scale: no pain; mild pain; moderate pain; and severe or intense pain was used as a self-reported measure of pain (Briggs & Closs, 1999). Researchers have reported the average kappa for the inter-rater agreement on pain in older adults between 0.68 – 0.75 (Bech, Lauritsen, Ovesen, & Overgaard,

2015). The PAINAD has been used to measure pain in NH residents with advanced dementia (Malara et al., 2016; Warden, Hurley, & Volicer, 2003). The PAINAD is based on five calculated behavior items: breathing independent vocalization, negative vocalization, facial expression, body language, and consolability. The total score ranges from 0 -10 based on the sum of each behavior item rating ranging rated 0 – 2 according to the severity of behavior exhibited (Warden, Hurley, & Volicer, 2003). PAINAD behaviors were assessed individually to evaluate the differences between those with and without PrI pain. The behaviors and definitions of scores on the PAINAD are shown in Figure 3. Internal consistency of the PAINAD ranges from coefficients of $\alpha=0.50$ to $\alpha=0.65$, and inter-rater reliability ranges from coefficients of $r=0.97$ to $r=0.82$ (Warden et al., 2003).

Statistical Analysis

Descriptive statistics were calculated for resident characteristics (age, race/ethnicity, BMI, functional status, cognitive status, presence of urinary/fecal incontinence), Ulcer characteristics (stage, size, location, duration, infection, and BWAT score), and PrI pain level separately. Correlations and multiple linear regression models were used to explore relationships and predictors of PrI pain levels. Independent sample t-tests and one-way analysis of variance (ANOVA) were used to evaluate the difference between PrI pain level, NH resident characteristics, and Ulcer characteristics. A *p* value of less than .05 was required for statistical significance. Analyses were performed using SPSS, version 20 (IBM Inc, 2011).

Results

Fifty-eight NH residents from four NHs with a mean of 115 Medicare-Medicaid certified beds were eligible for study enrollment and 33 consented for a consent rate of 57%. Results from 33 participants with 49 PrIs are reported here. Demographic and medical data for participants are

presented in Table 4.1. The mean age of participants was 82 years (standard deviation [SD] = 9.7 years), 74% (n=24) were female, 49% (n=16) were White, 27% (n=9) were Hispanic, and xx% were Black. Over half of the participants (58%, n=19) were functionally dependent and required extensive assistance bed mobility, transfer, locomotion on unit, dressing, eating, toilet use and personal hygiene and 42% (n=13) had mild to severe cognitive impairment.

Participants' PrIs were of various stages. Half of the PrIs were full thickness stage 3 (n=5), stage 4 (n=7), or unstageable (n=5). Over half of the PrIs (55%, n=18) were located on the sacrum and only 18% (n=6) were located on the heels. The prevalence of each stage and location are presented in Table 4.1. The mean size of PrIs was 41 cm² (SD = 168 cm²). The mean duration of PrI was 32 days (SD 28 days, range 2-90 days). Infection as defined in this study was present in 30% (n=10) of the PrI. The mean BWAT score for all PrIs was 25.7 (SD = 9.3, ranged 13-49). The prevalence of PrI pain was 82% (n=27). Of those with PrI pain, 15% (n=5) also reported severe general pain.

Relationship between PrI stage, size, location, duration, infection, BWAT score and PrI pain.

To examine the relationship between PrI pain and ulcer characteristics (e.g., stage, size, location, duration, infection, and BWAT score), Spearman Rho correlation coefficients were computed for VRS and PAINAD PrI pain scores and ulcer characteristics of location and stage. There was no significant relationship between VRS or PAINAD PrI pain scores and ulcer characteristics of location or stage. Pearson product moment correlations were computed for VRS and PAINAD PrI pain scores and ulcer characteristics of size, duration, infection and BWAT score. PrI pain as measured with the VRS was related to ulcer characteristics of infection ($r=0.60, p = 0.001$) and BWAT score ($r = 0.48, p = 0.008$). Each of the individual BWAT items

used for the infection score were significantly related to PrI pain (exudate type $r = .50, p = .005$), exudate amount ($r = .540, p = .002$), peripheral tissue edema ($r = .66, p = .000$), and skin color surrounding the wound ($r = .661, p = .000$). BWAT wound edges was also significantly related to PrI pain ($r = .58, p = .001$).

Linear regression analyses were conducted using the ulcer characteristics as predictors of PrI pain measured with the VRS (scored as present/absent as previously defined) (Table 4-2). First, all ulcer characteristics were entered into the model. The characteristics of infection ($\beta = 0.113, p = .008$) and ulcer duration ($\beta = -0.007, p = .023$) were significant predictors of PrI pain presence. Next, an adjusted trimmed linear regression analysis was conducted with ulcer characteristics of infection, BWAT score, and stage as predictors of presence of PrI pain. The characteristics of infection and BWAT score were chosen based on the correlational analysis and full model regression analysis and the characteristic of stage was chosen based on existing literature suggesting a relationship with PrI pain. Infection was a significant predictor of PrI pain presence ($\beta = 0.096; p = .022$). BWAT score and stage were not significant predictors of PrI pain presence. Table 4-2 presents the full and adjusted model results.

To examine differences in ulcer characteristics (e.g., stage, size, location, duration, infection, and BWAT score) for participants with and without PrI pain we conducted independent sample t-tests ulcer characteristics. Higher BWAT scores (mean =35.50, SD =10.66) and higher infection scores (mean =10.50, SD=5.07) were observed among those with PrI pain compared to those with no PrI pain (BWAT score mean 24.7, SD 8.54, $p = 0.031$, infection score mean 5.84, SD 2.68, $p = 0.008$). Most participants (85%; $n=23$) with PrI pain had a BWAT score of 16 or higher. Of those participants, 60% ($n=20$) had a BWAT score of 24 or higher. Only four of those with PrI pain had a BWAT score less than 16. The BWAT score of

participants without PrI pain (n=4) ranged between 13 and 31.

We also examined differences in PrI pain levels across ulcer characteristics using one-way analysis of variances (ANOVA). There was a significant difference between PrI pain levels and ulcer characteristics of infection ($p = 0.001$), and BWAT score ($p=0.019$). Post hoc pairwise comparisons using Bonferroni method were significant between participants with no pain compared to those with moderate pain for BWAT score and infection ($p = 0.016$ and $p = 0.000$), respectively. Infection scores were also significantly different between participants with mild pain and those with moderate pain ($p = 0.017$).

Relationship between age, gender, ethnicity/race, BIMS score, cognitive status, functional status, urinary and fecal incontinence, comorbidities, BMI, and PrI pain.

Correlation

To examine the relationship between PrI pain and resident characteristics (age, gender, ethnicity/race, BIMS score, cognitive status, functional status, urinary and fecal incontinence, BMI). Pearson's moment correlation coefficients were computed for both VRS and PAINAD score and resident characteristics. Resident characteristics with the closest relationship to PrI pain were ethnicity/race, cognitive status and urinary incontinence, but these were not significant ($r = 0.33, p=.07$; $r = -0.19, p = 0.33$; $r = 0.17, p = 0.36$, respectively). There were no significance relationships between age, gender, BIMS score, functional status, fecal incontinence, or BMI and PrI pain assessed with the VRS or the PAINAD.

Regression

Linear regression analyses were conducted using the resident characteristics (age, gender, ethnicity/race, BIMS score, cognitive status, functional status, urinary and fecal incontinence, BMI) in a full model as predictors of PrI pain presence or absence (Table 4-2). In this full model,

no resident characteristics were significant. A limited adjusted linear regression analysis was conducted using the resident characteristics most closely related to PrI pain based on the correlational analyses. Resident characteristics of ethnicity/race, cognitive status, and urinary incontinence were entered as predictors of PrI pain presence and none were significant.

Chi-square analysis was used to examine the number of comorbidities among participants with and without PrI pain. There was no difference between participants with and without pain in the number of comorbid conditions. One third of all participants (n=10) had a diagnosis of diabetes. Of those, 80% (n=8) had dual diagnoses of diabetes and cardiovascular disease. Six percent (n=2) of participants with diabetes had PrI pain. Muscle weakness, wasting, or atrophy was a secondary diagnosis of 15% (n=5) of all participants, and 6% (n=2) of those with PrI pain. PrI was the secondary diagnosis for 33% (n=11) of participants. Of those with PrI as a secondary diagnosis, 15% (n=5) had PrI pain.

Independent-sample t-tests were conducted to evaluate the differences in resident characteristics (age, gender, ethnicity/race, BIMS score, cognitive status, functional status, urinary and fecal incontinence, BMI) and PrI pain between participants with pain versus participants with no pain. There were no significant differences in resident characteristics and PrI pain level among participants with pain compared to those without pain. In general, participants with PrI pain had lower BIM scores (mean = 7.75, SD = 7.23) indicating more cognitive impairment than those with no PrI pain (mean = 10.77, SD = 4.12) but this was not significant ($p=0.23$).

One-way analysis of variances (ANOVA) was used to evaluate the difference between PrI pain level and resident characteristics. There was a significant difference between mean VRS score and BIMS score ($p<0.01$) and functional status ($p=0.02$). Participants with lower BIMS

mean score 1.5 (SD 0.71) indicative of more cognitive impairment, had moderate PrI pain compared to those with mild PrI pain (mean =14.0, SD 0.00), or no PrI pain (mean = 11.3, SD 4.16). Participants with moderate PrI pain also had more functional impairment with higher functional status (mean = 26, SD 2.82) compared to those with no PrI pain (functional status mean = 21.80, SD 3.48). Post hoc pairwise comparisons using Bonferroni method were significant for VRS pain levels and BIMS score for those with no PrI pain and moderate pain ($p=0.012$), and those with mild PrI pain versus those with moderate PrI pain ($p=.017$).

Pearson correlation was used to test the relationships between general pain and PrI pain. There was no relationship between general pain and PrI pain based on the VRS ($p > .05$). Paired sample t-tests were conducted to examine general pain and present or absence of PrI pain. There was no significant difference between general pain levels and presence or absence of PrI pain ($p > .05$).

PAINAD Behaviors

Chi-square analyses were conducted to examine differences in PAINAD behaviors and the presence or absence of PrI pain based on VRS scores for all six assessments. There were significant differences between participants with PrI pain (n=9) versus those without PrI pain (n=24) and PAINAD behaviors of body language (five of six assessments significant, all $p < .05$), facial expression (five of six assessments significant, all $p < .05$), and negative vocalization (two of six assessments significant, $p < .05$). Analyses of body language and PrI pain showed 55% (n=5) participants with PrI pain had tense, distressed, fidgeting, or pulling away body language, compared to 43% (n=3) with no PrI pain exhibiting the same body language. Of those with relaxed body language, 16% (n=4) had PrI pain compared to 84% (n=21) with no PrI pain ($X^2=7.417, p = .025$). Analyses of facial expression and PrI pain showed 40% (n=4) of

participants with PrI pain exhibited sad, frightened, or grimacing facial expressions, compared to 4% (n=1) with no PrI pain exhibiting the same facial expression. Whereas 21% (n=6) of those with PrI pain had smiling or inexpressive facial expressions compared to 79% (n=22) with no PrI pain ($X^2=7.13, p = .028$). Analyses of negative vocalization and PrI pain showed 22% (n=2) of those with PrI pain had occasional moaning, groaning, or crying. Whereas 23% (n=7) with PrI pain had no negative vocalization compared to 77% (n=24) of those with no PrI pain ($X^2=5.68, p = .05$). No other PAINAD behaviors were significant for participants with PrI pain versus those with no PrI based on the VRS for all pain assessments.

Discussion

In this study, we describe ulcer and resident characteristics related to PrI pain among 33 participants with 49 PrIs. Major findings of this study showed PrI pain was associated with the ulcer characteristics of infection (as defined by the sum of the four BWAT items of exudate type, exudate amount, skin color surrounding the wound and peripheral tissue edema) total BWAT score, and individual BWAT items of skin color surrounding wound, exudate type, exudate amount, peripheral tissue edema , and wound edges. Higher BWAT scores were associated with higher pain levels. To our knowledge, this is the first study to report an association between PrI pain and BWAT scores. This is clinically meaningful because the BWAT items could be instrumental in the early recognition of PrI pain among NH residents.

Our findings showed a relationship between infection and PrI pain with higher pain scores associated with higher infection scores. Infection was also a predictor of PrI pain presence. In their cross-sectional point prevalence study of 63 NH residents in 21 NHs, Rondas and colleagues (2015) also examined the association between infection and pain among NH residents with PrI. The participants had a total of 72 chronic wounds, which included 33 PrIs.

Pain was among the symptoms considered to be diagnostic of chronic wound infection; 16 of 72 (22%) chronic wounds were infected. Pain was present in 56% (n=9) of infected wounds. Other relevant clinical signs and symptoms to identify infection in the Rondas et al. study were increase of exudate (81%; n=13), erythema (68%; n=11), and wound recalcitrance (56%; n=9).

The diagnosis of infection in Rondas et al's study was determined based on responses to a questionnaire used by Rondas and colleagues who incorporated signs and symptoms based on World Union of Wound Healing Societies (WUWHS) 2008 criteria for wound infection (WUWHS, 2008). The WUWHS criteria indicate an increase of purulent exudate and erythema as triggers for suspecting localized infection in a wound.

Similar to Rondas et al. findings, we found an association between infection and PrI pain. In our study, infection was determined by four BWAT items directly related to the criteria established by the WUWHS (exudate amount, exudate type, skin surrounding wound, and peripheral tissue edema). All four BWAT items used to score infection in this study were individually significantly related to PrI pain. Surprisingly, to our knowledge no other study has examined the association of infection and PrI pain.

Of those participants with PrI pain, wound edges as measured with the BWAT were mostly distinct (41%, n=11). Those individuals with PrIs with more diffuse wound edges (26%, n=7) also experienced PrI pain. Wound edges may be a marker for wound severity or PrI pain, which we found to be related ($r=.58$, $p=.001$). It would be interesting to see if this holds true with other types of chronic wounds.

In our study, participants with stage 4 and DTI PrI had higher pain scores compared to participants with stages 1-3 PrI, stages 1-3 This finding was consistent with other studies, in which advance stages of PrI were associated with pain intensity (Ahn et al., 2013; Dallam et al.,

1995; Gunes, 2008). For instance, Dallam et al. (1995) reported higher pain levels were related to PrI stage among 132 hospitalized patients. Similarly, Gunes (2008) found higher pain intensity among 47 hospitalized participants with stage 4 PrI compared to lower than stage 4 PrI. Likewise, Langemo, Melland, Hanson, Olson, and Hunger (2000) found participants with stage 4 PrI reported more severe pain than those with stages 1 to 3 PrI in a phenomenological study of eight participants. Our study supports these findings.

This study revealed a positive relationship between PrI located on the sacrum and PrI pain, but this was not significant ($r=1, p=.23$). This finding is consistent with Dallam et al. (1999) study finding which found 69% (n= 90) of the participants had a sacral PrI in which 59% (n= 78) of them reported PrI pain. Gunes (2008) also found PrI located on the sacrum was most common in hospitalized patients who were also more likely to report PrI pain. It was surprising that ulcer size was not related to PrI pain. It is intuitive to think that greater wound surface area would induce greater pain, however this was not supported by our findings. The PrIs in this study ranged in size from 0.28cm² to 880cm² with a mean size of 41cm². However, most participants' ulcers were in the 3 cm² to 9cm² size range. It may be that there was insufficient size variability in this study to fully examine ulcer size.

Urinary incontinence and cognitive status measured with the BIMS score were the resident characteristics significantly associated with PrI pain level. There were also significant differences in PrI pain level and functional status. Urinary incontinence and cognitive status were significant predictors of PrI pain level in the adjusted models with the covariate of race/ethnicity. This finding is consistent with Ahn et al. (2013) study, which examined the relationship between cognitive impairment and pain severity in 56,577 NH residents with PrI using secondary data analysis of the MDS data. They found participants with severe cognitive impairment and any

stage of PrI had double the risk of being in severe general pain (odds ratio: Stage 1 = 1.71, Stage 2 = 1.96, Stage 3 = 2.19, and Stage 4 = 2.36). In our study, differences in PrI pain levels were observed between those with cognitive impairment, and functional status had higher PrI pain levels. Others support the relationship between PrI pain severity and subsequent reduction of NH residents' ability to participate in physical and social activities (Girouard, Harrison, & VanDenKerkof, 2008; Gorecki, Closs, Nixon, & Briggs, 2011; Pieper, 2012).

The average age of participants with PrI was 82 years, thus they may be more vulnerable to rapid skin changes with the aging process. Studies have showed that other skin wounds such as skin tears most often occur with adults over 65 years of age (Baranoski, 2001). Our finding is consistent with similar studies (Dallam et al., 1995; Szor, & Bourguignon, 1999), in which participants with PrI pain were in advanced aging process. Age is one of the characteristics of NH residents to be considered as an uncontrollable risk factor for skin injuries.

This is the first prospective study to investigate PrI pain in NH residents specifically and examine characteristics related to PrI pain. The closest studies to examine characteristics associated with PrI pain were both secondary analyses of the MDS (Ahn et al., 2013; Ahn et al., 2015). Ahn and colleagues (2015) examined the relationship between PrI stage and bodily pain intensity in NH residents after adjusting for other variables (e.g., cognition, functional impairment, presence of comorbidities, use of scheduled pain medication, and sociodemographic variables) that may be associated with bodily pain intensity. In their study, Ahn et al. (2015) found greater bodily pain was associated with advanced PrI stages. Participants with stage 4 PrI were 24% more likely than those with stage 1 PrI to have greater bodily pain intensity, and those with DTI were 22% more likely to have greater bodily pain intensity. Our findings of higher mean pain scores among participants with stage 4 and DTI PrI support Ahn et al.'s findings. In

their study, Ahn et al. reported participant cognitive function using BIMS score with a mean BIMS score of 13.55 (SD 11.82). Ahn et al's finding is slightly higher (less impaired) than participants in our study (mean BIMS score 10.30, SD 4.61).

This is the first study to individually examine each behavior item of the PAINAD and PrI pain. Our analysis of the individual PAINAD behaviors revealed participants exhibited some of the same behaviors regardless if they experienced PrI pain or not. Participants without PrI pain showed tense, distressed, fidgeting *body language* just as those with PrI pain demonstrated. This finding suggests that pain may have been unrecognized in our study among participants rated as having no PrI pain based on body language behavior of the PAINAD ($r=0.38$, $p=0.048$). Facial expression as rated on the PAINAD showed 55% of participants with PrI pain had sad, frown, or facial grimacing, whereas 45% of those with no PrI pain showed the same facial expression, which could also indicate the presence of pain not substantiated by the total PAINAD score ($r=11.33$, $p=0.003$). According to (Warden et al., 2003) tense, distressed, or fidgeting body language or sad, frightened, or grimacing facial expression may be indicative of general pain in individuals who are unable to report pain. This should be further explored in PrI pain.

Implications for Practice and Recommendations for Research

Understanding the influence of ulcer and resident characteristics associated with PrI pain is important in the management of PrI pain among NH residents. In this study, a third of NH residents reported moderate to severe PrI pain. Older adults are more prone to PrI due to certain health conditions and physiological condition (e.g., age, impaired mobility). Early nursing assessment and recognition of ulcer and resident characteristics associated with PrI pain may strengthen nurses' capabilities to reduce the suffering associated with PrI pain. Presence of an infected PrI or BWAT score of 24 or higher should trigger a pain assessment in NH residents

with PrI. Likewise, the presence of PrI among NH residents with cognitive impairment who exhibit behaviors such as tense, distressed, or fidgeting body language, or sad, frightened, grimacing facial expression, or urinary incontinence should prompt the nurse to perform a pain assessment. Although this study was small, it is clear that ulcer and resident characteristics are associated with PrI pain. These findings should prompt a pain assessment to include self-reported pain in addition to clinician observation of non-verbal pain behaviors.

Limitations of the study

A major limitation of this study was the small sample of 33 participants. The use of a convenience sampling technique to select the NHs and residents may affect the external validity of the study findings. Although a power analysis estimated a sample size of 28 as adequate for this study, due to the small number of participants we did not have enough spread across ulcer and resident characteristics to do more robust analyses. More research should be done in this area with a larger more diverse sample.

In this study, we were limited by the use of secondary analysis of the MDS data. We did not collect any objective measures of cognitive or functional, but use the MDS to obtain this information, which may have had some variability due to the different skills of the MDS coordinator at each facility. We did not examine the effect of PrI pain on the quality of life of participants, which may have provided insight to PrI pain effects among those who did not report pain. Future research using large samples of NH residents is needed in this area.

Conclusions

In summary, our study found significant and clinically meaningful findings related to PrI pain among NH residents. Higher BWAT scores, infection, cognitive impairment, functional impairment, and urinary incontinence were associated with PrI pain among NH residents. Healthcare providers should assess PrI pain levels in NH residents who present with these characteristics. Our study findings highlighted how the BWAT, our measure of infection, and PAINAD may be useful in the detection of pain among NH residents with PrI. The use of a validated instrument to identify wound infection, and a behavioral observation tool to assess pain should be considered for use among NH residents with PrI. This study has contributed to knowledge of PrI pain among NH residents; it will inform future research. Our findings serve as a reminder that regular pain assessments remain valuable in the management of pain to decrease suffering among NH residents with PrI.

Table 4-1 Demographic Characteristics of Participants (N = 33)

Characteristics	Mean (SD) or N (%)
Age	81.76 (9.72)
Female	27 (72.7)
Race/Ethnicity	
American Indian or Alaska Native	1 (3)
Asian American	2 (6.1)
Black	5 (15.2)
Hispanic	9 (27.3)
White	16 (48.5)
Body Mass Index	24.9 (4.96)
Underweight BMI = < 18.5 kg/m ²	
Obese = or > 30 kg/m ²	
MDS** Bed mobility-extensive assistance + total dependence	29 (87.8)
MDS** Transfer assessment-extensive assistance + total dependence	29 (87.8)
MDS** Activities of daily living (ADL) Assistance bed mobility-extensive assistance + total dependence	29 (87.9)
Transfer-extensive assistance + total dependence	29 (87.9)
Locomotion on unit -extensive assistance + total dependence	26 (78.8)
Dressing-extensive assistance + total dependence	22 (66.7)
Eating-extensive assistance + total dependence	24 (72.8)
Toilet use -extensive assistance + total dependence	32 (97)
Person hygiene -extensive assistance + total dependence	29 (87.8)
MDS Functional impairment total score	22.03 (4.59)
MDS* Urinary incontinence-frequent incontinence + always incontinent	22 (66.7)
MDS Bowel incontinence* frequent incontinence + always incontinent	26 (78.8)
MDS 3.0 Brief interview mental status (BIMS) summary score**	10.30 (4.61)
Comorbidities	
Diabetes mellitus	10 (30)
Heart disease	10 (30)
Musculoskeletal disease	5 (15)
Pressure injury	11 (33)
Number of Comorbidities	
2-3	30 (91)
4-5	3 (9)
Pressure Injury	

Stage 1	5 (15.2)
Stage 2	5 (15.2)
Stage 3	5 (15.2)
Stage 4	7 (21.2)
Deep tissue injury	6 (18.2)
Unstageable	5 (15.2)
Pressure injury location	
Sacral/coccyx	18 (54.5)
Trochanter	2 (6.1)
Ischial tuberosity	5 (15.2)
Lateral malleolus	2 (6.1)
Heels	6 (18.2)
Duration of pressure injury in days	32.24 (28.40)
Bates-Jensen wound assessment total score ⁺	25.67 (9.3)
Pressure injury wound size in centimeters	40.94 (167.95)

N = number of participants; SD = standard deviation* MDS = Minimum Data Set; MDS Bed Mobility, Transfer score where 1= independent, 4= dependent; MDS Urinary Incontinence, Bowel Incontinence scores where 1=continent,4=incontinent all the time; MDS-ADL, MDS-Activities of daily living impairment (possible range = 0-28, with higher scores indicating more functional impairments); MDS ADL Self-Performance Transfer & Bed Mobility (possible range = 0-4, with higher scores indicating total assistance required). ** MDS BIMS- Brief Interview for Mental Status (range = 0-15) where higher scores indicating greater cognitive ability; Staging according to NPUAP/EPUAP 2016 guidelines; Bates-Jensen Wound Assessment Tool total score range 13-65; where 13= minimal damage, 65= profound tissue damage.

Table 4-2
 Multiple Linear Regression of Nursing Home Residents Characteristics and Pressure Injury Pain

Predictor Variables	Standardized Coefficients Beta	t	p
Age	0.053	0.246	0.808
Race Ethnicity	0.184	0.848	0.407
Body Mass Index (BMI)	-0.162	-0.824	0.42
Functional Status Score	-0.224	-0.75	0.462
Cognitive Status	1.301	1.174	0.254
Brief Interview Mental Status Score	-1.697	-1.493	0.151
Urinary Continence	0.307	1.418	0.172
Fecal Continence	0.054	0.254	0.802
Gender	-0.223	-1.133	0.27
Pressure Injury Stage	0.162	0.8	0.432
Pressure Injury Location	0.058	0.343	0.735
Pressure Injury Size	0.041	0.256	0.8
Infection	0.694	2.901	*** 0.008
Bates Wound Assessment Tool Score (BWATS)	0.012	0.042	0.967
Pressure Injury Duration # of Days	-0.387	-2.439	** 0.023

***p < .01, **p < .05

Figure 4-1: Flow of Participants through Study

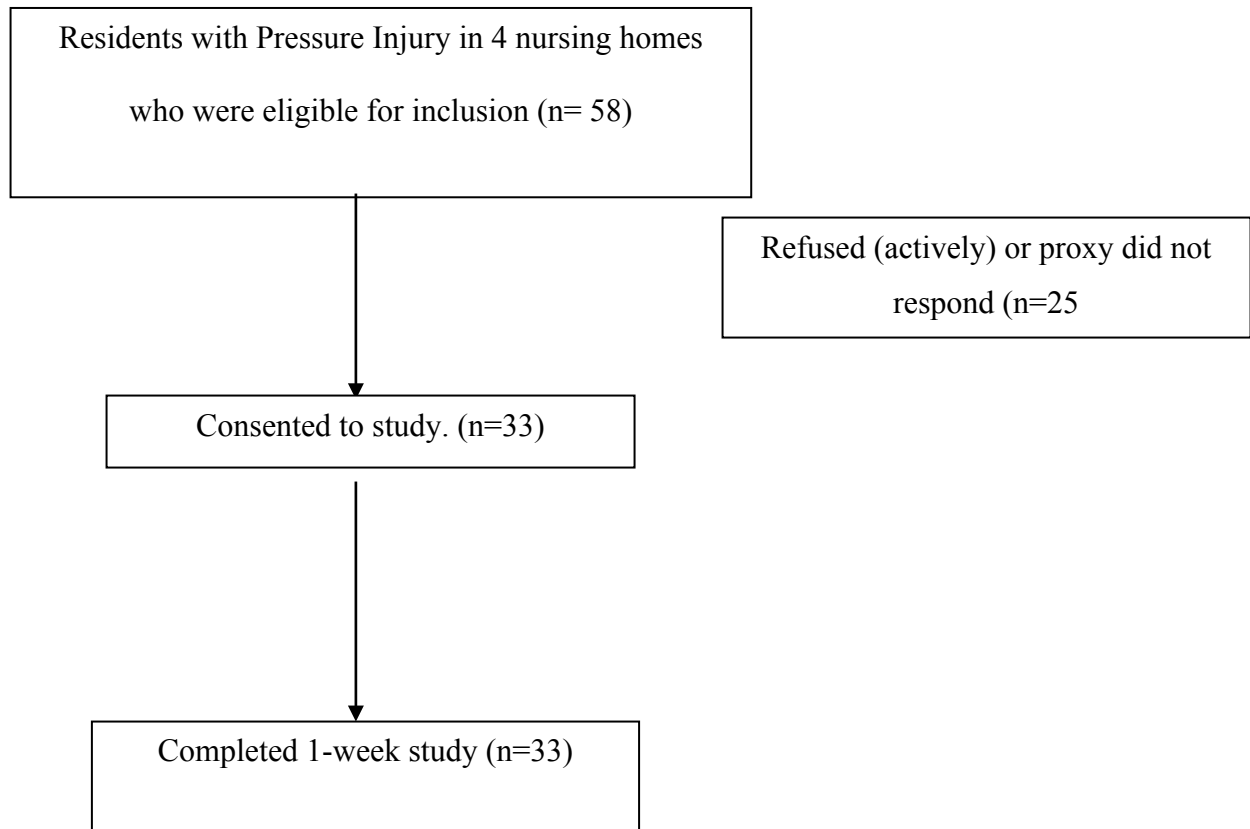


Figure 4-1 Legend: 58 residents in 4 nursing homes approached for recruitment into study, 33 consented for a consent rate of 56.9% 33 completed the one-week study.

Figure 4-2 National Pressure Ulcer Advisory Panel/ European Pressure Ulcer Advisory Panel (NPAUP/EPUAP) Pressure Injury Staging Guidelines

<p>Stage 1 Pressure Injury: Non-blanchable erythema of intact skin Intact skin with a localized area of non-blanchable erythema, which may appear differently in darkly pigmented skin. Presence of blanchable erythema or changes in sensation, temperature, or firmness may precede visual changes. Color changes do not include purple or maroon discoloration; these may indicate deep tissue pressure injury.</p>
<p>Stage 2 Pressure Injury: Partial-thickness skin loss with exposed dermis Partial-thickness loss of skin with exposed dermis. The wound bed is viable, pink or red, moist, and may also present as an intact or ruptured serum-filled blister. Adipose (fat) is not visible and deeper tissues are not visible. Granulation tissue, slough and eschar are not present. These injuries commonly result from adverse microclimate and shear in the skin over the pelvis and shear in the heel. This stage should not be used to describe moisture associated skin damage (MASD) including incontinence associated dermatitis (IAD), intertriginous dermatitis (ITD), medical adhesive related skin injury (MARSI), or traumatic wounds (skin tears, burns, abrasions).</p>
<p>Stage 3 Pressure Injury: Full-thickness skin loss Full-thickness loss of skin, in which adipose (fat) is visible in the ulcer and granulation tissue and epibole (rolled wound edges) are often present. Slough and/or eschar may be visible. The depth of tissue damage varies by anatomical location; areas of significant adiposity can develop deep wounds. Undermining and tunneling may occur. Fascia, muscle, tendon, ligament, cartilage and/or bone are not exposed. If slough or eschar obscures the extent of tissue loss this is an Unstageable Pressure Injury.</p>
<p>Stage 4 Pressure Injury: Full-thickness skin and tissue loss Full-thickness skin and tissue loss with exposed or directly palpable fascia, muscle, tendon, ligament, cartilage or bone in the ulcer. Slough and/or eschar may be visible. Epibole (rolled edges), undermining and/or tunneling often occur. Depth varies by anatomical location. If slough or eschar obscures the extent of tissue loss this is an Unstageable Pressure Injury.</p>
<p>Unstageable Pressure Injury: Obscured full-thickness skin and tissue loss Full-thickness skin and tissue loss in which the extent of tissue damage within the ulcer cannot be confirmed because it is obscured by slough or eschar. If slough or eschar is removed, a Stage 3 or Stage 4 pressure injury will be revealed. Stable eschar (i.e. dry, adherent, intact without erythema or fluctuance) on the heel or ischemic limb should not be softened or removed.</p>
<p>Deep Tissue Pressure Injury: Persistent non-blanchable deep red, maroon or purple discoloration Intact or non-intact skin with localized area of persistent non-blanchable deep red, maroon, purple discoloration or epidermal separation revealing a dark wound bed or blood filled blister. Pain and temperature change often precede skin color changes. Discoloration may appear differently in darkly pigmented skin. This injury results from intense and/or prolonged pressure and shear forces at the bone-muscle interface. The wound may evolve rapidly to reveal the actual extent of tissue injury, or may resolve without tissue loss. If necrotic tissue, subcutaneous tissue, granulation tissue, fascia, muscle or other underlying structures are visible, this indicates a full thickness pressure</p>

injury (Unstageable, Stage 3 or Stage 4). Do not use DTPI to describe vascular, traumatic, neuropathic, or dermatologic conditions.

Medical Device Related Pressure Injury:

This describes an etiology.

Medical device related pressure injuries result from the use of devices designed and applied for diagnostic or therapeutic purposes. The resultant pressure injury generally conforms to the pattern or shape of the device. The injury should be staged using the staging system.

Mucosal Membrane Pressure Injury: Mucosal membrane pressure injury is found on mucous membranes with a history of a medical device in use at the location of the injury. Due to the anatomy of the tissue these ulcers cannot be staged.

Source: National Pressure Ulcer Advisory Panel (2016).

<http://www.nPrIap.org/resources/educational-and-clinical-resources/nPrIap-pressure-injury-stages/>

NPUAP/EPUAP = National Pressure Ulcer Advisory Panel/European Pressure Ulcer Advisory Panel

Figure 4-3 Pain Assessment In Advanced Dementia (PAINAD)

Pain Assessment in Advanced Dementia Scale (PAINAD)

Instructions: Observe the patient for five minutes before scoring his or her behaviors. Score the behaviors according to the following chart. Definitions of each item are provided on the following page. The patient can be observed under different conditions (e.g., at rest, during a pleasant activity, during caregiving, after the administration of pain medication).

Behavior	0	1	2	Score
Breathing Independent of vocalization	• Normal	• Occasional labored breathing • Short	• Noisy labored breathing • Long period of	
Negative vocalization	• None	• Occasional moan or groan • Low-level speech with a	• Repeated troubled calling out • Loud	
Facial expression	• Smiling or	• Sad • Frightened	• Facial grimacing	
Body language	• Relaxed	• Tense • Distressed pacing • Fidgeting	• Rigid • Fists clenched • Knees pulled up • Pulling or pushing	
Consolability	• No need to	• Distracted or reassured by	• Unable to console,	
TOTAL SCORE				

(Warden et al., 2003)

Scoring:

The total score ranges from 0-10 points. A possible interpretation of the scores is: 1-3=mild pain; 4-6=moderate pain; 7-10=severe pain. These ranges are based on a standard 0-10 scale of pain, but have not been substantiated in the literature for this tool.

Source:

Warden V, Hurley AC, Volicer L. Development and psychometric evaluation of the Pain Assessment in Advanced Dementia (PAINAD) scale. *J Am Med Dir Assoc.* 2003;4(1):9-15.

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Conclusion

This is the first study to examine PrI pain among NH residents. Findings of chapter two revealed nine studies found in the literature on PrI pain that included NH residents. Most of the studies included small sample sizes of NH residents four to 132. The two largest studies found by Ahn and colleagues were both secondary analysis of the MDS. Both studies examined general bodily pain in NH residents with PrI and did not include a PrI pain assessment. The classic study by Szor and Bourgoignon (1999) included only four NH residents. Two studies examined PrI pain more than once during the study (Van Leen et al., 2014; Stern et al., 2014), however, PrI pain was not the primary outcome. Van Leen and colleague's study evaluated the response to the type of dressing change, and Stern et al's study evaluated cost effectiveness of implementing a multidisciplinary wound team.

Chapter three focused on the stability and severity of PrI pain at three different times of the day on two days. Eighty-two percent of participants had PrI pain, in which 42% reported pain as moderate or severe. Forty percent of participants reported higher PrI pain levels during the afternoon compared to the morning and mid-day.

Chapter four focused on ulcer and resident characteristics associated with PrI pain. Stage 4 PrI and DTI were associated with higher PrI pain levels. The higher the BWAT score, ($r= 0.48$, $p < .01$), and the higher infection score ($r=.0.60$, $p < .01$), the higher PrI pain level. The more cognitive and functional impairment, the higher PrI pain level ($p=.01$; $p=.02$, respectively).

Overall, the findings indicate most (82%) NH residents with PrI have pain. The pain associated with PrI is not stable among NH residents. Several resident and ulcer characteristics are associated with PrI pain and early identification of these should prompt a pain assessment.

Knowledge gained from this dissertation can inform future research and improve pain nursing care and pain management among NH residents with PrIs.