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Pressure Ulcer Prevention: A Study to Measure the Effects of Education on the Pressure Ulcer
Knowledge of Certified Nursing Assistants and Personal Care Assistants

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Table of Contents

Acknowledgements.....	5
Dedication.....	6
Abstract.....	7
Chapter I: Background and Introduction.....	9
Etiology and Risk Factors.....	10
Impact.....	11
Psychosocial Impact.....	12
Economic Impact.....	13
Impact on Society.....	13
Purpose.....	14
Chapter II: Review of Literature.....	15
Nutrition.....	15
Electronic Clinical Support Systems.....	20
Staff Relationships.....	22
Nurses' Knowledge and Application.....	26
Evidence Based Practice Implementation.....	27
Evidence Based Practice Education.....	29
Documentation.....	31
Prevention Instruments.....	33
Perioperative Risks.....	35
Blood flow and Ischemia.....	39
Repositioning.....	40
Stress.....	42
Multiple Variables.....	43
Age.....	46
Patients' Perspective.....	48
Chapter III: Methodology.....	51

Chapter IV: Results.....53
Chapter V: Discussion.....56
Appendix.....61
References.....73

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Dedication

This thesis is dedicated to Certified Nursing Assistants and Personal Care Assistants everywhere. Their jobs are not easy and are so important to help provide quality care to patients of every age group. They are vital to the healthcare team and I am honored to work along-side these men and women.

Abstract

Background Pressure ulcers, also known as “decubitus ulcers”, “pressure injuries” or more commonly “bed sores” occur when a patient is sitting or lying on a pressure point for an extended period of time, resulting in skin breakdown (Cutugno et al. 2015). Pressure ulcers can occur in any age group but most commonly occur in the geriatric population, especially those who are bed- or wheel-chair bound (Venes 2015). Being a preventable issue, pressure ulcers are a huge problem and cost our healthcare system billions of dollars annually (Cutugno et al. 2015). Pressure Ulcers also cause patients to experience embarrassment, anxiety, depression, and an increased risk of death by five times in the geriatric population (Aljezawi, Al Qadire, and Tubaishat 2014 p.6).

Certified Nurses’ Assistants (CNAs) and Personal Care Assistants (PCAs) are the primary caregivers in long term care facilities to geriatric patients. CNAs and PCAs have the responsibility to assist with preventing pressure ulcers as well as documenting and communicating with nurses about the new formation of pressure ulcers.

Objective The objective of this study was to assess the knowledge level of Certified Nurses’ Assistants (CNAs) and Personal Care Assistants (PCAs) related to pressure ulcer prevention technique and interventions.

Design This is a quantitative convenient sample study with a sample size of 37 participants.

Method Two long term care facilities were selected in West Central Montana. One facility was an assisted living facility and the other was a nursing home. Approval from the Administrators and Directors of Nursing at each facility were received to participate in the research. The research was then approved by the Carroll College International Review Board. Prior to each

presentation, written informed consent was obtained from each participant. Next, participants were encouraged to draw a number out of an envelope to ensure anonymity with responses to each test. Each participant then took a 10 question pre-test, taking no longer than 5 minutes to complete. The pre-tests were then collected into a folder labeled “pre-test.” After the pre-tests were collected, the participants listened to a 10 minute presentation about pressure ulcers and prevention practices. The participants were then asked to complete a 10 question post-test with the same questions as the pre-test in no longer than 5 minutes. The post-tests were then collected in a separate folder labeled “post-tests”. The pre- and post-tests were stored in a locked box until the data was compiled into a paired T test. Once the data was compiled, the tests were destroyed.

Discussion There was no significant change noted between the pre- and post-test results for either facility. Further studies might be encouraged to choose from a larger sample size to determine if the data is significant or not. Future studies might also consider looking at pressure ulcer rates in the facilities before and after presenting to determine if the interventions made an impact on pressure ulcer prevention practices done in the clinical setting.

Chapter I

Background

Introduction

One million cases of pressure ulcers occur in the United States annually. Of these, one million, approximately 2-30% or between 20,000-300,000 cases include high risk patients such as geriatric patients (Akolo, Adetifa, Sheppard & Volmink, 2010). Pressure ulcers, otherwise known as “pressure injuries,” “decubitus ulcers,” or “bed sores” are the result of a patient laying on different pressure points that result in skin breakdown that forms a wound (Venes, 2014). Pressure ulcers are considered preventable and it has been noted that preventable complications like pressure ulcers cost the United States \$29 billion annually (Cutugno et al., 2015, p.4).

Populations at significant risk for bed sores include elderly patients whose skin has lost the subcutaneous fat layer which acts as a cushion between the outer layers of the skin and the patients’ bones, increasing the risk of breakdown. Elderly patients especially at risk for pressure ulcers are those who are bedbound, wheelchair-bound, recovering from a major surgery, comatose, and/or suffering from poor nutrition, diabetes, or neuropathy (Venes, 2015). Pressure ulcers, especially pressure ulcers at advanced stages, break the skin barrier and compromise this basic external line of defense against infection (Venes, 2015).

Pressure ulcers increase the risk of death in the geriatric patient population five-fold (Aljezawi, Al Qadire, and Tubaishat, 2014, p.6). Approximately 36% of nosocomial or hospital acquired complications involve the geriatric patient population (ages 65 and above) (Cutugno, Hozak, Fitzsimmons and Ertogan, 2015, p.219). Despite pressure ulcers being preventable in most cases, they cost the United States \$11 billion in 2006 alone (Bosch et al., 2011, p.5). Given

that pressure ulcers increase the risk of death significantly in the geriatric population, I decided to focus on the knowledge level Certified Nursing Assistants have with pressure ulcer prevention practices.

Etiology and Risk Factors

Pressure ulcers result from pressure that is unrelieved and usually occur over a bony prominence in the body. This unrelieved pressure causes a decrease in blood flow to the tissues at and around this site, depriving the area of oxygen and nutrients found in the blood (Akolo et al., 2010). Without oxygen and nutrients, the skin and tissues at and around this site of excess pressure begin to break down, resulting in a pressure ulcer (Akolo et al., 2010). Common sites for pressure ulcers to occur include the back of the head (occiput), the back (thoracic, lumbar, coccyx and sacrum), greater trochanter, ischial tuberosity, both sides of the ankles (lateral and medial malleolus), shoulder blade (scapula), lateral knee, metatarsals (feet), and calcaneus (heel) (Akolo et al., 2010). Approximately 96% occur in the lower body with 70% of these occurring in buttocks and hip regions (Akolo et al., 2010).

The geriatric population is at increased risk for pressure ulcer development because the elderly often have decreased subcutaneous fat to act as “padding” for various pressure sites, chronic diseases than impact circulation and sensation in various areas, decreased nutrition, and decreased mobility (Venes, 2015). It has been noted that approximately 25% of patients, age 70 years, and older have some type of pressure ulcer (Akolo et al., 2010). Patients who already suffer from decreased sensation and blood flow to areas of the body, such as those who have vascular insufficiencies, diabetes mellitus, and neuropathies, are at an increased risk of developing pressure ulcers as a result of poor tissue perfusion (Akolo et al., 2010). Moisture can also impact the patient’s risk for pressure ulcer development. Patients who are incontinent can be

at an increased risk for skin irritation and potentially the formation of pressure ulcers (Akolo et al., 2010).

Other contributing factors that can result in pressure ulcer formation include shearing and friction burns from being moved improperly in bed. Shearing and friction burns occur when the patient's skin and another surface move against each other, resulting in a break in the patient's skin; this most commonly occurs when the patient is being repositioned in a chair or bed (Akolo et al., 2010).

Impact

In the U.S. alone, there are approximately one million pressure ulcer cases every year with 2-30% of these affecting patients at high risk, such as the elderly (Akolo et al., 2010). Pressure ulcers also impact caregivers and the society by requiring longer hospital stays and more intensive treatment in addition to patient's initial chief complaint, and they can be very financially burdensome to the healthcare field, with the U.S. spending approximately \$11 billion on pressure ulcer care in 2006 alone (Bosch et al., 2011, p.5). Pressure ulcers are also noted to be the second most common claim after wrongful death in the healthcare field with around 17,000 claims made annually in the United States alone (Agency for Healthcare Research and Quality, 2014).

The best preventative treatment for pressure ulcers is to reposition patients unable to reposition themselves every two hours (Venes, 2015). The approximate number of days the patient is in the hospital for the treatment of the pressure ulcer is anywhere between 5-13 days (Akolo et al., 2010). The treatment usually involves debriding the ulcer, and draining and skin grafting in severe cases (Venes, 2015). Although these can occur throughout the body, the major

area most affected is the buttocks and hips, with 70% of all pressure ulcers occurring in these regions (Akolo et al., 2010).

Psychosocial Impact

Due to the increased amount of time needed to treat the pressure ulcer, patients may experience depression and anxiety due to requiring more care and loss of independence (Akolo et al., 2010). Each year approximately 60,000 people die directly due to pressure ulcers (AHRQ, 2014).

In elderly adults, depression is most commonly linked to a chronic disease or morbidity or pain (Fiske, Wetherell, and Gatz, 2010, p. 1). Pressure ulcers are noted to be extremely painful (AHRQ, 2014). Depression in the elderly results in higher suicide rates than those in younger adults. The rates of depression for residents in long-term care facilities were noted to be between about 14-42%. Depression in elderly patients also increases their risk for disability and malnutrition (Fiske et al., 2010, p.4). With malnutrition comes weight loss that could decrease the already depleted subcutaneous fat stores under the skin, decreasing the padding between the patient's bones and his or her skin, increasing the risk for pressure ulcer development.

Depression not only impacts the patient, but also the patient's loved ones. Loved ones of older adults suffering from depression experience moderate to high levels of stress due to caregiver fatigue (Martire et al., 2008, p. 2). Anxiety in older adults has been noted to be directly correlated with physical morbidity as well as depression (Forlani et al., 2014, p.1). Approximately between 15-52% of the geriatric population suffer from anxiety (Forlani et al., 2014, p.1).

Economic Impact

Pressure ulcers are extremely costly and since they are considered preventable, insurance companies do not reimburse hospitals for expenses associated with pressure ulcers, which in the long term adds up to billions of dollars (Cutugno et al., 2015, p.220). Pressure ulcers, cost the healthcare system in the United States as a whole approximately \$9.1-11.6 billion per year. Pressure ulcers cost the individual patient between \$20,900- \$151,700 per pressure ulcer. It was also noted by Medicare in a 2007 study that pressure ulcers added approximately \$43,180 in costs to a hospital stay (AHRQ, 2014). Since pressure ulcers are preventable, they are an unnecessary financial burden to the patient and our healthcare system as a whole.

Pressure ulcers are found to occur most frequently in nursing home residents at a rate between 2-24% (Brienza et al., 2010). Several studies have noted correlations between pressure ulcers and high patient to nursing staff ratios (Brienza et al., 2010). With hospitals trying to cut costs by reducing nursing staff to patient ratios, the risk increases for pressure ulcer formation, and ultimately costs the hospital large amounts of money that is not reimbursable by insurance companies. This leads to negative outcomes for both the hospital and the patient (Brienza et al., 2010).

Impact on Society

It has been noted that 25% of geriatric patients over age 70 develop pressure ulcers while hospitalized (Akolo et al., 2010). Pressure ulcers and other preventable conditions are costing innocent lives; one study noted 98,000 lives were lost due to preventable conditions and errors in healthcare (Cutugno et al., 2015, p.220). It has been noted that “as much as \$29 billion in

healthcare expenses are due to pressure ulcers and other preventable diseases” per year (Cutugno et al., 2015, p.220).

Although pressure ulcers can occur in any group of people, the most noted group affected is the geriatric population. With one in four patients over age 70 having pressure ulcers while hospitalized, this is a serious problem (Akolo et al., 2010). Since pressure ulcers disrupt the skin integrity, this puts the patient at an increased risk for infection (Akolo et al., 2010). Patients with pressure ulcers are also at an increased risk for anxiety and depression due to potentially losing their independence (Akolo et al., 2010).

Purpose

The purpose of this study is to assess the knowledge level of Certified Nursing Assistants (CNAs) in pressure ulcer preventative measures before and after an educational intervention. I chose to look at the knowledge level of CNAs in pressure ulcer prevention, because CNAs in assisted living and long-term care facilities are the primary caregivers to the elderly patients or “residents” in these facilities. CNAs assist the residents with a number of tasks including, but not limited to, repositioning, bathing, dressing, feeding, toileting, grooming, and transferring.

Since they have such close contact with the residents on a daily basis, they are also responsible for being the “eyes and ears” for the nurses. This means they are responsible for assessing and documenting any noted issues or changes with the residents (like pressure ulcer formation) to the resident’s nurse. If CNAs have higher education levels regarding pressure ulcers and prevention practices, the hope would be to see a decrease in the number of pressure ulcers in elderly residents residing in long-term care facilities.

Chapter II

Review of Literature

While reviewing the literature, certain themes including nutrition, support systems, nurse's knowledge and application, documentation, prevention instruments, post-surgical risks, blood flow and ischemia, repositioning, stress, multiple variables, age, and the patients' perspective—were all contributed in the formation of pressure ulcers. A number of studies were conducted on pressure ulcer prevention and these were the common themes noted in the literature. Many of the studies in this review of literature included interviews, meta-analysis systematic reviews, observational cohort studies, and randomized control trials.

Nutrition

A number of articles discussed the importance of nutrition in the prevention of pressure ulcers. Some of the articles focused on nurses' ideas on how nutrition affects the formation of pressure ulcers. Other studies found a correlation between patients' poor nutrition status and a higher risk of developing pressure ulcers. There were also studies that focused on how determining the patients' nutrition status upon admission (using mini-nutritional assessments) helped to determine the patients' risk for developing a pressure ulcer.

Fossum, Alexander, Goransson, Ehnfors, & Ehrenberg, (2011) conducted a qualitative study looking at the reasoning of registered nurses when providing nutritional care and pressure ulcer formation in long term care facilities (p. 2425). The study was conducted using a scenario-based think-aloud by having nurses talk through a number of scenarios related to patient's nutritional and hydration status (p. 2425). The literature also discussed how patients in long-term care facilities are at an increased risk for pressure ulcer formation due to increased risk factors

such as age, nutrition, and decreased adipose tissue. With this information, the study was formed to look at the nurse's thought process around the prevention of pressure ulcers in hopes of making changes to current tools used in clinical practice to prevent pressure ulcers (p. 2426-2427).

This study used scenario-based think-aloud as the design (Fossum et al., 2011, p. 2425). The design was a qualitative design that included having 30 registered nurses working in nine different long-term care facilities in Norway. The nurses were asked to think aloud through four different scenarios based on realistic cases that did not include medication information but did contain information on the patient's hydration and nutrition status. Each session was recorded and transcribed verbatim (p. 2428). The researchers in this study were nurses and professors at accredited hospitals that used the nursing process as the theoretical framework (p. 2425-2429). The measurements used in this study included the participants' ages and experience working in a nursing home setting and a hospital setting (p. 2428).

Fossum et al. (2011) were also nurses and this could create bias during the interview process. This bias could result in the participants answering the questions how they think the researcher wants them to (p. 2425). The researchers did provide data on how the information was collected by having the nurses talk through different scenarios while their responses were recorded and later transcribed (p. 2428). This study found that most registered nurses used the same three thinking processes which include forming a relationship with the patient, looking at all the different options for care for the patient, and then deciding on the best care for the patient (p. 2429).

The researchers established credibility in this study by noting their titles and affiliations. The researchers were noted to include a PhD student, professors, and researchers with their

PhD's at major universities in Sweden and the U.S. (Fossum et al., 2011, p. 2425).

Transferability in this study was noted by the researchers listing exactly how the participants were selected and how the study was conducted (p. 2425). Dependability, however, was not found in this study because the research has not been replicated nor did it use a large enough sample population. Confirmability was found in this study because the researcher was able to explain the results of the study and the results of this study made sense (p. 2430).

A possible threat to the validity of this study might include the fact that responses in the study were subjective as well as having a same sample size of 30 nurses (Fossum et al., 2011, p. 2425). This could threaten the validity of a study because each participant could be answering in ways they believe the investigator wants them to answer instead of stating their own opinion of what they would do in the given situation. The sample size of 30 nurses is not quite large enough and would need to be tested again using a larger sample size.

This study done by Fossum et al. (2011) was useful in seeing the perceptions by nurses regarding patients' nutrition who are practicing in the field. Understanding the perceptions that nurses have about nutrition can help increase awareness of the importance of good nutrition and the prevention of pressure ulcers. However, this study would need to be replicated using a larger sample size as the study noted and to determine that data saturation has occurred. Future studies might also include having a situation that is conducive for the participant to be able to provide an unbiased answer without feeling like they have to answer the questions a certain way. There was not as much research about nutrition as it relates to pressure ulcer formation as expected. This is definitely an area that could be researched more in the future.

Langer and Fink (2014) conducted a systematic review to assess the effects of parenteral and enteral nutrition and pressure ulcer treatment and prevention (p. 1). The study noted that

poor nutrition status and/or dehydration can increase the patient's risk for developing pressure ulcers. Langer and Fink (2014) also went on to note that once a patient with poor nutrition develops a pressure ulcer, it can be very difficult to heal this wound (p. 2). It was also noted that elderly patients who have decreased mobility and decreased mental status are at risk for developing pressure ulcers (p. 2). One study noted that in an elderly care unit, 41% of patients had pressure ulcers (p. 3). Another study also noted that patients with low albumin levels, dehydration, and decreased calorie intake are at risk for pressure ulcer development (p. 3).

The sample included 23 prospective randomized controlled trials that evaluated parenteral and enteral nutrition effects on pressure ulcer prevention and treatment. Each measured either ulcer healing, new ulcer formation, or changes in the severity of the pressure ulcer (Langer and Fink, 2014, p. 1). Of the 23 trials, 15 were in a hospital setting, three in long-term care facilities, and one was conducted in a long-term care wing in a university hospital. Two studies included participants from different units. One study was in an orthopedic unit and another study did not list where the sample was gathered (p. 7). The overall median sample size was 88 with a range from 12 to 4023 participants (p. 7).

Bias of the articles reviewed was assessed by using the Cochrane Collaboration tool (Langer and Fink, 2014, p. 1). Langer and Fink (2014) found that the majority of the articles included had high rates of bias. Articles included were randomized controlled trials that looked at the effect of parenteral and enteral nutrition and the prevention or treatment of pressure ulcers. There was no specific type of participant required for the study to be included (p. 3). Outcomes for the patients were measured based on the time for the pressure ulcer to heal, the development of a new pressure ulcer, costs to the patient, rate of healing, change in the size of the ulcer, side

effects of the nutritional supplement(s), quality of life for the patient, and whether the patient would accept the supplements (p. 4).

The study completed by Langer and Fink was helpful in compiling research assessing the effects of parenteral and enteral nutrition on pressure ulcer prevention and treatment (Langer and Fink 2014 p. 1). Understanding these affects pressure ulcer treatment and prevention will be important in identifying patients at risk for the development of pressure ulcers (p. 3). This study was also helpful because it compiled research from multiple studies to provide an overall conclusion regarding how parenteral and enteral nutrition affects pressure ulcer development (p. 1).

Adequate nutrition is a main component in helping prevent pressure ulcers. Assessing patients who are at an increased risk for pressure ulcer formation can be done in a number of ways. Yatabe et al. (2013) conducted a prospective observational cohort study to determine the effectiveness of conducting mini-nutritional assessments and analyzing amino acid levels in participants' plasma to determine the risk of pressure ulcer formation (p. 1698). Yatabe et al. mentions how patients with poor protein nutrition are at an increased risk for pressure ulcer formation. The National Pressure Ulcer Advisory Panel and the European Pressure Ulcer Advisory Panels also noted that patients at increased risk for pressure ulcer formation are recommended to consume high protein diets (p. 1698). The Braden Scoring Scale for pressure ulcers has also indicated only have a 65% sensitivity and 70% specificity in predicting pressure ulcer formation (p. 1699). Yatabe et al. (2013) also mentioned that plasma amino acid levels, specifically arginine levels, in patients with pressure ulcers were found to be low, but there has been little research to further explore this (p. 1699).

The results of this observational study concluded that the mini-nutritional assessment was able to predict pressure ulcer formation (Yatabe et al. 2013 p. 1698). Participants in the study who were found to have pressure ulcers also had low amino acid levels (p. 1698). Of the 422 participants in this study, 30 acquired pressure ulcers during their hospital stay (p. 1700). The mini-nutritional assessment in this study was also noted to have a sensitivity of approximately 97% for predicting pressure ulcer formation (p. 1700).

Of the participants in this study, those who developed pressure ulcers were also found to have significantly lower serum arginine levels and Vitamin A levels (Yatabe et al. 2013 p. 1700). The study also pointed out that using the Braden Scale led to numerous patients being falsely negative for the risk of acquiring a pressure ulcer, with the weakest aspect of the scale being the nutrition portion (p. 1701). This study also indicated that low arginine and Vitamin A levels have been linked to slow wound healing (p. 1701). This study is helpful because it shows the Braden Scale is helpful, but it is weak in the nutritional section. In order to determine who is at risk for acquiring pressure ulcers, it might be helpful to not only incorporate the Braden Scale but also a mini-nutritional assessment as well with each patient.

Electronic Clinical Support Systems

Electronic clinical support systems incorporated information systems that help maintain compliance with pressure ulcer prevention practices in nursing homes. These systems are important because the implementation of electronic clinical systems would help decrease the rate of pressure ulcers in nursing homes. Implementing electronic clinical support systems would help decrease the rate of pressure ulcers by increasing compliance among staff (Beckman, Clays, Van Hecke, Vanderwee, Schoohoven, & Verhaeghe, 2012, p. 476).

The incidence of pressure ulcers in nursing homes is as high as approximately 23% (Beckman et al., 2012, p. 476-477). The literature review for the two-armed randomized control trial was taken from the Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel, as well as from the Journal of Gerontology, Journal of American Geriatric Society, and the British Medical Journal.

Beckman et al. (2012) created a two-armed randomized control trial to assess incorporating electronic clinical decision support systems to help with the compliance of pressure ulcer prevention in nursing homes (p.475). The wards of the different nursing homes were randomly assigned as either control or experiment groups. Baccalaureate-prepared nurses were assigned to be the contact persons between the participants and the researchers. The caregivers and the patients were not blinded in this study (p. 478). This study involved a sample of 11 randomly selected nursing home wards, five were controls and six were experimental. The sample involved four nursing homes, 464 residents with a mean age of approximately 85 years and 118 healthcare workers including nurses, Certified Nursing Assistants, and occupational and physical therapists (p. 475).

The measurement tools used in this study include the patients' sex, continence, weight, medication regimen, and risk of pressure ulcer development. Other measurements were taken of staff included their sex, age, role, education level, and experience (Beckman et al. 2012 p. 481). The intervention in this study was 16 weeks in duration and included educating staff about pressure ulcer prevention, getting staff feedback on education about pressure ulcer assessments used in current practice, as well as reminders of pressure ulcer information, classification, etc. Another intervention in this study was providing foam mattresses and other devices to help aid in the prevention of pressure ulcers (p. 475-479). Threats to validity might include that not all the

participants from the study participated in the post implementation assessment. The participants in the control group could have been more aware of the fact they were being observed and thus changed their actions. In addition, not all the healthcare workers were able to attend the educational activities (p. 485).

The results of the study done by Beeckman et al. (2011) concluded that the intervention did not produce significant data compared to the control group. The study also concluded that although there was no significant change in the knowledge of the healthcare workers on the prevention of pressure ulcers, there was a significant change in the attitudes of the healthcare workers with a mean score of 83.5% in the intervention group and a 72.1 % in the control group (Beeckman et al., 2012, p. 482-483). This study demonstrated the barriers to pressure ulcer prevention and interventions to pressure ulcer prevention. While there was no noted change in knowledge in the control group, there was a change in nurses' attitudes around pressure ulcers and pressure ulcer prevention noted in this study.

Although there was no significant data in the knowledge of healthcare workers from the study done by Beeckman et al. (2011), there was still a change in the healthcare workers' attitudes. Understanding staffs' attitudes around pressure ulcer treatment and prevention practices is important because if staff do find pressure ulcers to be an issue, then they might be more inclined to help prevent pressure ulcers; In contrast, staffs' complacent attitudes towards pressure ulcer prevention could be potential barriers to preventing pressure ulcers.

Staff Relationships

Staff relationships is a factor in pressure ulcer treatment and prevention because staff work together in healthcare facilities to take care of patients by treating and preventing pressure

ulcers. The ratio between nurses and other healthcare providers and patients is important because the more patients a nurse has to take care of, the less time is spent with each patient. This can lead to a number of issues that can negatively impact patient care.

A research study performed by Spilsbury, Hewitt, Stirk and Bowman (2011) notes that long-term care facilities have a decreased ratio of registered nurses to patients. The literature also noted that the quality of patient care could be improved in long term care facilities by educating staff and allowing staff to spend more time providing quality care to patients (Spilsbury et al., 2011, p. 732). This study used a meta-analysis systematic review approach; its purpose was to observe how the relationship between registered nurses and other healthcare workers affected the quality of patient care by preventing pressure ulcer formation in long term care facilities (p. 732). The studies included in this review were based in the U.S. with the exception of three that were completed in Australia. The total number of articles reviewed was 50. The studies that were examined were cross sectional and cohort study designs (p. 736). Of the studies selected to review, they all used very different sampling, ranging from multiple nursing home surveys including 14,113 nursing homes, to recruiting a single nursing home facility for an exploratory study (p. 736).

The study conducted by Spilsbury et al. (2011) identified some tools that measured pressure ulcer prevention and included OSCAR, Medicare and Medicaid Automated Certification System & Long-Term Care Facilities Questionnaire, the Department of Veteran Affairs databases, a 1987 Pennsylvania Long Term Care Facility Questionnaire, and a data subset from a study done by the National Pressure Ulcer Long-Term Study (Spilsbury et al. 2011 p. 739). A potential bias in this study might include the fact that the researchers selected the articles to include in the research (p. 734). The researchers used a number of databases including

Medline, CINAHL, and EMBASE to name a few (p. 734). The study noted there were no firm data links between nursing staff ratios and quality of care received by the patients (p.746). The researchers were able to maintain objectivity in this study by having two reviewers (p.734). Potential threats to the validity of some of the studies reviewed in this study might include the fact that the studies did not address how improving staff to patient ratios helped improve quality of patient care (p. 744).

The study done by Spilsbury et al. (2011) did not find a link between staff ratios and the formation of pressure ulcers. The study performed by Spilsbury et al. (2013) was a meta-analysis systematic review that looked at major databases to determine if there was a link between low staff ratios and pressure ulcer formation. Although there was no noted link between low staff ratios and the formation of pressure ulcer formation, this study is helpful in considering how low staff ratios may contribute to patients receiving a lower quality of care.

Relationships among staff members can be important to delivering quality patient care. If staff have a solid relationship and a strong team dynamic, the patient will receive quality care. When staff do not feel a team dynamic in the workplace, this ultimately will affect the patient. A study performed by Bosch, Halfens, van der Weijden, Wensing, Akkermans, and Grol (2011) looked at how team dynamics played a role in the prevention of pressure ulcers (p.5).

Bosch et al. (2011) performed a cross-sectional observational study to look at how team dynamics in the healthcare field influence the prevention of pressure ulcers (p.5). The literature in this article mentioned how healthcare professionals who were able to work in teams produced better patient outcomes and higher quality care. The article also notes that since pressure ulcers are preventable, they can be used to determine the quality of care that patients are receiving (p. 5).

This study included patients over 18 years of age who were assessed for their risk for pressure ulcers if they had a Braden score of less than or equal to 18 (p. 6). A few months later, questionnaires about team culture and organization on the unit were handed out to hospital supervisors to disseminate to one doctor and four nurses or nursing assistants per each patient in the study, including 494 healthcare workers (p. 5). This study also used a Competing Values Framework to measure the effectiveness of each ward. This study included 117 wards from 25 hospitals and 36 nursing homes which totaled 494 participants who responded to the questionnaire. The questionnaires used a Team Climate Inventory that measured group's objectives, interaction, commitment to group's goals, and supporting the group when trying to reach these goals (p. 6-7). In this study, no link was found between good healthcare team climate and organization and the prevalence of pressure ulcers (p. 10).

Some possible threats to validity in this study include having three or less healthcare workers reply to the questionnaire, patients not meeting the requirement of being at least 18 years of age with a Braden Score of 18 or less, and only using one ward in the facility (Bosch et al., 2011, p.6). Malnutrition in the patients (having a BMI less than 18.5 if younger than age 85 or less than 24 if older than 85 years of age) was also considered to be a confounding variable in this study (p. 7-8).

This study is helpful in understanding how nurses can foster a cohesive group environment to help produce quality care for patients and reduce the incidence of preventable nosocomial problems like pressure ulcers. In long term care facilities, the Certified Nursing Assistants and the Personal Care Assistants work together with nurses to help deliver quality care for patients in a number of ways including preventing pressure ulcers. The studies by Bosch et al. (2011) and Spilsbury et al. (2011) emphasized how fostering a team dynamic in the workplace

setting not only makes for a more enjoyable workplace, but also helps the patients receive adequate care to prevent pressure ulcers from forming.

Nurses' Knowledge and Application

The knowledge nurses have about pressure ulcers and ways to prevent their formation is important to providing quality patient care. Nurses who do not have adequate knowledge about pressure ulcer formation and prevention methods will be unable to provide the same quality of care as nurses who do have a strong base of knowledge on pressure ulcers. Applying this knowledge about pressure ulcers to clinical practice is just as important as having a firm knowledge base on pressure ulcer formation and prevention practices.

Gallant, Morin, St-Germain, and Dallaire (2010) conducted an evidence from single descriptive study to measure nurses' knowledge around pressure ulcers and how they are applying their knowledge to clinical practice (p. 184). The literature noted in this study mentions how nurses are responsible for preventing pressure ulcers by helping identify patients who are at risk for pressure ulcers upon admission (Gallant et al., 2010, p. 184).

This study is a descriptive correlational design. The theoretical framework for this study was not listed (Gallant et al., 2010, p. 183). The sample size for this study was 256 nurses who answered a questionnaire about their knowledge on pressure ulcer prevention practices (p. 183). The study received approval from the Faculty of Nursing Sciences at a university hospital, as well as authorization to view patient files (p. 185).

Data that were used in this study include the age and sex of the participants, number of years of clinical experience, areas of the hospital the nurses were working in, the nurses' exposure to pressure ulcer and prevention practices, their participation in training and evidence-

based practice, as well their highest level of study (Gallant et al., 2010, p. 184). The participants also filled out a voluntary questionnaire based on the Pressure Ulcer Knowledge Test developed by Pieper and Mott (p. 185).

The researchers were able to look at the patients' charts and compare these to the nurses' responses to the questionnaire to analyze and compare these results (Gallant et al., 2010, p. 185). This study found that nurses do not have adequate knowledge about pressure ulcer prevention (p. 183). Credibility was ascertained in the study by each of the researchers listing their titles and their affiliated institutions (p. 183). Transferability was ascertained by the researchers listing how they were able to collect this data and providing details so this study could be replicated (p. 184-185). Dependability in this study was not noted. Confirmability was noted in this study because the researchers split the patient population and randomly audited the patients' charts (p. 185). A potential bias in this study is that registered nurses are interviewing their peers, which could produce biased answers (p. 184).

This study is helpful in understanding what a baseline for nurses' knowledge on pressure ulcers. It was based on a questionnaire. The study done by Gallant et al. (2010) was helpful in my research because highlighted the fact that not all nurses have the same knowledge when it comes to pressure ulcer prevention practices. This is important because if not all nurses or nursing assistants have the same knowledge on pressure ulcer prevention, not all patients will receive the optimal care they need to prevent pressure ulcers from forming.

Evidence Based Practice Implementation

Evidence Based Practice is defined as a way for healthcare providers to incorporate current research and expertise into practice (Academy of Medical-Surgical Nurses, 2016).

Clinicians who incorporate evidence based practice in patient care are providing high quality care. Evidence based practice does change as new research identifies ways to improve the quality of care patients are receiving. Implementing evidence based practice on pressure ulcer prevention is one way clinicians can help prevent the formation of pressure ulcers.

Barker, Kamar, Tyndall, White, Hutchinson, Klopfer and Weller (2013) used a prospective observational cohort study to implement evidence based practice guidelines for pressure ulcer prevention and to examine if best practice guidelines are being used in the clinical setting (p. 314). The research discussed how pressure ulcers are preventable and how they remain a concern in nursing care. (Barker et al., 2013, p. 314). The literature also notes that although there have been studies on the best practice methods regarding pressure ulcer prevention, there were studies that have found the guidelines were not being implemented into the clinical setting. Other studies also found, when interviewing nurses on the barriers to pressure ulcer prevention, that staffing ratios and lack of time were reported most frequently by the nurses (Barker et al., 2013, p. 314).

The Barker et al. (2013) study was a prevalence point prospective observational cohort study that looked at pressure ulcer prevention in a single center in Australia (Barker et al., 2013, p. 315). The sample included 1045 patients in primary care, critical care, and emergency departments (p. 315). In this study, two registered nurses from the TNH Injury Prevention Unit assessed each patient's risk for pressure ulcer development (p. 316). The results included having a reduction in pressure ulcers by approximately 12.6% two years after the implementation of the program and a 2.6 % decrease six years after the implementation (p. 317). The study also found over 84% compliance from nurses with the program after its implementation (p. 317).

The results from this study Barker et al. (2013) were helpful in assessing how applying evidence based practice methods on pressure ulcer prevention helped decrease the incidence of pressure ulcer formation in these facilities. Not only did the study note a reduction in the formation of pressure ulcers- it also reported a high compliance rate after the research intervention. Understanding how evidence based practice implementation can help prevent pressure ulcers and also potentially increase compliance to best practice standards is important to providing quality patient care.

Evidence Based Practice Education

Evidence based practice education is important in helping educate staff on current research and best practice methods and helping staff implement these changes into clinical practice. When staff are educated on current research and current best practice methods, they have the tools to provide quality patient care and also decrease the formation and increase prevention of pressure ulcers. Evidence based practice education among staff also helps to decrease costs acquired by both the facility and the patient.

Padula Mishra, Makic and Valuck (2014) performed an expert interview study to help educate patient care clinicians about evidence based interventions that can be used to decrease the incidence of pressure ulcer formation in patients in hospital settings (p. 280). The literature noted that pressure ulcers are considered to be preventable and the U.S. Centers for Medicare & Medicaid Services are no longer paying hospitals for conditions that are preventable including pressure ulcers (p. 281). Padula et al. (2014) also noted how five elements, acknowledged by the National Pressure Ulcer Advisory Panel, are linked to preventing pressure ulcer formation, including frequent repositioning of patients, nutrition, moisture, incontinence, supportive surfaces on beds, and nursing prevention and education (p. 281).

The design of the Padula et al. (2014) was qualitative interviews with seven physicians in critical care, preventative medicine, and quality improvement; five nurses in critical care and wound care; and six health services researchers, all from two U.S. academic medical centers (p.283). These specialists reviewed the current NPUAP guidelines for pressure ulcer prevention and offered their thoughts on how the guidelines could be changed to reduce the prevalence of pressure ulcers (p. 283). The researchers conducting this study include a nurse researcher, a physician, a pharmacist and a researcher from major universities interviewing physicians, nurses and researchers in the clinical field.

A major bias in this study might include interviewing their peers in the medical community. The researchers did provide a sample of the best practice framework that was provided to physicians, nurses and researchers participating in the study. The findings were consistent among the participants involved in the study. The study noted that quality improvement methods should be used in combination with evidence based practice to prevent the formation of pressure ulcer (Padula et al., 2014, p. 283).

For credibility, the researchers listed their affiliated institutions as well as their credentials (Padula et al., 2014, p. 280). Transferability was seen in this study because the researchers noted important parts of the study that could be easily replicated (p. 282-283). Dependability was noted in this study because their findings do correlate with the input from participants. Confirmability in this study was noted because the researchers used the participants' input on the best-practice framework to form a new revised framework (p. 283). A potential threat to the validity of this study is the small number of clinicians who were interviewed (p. 283). Had the interviewing group of specialists been larger, it would have provided better data for this study.

Evidence based practice education is an important factor when assessing prevention methods for pressure ulcers. If clinicians are not well informed on the current methods and research about ways to prevent pressure ulcers, the patient will receive substandard care and may be at an increased risk for pressure ulcer formation. Understanding and learning evidence based practice methods is very important to understanding how to help clinicians prevent pressure ulcer formation in patients.

Documentation

Documentation is important for facilities to ensure that patient care is consistent. Nurses, nursing assistants, and personal care assistants are responsible for charting what care they have provided to the patient. Documentation also serves as a form of communication among staff regarding patients who are at increased risk for pressure ulcer formation, charting what is already being used for these patients and other important information, such as when the patient was last repositioned.

Sving, Idvall, Hogber, and Gunningberg (2013) created a cross-sectional study that looked at documentation of skin assessments, use of pressure relieving mattresses, and repositioning patients to prevent pressure ulcer formation (p. 718). The literature reviewed was relevant to the topic and included Cochrane reviews of practice using foam mattress pads to reduce risk of pressure ulcer formation (p. 718). The literature also noted that the higher the nurse to patient staff ratio was, the higher the incidence of pressure ulcer formation (p. 718).

The study focused on different contributing factors for pressure ulcer formation including a thorough skin assessment within 24 hours of being admitted, risk assessment for pressure ulcer formation, planned repositioning in bed, and the use of foam mattresses (Sving et al. 2013 p.

718). The literature noted how there is a lot of information about pressure ulcer formation but it is not being implemented into clinical practice (p. 718).

The information for this study, including pressure ulcer prevalence and prevention, was collected on the last day of the month. The nurse to patient ratio information was gathered for the whole month (Sving et al. 2013 p. 719). This design was appropriate because this type of study helps provide a snapshot of whether there is a relationship between nursing staffing ratios and pressure ulcer prevalence. There were 825 participants in two hospitals and the participants were 18 years and older and included patients from different floors, each of whom was admitted the day before the study began (p. 719).

The Braden score was used at the patient's bedside to determine how at risk the patient was for acquiring pressure ulcers (Sving et al. 2013 p. 719). Each patient who currently had a pressure ulcer was categorized based on the stage of ulcer (stages I-IV) (p. 719). If the patient was noted to have an increased risk for pressure ulcer formation using the Braden Scale, then the patient was repositioned and was given a foam mattress pad for the bed. Both were interventions to help reduce the formation of pressure ulcers in patients. (p. 720). The sample characteristics were described, with the average age in the study being approximately 68 years of age, patients receiving care in either a general or university hospital located in Sweden, and patients having been in the hospital around six days prior to being a part of the study (p. 720).

The results of this study were that the patients who were at increased risk for developing pressure ulcers, 44.1-58.7% received preventative measures, with patient repositioning being performed the least amount (Sving et al. 2013 p. 720). Patients at the university hospital were found to have more documentation of skin and risk assessments for pressure ulcer prevention as well as providing foam mattresses, but were less likely to be repositioned. Patients in the medical

unit at the general hospital were more likely to be repositioned but were not provided with foam mattresses as a preventative measure (p. 720). In both hospitals, it was found that the less time nurses spent per patient increased the patient's risk for pressure ulcer development (p. 720).

An unexpected event that occurred with this study was the fact that the number of hours registered nurses spent with patients did not relate with the other variables (skin assessment, risk assessment, foam mattress use, and repositioning patients). The researcher noted this could be due to nurses' delegating these tasks to nurse assistants, or to their being unaware of the importance of pressure ulcer prevention, or to their not making prevention of pressure ulcers a priority of care (Sving et al., 2013, p. 723).

These results will help when caring for patients because this study notes that if patients do not receive skin and risk assessments and repositioning interventions then they are at an increased risk for developing pressure ulcers. Implementing these preventative tactics together can help decrease the prevalence of pressure ulcers and deliver higher quality care to patients. This study also stressed the importance of educating the hospital staff providing patient care on pressure ulcer prevention and ways to integrate these interventions into clinical practice (Sving et al., 2013, p. 723). This relates to my research because assessing nursing assistants' and patient care assistants' knowledge about pressure ulcers is the core of my research and is critical to understanding how pressure ulcers form and ways to help prevent them.

Prevention Instruments

“Prevention instruments” is a broad term that includes a number of devices used to help prevent pressure ulcers from forming, such as special mattresses, repositioning devices, or special monitoring devices. A systematic review and meta-analysis done by Walia et al. (2016)

looked at how effective pressure ulcer prevention devices were (p. 568). The literature noted that pressure injuries (also known as pressure ulcers) account for approximately 2.5 million cases in the U.S. annually; about 3-14% occur in people who end up hospitalized and 2-24% occur in skilled nursing facilities (Walia et al., 2016, p. 568). This costs the U.S. annually around \$11 billion and the individual patient between \$500-\$130,000. Monitoring devices to assess for pressure ulcer risks are used to help prevent the formation of pressure injuries. These devices monitor pressure, heat and motion in those at-risk areas on the patient to prevent pressure injuries from occurring (p. 568-569).

Studies used in the Walia et al. (2016) systematic review were selected from CINAHL and PubMed/Medline databases. The study used six reviewers; three to review titles, two reviewed abstracts and full articles, and one reviewer assisted when the two reviewers disagreed about what articles met the inclusive criteria. Inclusive criteria included cohort and clinical trials that evaluated pressure injuries and risk factors for the formation of pressure injuries on any person in any setting. Another inclusive criteria is that the study had to be in English (Walia et al., 2016, p. 569).

The study discussed how a Methodological Index for Nonrandomized Studies Instrument (also known as MINORS) was used to compare articles by a second reviewer after a first reviewer briefly assessed the article (Walia et al. 2016 p. 569). This was used by the second reviewer to assess on a scale 1-16 with 12 being a high quality study for those that are noncomparable (p. 569). For studies that are comparable, the scale went from 1-24 with 18 being considered a high quality study (p. 569). Some limitations in this study might include that there were no randomized controlled trials in this systematic review and only studies involved in this research were observational. The devices used to monitor and prevent the formation of pressure

injuries were not individually discussed in the studies, which has been noted as another limitation to the study (p. 570).

The results of the study concluded that of the 1,866 studies assessed, nine articles that included 1,270 patients met the inclusion criteria (Walia et al., 2016, p. 570). The outcomes for each of these studies was different and varied from assessing the number of new pressure ulcers that were related to various instruments used in the study (p. 570). These instruments included notifying the healthcare professional or patient about the risk for pressure ulcer formation. Others were able to be placed in high risk formation areas such as wheelchairs, beds, and regular chairs to reduce formation of pressure injuries. Another had an actual pressure map to assist healthcare workers when repositioning patients. Other studies included interventions that had external sensors on the patient to notify healthcare workers of the risk for pressure ulcer formation on the patient (p. 570). All studies included in this systematic review were found to show a significant decrease in the number of pressure injuries after the incorporation of pressure ulcer prevention devices (p. 570).

Prevention instruments are helpful in preventing pressure ulcers. This is important and pertinent to my study because educating Certified Nursing Assistants and Personal Care Assistants about the effectiveness of prevention instruments and incorporating these into patient care will enable clinicians to provide quality care and prevent pressure ulcer formation in patients.

Perioperative Risks

During and after surgery, patients are at an increased risk for the development of pressure ulcers. Since patients are immobile during surgery and usually have decreased mobility post-

operatively, this can put them at an increased risk for pressure ulcer formation. By assessing patients at risk for forming pressure ulcers during the perioperative period, clinicians can reduce the formation of pressure ulcers (Baumgarten et al., 2012, p. 579).

Baumgarten et al. (2012) conducted a prospective cohort study to identify the healthcare related risk factors for pressure ulcer formation during and after hip surgery (p. 277). The study noted that pressure ulcers have a significant negative impact by decreasing quality of life and increasing pain, length of hospital stay, cost of stay, medical complications, and mortality (p. 578). It was also noted that pressure ulcer prevention is a major goal for the Centers for Medicare and Medicaid Services because it is seen as preventable and healthcare settings are not getting reimbursed for pressure ulcer care (p. 578). The study also mentioned that patients at risk are those who are immobile, incontinent, and have poor nutrition (p. 579). This prospective cohort study was conducted at nine hospitals in Baltimore Hip Studies network from 2004-2007 (p. 277). The sample included 658 patients who were 65 years or older and underwent hip fracture surgery (p. 277).

Threats to validity in this study include the fact that the information gathered from patients' charts to determine patients' risk for pressure ulcer formation was incomplete or missing in some areas (Baumgarten et al. 2012 p. 583). Another limitation to this study was that pressure ulcers that formed in the acute setting were noted, but there was no follow up about pressure ulcer formation after the patient was discharged (p. 583). Another limitation with this study concerned the primary investigators, who were unable to obtain a baseline assessment of each of the patients at admission and often this was not accomplished until the patients had already been admitted for 2-3 days (p. 583).

A measurement tool used in this study was a baseline skin examination, conducted on alternating days for patients who had one or more pressure ulcers that were stage II or higher (Baumgarten 2012 p. 577). A mini-mental status exam was also completed on each patient to determine if the patient was able to give consent (p. 578). Another measurement in this study was assessing the body mass index of each of the patients via their charts or from their respective proxy, as well as obtaining lab values such as albumin levels, arterial blood gas levels, creatinine levels, blood pressure readings, age, activity level, and if the patient had a history of heart failure (p. 560).

Informed consent was obtained in this study for patients who were conscious and oriented. Patients who scored below 20 on the Mini Mental Status Exam gave verbal and written consent through a proxy and written proxy consent was obtained for patients who were unconscious or unable to communicate (Baumgarten 2012 p. 578). The study was also approved by the Institutional Review Boards of University of Maryland, Baltimore, and at each of the participating hospitals (p. 578).

The study concluded that, of the 658 patients involved in this study, 96 patients went on to develop one or more pressure ulcers; among these 96 people, there were 121 pressure ulcers (Baumgarten et al. 2012 p. 581). The study also noted that patients who developed pressure ulcers were most likely be incontinent, bed-bound, have poor nutrition, poorer mental status, and other severe illnesses at the start of the study. It was also reported that 55% of these pressure ulcers were found on the sacrum/lower back region and 13% were on the patients' heels (p. 581). Patients who underwent surgery longer than 24 hours after their admission were noted to be at higher risk of developing a pressure ulcer.

A similar study was performed by Tschannen, Bates, Talsma & Guo (2012) to assess the risk of pressure ulcer development during surgery (Tschannen, Bates, Talsma, & Guo, 2012, p. 116). Tschannen et al. (2012) noted that pressure ulcers from 1992-2006 rose by approximately 80% and that pressure ulcers can occur within a few days of hospital admission (p. 117). This study also noted that surgical patients may be at an increased risk for pressure ulcer formation because, while under anesthesia, patients will not notice pressure points and may be at an increased risk for developing pressure ulcers (p. 117). This was designed as a cohort study looking at the EMR of 3,225 surgical patients from November 2008-August 2009 at a Midwest hospital (p. 116). The sample included 3,225 surgical patients in a Midwest hospital from November 2008-August 2009. The participants were 18 years or older, were admitted to one of five units, and had a hospital stay of longer than 48 hours (p. 118).

Multiple tools were used in this study. BMI was used to determine the patient's body mass index based on their height and weight. The Braden Scale was used to determine patients at increased risk for pressure ulcer development before surgery. The patient's risk for mortality was also measured using software, All Patient Redefined Diagnosis Related Group (APR DRG). Other data used in this study was the number of surgeries the patient was undergoing, how long the patient spent in the operating room, total time spent in surgery (this included time spent preoperatively being prepped for surgery), and the use of vasopressors during surgery (Tschannen et al., 2012, p. 199).

The study concluded that of the 3,225 participants, 12% developed at least one hospital-acquired pressure ulcer during their stay (Tschannen et al., 2012, p. 120). The mean age of the patients involved in the study were being approximately 59 years and the average BMI was 28.7 (p. 120). It was also noted that patients who developed pressure ulcers were older, spent more

time in the operating room and more total time in surgery, had multiple surgeries, were treated with vasopressors, had lower Braden Scores, and/or had diabetes (p. 121). The study found that for every additional hour the patient was in surgery, they were at an increased risk for pressure ulcers (p. 121). It was also noted that patients with diabetes were 49% more likely to develop a pressure ulcer (p. 121).

There were multiple factors noted between the two studies conducted by Tschannen et al. (2012) and Baumgarten (2012) which put patients during the perioperative period at risk for developing pressure ulcers. The risk factors in both studies were age, increased time in surgery, low Braden Scores, and having diabetes. Although my research is not looking at pressure ulcer formation specifically during the perioperative period, this research is still applicable. Patients with increased age, low Braden Scores, and diabetes, as well as being immobile for long periods of time, are noted to have an increased risk for pressure ulcer formation (Tschannen et al., 2012, p. 121). This can be applied not only to the operating room, but also to long-term care facilities.

Blood flow and Ischemia

Prolonged pressure on one area of the body can impact blood flow to tissues. Ischemia is the result of decreased blood flow to tissue (Venes, 2015). Once ischemia develops in a pressure point area, the skin is at an increased risk for break down, causing the formation of a pressure ulcer (Venes, 2015).

Liao, Burns, and Jan (2013) conducted a review of information looking at blood flow through the patient's skin and risk for developing pressure ulcers (p. 25). The study was identified as a review. The primary investigators failed to mention if it was a systematic review and simply noted the study as being a review (p. 25). The article discussed theories of

repositioning patients on a routine basis to decrease pressure in certain areas, decreasing the patient's risk for developing a pressure ulcer, and how ischemia around the pressure site also contributes to the development of pressure ulcers (p. 26). Liao et al. (2013) also mentioned how blood flow oscillations otherwise known as BFO, can be used to determine patients at increased risk for pressure ulcer formation (p. 26). The article also mentions how BFO is used to measure the amount of blood flow an area of skin is receiving and how the BFO is often impaired in patients who are elderly, and/or have hypertension or diabetes (p. 26).

The design of this study was a review of blood flow through a patient's skin and blood flow oscillation (BFO) and how this contributes to pressure ulcer formation (Liao et al., 2013, p. 25-26). Liao et al. (2013) also, provided information on the background of BFO and how this would be important for clinicians to implement in clinical practice to identify patients at increased risk for developing pressure ulcers (p. 25-26).

The study mentioned how BFO could be used to help clinicians to determine patients at an increased risk for pressure ulcer formation (Liao et al., 2013, p. 33). Blood flow oscillation is helpful in determining patients who may be at an increased risk for pressure ulcer formation due to decreased blood flow to the tissues (p. 33). Understanding how impaired blood flow results in pressure ulcer formation is important for prevention by repositioning the patient frequently and assessing patients at high risk for compromised blood flow such as elderly patients and patients with diabetes (p.25-26).

Repositioning

Another important method for preventing pressure ulcers, mentioned in studies noted earlier in this literature review, is repositioning the patient. How often patients were repositioned

and how they were repositioned are two important aspects of repositioning. Gillespie et al. (2014) conducted a systematic review evaluating the effects of manual repositioning on preventing pressure ulcers in adults, evaluating the most effective repositioning schedules, and comparing different repositioning regimens, and schedules (p. 1).

Repositioning helps prevent the formation of pressure ulcers (Gillespie et al., 2014, p. 2). The study also found that pressure ulcers most commonly occur in elderly patients and those who are immobile (p. 2). The control trials were obtained from Cochrane Wounds Group Specialized Register, Cochrane Central Register of Controlled Trials, Ovid Medline, Ovid Embase, EBESCO, and CINAHL (p. 3).

The sample in this review included 502 randomized controlled trials (Gillespie et al., 2014, p. 3). These trials included adults who did not have pressure ulcers (p.4-5). Two reviewers were used to evaluate study inclusion (p. 2). Bias for each included study was assessed by using the Cochrane Collaboration (p. 7). The study concluded that there are not many studies done on repositioning and how well it prevents the formation of pressure ulcers (p. 19). It was also noted that the data obtained from the different studies was inconsistent and had significant bias (p. 19).

In addition to the use of prevention instruments, as mentioned earlier in this literature review, assessing the patient at risk for the development of pressure ulcers, and repositioning can decrease the formation of pressure ulcers (Gillespie et al., 2014, p.2). This is important to my study because Certified Nursing Assistants (CNAs) and Personal Care Assistants (PCAs) are the main care providers in long term care facilities and they help reposition patients who are at risk for pressure ulcer formation.

Stress

Another important aspect to the formation of pressure ulcers is stress. Patients in long-term care facilities experience stress often related to depression or anxiety (both of which are very common in the geriatric population) or even chronic pain (Fiske et al., 2010, p. 4). These stressors, as noted by Gouin & Kiecolt-Glaser (2012), can delay wound healing.

Gouin & Kiecolt-Glaser (2012) conducted a meta-analysis to assess the link between psychological stress and wound healing (p. 1). Patients who experience high rates of emotional stress, such as depression and anxiety, were noted to have wound healing take four times longer than patients who were not emotionally stressed (p. 2).

Pain as a physical stressor was also indicated to impede healing. Gouin & Kiecolt-Glaser (2012) noted that patients who experience a lot of pain post-operatively (acutely) and four weeks later (persistent) had slower healing rates than patients who only experience pain post-operatively (acute) (p. 3). Another study included married couples who were asked to undergo a blister wound (caused by a vacuum suction to the participants' forearm) twice. After undergoing each blister wound, the couples were asked to attend two meetings—the first was a social support session and the second was a discussion on disagreements within their marriage. The study noted couples healed slower following the session discussing their marital disagreements (p. 4). A separate study found that of the participants who underwent a blister-wound, participants who self-reported (via questionnaire) on an Anger Expression Scale as having poor anger control were also found to heal slower than participants who reported having higher anger control (p. 4).

This meta-analysis looked at several observational experimental studies to assess the impact of stress on wound healing (Gouin & Kiecolt-Glaser, 2012, p. 1). The sample included several prospective observational experimental studies used in this study (p. 2). Each assessed the effects of stress on wound healing (p. 2). The authors could have gone more into detail about how the studies were chosen and the exact number of participants in each. The study noted that stress does impact wound healing, which was repeated several times by different studies.

Gouin & Kiecolt-Glaser (2012) found that stress delayed wound healing in patients (p. 2). This study was helpful in understanding how psychological and physiological stressors like pain, depression, and anxiety can impact pressure ulcer healing. This knowledge is important to my study because elderly patients often experience some sort of pain, depression, or anxiety as noted by Fiske et al. (2010) and Gouin & Kiecolt-Glaser (2012).

Multiple Variables

In addition to the studies that looked at one variable, discussed earlier in this literature review, some studies assessed how multiple variables such as documentation, staff education, and skin teams were used to decrease the formation of pressure ulcers. Studies have also looked at other variables that could be contributing to the formation of pressure ulcers, such as patients who are elderly, obese, or suffer from diabetes. Other factors such as impaired skin perfusion and prolonged pressure points have also been considered in studies.

Sullivan and Schoelles (2013) conducted a systematic review to review different components for reducing pressure ulcers and how in-facility programs are working to reduce pressure ulcers acquired in the facility (p. 410). The study noted that pressure ulcers increased by 80% from 1995-2008; it predicts they will keep increasing due to growing numbers of people

who are obese, suffer from diabetes, or are elderly (p. 410). Pressure ulcers are also estimated to lead to approximately 60,000 deaths annually (p. 410).

Sullivan and Schoelles (2013) retrieved articles from CINAHL, the Cochrane Library, EMBASE, Medline, and preMedline from 2000-2012 (p. 410). A total of 26 studies were selected (p. 412). Studies included in this research implemented multiple pressure ulcer prevention initiatives. Initiatives might include documentation, ongoing staff education, sustained audit and feedback, and the use of skin teams. Another component of the sample was the studies selected had to report pressure ulcer rates at least six months after the intervention implementation (p. 410).

Two reviewers were used to assess these studies for inclusion. The studies were measured for evidence of validity using Standards for Quality Improvement Reporting Excellence (SQUIRE) guidelines (Sullivan and Schoelles, 2013, p. 411). The SQUIRE guidelines included 19 items and the investigators considered the study high quality if the study met 8-10 of the 19 items and moderate quality if 5-7 items were met and low quality if less than 5 items were met (p. 411). The results of this study concluded that there is little research on pressure ulcer prevention methods on the system level (p. 415).

A second study performed by Coleman et al. (2012) also assessed multiple variables that could possibly contribute to the formation of pressure ulcers; they conducted a systematic review to identify factors that could predict pressure ulcer development (p. 974). This study notes that there are numerous variables that could indicate possible pressure ulcer formation, such as immobility, impaired skin perfusion due to diseases such as diabetes, and prolonged pressure on bony prominences on the body (p. 975).

The researchers used Medline, AMED, British Nursing Index, EMBASE, PsycINFO, CINAHL, Cochrane Library, Proquest, Networked Digital Library of Theses and Dissertations, International Theses in Progress, Theses Canada Portal, Australian Digital Theses Program, Russian Academy of Sciences Bibliographies, and Index to Theses. These resources were all used to research articles in this systematic review (Coleman et al., 2012, p. 976). The studies were selected by one reviewer and verified with another reviewer to meet the inclusive criteria (p. 976).

The study's sample included research studies with primary research involving adults 18 years and older in any healthcare setting with an outcome of the development of a new pressure ulcer. The studies selected also included prospective cohort, retrospective review, or randomized controlled trials. Other data for studies included the research having a follow up time period of three days from the development of a new pressure ulcer, and studies that looked at multiple variables that could contribute to the development of a pressure ulcer (Coleman et al., 2012, p. 975). The sample size was 365 studies (p. 977).

A potential threat to the validity of this study is that it included a number of studies considered low quality studies (Coleman et al., 2012, p. 999). A bias noted in this study was the fact that this was the first systematic review ever done to look at risk factors that contribute to the development of pressure ulcers (p. 999). Studies in this systematic review were measured based on quality of being either low, medium, or high quality studies.

The criteria used to assess the quality of the research included whether each study looked at more than ten events, if there were enough data to provide an accurate analysis and a thorough methodology section, if the variables and the setup of the study were appropriate, and if the setup of the study and the hypothesis of the studies were effective. Low quality studies were found to

meet one or none of the criteria listed. Medium quality studies were noted to include at least three of the criteria and high quality studies included all of the criteria (Coleman et al., 2012, p. 976).

The study noted that no one single variable can predict possible pressure ulcer formation (Coleman et al., 2012, p. 974). The study also noted this was the first systematic review of pressure ulcer risk factors to ever be completed (p. 999). This systematic review is helpful in understanding that patients at risk for pressure ulcers can have multiple variables that put them at risk from age, nutrition status, immobility, skin moisture, incontinence, and poor skin perfusion to name a few. This is important to know when assessing patients who may be lacking in one area and not in other areas, so as not to miss patients at risk for developing pressure ulcers.

Numerous factors have been identified as contributing factors to the formation of pressure ulcers including patients who are elderly, immobile, suffer from diabetes, decreased nutrition status, and poor skin perfusion. These factors are all important and applicable to my research because most residents in long-term care facilities have at least one of these traits, placing them at increased risk for forming pressure ulcers.

Age

Another contributing factor to the formation of pressure ulcers is age. Geriatric patients have been noted to be at an increased risk for developing pressure ulcers. This is important because most residents in long-term care facilities are geriatric patients.

Theisen, Drabik and Stock (2011) conducted a retrospective observational study to evaluate the effect of pressure ulcers on the length of stay in hospitals in geriatric patients (p. 380). The study mentions that not only is having patients with extended length of stays costly to

the patient, it also increases the patient's risk for infection (p. 381). The study also mentions how pressure ulcers are uncomfortable, painful, and embarrassing. Pressure ulcers are also costly and sometimes require specialized staff to treat them (p. 381). It has also been noted that 70 % of all pressure ulcer cases occur in patients who are 65 years or older (p. 381).

The participants were assessed by a trained nursing staff who used a "Nursing Pressure Ulcer Prophylaxis" indicator to determine patients at risk in the unit for pressure ulcers (Theisen et al., 2011, p. 381). The data for this study was collected from 2008 to 2009 (p. 381). There were 3198 participants 75 years or older in a 1350 bed German University hospital (p. 380). The mean age of participants was approximately 82 years and the mean age of participants who had pressure ulcers was around 83 years of age (p. 380). The age range of the patients was from 75 to 99 years of age (p. 382). The study noted that participants who had pressure ulcers had an increased hospital stay of approximately 7 days longer (p. 380). Nurses who worked in the hospital and were specifically trained collected data for this study (p. 381). There was a conflict of interest because one of the investigators in this study worked at the University associated with the hospital used in this study (p. 385).

The study concluded that, while the mean age of participants who experienced pressure ulcers was approximately 83 years of age, 187 of these patients were also found to be 90 years or older (Theisen et al., 2011, p. 182). The study also concluded that participants who had pressure ulcers had an extended length of stay in the hospital by an average of approximately 7 days (p. 380). Of the patients admitted to the hospital during this time 156 had an increased length of stay in their hospital for 30 days or longer. This study also found that 228 patients admitted to this hospital had either hospital acquired pressure ulcers or pressure ulcers upon their admission

(p. 182). The length of stay was longer for patients who had hospital acquired pressure ulcers than for those who had pressure ulcers upon admission (p. 182).

This study was applicable to my research because most residents in long-term care facilities are part of the geriatric population. Elderly patients are also at an increased risk of having other comorbidities such as diabetes which can result in poor skin perfusion. Knowing these increased risk factors in the elderly population is helpful in identifying residents at risk.

Patients' Perspective

After looking at all other aspects that contribute to the formation of pressure ulcers, the last topic is looking at pressure ulcers from the patients' perspective. Pressure ulcers not only are painful, embarrassing, and increase the patient's risk for infection; they also cause the patient to experience anxiety, depression and isolation. Stressors such as anxiety and depression slow wound healing, and increased time spent in the care facility, added costs to the patient and the facility, and poor patient outcomes (Fiske et al., 2010, p.1).

Latimer, Chaboyer, and Gillespie (2014) conducted personal interviews to assess patients' perspectives about pressure injuries (p. 648). Pressure injuries can result in social isolation, depression, pain, and even death in patients (p. 648). Involving patients in patient-centered care helps empower patients and increase health outcomes for the patient (p. 648-649). There is currently little evidence of how involving patients in decision-making in patient-centered care may be helpful in pressure ulcer prevention (p. 649).

This study included 20 semi-structured interviews with 10 questions lasting 10-15 minutes with patients stating their thoughts, feelings, and opinions on pressure injuries (Latimer et al., 2014, p. 649). Of the interviews, 19 were digitally recorded and one was transcribed.

Interviews were conducted in a quiet place or at the patient's bedside (p. 649). The sample included 20 adults from two metropolitan Australian hospitals who were at least 18 years of age and had been in the hospital for at least three days, could provide informed consent, and who relied on staff to help transfer and reposition (p. 648).

The participants were chosen by the charge nurse of the unit and the participants varied in age, ethnicity, gender, and medical condition (Latimer et al., 2014, p. 648). Of the participants in this study, over half were female, and the age range of participants ranged from 24-80 years with the mean age being approximately 66 years of age. Approximately one third of the participants were found to have a personal experience with pressure injuries. A potential threat to validity might arise from the fact that after two interviews, the researchers made slight changes to the questions before conducting the rest of them (p. 649). Each participant provided written informed consent (p. 649).

The researcher's role was to ask the participant 10 questions related to the patient's experience and thoughts about pressure ulcers and patient involvement in pressure ulcer prevention and care (Latimer et al., 2014, p. 649). A potential bias to this study might include the fact that the study was funded by a grant from the same place one of the researchers in the study was employed (p. 652). The interviews were recorded and common themes that were noted included "experiencing pressure injury," "participating in pressure injury prevention," and "resourcing and treating pressure injuries" (p. 651). The researchers also noted subthemes under the "experiencing pressure injuries" which included experiencing pain, stress, a variety of emotions, smelling the pressure injury, and relieving pressure on the pressure ulcer site.

Subthemes noted under the "participating in pressure injury prevention" was knowing about the pressure injury, being self-determined, remembering the experience of pressure

injuries, and involving the patient in decisions. The last subcategories under “resourcing and treating pressure injuries” included expensive pressure injury prevention care, prolonged healing, and difficulty accessing pressure injury care (Latimer et al., 2014, p. 651). The findings were consistent with the questions asked of each participant. This study did give some insight into patients’ thoughts and opinions on pressure injuries (p. 649).

The Latimer et al. (2014) study showed evidence of each of the four components of trustworthiness. Credibility was established through purpose sampling and context selection of words and themes that came about in the research. Transferability was identified in this article because the researchers were clear about how they conducted their research, which could also be replicated. Dependability in this study was realized by using semi-structured interviews that lasted about the same amount of time for each participant and research team meetings that occurred throughout the data collection process (Latimer et al., 2014, p. 650). Confirmability was found in this study because the results of this study make sense and meet realistic expectations of what might be found in this research.

Patients’ perspectives are important in preventing pressure ulcers because understanding what the patient goes through when they have pressure ulcers might help motivate clinicians to prevent pressure ulcers from forming. Understanding the patients’ perspectives can enable clinicians to work more effectively with patients to develop ways to prevent pressure ulcers while also ensuring patients’ comfort. This study was helpful in my study because seeing the patient’s perspective is helpful in ensuring quality care is being given.

Chapter III

Methodology

Certified Nursing Assistants (CNAs) and Personal Care Assistants (PCAs) from two long-term care facilities, one assisted-living facility and one skilled-nursing facility, in a small rural community in the northwest were recruited. The CNAs and PCAs were recruited by fliers placed in the facility to recruit the CNAs to take a pre-test, attend a short informational session, and take a post-test about pressure ulcer prevention methods. The flier and information shared with the CNAs was provided to the Director of Nursing and Administrator at each facility and each Director of Nursing gave their approval in writing for this study to be completed in their respective facilities.

The whole session took approximately 30 minutes. The CNAs and PCAs recruited were asked to sign a consent form prior to participating in this study agreeing that they were at least 18 years of age and employed at one of the facilities where this study was conducted. The consent form was thoroughly reviewed and possible risks explained as needed. This study was also approved by the Institutional Review Board at Carroll College. The ages, gender, race, and ethnicity of the CNAs and PCAs recruited varied. The sample size for this study was 37 participants.

This study focused on the knowledge CNAs and PCAs have related to pressure ulcer prevention because CNAs and PCAs are the main caregivers in long-term care facilities. CNAs and PCAs assist elderly patients or “residents” with bathing, dressing, toileting, transferring, grooming, feeding, and repositioning. CNAs and PCAs are constantly in close contact with residents and are often referred to as the “eyes and ears” for the nurses. By being the “eyes and

ears” for the nurses, CNAs and PCAs are responsible for reporting and documenting any noted issues or changes with the residents including the formation of pressure ulcers to the nurse in charge of that resident’s care for the day. Assessing knowledge level of CNA and PCAs would be helpful in determining what CNAs and PCAs know and do not know that could be helpful in preventing pressure ulcers. If CNAs and PCAs had higher knowledge levels of pressure ulcers and ways to prevent their formation, this would hopefully decrease the number of pressure ulcers found in elderly residents residing in long-term care facilities.

Each CNA and PCA was asked to draw a number out of a hat and write the number at the top of the pre-test and post-test to help maintain anonymity. The participants were then given five minutes to fill out the pre-test and handed in their pre-test to a manila folder marked “Pre-Tests.” The participants then attended a 15-minute PowerPoint presentation about pressure ulcers and pressure ulcer preventative measures in a conference room at the facility. After the presentation, the CNAs and PCAs were asked to fill out the post-test. After completing the post-test, the CNAs and PCAs were asked to turn in their post-test to a second manila folder marked “Post-Tests.” The entire study only took approximately 30 minutes in length and was offered multiple times to ensure attendance from staff working different shifts like night, day, and evening shifts.

The pre- and post-test results were compiled in a paired T-test table with the help of a professor at a rural northwest college who assisted in creating the table, as well as in compiling and analyzing the quantitative data. While the data was being compiled, the folders were kept in a locked box in a locked office in a rural northwest college. Once the data was compiled into a paired T-test table and results analyzed, the tests were shredded and destroyed. The results from each facility were shared with the Director of Nursing for the respective facilities.

Chapter IV

Results

The data collected from the pre- and post-tests from both facilities was compiled into a paired T-test table. The responses from the pre- and post-tests were compiled into a paired T-test for each individual question. Each question had two paired T-test tables—one for each facility, making a total of twenty tables. There was no noted significance found among these tables, with the p-values ranging between 3.95 E-9 and 0.75. The tables can be found in appendix tables 1.1-10.2. Listed below are examples of tables created to compare the pre-tests and post-tests. The first table is comparing the total score of the pre-tests (variable 1) and post-tests (variable 2) in the assisted living facility:

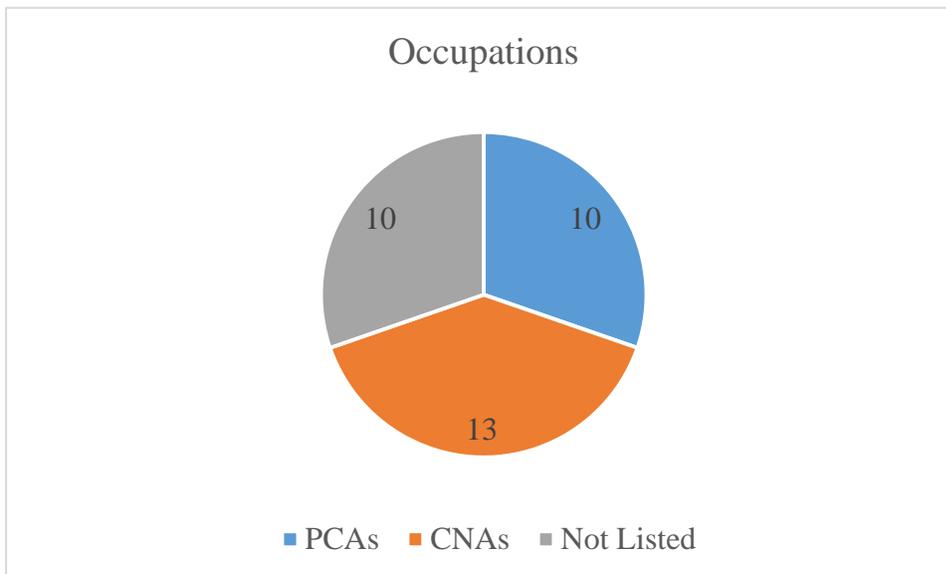
T-test: Paired Two Sample for Means		
	<i>Variable 1</i>	<i>Variable 2</i>
Mean	14.79167	18.83333
Variance	19.21558	13.62319
Observations	24	24
Pearson Correlation	0.736751	
Hypothesized Mean Difference	0	
df	23	
t Stat	-6.60068	
P(T<=t) one-tail	4.91E-07	
t Critical one-tail	1.713872	
P(T<=t) two-tail	9.81E-07	
t Critical two-tail	2.068658	

The second table is comparing the total pre-test (variable 1) and post-test (variable 2) scores of the nursing home:

t-Test: Paired Two Sample for Means		
	Variable 1	Variable 2
Mean	17	19.88889
Variance	9.25	15.86111
Observations	9	9
Pearson Correlation	0.804946	
Hypothesized Mean Difference	0	
df	8	
t Stat	-3.65871	
P(T<=t) one-tail	0.003207	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.006413	
t Critical two-tail	2.306004	

The data was then compiled into four tables—a paired T-test was run for all the pre- and all post-test responses for each facility. The p-values for each ranged between 0.003 and 4.9 E-7. These tables can be found in appendix tables 11-12. This data, again, did not produce any significance between the pre- and post-tests. Although both ways the tests were run did not produce any significant findings, this does not indicate that education does not increase knowledge.

The occupations of the participants was also compiled into a pie chart noted below. This study included 13 Certified Nursing Assistants (CNAs), 10 Personal Care Assistants (PCAs), and 10 did not list their occupation.



Chapter V

Discussion

Though this study did not produce statistically significant results, there are a number of possible reasons for this. A study by Zulkowski, Ayello, and Wexler (2006), noted that certifications do improve knowledge for nurses. Although no significant results arose from this study, there was no conclusion drawn that education does not impact knowledge. Future studies that might repeat this study should consider a number of variables, like sample size, before performing further research.

Some potential variables that may have impacted the results of this study include a small sample size, the tool used in this study, and varying levels of competency among the participants. The sample size for this study was 37 participants; two pre- and post-tests were incomplete, which reduced the sample size to 35 participants. The study also used only two facilities, which produced limited results.

The tool used in this study was adapted from a previous study performed by Zulkowski, Ayello, and Wexler (2006). Zulkowski et al. (2006) used the Pieper Pressure Ulcer Knowledge Tool to compare knowledge levels of nurses with certifications in wound healing, other certifications, or no certifications to determine if certification is related to increased knowledge (p. 35). The Pieper Pressure Ulcer Knowledge Tool is based on three components including prevention, general wound knowledge, and staging, each requiring responses of “don’t know,” “yes,” or “no” (Zulkowski et al., 2006, p.35). The Pieper Pressure Ulcer Knowledge Tool has been noted to be reliable and valid (Zulkowski et al., 2006, p.35). Zulkowski et al. (2006) found,

using the Pieper Pressure Ulcer Knowledge Tool, that certification did increase nurses' knowledge, with a correlation of $P < 0.05$ (p. 37).

The tool used in this study included components of the Pieper Pressure Ulcer Knowledge Tool and also included multiple choice and "select all that apply questions" as well. The reliability and validity of the tool used in this study has not been determined. Although my study did not produce any significant data, Zulkowski et al. (2006) found that certification leads to increased knowledge and competency. Therefore, I would caution against making the conclusion that education does not increase knowledge.

There was also a notable difference in the level of competency in the group members. The participants in the study were Certified Nursing Assistants (CNAs) and Personal Care Assistants (PCAs). CNAs are required to complete 45 to 50 hours in the classroom and approximately 25 to 30 clinical hours in the state of Montana (Nursing Licensing, 2017). PCAs in Montana are required to complete 16 to 20 clinical hours (Marquand, 2013, p.15). With varying levels of training required, there could possibly be a difference in the level of care provided. The number of years working as a CNA or PCA could also have played a role in the variation of the data collected.

The two facilities used in this study could have an impact on the study's results as well. One facility was a skilled nursing facility, meaning residents are receiving care under the supervision of a registered nurse 24 hours a day (Montana Department of Health and Human Services, 2017). The other was an assisted living facility where residents received care and are supervised by staff, which does not always include a registered nurse (Montana Code Annotated, 2005, p.6). Each facility providing a different level of care, could have played a role in the differing results found in this study.

Some of the data collected were also incomplete. On the pre-tests, there were some answers that were left blank, which were included in the compilation of the data. This could have resulted in skewed data since the question could not technically be counted as correct or incorrect. Two participants only filled out a pre- or post-test, which disqualified these tests from being included in this study.

When the data collection was completed, another potential variable that could have impacted the results of the study. In the skilled nursing facility, the data collection was conducted between shifts, which could have resulted in the participants feeling distracted by work that still needed to be completed before the shift was over or by participants coming on shift feeling anxious to get onto the floor and start their shift. In the assisted living facility, the data was collected prior to the participants completing an educational in-service at the facility. This could have caused the participants to feel distracted when completing the pre-and post-tests and more focused on other content they were going to learn and be checked off on.

The intervention in this study may have also impacted the study. While the same information was shared in each group of participants, the data in the presentation could have been unclear to some of the participants. The intervention lasted approximately 10 minutes in each presentation and this may not have been enough time for the participants to ask questions and think about the material being presented. The intervention might have introduced information that may have not been at the learning level of some of the participants—the material may have been either above or below the learning level of the participants, which could have made learning the material more difficult. The presentation of the information in the intervention may have been dull and resulted in a loss of interest in the participants, which would also hinder learning.

Some nursing implications related to this study include better educating CNAs and PCAs about pressure injuries and ways to prevent them. Another implication includes requiring a higher knowledge level about pressure injuries and prevention methods for CNAs and PCAs to become certified and /or hired. Requiring a higher knowledge level about pressure injuries, as well as frequent and regular-scheduled education after hire, could help decrease the frequency of pressure ulcers.

A potential nursing implication for decreasing pressure injuries might include requiring staff during in-services and before becoming certified as a CNA or PCA to demonstrate ways to properly reposition patients and checking areas of the body that commonly develop pressure injuries. Future research that could be helpful includes repeating this study but with a larger sample size and a different tool. Other research might include CNAs' and PCAs' perceptions of pressure injuries and how to prevent them, which might be helpful since most residents in long-term care facilities are cared for by either CNAs or PCAs. Understanding their perceptions might reveal ways to effectively reduce the prevalence of pressure injuries.

Other research could compare different assisted living facilities together and compare different skilled nursing facilities together. Skilled nursing facilities and assisted living facilities are different as far as the level of care provided. In this study they were compared, but further research could provide more accurate data for the level of care provided in each facility. Finally, it might be helpful to also include further research on how knowledge that caregivers like CNAs and PCAs have impacts the overall rate of pressure ulcers by looking at the rate before and after the study.

Although no statistically significant results were found in this data, this study was helpful in understanding the need for further research in this area, to examine how knowledge levels of

caregivers like CNAs and PCAs impact the care that patients receive. It is also important to stress that, although no statistically significant results came from the study, we should not conclude education produces no results in increased knowledge that could improve patient care. There were many possible reasons why this study did not produce significant results. Future studies could look more in depth at how the CNAs' and PCAs' knowledge of pressure ulcers might impact the development of pressure ulcers in different facilities.

Appendix

Table 1.1 (Assisted living facility)

Variable 1 is pre-test information and Variable 2 is post-test information for Question 1

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	2.25	2.875
Variance	1.413043	0.896739
Observations	24	24
Pearson Correlation	0.183466	
Hypothesized Mean Difference	0	
Df	23	
t Stat	-2.22322	
P(T<=t) one-tail	0.018154	
t Critical one-tail	1.713872	
P(T<=t) two-tail	0.036309	
t Critical two-tail	2.068658	

Table 1.2 (Nursing home)

Variable 1 is pre-test information and Variable 2 is post-test information for Question 1

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	3.22222222	3.111111111
Variance	0.944444444	1.361111111
Observations	9	9
Pearson Correlation	0.52674565	
Hypothesized Mean Difference	0	
Df	8	
t Stat	0.31622777	
P(T<=t) one-tail	0.37996148	
t Critical one-tail	1.85954804	
P(T<=t) two-tail	0.75992297	
t Critical two-tail	2.30600414	

Table 2.1 (Assisted living facility)

Variable 1 is pre-test and Variable 2 is post-test information for Question 2

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	2.208333	3.25
Variance	1.737319	0.456522
Observations	24	24
Pearson Correlation	0.329538	
Hypothesized Mean Difference	0	
Df	23	
t Stat	-4.02571	
P(T<=t) one-tail	0.000264	
t Critical one-tail	1.713872	
P(T<=t) two-tail	0.000528	
t Critical two-tail	2.068658	

Table 2.2 (Nursing home)

Variable 1 is pre-test and Variable 2 is post-test information for Question 2

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	2.33333333	2.888889
Variance	0.25	1.861111
Observations	9	9
Pearson Correlation	0.06108472	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-1.1704115	
P(T<=t) one-tail	0.13775886	
t Critical one-tail	1.85954804	
P(T<=t) two-tail	0.27551771	
t Critical two-tail	2.30600414	

Table 3.1 (Assisted living facility)

Variable 1 is pre-test and Variable 2 is post-test information for Question 3

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.25	1.416667
Variance	0.195652	0.253623
Observations	24	24
Pearson Correlation	-0.09759	
Hypothesized Mean Difference	0	
Df	23	
t Stat	-1.16316	
P(T<=t) one-tail	0.128345	
t Critical one-tail	1.713872	
P(T<=t) two-tail	0.256691	
t Critical two-tail	2.068658	

Table 3.2 (Nursing home)

Variable 1 is pre-test and Variable 2 is post-test information for Question 3

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.555556	1.666667
Variance	0.277778	0.25
Observations	9	9
Pearson Correlation	-0.15811	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-0.4264	
P(T<=t) one-tail	0.340529	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.681057	
t Critical two-tail	2.306004	

Table 4.1 (Assisted living facility)

Variable 1 is pre-test and Variable 2 is post-test information for Question 4

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	0.541667	1.375
Variance	0.259058	0.331522
Observations	24	24
Pearson Correlation	0.166905	
Hypothesized Mean Difference	0	
Df	23	
t Stat	-5.8158	
P(T<=t) one-tail	3.16E-06	
t Critical one-tail	1.713872	
P(T<=t) two-tail	6.32E-06	
t Critical two-tail	2.068658	

Table 4.2 (Nursing home)

Variable 1 is pre-test and Variable 2 is post-test information for Question 4

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	0.444444	1.555556
Variance	0.277778	0.527778
Observations	9	9
Pearson Correlation	0.253917	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-4.26401	
P(T<=t) one-tail	0.001373	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.002746	
t Critical two-tail	2.306004	

Table 5.1 (Assisted living facility)

Variable 1 is pre-test and Variable 2 is post-test information for Question 5

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.416667	1.625
Variance	0.514493	0.331522
Observations	24	24
Pearson Correlation	0.078956	
Hypothesized Mean Difference	0	
Df	23	
t Stat	-1.15504	
P(T<=t) one-tail	0.129968	
t Critical one-tail	1.713872	
P(T<=t) two-tail	0.259935	
t Critical two-tail	2.068658	

Table 5.2 (Nursing home)

Variable 1 is pre-test and Variable 2 is post-test information for Question 5

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.222222	1.666667
Variance	0.694444	0.25
Observations	9	9
Pearson Correlation	0.5	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-1.83533	
P(T<=t) one-tail	0.051893	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.103786	
t Critical two-tail	2.306004	

Table 6.1 (Assisted living facility)

Variable 1 is pre-test and Variable 2 is post-test information for Question 6

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.666667	1.791667
Variance	0.405797	0.346014
Observations	24	24
Pearson Correlation	0.734857	
Hypothesized Mean Difference	0	
Df	23	
t Stat	-1.3656	
P(T<=t) one-tail	0.092636	
t Critical one-tail	1.713872	
P(T<=t) two-tail	0.185272	
t Critical two-tail	2.068658	

Table. 6.2 (Nursing Home)

Variable 1 is pre-test and Variable 2 is post-test information for Question 6

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.888889	1.888889
Variance	0.111111	0.111111
Observations	9	9
Pearson Correlation	1	
Hypothesized Mean Difference	0	
Df	8	
t Stat	#DIV/0!	
P(T<=t) one-tail	#DIV/0!	
t Critical one-tail	#DIV/0!	
P(T<=t) two-tail	#DIV/0!	
t Critical two-tail	#DIV/0!	

Table 7.1 (Assisted living facility)

Variable 1 is pre-test and Variable 2 is post-test information for Question 7

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.041667	1.75
Variance	0.650362	0.369565
Observations	24	24
Pearson Correlation	0.37691	
Hypothesized Mean Difference	0	
Df	23	
t Stat	-4.30294	
P(T<=t) one-tail	0.000132	
t Critical one-tail	1.713872	
P(T<=t) two-tail	0.000265	
t Critical two-tail	2.068658	

Table 7.2 (Nursing home)

Variable 1 is pre-test and Variable 2 is post-test information for Question 7

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.777778	2
Variance	0.444444	0
Observations	9	9
Pearson Correlation	#DIV/0!	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-1	
P(T<=t) one-tail	0.173297	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.346594	
t Critical two-tail	2.306004	

Table 8.1 (Assisted living facility)

Variable 1 is pre-test and Variable 2 is post-test information for Question 8

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.5	1.666667
Variance	0.434783	0.405797
Observations	24	24
Pearson Correlation	0.621059	
Hypothesized Mean Difference	0	
Df	23	
t Stat	-1.446	
P(T<=t) one-tail	0.080834	
t Critical one-tail	1.713872	
P(T<=t) two-tail	0.161668	
t Critical two-tail	2.068658	

Table 8.2 (Nursing home)

Variable 1 is pre-test and Variable 2 is post-test information for Question 8

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.666667	1.777778
Variance	0.25	0.194444
Observations	9	9
Pearson Correlation	0.188982	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-0.5547	
P(T<=t) one-tail	0.297132	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.594264	
t Critical two-tail	2.306004	

Table 9.1 (Assisted living facility)

Variable 1 is pre-test and Variable 2 is post-test information for Question 9

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.708333	1.75
Variance	0.476449	0.369565
Observations	24	24
Pearson Correlation	0.751201	
Hypothesized Mean Difference	0	
Df	23	
t Stat	-0.43963	
P(T<=t) one-tail	0.332153	
t Critical one-tail	1.713872	
P(T<=t) two-tail	0.664306	
t Critical two-tail	2.068658	

Table 9.2 (Nursing home)

Variable 1 is pre-test and Variable 2 is post-test information for Question 9

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.777778	1.888889
Variance	0.444444	0.111111
Observations	9	9
Pearson Correlation	-0.125	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-0.4264	
P(T<=t) one-tail	0.340529	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.681057	
t Critical two-tail	2.306004	

Table 10.1 (Assisted living facility)

Variable 1 is pre-test and Variable 2 is post-test information for Question 10

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	31.75	1.208333
Variance	288.1087	0.346014
Observations	24	24
Pearson Correlation	-0.00327	
Hypothesized Mean Difference	0	
Df	23	
t Stat	8.808672	
P(T<=t) one-tail	3.95E-09	
t Critical one-tail	1.713872	
P(T<=t) two-tail	7.91E-09	
t Critical two-tail	2.068658	

Table 10.2 (Nursing home)

Variable 1 is pre-test and Variable 2 is post-test information for Question 10

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	1.111111	1.444444
Variance	0.111111	0.277778
Observations	9	9
Pearson Correlation	0.395285	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-2	
P(T<=t) one-tail	0.040258	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.080516	
t Critical two-tail	2.306004	

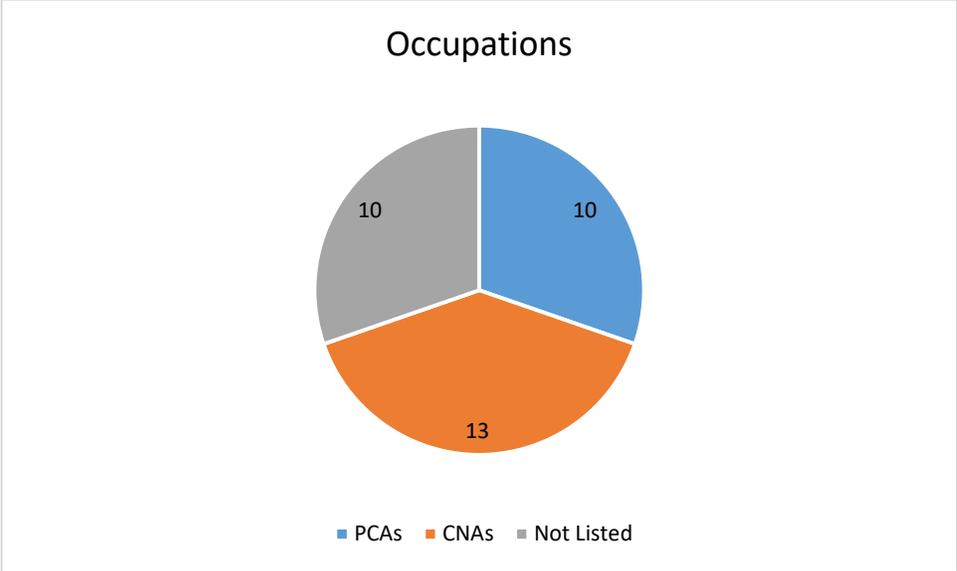
Table 11 – (Assisted living facility--Variable 1 is the comprehensive pre-test results and Variable 2 is comprehensive post-test results)

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	14.79167	18.83333
Variance	19.21558	13.62319
Observations	24	24
Pearson Correlation	0.736751	
Hypothesized Mean Difference	0	
df	23	
t Stat	-6.60068	
P(T<=t) one-tail	4.91E-07	
t Critical one-tail	1.713872	
P(T<=t) two-tail	9.81E-07	
t Critical two-tail	2.068658	

Table 12- (Nursing home--Variable 1 is comprehensive pre-test results and Variable 2 is comprehensive post-test results)

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	17	19.88889
Variance	9.25	15.86111
Observations	9	9
Pearson Correlation	0.804946	
Hypothesized Mean Difference	0	
Df	8	
t Stat	-3.65871	
P(T<=t) one-tail	0.003207	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.006413	
t Critical two-tail	2.306004	

Chart 1



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