The Relationship between Nursing Documentation and Incidence of Pressure Ulcers in Intensive Care Units

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UNIVERSITY OF MIAMI

THE RELATIONSHIP BETWEEN NURSING DOCUMENTATION AND INCIDENCE OF PRESSURE ULCERS IN INTENSIVE CARE UNITS

By

Dan Li

A DISSERTATION

Submitted to the Faculty of the University of Miami in partial fulfillment of the requirement for the degree of Doctor of Philosophy

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the requirement for the degree of
Doctor of Philosophy

THE RELATIONSHIP BETWEEN NURSING DOCUMENTATION AND
INCIDENCE OF PRESSURE ULCERS IN INTENSIVE CARE UNITS

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Pressure ulcer prevention requires consistent assessments and documentation. Documentation of pressure ulcers among providers is often inconsistent and can lead to a delay in proper treatment of pressure ulcers. 

**Purpose:** The purpose of this study was to explore the quality/comprehensiveness of nursing documentation of pressure ulcers and to investigate the relationship between nursing documentation and incidence of pressure ulcers in Intensive Care Units (ICUs). 

**Sample:** A convenience sample of ICU patients at the selected medical center comprised the study’s sample. All patients’ medical records of patients admitted to ICUs between the time periods of September 01, 2011 through September 30, 2012 were audited for the proposed study. Data used in the analysis were from 98 pressure ulcer patients and 98 non-pressure ulcer patients from four ICUs at the selected medical center. 

**Method:** This study used a retrospective, comparative, descriptive, correlational design to examine the relationship between nursing documentation and incidence of pressure ulcers in ICUs. 

**Instruments:** The quality and comprehensiveness of pressure ulcer documentation were measured by the modified European Pressure Ulcer Advisory Panel Pressure Ulcers Assessment Instrument and the Comprehensiveness in Nursing Documentation instrument. 

**Analyses:** The analysis of data was conducted using the PASW version 19.0. Descriptive statistics were used to describe the study sample and to calculate the frequencies of categorical variables, which are the aspects of pressure ulcer documentation. One-way ANOVA was used to compare
the scores of comprehensiveness of nursing documentation in four ICUs. Kruskal-Wallis H test was used to compare the quality score of pressure ulcer documentation in the four ICU settings. Pearson’s $r$ Correlation was used to explore the relationships between the quality and comprehensiveness of documentation of pressure ulcers as well as the incidence of pressure ulcers. A Chi square test was used to test differences between the pressure ulcer patients and non-pressure ulcer patients in terms of categorical variables (gender, nutritional status, and primary diagnosis). Patients with and without pressure ulcers were compared by age and length of stay. An independent sample $t$ test was also used to examine the differences in quality/comprehensiveness scores between dayshift and nightshift. Results: The results of this study showed a lack of quality/comprehensiveness in nursing documentation of pressure ulcers. There were no significant differences in pressure ulcer incidence across four ICUs. The MICU had the highest quality/comprehensiveness score among the four ICU settings. The correlations between quality/comprehensiveness of pressure ulcer documentation and incidence of pressure ulcers were not statistically significant. Patients with pressure ulcers differ from patients without pressure ulcers in length of stay and nutritional status. There were no statistically significant differences in quality/comprehensiveness scores of pressure ulcer documentation between dayshift and nightshift. Conclusions: The findings of this study have shown that staff nurses often perform poorly on documenting pressure ulcer appearance, staging and treatment. Nursing documentation of pressure ulcers did not provide a complete picture of patients’ care needs that require nursing interventions. The findings of this study can be used to design educational interventions for both student and staff nurses and has implications for nursing practice, policy and future research.
To my wonderful Grandma, Mom, Husband

and

my children, Alyssa and Felix

for their constant love and support
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I am honored to dedicate this dissertation to my Dad who always encouraged me to learn. His death still to this day saddens me, even though he died when I was in high school. I wish to express my deepest appreciation to and love for my family. Their patience and encouragement through my doctoral journey will never be forgotten.

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Chapter 1

Introduction

Many of complications experienced by hospitalized patients are preventable. Preventing pressure ulcers, reducing their incidence, and timely treatment of pressure ulcers is one of the most significant challenges facing health care today (Elliott, McKinley, & Fox, 2008). Diminished quality of life, pain and body image disturbances have all been reported as result of pressure ulcer development (Defloor, De Bacquer, & Grypdrorck, 2005). In addition, the presence of a pressure ulcer is associated with prolonged hospital lengths of stay, increased risk of healthcare-associated infections, and increased mortality (Hurt, Bergquist, Gajewski, & Dunton, 2006).

The Joint Commission of Accreditation of Health Care Organizations (JCAHO, 2008) reports that approximately 2.5 million patients develop pressure ulcers each year in the United States. Pressure ulcers are observed in patients across the care continuum including the intensive care unit (ICU). Scientific advances, superior medical technology, and innovative quality of care interventions have dramatically improved health care in the United States over the past 20 years (Vincent et al., 2006). However, the numbers of pressure ulcer acquired during hospitalization continues to increase. The Healthcare Cost and Utilization Project (2006) found that pressure ulcer occurrence increased 63% in hospitalized patients in the decade between 1993 and 2003, with only an 11% increase in the total number of hospitalizations during the same time period. By 2006, an 80% increase in pressure ulcer occurrence was documented by the Healthcare Cost and Utilization Project between 2003 and 2006 (Rosso, Steiner, & Spector, 2008). The prevalence of pressure ulcers in hospitalized patients ranges from 13% to 18%
(Elliott et al., 2008; Kottner, & Halfens, 2010). Estimated prevalence rates of 11-24% are commonly reported in long-term facilities (Tannen, Dassen, & Halfens, 2008). The prevalence of pressure ulcers in community dwelling adults has been reported to range from 7% to 33% (Stewart & Box-Panksepp, 2004). In the ICU setting, the prevalence rates of acquired pressure ulcers are cited as the highest among hospitalized patients, ranging from 14% to 42% (Whittington & Briones, 2004). The incidence rates of pressure ulcers in ICUs have been reported to vary between 1 and 56% (Keller, Wille, Van Ramshorst, & Van der Werken, 2002; Schoonhoven, Defloor, Buskens, & Grypdonck, 2002), with rates higher than in a non-ICU hospitalized patient population, where it varies between 1 and 11% (Defloor et al., 2005; Keller et al., 2002; Schoonhoven et al., 2002).

Pressure ulcers are costly to the health care system because pressure ulcer treatment and prevention consume large quantities of resources in terms of medications, equipment and nursing care. In the United States, hospital acquired pressure ulcers cost the healthcare system an estimated $2.2 to $3.6 billion dollars a year (JCAHO, 2008). As reported by Brem and colleagues in 2010, the average hospital charge per pressure ulcer was $48,000. According to Lyder (2006), approximately 1.3 million to 3 million adults have more than one pressure ulcer, which cost $5,000 to $70,000 per pressure ulcer per treatment. Depending on the severity of a pressure ulcer, costs can range from thousands to hundreds of thousands of dollars. Calculation of the costs for pressure ulcer treatment includes nursing care, supplies for dressings, medications, nutritional services, and physician fees. According to the Centers for Medicare and Medicaid Services (CMS) data from January through September 2007, the treatment of 257,412 stage III and stage IV
pressure ulcers cost Medicare $11 billion dollars (CMS, 2008). However, this view is very narrow since other health services were not calculated. One estimate for the other health services that must be considered includes the costs related to the patient and their family, and the cost of the disease to society.

Clearly, pressure ulcers are a major burden in terms of utilization of health care resources and personnel. The Center for Medicare and Medicaid Services (CMS) considers pressure ulcers to be reasonably preventable and has included them on its list of “no pay” conditions. CMS stopped reimbursement for hospital-acquired stage III and stage IV pressure ulcers starting in October, 2008 (CMS, 2008). This reimbursement change has forced hospitals around the country to develop new programs to prevent pressure ulcers in hospitalized patients. In addition, the JCAHO views the development of pressure ulcers as a sentinel event and has issued substantial financial penalties to hospitals that do not follow established federal regulations and guidelines for both prevention and treatment of pressure ulcers (Lyder & van Rijswijk, 2005). Consequently, the decision required ICUs to be more vigilant than ever in ensuring that community acquired pressure ulcers were identified on admission and clearly documented as such. Prevention is usually considered to be more cost-effective than treatment (Defloor et al., 2005). Pressure ulcer prevention may cost as little as $500, with assessing pressure ulcer development risk, skin care, using pressure-reducing support mattress, nutrition and education (Padula, Mishra, Makic, & Sullivan, 2011). Thus, there is an urgent need to identify risk factors for pressure ulcer development in patients admitted to ICU settings.

In order to control cost and provide optimal care, many healthcare organizations are utilizing innovative and comprehensive strategies to ensure accurate pressure ulcer
identification, documentation and treatment. However, one problem is that nurses do not
document pressure ulcers accurately and comprehensively (Gunningberg, Dahm, &
Ehrenberg, 2008; Gunningberg & Ehrenberg, 2004; Gunningberg, Fogelberg-Dahm, &
Ehrenberg, 2009). It becomes more important than ever for nurses to document a
thorough skin assessment on adults admitted to the hospital. The focus of this study is to
investigate the quality and comprehensiveness of pressure ulcer documentation and its
relationship to the incidence of pressure ulcers.

### Background of the Study

#### Definition of Pressure Ulcers

The European Pressure Ulcer Advisory Panel and the National Pressure Ulcer
Advisory Panel (2009) define a pressure ulcer as

… localized injury to the skin and/or underlying tissue usually over a bony
prominence, as a result of pressure, or pressure in combination with shear. A
number of contributing or confounding factors are also associated with pressure
ulcers; the significance of these factors is yet to be elucidated (p. 7).

Pressure ulcers are areas of local tissue trauma usually developing where soft
tissues are compressed between bony prominences and any external surface for
prolonged time periods (Pieper, 2005). Pressure ulcers vary from superficial tissue
damage to deep craters exposing muscle and bone. They are complex lesions of the skin
and underlying structures and vary considerably in size and severity. Pressure ulcers are
the result of mechanical injury to the skin and underlying tissue. An understanding of the
pathophysiology of pressure ulcers has evolved as research and new advances in the area
of basic cellular mechanisms and clinical practice has occurred (Rainey, 2002).
Etiology of Pressure Ulcers

It is generally accepted that pressure ulcers are causally related of the effects of three tissue forces: pressure, shear, and friction (Pieper, 2005). The National Pressure Ulcer Advisory Panel (NPUAP) initiative to agree on standard terms and definitions relating to support surfaces provides useful definition for all three forces.

**Pressure.** Pressure is a perpendicular force that compresses tissues, typically between a bony prominence and an external surface, and can result in decreased tissue perfusion and ischemia (Dealey, 2009). One of the earliest studies on the etiology of pressure ulcers was reported in 1852 by Brown-Sequard. He suggested that externally applied pressure on the skin surface along with moisture were important factors for pressure ulcer development. Paget (1873) suggested that unrelieved pressure was the primary cause of a pressure ulcer. Paget also introduced the term “bed sores” to describe pressure ulcer lesions. Charcot (1879) postulated that nerve injury would trigger the release of a neurotrophic factors that lead to tissue necrosis after observation of pressure ulcers that developed in both paraplegic and debilitated patients.

Murno (1940) suggested that the occurrence of pressure ulcer and tissue destruction was dependent on a number of conditions including the bony prominence underneath the tissue, the thickness of the padding tissue, the duration of unrelieved loading and the integrity of the skin tissue. The pressure-time relationship established by Reswick and Rogers (1976) was somehow adopted as a clinical guideline for pressure ulcer management and were considered as one of the influencing parameters that contributed to pressure ulcer formation. Pressure causes a decrease in capillary blood flow and occlusion of blood perfusion leading to tissue ischemia.
(1981) concluded that the average intravascular capillary pressure was 32 mmHg. Sitting on a hard surface resulted in local pressure of 300-500 mmHg (depending on the surface area and person’s weight); lying in bed causes a local pressure of 50-94 mmHg on the scapula, sacrum and heels. Thus, results from these experiments demonstrated that both the intensity and duration of such pressure produced a pressure ulcer. Therefore, reducing the intensity of the pressure through pressure-relieving surface use is as important as frequently repositioning of a patient to reduce pressure points (Reuler & Cooney, 1981).

**Shear.** Shear is a force parallel to the skin surface. Whereas pressure acts perpendicularly to cause ischemia, shear causes ischemia by displacing blood vessels laterally by narrowing the vessel and impeding blood flow to the tissue (Dealey, 2009). Shear is affected by the amount of pressure exerted, the coefficient of friction between the materials contacting each other, and the extent to which the body makes contact with the support surface. When the head of the bed is raised or a patient slides downward in a chair, the body is angulated above the support surface, causing skeletal muscle and deep fascia to slide downward with gravity while the skin and superficial tissues adhere to the chair surface or bed linens. This shear force can cause a change in the angle of the vessels, and thus, compromise blood supply, resulting in ischemia, cellular death, and tissue necrosis (Rainey, 2002). Shear was first described as a major contributor to pressure ulcer development by Reichel in 1958. He stated that the effect of shearing forced wound concentrate in the deeper portion of the superficial fascia, stretching the blood vessels thus leading to tissue necrosis. Rudd (1962) supported Reichel’s definition that shearing force was a factor that continued to deep tissue necrosis.
In 1968, Palmer and colleagues discussed the effect of pressure and shear on the tissue surface in relation to tissue breakdown. Palmer concluded that shear alone cannot cause damage to tissue but the combination of other stresses within the tissue can induce damage that is different from the damage caused by pressure alone. Other studies (Bennett & Lee, 1988; Bryant, 1992) suggested that 40% of pressure ulcers could result from shear injury, especially to deep tissues overlying bony prominence. Zhang, Turner-Smith and Roberts (1994) studied the reaction of skin and soft tissue to shear force applied externally to the skin surface by examining skin blood flow using laser Doppler flowmetry. They reported that skin blood flow was reduced when either pressure or shear forces was increased. In 2006, Nakagami and colleagues found that shear was often responsible for tunneling and sinus tracts which are both associated with pressure ulcers. Shear force combined with a small amount of pressure has been recognized as a major factor in the development of Stage II pressure ulcers (Nakagami et al., 2006).

**Friction.** Friction is the adherent force resisting and shearing movement of the skin, which may result in denuded areas of the dermis through repeated epidermal shedding or avulsion of sheets of epidermis (Dealey, 2009). The role of friction in pressure ulceration is generally described in terms of poor lifting and handing techniques, resulting in patients being “dragged” rather than lifted clear of the bed. Pressure combined with friction produces ulcerations at lower pressure gradients than just pressure alone. In 1973, when Dinsdale was exploring the pathogenesis of pressure ulcers using pigs, he found that friction separated the epidermis above the basal cells. When pressure
alone was applied, no pathological changes were observed for pressures of below 150 mmHg. When pressure plus friction was applied, pathological changes were observed for all pressure above 45 mmHg.

Friction forces are also increased in the presence of moisture. Moisture contributes to pressure ulcer development by removing oils on the skin, making it more friable, as well as interacting with body support surface friction. Constant moisture on the skin leads to maceration of the tissues. Prolonged exposure of tissue injury to moisture from perspiration, urinary or fecal incontinence, or wound exudates further weaken the intercellular bonds in the epidermal layers, causing maceration and epidermal ulceration (Parish, Witkowski, & Crissey, 1983). Ohura and colleagues (2005) compared three heel dressings for friction properties in a laboratory setting and suggested that dressings with a low friction external surface can significantly reduce shear force. Lindholm and colleagues (2008) reported that sub-scores for friction on the Braden Scale for predicting pressure ulcer risks in patients with hip fractures were significantly correlated with the development of pressure ulcers at the time of discharge.

**Clinical Classification of Pressure Ulcers**

Pressure ulcers are commonly classified according to grading or staging systems based on the depth of tissue destruction. The stage is determined on initial assessment by noting the deepest layer of tissue involved. Several classification schemes have been developed for pressure ulcers (Guttmann, 1955; Parish et al., 1983; Shea, 1975; Yarkony et al., 1990). The earliest classification system in the literature was developed by Guttmann in 1955. In 1975, Shea developed the first well-documented staging method, consisting of a numeric classification system that was based on pathological condition.
Shea’s system consisted of four grades, with I defined as an acute inflammatory response while grade IV was defined as penetration of the fascia and severe undermining. Classification systems were also developed in 1959 by Campbell, in 1976 by Barton, and in 1981 and 1985 by Daniel, Priest, and Whealey.

In 1989, the NPUAP developed a four-stage system similar to that of the previously developed systems during the first Consensus Conference. The classifying system has been standardized in the United States since the Agency for Health Care Policy and Research (AHCPR) accepted the NPUAP (1989) consensus definition for staging (Table 1). The definition of Stage I pressure ulcer was updated in 1997 by NPUAP to address detection in darker skin tones and was revised to “nonblanchable erythema of intact skin, the heralding lesion of skin ulceration. In individuals with darker skin, warmth, edema, or hardness, may also be indictors (p. 80)”.

In 2001, NPUAP discussed the concept of another etiology for pressure ulcers. If the pressure ulcers begin as “purple” or “bruised” looking tissue, there may have a propensity to become large stage IV ulcers quickly. The term ‘deep tissue injury’ was selected because it was likely that the etiology of these pressure ulcers was high levels of pressure at the bone-muscle interface. During its Consensus Conference in 2005, NPUAP confirmed that deep tissue injury is a form of pressure ulcer and the addition of deep tissue injury into the staging language would help guide more aggressive, early, appropriate treatment interventions that may lead to better outcomes. In 2009, EPUAP and NPUAP revised the definition of unstageable ulcers to classify an ulcer with a necrotic tissue as unstageable, when the depth of the ulcer can be seen. The new definition is “Full thickness tissue loss in which the base of the ulcer is covered by slough
(yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed (European Pressure Ulcer Advisory Panel & National Pressure Ulcer Advisory Panel [EPUAP& NPUAP], 2009, p. 9).”

There are six stages of pressure ulcer classification, ranging from suspected injury and initial redness to full-thickness tissue loss and necrosis. Despite the numbered stages of severity, the development and healing of pressure ulcers do not necessarily pass consecutively from one stage to the next. The six stages are defined in Table 2.

**Pressure Ulcer Prevention Risk Assessment Scales**

The focus of pressure ulcer prevention has historically revolved around identifying risk factors and providing preventive interventions aimed at reducing those factors. An accurate identification of what places a person at risk for developing a pressure ulcer is crucial in order to identify those at risk and initiate appropriate prevention interventions. Therefore, the need for a valid and reliable pressure ulcer risk assessment tool that can reduce the prevalence and incidence rate is undeniable (Thomson & Brooks, 1999). Risk assessment scales (RAS) were introduced to the healthcare community as early as the 1950’s. As a tool, RAS establishes a point scale according to a group of parameters regarded as risk factors for the development of pressure ulcers (Pancorbo-Hidalgo, Garcia-Fernandez, Lopez-Medina, & Alvarez-Nieto, 2006). The cut-off score will alert practitioners to implement interventions for at-risk patients. Also, the use of a risk assessment tool allows for targeting of interventions to specific risk factors for individual patients. Approximately 17 assessment tools are used in clinical practice, the Norton scale and the Braden scale are widely used for pressure ulcer prevention (Rapp et al., 2010; Stotts & Gunningberg, 2007). Selection of which risk
assessment instrument to use is determined by reliability of the tool for the intended raters, predictive validity of the tool for the population, the sensitivity and specificity of the instrument under consideration, and the ease of use and time required for completion (Serpa, Santos, Peres, Cavicchioli, & Hermida, 2011).

The Norton scale is the oldest risk assessment instrument. The Norton Scale, developed in 1961, was designed to identify the need for prevention of pressure ulcers in elderly hospital patients and nursing home residents. The scale was developed from clinical experience and consists of five subscales: physical condition, mental state, activity, mobility, and incontinence. Each of the subscales is scored from 1 to 4 with the sum of total scores ranging from 5 to 20. There are clear criteria for each rating (see Table 3 for a description of the subscales and the meaning of the scores). The scale does not take into account the nutritional status of the patient, etiological factors or surgery. The predictive validity of the scale has been examined in different settings. A specificity ranging from 26% to 89%, a sensitivity from 63% to 100%, a predictive value positive test (PVP) ranging from 9% to 70%, and a predictive value negative test (PVN) from 35% to 93% have been presented in different studies (Bergstrom, Braden, Laguzza, & Holman, 1987; Bridel, 1993; Chan, Chow, French, Lai, & Tse, 1997; Dealey, 1989; Goldstone & Goldstone, 1982; Pang & Wong, 1998; Wardman, 1991).

The Braden Risk Assessment Scale is most commonly used in North America (Balzer et al., 2007). It was developed in 1987 and is composed of six pressure ulcer risk criteria: sensory perception, moisture, activity, mobility, nutrition, friction and shear (Bergstrom et al., 1987). Patients are assessed in relation to these categories. Each category is rated on a scale of 1 to 4 excluding the ‘friction and shear’ category which is
rated on 1 to 3 scale. This combines for a possible total of 23 points (see Table 4 for a description of the subscales and the meaning of the score). Lower scores indicate lower function and higher risk for developing a pressure ulcer. The cutoff score for hospitalized patients is considered to be 16 or less, indicating at-risk status. In elderly patients, the cutoff score of 17 or 18 is a better predictive value of risk status (Halfens, Van Achterberg, & Bal, 2000). The Braden Scale has relatively high interrater reliability when it has been tested in acute care ($r = .86 \text{ and } .89$) and long-term care settings with several levels of nurse raters ($r = .84 \text{ and } .94$) (Bergstrom et al., 1987; Halfens et al., 2000; Magnan & Maklebust, 2008). Its validity has been established with expert opinion, and predictive validity has been demonstrated with good sensitivity and specificity in several acute care settings.

**Nursing Documentation**

The current healthcare system focuses on reducing health care costs, improving healthcare quality, enhancing patient access to health care services and securing enhanced outcomes. The associated patient assessment, planning, intervention and evaluation activities demand greater and greater data, information and knowledge resources for decision making by patients and healthcare providers. With the advent of the computer, software was developed to assist healthcare providers in documenting patient care activities. Today, the traditional paper-based patient record is no longer exempt from the technological evolution. Computerized documentation has been rapidly replacing paper because the electronic health record promises significant advances in patient care in terms of readability, availability, and data quality (Holroyd-Leduc, Lorenzetti, Straus, Sykes, & Quan, 2011).
Defining Nursing Documentation

In any written or electronic form, documentation is generated information about a patient that describes the care or service provided to the patient (White, 2003). Health records may be paper documents or electronic documents, such as electronic medical records, faxes, e-mails, audio or video tapes and photographs. Through documentation, nurses communicate their observations, decisions, actions and outcomes of these interventions for clients. Documentation is an accurate account of what occurred and when it occurred (Iyer & Camp, 1995).

Documentation is a valuable tool to assess client progress and determine if interventions are effective, and to identify and record changes to the plan of care as needed (Eggland & Heinemann, 1994). Documentation is an important resource of data for making observations about the client’s condition as well as facilitating nursing research and managing resources. Documentation has the potential to improve the quality of health care since tracking of patient events are possible. Nursing documentation also includes incident reports which can reflect on nursing practice and provide needed changes based on evidence about an event (White, 2003).

Nursing documentation is a necessary method for demonstrating that nurses have applied nursing knowledge, judgment and skills according to professional protocols and standards (Iyer & Camp, 1995). Documentation may be used as evidence in legal proceedings such as lawsuits, coroner’s inquests, and disciplinary hearings through professional regulatory bodies. In a court of law, the client’s health record serves as the legal record of the care or service provided (Eggland & Heinemann, 1994). Nursing care
will be measured according to the nursing documentation based on the standard of a reasonable nurse with similar education and experienced in a similar situation (White, 2003).

**Electronic Health Record**

In 2004, President George W. Bush introduced a mandate for an electronic health record (EHR) for most Americans by 2014 (Carpenito-Moyet, 2009). The Office of the National Coordinator for Health Information Technology was established to coordinate the development of this program. Two goals to guide the adoption of information technology were the adoption of EHRs by healthcare providers and the use of personal health records by patients (Carpenito-Moyet, 2009). President Bush’s mandate led to an accelerated implementation rate for hospital electronic documentation system. As hospitals attempt to fully realized the promise of EHRs, the American Hospital Association’s 2007 survey reported that hospitals continue to accelerate their use of EHRs, with 68 percent reporting fully or partially implemented EHRs in 2006 (AHA, 2007).

In 2009, The President of the United States signed the American Recovery and Reinvestment Act (ARRA) of 2009. Part of this law is the Health Information and Technology for Economic and Clinical Health Act, which addresses factors related to health care. The American Recovery and Reinvestment Act of 2009 announced that hospitals have less than 18 months to implement more than 20 electronic health record (EHR) functionalities. On the other hand, the end result will be improved patient care along every important parameter (quality, safety, effectiveness) while simultaneously improving a hospital's operational efficiencies.
Basic EHR systems have been defined as:

(1) A longitudinal collection of electronic health information about a person, or healthcare provided; (2) immediate electronic access to a person or population level information by authorized users; (3) provision of knowledge and decision-support that enhance the quality, safety, and efficiency of patient care; and (4) support of efficient processes for healthcare delivery” (Institute of Medicine of the National Academies, 2003, p. 1).

Throughout healthcare facilities, there are various forms of EHR systems that have different functions. Most EHRs are based on professional nursing organization standards, regulatory requirements, and other evidence-based practice sources (Jamal, McKenzie, & Clark, 2009). EHRs that are based on evidence based practice (EBP) have eight core functions: decision support, health information and data, results management, order entry, electronic communication and connectivity, patient support, administrative processes and population health management (Jamal et al., 2009). An EHR refers to an information repository where patient data are stored in digital form. It contains retrospective, concurrent, and prospective information and its primary purpose is to support continuing, efficient and integrated quality health care. The combination of structured data and the development of a robust national vocabulary delivers a consistent representation of what healthcare providers do during the delivery of care. Standardized documentation allows the use of data from EHRs to learn about health care, preventive actions, and outcomes of nursing interventions. Moreover, EHRs have been shown to facilitate communication between health care professionals (HCPs), promote safety, reduce costs, and facilitate EBP (Poon et al., 2010; Wrenn, Stein, Bakken, & Stetson, 2010).
Nurses play an important role in the adoption, assessment and use of EHRs. Törnvall, Wahren and Wilhelmsso (2007) found that nurses responded positively to the structured form of the EHR because documentation was facilitated, clinical decisions were documented, and the overall evaluation of patient care was assessed. Mahler and colleagues (2007) demonstrated that after introduction of a computer based nursing documentation system, the quality of nursing documentation improved as stated by both auditors in their overall assessment of the documentation and the legal requirements for documentation.

There are advantages of using the EHR. Descriptions about patient assessment results are one advantage of the EHR. Another advantage of the EHR is improved communication among HCPs since the data is readily available and can improve the quality of patient care. The EHR allows physicians to have access to patient health information and data to facilitate timely clinical decisions. The records are able to be viewed by the physician when and where they are needed, which allows for the prevention and treatment of pressure ulcers. Other benefits include data available for health service researchers and public health officials. In order to coordinate with public health monitoring, quality monitoring, and research, the EHR provides easier access to collect information (Holroyd-Leduc et al., 2011).

**Documentation of Pressure Ulcers**

Part of the solution to the problem of pressure ulcers was the provision of guidelines. According to 2007 NPUAP guidelines, initial assessment of pressure ulcers includes the location, stage, measurement of the ulcer, presence of sinus tracts, undermining, tunneling, exudates, and necrotic tissue. In order to evaluate healing, a
systematic and routinely scheduled reassessment is necessary. Documentation of pressure ulcer reassessment must be completed periodically and recorded preferably on a table or chart. According to NPUAP (2007), pressure ulcers should be uniformly described to facilitate communication among staff and to ensure adequate monitoring of the progress toward healing. To determine adequacy of the treatment plan, it is essential to monitor pressure ulcers at consistent intervals. Assessment and documentation should be conducted at least every shift, unless there is evidence of deterioration, in which case both the pressure ulcer and patient’s overall management must be reassessed immediately (NPUAP, 2007).

Frequently, documentation among providers is inconsistent and can lead to a delay in proper treatment of the ulcer. Previous studies have demonstrated that documentation of pressure ulcers is inadequate. One retrospective study (Pieper, Mikols, Mance, & Adams, 1990) of 167 medical records compared information recorded in nurses’ notes to the standards of pressure ulcer care. Nurses’ notes were examined for documentation of pressure ulcer location, color, wound measurement or description of size, drainage characteristics, odor, evidence of healing and the nature of the surrounding tissue. The study results demonstrated that the documentation did not adhere to the standards. Only 16.86% of the notes contained actual wound measurement and 20.05% had size descriptions. Only 12.64% described evidence of healing. Gunningberg, Fogelberg-Dahm, and Ehrenberg (2009) conducted a study and found low accuracy in nurses’ and physician’ documentation of pressure ulcers when compared with the physical examination of patients. Medical records were audited for accuracy of documentation when compared with physical assessment of patients. Descriptions of
wound size and other characteristics were flawed, assessments were not correctly documented, and pressure ulcer prevention was poorly recorded. Comprehensiveness was found to be lacking in the documentation of pressure ulcer care. Stemitzer, Wild, and Hoelzenbein (2007) conducted a study to determine the variability and accuracy of assessment of chronic wounds by physicians and nurses working with patients with chronic wounds. The results showed that documentation of wound size and depth varied between physicians and nurses for the same ulcer. In an effort to decrease the rate of hospital acquired pressure ulcers, Ballard and colleagues (2008) conducted a study to develop a focused and an aggressive plan to reduce the rate of hospital acquired pressure ulcers in the ICU. The researchers first looked at the nursing assessment and documentation. The results revealed that routine skin assessments and documentation were inconsistent. One of the strategies is to redesign risk assessment and documentation by developing a wound chart similar to a Medication Administration Record (MAR). As a result, the nurses were able to chart a careful skin assessment on the wound MAR upon admission.

Pressure ulcer prevalence and incidence rates can be calculated based on auditing EHRs (Defloor et al., 2005). Although the benefits of using EHRs to record pressure ulcers are many, there are still many challenges that need to be developed before these systems can work properly. Nurses need to be educated with the necessary skills to manage information with technology and document pressure ulcer care correctly in EHRs. For example, some nurses may record pressure ulcers as an incision because an incision template in EHRs next to wound documentation is very similar to the wound
template. Others do not know or are not familiar with the template of wound description thus, they prefer not to document on the wound description page (Li & Korniewicz, 2013).

Another problem is that sites to upload digital photographs into the EHR do not exist. Photographing wounds should be a preferable method of presenting the wound size and other characteristics of the ulcers in order to assist HCPs to evaluate day to day care. Serial photography as a means for measuring pressure ulcer healing and to assess the efficacy of therapy is also necessary. Rates of healing and measures of therapeutic efficacy are more readily appreciated when the data are held in a visual format. This drawback makes incomplete pressure ulcer documentation in spite of photographic documentation available in the paper-based record (Li & Korniewicz, 2013).

In addition, the reminder to “avoid missing documentation” is not strong enough to force nurses to record on every page in the EHR. For example, nurses can ignore the wound description section if the patient does not have any wound or pressure ulcers. However, it is possible that nurses may overlook that section and forget to document. Therefore, if the software designer can improve the system by forcing nurses to document “N/A” or “None” rather than leaving it blank, the wound documentation page will attract the nurses’ attention and remind them to document the presence of a pressure ulcer (Li & Korniewicz, 2013).

**Problem Statement**

Pressure ulcer treatment requires consistent objective assessments and documentation in order for proper treatment to occur (Lyder & van Rijswijk, 2005). In
many instances, providers’ documentations vary or there is inadequate documentation regarding pressure ulcer condition, treatment, and preventive measures (Gunningberg et al., 2009). These deficiencies have consequences for the quality and safety in care in that errors could occur and the continuity of care for patients may be hampered. Patient records need to reflect valid and reliable data on pressure ulcers and actions taken for prevention and treatment (Gunningberg & Ehrenberg, 2004). To date, however, knowledge about the reliability of such data is limited.

Poor pressure ulcer documentation can cause significant human and financial costs associated with the occurrence of pressure ulcers. Limited or absence of the ongoing documentation of the skin assessment can result in lengthening the hospital stay, potentially increasing pain due to lack of treatment, increased cost due to the increase in complications or consequences, and increased human resources to care for the skin breakdown once it advances. Pressure ulcers reduce quality of life and pose a considerable worldwide economic quandary (Pham & Stern, 2012).

**Purpose of the Study**

The purposes of this dissertation are 1) to explore the quality and comprehensiveness of nursing documentation of pressure ulcers, and 2) to investigate the relationship between the nursing documentation of pressure ulcers and the incidence of pressure ulcers in Intensive Care Units (ICUs).
Research Questions

The following research questions will be explored:

1. What is the relationship between quality and comprehensiveness of the nursing documentation on the monthly incidence of pressure ulcers in ICUs located in a South Florida Hospital?
2. Do the patients with pressure ulcers differ in the patient characteristics (age, gender, length of stay, nutritional status and primary diagnosis) from the patients without pressure ulcers?
3. Are there associations between staff nurses characteristics (shift and ICU setting) and the quality/comprehensiveness of pressure ulcer nursing documentation?

Research Hypotheses

1. There is a relationship between quality and comprehensiveness of the nursing documentation on the incidence of pressure ulcers in Intensive Care Units (MICU, SICU, CVICU, and NICU).
2. Patients with pressure ulcers differ in the patient characteristics (age, gender, length of stay, nutritional status and primary diagnosis) from the patients without pressure ulcers.
3. There are associations between staff nurses characteristics (shift and ICU setting) and the quality/comprehensiveness of pressure ulcer nursing documentation.

Significance of the Study

Hospitals around the country are also scrambling to put new programs in place to prevent pressure ulcers after the CMS announced that as of October 2008, it will no
longer reimburse hospitals for treating eight “reasonably preventable” conditions including preventable pressure ulcers (CMS, 2008). Thus all the following regulatory requirements described have increased the national interested in the field of prevention or elimination of pressure ulcers, especially in ICUs.

**Regulatory Implications**

Despite major technical advances in health care, the incidence and prevalence of pressure ulcers have not declined in health care facilities. The Agency for Health Care Policy and Research (AHCPR, 1992) recommended that an initial pressure ulcer risk assessment be completed on each patient upon admission and reassessment be performed periodically based on the patient’s condition. Further, AHCPR recommended that a valid risk assessment tool, prompt identification of at-risk patients, and timely implementation for the prevention of pressure ulcers be initiated in each health care facility. Once an initial patient assessment is completed, clear documentation related to the patient’s skin should be clearly recorded. The recommended guidelines from AHCPR include documentation of pressure ulcers to ensure continuity of care, aid in recording changes associated with skin breakdown, and to maintain a future record of care.

In 1994, the American Nurses Association (ANA) launched the Safety & Quality Initiative to explore and identify the empirical linkages between nursing care and patient outcomes and this work resulted in the development of the National Database of Nursing Quality Indicators (NDNQI). The NDNQI receives data from more than 900 facilities nationwide and publishes quarterly reports on the quality of nurse staffing and patient outcome indicators of hospitals by individual units, including data on the rate and stage of hospital-acquired pressure ulcers (Hart et al., 2006). Data are then summarized and
published in quarterly reports that allow participating facilities to compare their results with previous quarters and with other hospitals across the nation that have similar characteristics. NDNQI data on pressure ulcers can be used as an indicator of nursing care quality and as a tool for guiding quality improvement initiatives. Both the NDNQI and the AHCPR developed clinical practice guidelines for the treatment of pressure ulcers.

In 2009, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) released new National Patient Safety Goals (NPSGs) and recommended that healthcare organizations implement guidelines associated with the prevention of pressure ulcer development among patients admitted to their healthcare facilities. Currently, healthcare organizations must meet all the NPSGs including the prevention of pressure ulcer when surveyed by JCAHO. This regulation has been used as a quality indicator associated with patient safety.

**Summary**

Pressure ulcers are commonly used as a quality indicator for nursing care regarded as a feasible area for improvement because of the considerable knowledge about risk factors and preventive actions that are available. To assure pressure ulcer prevention and timely treatment, it should be a requirement that every patient at risk for pressure ulcers is identified and that every pressure ulcer is documented comprehensively and supplemented with a color photograph. Although Electronic Heath Record provides the template to document practices for various areas of care (including pressure ulcer care), previous studies continue to report that data were often lacking and existing information was not specific enough in the documentation of nursing care in health records.
Therefore, there is an urgent need to investigate the quality and comprehensiveness of nursing documentation of pressure ulcers and the relationship between the nursing documentation of pressure ulcers and the incidence of pressure ulcers in Intensive Care Units.
Chapter 2

Review of Literature

History of Pressure Ulcers

There is evidence in the literature that descriptions of pressure ulcers existed as early as 3000 B.C. However, the bulk of the literature associated with pressure ulcer prevention was published after World War II, when this complication developed among immobilized patients (Parish, Witkowski, & Crissey, 1983). Prior to World War II, patients with spinal cord injuries and pressure ulcers had less than a 20 percent survival rate. These wounds were thought to be a sign of impending death since pressure ulcer patients experienced severe fluid and protein loss that led to hypoproteinemia, malnutrition, osteomyelitis, myonecrosis, necrotizing fasciitis, amyloidosis, sepsis, and gangrene (Levine, 2005).

The original terminology used to describe a pressure ulcer was the term ‘bed sore’ which described ulcer formation. However, more common medical terminologies associated with this problem include decubitus ulcers, decubiti and pressure sores. The word 'decubitus' is derived from a Latin expression referring to a lying position which was first coined by French physicians and nurses in the 1700's (Parish et al., 1983) because they believed that pressure ulcers were caused by lying in a position for a long time. To date, the term 'pressure ulcer' is now the preferred medical term, since it describes the central pathophysiological process behind ulcer formation (EPUAP & NPUAP, 2009).
Historically, Florence Nightingale’s statement in *Notes on Nursing* “If he has a bedsore, it’s generally not the fault of the disease, but of the nursing” (Nightingale, 1859, p. 8) was one of the earliest and most specific mention of the nurses’ role in pressure ulcer care and prevention. It was noted by Nightingale that when nurses provided direct care to patients and assisted in turning bed-ridden patients that the incidence of pressure ulcers decreased. Pressure ulcers are the fourth leading preventable error in the United States, and state and federal regulations consider their presence an indicator of poor-quality health care (Duncan, 2007). Currently, most health professionals suggest that the development of pressure ulcers is not solely the scope of nursing. Rather, it involves the coordination primarily between nursing, medicine, physical therapy, and nutrition. However, the coordination of patient care in the prevention of pressure ulcers continues to be a nursing process function (Dealey, 2009).

**Risk Factors Associated with Pressure Ulcers**

There is extensive literature that profiles the patient population most “at-risk” for pressure ulcers. Pressure ulcers and the risk factors that contribute to their development have been studied for almost 50 years. However, an existing conceptual framework to explain the associations between risk factors and pressure ulcer development generally does not have a specific patient population orientation. To identify nurse and patient-specific pressure ulcer risk factors, a conceptual framework specific to pressure ulcer risk in ICU patients is needed.
Nurse Characteristics

**Shift.** Night shift nurses typically get less sleep than their day working counterparts. The sleep length of night shift nurses is 15-20% that of day shift nurses (Peate, 2007). Compared to night time sleep, day sleep is of a poor quality due to disruptions of frequent awakening and deviation from the normal REM/non-REM sleep stage pattern. The chronic sleep deprivation of night shift workers can have significant negative effects on job performance and social functioning (de Cordova, Phibbs, Bartel, & Stone, 2012).

There are currently only two published studies regarding nurses’ actual reported barriers to carry out pressure ulcer prevention. Moore and Price (2004) reported the following barriers: lack of staff, lack of time, patient specific problems, lack of aids, lack of equipment, and unstable patients. More recent research performed by Smith and Waugh (2009) also asked the participants to identify barriers in pressure ulcer care. The following barriers were reported: patients are too heavy, not enough time, not enough staff to help, patient refusal/non-compliant and equipment not available. Both studies identified insufficient staff and time as barriers, as well as patient and equipment specific issues. Although both research studies identified and reported perceived barriers to pressure ulcer prevention and treatment, neither included the relationship between nurses’ shift, the quality of nursing documentation of pressure ulcers, and incidence of pressure ulcers.

Given the impending high incidence of pressure ulcers in ICUs and poor nursing documentation, understanding the relationship between these variables is particularly
relevant and timely (Gunningberg et al., 2008). It will help to elucidate the impact of nurses’ shift on the development of pressure ulcers in the ICUs.

**ICU setting.** Pressure ulcers remain a common health problem within different health care settings, especially in the intensive care units. Patients in ICUs have a high risk of developing pressure ulcers (Kottner & Halfens, 2010; Whittington & Briones 2004). This is because they are almost invariably limited in their overall physical activity and mobility, resulting in a decreased ability to actively change their position in bed. Especially in the surgical ICU, one of the surgery-related risk factors is having an extended period of pressure during the surgical procedure, remaining wet, metabolic and circulatory changes related to the surgical procedure and anesthesia (Armstrong & Bortz, 2001). Lahmann, Kottner, Dassen and Tannen (2011) conducted repeated cross-sectional surveys in a German hospital to compare the hospital-acquired pressure ulcers rate between general medical and surgical wards and ICUs. The results showed that the hospital-acquired pressure ulcer rate in general hospital wards was 3.9% and the rate was 14.9% in intensive care. Patients treated in an ICU are at greater risk of developing pressure ulcers compared to patients treated in hospital wards.

Sayar and colleagues (2009) conducted a descriptive and prospective study to determine incidence of pressure ulcers in patients at risk according to the Waterlow scale in ICUs and to evaluate risk factors in critically ill patients. The results showed that although there were differences in medical and surgical ICUs that affect the development of pressure ulcers, no statistically significant differences were found between the ICUs for incidence of pressure ulcers.
Shahin, Dassen, and Halfens (2008) conducted a cross-sectional study to assess pressure ulcer prevalence in ICUs patients, patients’ characteristics and preventive measures related to pressure ulcer prevalence in surgical and medical ICUs. The results of this study revealed that only minor differences were found between the mean prevalence rates of surgical and medical intensive care, which fluctuated from 25.1% to 28.6%. The results of this study also noted that there was a significant difference among intensive care specialties regarding the percentage of patients at risk for pressure ulcer development, with the highest number of patients being found in surgical wards (92.7%) and the lowest number of patients in medical wards (77.4%).

Additionally, Shahin, Dassen, and Halfens (2008) conducted a longitudinal study to assess pressure ulcer incidence in intensive care patients. This study compared pressure ulcer incidence and the course of pressure ulcers after the admission to an intensive care unit. The results of this study revealed the highest incidence was found in the surgical intensive care unit, while no pressure ulcers developed in the cardiac intensive care unit. However, the structures of the hospitals participating in this study did not include the recovery and intermediate or step-down wards. This indicates that all surgery patients were admitted to the ICUs, even though they only stayed there for a short period of time.

Another cross-sectional study was conducted by Shahin, Dassen, and Halfens (2009) to assess the allocation of preventive measures for patients at risk for pressure ulcers in surgical, interdisciplinary and medical intensive care units. The results revealed that there was no significant difference among ICU specialties regarding the number of patients at risk for pressure ulcers, age, body mass index, and Braden score.
Although there are no contradictory findings on the effect of ICU setting factors on pressure ulcer development from the aforementioned literature review, the findings are unique for the setting and population and cannot be generalized to other intensive care settings. More research is necessary to compare the incidence of pressure ulcers among different ICUs, which will provide an insight into pressure ulcer incidence as well as factors related to pressure ulcer incidence in intensive care patients.

**Patient Characteristics**

**Gender.** Various researchers have identified gender factors for the occurrence of pressure ulcers. Baumgarten and colleagues (2006) performed a prospective cohort study of 3,233 inpatients at two hospitals and found male gender was associated with pressure ulcer incidence. It may be because women have a lower waist–hip ratio and larger hip circumference than men. Thicker gluteal subcutaneous fat may protect women from the effects of pressure on the part of the body that is most vulnerable to immobility-related pressure ulcers.

In a prospective cohort study of patients admitted to a 500-bed long-term-care facility in Japan, Okuwa and colleagues (2006) found that the risk of developing lower extremity pressure ulcers for male patients was 2.95 times greater than for female patients. However, the researchers stated the mechanism by which male gender is associated with lower-extremity pressure ulcer development in bedfast older adult patients remains unclear. Fisher, Wells and Harrison (2004) used a cross-sectional study to explore factors associated with pressure ulcers in adults in acute care hospitals. They also found that male gender was associated with pressure ulcers when nutrition was altered. However, the researchers stated that this finding is difficult to explain because males generally have
better tissue tolerance than females due to their muscle mass and anabolic hormones.

Howard and Taylor (2009) reported that women were more likely to develop pressure ulcers compared to men in this sample because women were more physically impaired as indicated by higher rates of immobility, dependence in mobility, and dependence in transfer. Whereas, gender was not found to be predictive of pressure ulcer development in Anthony and colleague’s (2003) 5 year study of the Waterlow Risk Scale of 82,691 patient records, nor in Kayser-Jones and colleagues’ (2008) study of 117 terminally ill skilled nursing patients with pressure ulcers.

There was no consistent evidence indicating that one gender is more susceptible to pressure ulcers than the other. However, males generally have better tissue tolerance than females due to their muscle mass and anabolic hormones (Bergstrom, Braden, Kemp, Champagne, & Ruby, 1996; Zhong et al., 2012). Additional research is needed to validate and explore the nature of the relationship of gender to pressure ulcer development in ICUs.

**Age.** Age plays an important role for pressure ulcer development. Changes to the skin layers can be visible in the second decade of life as a result of excessive exposure to sunlight. The epidermis, dermis, and subcutaneous layers begin to change in the third decade of life with significant skin changes evident by approximately 70 years of age (Wysocki, 2007). Most studies show that age is significantly associated with pressure ulcer incidence (Bours, De Laat, Halfens, & Lubbers, 2001; Eachempati, Hydro, & Barie, 2001; Pokorny, Koldjeski, & Swanson, 2003). In general, persons at risk for development of a pressure ulcer or diagnosis of a pressure ulcer are 10 years older than those not at risk (Margolis, Bilker, Knauss, Baumgarten, & Strom, 2002). Older people are at high
risk of developing pressure ulcers, as reflected in the fact that 70% to 73% of those who
develop pressure ulcers are over 65 years old (Thomas, 2006). Age in itself does not
cause pressure ulcers, but combined with illness it becomes a major problem. In 1995,
Bennett and Moody recognized that the elderly were more likely to have multiple
illnesses and spend more time in hospitals with longer lengths of stay. In addition many
of the elderly also experienced malnutrition, or at least reduced nutritional intake which
also predisposed them to pressure ulcers. An additional fact is that the elderly heal more
slowly than younger people (Margolis et al., 2002), so once an elderly person has a
pressure ulcer it is likely to be a chronic one resulting in more problems.

Shahin and colleagues (2008) conducted a cross-sectional study to assess pressure
ulcer prevalence in intensive care patients, patients’ characteristics, and preventive
measures related to pressure ulcer prevalence in surgical and medical ICUs. The results
of this study support the results of other studies (Eachempati et al., 2001; Theaker, Mann,
Ives & Soni, 2000), which revealed a significant relationship between age and the
prevalence of pressure ulcers.

However, Fife and colleagues (2001) conducted a cohort study to determine risk
factors for pressure ulcers in an intensive care setting. A total of 186 were enrolled in the
study. The results showed that there was no relationship between age and the
development of pressure ulcers. Similarly, Sayar and colleagues (2009) conducted a
descriptive, prospective study to determine incidence of pressure ulcers in patients at risk
according to the Waterlow scale in intensive care units and to evaluate risk factors in
critically ill patients. The results showed that age was not a pressure ulcer risk factor. The
mean age for patients who developed pressure ulcers was 61 years, but was 57.2 years for
those who did not develop pressure ulcer. The difference was not found to be statistically significant. Other studies have also reported that age is not related to pressure ulcer development (Nixon, Brown, McElvenny, Mason, & Bond, 2000; Theaker et al., 2005).

Previous reviews of studies about the relationship between age and incidence of pressure ulcers have produced conflicting results. Therefore, it is essential to investigate this relationship in this study.

**Length of stay (LOS).** The association of LOS and pressure ulcers is supported in many studies (Anthony et al., 2004; Bours et al., 2001; Celani, Spizzichino, Ricci, Zampolini, & Franceschini, 2001; Williams, Stotts, & Nelson, 2000). Some studies also reported that pressure ulcers and their consequences are directly related to increased LOS for patients, and can create increased cost for the institution (Allman, Goode, Burst, Bartolucci, & Thomas, 1999; Anthony et al., 2004).

Pieper and colleagues (1997) conducted a prospective, descriptive study to examine the occurrence of common skin lesions (including pressure ulcers) in ill persons at five acute care hospitals, a rehabilitation hospital, and a home care agency. The results indicated that acute care hospital patients with a pressure ulcer were older and had a longer LOS, more diseases, presence of surgeries, and lower serum albumin levels than those who do not have pressure ulcers.

In a prospective, cohort study, Allman and colleagues (1999) investigated if a stage II or greater pressure ulcer in-hospital is associated with increased hospital costs and increased LOS after adjusting for admission severity of illness, comorbidities, nosocomial infections, and other hospital complications. The authors reported the incidence of pressure ulcers was associated with significantly higher mean LOS (13.4 vs.
12.8 days, \( p = 0.0001 \). In addition, Williams, Stotts and Nelson (2000) found that LOS accounted for 11.2% of the variance of pressure ulcer prevalence in their prospective cohort study.

Celani and colleagues (2001) conducted a multicenter retrospective study to investigate certain factors influencing LOS, the incidence of pressure ulcers, and the neurologic improvement of patients with a traumatic or nontraumatic spinal cord injury. This study reported that LOS was statistically significant associated with pressure ulcers in traumatic spinal cord injury patients, \( F(1, 641) = 29.26, p < .05 \). Similarly, Ash (2002) conducted a retrospective study to explore the occurrence of pressure ulcers in a British spinal injuries unit. The results reported that patients with a spinal cord injury who developed pressure ulcers have a 55 day longer hospital stay than those who did not develop a pressure ulcer.

In summary, identification of pressure ulcer risk factors is imperative in the present day population in order to select patients for appropriate prevention interventions. It is also important to identify if LOS in ICU is a strong risk factor to implement preventive intervention for all prolonged ICU stay patients.

**Nutritional status.** Both the Center of Medicare & Medicaid Services (CMS) and Agency for Health care Research and Quality (AHRQ) specifically identify nutritional status as one of the more influential factors associated with pressure ulcer prevention, development, and treatment (CMS, 2007).

Guenter and colleagues (2000) conducted a descriptive survey to examine the nutritional status of 120 newly admitted hospitalized patients with Stage III and Stage IV pressure ulcers. Medical records and computerized charts were audited to extract data
from 120 patients’ charts. Using parametric and descriptive statistics, results showed that serum pre-albumin and albumin levels were below normal in the majority of patients, with 88% and 92% respectively. Seventy five percent of the patients had a moderately low or severely low serum pre-albumin level (mean=11.30±6 mg/dL) and more than 59% of all the patients had a moderately low or severely low serum albumin (mean=2.65±0.5g/dL). The majority of patients with severe pressure ulcers were malnourished as defined by pre albumin and or albumin level less than 11mg/dL and 2.5 g/dL respectively.

Williams, Stotts, and Nelson (2000) conducted a prospective cohort study to investigate the characteristics of patients with pressure ulcers present on admission to the hospital, predictors of pressure ulcers, and the severity of presented pressure ulcers. This study was comprised of 267 adult patients. The mean age of the patients was 65.7 years, and most (79.4%) were males. The mean albumin level was 2.9 g/dL and 34 of 267 patients had pressure ulcers. The results showed that patients with pressure ulcers had a significantly lower albumin level (< 2.5 g/dL), total lymphocyte count, hematocrit level, and hemoglobin level. In addition, they found that albumin level, oxygen saturation, and length of study accounted for 11.3% of the variance of pressure ulcer presence (p < .01) and that albumin level and length of stay accounted for 11.2% of the variance in ulcer severity (p < .001).

Bourdel-Marchasson and colleagues (2000) conducted a multi-center, randomized trial to assess the effect of nutritional supplementation on dietary intake and on pressure ulcer development in critically ill older patients. There were 377 in the control group versus 295 patients in the nutritional intervention group. There was no significant
difference for age, sex ratio, and C-reactive protein. During the trial, the nutritional group received the standard diet of 1800 kcal/day in three meals in addition to daily distribution of two oral supplements. Each supplement contained 200 kcal. Patients in the control group received the standard diet of 1800 kcal/day in three meals. The study was conducted for 15 days. The results showed that the cumulative incidence of pressure ulcers was 40.6% in the nutritional intervention group versus 47.2% in the control group. The researchers concluded that a decreased risk of pressure ulcer incidence is associated with increased dietary intake.

Fisher, Wells, and Harrison (2004) conducted a cross-sectional prevalence study of factors related to pressure ulcer development in acute care hospitals. A total of 1,992 patients were included in this study. The mean age of the patients was 62.5 years, with a mean of 27.8 days of hospital stay. The results showed that age, male gender, sensory perception, moisture, mobility, nutrition, and friction/shear were associated with pressure ulcer in acute care hospitals. A significant relationship between male gender and pressure ulcers was found when a nutritional deficit was present. The odds of having a pressure ulcer were more than double for male subjects with inadequate to poor nutritional status compared with female subjects.

In summary, four studies found that nutrition was a significant predictor of pressure ulcer development. While prior studies have focused on various aspects of nutrition in wound healing, the importance of albumin and pre-albumin is still controversial. More research is needed to further explore the role albumin and pre-
albumin in pressure ulcers management especially in ICU patients. This study will contribute to further validate the relationship of nutrition and pressure ulcer risk in patients in ICUs.

**Primary diagnosis.** The presence of diseases such as diabetes, respiratory diseases and vascular diseases have been speculated as risk factors among patients with pressure ulcers because those diagnoses can impair tissue perfusion and delay healing (Jaul, 2010; Masaki, Riko, Seiji, Shuhei, & Aya, 2007). Nijs and colleagues (2009) conducted a prospective descriptive study to determine the incidence of pressure ulcers occurring at least 48 hours after admission and risk factors for pressure ulcer grade II-IV in the surgical ICU population. The results showed that vascular disease was positively associated with the occurrence of pressure ulcers grade II-IV.

Many diagnoses are also associated with pressure ulcer development. Orthopedic injuries and spinal cord injuries are such conditions. Orthopedic injury and spinal cord injury patients have an alteration in mobility and activity. Individuals with spinal cord injuries have been reported to have a pressure ulcer prevalence of 50 to 60% (Lyons & Sorenson, 2007; New, Rawicki, & Bailey, 2004). Data from the Model Spinal Cord Injury Systems centers suggest that almost one third of individuals studied develop at least one pressure ulcer during their initial acute care and rehabilitation, and between 15% and 26% of persons with spinal cord injury develop a pressure ulcer thereafter (National Spinal Cord Injury Statistical Center [NSCIS], 1997).

The high prevalence of many systemic chronic illnesses, such as diabetes, cardiovascular disease, and chronic obstructive pulmonary disease contributes to pressure ulcer development. Frankel, Sperry and Kaplan (2007) conducted a retrospective study to
investigate risk factors for pressure ulcers in the surgical ICU. A total of 820 patients’ medical records were audited. The study revealed that diabetes, spinal cord injury, or renal insufficiency during an ICU admission are independent risk factors for pressure ulcer development.

Heart failure was a risk factor because it contributes to hemodynamic instability and respiratory insufficiency, and these in turn increase the risk for pressure ulcers by lowering tissue perfusion. Pokorny, Koldjeski, and Swanson (2003) conducted a study to determine the effectiveness of a skin care program in preventing development of ulcers in two intensive coronary care units. The researchers found that heart failure was a significant risk factor for the development of pressure ulcers. Similarly, Lewicki and colleagues (1997) conducted a study to identify preoperative, intraoperative, and postoperative factors associated with the development of pressure ulcers among patients undergoing cardiac surgery. They found that patients with pressure ulcers had a higher occurrence of comorbid conditions, including heart failure, than patients without pressure ulcers.

Cancer and other terminal conditions impair the immune system (Fromantin et al., 2011). Nonnemacher and colleagues (2009) conducted a survey to determine the combination of risk factors which best predicted the risk of developing pressure ulcers among inpatients in an acute care university hospital. The results identified that presence of a tumor increased the risk of developing pressure ulcers.

In summary, efforts to prevent pressure ulcers in ICUs should start at the time of admission. Early identification for patients at risk for a pressure ulcer can aid in
prevention of pressure ulcers. Thus, there is a need to identify what specific diagnoses are risk factors for the development of pressure ulcers among ICU patients.

**Nurse Characteristics Associated with Documentation**

Nursing documentation informs all members of the healthcare team about the patient’s condition, care and response to care, provides vital information for further care planning and acts as evidence of decision-making and care in a legal context (Wang, Hailey & Yu, 2011). Accurate documentation of nursing care is vital to nurses in daily hospital practice. Some studies revealed that several factors might influence nurses’ documentation, such as disruption of documentation activities, limited competence in documenting, confidence in documentation skills, inadequate supervision and inadequate staff development (Cheevakasemsook, Chapman, Francis, & Davies, 2006).

Paans, Nieweg, Schans and Sermeus (2011) conducted a systematic review to identify what factors influence the accuracy of nursing diagnoses documentation in clinical practice. Four domains of factors were revealed to influence the accuracy of diagnosis documentation. They are (1) the nurse as a diagnostician, (2) diagnostic education and resources, (3) complexity of a patient’s situation, and (4) hospital policy and environment. Other reviews on nursing documentation had different foci, such as essentials of quality nursing documentation, effects on documentation of assessment quality, nursing informatics to guide further design and implementation of electronic patient record, and effects of the EHR on nursing practice and healthcare outcomes (Jefferies, Johnson, & Griffiths, 2010; Müller-Staub, Lavin, Needham, & Van Achterberg, 2006; Oroviogoicoechea, Elliott, & Watson, 2008; Urquhart, Currell, Grant, & Hardiker, 2009). None of these researchers has concentrated on how nurses’ characteristics, such as
nurses’ shift and ICU setting, affect the quality and comprehensiveness of nursing documentation, although segmental relevant information was found. This study attempts to provide such information to fill the gap.

**Current State of Knowledge, Gaps and Limitations**

The literature provides a robust list of intrinsic and extrinsic risk factors associated with pressure ulcer development and patient characteristics that place a patient at risk for developing a pressure ulcer. Nursing documentation is used by nurses to communicate the current pressure ulcer risk factors or pressure ulcer status of individual patient. However, deficiencies in pressure ulcer care documentation, such as lack of prevention and treatment of pressure ulcer, were found in several studies (Gunningberg & Ehrenberg, 2004; Gunningberg, Lindholm, Carlsson, & Sjödén, 2000; Pieper, Mikols, Mance, & Adams, 1990). The EHR was expected to improve the quality of care provided to hospitalized patients, but the use of the EHR to improve patient outcomes remains unclear. A small body of literature (Abramson et al., 2011; Borycki, Kushniruk, Kuwata, & Kannry, 2011; Zlabek, Wickus, & Mathiason, 2011) provides preliminary evidence that the impact of an EHR on the provision of safe and quality care to the hospitalized patients. There were only few studies that specifically focused on impact of the EHR on healthcare-related outcomes, specifically pressure ulcer incidence (Gunningberg et al., 2008; Gunningberg et al., 2009). Therefore this study will be informed by the findings in the literature in order to develop research questions that examine the relationship between the EHR and pressure ulcer incidence in a population of ICU patients.
Conceptual Framework

The conceptual framework for this study is based on Donabedian’s (1966) Structure-Process-Outcome (SPO) model. Donabedian’s work in quality assessment and monitoring began 45 years with an evaluation of the medical care process at the physician-patient level (Donabedian, 1966). Later, Donabedian (1968, 1980) expanded on his work by providing a concept analysis of quality and to demonstrate the capacity of the model to organize elements of care as a means for assessing quality. Although much of Donabedian’s work is written for the purpose of quality management of medical care, it can and has been used to guide nursing research (Kobayashi, Takemura, & Kanda, 2011; Qu, Shewchuk, Chen, & Richards, 2010; Redekopp, 2007).

The SPO model includes three main domains: structure, process, and outcome (Donabedian, 1980). It has served as a unifying framework for examining health services and assessing patient outcomes. Its design was meant as an indirect evaluation of structure where health care is prescribed and the processes of the care and how these two components impact the outcome of care (Donabedian, 1992). A high quality structure sets the stage for the provision of high quality and thus improves outcomes.

Structure

The element of structure is defined as the physical and organizational properties of the setting in which health care takes place and relates to the organization of health care resources (Donabedian, 1966). It is characterized by the demographic characteristics of the providers, the adequacy of the facilities and equipment, the overall administrative environment, and client characteristics (Donabedian, 1966). Structure can increase or decrease the probability of good organizational performance.
Process

The element of process describes care activities, which are categorized into technical style and interpersonal style (Donabedian, 1982). Technical and interpersonal styles are intertwined, as the interpersonal relationship is the means by which the technical style is employed. Technical style is simply the intervention and is defined often by best practice or evidence based practice standards. Interpersonal style is the relationship formed by the provider and patient through communication. Process of care can be described in terms of client behaviors, provider behaviors, and the complex interactions between them (Donabedian, 1968). Assessment of process encompasses examining why certain things were done when they should not have been done and why other things were not done when they should have been done (Donabedian, 1968).

Outcome

The element of outcome is defined as “a change in patient’s current and future health (symptoms and functioning) that can be attributed to antecedent health care” (Donabedian, 1980, p.82). Outcome also refers to the end result of the process of care (Donabedian, 1966; Donabedian, 1985). Effectiveness of interventions is evaluated by measurement of outcomes. Outcomes are further divided into categories: clinical outcomes, patient satisfaction, functional status, and general well-being. Donabedian further asserted that when the causal relationship among structure, process and outcome have been demonstrated, “structure leads to process, and process leads to outcome” (Donabedian, 1992, p. 357). Also, important in the SPO model is that the structure and
process components interact to cause a change in outcome. The conceptual framework by Donabedian (1985) guides the selection and measurement of variables for the present study.

The SPO model is one of the most popular conceptual models for quality assessment in health care. Although the SPO model has not been used specifically with regard to the quality of nursing documentation for pressure ulcers, the SPO model has been used in studies of quality of care. Lee (2009) examined the relationships between organizational characteristics and quality of care highlighting the effect of nursing staffing levels in nursing homes by using the SPO model. The findings of this study showed that the SPO model was a useful conceptual framework with strong empirical findings. Given the findings, this study suggests that higher nurse staffing levels can improve quality of care in nursing homes. Adams-Wendling (2005) used the SPO model to evaluate the relationship of structure (nursing staffing, facility and resident characteristics) to outcomes (quality indicators and deficiencies). The results revealed that the relationship to facility or organizational factors varied in their relationship to outcomes.

Another study explored the meaning of delegation from the perspective of the acute care nurse which was developed using Donabedian's SPO model to organize the findings (Standing & Anthony, 2008). The results showed that the process of delegation centered on communication and on nurse-unlicensed assistive personnel relationship and was shaped by the structural themes. A study by Hoover (2008) examined the impact of patient characteristics and process of care delivery through telemonitoring on clinical, health care utilization and cost outcomes for patients with a primary or secondary
diagnosis of heart failure who had received home care services. The author found that there were no significant differences between the telemonitored group and non-monitored group for clinical indicators, other health care utilization, or cost outcomes.

**Concepts in the Present Study**

The conceptual framework of the present study relied on Donabedian’s three major conceptual components: structure, process, and outcome (SPO). The relationships between the major concepts based on the SPO model are shown in Figure 1. The concept of structure includes provider and client characteristics (Donabedian, 1980). The present study will focus on nursing documentation, so the concept of structure will include nurse characteristics, such as shift and ICU setting and patient characteristics, which consists of gender, age, length of stay, nutritional status and primary diagnosis. This element of the model explains that structure will have an impact on the accuracy in nursing documentation of pressure ulcers and the incidence of pressure ulcers.

The concept of process encompasses the practitioner’s activities (Donabedian, 1985). In this study, process is represented by the documentation system that will facilitate consistent care. Thus, in the present study the concept of process dealt with all the activities involved in pressure ulcer documentation, which comprised both the EHR and written documentation. Two instruments, which are EPUAP Pressure Ulcers Assessment Instrument (modified for record review) and the Comprehensiveness in Nursing Documentation (CIND) instrument will be used to measure of process.

Outcomes are effects from the process of care (Donabedian, 1980). In this present study, outcomes of care will be measured by the incidence of pressure ulcers. The following formula will be used to calculate incidence rate:
Incidence rate = \frac{\text{number of patients developing pressure ulcers per time period}}{\text{number of patients admitted per time period}} \times 100\%

The proposed variables are patient characteristics and documentation of pressure ulcers, which are thought to influence incidence of pressure ulcers. Based on the SPO model, the conceptual framework of the present study is shown in Figure 1. Figure 2 illustrates the substruction of this study including the constructs of structure, process and outcome, and further delineating the related concepts, variables, and empirical indicators.

**Definition of Terms**

**Pressure ulcer stages:** the stages of pressure ulcers are shown in Table 2.

**Structure of Care**

**Nurse characteristics:** is theoretically defined as nurse demographics. In the context of this study, operationally, nurse characteristics include nurses’ shift (dayshift or nightshift) and the ICU setting (the unit in which health care takes place).

**Nurses’ shift:** theoretically refers to staff nurse working schedule. The working shift length is defined as the number of the hours the nurses worked. There are 8-hour working schedules and 12-hour working schedules. In the context of this study, operationally, nurses’ shift refers to the 12-hour working schedule, i.e. dayshift and nightshift.

**ICU setting:** theoretically refers to the hospital departments which provide specialized patient care. In the context of study, operationally, it refers to Intensive Care Units, which includes medical intensive care unit (MICU), surgical intensive care unit (SICU), cardiovascular intensive care unit (CVICU), and neurological intensive care unit (NICU) in this study.
**Patient characteristics:** theoretically refer to varying states of disease, demographics and other risk factors. In the context of this study, operationally, patients who were admitted to ICUs were adjusted to take into account gender, age, LOS, nutritional status, and primary diagnosis because these variables have been shown to be related to the incidence of pressure ulcers. Those variables requiring further explanation will follow.

**Gender:** is theoretically defined as a range of characteristics of femininity and masculinity (Bradley, 2007). Operationally, gender is defined as the sex of patient.

**Age:** is theoretically defined as the chronologic age of the patient, that is the number of years elapsed from birth to a given time (McPherson, 2008). Operationally, age is defined as the chronologic age of the patient at the time of admission into the intensive care unit.

**LOS:** is theoretically defined as the total amount of time of the hospitalized admission. Operationally, length of stay is defined as the total number of the days the patient spent in the ICUs.

**Nutritional status:** is theoretically defined as the usual nutritional intake of the patient inclusive of oral, parenteral or enteral feeding routes (Braden & Bergstrom, 1987). Operationally, nutrition is defined as the patient’s albumin and pre-albumin levels in this study.

**Primary diagnosis:** is theoretically defined as the condition established to be chiefly responsible for the admission of the patient to the hospital for care. Operationally, primary diagnosis is the condition motivating admission of a patient to the ICUs.
Process of Care

**Electronic Health Record (EHR):** Basic EHR systems have been defined as:

1. A longitudinal collection of electronic health information about a person, or healthcare provided; 2. immediate electronic access to a person or population level information by authorized users; 3. provision of knowledge and decision-support that enhance the quality, safety, and efficiency of patient care; and 4. support of efficient processes for healthcare delivery” (Institute of Medicine of the National Academies, 2003, p. 1).

Operationally, the EHR is electronic health record at University of Miami hospital used by the nurses to document patient care.

**Written documentation:** is theoretically defined as a repository of an individual’s medical status and health care composed mainly of handwritten and data entry and few computer generated reports (Urquhart et al., 2009). Operationally, written documentation is a written medical record preserving the patient’s healthcare information. Photographs of the pressure ulcers are also included in written documentation.

**Quality of documentation in pressure ulcers:** theoretically, is defined as accurate patient data obtained through the nursing process. Operationally, quality pressure ulcer documentation will include location, dressing type, wound type, granulation, wound odor, wound color, drainage amount, drainage color, staging, comment, hardening around wound, physician notified, date notified, photo taken, date taken, equipment used, repositioning, dressing change, medication applied, and outcome description.

**Comprehensiveness of documentation in pressure ulcers:** theoretically, is defined as complete coverage of the nursing process within documentation. Operationally, a comprehensive documentation of pressure ulcers will include a) pressure ulcers are present with detailed descriptions, such as location, dressing type, wound type,
granulation, wound odor, wound color, drainage amount, drainage color, staging, comment, hardening around wound, physician notified, date notified, photo taken, date taken; AND b) turning patient every 2 hours; AND c) dressing is present; OR/AND d) medication is applied on pressure ulcer area; AND e) wound healing progress is described and evaluated.

Outcomes of Care

**Incidence**: is a measure of the proportion of a group who is pressure ulcer–free at the outset, but who develop a pressure ulcer over a given time frame (Langemo, Anderson, Hanson, Hunter, & Thompson, 2007). Operationally, incidence of pressure ulcers is the number of admitted ICU patients who developed a pressure ulcer in the hospital out of all admitted patients in ICUs during specific time period.

To calculate incidence, the numerator of the fraction represents numbers of at-risk patients developing pressure ulcers per time period, and the denominator of the fraction defines the number of at-risk patients admitted per time period (Defloor et al., 2005).

**Summary**

The results of this review of literature demonstrated that factors associated with pressure ulcer incidence and factors associated with quality and comprehensiveness of pressure ulcer documentation have been identified in the research literature. In contrast to previous reviews on this topic, which tended to only focus on patient risk factors associated with pressure ulcer incidence, this current study noted that nursing documentation played a role in the prevention of pressure ulcers in ICUs. The conceptual framework for this study was based on Donabedian’s Structure-Process-Outcome (SPO) model. This framework guided the exploration of the quality and comprehensiveness of
nursing documentation of pressure ulcers, and the examination of the relationship between the nursing documentation of pressure ulcers and the incidence of pressure ulcers in Intensive Care Units (ICUs).
Chapter 3
Method

The purpose of this dissertation was 1) to explore the quality and comprehensiveness of nursing documentation of pressure ulcers, and 2) to investigate the relationship between the nursing documentation of pressure ulcers and the incidence of pressure ulcers in Intensive Care Units (ICUs). The following research questions were explored:

1. What is the relationship between quality and comprehensiveness of the nursing documentation on the monthly incidence of pressure ulcers in ICUs located in a South Florida Hospital?
2. Do the patients with pressure ulcers differ in the patient characteristics (age, gender, length of stay, nutritional status and primary diagnosis) from the patients without pressure ulcers?
3. Are there associations between staff nurses characteristics (shift and ICU setting) and the quality/comprehensiveness of pressure ulcer nursing documentation?

Research Hypotheses

1. There is a relationship between quality and comprehensiveness of the nursing documentation on the incidence of pressure ulcers in Intensive Care Units (MICU, SICU, CVICU, and NICU).
2. Patients with pressure ulcers differ in the patient characteristics (age, gender, length of stay, nutritional status and primary diagnosis) from the patients without pressure ulcers.
3. There are associations between staff nurses characteristics (shift and ICU setting) and the quality/comprehensiveness of pressure ulcer nursing documentation.

**Research Design**

This study used a retrospective, comparative, descriptive, correlational design to examine the relationship between pressure ulcer documentation and the incidence of pressure ulcers in ICUs. Donabedian’s conceptual model of structure, process and outcome (2005) was used to evaluate the relationship between the process (quality and comprehensiveness in nursing documentation of pressure ulcers) and the outcomes (incidence of pressure ulcers) of the study. It is assumed that there is a causal relationship between the nursing documentation of pressure ulcers and the incidence of pressure ulcers.

Descriptive research is exploratory in nature and contributes to the foundation of a discipline. The advantage of a descriptive correlational design is that the researcher can explore the relationship between not only two variables but multiple variables within a currently occurring situation (Burns & Grove, 2005). A descriptive correlational design provides an understanding of many interrelationships that may exist within a situation during a short time, thus variables in the study must be clearly described (Burns & Grove, 2005).

Retrospective design is used to link a phenomenon existing in the present to a phenomenon that occurred in the past, before the study was initiated. That is, the researcher is interested in a present outcome and attempts to determine antecedent factors that caused the outcome. A retrospective chart review, the use of preexisting record, is
common in nursing research because these documentations are an economical and convenient source of information (Polit & Beck, 2004). Patients’ records provide easy access to address many clinical questions in a short period of time that would ordinarily have taken years to collect prospectively. The Electronic Health Record (EHR) and written records can contain numerous variables with which to describe, explain, correlate and predict the relationship among different nursing interventions. The purpose of this study is to investigate the nursing documentation system and identify factors associated with the accurate documentation of pressure ulcers among ICU patients.

**Sample and Setting**

The study was conducted at the University of Miami hospital. The hospital is a 560-bed medical center located in South Florida. The University of Miami Hospital is a full service facility with an emphasis on Cardiac Medicine, including Open Heart surgery, Comprehensive Cancer Care, Neurology, Neurosurgery, Orthopedic Surgery and Rehabilitation, Hepatology, Dermatology, and Plastic and Reconstructive Surgery. Clinical services provided are Ambulatory Surgery, Bariatric, Cardiac Intervention, Cardiology/Cardiovascular, Cardio Vascular ICU, Dermatology, Emergency Department, General Surgery, GI Center, Immunology, Interventional Radiology, Medical ICU, Medical Surgical Telemetry, NICU, Neurosurgery, Oncology, Orthopedics, Pain Center, Progressive Care Unit, Psychiatry, Radiation Oncology, Sports medicine, Surgical ICU, Surgical Services, Wound Cure, Physical, Occupational, and Speech Therapy. The study location has been selected due to the availability of both an EHR and written record. Also, the hospital provides services to patient populations at risk for pressure ulcers. A letter of
support from UMH hospital has been obtained (Appendix B). A pilot study (Li & Korniewicz, 2013) was completed at the proposed site to determine the feasibility to conduct and review both the EHR and written medical record for pressure ulcer nursing documentation. Overall findings demonstrated that documentation of pressure ulcers was poor or inaccurate in both the EHR and the written medical record. Also, findings demonstrated that some nurses were not familiar with the electronic forms for pressure ulcer documentation.

The hospital has approximately 15,000 annual admissions and 4,000 admissions to the ICUs. A convenience sample of ICU patients at the selected medical center comprised the study’s sample. All patients’ medical records, which show that patients were admitted to ICUs between the time periods of September 01, 2011 through September 30, 2012, were audited for the proposed study. Data used in the analysis were from 98 pressure ulcer patients and 98 patients without pressure ulcers from four ICUs at the selected medical center. Two dayshift and two nightshift pressure ulcer documentations were collected from each pressure ulcer patient’s EHR. The initial two pressure ulcer documentations were collected from each pressure ulcer patient’s written medical records. The total collected EHR documentation was 392. The total collected written medical documentation was 196.

Inclusion Criteria

Patient’s records were included in the study if patients were: a) admitted to one of the Intensive Care Units (MICU, SICU, CVCU, and NICU) during the time period of
September 01, 2011 through September 30, 2012; b) length of stay (LOS) in any of the ICU’s was equal to or greater than 3 days; c) documentation of a pressure ulcer(s) during their LOS in the ICUs; and d) older than 18 years old.

Exclusion Criteria

Patient records were excluded if: 1) they were not directly admitted to an ICU but were transferred from other units within the hospital, 2) if a pressure ulcer(s) were documented on admission, and 3) if patient was discharged or transferred within 48 hours of getting pressure ulcers.

Data Collection Procedures

Upon University of Miami Institutional Review Board (IRB) approval, an EHR and written medical chart review was conducted to collect data regarding the dependent variables (e.g. shift, ICU setting, patient’s age, gender, length of stay, nutritional status and primary diagnosis) and the dependent variables associated with pressure ulcers (e.g. pressure ulcer’s location, staging, appearance include size, tunneling, undermining, exudates’ odor and type, wound bed color, surrounding skin color and wound edges/surrounding tissue, infection, dressing appearance, and photos of wounds).

Participants in this study were not be required to submit informed consent since a “waiver of consent” was requested consistent with the Waivers or Modifications of Informed Consent, under the University of Miami IRB waiver. The waiver of consent waives the requirement for the investigator to obtain a signed consent form for some or all participants, if it finds that:
1) The research involves no more than minimal risk to the subjects; AND 2) The waiver or alteration will not adversely affect the rights and welfare of the subjects; AND 3) The research could not practicably be carried out without the waiver or alteration; AND 4) Whenever appropriate, the subjects will be provided with additional pertinent information after participation. (IRB Policy and Procedure Committee, 2006, para. 5).

Chart reviews of patients’ demographic and clinical information complied with the Health Insurance Portability and Accountability Act of 1996 (HIPPA) confidentiality agreements signed by the principal investigator at University of Miami Hospital.

A pilot study was conducted by the principal investigator at University of Miami Hospital to develop chart review and data extraction protocols while completing an earlier study related to medical devices (Hill-Rom beds). All the information gathered from patient EHR and medical records was recorded on a secured data entry form and all data collection records are locked in a file at the University of Miami School of Nursing and Health Studies (UMSONHS). Only the principal investigator has the access to the file. The paper abstraction form (Appendix C) is stored in a drawer secured by lock and key at principle investigator’s office. All of these paper data abstraction forms were subsequently entered into an Excel spreadsheet which was imported to PASW for analysis purposes. The database is accessed by a computer security code and available only to the principal investigator.

Patient demographics (age and gender) are located at the “Visit History” section in the EHR. Length of stay was calculated based on admission date and discharge date. Admission date and discharge date are located at “Care-area Administrative” section in EHR. Primary diagnosis is located at the “Assessment Forms” section in EHR. Pressure ulcer documentation is located at “Wound Section and Integumentary Assessment WDP”
section under shift assessment in EHR. Risk assessment score is located at “Braden Pressure Ulcer Risk Assessment” section under shift assessment in EHR. Pressure ulcer pictures are located at “Photographic Wound Documentation” section in the written record.

Special measures were taken in order to protect patients’ confidentiality. Anonymity of patients was maintained by giving patients an identification number, excluding information that would hinder their privacy or rights of confidentiality (i.e. name, address, social security number), and creating a password-protected database for the information. All patient data and a legend of patients’ identification numbers are kept in a locked file cabinet in the principle investigator’s office at the University of Miami School of Nursing and Health Studies. Unique identifying information was taken from the patients’ charts and transferred to the master legend list that is kept on a password-protected Excel spreadsheet. Only the principle investigator has access to the file cabinet. The data from the research will be destroyed three years after the completion of the study.

All patients’ medical records, which show that patients were admitted to ICUs between the time periods of September 01, 2011 through September 30, 2012, were audited to obtain data in all four ICU settings. No patient was included more than once. The incidence rate of pressure ulcers from September 01, 2011 through September 30, 2012 was calculated.
Variables and their Measurement

Independent variables

The independent variables for the study are the following staff nurse characteristics: shift and ICU setting. The following patient characteristics were included: gender, age, LOS, nutritional status (albumin and pre-albumin level) and primary diagnosis. All the independent variables were retrieved from auditing EHR and the written medical record. Shift is reported as a categorical variable (dayshift/nightshift). ICU setting is reported as a categorical variable (MICU, SICU, CVICU, and NICU). Age is reported as a continuous scale variable in number of years. Gender is reported as a categorical variable (male/female). LOS is reported as a continuous variable (number of days). Nutritional status (albumin and pre-albumin level) is reported as a categorical variable (severely low, moderate, mild and normal). Primary diagnosis is reported as a categorical variable.

Dependent variables

The dependent variables are the quality of nursing documentation, comprehensiveness of nursing documentation and incidence of pressure ulcers. The quality of pressure ulcer documentation is defined as a thorough recording of every aspect of a pressure ulcer, which includes location, staging, appearance (include size, tunneling, undermining, exudates’ odor and type, wound bed color, surrounding skin color and wound edges/surrounding tissue), infection, dressing appearance, and pictures. The quality of pressure ulcer documentation is reported as a categorical variable (yes/no). The comprehensive documentation of pressure ulcers includes the five steps of
nursing process which are assessment, diagnosis, planning, implementation and evaluation. The comprehensive documentation of pressure ulcers is reported as a categorical variable (1, 2, 3, 4, and 5). Incidence of pressure ulcers is defined as a measure of the proportion of a group who is pressure ulcer–free at time of admission, but who develops a pressure ulcer while receiving care in ICUs. The incidence rate of pressure ulcers during a specific period is reported as a continuous variable. The quality and comprehensiveness of pressure ulcer documentation was measured by the modified European Pressure Ulcer Advisory Panel Pressure Ulcers Assessment Instrument and the Comprehensiveness in Nursing Documentation (CIND) instrument. Based on the results of the medical record audit and EHR review, the incidence of pressure ulcers was calculated monthly in each of the respective ICU settings.

**Sample Size**

The sample size is determined by a power analysis to diminish the likelihood of accepting a false null hypothesis (Type II error). The power to detect group differences influenced by the alpha level, effect size, size of the sample, and type of analysis (Cohen, 1988). The sample size should be large enough to detect meaningful differences. Power has been set at .90, a more conservative rate than the conventional .80 since Type II error rate may occur in an exploratory study (Cohen, 1988). A power of .90 allow for a 10% tolerance of a Type II error. The power is the probability that the test will reject a false null hypothesis.

The level of significance, or the alpha error, is associated with a Type I error. A Type I error is the probability of rejecting the null hypothesis when it is true. The smaller
the alpha, the more rigorous is the standard of null hypothesis rejection. Since a Type II error is considered as equally serious in this study, an alpha level of .05 will be selected because the level had been suggested for use in most studies of behavioral science research (Cohen, 1988).

The effect size is the degree that the phenomenon is found in the population or the strength of the relationship between the independent and dependent variables. Strategies to establish effect size for a study include determining the effect size of other studies. There are no studies available similar to the proposed study in which the effect size can be estimated, therefore a medium effect size of .25 was set. Cohen (1988) identified this as a medium effect size when correlation is the statistical procedure used.

To determine sufficient sample size G* Power (Buchner, Erdfelder, & Faul, 1997) was used. The number of groups were four (SICU, MICU, NICU and CVICU) for a one-way ANOVA. The degree of freedom was 3. Using the following information: alpha (.05), estimated power (.90), and the effect size (.25), a minimum sample size of 231 was required. The final number of pressure ulcer documentation was $N = 392$ from the four ICU settings.

**Ethical Consideration and Data Recording**

IRB approval for this retrospective data analysis was obtained from University of Miami. As an exempt retrospective analysis, no informed consent was necessary. Data were collected by using paper and pencil to assess the EHR and paper documentation. The patient records were examined and only the non-identifying data listed on the data
collection sheet (Appendix C) were recorded. The data collection sheets are kept in a locked cabinet in the researcher’s office. Data from the data collection sheet was entered onto a spreadsheet stored on a password protected computer located in a locked office at School of Nursing and Health Studies at the University of Miami. Non-identifiable data was recorded directly from the EHR and paper documentation onto a data collection sheet (Appendix C) and then onto an Excel spreadsheet, transformed onto a PASW data set. The researcher was the only individual doing chart reviews and collecting data.

Due to the retrospective nature of this study and the use of archival data, participants were not be required to engage in any additional tasks. Only a review of their EHR and medical records that were collected as part of their routine hospitalization occurred. Participation in this study had no influence on the patients’ clinical care at the time of their hospital stay since it is retrospective and patients have already been treated and discharged. No services were denied or added as part of this research study.

**Instruments**

In order to quantify the process of care, two data collection forms were used in this study. They are the EPUAP Pressure Ulcers Assessment Instrument (modified for record review) and the Comprehensiveness in Nursing Documentation (CIND) instrument.

**The EPUAP Pressure Ulcers Assessment Instrument**

The EPUAP data collection form (Vanderwee, Clark, Dealey, Gunningberg, & Defloor, 2007) used for the physical examination of patients was modified to be suitable for audit of patient records in the proposed study. The modified instrument included five
categories. The first category includes patient demographic data, the patient’s primary
diagnosis, the patient’s length of stay in ICUs, and current nutritional status. The second
category is risk assessment. The vulnerability of each patient to developing pressure
ulcers is assessed using the Braden Scale. The Braden Scale consists of six sub-scales:
sensory perception, moisture, activity, mobility, nutrition, and friction and shear. The total
score ranges from 6 to 23. The third category provides details about the skin
observations, which include location, staging, appearance (include color, surface of the
wound and the area surrounding the wound), infection, odor, exudates, pain, dressing
appearance and picture. In addition, anatomical locations of all existing pressure ulcers
are recorded. The fourth category, prevention and implementation, involved the
equipment used in bed and in the chair, dressing change and treatment. Furthermore, it is
also recorded whether the patient received manual repositioning in bed or in the chair.
The fifth category, evaluation, included information on presence or absence of signs,
symptoms, or condition of pressure ulcers.

The Comprehensiveness in Nursing Documentation (CIND) Instrument

A 5-point level scale developed by Ehnfors and Smedby (1993) was used to
assess the comprehensiveness of the nursing documentation concerning prevention and
treatment of pressure ulcers. The scale has been tested for interrater reliability, and
Cohen’s kappa was reported to be 0.65, and 0.72-1.0, which is interpreted as good to
excellent agreement. The following criteria were used:

- Score 0. No documentation.
- Score 1. The problem is described or interventions planned or implemented.
- Score 2. The problem is described and interventions planned or implemented.
Score 3. The problem is described and intervention planned or implemented and nursing outcome is recorded.

Score 4. The problem is described and intervention planned and implemented and nursing outcome is recorded.

Score 5. All aspects of the nursing process are recorded. Good description of the problem. Recording of relevance to nursing.

The content of the nursing care documentation was evaluated quantitatively according to the evaluation criteria created on a scale of 0-5, in which the highest score represented the most comprehensive documentation which means the use of nursing process and the use of classifications in the different phases of nursing process and relationships between nursing assessment, nursing diagnoses, nursing planning, nursing interventions, and nursing outcomes (See Table 5).

**Data Analysis**

The analysis of data was conducted using the Statistical Package for Social Sciences PASW version 19.0. Descriptive statistics were used to describe the study sample (mean, standard deviation, frequencies and percentage) prior to analysis. Inferential statistics were used to examine the three study questions and will be described in further detail. There were three research questions to be answered in this study.

Question 1: What is the relationship between quality and comprehensiveness of the nursing documentation on the monthly incidence of pressure ulcers in ICUs located in a South Florida Hospital?” The hypothesis is: “There is a relationship between quality and comprehensiveness of the nursing documentation on the monthly incidence of pressure ulcers in Intensive Care Units (MICU, SICU, CVICU, and NICU).”
Descriptive statistics were used to calculate the frequencies of categorical variables, which are the aspects of pressure ulcer documentation. The variables are location, dressing type, wound type, granulation, wound odor, wound color, drainage amount, drainage color, staging, comment, hardening around wound, physician notified, date notified, photo taken, date taken, equipment used, repositioning, dressing change, medication applied, and outcome description, and pictures for both EHR and written medical record. Kruskal-Wallis H test was used to compare the score of quality of nursing documentation in four ICU settings. Each pressure ulcer that was documented was assigned a score of comprehensiveness ranging from 1 to 5. Higher scores indicated more comprehensive nursing documentation. One-way ANOVA was used to compare the score of comprehensiveness of nursing documentation in four ICU settings.

The incidence rate of pressure ulcers was calculated in the four ICU settings. Chi squares tests ($\chi^2$) was calculated to compare the incidence in the four ICU settings. The quality of nursing documentation and the comprehensiveness of nursing documentation of pressure ulcers was averaged and calculated according to the four ICU settings. Based on the aforementioned quality and comprehensiveness average score and monthly incidence rate of the four ICU settings, Pearson’s $r$ Correlations were conducted to explore the relationships between the quality/comprehensiveness of nursing documentation of pressure ulcers and the incidence of pressure ulcers.

Question 2: “Do the patients with pressure ulcers differ in the patient characteristics (gender, age, LOS, nutritional status and primary diagnosis) from the patients without pressure ulcers?” The hypothesis is “The patients with pressure ulcers
differ in the patient characteristics (gender, age, LOS, nutritional status and primary
diagnosis) from the patients without pressure ulcers”.

Descriptive statistics were used to calculate the frequencies of categorical
variables, which are gender, nutritional status, and primary diagnosis. Chi square tests
($\chi^2$) were calculated to compare gender, nutritional status and primary diagnosis among
the four ICU settings and between the pressure ulcer group and the non-pressure ulcer
group. An independent samples $t$-test was used to address if patients with pressure ulcers
differ in age from patients without pressure ulcers. The Mann Whitney U Test was used
to compare if pressure ulcer patients differ in LOS from non-pressure ulcer patients.

Question 3: “Are there associations between staff nurses characteristics (shift and ICU setting) and the quality/comprehensiveness of pressure ulcer nursing documentation?” The hypothesis is “There are associations between staff nurses characteristics (shift and ICU setting) and the quality/comprehensiveness of pressure ulcer nursing documentation.”

The relationship between ICU setting and quality/comprehensiveness of pressure ulcer nursing documentation was examined in question 1. The average score of quality/comprehensiveness of pressure ulcer nursing documentations were calculated in the four ICU settings. The independent sample $t$-tests were used to exam the differences in quality/comprehensiveness scores between dayshift and nightshift.
Summary

This study investigated the quality and comprehensiveness in nursing documentation of pressure ulcers and the incidence of pressure ulcers in the four ICU settings. This study has been designed to examine the staff nurses’ characteristics (shift and ICU setting) and specific patient characteristics (gender, age, length of study, nutritional status and primary diagnosis) and their relationship to the incidence of pressure ulcers. Detailed findings of this study will be presented in Chapter Four.
Chapter 4

Results

Overview

The purpose of this study was 1) to explore the quality and comprehensiveness of nursing documentation of pressure ulcers and 2) to investigate the relationship between the nursing documentation of pressure ulcers and the incidence of pressure ulcers in ICUs. The results of the data analysis are presented this chapter. First, demographic characteristics of the participants and nursing staff will be presented. Next, descriptions for study variables and the results of statistical tests will be presented to answer the research questions. The Statistical Package for Social Sciences (PASW) version 19.0 was used to evaluate statistical assumptions and to obtain the findings.

Research questions

1. What is the relationship between quality and comprehensiveness of the nursing documentation on the monthly incidence of pressure ulcers in ICUs located in a South Florida Hospital?

2. Do the patients with pressure ulcers differ in the patient characteristics (age, gender, length of stay, nutritional status and primary diagnosis) from the patients without pressure ulcers?

3. Are there associations between staff nurses characteristics (shift and ICU setting) and the quality/comprehensiveness of pressure ulcer nursing documentation?
Descriptive Statistics

Demographic Characteristics

The sample of this analysis consisted of 196 patients with 98 hospital acquired pressure ulcer patients and 98 patients without pressure ulcers who were admitted to ICUs during the time period of September 01, 2011 through September 30, 2012. Two dayshift and two nightshift pressure ulcer documentations were collected from each pressure ulcer patient’s EHR. The initial two pressure ulcer documentations were collected from each pressure ulcer patient’s written medical records. The total collected EHR documentation was 392. The total collected written medical documentation was 196. Both pressure ulcer group and non-pressure ulcer group were comprised of 26.5% of SICU patients ($n = 26$), 24.5% of CVICU patients ($n = 24$), 26.5% of MICU patients ($n = 26$), and 22.5% of NICU patients ($n = 22$) (Table 6).

Gender. More than half (56.1%, $n = 110$) of the patients are male gender.

Age. Of the total samples, patients ranged in age from 27 to 103 years ($M = 70.71$, $SD = 14.66$). Slightly more than 30% of patients were younger than 65 years old.

LOS. Patients ranged in LOS from 3 to 51 days ($M = 7.76$, $SD = 6.17$). More than half of the patients had stayed in the ICUs for five days or longer.

Nutritional status. Of the total sample, albumin levels ranged from 0.90 to 4.50 g/dL ($M = 2.60$, $SD = 0.77$). More than 30% of patients had severely low albumin levels ($< 2.1$ g/dL). More than 30% of patients had moderate albumin levels (between 2.1 g/dL and 2.9 g/dL). More than 20% of patients had mild albumin levels (between 2.9 g/dL and
Less than 15% of patients had normal albumin levels (> 3.5 g/dL). The pre-albumin levels ranged from 0.00 to 31.40 mg/dL ($M = 12.57, SD = 6.19$). Less than 10% of patients had severely low pre-albumin levels (< 5 mg/dL). More than 20% of patients had moderate pre-albumin levels (between 5 mg/dL and 9 mg/dL). More than 40% of patients had mild pre-albumin levels (between 9 mg/dL and 17 mg/dL). Less than 25% of patients had normal pre-albumin levels (between 18 mg/dL and 45 mg/dL). The majority of patients were nutritionally compromised.

**Primary diagnosis.** Of the total sample, a cardiovascular diagnosis (30.1%) was identified with the highest percentage, followed by respiratory 17.3%, infection 16.3%, gastrointestinal 10.2%, renal disease 7.7%, neurological 5.1%, cancer 4.6%, metabolic disorder 4.1%, orthopedic 4.1%, and wounds 0.5%.

**Analysis of Study Variables**

**Description of the Variables**

**EHR documentation.** This section of the analysis is a description of the results of EHR documentation of pressure ulcers. EHR documentation consists of 20 detailed descriptive items: location, dressing type, wound type, granulation, wound odor, wound color, drainage amount, drainage color, staging, comment, hardening around wound, physician notified, date notified, photo taken, date taken, equipment used, repositioning, dressing change, medication applied, and outcome description. Each item was coded as 1 (documented in the EHR) or 0 (not documented in the EHR). Across all 20 items, location had a highest percentage of EHR documentation (79.1%). Wound color and
Photo Taken were found only in 54.8% and 57.4% respectively of the patient records, although more frequently addressed than other descriptions of pressure ulcers. Wound odor and physician notify date had only 2% percentage of EHR documentation. Table 7 displays the percentage of each item for 392 pressure ulcer documentations. The total of all items were summed resulting in possible total scores ranging from 0 to 20. For the purpose of this analysis the mean of quality scores were calculated for each pressure ulcer patient.

In addition, each pressure ulcer documentation had comprehensiveness scores ranging from 0 to 5 based on the CIND Instrument (Ehnfors & Smedby, 1993). Higher scores indicated more comprehensive nursing documentation. The following criteria were used:

- Score 0. No documentation.
- Score 1. The problem is described or interventions planned or implemented.
- Score 2. The problem is described and interventions planned or implemented.
- Score 3. The problem is described and intervention planned or implemented and nursing outcome is recorded.
- Score 4. The problem is described and intervention planned and implemented and nursing outcome is recorded.
- Score 5. All aspects of the nursing process are recorded. Good description of the problem. Recording of relevance to nursing.

Across all six scores, score 2 had the highest percentage of EHR documentation (30.6%). Table 8 displays the percentage of each score for 392 pressure ulcer documentations. For the purpose of this analysis the mean of the comprehensiveness
score was calculated each pressure ulcer patient. Table 9 lists monthly average comprehensiveness scores for 13 months across four ICUs.

**Written pressure ulcer documentation.** This section of the analysis is a description of the results of the written documentation of pressure ulcers. The written section of the data collection tool consists of 14 detailed descriptive items: location, stage, size, depth, exudate, tunneling, undermining, granulation, wound bed, surrounding skin color, wound edges/surrounding tissue, date first observed, photo taken date, and wound location circled. Each item was coded as 1 (documented in the written record) or 0 (not documented in the written record). Across all 14 items, location had a highest percentage among all items (89.3%). Photo Taken Date and Stage were found only in 83.7% and 69.4% respectively of the patient records, although more frequently addressed than other descriptions of pressure ulcer. Granulation, undermining and tunneling had the lowest percentage of EHR documentation, respectively 9.7%, 22.4% and 24%. Table 10 displays the percentage of each item for 196 pressure ulcer written records.

**Analysis of Research Questions**

Question 1.1: What is the relationship between the monthly incidence of pressure ulcers and ICU setting?

Descriptive statistics as well as a Chi square test were used to analyze this question. A Chi square test indicated there was no statistically significant difference in pressure ulcer incidence rate across the four ICU settings, $\chi^2(3) = 10.57, p = .14$. 
Question 1.2: What is the relationship between the quality of the nursing documentation and ICU setting?

Descriptive statistics as well as the Kruskal-Wallis H test were used to analyze this question. Because the assumption of the homogeneity of variance assumption has not been met, four ICU settings were compared using Kruskal-Wallis H test to determine if there were significant differences in the quality of nursing documentation across four ICU settings. Results from the Kruskal Wallis H test $[H (3) = 10.10, p = .018]$, indicated that there was a statistically significant difference in quality of nursing documentation across four ICU settings. A Bonferroni post-hoc test revealed that the quality scores in the MICU were statistically significantly higher compared to the CVICU ($p < .001$) and the NICU ($p = .009$). There were no statistically significant differences between the MICU and the SICU ($p = .686$). The MICU had the highest quality score among ICU settings. Findings are summarized and reported in Table 12.

Question 1.3: What is the relationship between the comprehensiveness of the nursing documentation and ICU setting?

Descriptive statistics as well as a one-way ANOVA were used to analyze this question. Because the assumption of the homogeneity of variance assumption has been met, four ICU settings were compared using a one-way ANOVA to determine if there were significant differences in comprehensiveness score across the four ICU settings. There was a statistically significant difference between groups as determined by one-way ANOVA $[F(3, 388) = 4.10, p = .007]$. A Bonferroni post-hoc test revealed that the comprehensiveness scores in the MICU were statistically significantly higher compared
to the CVICU ($p = .009$) and the NICU ($p = .036$). There were no statistically significant differences between the MICU and the SICU ($p = .272$). The MICU had the highest comprehensiveness scores among the four ICU settings. Of six scores, score 2 had the highest percentage of EHR documentation, which only presented “the problem is described and interventions planned or implemented”. In this study, score 2 means that “Nursing notes state a) pressure ulcers are present; AND b) turning patient every 2 hours; OR c) dressing is present; OR d) medication is applied on pressure ulcer area”. Only 19% ($n = 75$) of the nursing documentation had score 4 or higher, meaning that “the problem is described and intervention planned and implemented and nursing outcome is recorded”. Findings are summarized and reported in Table 13.

Question 1.4: What is the relationship between the quality of nursing documentation on the monthly incidence of pressure ulcers in ICUs located in a South Florida Hospital?

The monthly pressure ulcer incidence was calculated (Table 11). Pearson’s Correlations ($r$) were calculated for quality score and monthly pressure ulcer incidence. The value of statistical significance was an alpha level of .05. The monthly average quality score was negatively correlated to the monthly incidence of pressure ulcers for the overall sample ($r = -.232$). However, the correlation was not statistically significant ($p = .446$).

Question 1.5: What is the relationship between comprehensiveness of the nursing documentation on the monthly incidence of pressure ulcers in ICUs located in a South Florida Hospital?
Pearson’s Correlations ($r$) were calculated for quality score and monthly pressure ulcer incidence. The value of statistical significance was an alpha level of .05. The monthly average comprehensiveness score was negatively correlated to the monthly incidence of pressure ulcers for the overall sample ($r = -.224$). The correlation was not statistically significant ($p = .461$).

Question 2.1: Do the patients with pressure ulcers differ in patient’s gender from the patients without pressure ulcers?

The pressure ulcer group was comprised of 45.9% of female ($n = 45$) and 54.1% of male ($n = 53$). The non-pressure ulcer group was comprised of 41.8% of female ($n = 41$) and 58.2% of male ($n = 57$). The pressure ulcer group had slightly more females than the non-pressure ulcer group, and slightly less males than the non-pressure ulcer group (Table 14). A Chi square test indicated there was no statistically significant difference in patient’s gender between pressure ulcer patients and patients without pressure ulcers, $\chi^2(1) = .33, p = .565$.

Question 2.2: Do the patients with pressure ulcers differ in the patient’s age from the patients without pressure ulcers?

Of the total samples, patients with pressure ulcers ranged in age from 32 to 97 years ($M = 71.59, SD = 13.04$); patients without pressure ulcers ranged in age from 27 to 103 years ($M = 69.84, SD = 16.14$). Patients without pressure ulcers are slightly younger than patients with pressure ulcers (Table 15). The independent sample $t$ test was calculated to examine the differences in age of the pressure ulcer group compared to the non-pressure ulcer group. Since the assumption of the homogeneity of variance assumption has not been met, a correction was used to interpret the results. The result
revealed that there was no statistically significant difference in the patient’s age between pressure ulcer patients and patients without pressure ulcers \((p = .403)\).

**Question 2.3: Do the patients with pressure ulcers differ in the patient’s length of stay from the patients without pressure ulcers?**

Patients with pressure ulcers ranged in LOS from 3 to 51 days \((M = 9.97, SD = 7.16)\); patients without pressure ulcers ranged in LOS from 3 to 21 days \((M = 5.54, SD = 3.92)\). Patients with pressure ulcers had longer ICU stays than patients without pressure ulcers (Table 15). The Shapiro-Wilk Test was used to determine the normality of LOS prior to analyze this question. The result revealed that the data significantly deviated from a normal distribution \((p < .001)\). The Mann Whitney U Test was used to analyze this question. From the result, it can be concluded that LOS of pressure ulcer patients was statistically significantly higher than non-pressure ulcer group \((U = 2152.5, p < .001)\).

**Question 2.4: Do the patients with pressure ulcers differ in the patient’s nutritional status (albumin and pre-albumin) from the patients without pressure ulcers?**

Of the total sample, the pressure ulcer group’s albumin levels ranged from 0.90 to 4.50 g/dL \((M = 2.35, SD = 0.78)\). The non-pressure ulcer group’s albumin ranged from 1.10 to 4.5 g/dL \((M = 2.84, SD = 0.69)\). The pressure ulcer group’s pre-albumin ranged from 0.00 to 28.30 mg/dL \((M = 10.62, SD = 5.80)\). The non-pressure ulcer group’s pre-albumin ranged from 4.10 to 31.40 mg/dL \((M = 14.57, SD = 5.95)\). In general, the non-pressure ulcer group had higher levels of albumin and pre-albumin than the pressure ulcer group (Table 16). A Chi square test was used to examine the differences in albumin and pre-albumin levels of the pressure ulcer group compared to the non-pressure ulcer group. The result revealed that there was statistically significant difference in patient’s albumin
levels between pressure ulcer patients and patients without pressure ulcers, $\chi^2(3) = 27.26, p < .001$. In addition, there was a statistically significant difference between the levels of pre-albumin of pressure ulcer patients and patients without pressure ulcers, $\chi^2(3) = 17.47, p = .001$. Non-pressure ulcer patients in the CVICU had the highest albumin levels. Non-pressure ulcer patients in the NICU had the highest pre-albumin levels.

Question 2.5: Do the patients with pressure ulcers differ in the patient’s primary diagnosis from the patients without pressure ulcers?

The pressure ulcer group was comprised of 29.6% cardiovascular, 20.4% infection, 16.3% respiratory, 12.2% gastrointestinal, 6.1% orthopedic, 6.1% renal disease, 4.1% cancer, 3.1% metabolic disorders, and 2.0% neurological disorders. The non-pressure ulcer group was comprised of 30.6% cardiovascular, 18.4% respiratory, 9.2% renal disease, 8.2% neurological disease, 8.2% gastrointestinal, 5.1% cancer, 5.1% metabolic disorders, 2.0% orthopedic, and 1.0% of wounds. Both the pressure ulcer group and the non-pressure ulcer group had the highest percentage of cardiovascular diseases. Infection and respiratory diseases are higher than other primary diagnosis in both the pressure ulcer group and the non-pressure ulcer group. Table 17 displays the percentage of primary diagnosis by groups. A Chi square test indicated there was not a statistically association between patient’s primary diagnosis and pressure ulcer group and non-pressure ulcer groups, $\chi^2(9) = 10.75, p = .294$. 
Question 3: Is there an association between shift and the quality/comprehensiveness of pressure ulcer nursing documentation?

The independent sample $t$ tests were used to examine the differences in quality/comprehensiveness scores between dayshift and nightshift. The result revealed that there was no statistically significant difference in quality scores between dayshift and nightshift, $t(390) = 1.57, p = .118$. The result also revealed that there was no statistically significant difference in comprehensive scores between dayshift and nightshift, $t(390) = 1.82, p = .069$. 
Chapter 5
Discussion

Overview

This study was designed 1) to explore the quality and comprehensiveness of nursing documentation of pressure ulcers and 2) to investigate the relationship between the nursing documentation of pressure ulcers and the incidence of pressure ulcers in ICUs. Using a retrospective, comparative, descriptive, correlational design, this study also determined differences in patients’ characteristics between the pressure ulcer group and the non-pressure ulcer group. This chapter serves to summarize and discuss the findings of this study. The next section will discuss study limitations as well as implications for nursing practice, education and policies. The last section will discuss recommendations for further research.

Donabedian’s SPO model (1980) served as the conceptual framework to guide the quality and comprehensiveness of nursing documentation of pressure ulcers analysis focusing on identifying the relationship between the nursing documentation of pressure ulcers and the incidence of pressure ulcers in ICUs. From this conceptual framework, three research questions were generated and tested:

1. What is the relationship between quality and comprehensiveness of the nursing documentation on the monthly incidence of pressure ulcers in ICUs located in a South Florida Hospital?
2. Do the patients with pressure ulcers differ in the patient characteristics (age, gender, length of stay, nutritional status and primary diagnosis) from the patients without pressure ulcers?

3. Are there associations between staff nurses characteristics (shift and ICU setting) and the quality/comprehensiveness of pressure ulcer nursing documentation?

Discussion of Findings

Question 1.1: What is the relationship between the monthly incidence of pressure ulcers and ICU setting?

There were no significant differences in monthly pressure ulcer incidence across four ICU settings. Thus, the type of ICU setting has no demonstrable effect on the incidence of pressure ulcers. This study finding supports results published by Sayar and colleagues (2009) in which there were no statistically significant differences found between ICUs for incidence of pressure ulcers. This study contradicts the findings in one previous study (Shahin, Dassen, and Halfens, 2008) that reported that the NICU had the highest incidence of pressure ulcers among ICU settings. This study reported that NICU had an incidence of 4.5%, SICU 2.9%, and 0% in CVICU. However, the structures of the hospitals participating in Shahin and colleagues’ study (2008) did not include the recovery or step-down wards. Therefore, all surgery patients were admitted to the ICUs, even though they only stayed there for a short period of time. It means that the ICU patients in their study were not all critically ill patients, which may be a factor in the generalizability of their findings.


**Additional findings**

Additionally, the results of this study revealed a lower pressure ulcer incidence (2.3%) overall, compared to other studies (Keller, Wille, Van Ramshorst, & Van der Werken, 2002; Schoonhoven, Defloor, Buskens, & Grypdonck, 2002). This finding can be explained by the retrospective nature of the study because data collection relied on the patients’ chart. The researcher was not able to assess patients’ skin in order to accurately identify pressure ulcers. Red areas on the skin might be not considered pressure ulcers (Gunningberg & Ehrenberg, 2004). This could decrease the number of documented hospital acquired pressure ulcers. Additionally, a wound care team was established in this hospital beginning in 2010. One may speculate that the wound care team could be responsible for reducing the incidence of pressure ulcers in this hospital due to the wound care teams’ expertise and availability of time to focus on the skin assessment by providing prompt prevention and management of pressure ulcers (Hiser et al., 2006).

**Question 1.2: What is the relationship between the quality of the nursing documentation and ICU setting?**

Quality of nursing documentation was defined as accurate patient data obtained through the nursing process. Quality of pressure ulcer documentation was examined by using EPUAP Pressure Ulcers Assessment Instrument (2007). Results indicated that there was a statistically significant difference in quality of nursing documentation across four ICU settings. A post-hoc test further revealed that the quality scores in the MICU were statistically significantly higher compared to the CVICU and the NICU. There were no statistically significant differences between the MICU and SICU. However, the mean
quality scores in the MICU were higher than the mean quality scores in the SICU. No similar study that investigated the quality of pressure ulcer documentation across ICU settings was identified in the literature search. In this study, 725 patients were admitted to the MICU; 1660 patients were admitted to the SICU; 1190 patients were admitted to the CVICU, 1174 patients were admitted to the NICU during the time period of September 01, 2011 through September 30, 2012. The number of admissions was variable among ICU settings, which may or may not have an impact on the results of the study; however, it may be a factor to consider in the generalizability of the findings.

**Additional findings**

Among the 392 patients’ documentations with pressure ulcers, only 314 documentations had corresponding presence of pressure ulcers in the patient record and a full pressure ulcer description was available in only two documentations. Location of pressure ulcers was by far most frequently documented in EHR. Documentation with “Wound color” and “Photo Taken” were found only in a slightly more than half of the patient records, although more frequently addressed than other descriptions of pressure ulcers. Wound odor, physician notify date, hardening, granulation, size, staging were only recorded in a small portion of the nursing documentation. Data in the EHR to support the identification of a pressure ulcer, risk factors and/or care plans to prevent or treat a pressure ulcer were scarce and showed a lack of quality. Previous studies (Guningberg & Ehrenberg, 2004; Thoroddsen, Sigurjónsdóttir, Ehnfors, & Ehrenberg, 2013) reported similar findings in Sweden and Iceland. Guningberg and Ehrenberg’s (2004) study showed lack of accuracy of pressure ulcer description in nursing documentation; that is, only half of the observed pressure ulcers were recorded in a
university hospital in Sweden. Thoroddsen and colleagues (2013) indicated that information in patient records lacked accuracy, completeness and comprehensiveness in a university hospital in Iceland. The results of this study further substantiate and strengthen these previous findings, indicating that omissions of pressure ulcer documentation were identified at different levels in patients’ records.

Documentation in an incorrect section was found in 91 pressure ulcer documentation reports. It was noted that pressure ulcer documentation appeared in several different sections within the patient’s EHR and the methods utilized for that documentation were inconsistent. Because different sections had different functions, other sections in the EHR did not include all the components that were used to describe pressure ulcer appearance. Thus, staff nurses only documented pressure ulcers based on the structure of the incorrect section, which did not fully address the comprehensiveness of the required pressure ulcer description. One potential explanation is that the staff nurses were not familiar with the EHR for pressure ulcer documentation. This finding indicates that correct use of an EHR is an important component in improving the quality of pressure ulcer documentation. It is also possible that the EHR was not designed correctly based on professional nursing organization standards, which was beyond the scope of this study.

Compared to the documentation in the EHR, the written medical records had a higher percentage of documentation of the presence of pressure ulcers. Similar to the documentation in the EHR, the location of the pressure ulcer was the most frequently documented in the written medical records. This finding may be explained by the fact that “location” is the first documentation prompt for pressure ulcer description in both the
EHR template and the written medical record. Granulation was only recorded in a small portion of nursing documentation. These findings are consistent with previous studies. Hale and colleagues (1997) reported not a single patient record fulfilled the requirements for the recording of nursing practice. Ammenwerth and colleagues (2001) identified incomplete documentation and poor legibility with written medical record in their randomized controlled trial. Perhaps one explanation for missing documentation may be that complete description of pressure ulcer documentation takes time, especially with increased patient acuity and the current nursing shortage. In addition, it may indicate deficient knowledge or an inability to express basic nursing care in writing (Jefferies, Johnson, & Griffiths, 2010).

Of 196 written medical records, a full pressure ulcer description was available in only seven patient records; photographs without patient identification or a sample measure (e.g. a 10 cm strip of paper tape) were found in 84 documentations. The overall findings from this study often showed incomplete nursing documentation and poor quality in the written medical record. The NPUAP strongly encourages that a pressure ulcer protocol should include clear patient identification, date and time of the photo, marking for a sample measure in each frame, and that the photographs become part of the medical record (EPUAP & NPUAP, 2009). No similar study was identified in the literature in which to investigate the quality of photographs of pressure ulcer documentation.

Question 1.3: What is the relationship between the comprehensiveness of the nursing documentation and ICU setting?
Comprehensiveness of documentation in pressure ulcers was defined as complete coverage of the nursing process within the documentation. A comprehensive documentation of pressure ulcers includes a) pressure ulcers are present with detailed descriptions, such as location, staging, appearance (include size, tunneling, undermining, exudates’ odor and type, wound bed color, surrounding skin color and wound edges/surrounding tissue), infection, dressing appearance, pictures; AND b) turning patient every 2 hours; AND c) dressing is present; AND d) medication is applied on pressure ulcer area; AND e) wound healing progress is described and evaluated.

Results indicated that there was a statistically significant difference in comprehensiveness of nursing documentation across four ICU settings. A post-hoc test result showed that the comprehensiveness score in the MICU was statistically significantly higher compared to the CVICU and the NICU. There were no statistically significant differences between the MICU and the SICU. No similar study was identified in the literature in which to compare the comprehensiveness of pressure ulcer documentation across ICU settings. Comprehensiveness was lacking in the recording of pressure ulcer care, nursing diagnosis, intervention as well as outcomes of nursing care. The results were consistent with results in other studies that measured the comprehensiveness of pressure ulcer documentation using this instrument (Ehrenberg & Ehnfors, 1999; Gunningberg & Ehrenberg, 2004; Gunningberg, Lindholm, Carlsson, & Sjödén, 2000; Gunningberg, Lindholm, Carlsson, & Sjödén, 2001).

*Question 1.4: What is the relationship between the quality of nursing documentation on the monthly incidence of pressure ulcers in ICUs located in a South Florida Hospital?*
Although the correlation between the quality of nursing documentation and the incidence of pressure ulcers in ICUs was not statistically significant, the finding from this data analysis is worthy of discussion. The monthly average quality score was negatively associated with the incidence of pressure ulcers for the overall sample. The negative correlation indicates that quality score does have a weak relationship with the incidence of pressure ulcers. That is, as quality score increased, incidence of pressure ulcer decreased. This finding has not been reported in the literature. Further research with a larger sample size may establish the direction and strength of the relationship. Previous studies were sparse and limited in scope in regards to quality of nursing documentation related to incidence of pressure ulcers in the ICU setting. One previous study (Shahin, Dassen, and Halfens, 2008) indicated that further observation and frequent assessment might help to reduce pressure ulcer incidence. Some preventive measures, such as foam mattresses and alternating air pressure mattresses, probably have a positive effect on preventing pressure ulcers in ICUs as well. In Garling’s report (2008) regarding root cause analyses of incidents recorded on the Incident Information Management System at one Sydney metropolitan tertiary referral hospital, nearly half of the adverse events were attributed to two factors: poor communication and a lack of policy and procedure to ensure that an appropriate communication system was maintained. The finding of this current study indicates that quality nursing documentation promotes consistent and effective communication between caregivers and facilitates continuity and individuality of care and safety of patients.
Question 1.5: What is the relationship between comprehensiveness of the nursing documentation on the monthly incidence of pressure ulcers in ICUs located in a South Florida Hospital?

The monthly average comprehensiveness score was negatively associated with the monthly incidence of pressure ulcers for the overall sample. The negative correlation indicates that comprehensiveness score does have a week relationship with the incidence of pressure ulcers. That is, as comprehensiveness score increased, incidence of pressure ulcer decreased. This finding has not been reported in the literature. However, the correlation was not statistically significant. This could be explained by the small sample size because only 13 months of incidence data was collected and analyzed. Further research with a larger sample size may establish the direction and strength of the relationship.

Question 2.1: Do the patients with pressure ulcers differ in gender from the patients without pressure ulcers?

The result indicated there was no statistically significant association between patient’s gender and the presence of a pressure ulcer. Unlike the findings of other studies, neither male gender (Baumgarten et al., 2006; Fisher, Wells & Harrison, 2004; Okuwa et al., 2006), nor female gender (Howard & Taylor, 2009), had a significant effect on the incidence of pressure ulcers. This finding supports previous research that gender was not a pressure ulcer risk factor (Anthony, Reynolds, & Russell, 2003; Kayser-Jones et al., 2008; Lyder et al., 2012).
Question 2.2: Do the patients with pressure ulcers differ in age from the patients without pressure ulcers?

The result revealed that there was no statistically significant difference in the patient’s age between pressure ulcer patients and patients without pressure ulcers in the ICU setting. This finding supports previous research that age was not a pressure ulcer risk factor (Fife et al., 2001; Nixon, Brown, McElvenny, Mason, & Bond, 2000; Sayar et al., 2009; Theaker et al., 2005). This study contradicted the findings in some previous studies (Bours, De Laat, Halfens, & Lubbers, 2001; Eachempati, Hydo, & Barie, 2001; Pokorny, Koldjeski, & Swanson, 2003) which reported that age is significantly associated with pressure ulcer incidence. The reason for the discrepancy between the current findings and some previous research may lie in the setting of patient admission. Bergstrom and colleagues (1987) found that medical-surgical patients who developed pressure ulcers were significantly older than medical-surgical patients who did not develop pressure ulcers. However, Bergstrom, Demuth, and Braden (1987) found that there was no significant age difference between the two groups in ICU settings. It may be fair to speculate that age in itself may be not associated with incidence of pressure ulcers in ICUs, but combined with other risk factors, age can become a major risk factor in the incidence of pressure ulcers.

Question 2.3: Do the patients with pressure ulcers differ in the patient’s LOS from the patients without pressure ulcers?

From the result, LOS of pressure ulcer patients was statistically significantly higher than non-pressure ulcer group. The association of LOS and pressure ulcers is supported in other studies (Anthony et al., 2004; Celani, Spizzichino, Ricci, Zampolini, &
Franceschini, 2001; Williams, Stotts, & Nelson, 2000). ICU LOS was examined in three studies and was found to be a significant predictor for pressure ulcer development in all three studies (Bours et al., 2001; Eachempati, Hydo, & Barie, 2001; Theaker, Mannan, Ives, Soni, & Theaker, 2000). Findings from this study and previous research support the proposition that patients who stay for longer periods of time in the ICU setting have a greater risk of pressure ulcer development.

**Question 2.4: Do the patients with pressure ulcers differ in the patient’s nutritional status (albumin and pre-albumin) from the patients without pressure ulcers?**

The results revealed that there was a statistically significant difference between albumin levels and pre-albumin levels of pressure ulcer patients when compared to patients without pressure ulcers. This study finding supports findings published by previous studies (Bourdel-Marchasson et al., 2000; Fisher, Wells & Harrison, 2004; Guenter et al., 2000; Williams, Stotts, & Nelson, 2000) in which nutrition was a significant predictor of pressure ulcer development. This finding may also be explained by the fact that poor nutritional intake reduces nutrient availability in the body for energy metabolism, maintenance, and repair, which increases the risk of pressure ulcer development (Poskitt & Burdge, 2004). Action must be taken to identify, prevent, and treat malnutrition in all hospitalized patients to prevent pressure ulcers.

**Question 2.5: Do the patients with pressure ulcers differ in the patient’s primary diagnosis from the patients without pressure ulcers?**

This study finding indicated there was no statistically association between patient’s primary diagnosis and pressure or non-pressure ulcer groups. The most common primary diagnosis of pressure ulcer patients were cardiovascular (29.6%), infection
(20.4%), respiratory (16.3%), and gastrointestinal patients (12.2%). A similar finding was identified in another published study that utilized a sample of medical, surgical and intensive care patients in a northern California hospital (Jenkins & O'Neal, 2010). This finding also was supported the research of Lyder and colleagues (2012) who reported that cardiovascular disease may increase vulnerability to development of hospital acquired pressure ulcers. Thus, patients entering the hospital with any cardiovascular conditions should be identified as being at higher risk for developing pressure ulcers. Rogenski and Kurcgant (2012) also reported that respiratory (36.7%) and cardiovascular (27.8%) diagnoses are two most common primary diagnoses in pressure ulcer patients in a university hospital in Brazil. There are several other populations at an increased risk for pressure ulcers reported in the previous research that were not highly represented in this current study, but this may only indicated that these populations, i.e. spinal cord injury (Lyons & Sorenson, 2007; National Spinal Cord Injury Statistical Center [NSCIS], 1997; New, Rawicki, & Bailey, 2004) and patients with cancer (Fromantin et al., 2011; Nonnemacher et al., 2009), do not contribute to a very large segment of this hospitalization patient population in general.

**Question 3: Is there an association between shift and the quality or comprehensiveness of pressure ulcer nursing documentation?**

The results revealed that there were no statistically significant differences in quality or comprehensiveness score between dayshift and nightshift. No other studies have reported the association between shift and nursing documentation. Although there was strong evidence that health care providers who work at night or rotate to work at
night were more likely to have poor outcomes (e.g., fatigue, decreased mental well beings, and job satisfaction), from previous research findings (Admi, Tzischinsky, Epstein, Herer, & Lavie, 2009; Burch, Tom, Zhai, Criswell, Leo, & Ogoussan, 2009; Geiger-brown, Muntaner, Lipscomb, & Trinkoff, 2004; Ruggiero, 2003; West, Ahern, Byrnes, & Kwanten, 2007) and this study finding, it cannot be determined if those poor employee outcomes impacted the quality of their nursing documentation.

Implications

Implications for Nursing Education

Pressure ulcer prevention and treatment requires consistent objective assessments and documentation in order for proper interventions to be implemented. The findings of the current study showed that tunneling and undermining were the main characteristics omitted in both the EHR and written medical record. Tunneling can result in abscess formation and further impede the healing process. Undermining, is destruction of the tissue under the skin around the edges of the wound, resulting in impaired healing. It is important to immediately identify the presence of tunneling and undermining and document the location and extent of undermining (Baranoski & Ayello, 2004). The treatment of a pressure ulcer with or without tunneling and undermining is completely different. Failure to document pressure ulcers thoroughly can cause infection and delay the healing process (Baranoski & Ayello, 2004). Education should be provided to staff nurses regarding comprehensive documentation of pressure ulcers. Additionally, although the current hospital policy requires photographs of all pressure ulcers to be taken on patient admission, every Wednesday, and on day of discharge, only nine of 98 patients’
records have met the hospital policy with sufficient photographs in their written medical records. Photographs assist the health care provider in determining the efficacy of pressure ulcer treatment and provide an excellent communication tool for the wound care team (Doughty, 2004). A photograph can provide a more objective visual of the healing progress of the pressure ulcers and verify health care providers’ acknowledgement of the wound and its severity, helping to decrease liability concerns and lack of physician coordinated pressure ulcer care (Hess, 2005). The lack of consistent photographs inhibited the researcher’s ability to audit for pressure ulcer wound healing assessment. Therefore, staff nurse training and education would be reinforced to meet current hospital policy.

This study demonstrated that documentation of pressure ulcers is inadequate. A more consistent wound care and pressure ulcer curriculum among educational programs in both schools of nursing and health care settings would be beneficial. First, the study findings have implications for creating specific lectures on pressure ulcers for undergraduate nursing students. A 2003 review of nursing textbooks done by Ayello and Meaney revealed that there was a wide variation in the amount and quality of information dedicated to pressure ulcers in nursing textbook. Education on pressure ulcers in undergraduate nursing programs is often inadequate (Cullen & Cox, 2005; Vogelphohl & Dougherty, 1993). A lecture on pressure ulcers can give several pictures of a wound, and students can be asked to examine and assess wound characteristics. After initial examination, students will be asked to document wound characteristics in the designed EHR and written record. Secondly, the findings may have implications for continued
education needs of the staff nurses. The results of this current study can be utilized as examples of poor nursing documentation, and nurses can be asked to point out the deficits. They will also be asked how to document properly in both the EHR and the written record. In addition, staff nurses need more “hand on” education, and use of innovative education technologies to teach staff nurses about how to effectively use the EHR must be explored.

**Implications for Practice**

**Pressure ulcer prevention.** Nurses have long been concerned with the prevention of pressure ulcers and evidence based practice guidelines have been developed to guide pressure ulcer prevention practices, yet the prevalence and incidence of pressure ulcers has not changed substantially. The study findings demonstrate that patients who develop pressure ulcers differed from those patients who do not develop pressure ulcers in both nutritional status and LOS. Early nutrition screening and assessment are essential to identify risk of malnutrition, which may precipitate pressure ulcer development and delay healing. Both CMS and AHRQ (CMS, 2007) specifically identified nutritional status as one of the most influential factors associated with pressure ulcer prevention, development, and treatment. Malnutrition may decrease the body’s ability to fight infections and interfere with pressure ulcer healing. There is a need to quickly identify and treat malnutrition when pressure ulcers are present. Nurses should be more vigilant about skin care in patients who are high risk. The prevention of care that staff nurses provide to ICU patients may be improved when nurses have increased awareness of the factors related to pressure ulcer development.
Legal. Another implication of this study involves litigable risk. The results from this study show that among the 392 patients’ documentation with pressure ulcers, a full pressure ulcer description was only available in two patient medical records. As seen from the results of this study, data in the EHR to support identification of a pressure ulcer or risk factors and care plans to prevent or treat a pressure ulcer were scarce and lacking in quality. Lawyers use copies of the government written pressure ulcer prevention guideline to evaluate medical records for pressure ulcer litigation (Pieper & Mott, 1995). Nurses can be held liable for substandard care to prevent pressure ulcers. The common complaints in lawsuit can be failure to follow a standard of care, failure to communicate, failure to assess and monitor appropriately, failure to report significant findings, and failure to document (Ayello et al., 2010). Nursing documentation must describe the care given to the patient by the nurse as accurately as possible. Nursing care should be fully expressed in the content of the nursing documentation, in a quality structure and format and through an appropriate documentation process.

Reimbursement. In October 2008, CMS ceased to cover the cost of stages III and IV hospital acquired pressure ulcers. From this study, the stages of pressure ulcers were only documented in 53 medical records out of the 392 patients’ documentation in their EHRs, whereas 136 written medical records out of the 196 included staging. Based on the study findings, nursing documentation cannot assist in justifying reimbursement for services. Consequently, the costs related to pressure ulcer treatment place a tremendous financial burden on the hospitals. Therefore, it now becomes more important than ever for nurses to document a thorough skin assessment that includes pressure ulcer staging in
patient’s medical records. It was also suggested that nurses should receive education on staging of pressure ulcers through continuing education reviews and updates.

**Regulatory.** Health Care Financing Administration (HCFA) regulation tag number F314 refers to the regulations governing care of pressure ulcer, including prevention in long term facilities. It mandates that simply stating the stage of the ulcer is insufficient, as description of the wound should be accompanied by measurement of length, width, depth, and notation of odor and presence of drainage. Wound care documentation should also contain a full narrative description of the wound, current treatment, and wound healing status. Photographs can provide supplementary documentation of the wound, but should never replace written descriptions. Each facility must decide whether photographs should be a part of their wound care documentation program (CMS, 2007). In the current study, results show that wound odor, physician notify date, hardening, granulation, size, staging were only recorded in a small portion of patients’ documentation. It indicates that the current documentation showed non-compliance of Tag F314. This regulation provides surveyors step-by-step direction on how to accurately and thoroughly investigate the policies and procedures related to pressure ulcers and subsequently assess related fines for those who fall short of the national standards. Nursing documentation is a reflection of the care delivered. There should be evidence that the patient was accurately assessed, the care planning was focused, the care plan was implemented and its outcomes were evaluated. Indeed, the regulatory board considers that lack of documented evidence of care planning as indicative that care was not delivered.
Implications for Policies

**JCAHO.** In 2009, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) released new National Patient Safety Goals (NPSGs) and recommended that healthcare organizations implement guidelines associated with the prevention of pressure ulcer development among patients admitted to their healthcare facilities. Currently, healthcare organizations must meet all the NPSGs including the prevention of pressure ulcers when surveyed by JCAHO. This regulation has been used as a quality indicator associated with patient safety. Knowing more about the quality of pressure ulcer documentation could help JCAHO develop policies that aim to address the pressure ulcer documentation issues relating to the provision of safe, high-quality health care.

**NPUAP.** According to NPUAP guidelines, assessment and documentation of pressure ulcers should be conducted at least every shift, unless there is evidence of deterioration, in which case both the pressure ulcer and patient’s overall management must be reassessed immediately (NPUAP, 2007). As seen from the results of this study, there were 78 medical records that did not show corresponding records of pressure ulcers even though those patients had pressure ulcers. The study results demonstrated that documentation did not adhere to the NPUAP guidelines. Failure to document pressure ulcers means that the pressure ulcers were neglected in those shifts, adversely impacting the patient’s care.
Implications for Research

In this study, the researcher used 13 months pressure ulcer incidence data collected in ICU settings to determine the relationship between the quality/comprehensiveness of pressure ulcer documentation and incidence of pressure ulcers. Future researchers may want to replicate this study with a larger sample size that may help to establish the direction and strength of the relationship between the quality/comprehensiveness of pressure ulcer documentation and incidence of pressure ulcers.

The retrospective chart review in this study revealed inconsistencies in pressure ulcer documentation in ICU settings. Researchers may wish to investigate pressure ulcer documentations in other settings, such as medical surgical wards and telemetry wards. It would allow for broader generalizations of their findings. Many standard hospital EHRs are poorly designed for pressure ulcer documentation and may not accommodate the documentation needs of pressure ulcer patients (Ayello et al., 2010). Researchers may also wish to investigate pressure ulcer documentation systems in other EHRs to find a design that optimizes ease of use and accuracy of documentation.

A future study should include more demographic variables of staff nurses other than shift and ICU setting to determine effects on the quality/comprehensiveness of pressure ulcer documentation. Other demographic variables that might include age, gender, education levels, and working experience; all of these factors may significantly affect quality/comprehensiveness of pressure ulcer documentation.
Another future study could explore the barriers to prevent staff nurses from documenting pressure ulcer properly. Exploration through qualitative methodology of the staff nurses’ perceived barriers could be expanded to determine the extent to which the perception of barriers influences their documentation. This, will promote the provision of care that may result in an improvement in patient care.

**Limitations**

There were several limitations noted in this study. The first limitation was that data were retrospectively collected, and it is possible that hospital pressure ulcers could have been present, and simply not recorded or adequately described. This approach may have led to underestimating the number of patients who developed hospital acquired pressure ulcers during the hospital stay. Although every attempt was made to document the incidence of hospital acquired pressure ulcers, identification of pressure ulcers relies on the EHR and written record rather than assessing patients’ skin condition by the researcher. In addition, although the nurses did not document pressure ulcer accurately, they may have verbalized the patient’s condition to doctors and/or other nurses. Since there was no contact with patients or staff nurses, only the documented data in the EHR and written record were available for recording.

Due to the retrospective design of the study, nurse characteristics did not include other important factors that may be associated with quality and comprehensiveness of nursing documentation, such as gender, age, education level, and working experience. These variables may provide greater insight into nursing documentation from a nursing perspective and should be considered for future studies.
Another limitation was the use of a convenience sample of health records from one health care facility. This poses a large threat to the generalizability of the results of this study. Replication of the current study using multiple sites with a larger sample is recommended for future research.

**Conclusions**

The study was designed to gain an understanding of the risk factors for pressure ulcer development and to investigate the relationship between nursing documentation of pressure ulcers, and the incidence of pressure ulcers in the ICU settings. In summary, the study findings could not document significant correlations between the quality and comprehensiveness of pressure ulcer documentation and incidence of pressure ulcers. However, evidence has shown that nursing records do not provide a complete picture of patients’ care needs that require nursing intervention. Therefore, nursing documentation as a source of research data that attempts to relate patient outcomes to nursing interventions is severely limited. The inadequacy of nursing records has been noted for many years. Unless nurses are willing and able to record what they do and make this visible, nursing documentation will not be able to serve as an audit function evaluating patients’ responses to nursing interventions.
<table>
<thead>
<tr>
<th>Stage(^*) (1989)</th>
<th>Sign and symptoms</th>
<th>Stage(^**) (2007)</th>
<th>Sign and symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage I</td>
<td>Nonblanchable erythema of intact skin; the heralding lesion of skin ulceration.</td>
<td>Stage I</td>
<td>Intact skin with non-blanchable redness of a localized area usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area.</td>
</tr>
<tr>
<td>Stage II</td>
<td>Partial-thickness skin loss involving epidermis and/or dermis. The ulcer is superficial and presents clinically as an abrasion, blister or shallow crater.</td>
<td>Stage II</td>
<td>Partial thickness loss of demis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled blister.</td>
</tr>
<tr>
<td>Stage III</td>
<td>Full-thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia, the ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.</td>
<td>Stage III</td>
<td>Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling.</td>
</tr>
</tbody>
</table>

\(^*\) *National Pressure Ulcer Advisory Panel (NPUAP) Classification System in 1989*

Table 1 Continued.

<table>
<thead>
<tr>
<th>Stage&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Sign and symptoms</th>
<th>Stage&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Sign and symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage IV</td>
<td>Full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone or supporting structures. Undermining and sinus tracts may be associated with stage IV pressure ulcers.</td>
<td>Stage IV</td>
<td>Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunneling.</td>
</tr>
<tr>
<td>Suspected</td>
<td>Purple or maroon localized area of discolored intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep Tissue Injury</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstageable</td>
<td>Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage</td>
<td>Sign and symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage I</td>
<td>Intact skin with non-blanchable redness of a localized area usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its color may differ from the surrounding area. Pressure Ulcer Prevention Risk Assessment Scales.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage II</td>
<td>Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled blister.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage III</td>
<td>Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle is not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage IV</td>
<td>Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunneling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstageable</td>
<td>Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown or black) in the wound bed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Description of Norton subscales

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>Very</td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
</tr>
<tr>
<td>Condition</td>
<td>Bad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental</td>
<td>Stuporous</td>
<td>Confused</td>
<td>Apathetic</td>
<td>Alert</td>
</tr>
<tr>
<td>Condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Bedfast</td>
<td>Chairbound</td>
<td>Walk with Help</td>
<td>Ambulant</td>
</tr>
<tr>
<td>Mobility</td>
<td>Immobile</td>
<td>Very</td>
<td>Slightly</td>
<td>Full</td>
</tr>
<tr>
<td></td>
<td>Limited</td>
<td>Impaired</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incontinence</td>
<td>Urinary and Fecal</td>
<td>Usually</td>
<td>Occasional</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Urinary</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Total score of less than 10 = very high risk, 10-14=high risk, 14-18=medium risk, over 18= low risk (Norton, McLaren, & Smith, 1976).
Table 4. Description of Braden subscales

<table>
<thead>
<tr>
<th>Subscale</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory</td>
<td>Completely</td>
<td>Very limited</td>
<td>Slightly</td>
<td>No</td>
</tr>
<tr>
<td>Perception</td>
<td>Limited</td>
<td>Limited</td>
<td>Impairment</td>
<td></td>
</tr>
<tr>
<td>Moist</td>
<td>Constantly</td>
<td>Very moist</td>
<td>Occasionally</td>
<td>Rarely moist</td>
</tr>
<tr>
<td>Wetting</td>
<td>Moist</td>
<td>Moist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Bedfast</td>
<td>Chairfast</td>
<td>Walks</td>
<td>Walks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Occasionally</td>
<td>Frequently</td>
</tr>
<tr>
<td>Mobility</td>
<td>Completely</td>
<td>Very limited</td>
<td>Slightly limited</td>
<td>No limitation</td>
</tr>
<tr>
<td></td>
<td>Immobile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrition</td>
<td>Very poor</td>
<td>Probably inadequate</td>
<td>Adequate</td>
<td>Excellent</td>
</tr>
<tr>
<td>Friction and</td>
<td>Definitely a</td>
<td>Potential problem</td>
<td>No apparent</td>
<td></td>
</tr>
<tr>
<td>Shear</td>
<td>problem</td>
<td>problem</td>
<td>problem</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Total score of 9 or less = very high risk, 10-12=high risk, 13-14=moderate risk, 15-18=at risk, over 18=not at risk (Bergstrom, Demuth, & Braden, 1987).
Table 5. CIND instrument score and corresponding description in nursing documentation

<table>
<thead>
<tr>
<th>CIND Score*</th>
<th>Chart Review Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Score 1. The problem is described or</strong> interventions planned or implemented.</td>
<td>Nursing notes state a) pressure ulcers are present; OR b) turning patient every 2 hours; OR c) dressing is present; OR d) medication is applied on pressure ulcer area.</td>
</tr>
<tr>
<td><strong>Score 2. The problem is described and</strong> interventions planned or implemented.</td>
<td>Nursing notes state a) pressure ulcers are present; AND b) turning patient every 2 hours; OR c) dressing is present; OR d) medication is applied on pressure ulcer area.</td>
</tr>
<tr>
<td><strong>Score 3. The problem is described and intervention planned or implemented and nursing outcome is recorded.</strong></td>
<td>Nursing notes state a) pressure ulcers are present; AND b) turning patient every 2 hours; OR c) dressing is present; OR d) medication is applied on pressure ulcer area; AND e) wound healing progress is described and evaluated.</td>
</tr>
<tr>
<td><strong>Score 4. The problem is described and intervention planned and implemented and nursing outcome is recorded</strong></td>
<td>Nursing notes state a) pressure ulcers are present; AND b) turning patient every 2 hours; AND c) dressing is present; OR/AND d) medication is applied on pressure ulcer area; AND e) wound healing progress is described and evaluated.</td>
</tr>
<tr>
<td><strong>Score 5. All aspects of the nursing process are recorded, including nursing history, diagnosis, goals and discharge notes. There is an adequate description of the problem. The recording is of relevance to nursing.</strong></td>
<td>Nursing notes state a) pressure ulcers are present with detailed descriptions, such as location, staging, appearance (include size, tunneling, undermining, exudates’ odor and type, wound bed color, surrounding skin color and wound edges/surrounding tissue), infection, dressing appearance, pictures; AND b) turning patient every 2 hours; AND c) dressing is present; OR/AND d) medication is applied on pressure ulcer area; AND e) wound healing progress is described and evaluated.</td>
</tr>
</tbody>
</table>

* Ehnfors and Smedby (1993)
Table 6
Total Sample \((n = 196)\)

<table>
<thead>
<tr>
<th>Group</th>
<th>SICU</th>
<th>CVICU</th>
<th>MICU</th>
<th>NICU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure ulcers</td>
<td>26 (26.5)</td>
<td>24 (24.5)</td>
<td>26 (26.5)</td>
<td>22 (22.5)</td>
</tr>
<tr>
<td>Non pressure ulcers</td>
<td>26 (26.5)</td>
<td>24 (24.5)</td>
<td>26 (26.5)</td>
<td>22 (22.5)</td>
</tr>
</tbody>
</table>
### Table 7

Quality of EHR Documentation of Pressure Ulcers ($n = 392$)

<table>
<thead>
<tr>
<th>Descriptions</th>
<th>Documented in EHR $N$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>310 (79.1)</td>
</tr>
<tr>
<td>Dressing Type</td>
<td>175 (44.6)</td>
</tr>
<tr>
<td>Wound Type</td>
<td>149 (38)</td>
</tr>
<tr>
<td>Granulation</td>
<td>31 (7.9)</td>
</tr>
<tr>
<td>Wound Odor</td>
<td>2 (2.0)</td>
</tr>
<tr>
<td>Wound Color</td>
<td>215 (54.8)</td>
</tr>
<tr>
<td>Drainage Amount</td>
<td>82 (20.9)</td>
</tr>
<tr>
<td>Drainage Color</td>
<td>65 (16.6)</td>
</tr>
<tr>
<td>Stage</td>
<td>53 (13.5)</td>
</tr>
<tr>
<td>Comment</td>
<td>36 (9.2)</td>
</tr>
<tr>
<td>Hardening</td>
<td>15 (3.8)</td>
</tr>
<tr>
<td>Physician Notified</td>
<td>86 (21.9)</td>
</tr>
<tr>
<td>Notify Date</td>
<td>8 (2.0)</td>
</tr>
<tr>
<td>Photo Taken</td>
<td>225 (57.4)</td>
</tr>
<tr>
<td>Taken Date</td>
<td>187 (47.7)</td>
</tr>
<tr>
<td>Equipment Used</td>
<td>69 (17.6)</td>
</tr>
<tr>
<td>Reposition</td>
<td>98 (25.0)</td>
</tr>
<tr>
<td>Dressing Change</td>
<td>159 (40.6)</td>
</tr>
<tr>
<td>Medication Applied</td>
<td>179 (45.7)</td>
</tr>
<tr>
<td>Outcome Description</td>
<td>99 (25.3)</td>
</tr>
</tbody>
</table>
Table 8
Comprehensiveness of EHR Documentation of Pressure Ulcers (n = 392)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Documented in EHR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
</tr>
<tr>
<td>Score 0</td>
<td>78 (19.9)</td>
</tr>
<tr>
<td>Score 1</td>
<td>98 (25.0)</td>
</tr>
<tr>
<td>Score 2</td>
<td>120 (30.6)</td>
</tr>
<tr>
<td>Score 3</td>
<td>22 (5.6)</td>
</tr>
<tr>
<td>Score 4</td>
<td>71 (18.1)</td>
</tr>
<tr>
<td>Score 5</td>
<td>3 (0.8)</td>
</tr>
</tbody>
</table>
Table 9
Monthly Average Comprehensiveness Score across 4 ICUs ($n = 392$)

<table>
<thead>
<tr>
<th>Month</th>
<th>Comprehensiveness Score</th>
<th>$M$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SICU</td>
<td>CVICU</td>
</tr>
<tr>
<td>Sep, 2011</td>
<td>1.13</td>
<td>1.50</td>
</tr>
<tr>
<td>Oct, 2011</td>
<td>2.75</td>
<td>2.08</td>
</tr>
<tr>
<td>Nov, 2011</td>
<td>1.42</td>
<td>2.25</td>
</tr>
<tr>
<td>Dec, 2011</td>
<td>2.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Jan, 2012</td>
<td>2.38</td>
<td>1.33</td>
</tr>
<tr>
<td>Feb, 2012</td>
<td>0.58</td>
<td>1.25</td>
</tr>
<tr>
<td>Mar, 2012</td>
<td>2.00</td>
<td>0.75</td>
</tr>
<tr>
<td>Apr, 2012</td>
<td>1.75</td>
<td>2.50</td>
</tr>
<tr>
<td>May, 2012</td>
<td>2.13</td>
<td>0.50</td>
</tr>
<tr>
<td>Jun, 2012</td>
<td>2.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Jul, 2012</td>
<td>3.13</td>
<td>0.00</td>
</tr>
<tr>
<td>Aug, 2012</td>
<td>0.00</td>
<td>0.50</td>
</tr>
<tr>
<td>Sep, 2012</td>
<td>1.13</td>
<td>0.63</td>
</tr>
</tbody>
</table>
Table 10

Quality of Written Records \((n = 196)\)

<table>
<thead>
<tr>
<th>Descriptions</th>
<th>Documented in Written Records</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N) (%)</td>
</tr>
<tr>
<td>Location</td>
<td>175 (89.3)</td>
</tr>
<tr>
<td>Stage</td>
<td>136 (69.4)</td>
</tr>
<tr>
<td>Size</td>
<td>75 (38.3)</td>
</tr>
<tr>
<td>Depth</td>
<td>45 (23.0)</td>
</tr>
<tr>
<td>Exudate</td>
<td>115 (58.7)</td>
</tr>
<tr>
<td>Tunneling</td>
<td>47 (24.0)</td>
</tr>
<tr>
<td>Undermining</td>
<td>44 (22.4)</td>
</tr>
<tr>
<td>Granulation</td>
<td>19 (9.7)</td>
</tr>
<tr>
<td>Wound Bed</td>
<td>115 (58.7)</td>
</tr>
<tr>
<td>Surrounding Skin Color</td>
<td>112 (57.1)</td>
</tr>
<tr>
<td>Wound Edge</td>
<td>98 (50.0)</td>
</tr>
<tr>
<td>First Observed Date</td>
<td>49 (25.0)</td>
</tr>
<tr>
<td>Photo Taken Date</td>
<td>164 (83.7)</td>
</tr>
<tr>
<td>Circle Location</td>
<td>107 (54.6)</td>
</tr>
</tbody>
</table>
Table 11

Monthly Pressure Ulcer Incidence in 4 ICU Settings

<table>
<thead>
<tr>
<th>Month</th>
<th>SICU (%)</th>
<th>CVICU (%)</th>
<th>MICU (%)</th>
<th>NICU (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep, 2011</td>
<td>1.40</td>
<td>5.30</td>
<td>7.70</td>
<td>1.30</td>
</tr>
<tr>
<td>Oct, 2011</td>
<td>0.70</td>
<td>6.10</td>
<td>5.90</td>
<td>3.80</td>
</tr>
<tr>
<td>Nov, 2011</td>
<td>2.10</td>
<td>2.40</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Dec, 2011</td>
<td>2.70</td>
<td>0.00</td>
<td>6.10</td>
<td>3.30</td>
</tr>
<tr>
<td>Jan, 2012</td>
<td>1.50</td>
<td>3.00</td>
<td>4.30</td>
<td>3.00</td>
</tr>
<tr>
<td>Feb, 2012</td>
<td>2.60</td>
<td>3.50</td>
<td>8.00</td>
<td>2.20</td>
</tr>
<tr>
<td>Mar, 2012</td>
<td>1.40</td>
<td>0.00</td>
<td>2.80</td>
<td>1.70</td>
</tr>
<tr>
<td>Apr, 2012</td>
<td>1.60</td>
<td>1.30</td>
<td>3.90</td>
<td>1.20</td>
</tr>
<tr>
<td>May, 2012</td>
<td>2.90</td>
<td>0.90</td>
<td>5.70</td>
<td>2.10</td>
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<tr>
<td>Jun, 2012</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>4.10</td>
</tr>
<tr>
<td>Jul, 2012</td>
<td>1.60</td>
<td>0.00</td>
<td>1.50</td>
<td>0.00</td>
</tr>
<tr>
<td>Aug, 2012</td>
<td>0.00</td>
<td>1.00</td>
<td>2.30</td>
<td>0.00</td>
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<tr>
<td>Sep, 2012</td>
<td>1.90</td>
<td>2.40</td>
<td>1.60</td>
<td>1.10</td>
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</table>
Table 12
Mean Differences for Quality Score by ICU Settings

<table>
<thead>
<tr>
<th>ICU Settings</th>
<th>Mean (SD)</th>
<th>Mean Difference (compare to MICU)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICU</td>
<td>7.27 (3.40)</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>SICU</td>
<td>5.90 (2.64)</td>
<td>-1.37</td>
<td>.686</td>
</tr>
<tr>
<td>CVICU</td>
<td>4.42 (4.32)</td>
<td>-2.85</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>NICU</td>
<td>5.24 (3.05)</td>
<td>-2.03</td>
<td>.009</td>
</tr>
<tr>
<td>ICU Settings</td>
<td>Mean (SD)</td>
<td>Mean Difference (compare to MICU)</td>
<td>p-value</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>-----------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>MICU</td>
<td>2.16 (1.38)</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>SICU</td>
<td>1.79 (1.41)</td>
<td>-.38</td>
<td>.272</td>
</tr>
<tr>
<td>CVICU</td>
<td>1.55 (1.26)</td>
<td>-.61</td>
<td>.009</td>
</tr>
<tr>
<td>NICU</td>
<td>1.62 (1.33)</td>
<td>-.54</td>
<td>.036</td>
</tr>
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</table>
Table 14
Gender (Female) of the Samples from Each ICU Setting

<table>
<thead>
<tr>
<th>Group</th>
<th>SICU</th>
<th>CVICU</th>
<th>MICU</th>
<th>NICU</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$N$ (%)</td>
<td>$N$ (%)</td>
<td>$N$ (%)</td>
<td>$N$ (%)</td>
<td>$N$ (%)</td>
</tr>
<tr>
<td>Pressure ulcers</td>
<td>11 (42.3)</td>
<td>10 (41.7)</td>
<td>13 (50.0)</td>
<td>11 (50.0)</td>
<td>45 (45.9)</td>
</tr>
<tr>
<td>Non-pressure ulcers</td>
<td>12 (46.2)</td>
<td>10 (41.7)</td>
<td>9 (34.6)</td>
<td>10 (45.5)</td>
<td>41 (41.8)</td>
</tr>
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</table>
Table 15
Age and LOS of the Samples \((n = 196)\)

<table>
<thead>
<tr>
<th>Group</th>
<th>SICU</th>
<th>CVICU</th>
<th>MICU</th>
<th>NICU</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(M)</td>
<td>(M)</td>
<td>(M)</td>
<td>(M)</td>
<td>(M)</td>
</tr>
<tr>
<td></td>
<td>((SD))</td>
<td>((SD))</td>
<td>((SD))</td>
<td>((SD))</td>
<td>((SD))</td>
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</table>

Pressure ulcers

<table>
<thead>
<tr>
<th></th>
<th>Age (in years)</th>
<th>(64.58)</th>
<th>(77.67)</th>
<th>(71.65)</th>
<th>(73.18)</th>
<th>(71.59)</th>
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<tbody>
<tr>
<td></td>
<td>((12.85))</td>
<td>((10.70))</td>
<td>((12.65))</td>
<td>((12.03))</td>
<td>((13.04))</td>
<td></td>
</tr>
<tr>
<td>LOS (in days)</td>
<td>(11.77)</td>
<td>(7.00)</td>
<td>(11.46)</td>
<td>(9.32)</td>
<td>(9.97)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>((10.20))</td>
<td>((2.92))</td>
<td>((6.63))</td>
<td>((5.83))</td>
<td>((7.16))</td>
<td></td>
</tr>
</tbody>
</table>

Non-pressure ulcers

<table>
<thead>
<tr>
<th></th>
<th>Age (in years)</th>
<th>(67.54)</th>
<th>(72.08)</th>
<th>(66.77)</th>
<th>(73.73)</th>
<th>(69.84)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>((12.63))</td>
<td>((19.18))</td>
<td>((17.29))</td>
<td>((14.64))</td>
<td>((16.14))</td>
<td></td>
</tr>
<tr>
<td>LOS (in days)</td>
<td>(4.92)</td>
<td>(5.58)</td>
<td>(6.69)</td>
<td>(4.86)</td>
<td>(5.54)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>((2.70))</td>
<td>((4.49))</td>
<td>((4.88))</td>
<td>((3.06))</td>
<td>((3.92))</td>
<td></td>
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</table>
Table 16
Albumin and Pre-albumin the Samples from Each ICU setting

<table>
<thead>
<tr>
<th>Nutritional Status</th>
<th>Pressure ulcer group</th>
<th>Non-pressure ulcer Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SICU</td>
<td>CVICU</td>
</tr>
<tr>
<td>Albumin (g/dL)</td>
<td>2.42</td>
<td>2.33</td>
</tr>
<tr>
<td></td>
<td>(0.88)</td>
<td>(0.55)</td>
</tr>
<tr>
<td>Pre-albumin (mg/dL)</td>
<td>10.73</td>
<td>10.02</td>
</tr>
<tr>
<td></td>
<td>(6.30)</td>
<td>(5.69)</td>
</tr>
</tbody>
</table>
Table 17

Primary Diagnosis by Groups

<table>
<thead>
<tr>
<th>Primary Diagnosis</th>
<th>Pressure ulcers N (%)</th>
<th>Non-pressure ulcers N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular</td>
<td>29 (29.6)</td>
<td>30 (30.6)</td>
</tr>
<tr>
<td>Infection</td>
<td>20 (20.4)</td>
<td>12 (12.2)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>16 (16.3)</td>
<td>18 (18.4)</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>12 (12.2)</td>
<td>8 (8.2)</td>
</tr>
<tr>
<td>Renal</td>
<td>6 (6.1)</td>
<td>9 (9.2)</td>
</tr>
<tr>
<td>Orthopedic</td>
<td>6 (6.1)</td>
<td>2 (2.0)</td>
</tr>
<tr>
<td>Cancer</td>
<td>4 (4.1)</td>
<td>5 (5.1)</td>
</tr>
<tr>
<td>Metabolic Disorder</td>
<td>3 (3.1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Neurological</td>
<td>2 (2.0)</td>
<td>2 (2.0)</td>
</tr>
</tbody>
</table>
Figure 1. Conceptual framework of study

- Structure
  - Nurse Characteristics
    - Shift
    - ICU Setting
  - Patient Characteristics
    - Gender
    - Age
    - Length of Stay (LOS)
    - Nutritional Status
    - Primary Diagnosis

- Process
  - Documentation (EHR)
    - Quality
    - Comprehensiveness

- Outcome
  - Pressure ulcer
    - Incidence
Figure 2. Substruction of the study

<table>
<thead>
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<th>Construct</th>
<th>Structure</th>
<th>Process</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>Concept</td>
<td>Nurse Characteristics</td>
<td>Nursing Documentation (both EHR and written medical record)</td>
<td>Pressure Ulcer</td>
</tr>
<tr>
<td>Variables</td>
<td>Nurse Characteristics</td>
<td>Nursing Documentation Electronic Health Record (EHR)</td>
<td>Incidence of pressure ulcer</td>
</tr>
<tr>
<td></td>
<td>Shift</td>
<td>Quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ICU setting</td>
<td>Comprehensiveness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patient Characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Length of Stay (LOS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nutritional Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primary diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empirical Indicator</td>
<td>Data Collection Tool</td>
<td>Quality of EHR</td>
<td>Incidence rate of pressure ulcer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EPUAP Pressure Ulcers Assessment Instrument</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Comprehensiveness of EHR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comprehensiveness in Nursing Documentation Instrument</td>
<td></td>
</tr>
</tbody>
</table>

Incidence rate of pressure ulcer:
\[
\frac{\text{number of patients developing pressure ulcer per time period}}{\text{number of patients admitted per time period}} \times 100\%.
\]
References


Centers for Medicare & Medicaid Services (2006). Medicare program; changes to the hospital inpatient prospective payment systems and fiscal year 2007 rates; fiscal year 2007 occupational mix adjustment to wage index; health care infrastructure improvement program; selection criteria of loan program for qualifying hospitals engaged in cancer-related health care and forgiveness of indebtedness; and exclusion of vendor purchases made under the competitive acquisition program (CAP) for outpatient drugs and biological under part B for the purpose of calculating the average sales price (ASP). Final rules and interim final rule with comment period. *Federal Register, 71*(160), 47869-48351.


Jenkins, M., & O'Neal, E. (2010). Pressure ulcer prevalence and incidence in acute care. *Advances In Skin & Wound Care, 23*(12), 556-559. doi:10.1097/01.ASW.0000391184.43845.e1


Paget, J. (1873). In the wards. Clinical lectures on bed-sores. *The Student's Journal and Hospital Gazette, 10*(1), 144-146.


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<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation. OR limited ability to feel pain over most of body.</td>
<td>Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restless. OR has a sensory impairment which limits the ability to feel pain or discomfort over 1/4 of body.</td>
<td>Responds to verbal commands, but cannot always communicate discomfort or has need to be tuned. OR has some sensory impairment which limits ability to feel pain or discomfort in 1/2 extremities.</td>
<td>Responses to verbal commands. Has no sensory deficit which would limit ability to feel or express pain or discomfort.</td>
</tr>
</tbody>
</table>

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Degree to which skin is exposed to moisture</td>
<td>Skin is held moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.</td>
<td>Skin is often, but not always moist. Linen must be changed at least once a shift.</td>
<td>Skin is occasionally moist, requiring an extra linen change approximately once a day.</td>
<td>Skin is usually dry, linen only requires changing at routine intervals.</td>
</tr>
</tbody>
</table>

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Degree of physical activity</td>
<td>Confined to bed.</td>
<td>Ability to walk severely limited or non-existent. Cannot bear own weight and must be assisted into chair or wheelchair.</td>
<td>Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.</td>
<td>Walks outside room at least twice a day and inside room at least once every two hours during waking hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Ability to change and control body position</td>
<td>Does not make even slight changes in body or extremity position without assistance.</td>
<td>Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.</td>
<td>Makes frequent though slight changes in body or extremity position independently.</td>
<td>Makes major and frequent changes in position without assistance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Food intake pattern</td>
<td>Never eats a complete meal. Rarely eats more than ½ of any food offered. Eats 2 or 3 servings of less than protein (meat or dairy products) per day. Tolerates fluids poorly. Does not take a liquid dietary supplement OR is NPO and/or maintained on clear liquids or IVs for more than 5 days.</td>
<td>Rarely eats a complete meal and generally eats only about ½ of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement. OR receives less than optimum amount of liquid diet or tube feeding</td>
<td>Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) per day. Occasionally will refuse a meal, but will usually take a supplement when offered OR is on a tube feeding or TPN regimen which probably meets most of nutritional needs.</td>
<td>Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures or agitation leads to almost constant friction.</td>
<td>Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.</td>
<td>Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B

January 29, 2013

Dan Li, BSN, RN
PhD Student
University of Miami School of Nursing & Health Studies
5030 Brunson Drive
Coral Gables, FL 33146

To Whom It May Concern,

I am pleased to write this letter in support of Dan Li’s dissertation research, “The research between the nursing documentation of pressure ulcers and the incidence of pressure ulcers.” From our conversation, I understand that the purposes of this study is to explore the quality and comprehensiveness of nursing documentation of pressure ulcers, investigate the relationship between the nursing documentation of pressure ulcers and the incidence of pressure ulcers in Intensive Care Units.

I believe that University of Miami Hospital is an ideal site to conduct this research. After I receive a copy of your letter of approval from the University of Miami Institutional Review Board (IRB), a member of my staff will provide you with access to the electronic medical record system as well as any written medical records that you will require.

The results of your dissertation research will assist us with identifying the quality of pressure ulcer documentation and may potentially assist in improving the quality of nursing documentation of pressure ulcers at UMH.

If you have any questions or if I may be of any further assistance, please do not hesitate to contact my office at 305-689-4515.

Sincerely,

David Zambrana, DNP, MBA, RN
Chief Operating Officer
### Appendix C

**General Data:** Staff nurse

<table>
<thead>
<tr>
<th>Shift</th>
<th>Day shift</th>
<th>Night shift</th>
</tr>
</thead>
</table>

**Nursing administrative environment:**  
- MICU  
- SICU  
- CVICU  
- NICU

**Patient Data:**

- **Age:** __________  
- **Gender:** Female ☐  Male ☐  
- **Length of Stay in ICUs:** __________  
- **Primary Diagnosis:** __________  

**Braden Scale:** Total score __________  
Mark all existing pressure ulcers on the figures

**Sensory perception:** __________  

**Moisture:** __________  

**Friction and Shear:** __________  

**Mobility:** __________  

**Activity:** __________  

**Nutrition:** __________  

**Skin Observation:**

**Written record audit:**

- **Location:** Yes ☐  No ☐  
- **Surrounding Skin Color:** Yes ☐  No ☐  
- **Stage:** Yes ☐  No ☐  
- **Wound edges/surrounding tissue:**  
- **Size:** Yes ☐  No ☐  
- **Depth:** Yes ☐  No ☐  
- **Exudate:** Yes ☐  No ☐  
- **Tunneling:** Yes ☐  No ☐  
- **Undermining:** Yes ☐  No ☐  
- **Granulation:** Yes ☐  No ☐  
- **Wound Bed:** Yes ☐  No ☐  
- **Date first observed:** Yes ☐  No ☐  
- **Photo taken date:** Yes ☐  No ☐  
- **Wound location circeled:** Yes ☐  No ☐
### Appendix C

#### Skin Observation:

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<tr>
<th>EHR audit:</th>
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<tbody>
<tr>
<td>Location:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Dressing type:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Wound type:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Granulation:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Wound Odor:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Wound Color:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Drainage amount:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Drainage color:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Staging:</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Comment:</td>
<td>Yes</td>
<td>No</td>
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#### Prevention and Implementation:

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<td>Equipment used:</td>
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<td>No</td>
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<td>Repositioning:</td>
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<td>Dressing change:</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Medication applied:</td>
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<td>No</td>
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#### Evaluation:

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<tr>
<td>Outcome description:</td>
<td>Yes</td>
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</tbody>
</table>
Appendix D

Date: July 12, 2012

To: Dan Li – University of Miami

From: Barbara Braden, PhD, RN, FAAN, Nancy Bergstrom, PhD, RN, FAAN

RE: Permission to use the Braden Scale*

As holders of the official copyright for the Braden Scale for Predicting Pressure Sore Risk and the interventions, we hereby grant permission for the use of the scale and the protocols in your written PhD dissertation.

*It is understood that the name of the instrument and the indication that the copyright belongs to Braden and Bergstrom remain on any copies and that you do not make any changes to the wording or the scoring of this tool.