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Hospital Acquired Pressure Injury Gap Analysis

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Abstract

Hospital acquired pressure injuries (HAPIs) were identified as an area for a quality improvement (QI) project in a progressive care unit (PCU) in a Midwestern Hospital. In order to reduce HAPIs and provide the best possible preventative care, a gap analysis between the current care practices on the progressive care unit and the best evidence-based practice recommendations for HAPI prevention in the areas of risk/skin assessment, surface support, nutrition and hydration, repositioning/movement, moisture management, and prophylactic dressings was conducted. The Model for Improvement (MFI) was the QI framework that guided this pressure injury gap analysis.

The goals of this gap analysis were to identify, collect, and compile information in the areas of risk/skin assessment, support surfaces, nutrition and hydration, repositioning/mobilization, moisture management, friction/shear, and prophylactic dressings.

The aim of this QI project was to reduce the incidence of HAPIs in the PCU microsystem and identify the best possible evidence-based HAPI preventative care by examining existing practices and processes that are currently implemented and compare them to the most current CPG recommendations. The evaluation of this information/data will identify opportunities for future QI projects to improve outcomes for HAPI prevention within this microsystem.

Keywords: Pressure Ulcer, Pressure Injury, Hospitalized Adults, Prevention of Pressure Ulcer, Immobility, Repositioning, Turns and Repositioning, Risk Factors, and Nutrition.

Pressure Injury Gap Analysis

Chapter 1: Microsystem Introduction and Background

Hospital acquired pressure injuries (HAPIs) are a significant cause of increased patient suffering that contributes to increased morbidity, mortality, healthcare costs, length of stay (LOS), as well as a decreased quality of life and quality of care (Agency for Healthcare Research & Quality [AHRQ]; 2014; Chou et al., 2015; Cooper, 2013; Fabbruzzo-Cota et al., 2016; Reid, Ayello, & Alavi, 2016; Smit, Harrison, Letzkus, & Quatrara, 2016). The AHRQ (2014) reports that over 2.5 million patients develop pressure injuries annually that can lead to additional serious consequences such as infection, pain and suffering, and an increased financial burden on the healthcare system.

HAPIs are one of the main causes of increasing health care costs, leading to approximately $285 million spent yearly to manage and treat patients with pressure injuries (Fabbruzzo-Cota et al., 2016; Reid et al., 2016). Since 2008, the Centers for Medicare and Medicaid Services (CMS) stopped reimbursing for costs associated with HAPIs. Hospital administrators are becoming concerned with providing higher level of care using evidence-based strategies in an effort to reduce the incidence of HAPIs occurring during inpatient hospitalizations (AHRQ, 2014; Chou et al., 2015; Reid et al., 2016). Healthcare personnel are increasing their awareness of the potential for pressure injuries through more thorough skin assessment and evaluation, prevention programs, and investigation of patients who have acquired pressure injuries during hospitalization (AHRQ, 2014; Chou et al., 2015; Cooper, 2013; Reid et al., 2016). Therefore, the purpose of this paper is to examine the problem of pressure injuries within a specific hospital microsystem.

Microsystem Assessment and Key Aspects

Clinical microsystems are areas within a macrosystem where health care is delivered to individuals who need care. "The clinical microsystem is the place where patients, families, and care givers meet" (Nelson, Batalden, Godfrey, & Lazar, 2013, p. 2). Therefore, the microsystem is where clinical nurse leaders (CNLs) have the most direct and influential impact when they are looking at quality initiatives to effect patient outcomes. This evidence-based quality improvement project of pressure injury prevention was conducted in a 21-bed adult progressive care unit (PCU) located within a Midwestern hospital. The purpose of this microsystem assessment was to evaluate the unit dynamics that contribute to providing the best possible patient care and to identify barriers and or gaps in healthcare service that lead to patient compromise and development of pressure injuries. The evaluation of the microsystem begins with the assessment of the 5Ps which include: *Purpose*, *Patients*, *Professionals*, *Processes*, and *Patterns.*

Purpose

The purpose of this adult PCU is to provide close observation and frequent assessment to intermediate medical, surgical, pulmonary, and cardiac care for patients who have acute medical needs. All rooms are private and allow for multiple types of care including bedside cardiac monitoring. High quality patient-centered care is provided through vigilant and direct evidenced-based nursing care of the patient in conjunction with the interdisciplinary team to increase the patient's quality of care and to maintain good outcomes at low cost.

Patients

This multidisciplinary unit cares for patients with cardiac, medical, pulmonary, and surgical needs. The most common patient diagnoses include respiratory issues such as chronic

obstructive pulmonary disease (COPD), pneumonia, congestive heart failure (CHF), myocardial infarctions (MI), infection, sepsis, arrhythmias, diabetic ketoacidosis (DKA), thrombolytic therapy, drug/alcohol withdrawal, hypertensive urgency, renal failure, and stroke. The average age of patients is between 60 and 80 years and the average LOS is two to three days. Patients on this unit meet criteria for increased acuity, compared to patients on a basic inpatient floor, and have injuries or medical conditions that require frequent monitoring and/or observation. These nursing needs are less than that of an adult intensive care unit (ICU) but greater than those on a general floor.

The patients who encounter services on this unit are often a vulnerable population. They are advanced in age with multiple comorbidities. Some patients suffer from chronic illness, dementia and/or depression and may require increased assistance with activities of daily living, including turning and repositioning to prevent pressure injury. Because of the potential for frequent episodes of acute illness, this population experiences higher rates of hospitalizations. Pressure injuries are one type of complication that can befall this population due to the acuity of their illness, long periods of lying in one position during testing or procedures, such as cardiac catheterizations, and patient frailty (Bhattacharya & Mishra, 2015).

Professionals

Care for patients and their families is provided by a multidisciplinary team of professional healthcare providers including physicians, hospitalists, and nurse practitioners. The unit maintains a staff of four clinical coordinators functioning as a clinical nurse leader (CNL), clinical nurse educator, clinical nurse manager, and clinical nurse specialist (CNS). The nursing staff is composed of 38 to 40 registered nurses (RNs), 17 certified nurse assistants (CNAs) using two to three CNAs per shift, four unit secretaries (who are cross trained to fill in gaps and help

with staffing needs), social workers, respiratory therapists, physical and occupational therapists, pharmacists, lab technicians, and dietary services all of whom work together to provide individualized care for patients as needed.

The nursing staff and the CNAs are most closely associated with patient care at the bedside. Nurses and CNAs are responsible for assessing, planning, implementing, and evaluating the patient's needs as directed by the provider and team. Care for patients is available around the clock.

Processes

Pressure injury risk determination is a two-part process that is performed and documented within eight hours of a patient admission to the PCU. The first part of the patient skin examination is a head-to-toe skin assessment conducted by two registered nurses who work together to obtain baseline patient information regarding skin integrity. Following the initial skin inspection, nurses calculate a pressure injury risk assessment using the Braden Scale for Predicting Pressure Sore Risk (See Appendices A and B) to determine patient risk for pressure development. The Braden Scale for Pressure Sore Risk will be referred to as The Braden Scale from this point forward for this paper.

The Braden Scale is a copyrighted, validated, and nationally known risk assessment tool to help nurses identify patients who may be at high risk of developing pressure injuries. The Braden Scale is composed of six subscales which include sensory perception, moisture, activity, mobility, nutrition and friction and shear. Patient scores calculated from a nursing assessment and range from 6 (high risk) to 23 (low risk), with 18 being the key number for identifying patient risk (Lyder & Ayello, 2008). Pressure injury risk assessments are ongoing and conducted

every 24 hours by the day shift RN to continually monitor patients for any/all contributing factors of pressure injury development.

Clinical nurse leaders participate in daily multidisciplinary rounds providing an environment for communication, patient management, and an opportunity to be knowledgeable about the "patient's story" while focusing on evidence-based practice and the best possible outcomes. Multidisciplinary rounding is used to identify and monitor patients who are most at-risk for pressure injury development. The bedside RN updates the multidisciplinary team regarding the risk status calculated from the Braden Scale scores, Braden Scale subscale scores, and/or other significant clinical factors to foster awareness, elicit communication, and promote intervention.

Hourly rounding is a process during which staff members have the opportunity to be proactive with pressure injury prevention strategies. The five words healthcare staff use to refer to hourly rounding are referred to as pain, pump, potty, position, and periphery. The 5 P's include assessment of pain and/or pain relief, inspection of the intravenous pump to intercept alarms or complications before they occur, assistance to the bathroom, assistance back to bed, and repositioning. Staff ensures that patients have access to the call light, phone, and any important peripheral items they may need, such as water and tissue. (Death, 2017; Tzeng, 2010). The hourly rounding leads to patients feeling safe, secure, and cared about. In addition, nurses who participate in hourly rounding improve patient satisfaction, decrease the potential for falls, reduce the incidence of HAPIs, as well as lower the need for patients to use their call light. (Death, 2017; Mitchell, Lavenberg, Trotta, & Umscheid, 2014; Tzeng, 2010). Hourly rounding provides an optimal time for nurse/patient interaction that can promote healthy skin integrity and offer patients quality care.

Patterns

Patterns of behavior in the workplace contribute to the health outcomes of the patients. Patterns provide microsystem information and reveals areas that need improvement (McKeon et al., 2009). Areas for improvement involve patterns related to time, such as, interruptions, prolonged wait times, and/or delays in the processes of delivering patient care (McKeon et al., 2009). Some interruptions in this microsystem unit may not be avoidable due to unplanned events and changes that occur in an intermediate care unit. Examples of unplanned events include detrimental changes in a patient status, detainment in surgery, and delays during discharge process due to unforeseen events with transportation. Other areas in the hospital, such as the emergency department, cardiac catheterization lab, and the surgical department also contribute to transition of care issues regarding time concerns (McKeon et al., 2009).

Another area where time is an issue involves staffing work flow patterns. Staffing assignments in this microsystem unit are acuity based; therefore, nurses may be caring for patients who are not located near one another. All of these patterns may adversely influence the care that nurses strive to provide to patients who are at-risk for pressure injury development. These unforeseen, unplanned events can potentially prevent nurses from returning to patients' rooms in a timely manner to assess skin integrity and turn and/or reposition them (McKeon et al., 2009). At-risk patients who are delayed in the surgical suite, detained in the catheterization lab, or remain on hard surfaces for prolonged periods of time due to testing or procedures can all be negatively impacted, resulting in the early stages of pressure injury (McKeon et al., 2009). Therefore, CNLs need to identify and address patterns within the microsystem that contribute to negative impact on patients who are at-risk for HAPI development and to be vigilant with timely assessment and interventions.

Practice Problem

Pressure injuries are defined as "localized injury to the skin and/or underlying tissue, usually over a bony prominence, as a result of pressure alone or in combination with shear" (Qaseem, Mir, Starkey & Denberg, 2015, p. 359). The American College of Surgeons published guidelines on the prevention of pressure injuries (Qaseem et al., 2015). These guidelines list risk characteristics for development of patients acquiring a HAPI. These same guidelines indicate that the major risk factor for HAPI is limited mobility, such as that experienced by patients who are in hospitals or in long-term care (LTC) facilities (Qaseem et al., 2015).

According to the guidelines, patients in this microsystem unit where this project is taking place would experience increased risk for HAPI due to advanced age, chronic health issues, incontinence, and malnutrition. (Qaseem et al., 2015). These disorders can compromise soft tissue integrity and make patients susceptible to injury (Qaseem et al., 2015). These at-risk patients are also subject to lying in bed or on examination tables for long periods of time for tests and procedures which leads to increased pressure on the most susceptible areas such as bony prominences, heels, and sacrum (Cooper, 2013).

Incidence and Significance of Pressure Injury

HAPIs are an all too frequent health care problem that are associated with increased morbidity and mortality in hospitalized patients around the world (National Pressure Ulcer Advisory Panel [NPUAP], European Pressure Ulcer Advisory Panel [EPUAP], & Pan Pacific Pressure Injury Alliance [PPPIA], 2014). The average prevalence of HAPIs is approximately 10% in acute care settings (NPUAP et al., 2014). The NPUAP, PPUAP and PPPIA (2014) guideline will be referred to henceforth as the International clinical practice guideline (CPG). HAPIs add to the burden of sickness by contributing to decreased patient autonomy and security,

while increasing patient's length of stay, readmission rates and hospital costs (Gardiner, Reed, Bonner, Haggerty, & Hale, 2016). The estimated cost of providing care to patients with HAPIs is between $37,800 to $70,000 and, up to $ 11 billion annually in the United States (Gardiner et al.,2016; Qaseem et al., 2015). In acute care hospitals, the prevalence of HAPIs ranges from 0.4% to 38% of admitted patients (Gardiner et al.,2016; Qaseem et al., 2015). Therefore, examining the most current evidence-based prevention strategies, treatment plans, and the scientific evidence is necessary in order to reduce the occurrence of HAPIs in health care facilities for all individuals.

Pressure Injury Problem in Microsystem

The PCU is participating in a pilot of a hospital wide safety initiative involving attempts to reduce HAPIs in the acute care setting. The impetus came about a year ago, when hospital administrators became aware of two cases of HAPI development. Staff were recruited to form an interdisciplinary skin team in June of 2016, to begin researching HAPIs within the institution, and to find a solution to decrease the incidence of this serious problem.

The skin team thus far is composed of ten employees of the hospital, including representatives from the departments of nursing administration, the intensive care unit (ICU), the PCU, the general floor staff, two CNLs and risk management. Currently, the skin team representatives are actively recruiting additional representatives from a variety of in-house staff, including physicians, dietitians, and physical therapists as well as others who are interested in being a part of the committee. Since the skin team is in the formative stages, baseline data for pressure injury incidence and prevalence is unavailable.

The skin team has created an ongoing document that contains the action plan, responsible parties for action items, updates, completion dates and status of action items. The action plan will

include staff education using the National Database of Nursing Quality Indicator (NDNQI) modules, formal teaching, Braden Scale score education with a focus on the subscale scores of the tool, consistent skin assessments performed by two nurses simultaneously who work together to complete the initial skin assessment upon patient admission to the unit, an Epic documentation tool, and continual evaluation. The CNLs will be working on a nursing care plan for skin injury along with policy and procedure protocols. They will also be evaluating risk assessment tools. Although the HAPI prevention initiative is hospital wide, this project will focus only on the progressive care microsystem unit, which includes up to 19 patients.

In order to reduce HAPIs and provide the best possible preventative care, a gap analysis between the current care practices on the progressive care unit and the best evidence-based practice recommendations for HAPI prevention in the areas of risk/skin assessment, surface support, nutrition and hydration, repositioning/movement, moisture management, and prophylactic dressings was conducted. The MSN student and the CNL preceptor will use the gap analysis to plan future improvement activities aimed at reducing the incidence of HAPIs on this unit. The Model for Improvement (MFI) was the quality improvement (QI) framework that was used to guide this pressure injury gap analysis. A review of four clinical practice guidelines (CPGs), including the Agency for Healthcare Research (2014), the Institute for Healthcare Improvement (2011), the National Database of Nursing Quality Indicators (2018), and the International guideline (2014), along with a search of the scientific literature, was conducted. A list of best nursing practices for HAPI was synthesized from the literature review. The QI project involved a review of patient charts to identify the "gaps" between current practices in the microsystem with the identified "best practices." An assessment of the barriers that contribute to

best practice implementation was studied. A report was prepared and provided to the CNL and QI team for review with recommendations for future quality improvement projects.

Based on the results of this gap analysis of the identified best practices and actual practice within the microsystem, recommendations were made to the QI team regarding changes that could be made to reduce pressure injury incidence.

Summary

HAPIs are a significant concern for hospital systems that lead to increased pain and suffering. HAPIs contribute to increased morbidity, added days to hospital stay, additional healthcare costs, decreased patient satisfaction, decreased quality of life, and quality of care, and increased risk of death (AHRQ, 2014; Chou et al., 2015; Cooper, 2013; Fabbruzzo-Cota et al., 2016; Reid et al., 2016; Qaseem et al., 2015). The next step in the QI process is to analyze the literature to identify the best evidenced-based practices to implement in hospitals to prevent the occurrence of HAPIs. This microsystem unit has a population at very high risk for HAPIs. In order to reduce HAPIs and provide the best possible preventative care, a gap analysis between the current care practices on the PCU and the best evidence-based practice recommendations for HAPI prevention was conducted. This gap analysis focused on the areas of risk/skin assessment, surface support, nutrition and hydration, repositioning/movement, moisture management, and prophylactic dressings. The results of this analysis identified the best practices for HAPI prevention, within this microsystem.

Chapter 2: Literature Review

Clinical nurse leaders (CNLs), in conjunction with other healthcare disciplines, take responsibility for identifying problems within a microsystem (Wienand et al., 2015). CNLs who are clinicians, quality managers, and leaders within a progressive care unit microsystem in a

midwestern hospital, accomplish their roles through using evidence-based practices (EBP) and evaluating system outcomes to reduce fragmented care (Wienand et al., 2015). Dontje (2007) states that the combined "use of EBP and national guidelines improves the quality of healthcare as well as closes the gap between practice and research outcomes within the microsystem."(p. 1).

The first step to gain EBP information about a clinical problem is through conducting a literature review (Polit & Beck, 2017). The EBP literature review of hospital acquired pressure injuries (HAPIs) provides CNLs with insight into current practice, procedures, and measures that lead to the implementation of the best possible outcomes, and highest quality of care, with lowest cost. The purpose of this review is to evaluate the results of the most current literature available for prevention of HAPIs. A specific emphasis on the most recent and comprehensive clinical practice guidelines includes the Agency for Healthcare Research and Quality (AHRQ, 2014), the Institute for Healthcare Improvement (IHI, 2011), the National Database of Nursing Quality Indicators (NDNQI, 2018), and the International guideline, (2014). In addition, any high-level studies currently conducted that add to the evidence were included. The results from the literature review provided guidelines for the best practices to guide pressure injury prevention.

Incidence and Consequences of Hospital Acquired Pressure Injury

HAPIs are a significant health concern that impact close to three million adult patients in the United States on a yearly basis (Agency for Healthcare Research and Quality [AHRQ], 2014; Gardiner et al., 2014; IHI, 2011; Qaseem et al., 2015). Clark and associates (2014) state that pressure injuries are a result of prolonged periods of "mechanical load that is placed on the skin and soft tissue" which results in injury (p. 490). Today, HAPIs continue to remain a health concern, especially for patients of advanced age (Barker et al., 2013). Prevention of HAPIs is primarily a nursing responsibility. Nightingale documented her findings in 1859 and stated, "If

he has a bedsore, it's generally not the fault of the disease, but of the nursing" (Lyder & Ayello, 2008, p.267). Therefore, HAPIs are considered to be highly preventable, especially if patients receive appropriate screening, assessment, and proper prevention interventions (Miller, 2016).

Multiple studies demonstrate that HAPIs contribute to poor patient outcomes, disfigurement, slow healing and recovery from comorbid conditions, depression, localized infection, sepsis, osteomyelitis and death (AHRQ, 2014; Chou et al., 2015; Cooper, 2013; Fabbruzzo-Cota et al., 2016; Gardiner et al., 2014; Miller, 2016; Reid et al., 2016). Patients with HAPIs experience pain, suffering, decreased quality of life and increased hospital LOS which contributes to both increased hospital cost and readmission rates (Smit et al., 2016).

According to the AHRQ, (2014) and the IHI, (2011), there are over 2.5 million individuals in acute care settings who develop pressure injuries annually in the United States (US). Incident rates for HAPIs in acute care facilities have been reported to be between 0.4% to 38% (Gardiner et al., 2014; IHI, 2011; Qaseem et al., 2015). The overall estimated cost of pressure injuries range between $9.1 billion to $11.6 billion per year while the cost of individual patient care in the US averages between $20,900 to $151,700 per pressure injury (AHRQ, 2014). In 2007, Medicare estimated the average cost of $43,180 per pressure injury per stay (AHRQ, 2014). The AHRQ (2014) reports that there is an increased risk for patient mortality resulting in approximately 60,000 deaths annually. More than 17,000 pressure injury lawsuits occur annually related to HAPIs (AHRQ, 2014). Due to challenges within healthcare, aging adult populations, and a shortage of nurses, the likelihood exists that HAPIs will continue to increase and remain a significant health concern (Lyder & Ayello, 2008; Miller, 2016).

Search Methods

The search for relevant, evidenced-based literature was conducted by searching electronic databases including CINAHL Complete, Cochrane Library, National Guideline Clearinghouse, and PubMed from the dates of 2005 through 2018. Various articles were obtained from references lists of articles reviewed during the search and from articles referenced in the International (2014) clinical practice guideline. The key search terms utilized were "pressure ulcer," "pressure injury," "hospitalized adults," "prevention of pressure ulcer," "immobility," "repositioning," "turns and repositioning, "risk factors" and "nutrition." Some original articles dated further back and provided a historical account. Studies included patients without evidence of pressure injury from nursing homes or, long-term care facilities and from studies conducted in acute care settings (intensive care units or progressive care units). The literature review yielded eight themes. The results of the review are summarized by theme below.

Pressure Injury Terminology, Definitions and Staging Criteria

Changes in pressure ulcer terminology and staging criteria have been updated. The term *"pressure injury"* now replaces *"pressure ulcer"* in the National Pressure Ulcer Advisory Panel Injury Staging System (NPUAP, 2016, para.1). Pressure injuries are now defined as:

> A pressure injury is localized damage to the skin and/or underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, co-morbidities and condition of the soft tissue**.** (NPUAP, 2016, para. 5)

The International CPG (2016) also updated the classification system to define the stages of pressure injury. Arabic numbers replaced Roman numerals when referring to the names of the stages (NPUAP, 2016, para.2). Stage 1 pressure injuries are defined as non-blanchable erythema of intact skin, Stage 2 as partial thickness skin loss with exposed dermis, Stage 3 as full-thickness skin loss, Stage 4 as full-thickness skin and tissue loss. Unstageable pressure injuries are now identified as obscured full-thickness skin and tissue loss and deep tissue pressure injury as persistent non-blanchable deep red, maroon or purple discoloration. These last two classifications can be deemed either stage 3 or stage 4 depending on injury criteria (NPUAP, 2016, paras, 3,7).

Risk Factors and Risk Assessment Tools

HAPIs are a common but preventable complication (Barker et al., 2013; Jacobson, Thompson, Halvorson, & Zeitler, 2016; Miller, 2016;). Yet, despite the availability of clinical practice guidelines, pressure-relieving strategies, equipment, and continual education, HAPIs continue to persist (Barker et al., 2013). Assessment of patients and their risk factors for HAPIs is a core element of clinical practice that can be used to help identify those who are susceptible to HAPI to individualize interventions and prevent HAPIs (NPUAP et al., 2014). Research studies show that there are numerous patient risk factors for HAPIs including advanced age, acute illness, low body mass index, malnourishment, renal insufficiency, immobility, altered sensation, cognitive decline, altered circulation, comorbid conditions, diabetes, and extended LOS (Alderden, Rondinelli, Pepper, Cummins, & Whitney, 2017; Alderden, Whitney, Taylor, & Zaratkiewicz, 2011; Dziedzic, 2014; Moore & Cowman, 2014; see Appendix C). Patients who smoke and use oxygen are also considered to be high-risk for development of pressure injury (NPUAP et al., 2014).

Pressure injury prevention is a multidisciplinary responsibility, while both bedside nurses and CNAs take a central role (AHRQ, 2014). Bedside nurses are responsible for carrying out system processes such as risk assessment, skin assessment, mechanical loading, skin care, mobility, and documentation of associated patient care. CNAs who work under the supervision of the RN can be taught to observe and check the skin during times of patient assistance such as cleaning, bathing, or turning the patient (AHRQ, 2014). Dziedzic (2014) recommends that CNAs, who provide bedside care, use a body outline tool to report abnormal findings to bedside nurses for further patient evaluation and documentation. CNLs ensure patient safety and quality of care which is measured through patient outcomes such as HAPI incident rates, added days to LOS, readmission rates within 30 days of patient discharge, patient/family satisfaction scores, seamless lateral transitions of care, and effective communication between providers, staff, patients, and families (Wienand et al., 2015). CNLs are directly involved with patient and staff education regarding prevention of pressure injuries (Wienand et al., 2015).

Comprehensive Skin Assessment

All of the CPGs reviewed stated that a comprehensive skin assessment needs to be performed as soon as possible, but not later than 24 hours after hospital arrival, in order to comply with the Joint Commission regulations and to obtain baseline skin data to be used for future comparisons (AHRQ, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014). In these guidelines, the authors recommend subsequent skin assessments to be carried out in four distinct time frames, including: 1), daily, 2), when patients transfer to other areas; 3), when there is a change in the patient's condition; and 4), at discharge. The skin assessment should be performed visually and with touch, using head-to-toe method, providing special attention to the bony prominences, and assessing for excessively dry skin or moisture-associated skin damage

(AHRQ, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014). The key factors of the assessment are to examine the skin for alterations in temperature, erythema, edema, and tissue integrity by comparing the skin to adjacent tissue or symmetrical body part (Bryant & Nix, 2016). If erythema is detected, the RN must then determine if the skin is blanchable or nonblanchable (Bryant & Nix, 2016).

Other important aspects of the skin assessment include color, moisture, turgor, and skin integrity. Removal of patient garments is necessary to assess skin integrity within skin folds and buttocks, between fingers and toes, under medical devices, and/or under therapeutic support socks (Bryant & Nix, 2016; Dziedzic, 2014; IHI, 2011, NPUAP et al., 2014). The purpose of these steps is to identify whether the patient has any preexisting pressure injuries and/or current risk factors that could contribute to HAPI development. (Bryant & Nix, 2016; Dziedzic, 2014; IHI, 2011; NPUAP et al., 2014).

The RN must identify and document pressure injuries that are "present on admission." A HAPI is considered a "never event," which means that HAPIs are preventable. A pressure injury that has occurred during a hospitalization or was not documented by a provider as "present on admission" will result in the hospital receiving no reimbursement for any associated care of the injury. Hospitals are paid for the care of pressure injuries that originated before hospital admission; HAPIs occurring during hospitalization will be the responsibility of the admitting institution (Wake, 2010).

Patients with a body mass index (BMI) greater than 30 are at high risk for HAPI due to immobility, diminished circulation to fatty tissue, and skin changes that occur because of skin-to-weight ratio. Therefore, conducting frequent skin assessments with special attention to skin folds, between the thighs, in the groin, and posterior aspects of the legs is important in patients

with a BMI greater than 30 (Dziedzic, 2014). Poor self-care, often seen in patients with a high BMI, also contributes to greater risk for skin breakdown in this population (Dziedzic, 2014).

Risk Assessment Tools

Risk assessment and screening of patients at-risk for HAPI involves identification of objective, subjective, and psychosocial considerations to determine and evaluate the risk and healthcare needs of the patient (Bryant & Nix, 2016; NPUAP et al., 2014). In order to strengthen the efficiency of the pressure injury assessment, expert opinion recommends usage of a validated risk assessment tool and exceptional clinical nursing judgement (Bryant & Nix, 2016; NPUAP et al., 2014). Risk assessment tools and/or scales that demonstrate reliability and validity, identify patients who are at-risk of developing a HAPI. Use of risk assessment tools and /or scales are recommended in the literature and by many clinical practice guidelines (see Appendices A and B; AHRQ, 2014; Bryant & Nix, 2016; IHI, 2011; Moore & Cowman, 2014; NDNQI, 2018; NPUAP et al., 2014). The three most frequently used risk assessment scales used are the Norton Scale, the Waterlow Scale, and the Braden Scale for the Prediction of Pressure Sore Risk (Dziedzic, 2014).

The Braden Scale (1988), used in the PCU, is an evidence-based tool that identifies patients at-risk for the development of pressure injury (Dziedzic, 2014). The Braden Scale is one of the most widely used risk assessment tools in the United States and has been scientifically validated (Dziedzic, 2014). The Braden Scale comprises six risk factor subscales which include sensory perception, skin moisture, physical activity, nutritional intake, friction and shear, and mobility. All subscale scores are rated from 1 to 4 except for friction/shear which is rated from 1 to 3. The subscale scores help to identify patient areas of highest risk so that specific interventions can be identified for the patient. The lower the total Braden Scale score the higher

the risk for pressure injury development. Nurses identify the lowest Braden Scale subscale scores to target prevention interventions to the areas of highest risk. (Bryant & Nix, 2016; Dziedzic, 2014; Menegon et. al., 2012). Patients are categorized by degree of risk based on calculation of total Braden Scale scores as follows: very high risk; ≤ 9; high risk; 10-12; moderate risk; 13-14; and mild risk; 15-18. Patients with Braden Scale total scores of 19 or greater are not at high-risk (Bryant & Nix, 2016; Dziedzic, 2014; Menegon et. al., 2012). HAPI prevention care plans consider the total Braden Scale score, the Braden Scale subscale scores, additional patient risk factors, and clinical nursing judgement (Bryant & Nix, 2016; NPUAP et al., 2014).

Studies conducted by Lahmann & Kottner (2011; see Appendix C) and Tescher, Branda, Byrne, & Naessens (2012; see Appendix C) found that limited mobility and friction and shear place the patient at greatest risk for HAPI. Therefore, patients with low Braden Scale subscale scores in these areas are also at-risk, even if their total Braden Scale score is 19 or greater (see Appendix A).

One example that illustrates the importance of the Braden Score subscale scores is reflected by this true story of 70-year-old male patient who had a pre-op Braden Scale total score of 21. The patient was healthy, but overweight. He had a history of diabetes, arterial insufficiency, peripheral neuropathy and previous diabetic ulcers. His Braden Scale subscale scores in sensory perception were most likely where he lost one or two points, placing him at-risk for HAPI, despite a total score of 21. The patient was admitted for a laparoscopic cholecystectomy; but, during the procedure and recovery, his heels were not protected, suspended and/or offloaded. The result was that he acquired bilateral heel ulcerations which led to bilateral below the knee amputations (University of Albany, 2012).

Risk factors that predispose patients to developing a HAPI will vary; therefore, one risk assessment tool will not likely meet the needs of all patients in all clinical settings (Moore & Cowman, 2014). Clinical nursing judgement and knowledge of the patients predisposing factors are also valuable components of the patient assessment (AHRQ, 2014; NDNQI, 2018; NPUAP et al., 2014; The Joint Commission, 2016). Braden, the author of the most frequently used risk assessment scale, the Braden Scale for Predicting Pressure Sore Risk, stated in a webinar that when providing the best care possible, staff need to utilize the use of risk assessment tools, clinical nursing judgement, consideration of individual factors, in combination with a comprehensive skin assessment (University of Albany, 2012).

Support Surfaces

Pressure relieving support surfaces are "specialized devices for pressure redistribution designed for management of tissue loads, microclimate, and/or other therapeutic functions (i.e., any mattress, integrated bed system, mattress replacement, overlay, or seat cushion, or seat cushion overlay)" (NPUAP et al., 2014, p.105). Support surfaces contain air, water, foam, fluid, or gel and can be powered or non-powered, active or reactive (Bryant & Nix, 2016; IHI, 2011). Support surfaces aid with pressure injury prevention by reducing pressure to vulnerable areas of the body in patients who are at-risk of developing a pressure injury. This need arises when patients have limited mobility due to their conditions, are too weak to reposition themselves, or are unable to perceive the need to reposition themselves when they are in bed or up in a chair (Bryant & Nix, 2016; McInnes, Jammali-Blasi, Bell-Syer, Dumville, & Cullum, 2012; NPUAP et al., 2014).

All the CPGs reviewed advocate for the use of support surfaces in HAPI prevention. Patients who are at-risk for HAPI, and are on support surfaces, still need to be turned and

repositioned (AHRQ, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014). Nursing staff is responsible for ensuring that the support system is turned on, powered, working correctly, and documented in the electronic medical record (IHI, 2011). A Cochrane review of support surfaces determined that patients who lying on regular foam mattresses were at higher risk for pressure injury than those who were lying on higher-specification foam mattresses (McInnes et al., 2012). (See Appendix C). These same authors also reported that patients who use sheepskin overlays on the mattress were at lower risk for pressure injury development (McInnes et al., 2012).

Nutrition and Hydration

The risk for HAPI increases for patients who suffer from poor nutritional intake and/or poor nutritional state. States of undernutrition also account for delayed healing in existing pressure injuries. As individuals age, appetite declines, and metabolic rate slows which contribute to malnutrition (Taylor, 2017). Complications from comorbidities can lead to malnutrition, however many bariatric patients suffer from malnutrition as well (NPUAP et al., 2014; Taylor, 2017).

Malnutrition has been correlated with increased risk of pressure injury and delayed healing (NPUAP, et al., 2014). Consequently, nutrition screening and risk assessment need to be conducted to determine risk of malnutrition. Factors indicative of a risk for malnutrition include poor diet intake, and /or unintentional weight loss (NPUAP et al., 2014). Clinical practice guidelines recommend nutritional screening and risk assessment upon admission and with changes in patient condition. Referral for a nutrition consult by a registered dietician may be needed for a more in-depth assessment (NPUAP et al., 2014).

Historically, measures used to define malnutrition have been serum protein, which includes albumin and prealbumin. However, according to the International guideline (NPUAP et

al., 2014), clinical guidelines “serum albumin and prealbumin are generally not considered reliable indicators of nutritional status”; rather, they reflect the intensity of the inflammatory response (p. 79).

Nutrition status can be obtained using validated tools such as the Malnutrition Universal Screening Tool (MUST). The MUST is a five-step screening tool used to identify adult individuals who are malnourished, at-risk of undernutrition, or obese and includes guidelines for management of nutritional deficits, which can help to formulate interventions for a plan of care (Bapen, 2011). The International guideline (2104) recommends the use of a valid and reliable tool. The other CPGs stress the importance of nutritional assessment and identify malnutrition indicators and steps needed to assess for malnutrition but did not specifically state use of a valid and reliable tool (AHRQ, 2014; IHI, 2011; NDNQI, 2018). The Braden Scale can also be used to detect nutritional deficits.

The NDNQI (2018) and the International CPGs (2014) recommend protein intake to be a minimum of 30 to 35 kilocalories per kilogram of body weight per day depending on underlying medical conditions and level of activity. Fortified, high-calorie, high-protein supplements can be offered between meals as needed for patients who have intact renal function (NDNQI, 2018). Parenteral or enteral nutrition support can be provided when oral intake is in adequate. Adequate hydration is necessary to allow for vitamins, minerals, glucose, and other vital minerals to be transported through the body (NDNQI, 2018). Dehydration leads to skin fragility and thus makes it more susceptible to breakdown (Taylor, 2017). Patients must be offered water when it is time for repositioning, toileting, and assessing for cleanliness, unless contraindicated (IHI, 2011; NDNQI, 2018; NPUAP et al., 2014). Nutritional support is a multidisciplinary responsibility;

therefore, documentation of diet type and percent of food consumed is vital for ongoing patient assessment (NPUAP et al., 2014).

Repositioning, Heels, and Early Mobilization

According to all the CPGs reviewed, repositioning and early mobilization are vital components in the prevention of HAPIs (AHRQ, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014). Pressure injuries form when pressure or loading causes ischemia to the tissue resulting in deformation and injury (Sprigle & Sonenblum, 2011). Healthy individuals are able to reposition themselves when they feel the impetus to do so. But in some individuals, this stimulus or ability to feel pain may be altered which will limit their ability to move or reposition themselves. Repositioning requires making a change in position in the lying or seated individual at regular intervals to enhance comfort and reduce the risk of tissue damage that could potentially contribute to pressure injury (NPUAP et al., 2014). Pressure injury education promotes an understanding about the importance not to delay or refuse repositioning and must be provided to patients and families as part of their standard care (Bryant & Nix, 2016).

Frequency of Repositioning

Frequent repositioning is an important intervention to reduce pressure, friction, and shear in the acute care setting. Clinical practice in many organizations is to turn patients every two hours (Dziedzic, 2014). The origin of repositioning patients every two hours is still unknown. One study has reported that “anecdotally the two-hourly interval is attributed to the length of time taken for the nurses in the Crimean War Hospitals to work their way down one side of a ward and up the other” (Hagisawa & Ferguson-Pell, 2008, p.76). Guttmann, a British surgeon, made the first statement regarding two-hourly rounding in 1953 where he documented “the cardinal methods in local prophylaxis are frequent change of posture (every two hours day and

night) and redistribution of pressure" (Hagisawa & Ferguson-Pell, 2008, p.78). However, there is lack of scientific data to support why two-hourly repositioning is considered optimal to prevent pressure injury development (Bryant & Nix, 2016; Defloor, De Bacquer & Grypdonck, 2005; see Appendix C). Despite the lack of evidence for the frequency of repositioning, most clinical practice guidelines continue to use two-hour repositioning as the gold standard for prevention of pressure injury (AHRQ, 2014; IHI, 2011; NDNQI, 2018). But research studies conducted by Bergstrom (2014), Bergstrom et al (2013); Defloor, Bacquer, & Grypdonck (2005); Moore, Cowman, & Conroy (2011); NPUAP et al., (2014), and Vanderwee, Grypdonck, De Bacquer, & Defloor (2007), suggest no significant reduction in pressure injury incidence when patients are repositioned at 2-, 3-, or 4-hour intervals with patients on viscoelastic (memory foam) mattresses (see Appendix C).

Bergstrom and associates (2013) conducted a study examining the frequency of turning and pressure injury development within nursing home residents (See Appendix C). They found no difference in the development of pressure injuries in relationship to turning frequency (2-, 3-, or 4-hours between turns). Negative aspects have also been attributed to frequent repositioning of patients in the literature (Bergstrom, 2014; Gillespie et al., 2014; see Appendix C). Concerns from these same studies suggest that frequent repositioning has the risk of negatively impacting the resident's quality of life due to depriving them of sleep by waking them (Bergstrom, 2014). In addition, frequent turns are a difficult standard, and nursing home staff are at-risk of injury (Bergstrom, 2014; Bergstrom et al., 2013). In a Cochrane review of repositioning for pressure ulcer prevention in adults, Gillespie et al., (2014) stated that repositioning can cause reduced sleep, increased pain, and more injuries to nurses. Due to lack of evidence, the International CPG (2014), no longer recommends repositioning patients every two hours.

Methods of Repositioning

Despite the controversy on how often to turn patients, there is clear evidence on how to reposition patients to reduce HAPI risk. Repositioning methods involve subtle shifts of offloading pressure from bony prominences to reduce the duration which is most critical in pressure injury development (Bryant & Nix, 2016; NPUAP et al., 2014). Three of the four CPGs in this gap analysis state that the proper technique for turning patients in bed is by using the 30-degree side-lying position with a pillow in between the patient's legs (see Appendix D). The patient is turned alternately from left side, to back, to right side, to back. Prevent placing the patient in the 90-degree side-lying position because it places pressure directly on the patient's trochanter. The International CPG (2014) is the most comprehensive guideline and suggests using slow incremental movements with turns to allow for tissue reperfusion. The NDNQI (2018) and the International (2014) CPGs also suggest limiting the head-of-bed to an angle of 30-degrees or less to aid with the prevention of shear.

Heels are vulnerable and susceptible to breakdown, especially in patients who suffer from sensory perception disorders, diabetes, vascular disease, and obesity. Therefore, special attention needs to be taken though Braden Scale total and/or Braden Scale subscale scores may not reflect the patient to be at-risk (Bryant & Nix, 2016). HAPIs to the heel impact mobility and limits the ability to be independent which increases the risk of pressure injury in other areas of the body (Dziedzic, 2014). The goal of offloading pressure to the heels is to elevate the legs off the bed surface and "float" the heels which redistributes the pressure to the lower legs. Floating heels is accomplished using pillows, or heel suspension devices. All guidelines reviewed for this project recommend floating the heels at all times to offload pressure (AHRQ, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014). The NDNQI (2018) and the International CPG (2014) also

recommend flexing the knee 5° to 10° and using pillows or a foam cushion to prevent pressure to the area of the Achilles tendon. The NDNQI guideline (2018) suggests considering a multi-layer silicone bordered foam dressing on the heels to diminish the potential for friction and shear injuries in patients who are high risk.

Early Mobilization

The International guideline (NPUAP et al., 2014) defines mobilization as the ability of an individual to move from bed to ambulation in an organized fashion. This same guideline (2014), states that patients on bedrest should progress to sitting and ambulation as quickly as they can tolerate in order to reduce the potential for pressure injury. Dickinson, Tschannen, & Shever, (2013; see Appendix C) conducted a study to determine the outcome of implementing an early mobility protocol in a surgical intensive care unit (ICU) to increase patient mobilization in an effort to reduce HAPIs. The interventions in the protocol began with range of motion, head of bed elevation, and repositioning every two hours. The protocol then advanced in a step wise fashion to include dangling, sitting, out of bed, then standing, leading to ambulation which was provided three times per day (Dickinson et al, 2013). Surprisingly, the results of the study showed that there was a significant increase in HAPIs when using the protocol. The authors (2013) concluded that the reason for the increase in HAPIs when using the above protocol was possibly due to increased patient acuity; but there was no conclusive evidence that early mobility helped prevent pressure injuries.

The research studies and CPGs reviewed for this analysis have not identified all of the best practices for mobilizing patients. The evidence is conflicting; however, the guidelines still recommend turning, repositioning, and early mobilization. These same guidelines speak to repositioning patients as often as tolerated, but at least every two to four hours as well as

maintaining the head-of-bed at the lowest position for comfort and prevention of friction and shear (AHRQ, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014). The International CPG (2014) provides the most thorough recommendations, but they too, are brief and identify immobility as a risk factor. Interventions listed by these same guidelines (2014) include assessment of immobility status, using a pressure redistribution seat cushion for patients who have reduced mobility, but are able to sit in a chair, and using equipment such as walkers, overhead trapezes on beds, and other devices that support continued mobility and independence. Dziedzic (2016) recommends involving physical therapy/occupational therapy in the patient's plan of care. As stated earlier, there is conflicting evidence; but the reviewed guidelines recommend progressively increasing activity as rapidly as possible (NPUAP et al., 2014).

Moisture Management

Expert opinion attests to the fact that there is a correlation between skin care and pressure injury occurrence. Therefore, patients are entitled to the best practice for skin preservation while in the hospital setting (Lyder & Ayello, 2008). Mild cleansers and barrier wipes clean, deodorize and should be used promptly after episodes of incontinence along with barrier cream to protect the skin from breakdown (AHRQ, 2014; Bryant & Nix, 2016; Dziedzic, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014). Absorbent incontinence/under-pads that are compatible with support surfaces, and wick moisture away from the skin, are preferable to adult briefs or diapers (AHRQ, 2014; Bryant & Nix, 2016; Dziedzic, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014). Documentation of moisture management and meticulous skin care is important and provides a record of interventions that were enacted to prevent HAPI development (AHRQ, 2014; Bryant & Nix, 2016; Dziedzic, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014).

Friction and Shear

Friction and shear are significant contributors to pressure injury development (Bryant & Nix, 2016). Friction is a force that occurs when two surfaces are rubbed together. Friction is demonstrated when heels and elbows rub against the bed or bed coverings (Bryant & Nix, 2016). Episodes of friction and shear occur when gravity pushes down on the patient's body against resistance of a surface such as a bed or a chair. Friction and shear cause the body to move but the skin remains in place. Friction/shear are demonstrated when the patient slides down in bed or, is dragged across a bed or when transferred from a bed, stretcher, or onto a procedure table (Bryant & Nix, 2016). In order to reduce the potential for skin damage due to friction and/or shear, all of the reviewed guidelines recommend maintaining the head of the bed at 30-degrees or less; and to use lift sheets when transferring or repositioning patients. Raising the knee gatch of the bed to 10 or 20-degrees before raising the head of the bed can help to prevent the patient from sliding down while in bed, thus reducing the risk of shear. Other evidence-based recommendations included lifting patients using a draw sheet as opposed to dragging them across the bed, using a trapeze when indicated, and protecting elbows, sacrum, and heels, with multi-layer silicone foam dressings or protectors if bony prominences are exposed to friction risk (AHRQ, 2014; Bryant & Nix, 2016; Dziedzic, 2014; Lyder & Ayello, 2008; NDNQI, 2018; NPUAP et al., 2014).

Prophylactic Dressings

Research shows emerging evidence for the use of silicone dressings in prevention of pressure injuries in the sacrum and heels (NPUAP et al., 2014). This same International CPG (2014) recommends multi-layer silicone foam dressings for reducing friction/shear forces. The composition of the dressing, and its ability to absorb the impact aid in protecting the skin (NPUAP et al., 2014). Assessment of the dressings along with evaluation of the patient's skin is

important to observe, document, and report on a regular basis. Dressings can be changed every three days or as needed if they become soiled, or no longer intact (NPUAP et al., 2014).

Clark et al. (2014), Santamaria et al. (2015a) and Tayyib and Coyer (2016), conducted systematic reviews of the role that prophylactic dressings play in the prevention of pressure injury (see Appendix C). These researchers stated that a pressure ulcer results from prolonged periods of "mechanical load that is placed on the skin and soft tissue" (Clark et al., 2014, p. 460). Pressure injury is caused by direct pressure, shear or friction. The results revealed that pressure ulcer prevention is achieved through the introduction of a soft silicone foam dressing over the sacral area, especially in patients with limited mobility such as in ICU settings (Santamaria et al., 2015a; see Appendix C).

A randomized control trial (RCT) carried out by Santamaria et al. (2015a) was instituted for the purpose of determining the efficacy of multi-layered soft foam dressings as a treatment in the prevention of HAPIs. Patients in ICU settings are at higher risk for HAPI with incidence rates ranging between 3.3% - 53.4% (Santamaria et al., 2015a). These same researchers suggest that when prophylactic pressure dressings are applied upon admission to the emergency department (ED) and prior to transfer to the ICU, risk for HAPI decreases significantly. The results of their study showed a 10% lower incident rate of HAPIs in the intervention group compared to the control group (Santamaria et al., 2015a, p.303). These same professionals stated that their findings are statistically and clinically significant when using prophylactic pressure dressings for prevention of sacral and heel pressure injuries (see Appendix C).

Santamaria et al. (2015b) evaluated the cost implications of treatment verses non-treatment of HAPIs using prophylactic soft foam dressings to high risk ICU patients. Cost evaluation included care, labor, material costs, and degree or stage of injury progression. These

researchers found that on average, the net cost per patient was significantly lower among the intervention group. Therefore, the authors concluded that the use of prophylactic pressure dressings are financially beneficial for both patient and hospital when dressings are placed in the ED prior to admission to the ICU. The authors recommend the adoption of protocols and procedures to incorporate soft silicone foam dressings for the benefit of ICU patients at-risk of acquiring pressure injury (Santamaria et al., 2015b; see Appendix C). Tayyib & Coyer (2016) identified that further randomized control studies contain standard pressure injury definitions, staging systems, an intervention and comparative care integrity.

Literature Review Summary

Pressure injury is defined 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" (Reid et al., 2016, p. 118). The AHRQ (2014) reports that close to three million patients develop HAPI yearly, giving evidence that assessment and prevention strategies are important to implement. Risk and skin assessment begin at admission and includes using valid and reliable risk assessment tools, making clinical nursing judgements, and considering individual factors in order to provide the highest level of care for patients who are at-risk for HAPI.

As stated above, the results of the Santamaria et al. (2015a) study revealed a ten percent reduction in both sacral and heel HAPIs incidence rates when using Mepilex Border Sacrum and Mepilex Heel dressings prophylactically. These findings were so profound that administrators, from the hospital where the research study was conducted, now require all patients admitted to the ICU through the ED to receive prophylactic pressure injury dressings to both their sacrum and heels. There is strong evidence, including a randomized control trial (RCT), that silicone

dressings are beneficial for reducing HAPI incidence for high risk patients in critically ill settings (Santamaria et al., 2015a; Santamaria et al., 2015b).

The International CPG (2014) identifies the need for more research in many areas of HAPI prevention. Examples of future areas for study identified by these guidelines are: determining the most efficient repositioning schedule when using support surfaces, determining the best use of prophylactic dressings, determining the role of nutrition supplementation including multivitamins, identifying the best screening and risk assessment strategies, identifying the best risk assessment tools, and determining the best support surfaces.

The results of the information garnered from this thorough search of the literature was used to identify gaps in practice in the microsystem. Risk and skin assessments, support surfaces, nutrition and hydration, repositioning and early mobility, moisture management and prophylactic dressing usage was observed and audited to determine where evidence-based practice was lacking and where improvements could be made based on current strategies that are found in the literature. Overall, the evidenced-based guidelines and the scientific literature have moderate to strong support for the following interventions for the prevention of HAPIs:

1) Conduct and document a comprehensive head-to-toe skin assessment, using two nurses per skin inspection, as soon as possible but within eight hours of hospital admission, when a patient exhibits a change in status, and prior to discharge. The Joint commission recommends conducting skin assessment within 24 hours (High level recommendation, AHRQ, 2014; NDNQI, 2018; NPUAP et al., 2014).
    a. Inspect skin for erythema; differentiate between blanchable or nonblanchable erythema (High level recommendation, NPUAP, EPUAP, & PPPIA, 2014).

   b. Observe/document skin temperature, edema, turgor, color, moisture, and skin integrity (Moderate level recommendation, AHRQ, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014; The Joint Commission, 2016).
   c. Recognize patient risk factors and use clinical nursing judgement in combination with a risk assessment tool considering previous and/or existing pressure injury, diabetes, tissue perfusion, smoking status, and oxygenation (High level recommendation, AHRQ, 2014; NDNQI, 2018; NPUAP et al., 2014; The Joint Commission, 2016).

2) Conduct/document a risk assessment using the Braden Scale for Predicting Pressure Sore Risk tool as soon as possible, but within a maximum of eight hours of admission, and then every 12 hours. Pay special attention to Braden Scale subscale scores in the areas of activity, mobility, and skin status (High level recommendation, AHRQ, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014; The Joint Commission, 2016).
3) Conduct/document a Nutritional Screening Assessment to determine nutritional risk using a valid and reliable tool (i.e. the MUST or MNA®; Moderate to high level recommendation, NPUAP et al., 2014; The Joint Commission, 2016).
4) Develop, activate, and document an individual risk-based prevention care plan for at-risk individuals (High level recommendation, AHRQ, 2014; IHI, 2011, NDNQI, 2018, NPUAP et al., 2014, p. 44; The Joint Commission, 2016).
5) Turn and reposition all at-risk patients unless contraindicated. Schedule frequency based on patient's tissue tolerance, level of activity/mobility, acuity, skin condition, and comfort. Use the 30-degree tilted side-lying position (alternately,

right side, back, left side, back) with a pillow between the patient's legs (High level recommendation, IHI, 2011; NDNQI, 2018; NPUAP et al., 2014; The Joint Commission, 2016).

6) Float/suspend patient's heels using pillows, a foam cushion, or a heel suspension device always (High level recommendation, IHI, 2011, NPUAP et al., 2014).
7) Limit the head of patient's bed to a 30-degree angle or less (High recommendation, AHRQ, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014).
8) Consider multi-layer silicone prophylactic pressure dressings (Moderate level of recommendation, NPUAP et al., 2014).
9) Consider use of support surface and/or pressure relieving devices specific to individual patient needs (i.e. specialty beds; chair cushions; High level recommendation, AHRQ, 2014; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014, p.106; The Joint Commission, 2016).

Chapter 3: Quality Improvement Framework

CNLs, in partnership with other healthcare professionals, take accountability for determining problems within a microsystem (Wienand et al., 2015). CNLs are outcomes managers who are responsible for creating, implementing, and evaluating patient care by coordinating, appointing, and overseeing care provided to patients and families by the healthcare team within their microsystem unit (Wienand et al., 2015). CNLs use evidence-based care practices to provide high quality care to those whom they serve. One way to introduce evidence-based care into practice within a microsystem is through the implementation of a healthcare model (Melnyk & Fineout-Overholt, 2015). The framework or structure of the model is intended to guide, influence, and evaluate the steps of change that take place within a healthcare system.

The purpose of this section of the paper is to consider the Model for Improvement (see Appendix E) when implementing change in this progressive care unit (PCU) microsystem regarding the reduction of hospital acquired pressure ulcers (HAPIs).

The Model for Improvement (MFI) is a framework that provides a template or guideline for problem-solving when implementing change within a system (Langley et al., 2009, p. 5). The MFI is widely used, easy to understand, and useful for implementing either simple or complex change. The overall goal of change is to improve the quality of care and outcomes, reduce cost, and heighten lifelong learning through lasting and sustained change (Langley et al., 2009; Raymond & Dawda, 2016).

The MFI was created by a group of consultants known as the Associates in Process Improvement in late 1980's and early 1990's (Little, 2009, slide 11). These individuals worked with Berwick (1991) to develop *The Improvement Guide* which was published in 1996 and then again with a second edition in 2009 (Little, 2009, slide 11). The goals, identified by the developers of the MFI, included that the model 1) would work, 2) could be applied to both products and processes, 3) would have criteria for ease of use, 4) will generate success by all users in any/all environments, and 5) would be fun to use and would promote learning (Little, 2009, slide 12).

Model for Improvement

In the microsystem, the MFI was helpful in identifying solutions for reducing HAPIs by working through the stages of the model. Three purposes of the model are to establish new information, test new clinical ideas, and implement the plan using the new ideas (Little, 2009, slide 18). For this gap analysis, establishing new information and making recommendations based on the results were the only aspects of the model explored.

The PCU has determined that prevention of HAPIs are a priority. A comprehensive gap analysis in this unit was very valuable in providing information about nursing practices compared to the EBP recommendations. Evidence from this quality improvement gap analysis provided data to drive future practice changes.

The Model for Improvement is a structured and systematic 2-part approach to quality improvement that is based on a format for CNLs to ask three essential questions, including "What are we trying to accomplish?; How will we know that a change is an improvement?; and What change can we make that will result in improvement?" (Raymond & Dawda, 2016, p. 768). The second part of the model consists of a series of Plan-Do-Study-Act (PDSA) cycles, which are a course of trial-based ideas that are tested to determine if the change will work (Langley et al., 2009). The steps involve a plan, a small test of change, time to analyze the data and results, and modify the change based on the analysis of the study (IHI, 2018).The previous three questions, "What are we trying to accomplish?; How will we know that a change is an improvement?; and What change can we make that will result in improvement?" when combined with the Plan-Do-Study-Act (PDSA) cycles make-up the foundation of the model (Langley et al., 2016). There is greater success with implementing change when using a systematic approach because the process makes the improvement more likely to occur (Raymond and Dawda, 2016).

Model for Improvement Concepts

Establishing the Team

The first step in the Model for Improvement is to form a team (Institute for Healthcare Improvement [IHI], 2018). Utilizing individuals who demonstrate leadership and authority, and clinical expertise within the microsystem, is necessary to review issues/concerns that may be part of this improvement project. An effective team was created and composed of members who have

organizational expertise in system, technical, and day-to-day leadership (IHI, 2018). All three of these areas should have personnel who demonstrate clinical competence and capability to drive successful improvement (IHI, 2018). The team required a clinical leader who understands the microsystem and has authority to implement future change (IHI, 2018). The technical expert will be valuable in assisting to acquire data from the patient electronic record, identify pertinent measures, use of appropriate tools, and provide guidance with data collection and interpretation (IHI, 2018). The day-to-day leader was the individual who vested interest in the project and was present to oversee the data collection and clinical observations in the microsystem (IHI, 2018). This team may include one or more members who harbor these three qualifications for the improvement project to commence (IHI, 2018).

Identifying the Aim

The IHI (2018), recommends that the aim is to be time-specific, and measurable and clearly identifies the population of patients impacted by the QI project (IHI, 2018). The aim should be safe, effective, patient-centered, timely, efficient, and equitable (IHI, 2018). An example would be to conduct a comprehensive gap analysis in a progressive care unit to reduce the incidence of HAPIs. This QI project did identify "gaps" in clinical care practice as compared to the most salient recommendations from current evidence-based clinical practice guidelines.

The aim of this HAPI prevention gap analysis was to reduce the incidence of HAPIs in adult patients in the PCU by 100% by July 31, 2018 and identify the best possible evidence-based HAPI preventative care by examining existing practices and processes that are currently implemented and compare them to the most current CPG recommendations. The results of this two-month gap analysis provided information for future QI projects with the goal of reducing HAPIs in the microsystem to zero percent.

Establishing Measures

Measurement is a vital part of testing and actualizing change (IHI, 2018). Measurement demonstrates if the change is contributing to improvement (IHI, 2018). The balanced set of measure for the QI projects includes outcome measures, process measures, and balancing measures (IHI, 2018).

Outcome Measures. The outcome measures will evaluate the system impact of the change and if the change has led to an improvement (IHI, 2018). Outcome measures are important in the management of patient care as they reflect whether practices demonstrate change and improvement (IHI, 2018). In this gap analysis for the prevention of HAPI, the metrics reflected areas of clinical patient care that are of high quality and areas where evidence-based improvements can be implemented.

For this QI project, the outcome measure was HAPI incidence. The results of this gap analysis was prepared for the CNL and included differences in care that exist between CPG recommendations and current standard care to identify future quality improvement projects to implement that will lead to zero incidence of HAPIs in the PCU.

Process Measures. The process measures provide information to the leadership to identify if the parts/steps in the system create improvement as planned (IHI, 2018). The team was made aware if the pressure injury education, patient care interventions, and documentation of those interventions are effective in making an improvement. The data from the chart audits and clinical observations indicated where improvements are taking place and where future change is needed.

For this QI gap analysis, the best practice interventions identified from the CPGs and scientific literature, were compared with current practice data extracted from patient charts in the

PCU to determine if standards of care for HAPI prevention are being met. HAPI care was observed by the MSN student, on these same patients, on the same day that audited care is acquired, and was recorded on the data collection tool.

Balance Measures. The balance measures provide an opportunity for the CNL to look at the system from an alternative viewpoint (IHI, 2018). The balancing measures will identify if change in the system is creating problems in a different section of the system (IHI, 2018). Requiring staff to perform skin assessments with two nurses simultaneously may create a new nursing problem. New issues may arise regarding efficient time management for patient care, staff availability, and/or time spent on providing comprehensive skin assessments. Looking at the system from different aspects assists the CNL to guide the strategies used to impart effective change (IHI, 2018).

Identifying the Change

The ability to create, test, implement, and evaluate change is necessary to continuously improve (IHI, 21018). A change concept is an approach to improvement that leads to better outcomes or improvement (IHI, 2018). There are a variety of changes that lead to improvement (IHI, 2018). These changes are derived from change concepts (IHI, 2018). Examples of change concepts are elimination of waste, improvement in work flow, and management of time (IHI, 2018). These concepts focus on the way that a process is carried out (IHI, 2018). These change concepts were valuable to be aware of when the CNL looks at the data from the gap analysis in the PCU microsystem project.

Plan-Do-Study-Act

Once the team has determined the aim, established the members, and identified measures to determine whether a change leads to improvement, the next step is to test the proposal in the

setting (IHI, 2018). The purpose of a trial is to determine if the plan will result in an improvement by going through the PDSA cycle (IHI, 2018). The PDSA steps are defined according to Langley et al. 2009 and Raymond & Dawda, (2016) as follows:

Plan: During this phase, the implementation is planned and includes questions that need to be solved, predictions of the answers to the questions, and a plan for data collection that will help to answer the questions.

DO: The plan is implemented and carried out. All observations are recorded.

Study: Analyze the data, compare it to predictions and summarize what was learned during the process.

Act: Improve the change based on findings and determine when to begin the next PDSA cycle.

Conclusion

The MFI is a guideline for change in the clinical setting. The MFI and the PDSA cycle are reliable methods used to guide lasting and sustainable change (IHI, 2018) The MFI can be used in a variety of situations to improve quality outcomes using scientific based evidence (Little, 2009). This tool appears to be easy to use and can assist users determine the appropriate steps to take to impact change in the microsystem. The MFI was a useful guide to aid in the reduction of HAPIs in the clinical microsystem unit. Hospitals staff can implement best practice in prevention of HAPIs using an interdisciplinary approach for the benefit of patients and their families while also generating improved patient outcomes.

Chapter 4: Planned Clinical Quality Improvement Initiative

Most patients admitted to this PCU are of advanced age and have multiple risk factors for skin breakdown. Limited mobility, diabetes, urinary/fecal incontinence, peripheral vascular

disease, stroke, and congestive heart failure are just a small sampling of the issues that these patients experience daily in addition to being acutely ill. HAPIs lead to increased patient pain and suffering which contribute to increased morbidity, mortality, healthcare costs, added length of stay, increased readmission rates, as well as decreased quality of life, and quality of care. The estimated cost of providing care to patients with a HAPI is between $37,800 to $70,000, up to 11 billion annually in the United States. A comprehensive gap analysis for HAPI prevention was conducted in this PCU microsystem because there has been an increase of HAPIs in this Midwestern Hospital over the past year and the PCU has a population at very high risk for HAPIs.

Project Purpose

In order to reduce the incidence of hospital acquired pressure injuries (HAPIs) and provide the best possible preventative care interventions, a comprehensive gap analysis between the current care practices in the progressive care unit (PCU) and the best evidence-based practice recommendations was conducted. The purpose of this gap analysis is to improve outcomes by reducing the incidence of HAPIs, improving quality of life, quality of care, increased patient satisfaction, reduced readmission rates, and reduced healthcare costs in this hospital PCU. The gap analysis included a review of four clinical practice guidelines (CPGs), along with a search of the scientific literature (see Appendix F). The HAPI prevention variables were identified from the literature search. A list of best nursing practices for HAPI prevention was synthesized from the literature review (see Appendix G). In order to identify measures, patient charts was audited to record current care practices in the PCU microsystem by collecting data and entering it into an Excel spreadsheet for further review (see Appendix G). Direct clinical observations of HAPI preventative patient care were conducted on the same patients on the day that their charts were

audited (see Appendix G). The data from the HAPI audits and observation of care were analyzed and evaluated. The results of this project identified opportunities for future QI projects (see Appendix H).

The Model for Improvement was the QI framework that was used to guide this gap analysis (see Appendix E).

The Model for Improvement to Guide this Gap Analysis

Establishing the Team

HAPIs are a multidisciplinary concern. Therefore, the prevention of HAPIs requires a team approach. The skin team will bring value by including all staff together working on a common goal to improve outcomes. There are many stakeholders in the prevention of HAPIs, such as the PCU CNL, the clinical nurse specialist (CNS) who was leading this process improvement, and the MSN student who was conducting the gap analysis. Other key individuals who are invested in this endeavor are nursing managers, CNLs from other microsystem units (MUs), nursing staff, nursing educators, risk managers, quality and performance improvement individuals, dieticians, wound care nurse practitioners, physical/occupational therapists, materials management, central supply department, healthcare providers, and information technologists.

Identifying two RNs from this PCU microsystem who can act as skin care champions is important. These skin care champions are PCU staff RNs who are passionate about HAPI prevention and are competent and respected by both staff and administration. These same champions can reinforce good skin care and assist with keeping staff focused on reducing HAPI risk in the PCU microsystem. This skin care team has support from higher management and the plan is to pilot HAPI prevention in the PCU and then advance the evidence-based care to hospital

wide usage. The skin care team has divided up the responsibilities and these sub-groups report back during skin team meetings with pertinent information. The use of sub-groups divides the workload, helps to accomplish improvement more effectively and efficiently as well as shares ownership of the outcomes.

Identifying the Aim

The aim of this HAPI prevention gap analysis is to reduce the incidence of HAPIs in adult patients in the PCU microsystem by 100% by July 31, 2018, and to identify the best possible preventative care by examining existing HAPI prevention practices and processes and compare them to the most current CPG recommendations. The results of this gap analysis will provide information for future QI projects with the goal of reducing HAPIs in the microsystem to zero percent.

Establishing Measures

Using four CPGs, the most salient "best practices" for HAPI prevention was identified. Each of the best practices were operationalized for the PCU microsystem. This list of "best practice" evidence-based, nursing practices for HAPI prevention variables was synthesized from the literature review. Charts of current patients on the unit were audited to determine if the standards are met. In addition, observations of patient care was conducted. These direct patient observations of HAPI preventative care were conducted on the same patients on the day that their charts were audited in order to assess strengths and weaknesses of HAPI prevention strategies. The chart audits and clinical patient observations provided current data that was analyzed for future process improvement changes.

The short-term goals of this project are to collect data that will reflect current standard care for HAPI. This goal was accomplished over the month of July when patient charts were

audited in the areas of skin/risk assessment, repositioning, floating/suspending patient heels, nutrition assessment, and prophylactic dressings. These specific areas provide insight to where care is lacking especially when actual care was compared to best practice recommendations by current CPGs. Direct patient observation was also conducted simultaneously to determine strengths and weaknesses with delivering bedside care.

The long-term goal was to determine areas for future QI improvement opportunities. The results of this gap analysis identified areas for improvement to reduce the incidence of HAPIs until zero percent is achieved and sustained. QI is an ongoing process, therefore, CNLs need to be aware of HAPI unit data in order to monitor incidence of pressure injuries. Striving to achieve zero percent HAPIs and high-level preventative care in the MU will lead to positive outcomes such as patient satisfaction, increased quality of care, reduction of cost, decreased readmission rates, and lower LOS.

Outcome Measures. The outcome measure in this gap analysis is a reduction in the incidence of HAPIs in this PCU while identifying the best evidence-based care for HAPI prevention.

Process Measures. Fifty-five patient charts and observations of these same 55 patients who met QI project criteria were audited over the month of July, 2018 (eleven patients for each of five days). Chart audits and observations were recorded on the Excel data collection tool and calculations were determined from the results (see Appendix H).

The MSN student implemented process measures to evaluate the results of documented nursing interventions through chart audits. Clearly articulating the criteria for the data collection carried out by listing the definitions was included. The following list includes the best practice guideline definitions/recommendations and included the following operationalized definitions:

- Length of Stay (LOS) is the number of patient days in the hospital, not the Progressive Care Unit (PCU). (Patients with LOS greater than 3 days are at-risk for HAPI).
- Skin Assessment: Initial comprehensive head-to-toe assessment, conducted/documented by 2 RNs within 24 hours of admission; then bedside nurse to conduct every 12 hours.
    - Important to identify whether the patient has any preexisting pressure injuries and/or current risk factors that could contribute to HAPI development.
    - Important to identify pressure injuries "present on admission" for hospital to receive reimbursement for pressure injury care/treatment.
- Risk Assessment: Braden Scale for Pressure Sore Risk includes: Total calculated score range between 6 and 23; Subscale scores range between 1 and 4, completed on admission and every 12 hours. (Braden Scale ≤ 18 designates a patient who is at-risk).
- Nutrition assessment: Malnutrition Universal Screening Tool; Total score calculated/documented on admission; Yes or No
- Care Plan: "Potential for Compromised Skin Integrity" activated when Braden Scale subscale scores are ≤ 3 in Sensory, Activity, and/or Mobility; Yes or No
- Offloading: Documented position change using the 30-degree side-lying position, when patient is in bed, every two hours when Braden Scale subscale scores are ≤ 3 in Sensory, Activity, and/or Mobility; Yes or No

    - Patients are repositioned every two hours using 30-degree side lying position (alternating right side, back, left side, back) and position is documented in patient chart.

- Suspend/Float heels: Documented heels are elevated off the bed surface using pillows, Mepilex prophylactic heel dressings, or Prevalon boot.
- HOB (Head of bed); Documented HOB ≤ 30-degrees when Braden Scale subscale scores are ≤ 3 in Sensory, Activity, and/or Mobility; Yes or No
- Prophylactic Dressing: Documented dressing to sacrum when Braden Scale subscale score is ≤ 3 in Mobility **and any of the following:** Braden Scale total score ≤ 18; History of HAPI; surgery > 6 h; DM; BMI ≥ 30; Poor nutrition: Yes or No

Patient observations will include:

- Offloading: Patient is observed to be in 30-degree side lying position with pillows between legs.
- Suspend/Float heels: Heels are observed to be suspended or floated off bed surface at all times, using pillows, foam dressings, or heel suspension boots.
- Head of bed ≤ 30-degrees: HOB is observed to be ≤ 30-degrees for Braden Scale subscale scores of ≤ 3 for Sensory, Activity, and/or Mobility.

Balance Measures. Continually looking at the system from different aspects assist to implement effective change. Potential issues with nursing work flow and time management were considered.

Identifying the Change

The data from the patient chart audits and patient observations was analyzed and evaluated. A report of the findings of the gap analysis was provided to the CNL preceptor for review with recommendations. The results of this gap analysis identified opportunities for future quality improvement projects.

Plan-Do-Study-Act

The team has been identified and the aim established, the next step is to test the proposal in the PCU setting. The purpose of the trial is to determine if the plan will result in change. This is where the Plan-Do-Study-Act (PDSA) cycle will be implemented.

Plan: Review of Clinical Practice Guidelines (CPGs) and scientific literature for the best evidence-based practice recommendations for HAPI prevention interventions. Identify the current standards of care for HAPIs in the PCU.

Do: Fifty-five patient chart audits and clinical observations on these same 55 patients to determine current care practices in the PCU for HAPI prevention.

Study: Analyze the data and compare the data to the recommendations from the CPG's and the scientific literature. Summarize the findings and prepare a report for future QI projects for the CNL of the PCU.

Act: The recommendations and findings from this gap analysis provided future opportunities for the CNL to implement in order to reach the aim of reducing the incidence of HAPI in the PCU.

Steps for Implementation of Project, including Timeline

The implementation of this HAPI gap analysis began with a review of four CPGs, including the Agency for Healthcare Research (2014), the Institute for Healthcare Improvement

(2011), the National Database of Nursing Quality Indicators (2018), and the International guideline (NPUAP et al., 2014), along with a search of the scientific literature. A list of best nursing practices for HAPI was synthesized from the literature review. The QI project involved a review of patient charts to identify the "gaps" between current practice in the microsystem with the identified "best practices." A report was prepared and provided to the CNL and QI team for review with recommendations.

Data Collection Tools

To capture QI data, an Excel document was created (See Appendix H). This tool was utilized to conduct 55 chart audits and 55 patient observations during the month of July, 2018. Data was collected on eleven patients over five days. The Excel document provided a summary of documentation and observation of clinical performance in the PCU. Direct clinical outcomes were measured by observations such as; patient's head of bed is elevated to 30-degrees or less, patients are in 30-degree side lying position with pillow between legs, and suspension/floating of patient's heels with the use of pillows.

Pressure Injury Gap Analysis Timeline

The gap analysis (involving chart audits and observation of nursing practices) started in May of 2018 and continued through July of 2018. Based on the results of a gap analysis of the identified best practices and actual practice within the microsystem, recommendations were made to the quality improvement team regarding changes that could be made to reduce pressure injury incidence. Information technology was involved with providing reports to assess the patient electronic health record. Participation in the intradisciplinary skin team was ongoing until the project has been completed. Data collected from the patient record remained anonymous. Timeline is as follows:

- February -March, 2018: Conduct literature review.
- April-June, 2018: Develop list of best practices; operationalize measures.
- July, 2018: Audit charts and observe care
- July, 2018: Aggregate data, prepare findings, and share recommendations/finding with CNL and staff.

Next Steps

Once the gap analysis is completed and the report shared with the CNL and the QI team in August of 2018, the CNL will have ample time to review the findings and recommendations. This information is valuable for the CNL and the QI team to use for future process improvement opportunities within this microsystem based on the findings. The improved standards of care reduction will lead to reduced incidence of HAPIs and better patient outcomes, Improved patient satisfaction scores, decreased healthcare costs, readmission rates, and patient's LOS. This comprehensive gap analysis in the PCU microsystem provided a thorough and comprehensive evaluation of the state of current practice compared to high level evidence-based recommendations for HAPI prevention using CPGs. This gap analysis is an ideal way to determine future QI process improvement opportunities within this PCU microsystem unit.

Chapter 5: Clinical Evaluation

HAPIs have become a significant concern for hospital systems that lead to increased patient suffering, pain, and disfigurement that contributes to increased morbidity, mortality, added length of stay (LOS), healthcare costs, as well as decreased quality of life and quality of care (AHRQ, 2014; Chou et al., 2015; Cooper, 2013; Fabbruzzo-Cota et al., 2016; Reid et al., 2016; Smit et al., 2016). The estimated cost of providing care to patients with a HAPI is between $37,800 to $70,000, up to 11 billion annually in the United States (Gardiner et al., 2016; Smit et

al., 2016). One HAPI is too many; therefore, members of the risk management department have formed an interdisciplinary team to address HAPIs in the acute care setting because there is a hospital-wide increase in incidence.

The purpose of this quality improvement (QI) project, in the progressive care unit (PCU) of this Midwestern Hospital, was to conduct a comprehensive gap analysis for the prevention of HAPIs using the Model for Improvement (MFI) as a guide. The goals of this gap analysis were to identify, collect, and compile information in the areas of risk/skin assessment, support surfaces, nutrition and hydration, repositioning/mobilization, moisture management, friction/shear, and prophylactic dressings.

Project Overview Using the Model for Improvement

The MFI helped to guide this QI improvement project. In this chapter, the results of the gap analysis are reviewed, and recommendations made for the CNL to plan future QI activities aimed at reducing the incidence of HAPIs on this unit. This purpose of this chapter is to provide an examination of how the project was conducted. The key information includes identification of successes, difficulties, strengths and weaknesses that were part of the process, along with data and outcomes.

Establishing the Aim

The aim of this HAPI prevention gap analysis a to reduce the incidence of HAPIs in adult patients in the PCU microsystem by 100% by July 31, 2018, and to identify the best possible preventative care by examining existing HAPI prevention practices and processes and compare them to the most current CPG recommendations. The results of this gap analysis provided information for the CNL to identify future QI projects with the goal of reducing HAPIs in the microsystem to zero percent.

The Measures

In order to reduce HAPIs and provide the best possible preventative care, an analysis between current care practices on the PCU and the best evidence-based practice recommendations for HAPI prevention in the areas of risk/skin assessment, malnutrition screening, turning/repositioning, heel offloading, head-of-bed elevation, and prophylactic dressings was conducted. Using the four CPGs, the most salient "best practices" for HAPI prevention was identified. Each of the best practices was operationalized for the microsystem.

Charts of 55 current patients in the PCU MU were audited over five days to determine if standards were met. In addition, 55 observations of patient care (i.e. proper positioning, turning, heel positioning and level of the head of the bed), on these same patients, were conducted to determine if evidence-based strategies were being implemented in the clinical setting. Using these operationalized best practices, pressure injury prevention comparison data was acquired from the patient charts in July, 2018. Qualitative data was prepared and presented graphically to the CNL and the PCU staff, comparing best practice recommendations with current practices on the unit.

Establishing the Change

A report, including findings and recommendations was prepared and shared with the microsystem CNL and staff. The results of this gap analysis provides information for future QI projects with the goal of reducing HAPIs in the microsystem to zero percent.

The Plan-Do-Study-Act Cycle

Once the first three steps of the MFI were completed, the next phase in the gap analysis was to activate the Plan-Do-Study-Act (PDSA) cycle.

Plan

A review of four clinical practice guidelines (CPGs), including the AHRQ (2014), the IHI (2011), the NDNQI (2018), and the International guideline (2014), along with a search of the scientific literature, was conducted. Using these CPGs, a list of best nursing practices for HAPI prevention was garnered from the literature review. Each of the best practices were identified and defined for the microsystem (see Appendix F).

Do

Charts of 55 current patients in the PCU MU, were audited over five days to determine if care standards were met. In addition, 55 observations of patient care (i.e. proper positioning, turning, heel positioning and level of the head of the bed), on these same patients, were conducted to determine if evidence-based strategies were being implemented in the clinical setting. Using these operationalized best practices, pressure injury prevention comparison data was acquired from the patient charts in July, 2018. Qualitative data was prepared and presented graphically to the CNL and the PCU staff, comparing best practice recommendations with current practices on the unit.

HAPI Assessment Tools

Skin Assessment

Conducting a comprehensive head-to-toe skin assessment by two RNs simultaneously on all patients admitted to the PCU at the time of admission is the first step in HAPI risk/skin assessment identification. Based on the audit scores, 51/55 (92.7%) of newly admitted patients had completed/documented skin assessments on admission by two RNs (see Appendix F). Both names of RNs completing the examination were included in the documentation. Skin alteration/assessment and documentation is a valuable multi-disciplinary function tied to

reimbursement. The skin assessment is important in order to identify pressure injuries that are present on admission since hospital acquired conditions are no longer reimbursable, this includes Stage 2 and Stage 3 pressure injuries that occur during a patient's hospital stay.

Braden Scale

The patient's risk for HAPI development is then determined by the Braden Scale (1988) which is a valid and reliable risk assessment tool. This risk assessment tool is used in combination with clinical nursing judgement and the nurses' consideration of the patient's individual risk factors such as diabetes, previous history of pressure injury, and vascular/circulation issues (University of Albany, 2012). Nurses are required to complete Braden Scale scores every 12 hours to continually reassess and document the patient's risk status and to individualize and implement care plans as the patient's status changes. There was 100% compliance completing the Braden Scale scores (see Appendix F).

Braden Scale subscale scores are part of the Braden Scale, but the subscale scores are important even if a patient scores 19 or greater (indicating low risk of HAPI) on the Braden Scale total score. Of 55 patient charts reviewed, 45 (81%) scored ≤ 3 in the areas of Sensory, Activity, and Mobility indicating that these patients are at-risk due to compromised sensory perception and limited mobility. Of the 55 patients, 29 (52.7%) had Braden Scale scores of 19 or greater but had subscale scores of 3 or less in Sensory, Activity, and/or Mobility, warranting activation of a HAPI prevention care plan. If a patient scores 3 or less in Sensory, Activity, and/or Mobility, a care plan is expected to be activated. These 29 patients, who had Braden Scale scores of 19 or greater, are at-risk because of their low subscale scores. These patients may require activation of the HAPI prevention care plan so that nurses can be watchful and vigilant with individualized interventions for these patients. The number of patients who scored 3 or less

in these areas were 45 out of 55. Out of these 45 patients care plans were activated 40/45 (88.8%) times.

Malnutrition Screening

The MUST is a five-step tool used to identify adult patients who are malnourished or are at-risk for malnutrition (Bapen, 2003). Unit policy states that a score should be calculated on all admitted adult patients. Patients with a score of 0 are at low risk; a score of 1 indicates medium risk and requires observation and rescreening weekly while in the hospital; and a score of 2 or greater requires a referral to the dietician for further evaluation. The unit scored high in this area also with 51 (92.7%) having documented, completed MUST tool scores in their charts.

Turning/Repositioning

Patient turning/repositioning is carried out every two hours using the 30-degree side lying position for patients in this MU due to the high level of acuity, limited mobility, older age, and the complexity of the medical issues present, such as diabetes, stroke, congestive heart failure, peripheral vascular disease, tissue perfusion needs, smoking history, and oxygen usage. Patients with Braden subscale scores ≤ 3 in the areas of Sensory, Activity, and/or Mobility meet the care plan criteria for every two-hour turning/repositioning. The result of the chart audit showed that 48 patients (87%) met this criteria evidenced by Braden Scale subscale scores of 3 or less, regardless of their total score. This finding means that 48 out of 55 patients would require turning and repositioning every two hours, regardless of their Braden total score. Additionally, the nurses must document the turns by indicating the side the patient was turned onto; and that the side turned onto must be different from the previous direction and completed within two hours. The compliance with documenting turns by indicating the side the patient was turned onto was 11/55 (20%), indicating a need for improvement. This finding reflects that out of the 87% of

the patients who met the requirement for every two-hour turning/repositioning, only 20% were documented correctly as being turned every two hours and included a position change that was different from the previous position, regardless of their Braden total score.

Prophylactic Dressings

Patients with limited mobility (Braden Scale subscale score ≤ 3 in Mobility) and one of the following; Braden Scale score ≤ 18; history of pressure injury; surgery lasting six hours or longer; poor nutritional intake; BMI 35 or greater; diabetes; a provider order requiring the patient's head of the bed > 30-degrees, should have a sacral prophylactic dressing. There were 33/55 (60%) patients who met this criteria. Out of the 33 patients who met the above criteria, 21/33 (63.6%) had the dressing documented.

Incidence of HAPIs

The PCU CNL has been posting the number of days since the last HAPI data in the workroom. The posting is visible for all disciplines to see and take ownership and pride for the positive results. A downward trend in HAPIs has occurred over the last three months. The skin team members also invited a subject matter expert (SME) to conduct an evaluation and provide recommendations for improvement strategies in the areas of hospital acquired infections. The information from the SME included HAPI prevention strategies along with recommended best practice interventions and recommended products for high quality care.

Project Strengths and Weaknesses

The literature review provided an overwhelming amount of information for evidence-based interventions, recommendations, and high-quality patient care strategies. The most time-consuming portion of the project involved synthesizing the information for the literature review, as there are many components that contribute to increasing a patient's risk of a HAPI. The data

collection tool was easily created. The tool required a few iterations to define the most salient best practice interventions to be included for the audit; and to rephrase the operationalized best practices due to recent changes in current standards of care in the PCU microsystem.

One of the difficulties encountered was having limited HAPI data from the microsystem and limited access to historical patient charts. The hospital representatives sent the information to an outside company to provide them with HAPI reports and data. Information that is unit based has not been completed by this outside company during the time of this project.

Strengths of this gap analysis were numerous as evidenced by the chart audits and observations. There are several new evidence-based interventions that have recently been put into practice in this MU for the prevention of HAPIs. The identified strengths include staff education for all employees of the PCU regarding HAPI prevention. Online HAPI modules offered through the NDNQI, (2018) are used for this initial education. Formal HAPI education will be updated and included in new employee orientation.

The interventions that were assessed revealed good adherence to several areas including skin assessment (92.7%), risk assessment (100%) and malnutrition screening (92.7%). Areas that demonstrated moderate success included care plan activation (83.3%), Of the 60% of patients who met prophylactic dressing application criteria, 63.6% had a sacral dressing documented. 58% of patients had documentation for head of bed elevation at 30-degrees or less.

Project Sustainability

The project strengths show motivation, determination, and dedication by the staff in order to provide the highest level of evidence-based care through the above-mentioned improvement additions and cost-effective strategies for their at-risk population in the PCU microsystem. The

staff in this PCU microsystem are high functioning, independent, and provide excellent patient care as evidenced by the data collection and observations.

Evaluation of Outcomes

This gap analysis is valuable because it provided insight to the strengths and weaknesses of the current standard of care compared to recommended evidence-based care from the CPGs and the scientific literature. Gaps in care give information that allow the CNL to review for future quality improvement projects. The data reflected a reduction in HAPI during the last three months.

Implications for Practice

This gap analysis provides insight as to the best possible evidence-based interventions for the prevention of HAPI in an acute care setting. The data extracted from chart audits and clinical observations identified gaps in practice when compared with best practice guidelines and the scientific literature. These gaps provide future process improvement opportunities for continually improving outcomes in this PCU microsystem.

Recommendations for Continuing Improvement

Upon completion of the gap analysis, a review of the data identified several areas for continuous improvement opportunities in this PCU MU. Recommendations will follow in the areas of Floating/Suspending Heels, Turning/Repositioning, Head of the Bed elevations, and Prophylactic dressing usage. These interventions will need to be added to the flowsheets in the patient chart in order to document clearly that this specific evidence-based care was provided.

Floating/Suspending Heels (Chart Audits)

The CPGs recommend floating/suspending heels from the surface of the bed at all times (IHI, 2011; NDNQI, 2018; NPUAP et al., 2014). Repositioning to prevent heel pressure injuries

includes elevating and offloading the heels completely in a way that distributes the weight of the leg along the calf without placing pressure on the Achilles tendon. In order to accomplish heel offloading for short-term use and with cooperative individuals, the legs are elevated from the bed surface completely by placing a pillow or foam cushion under the lower legs. The pillows or foam cushions when used for heel elevation should extend the length of the calf to protect the Achilles tendon (High level recommendation; NPUAP et al., 2014). In addition, the knee gatch of the bed should be in a 5° to 10° flexion to prevent hyperextension of the knee. Hyperextension of the knee can cause compression of the popliteal vein leading to deep vein thrombosis (DVT). (Low level recommendation; NPUAP et al., 2014).

Heel suspension devices also elevate and offload the heels completely and distribute the weight of the leg along the calf while protecting the Achilles tendon. Heel suspension devices, such as a foam boot, are recommended for patients who are unlikely to keep their legs on the pillows or will need long-term support (Moderate level recommendation; NPUAP et al., 2014). The suspension devices need to be removed periodically in order to assess the underlying skin integrity (Moderate level recommendation; NPUAP et al., 2014). Emerging therapies also suggest the use of a multi-layer foam heel dressing (i.e. Mepilex prophylactic heel dressings). (NDNQI, 2018; NPUAP et al., 2014).

Current practice revealed that the chart documentation stated knee gatch is elevated by 5-degrees to 10-degrees (100%), but nursing staff also documented “foot of bed elevated.” “Foot of the bed elevated” does not reflect that heels are being suspended or floated off the bed surface. “Foot of bed elevated” terminology must be eliminated from the flowsheet and replaced with clear, and accurate terminology. Out of 55 patients, only 7 (20%) had documentation that stated, “heels elevated.”

Floating/Suspending Heels (Clinical Observations)

Clinical observations of patient care for floating/suspending heels revealed that 100% of the patients had the knee gatch of the bed elevated by 5-degrees to 10-degrees as recommended by the CPGs. Of the 55 patients, 36 were in bed. Of these 36 patients, none (0%) had heels elevated or protected in a foam boot or covered with prophylactic heel foam dressings.

Recommendations for heel protection will need to be determined by the CNL because these interventions involve a cost; however, until determined, heels can be elevated on pillows for short term and with cooperative individuals.

Turning and Repositioning (Chart Audits)

Repositioning is necessary to offload pressure from tissue. A HAPI cannot develop without loading. Therefore, all patients who are at-risk of a HAPI need to be repositioned every two hours or at regular intervals, unless contraindicated, to prevent ischemia and tissue damage from occurring (High level recommendation; IHI, 2011; NDNQI, 2018; NPUAP et al., 2014). Reassessment of the patient's skin and comfort is necessary to evaluate the repositioning schedule to identify early indications of pressure damage and to reevaluate the planned repositioning schedule and/or care plan as necessary. Nursing staff and certified nurse assistants (CNAs) need to clearly document the position the patient is being turned onto (left side, supine, right side, supine) using the 30° side-lying position and this new position is different from the previous position.

The term "repositioned" needs to be eliminated or redefined to identify a boost only. "Repositioned" is unclear and can be inferred to indicate that the patient was repositioned, when in fact, the patient was only "boosted." Therefore, the patient chart should include documentation of timely repositioning (at regular intervals or every two hours) and documentation to include the

position the patient was turned onto (left side, right side, supine), and that the position is different from the previous position, otherwise it is not a valid offloading position change.

If the patient "refused" to be repositioned, document the reason for refusal and notify the bedside nurse for further investigation. Remove the documentation option "self" under repositioning for patients who do not require two hour turning and repositioning, even if the patient is not at-risk and record the actual patient position. This documentation standardizes every two-hour repositioning observations and intervention for HAPI prevention.

In summary, the nurse is to observe and assess patients at regular intervals or every two hours and document the actual position the patient was turned onto and that the position is different from the previous position. These results provide future opportunities for QI projects.

Turning/Repositioning (Clinical Observations)

Of the 36 patients who were in bed, 14 (38%) were observed to lying on the right side or the left side. The remaining 22 patients (61%) were supine.

Head-of-Bed Elevations (Chart Audits)

Limiting the head-of-the-bed elevation to 30-degrees or less is necessary for at-risk patients, when in bed, unless contraindicated by provider order, feeding and or digestive concerns. Elevating the head-of-bed may be medically required in order to enhance breathing and/or prevent aspiration pneumonia. Of the 36 patients who were in bed, 21(58%) had documentation that the head of their bed was ≤ 30-degrees.

Head-of-bed Elevations (Clinical Observations)

Variations in the elevation of the head-of-bed were observed and one patient controlled the elevation of the head-of-bed as the observation was occurring. Of the 36 patients who were in bed, 13 (36%) had the head of the bed at 30-degrees or less. The remaining 64% of patients had

the head-of-bed elevations of that were higher than 30-degrees. Recommendations would include patient education and reinforcement of the necessity for the head-of-bed elevations to remain at 30-degrees or less to reduce the risk of friction/shear injuries.

Prophylactic Dressings

Prophylactic sacral dressings are now being used for at-risk patients in this PCU MU. The data thus far indicates that 63.3% of the patients who met criteria for prophylactic dressing were using them. This percentage is expected to increase as staff nurses become increasingly aware of this intervention. Patients who suffer from frequent episodes of urine/fecal incontinence are given two trials of prophylactic applications before discontinued use due to dressing inadherence and/or frequent soiling to the sacral area. Another recommendation is to remind staff to apply and document prophylactic sacral dressing usage and assess/document skin underlying dressing every 12 hours. Underlying skin assessment needs to be added to patient flowsheet by information technology since there is not a location to document visual assessment. A final recommendation is to document removal of sacral dressing and reason when patient fails two trials of preventative dressing usage.

The MFI and the PDSA cycles will continually be utilized for future actions based on these gap analysis findings. The PDSA cycle can be used an unlimited number of times in order to improve patient care and improve outcomes in order to sustain a zero percent of HAPI in this microsystem. Success with the PDSA cycles will lead to hospital wide usage by standardizing high quality care that will improve outcomes, quality of life, quality of care, and be cost efficient.

In summary, the gap analysis conducted for this project indicated that staff are adhering to best practices in the areas of risk and skin assessment and malnutrition screening. However, several areas should be targeted for ongoing improvement. These include improvement efforts

with floating/suspending heels and offloading patients every two hours. In addition, the CNL can identify two-unit based RNs to act as skin care champions serving as a resource for staff education and reinforcement of HAPI prevention protocols that have been developed and implemented by the skin care team (Carson, 2013).

The CNL must also advocate for creating a full-time position for a Wound, Ostomy, and Continence (WOC) nurse as well as advocating for the addition of a Wound team nurse practitioner (NP) to cover at-risk patients who are admitted over the weekend to prevent a lapse in patient assessment, evaluation, and treatment. Without NP weekend coverage, patients admitted on a Friday may not be seen until Monday. All of these interventions can lead to improved outcomes for the reduction and prevention of HAPIs in the microsystem (Carson, 2013).

Reflection of MSN Essentials Enactment with this Project

The American Association of Colleges of Nursing (AACN) *Essentials of Master's Education in Nursing* (2013) provides clinical competencies to aid with achieving the CNL role during the clinical immersion. All of the Essentials provided opportunities to enact in this gap analysis. Essential III allowed for performing a comprehensive microsystem assessment which was valuable in determining the QI project to complete. Essential III was achieved through conducting a comprehensive literature review which synthesized pertinent evidence-based data from the CPGs and the scientific literature. Using the tools helped to conduct data collection and analysis.

Essential V was utilized when participating with information technology to access appropriate data to aid with documenting evidence for HAPI prevention nursing practice. This interdisciplinary collaboration for HAPI required more than one meeting with many stakeholders

in order to integrate the correct patient information to be implemented in the patient electronic record. Working with the information technology representatives will be ongoing as patient care changes and flowsheets require updating.

Essential II was utilized in this project through improving leadership skills. Assisting staff with providing HAPI preventive care at the bedside provided opportunities to reinforce to patients and family members the need for turning, repositioning, increasing mobility/activity, and moisture control. Attending daily rounds assisted the CNL to be knowledgeable of the patient's story and to identify risks, barriers to discharge, and the plan of care in order to speak to patients at the bedside or collaborate with providers regarding patients care. This Essential also was utilized when doing a cost benefit analysis for the use of prophylactic dressings in the prevention of HAPIs. Overall, many of the MSN Essentials were used, some in part, and others on a more regular basis in order to obtain the knowledge that these competencies intended to expose CNL students to during their clinical immersion experience.

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Appendix A

BRADEN SCALE – For Predicting Pressure Sore Risk

SEVERE RISK: Total score ≤ 9 **HIGH RISK**: Total score 10-12
MODERATE RISK: Total score 13-14 **MILD RISK**: Total score 15-18

RISK FACTOR	SCORE/DESCRIPTION				DATE OF ASSESS ➡ 1	2	3	4
SENSORY PERCEPTION Ability to respond meaningfully to pressure-related discomfort	**1. COMPLETELY LIMITED** – 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 surface.	**2. VERY LIMITED** – Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness, **OR** has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body.	**3. SLIGHTLY LIMITED** – Responds to verbal commands but cannot always communicate discomfort or need to be turned, **OR** has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	4. **NO IMPAIRMENT** – Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.				
MOISTURE Degree to which skin is exposed to moisture	1. **CONSTANTLY MOIST**– Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	2. **OFTEN MOIST** – Skin is often but not always moist. Linen must be changed at least once a shift.	3. **OCCASIONALLY MOIST** – Skin is occasionally moist, requiring an extra linen change approximately once a day.	4. **RARELY MOIST** – Skin is usually dry; linen only requires changing at routine intervals.				
ACTIVITY Degree of physical activity	1. **BEDFAST** – Confined to bed.	2. **CHAIRFAST** – Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	3. **WALKS OCCASIONALLY** – Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	4. **WALKS FREQUENTLY**– Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.				
MOBILITY Ability to change and control body position	1. **COMPLETELY IMMOBILE** – Does not make even slight changes in body or extremity position without assistance.	2. **VERY LIMITED** – Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	3. **SLIGHTLY LIMITED** – Makes frequent though slight changes in body or extremity position independently.	4. **NO LIMITATIONS** – Makes major and frequent changes in position without assistance.				
NUTRITION Usual food intake pattern [1]NPO: Nothing by mouth. [2]IV: Intravenously. [3]TPN: Total parenteral nutrition.	**1. VERY POOR** – Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein [meat or dairy products] per day. Takes fluids poorly. Does not take a liquid dietary supplement; **OR** is NPO[1] and/or maintained on clear liquids or IV[2] for more than 5 days.	**2. PROBABLY INADEQUATE** – 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.	**3. ADEQUATE** – Eats over half of most meals. Eats a total of 4 servings of protein [meat, dairy products] each day. Occasionally refuses a meal, but will usually take a supplement if offered, **OR** is on a tube feeding or TPN[3] regimen, which probably meets most of nutritional needs.	4. **EXCELLENT** – 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.				
FRICTION AND SHEAR	1. **PROBLEM**- 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.	2. **POTENTIAL PROBLEM**– 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.	3. **NO APPARENT PROBLEM** – 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 at all times.					
TOTAL SCORE	**Total score of 12 or less represents HIGH RISK**							

ASSESS	DATE	EVALUATOR SIGNATURE/TITLE	ASSESS.	DATE	EVALUATOR SIGNATURE/TITLE
1	/ /		3	/ /	
2	/ /		4	/ /	

NAME-Last	First	Middle	Attending Physician	Record No.	Room/Bed

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Use the form only for the approved purpose. Any use of the form in publications (other than internal policy manuals and training material) or for profit-making ventures requires additional permission and/or negotiation.

Appendix B

Date: April 16, 2018

To: Mary Lou Hall, BSN, RN – Graduate Student – Grand Valley State University

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

RE: Permission to use the Skin Assessment Tool*

As holders of the official copyright for the Skin Assessment Tool, we hereby grant permission for the use of the tool in your paper on hospital acquired pressure injuries.

*It is understood that the tool must be printed as it appears on the Braden Scale website (www.bradenscale.com) in relation to title, wording and scoring of each subscale, and the acknowledgement, "Copyright, Barbara Braden and Nancy Bergstrom, 1988. Reprinted with permission. All rights reserved."

**Permission is granted for this purpose only. Additional permission is required for other uses. We are in the process of a business transition. As such, any additional permissions might be considered and granted by a new owner.

Appendix C

Author	Purpose	Method	Sample	Measure	Findings
Defloor, T., Bacquer, D. D., & Grypdonck, M. H. F. (2005).	To investigate the effect of four different preventative regimes involving turning (2,3 hourly) or the use of a pressure-reducing mattress in combination with less frequent turning (4, 6 hourly)	Over 28 days, four different turning schemes used: • turning every 2 hours on a SI mattress • turning every 3 h on a SI mattress • turning every 4 hours on a VE mattress turning every 6 hours on a VE mattress	838 geriatric nursing home patients	Repositioning schedules for the prevention of HAPIs	The incidence of nonblanchable erythema was not different between the groups. The incidence of stage 2 and higher-pressure injuries in the 4-hour group was 3%, compared with the incidence figures in other groups varying between 14.3% and 24.1% Turning every 4 hours on a VE mattress resulted in a significant reduction in the number of pressure injury lesions and makes turning a feasible prevention method in terms of effort and cost. (Stages 2-4)
Gillespie et al., (2014).	To assess effects of repositioning on HAPI Determine most effective repositioning schedules for HAPIs	Systematic review (Cochrane review)	4 studies • 3 RCT • 1 Economic study 502 randomized patients from acute and LTC	Repositioning for HAPI reduction	No differences between 4-hourly repositioning and 6-hourly repositioning on viscoelastic foam. (Low quality evidence) Need for further research to measure the effects of repositioning on pressure ulcer development to find the best repositioning regimen in terms of frequency and position. Important to note that due to lack of evidence to show that repositioning is

CI = confidence interval; HAPI = hospital acquired pressure injury; ICU = intensive care unit; LOS = length of stay; LTC = long-term care; NH = nursing home; PCU progressive care unit; RCT = randomized controlled trial; SR = systematic review; SI = standard institutional; VE = viscoelastic foam

Author	Purpose	Method	Sample	Measure	Findings
					effective or which repositioning regimen is the best does not mean that repositioning is ineffective.
Moore, Z., & Cowman, S. (2014)	To determine if HAPI risk assessment tools reduces the incidence of PIs	SR	2 studies	Braden risk assessment tool	No statistical difference in 3 groups
Bergstrom et al., (2013)	To determine optimal repositioning frequency of NH residents at-risk for HAPIs when cared for on high-density foam mattresses	RCT	27 NHs • 20 NHs in the US • 7 NHs in Canada 942 participants aged 65 or greater without PIs	HAPI incidence with turning at different intervals	No difference in HAPI incidence over 3-week observation between those turned at 2-, 3-, or 4-hour intervals in NH residents using a high-density foam mattress who are at high risk for PI development when they were positioned consistently, and skin was monitored.
Moore, et al., (2011)	To compare the incidence of PI among older persons using two different repositioning regimens	RCT (multi-centre, prospective, cluster-randomised controlled trial)	213 participants Control group (n= 114) received standard care (six-hour repositioning, using 90° lateral rotation	Two different repositioning regimens. • Repositioning every 3 hours 30° tilt • Repositioning q 6 hours using 90° lateral rotation	Repositioning older adults at-risk of PI every three hours at night, using the 30° tilt, reduces the incidence of PI compared with usual care.

CI = confidence interval; HAPI = hospital acquired pressure injury; ICU = intensive care unit; LOS = length of stay; LTC = long-term care; NH = nursing home; PCU progressive care unit; RCT = randomized controlled trial; SR = systematic review; SI = standard institutional; VE = viscoelastic foam

Author	Purpose	Method	Sample	Measure	Findings
Lahmann, N., and Kottner, J. (2011)	To explore the empirical relationships between friction forces and Stage 2 HAPIs and between pressure forces and Stage 3 and 4 PIs.	Controlling for age, subscales were entered Chi-square Automatic Interaction Detection (CHAID) to determine which sub scales were predictive of superficial PIs and which were predictive of full-thickness ulcers (Stage 3 and 4)	Setting: 161 hospitals of all specialties and categories throughout Germany Subjects: 28,299 Adult hospital patients. Average age: 65.4	"Friction and Shear" problems according to the Braden scale. 5.4% (95% CI 5.1-5.6) were "Completely immobile" Prevalence of categories 3 and 4 was 1.9%	Friction and Shear were the strongest predictor of Stage 2 PI Mobility subscale score of 1 (completely immobile) was the strongest predictor of Stage 3 and 4 PIs. There is a strong relationship between frictional forces and superficial skin lesions and between pressure and deeper Stages 3 and 4 PIs.
Tescher, A., Branda, M., Byrne, T., & Naessens, J. (2012)	To improve identification of risk factors for PI development and enhance targeted interventions and prevention strategies. Exclusion criteria: Patients with LOS less than 24 hours	Retrospective Cohort Analysis of electronic medical record data from Jan 1, 2007 to December 31, 2007	Sample/Setting: 12,566 adult patients in ICU or PCU within Mayo Clinic with Braden score of 18 or less 416 (3.3%) patients developed a HAPI stage 2-4 were studied	The Braden Scale score total by itself was found to be highly predictive of pressure ulcer development ($P \leq .0001$, $C = 0.71$), as were all individual sub scores.	Friction and shear subscale had greatest predictive power. Patients scoring 1 on both activity and moisture had a 57% increase in risk (as compared to patients with a score of 1 on only one of those sub scores). Patient who scored the lowest on both mobility and sensory perception sub scores had a 67% increase in risk as compare to those with 1 on mobility

CI = confidence interval; HAPI = hospital acquired pressure injury; ICU = intensive care unit; LOS = length of stay; LTC = long-term care; NH = nursing home; PCU progressive care unit; RCT = randomized controlled trial; SR = systematic review; SI = standard institutional; VE = viscoelastic foam

Author	Purpose	Method	Sample	Measure	Findings
					but a higher sensory perception sub score. The total Braden Scale score is predictive of HAPI development but does not assist staff to develop an individualized targeted prevention plan. In contrast, the use of subscale scores can enhance prevention programs and resource utilization by focusing care on the risk factors specific to the individual patient.
Clark et al., (2014)	Effects of prophylactic dressings for prevention of HAPI Searched 4 databases from inception to 2013	SR 3 RCT	21 studies in primary and secondary care	Prophylactic dressings for HAPI prevention	Sacral prophylactic pressure dressings significantly reduced HAPI in primary and secondary care. Prophylactic pressure dressings are reasonable to implement; evaluate cost to help decide Risk/Benefit: Benefits outweigh risks.
Santamaria et al., (2015a).	Effect of multi-layered soft silicone prophylactic dressing in prevention of sacral/heel HAPI Patients with pre-existing sacral or	RCT	440 patients in a large teaching hospital in Australia. ICU: 24 beds	Prophylactic dressings for HAPI prevention	Multi-layer soft silicone foam dressings are effective in preventing HAPI in critically ill pts. when applied in the ED prior to ICU admission. Marginal cost to hospital can save more than a quarter of a million dollars in treatment, annually.

CI = confidence interval; HAPI = hospital acquired pressure injury; ICU = intensive care unit; LOS = length of stay; LTC = long-term care; NH = nursing home; PCU progressive care unit; RCT = randomized controlled trial; SR = systematic review; SI = standard institutional; VE = viscoelastic foam

Author	Purpose	Method	Sample	Measure	Findings
	heel pressure ulcers/trauma were excluded. Patients with suspected or actual spinal injury excluded.				Prophylactic pressure dressings are reasonable to implement Cost efficient in prevention of PIs Risk/Benefit: Benefits outweigh risks.
Santamaria et al., (2015b)	Evaluate the cost-benefit of using prophylactic pressure dressings in HAPI prevention.	RCT	440 patients in a large teaching hospital in Australia. ICU: 24 beds	Cost of Prophylactic dressings for HAPI Average net cost of intervention was lower than that of the control group (AU $70.82 versus AU $144.56)	The application of prophylactic dressings resulted in a 10% reduction in the incidence rate of sacral and heel PIs in the intervention group Evidence for the cost-benefit of applying Mepilex Border Sacrum and Mepilex heel dressing to critically ill pts. in ED prior to ICU admission. A 10% HAPI reduction with the use of prophylactic dressings in the ICU could render an annual cost saving anywhere from $172,880 to $293,800 for the hospital, depending on the stage and the location of PIs. Intervention costs of dressings and time for application is offset by huge treatment savings accruing through the reduction of HAPIs in and ICU.

CI = confidence interval; HAPI = hospital acquired pressure injury; ICU = intensive care unit; LOS = length of stay; LTC = long-term care; NH = nursing home; PCU progressive care unit; RCT = randomized controlled trial; SR = systematic review; SI = standard institutional; VE = viscoelastic foam

Author	Purpose	Method	Sample	Measure	Findings
Dickinson, S., Tschannen, D., & Shever, L. L. (2013)	Purpose: To determine whether the implementation of an early, standardized process for mobility could reduce or eliminate HAPIs	Retrospective review from January 2008 to August 2009	1,348 patients admitted to the Surgical Intensive Care Unit at the University of Michigan Hospital	Early Mobility Protocol	Despite the implementation of the Early Mobility Protocol, there was not an improvement in the HAPI rate overall or with time as protocol compliance improved. Three months after interventions implemented, there is significant increase in HAPIs (6.1% versus 5.4%, $p = 0.009$). Reported increased length of stay: • in the surgical intensive care unit ($p < 0.001$) and • in the hospital ($p = 0.002$). Research authors reported that increase in HAPIs may be associated with an increase in patient acuity

CI = confidence interval; HAPI = hospital acquired pressure injury; ICU = intensive care unit; LOS = length of stay; LTC = long-term care; NH = nursing home; PCU progressive care unit; RCT = randomized controlled trial; SR = systematic review; SI = standard institutional; VE = viscoelastic foam

Appendix D

Variable	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, and PPPIA, 2014
Skin and Risk Assessment	1. Head-to-toe SA on admission, transfer to another level of care, transferred, discharged 2. Attention to: bony prominences, ears, skin folds, back of patient's head, under equipment, remove equipment • Temperature • Turgor • Color • Moisture level • Skin integrity 3. Standardized location in EMR to include 5 parameters 4. Diagram of body outline for staff to note skin changes 5. Consider keeping a unit log 6. Report results in shift reports 7. Report to patient provider 8. Educate staff: • NAs inspect skin with position	1. Skin Assessment 2. Risk Assessment • Within 4 hours of admission and daily <u>Risk Assessment:</u> • Braden Scale OR • Norton Scale done daily • Skin inspection daily • Documentation tools to prompt skin inspection • Hourly rounding • Educate all staff to inspect skin at every opportunity • Alerts on patient doors and chart for at-risk • Post pride in progress: post "Days since Last Pressure Injury data	1.Head-to-toe SA 2. Risk Assessment • Within 24 hours of admission to comply with Joint Commission regulations. • At least daily, preferably every shift <u>Risk Assessment:</u> • Braden Scale OR • Norton Scale Identify at-risk • Poor skin status • Decreased perfusion and oxygenation • Increased body temperature, advanced age, poor general health status • Document in EMR • Validate with observation of bedside practice 1. Education of healthcare professionals	1. Risk Assessment • Maximum 8 hours of admission • Repeat based on patient acuity • With change of patient condition 2. Comprehensive Skin Assessment • Document • Develop plan of care based on at-risk areas, and other risk factors • Explain plan of care with patient • Use structured approach to risk assessment using clinical nursing judgement, and relevant risk factors • Assessment of activity/mobility and skin status Consider bedfast/ chairfast patients to be at-risk Consider the impact of limited mobility on HAPI risk Consider impact of: • Perfusion/oxygenation • Poor nutritional status • Increased moisture Consider impact of: • Increase body temperature • Advanced age • Sensory perception • Hematologic measures and • General health status

EMR = electronic health record; HOB = head of bed; MNA = Mini Nutritional Assessment; MUST = The Malnutrition Universal Screening Tool; NA = nurse aide; RA = risk assessment; RN = registered nurse; SA = skin assessment; X = times

Variable	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, and PPPIA, 2014
	changes, during hygiene • RNs conduct comprehensive SAs and document results • Use SA and BSS to plan care Risk Assessment: • Validated RA tool • Braden OR Norton Scale • Care Plan based on subscale scores • Implement a system link from care plan to assessment • Skin champions • Wound care team • Multidisciplinary communication • Support surfaces • Prophylactic dressings		2. For at-risk patients: • Daily SA • Support surface • Routine repositioning • Nutritional support • Moisture management	<u>Risk Assessment tools:</u> • Braden Scale, Norton Score OR Waterlow Score • Clinical nursing judgement Skin Assessment: • Within 8 hours of admission • As part of every assessment • Ongoing based on clinical setting and patient condition • Increase frequency if condition deteriorates • Document findings Inspect skin for erythema and AVOID positioning patients on areas of erythema as possible Differentiate between: • Blanchable and • Nonblanchable Include the following factors in every SA including darkly pigmented skin: • Skin temperature • Edema and • Change in tissue consistency in relation to surrounding tissue • Local pain • Inspect skin under and around medical devices at least 2X daily

EMR = electronic health record; HOB = head of bed; MNA = Mini Nutritional Assessment; MUST = The Malnutrition Universal Screening Tool; NA = nurse aide; RA = risk assessment; RN = registered nurse; SA = skin assessment; X = times

Variable	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, and PPPIA, 2014
Support Surface	Pressure redistributing support surfaces provided for all patients Obtain support surfaces promptly for at-risk patients Address barriers to obtaining support surfaces Support surfaces for chair	Implement prevention strategies such as repositioning and placing patients on support surfaces for patients identified at-risk	• Select support surface determined by level of immobility, need for shear reduction, microclimate management, comfort, size and weight risk, HAPI risk, and presence of existing pressure injury • Continue to turn patients at-risk regardless of support surface used • Routinely check the support system is working properly • Suspend/ "float" heels off bed surface • Consider use of multi-layer silicone bordered foam dressing to heels to minimize shear to at-risk • Place obese patients on bariatric bed upon admission • Use appropriate devices to offload	Select a support surface based on: • Level of immobility/inactivity • Need for microclimate control/shear reduction • Size and weight of patient • Risk for HAPI • Existing pressure injury • Asses function of support surface with each patient encounter • Continue to reposition patients on support surfaces • Choose positioning devices and incontinence pads, clothing and linen that are compatible with support surface • Use high specification reactive foam mattress • Use an active support surface (overlay or mattress) for patients at higher risk of pressure development when frequent repositioning is not possible • Do NOT use small cell alternating pressure air mattresses or overlays <u>Seating support surfaces:</u> • Use a pressure redistributing seat cushion for patients sitting in a chair with reduced mobility

EMR = electronic health record; HOB = head of bed; MNA = Mini Nutritional Assessment; MUST = The Malnutrition Universal Screening Tool; NA = nurse aide; RA = risk assessment; RN = registered nurse; SA = skin assessment; X = times

Variable	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, and PPPIA, 2014
			pressure from skin folds • Supply bariatric size walkers, commodes, and a trapeze over the bed to assist with mobility • Document use of support surface, floating heels and if support surface was contraindicated • Educate patient/family on support surface need. If patient refuses support surface educate risk for HAPI	
Nutrition and Hydration	• Assess nutritional status of patient using risk assessment tool (Braden Scale) • Nutrition assessment completed within 24 hours of risk identification (CPG does not identify a specific tool for evaluation) • Nutrition assessment includes admission	Review of nutritional factors and hydration assessment • Unintended weight loss • Fluid imbalance • Edema • Reduced blood flow <u>Interventions:</u> • Assist patients with meals, snacks, and hydration	<u>Nutrition:</u> • Recommended nutritional intake is 30-35 kilocalories/kilogram of body weight/day • 1.25 to 1.5 grams of protein/kilogram of body weight/day • Assess renal function to ensure protein	Screen nutritional status for patients at-risk • On admission • With change in condition • Use a valid/reliable tool • The MNA tool • The MUST tool Refer patients at-risk of malnutrition to a dietician for further assessment <u>Interventions:</u> • Assess weight status • Assess ability to eat independently

EMR = electronic health record; HOB = head of bed; MNA = Mini Nutritional Assessment; MUST = The Malnutrition Universal Screening Tool; NA = nurse aide; RA = risk assessment; RN = registered nurse; SA = skin assessment; X = times

Variable	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, and PPPIA, 2014

	weight and weekly that are documented
	• Special diet ordered by provider within 24 hours of risk identification
	<u>Dietician:</u>
	• Make specific recommendations regarding diet/supplements
	
	<u>Patient care plan:</u>
	• Nutritional supplements
	• Feeding assistance
	• Adequate fluid intake
	• Dietitian consult as needed
		• Document nutritional intake
		• Alert dietician for inadequate intake
		• Offer water when patients are turned
		• Educate HAPI prevention with adequate nutrition and fluid intake
			intake appropriate
			• Vitamins/minerals as needed
			• Provide dietary supplements between meals
			• Assist with meals
			• Encourage family assistance with feeding
			• Consider enteral nutrition/parenteral nutrition of oral intake insufficient
			
			<u>Hydration:</u>
			• 1 ml of fluid per kcal/day
			
			Document:
			• Diet ordered
			• Percent of food consumed
			• For enteral nutrition; document amount compared to goal
			• For parental nutrition, document intake infused compared to goal
				• Assess total nutrient intake
				  • Food, fluid, oral supplements and enteral/parental feeds
				• Develop nutrition care plan
				• Follow evidence-based guidelines on nutrition/hydration for at-risk patients
				• Provide 30-35 kilocalories/kilogram of body weight for patients at-risk
				• Adjust energy intake based on weight change or level of obesity
				• Offer nutritional supplements in between meals
				• Consider enteral/parental nutrition when oral intake is insufficient
				• Offer 1025 to 1.5 grams protein/kg of body weight daily for at-risk adults
				• Offer high calorie, high protein nutritional supplements in addition to usual diet
				• Assess renal function to ensure protein intake is appropriate for patient.
				
				<u>Hydration:</u>
				• Provide/encourage adequate fluid intake
				• Monitor for signs/symptoms of dehydration:
				  • Weight change
				  • Skin turgor
				  • Urine output
				  • Elevated serum sodium
				  • Serum osmolality

EMR = electronic health record; HOB = head of bed; MNA = Mini Nutritional Assessment; MUST = The Malnutrition Universal Screening Tool; NA = nurse aide; RA = risk assessment; RN = registered nurse; SA = skin assessment; X = times

Variable	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, and PPPIA, 2014
			• Educate patient and family on importance of nutrition • Document noncompliance with nutrition plan.	• Provide increase fluids for dehydration, elevated temperature, vomiting, profuse sweating, diarrhea, or exuding wounds <u>Vitamins/Minerals</u> • Encourage a balanced diet • Encourage vitamin/mineral supplement **Note:** "Serum albumin and prealbumin are generally not considered reliable indicators of nutritional status; they appear to reflect severity of inflammatory response rather than nutritional status. Inflammation can increase the risk of malnutrition by increasing metabolism" (p. 79).
Reposition and Mobility	Frequent small repositioning shifts, patients shifting weight a little amount each time entering a patient room (15-20 degrees) Refer to (other) guidelines for repositioning (specific guidelines not identified) Mobility (Refer to Braden scale)	• Minimize pressure by repositioning • Reposition/turn patients every two hours, support with pillows and/or blankets • Use pillows under the calf to elevate heels off the bed surface • Use cushioning devices between the legs/ankles to maintain alignment and reduce pressure on bony prominences	• Frequency influenced by patient and the support surface being used • Turn immobile patients every 2 hours while in bed • Tailor frequency based on: •Tissue tolerance •Level of activity/mobility •Medical condition •Treatment goals •Skin condition/comfort	• Reposition all individuals at-risk unless contra-indicated • Consider the support surface in use when determining the frequency of repositioning • Determine repositioning frequency considering: • Tissue tolerance • Level of activity/mobility • General medical condition • Treatment objectives • Skin condition • Comfort • Teach patients to do 'pressure relief lifts' as appropriate

EMR = electronic health record; HOB = head of bed; MNA = Mini Nutritional Assessment; MUST = The Malnutrition Universal Screening Tool; NA = nurse aide; RA = risk assessment; RN = registered nurse; SA = skin assessment; X = times

Variable	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, and PPPIA, 2014

		• Use lift devices or "drawsheets" to move, rather than drag patients when transferring and repositioning patients	• Patients at-risk may need to be repositioned more frequent than every 2 hours
			• Support surface may reduce the frequency of turning/repositioning
			• Reposition patient regardless of support surface used
			• Evaluate tissue tolerance to turn schedule
			• Avoid turning onto reddened skin
			• Use slow gradual turns
			• Document time and position adopted
			• Position patients in a 30° side-lying position using pillows to support bony prominences
			• Consider smaller frequent shifts if patient unable to tolerate 30° side-lying position
				• Assess skin condition/comfort frequently and adjust repositioning schedule if patient not responding as expected to current regime
				
				<u>Repositioning technique:</u>
				• Reposition for relief or redistribution of pressure
				• Avoid positioning on bony prominences with existing nonblanchable erythema
				• Avoid pressure and shear forces
				  • Lift don't drag when repositioning
				  • Use mechanical lift when needed
				  • Avoid positioning on medical devices such as tubes, drainage systems, or foreign objects
				  • Do not leave the patient on the bedpan longer than necessary
				• Use the 30° tilt side-lying position (alternately, right side, back, left side, back)
				• Avoid the 90° side-lying position as it will increase pressure
				• Limit the HOB to 30° for bedbound patients
				• If sitting in bed, avoid HOB elevation the will increase pressure and shear on the sacrum and coccyx
				• <u>Seated patients:</u>
				  • Limit the time in a chair without pressure relief
				  • Position patient that allows full range of activities

EMR = electronic health record; HOB = head of bed; MNA = Mini Nutritional Assessment; MUST = The Malnutrition Universal Screening Tool; NA = nurse aide; RA = risk assessment; RN = registered nurse; SA = skin assessment; X = times

Variable	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, and PPPIA, 2014

			• Avoid HOB greater than 30 degrees to reduce shear/friction unless medically advised
			
			Chairfast patients:
			• Reposition every hour by caregiver
			• Encourage small shifts of weight every 15 minutes for 2 minutes
			• Use a pressure redistributing chair cushion
			• Ensure feet supported on floor or foot rest
			Both bedfast/chairfast:
			• Use draw sheets and mechanical lifts with turns and transfers
			• Avoid positioning on a medical device
			• Do not position on existing injury
			• Consider protective dressing on sacral or bony prominence to minimize shear
				• Select a seated posture that minimizes pressures and shear
				• Provide seat tilt to prevent sliding forward and adjust footrests and armrest to maintain posture and pressure redistribution
				• Ensure that feet are supported on the floor, or footrest
				• Do not use ring or donut-shaped devices (The edges create areas of high pressure that can damage tissue. Constriction at the edge may also impair circulation and create edema)
				• Avoid the following for heel elevation:
				  • Synthetic sheepskin pads
				  • Cutout ring, or donut-type devices
				  • Intravenous fluid bags and
				  • Water-filled gloves
				• Natural sheepskin may aid in HAPI prevention
				
				<u>Mobilization:</u>
				• Develop a plan for progressive sitting according to patient tolerance
				• Increase activity as rapid as tolerated (Passive range of motion, dangling limbs over side of bed, sitting out of bed, standing and walking)
				• Document frequency, position, and patient tolerance in the EMR

EMR = electronic health record; HOB = head of bed; MNA = Mini Nutritional Assessment; MUST = The Malnutrition Universal Screening Tool; NA = nurse aide; RA = risk assessment; RN = registered nurse; SA = skin assessment; X = times

Variable	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, and PPPIA, 2014
			• Increase activity as rapidly as tolerated • Document frequency/position of repositioning • Document patient refusal • Educate patient/family on importance of complying with plan	

Moisture Management	• Use moisture barrier ointments
	• Moisturize dry skin
	• Use mild soap and soft cloths or packaged cleanser wipes
	• Check incontinence pads frequently
	• Avoid diapers if possible
		• Keep patient dry and moisturize skin
		• Minimize skin exposure to incontinence, perspiration, and/or wound drainage
		• Use absorbent under pads to wick moisture away from skin
		• Limit use of disposable briefs (avoid if possible)
		• Use premoistened, disposable barrier wipes to cleanse, moisturize, deodorize/protect patient from
			Sources: Incontinence, wound drainage, perspiration
			Strategies to reduce skin moisture:
			• Cleanse after incontinent
			• Use absorbent under-pads that wick moisture away from skin
			• Use incontinence briefs only if needed
			• Consider a fecal containment device
			• Bariatric patients need moisture wicking material between skin folds
			• Consider support surface that manages
				Avoid positioning patients on areas of erythema whenever possible
				• Keep skin clean/dry
				• Use pH balanced skin cleanser
				• Do NOT massage or vigorously rub skin that is at-risk for HAPI
				• Develop/implement an individualized continence plan
				  • Clean skin as soon as possible after an episode of incontinence
				  • Use a barrier product
				  • Consider a skin moisturizer to hydrate dry skin
				  • Do NOT use dimethyl sulfoxide (DMSO) cream for HAPI prevention

EMR = electronic health record; HOB = head of bed; MNA = Mini Nutritional Assessment; MUST = The Malnutrition Universal Screening Tool; NA = nurse aide; RA = risk assessment; RN = registered nurse; SA = skin assessment; X = times

Variable	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, and PPPIA, 2014
		dermatitis due to incontinence • Use barrier cream • Store incontinent supplies at bedside	humidity/heat between bed and skin • Turn patients routinely • Apply moisture barrier to skin exposed to incontinence and draining wounds • Use cleansing wipes for hygiene and after incontinent • Moisturize dry skin • Document interventions • Document patient noncompliance • Educate patient and family on care and risk for HAPI with noncompliance	
Prophylactic Dressings	• Transparent dressings (e.g., Tegadern, Opsite) and hydrocolloid dressings (e.g., DuoDerm, Restore) do not protect against effects of friction	Not addressed	Consider dressings to heels	• Consider applying a polyurethane foam dressing to bony prominences (sacrum, heels) frequently at-risk of friction and shear • When selecting a prophylactic dressing consider: • Ability to manage microclimate • Ease of application/removal • Ability to assess skin

EMR = electronic health record; HOB = head of bed; MNA = Mini Nutritional Assessment; MUST = The Malnutrition Universal Screening Tool; NA = nurse aide; RA = risk assessment; RN = registered nurse; SA = skin assessment; X = times

Variable	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, and PPPIA, 2014
				• Anatomical location for dressing • Correct dressing size • Continue to carry out all prevention measures when using dressings • Assess skin for HAPI during each dressing change or at least daily • Replace dressing when damages, displaced, loose, or moist

EMR = electronic health record; HOB = head of bed; MNA = Mini Nutritional Assessment; MUST = The Malnutrition Universal Screening Tool; NA = nurse aide; RA = risk assessment; RN = registered nurse; SA = skin assessment; X = times

Appendix E

The Model for Improvement

AIM: What are we trying to accomplish?

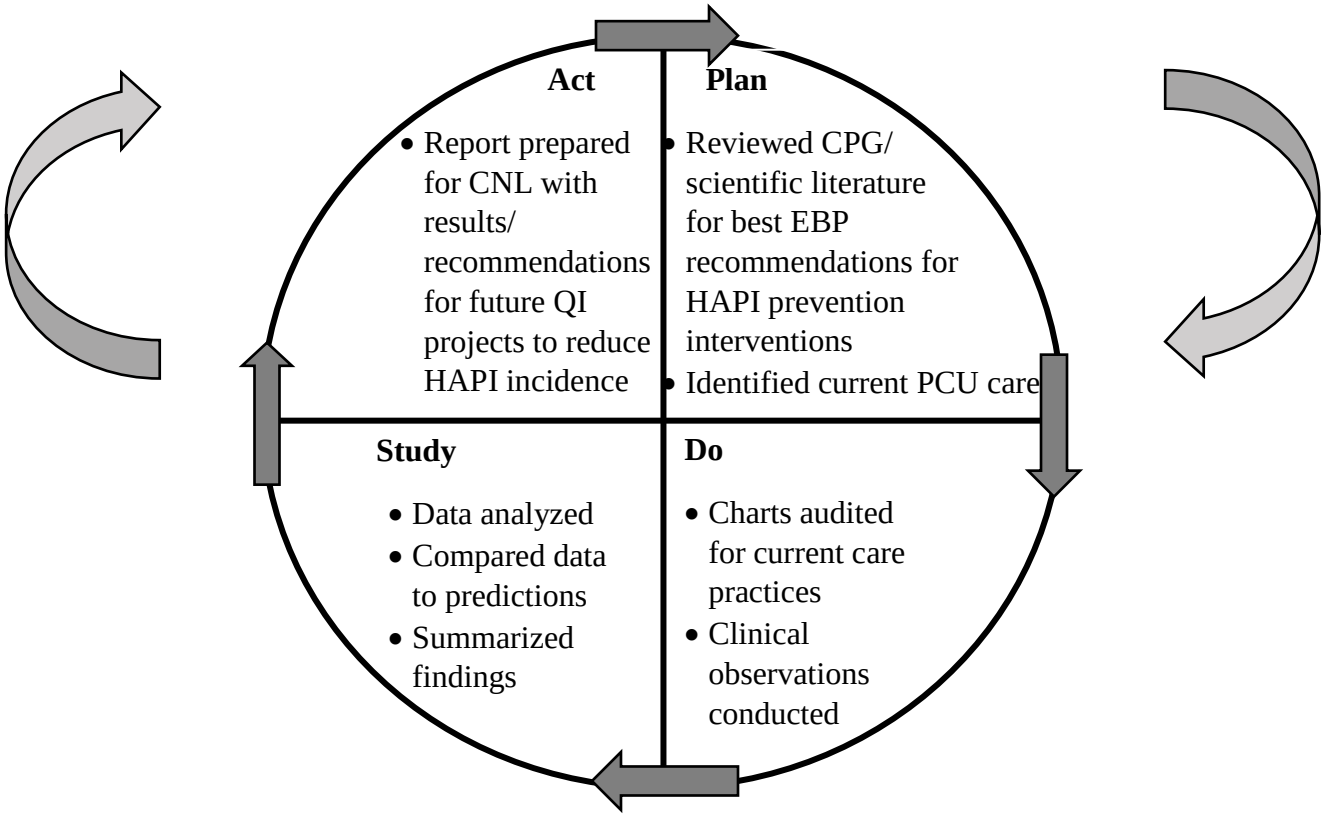
The aim of this HAPI prevention gap analysis was to reduce the incidence of HAPIs in adult patients in the PCU MU by 100% by July 31, 2018 and identify the best possible HAPI preventative care.

MEASURES: How will we know a change is an improvement**?**

- Patient charts were audited to measure current care practice in the microsystem and compared to best practice recommendations from the four CPGs to determine if the standards were met.
- Direct observations of HAPI preventative care were conducted on these same patients on the day that their charts were audited.

IDENTIFY THE CHANGE: What changes can we make that will result in improvement?

- The data from the HAPI audits and clinical observations were analyzed and evaluated.
- A report of the findings was provided to the QI team.
- The results identified opportunities for future quality improvement projects.



Langley, G. J., & Ebooks Corporation. (2009). *The improvement guide: A practical approach to enhancing organizational performance* (2nd ed., p. 24). San Francisco: Jossey-Bass

Appendix F

Clinical Practice Guideline Comparison Chart

Intervention	AHRQ, 2014	IHI, 2011	NDNQI, 2018	NPUAP, EPUAP, & PPPIA, 2014
Skin Assessment on admission	X		X	X
Risk Assessment on admission and every 12h	X	X	X	X
Nutrition Assessment on admission				X
Care Plan	X	X	X	X
Offloading every 2 h		X	X	X
Suspend/Offload Heels		X	X	X
HOB ≤ 30-degrees	X	X	X	X
Prophylactic Dressings			X	X

Appendix G

Variables and Operationalized Definitions

Variable	Operationalized Definitions for Clinical Observations
Offloading	Patient is observed to be in a 30-degree side-lying position with pillows between legs. Yes/No
Suspend/ Offload Heels	Heels are observed to be suspended/floated off bed surface at all times using pillows, prophylactic dressings or suspension boots. Yes/No
HOB (Head of bed)	HOB is observed to be ≤ 30-degrees for patients with Braden Scale subscale scores of ≤ 3 for Sensory, Activity, and/or Mobility. Yes/No

Variable	Operationalized Definitions for Chart Audits
LOS (Length of Stay)	Number of days patient is in hospital, not just in PCU.
Skin Assessment	Comprehensive head-to-toe, conducted/documented by 2 RNs within 8 h of admission. Yes/No
Risk Assessment	Braden Scale for Pressure Sore Risk includes: Total calculated score range between 6 and 23; Subscale scores ranges between 1 and 4, completed on admission and every 12 hours. Yes or No
Nutrition Assessment	Malnutrition Universal Screening Tool; Total score calculated/ documented on admission; Yes or No
Care Plan	"Potential for Compromised Skin Integrity" care plan activated when Braden Scale subscale scores are ≤ 3 in Sensory, Activity, and/or Mobility; Yes or No
Offloading	Documented position change using the 30-degree side-lying position, every 2 hours when patient is in bed when Braden Scale subscale scores are ≤ 3 in Sensory, Activity, and/or Mobility; Yes or No
Suspend/Float Heels	Documented heels elevated off the bed using pillows, Mepilex prophylactic heel dressings, or Prevalon boot; Yes or No
HOB (Head of Bed)	Documented HOB ≤ 30-degrees when Braden Scale subscale scores are ≤ 3 in Sensory, Activity, and/or Mobility; Yes or No
Prophylactic Dressings	Documented dressing to sacrum when Braden Scale subscale score is ≤ 3 in Mobility **and any of the following:** Braden Scale total score ≤ 18; History of HAPI; surgery > 6 h; DM; BMI 30; Poor nutrition: Yes or No

Appendix H

Compliance Rates of Evidence-Based HAPI Prevention CPG Recommendations