Event-based Therapeutic Repositioning an Evidence-Based Practice Change

DNP Final Project

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Nursing Practice in the
Graduate School of The Ohio State University

By
Mary Burkett, RN, MS, CNS, NEA-BC

Graduate Program in Nursing

The Ohio State University

2014

DNP Project Committee

Mary Margaret Gottesman, RN, PhD, FAAN, Advisor

Lynn Gallagher-Ford, RN, PhD, FNAP

Gerene Bauldoff, RN, PhD, FAAN

ABSTRACT

The problem: Patients in the ICU, particularly obese patients, are at high risk for developing pressure ulcers. Turning and repositioning are the primary approaches to their prevention. However, strong evidence has established that these strategies are not provided on the accepted every-two-hour policy in wide use.

Significance: Hospital-acquired pressure ulcers (HAPUs) are a never event in CMS quality care standards. HAPUs cost the US between 2.2 and 3.5 billion dollars annually. Hospitals receive financial penalties for HAPUs and absorb the cost of their treatment and extended length of stay, about $43,000 per patient. The human cost in constant pain is incalculable.

The PICOT Question: In the adult intensive care patient how does the implementation of an event-based therapeutic repositioning bundle as compared to usual care (by the clock) affect the incidence of hospital acquired pressure ulcers (HAPU) and the reliability of repositioning?

The Intervention Tested: Because evidence fails to support both the efficacy and effectiveness of current policy, an evidence-based review led to the development of a HAPU Prevention Bundle for ICU Patient, dubbed Event-Based Turning (EBT) by the staff. Included actions were: event-based turning using therapeutic repositioning strategies, low-air-loss bed surface, and use of a special repositioning sheet for obese patients.

Methods: The project was implemented in a 12-bed community ICU. All ICU patients admitted with intact skin during the study period were included. A pretest period with 20 patients established baseline nurse compliance with the existing policy and patient HAPU outcomes. Following staff nurse education and a coaching period, a second sample of 8 patients were followed and nurse compliance was measured again. Outcomes of interest were: HAPU development, compliance with both turning schedule and therapeutic positioning.

Results: The two samples were non-equivalent. Sample 1 was younger and experienced a lower severity of illness than patients in Sample 2. There were no HAPUs in either group; compliance with turning schedule was 34.7 percent in normal care group and 84.3 percent in the bundled group; perfect scores on therapeutic positioning occurred 41% of the normal care group and 63% in the bundled group. Nurses favorably reviewed the bundle, but a majority felt that they were not responsible for the prevention of HAPUs.

Conclusion: The EBT bundle improved both the compliance with timing and the quality of repositioning. The EBT bundle appears safe to test in similar settings and with higher acuity patients. Nurses' attitudes towards HAPU prevention are problematic and require further study.

Acknowledgements

I gratefully acknowledge the guidance of my committee, Dr. Gerene Bauldoff and Dr. Lynn Gallagher-Ford led by Dr. Mary Margaret Gottesman. In addition, I would like to acknowledge the team at St. Luke's Houston. I will always remember and be grateful for their generosity and perseverance. Michael Leger, Laura Josefsen, Kimberly Martin, Misty Thomas and Christina Taylor provided a means of completing this project and contributed to the use of best evidence to guide practice.

Dedication

I dedicate this project to my sister, Dr. Ann Bellar, RN, PhD. Ann has served as a mentor throughout my doctoral program and has provided guidance, which greatly enriched my learning. She is exacting but patient, brilliant and practical. It is with love and gratitude that I dedicate this project, the last of my doctoral work, to her.

Chapter 1

Purpose of the Project

The purpose of this Doctor of Nursing Practice (DNP) final project was to determine if a set of evidence-based practice repositioning interventions designed to improve reliability of repositioning and prevent hospital acquired pressure ulcers (HAPUs) in an adult intensive care would be an effective alternative to standard "by the clock" every two hour turning. The DNP student developed this quality project. Staff at the involved hospital implemented this project as a quality project. The data was de-identified when submitted for analysis to the DNP student. The project was under the supervision of the DNP faculty adviser. This paper is divided into five chapters: Nature of the Project; Review of the Literature; Methodology; Findings; and Implications and Conclusions.

Nature of the Problem

This section of the paper provides the evidence for the importance of HAPU reduction. Incidence, settings, and costs of HAPUs are reviewed. This section concludes with the PICOT question that guided this quality project.

Overview of HAPUs

Incidence. In 2007, there were 257,412 reported cases of pressure ulcers. HAPUs can occur in all healthcare settings and the reported incidence and prevalence varies widely. The settings that demonstrate the greatest risk are long-term care and intensive care units (Vanderwee et al., 2011). Incidence in the intensive care unit is reported with some degree of consistency as 8-20% (Lahmann, Kottner, Dassen, & Tannen, 2011; Lyder et al., 2012; Nijs et al., 2008; Terekeci et al., 2009; Vanderwee et al., 2011). Some of the reported variation in incidence results from disparate definitions and inclusion or exclusion of Stage I & 11 HAPUs. Regardless of

these issues, HAPU is a frequent complication in intensive care units, therefore the setting for this study is appropriate and the definition for HAPU was clear for this study**.**

Financial cost. The complication of HAPU results in spending resources on events that are generally considered preventable and has significant impact to affected patients (Black et al., 2011). The average cost of care per case related to the development of a HAPU is estimated to be $43,412.00 (National Quality Forum, 2012). The total cost of HAPU to the United States Healthcare System has been estimated to be 2.2-3.6 billion dollars (Kaitani, Tokunaga, Matsui, & Sanada, 2010) and the cost of care is estimated to be 2.5 times the cost of prevention (Lyder & Ayello, 2008).

Human cost. The toll on individuals who experience HAPUs is enormous and includes increased mortality, morbidity, length of stay and readmission after discharge (Lyder et al., 2012). A qualitative study examining the experience of patients with HAPU revealed themes of "endless" pain, restrictions on life and inadequate coping strategies (Hopkins, Dealey, Bale, Defloor, & Worboys, 2006).

PICOT Question

The literature to support the proposed project was collected, appraised and synthesized based upon the following PICOT question: "In the adult intensive care patient (P) how does the implementation of an event-based therapeutic repositioning bundle (I) as compared to usual care (C) affect the incidence of HAPUs (stage I-IV, non-stageable, and suspected deep tissue injury) and the reliability of patient repositioning (O) during the ICU stay? (T)". In response to this PICOT question, an evidence-based preventive bundle related to positioning and pressure relief/reduction was implemented and compared to usual care at the hospital (every two hour turn) in the ICU.

Chapter 2: Review of the Literature

Introduction

There is an emerging, credible body of literature related to hospital acquired pressure ulcers. This literature includes epidemiological studies related to risk factors, experimental studies related to prevention strategies, systematic reviews, and compliance studies. The current body of evidence has not completely supplanted "expert opinion" and traditional practice and beliefs. The purpose of this chapter is to summarize the evidence that supports the EBP practice change project to be proposed as the basis for a bundled approach to HAPU prevention and to introduce the Iowa Model of Evidence-Based Practice to Promote Quality Care (hence to be referred to as the "Iowa Model").

Pathophysiology of Pressure Ulcers

Pressure ulcers are the result of tissue hypoxia caused when pressure exerted on tissue impedes blood flow and oxygenation. The tissues at highest risk are structures in proximity to bony prominences; consequently, the most common sites for HAPUs are heels, sacrum, and acromion processes (Lyder et al., 2012). The two primary causative factors are pressure and time (Sprigle & Sonenblum, 2011). Pressure that impedes blood flow will result in tissue death if sufficient time elapses. Pressure that exceeds 25-32 mm. Hg. is considered a trigger for tissue ischemia (Bates-Jensen, 2012). Tissues exposed to potentially lethal pressure can recover if the time elapsed has not resulted in permanent injury. The recovery process itself can result in inflammation and over time can contribute to HAPU development. The cycle of ischemia and recovery contributing to injury is termed reperfusion injury. Additional contributing factors are friction, shear and moisture. Friction (rubbing of skin over a surface) and shear (movement of skin surface in opposing direction) increase HAPU risk by damaging the epidermis and dermis,

which increases the skin's susceptibility to pressure injury (Bates-Jensen, 2012). Moisture reduces the skin's natural protective oils and can lead to maceration. These factors then make the skin and underlying tissue more susceptible to pressure injury (Bates-Jensen, 2012). The obese critically ill patient poses unique risks for pressure ulcer development. The issues of friction, shear and moisture are more prevalent in the obese/bariatric patient due to challenges in repositioning large patients and having adequate space for air circulation. In addition, there is evidence that reliability of repositioning these patients may be reduced (Lowe, 2009). In summary, pressure ulcers are a result of tissue hypoxia caused by pressure and time. Contributing conditions include friction, shear and moisture and obesity. Addressing these risk factors provides the foundation of a prevention program.

Risk Assessment

There are two widely used, validated risk assessment tools, the Braden and the Norton scales (Bates-Jensen, 2012; Medical Advisory Secretariat, 2009; National Quality Forum, 2012; Richardson, Gardner, & Franz, 1998). There is evidence that use of a risk assessment scale can reduce the incidence of HAPU (Medical Advisory Secretariat, 2009). There is also evidence that nurses often ignore the risk information provided when the scales are used, do not use it as part of hand-off communication and do not necessarily structure interventions based upon the tool used (Ozdemir & Karadag, 2008; Voz, Williams, & Wilson, 2011). Standard tools do not capture risk adequately in the critical care patient population (Bates-Jensen, 2012). Additional risks not found on standard assessment tools, but common to the critically ill patient, include immobility, stage I pressure ulcers, perfusion issues, the need for mechanical ventilation, use of inotropes and hemodialysis (Levine, Sinno, Levine, & Saadeh, 2013; Coleman et al., 2013).

Classification of Pressure Ulcers

Pressure ulcers are classified by a standard method called staging and can range from Stage I (intact skin, non-blanchable erythema) to Stage IV (full thickness tissue loss, including exposed bone, tendon or muscle). Some ulcers are classified as unstageable due to the presence of slough or eschar. A final classification is suspected deep tissue injury (SDI), which is the initial presentation of a pressure injury characterized by a bruised appearance of the skin (National Quality Forum, 2012; Bates-Jensen, 2012) (see Table 1& Appendix A).

Standard classification of pressure ulcers has provided standard language and assessment techniques. It is important to note that many baseline rates are established by the inclusion of only Stage III and Stage IV pressure ulcers. There is evidence that unlike other care settings, even Stage I pressure ulcers are important to the critical care setting and predispose the patients to the progression of skin injury to more serious Stage III and Stage IV ulcers. Stage I ulcers are clinically significant in the critical care setting and should be tracked (Coleman et al., 2013).

In summary, pressure ulcers are the result of tissue ischemia that can result in full-thickness tissue destruction. There are standard risk assessment tools but the available evidence indicates that these tools do not capture all of the risks for ICU patients, are infrequently used by nurses in designing care and in performing hand-off communication. There is a standard pressure ulcer classification system, which includes clear definitions and objective criteria. For the ICU patient, HAPU rates should include all stages of skin injury. For the purposes of this study a clear definition of HAPU was developed and used. HAPU was defined as stage 1-IV, unstageable, and SDI.

Prevention

Prevention of hospital acquired pressure ulcers (HAPU) has emerged as a national priority related to costs and human suffering. The Center for Medicare and Medicaid (CMS, 2012) has defined HAPUs as never events and will no longer reimburse for the cost of care (see Appendix A).

HAPU prevention requires an intense amount of nursing time and effort. The anchor of prevention has been turning the patient every two hours, which uses significant nursing care resources (Ostadabbas et al., 2012; Schurman et al., 2009). The origin of this practice is unclear and probably began in the Nightingale era of nursing (Hagisawa & Ferguson-Pell, 2008). This era preceded a requirement for evidence to underpin practice and reflects a time when physical care activities formed the foundation for the practice of nursing. Nursing labor is currently a valued and limited resource that should be utilized prudently. Providing care that may be both unnecessary and ineffective in prevention of HAPU is a misuse of valuable nursing resources and creates cost during a time of shrinking financial resources. Additionally, a hidden cost results from patient movement injuries. These injuries are a significant risk to the nursing profession. Musculoskeletal injuries are the most common nursing injury and there is evidence that these injuries are cumulative over a career (Black, Shah, Busch, Metcalfe, & Lim, 2011). Proper patient positioning in terms of timing and technique is important to reduce both the incidence of HAPU as well as this occupational risk.

Prevention Strategies: Event Based Positioning

Skin preservation and HAPU prevention and treatment have many practices that are not rooted in or validated by the evidence. The correct interval for repositioning, the method of repositioning, and the best use of practical repositioning aids, the appropriate use of dressings,

topicals and advanced wound therapies have been the subject of research. This research has yet to be successfully and consistently translated into practice.

A group of evidence-based HAPU prevention strategies that will target the ICU population was the focus of this project. The priority of the project was the reduction of risk from the two primary risk factors of pressure and time.

Bates-Jensen (2012) describes clock-based and event-based repositioning as the two acceptable strategies for patient repositioning. Traditionally, nurses have been taught and most policies require clock-based repositioning and the general standard has been turning patients every two hours. This standard continues to be supported at the level of expert opinion but both national and international guidelines currently provide for flexibility in the frequency of repositioning based upon patient condition, tolerance and other factors (National Quality Forum, 2012, National Pressure Ulcer Advisory Panel; European Pressure Ulcer Advisory Panel, 2009). The rigid, traditional, by the clock approach is problematic for two reasons. The first reason is that there is no basis in the evidence to support clock based repositioning schedules, although this approach has intuitive appeal (Brolmann et al., 2012; Krapfl & Gray, 2008; Levine et al., 2013; Medical Advisory Secretariat, 2009; Reddy, Gill, & Rochon, 2006). Secondly, there is abundant evidence that in spite of two-hour turning as a standard, nurses fail to execute the standard and patients experience prolonged periods with no repositioning. In a study by Ozdemir & Karadag (2008) there was an 80 percent failure to reposition at the prescribed two-hourly interval. Goldhill, Badacsonyi, Goldhill, & Waldmann (2008) found that the average time to turn for the ICU patients studied was 4.85 hours. Vanderwee et al. (2011) performed a study that included more than 19,000 patients in which the implementation of prevention strategies and the prevalence rates for HAPUs were examined. The results indicated that only 10 percent of at risk

patients received full prevention strategies including repositioning. The literature reflects that the by the clock method to reposition can conflict with other nursing activities and priorities that take precedence such as medication and treatment administration, patient sleep, diagnostic testing, and rounding (Voz et al., 2011). In addition, the question of turning with "hemodynamic instability" such as the need for inotropic agents or fluid resuscitation is a pervasive issue in the ICU. Vollman (2012) eases most of these concerns with an evidence-based approach that includes initiating and evaluating repositioning at the time of admission, repositioning slowly, use of right lateral position if left lateral is not tolerated and use of rotational bed if manual repositioning cannot be accomplished. Because clock-based repositioning lacks evidence to support its efficacy and is rarely implemented according to the standard, event based repositioning, an evidence-based alternative approach to clock-based repositioning, is indicated. This repositioning strategy allows for efficiency for the nursing staff. In event- based repositioning, repositioning is planned around existing nurse-patient activities at acceptable intervals of times (Bates-Jensen, 2012). Repositioning can accompany existing activities such as assessments, nourishment, hand-offs and rounds. Ideally, the nursing staff can evaluate their routines and develop event-based repositioning strategies that can effectively be implemented.

The current body of evidence supports that patient repositioning intervals can be extended to three or four hours if the patient is on an appropriate pressure relieving surface. Studies by Vanderwee, Grypdonck, DeBacquer, & Defloor (2006) and Defloor, DeBacquer & Grypdonck (2005) demonstrate reduced HAPU incidence at four-hour turning intervals with the use of simple viscoelastic pressure relieving mattresses as opposed to standard care of every two-hour repositioning. The flexibility of turning intervals is reflected in both international and national guidelines, wound texts and systematic reviews (Bates-Jensen, 2012; Levine et al.,

2013; Medical Advisory Secretariat, 2009; National Quality Forum, 2012; Reddy et al., 2006). Event-based repositioning planned to assure a maximum time interval between repositioning of three hours and the use of pressure relieving surfaces (discussion to follow) are evidence-based prevention strategies. The determination of the repositioning triggering events must consider the maximum time interval. In summary, initiation of an event-based repositioning strategy that provides for routine and predictable repositioning intervals not to exceed three hours is evidence-based and was adopted as part of the bundle for this study.

Pressure Relieving Surfaces

Evidence supports that pressure relieving mattresses and surfaces reduce risk of HAPU by distributing pressure more evenly over the body surface in contact with the mattress. There is clear consensus, including systematic reviews, that pressure-relieving surfaces should be used for all patients at risk for HAPU development (Bates-Jensen, 2012; Coleman et al., 2013; Defloor et al., 2005; Levine et al., 2013; McInnis, Jammali-Blasi, Dumville, & Callum, 2011; Medical Advisory Secretariat, 2009; Vanderwee et al. 2006). The National Pressure Ulcer Advisory Panel (NPUAP) addressed the array of options and confusing nomenclature in 2007 by publishing the "Terms and Definitions Document" (National Pressure Ulcer Advisory Panel, 2007). The variety of overlays, mattresses and beds pose difficult choices for the clinicians providing care. The choice should not be guided by complexity or the presumption that cost equates to efficacy. For most patients the simple, cost effective options are appropriate. A systematic review performed by the Medical Advisory Secretariat of Ontario confirmed through several randomized controlled trials, that for ICU patients the use of special viscoelastic (non-powered) mattresses is an ideal option (Medical Advisory Secretariat, 2009). A systematic review by McInnis et al. (2011) reinforced the use of the viscoelastic mattress and provided further analysis for two other

commonly used devices, the low air loss mattress and alternating pressure overlays and mattresses. There was no difference in outcomes in either the low air loss group or the alternating pressure groups (McInnis et al., 2011). This evidence supports caring for high-risk patients admitted with intact skin, including ICU patients, with a variety of cost-effective options. It is important to note that patients admitted with serious pressure ulcers or post flap-closure procedures would require surfaces that that are more sophisticated such as the bead beds (Bates-Jensen, 2012). In summary for most patients admitted to the ICU with intact skin but at risk for pressure ulcer, simple viscoelastic mattresses, low air loss or alternating pressure surfaces would reduce the risk. For this study, low air loss mattresses were the standard support surface. The hospital had elected a standard use for all ICU patients prior to this project. In order to validate proper functioning of the mattress, a random check was done before and after the project initiation to validate appropriate functioning and use.

Therapeutic Positioning

The discussion of therapeutic positioning will be confined to common nursing care positions related to bed mobilization and HAPU prevention. It will not include prone position used in many ICUs for pulmonary purposes. Therapeutic positioning seeks to minimize pressure through proper positioning and alignment. Bed mobility through therapeutic positioning affects many organ systems other than the skin, but this discussion will be limited to HAPU prevention.

Proper bed mobility and repositioning are critical factors in the reduction of the risk for HAPU development. Body alignment, joint flexion and bed elevation at the head and knees are key considerations. In the supine position, the body should be in alignment with the head of the bed elevated at thirty degrees because elevation at angles greater than thirty degrees increases the risk of pressure ulcer. When clinical indications for increased elevation of the head of the bed

supersede HAPU prevention, additional skin protection strategies may be necessary. The hips and knees should be elevated and flexed with care taken to off-load, "float" the heels. One side of the pelvis should be lifted to reduce pressure on the sacrum. The ankle should always be kept as close to a ninety-degree angle as possible to prevent foot drop. If special boots are used to protect the heels and maintain alignment, these should be properly applied and removed completely for assessment every shift. The bed itself can be flexed at the knees or a limb elevator used; this reduces pressure on the hip joints (Rappl, 2012; Johnson & Mayenburg, 2009).

The lateral positions will usually be alternated with the supine position on a rotational basis. Proper positioning in the lateral position is optimally at a thirty-degree tilt maintained by a wedge, which minimizes pressure on the acromion processes (Harada, Shigematsu, & Hagisawa, 2002; Moore, Cowman, & Conroy, 2011; Sprigle & Sonenblum, 2011). The uppermost arm should be supported on a pillow at shoulder level and the uppermost leg should be slightly flexed at the hip and knee and supported by a pillow or wedge. The heels need to be floated (Rappl, 2012). ICU nurses need to be aware of the potential negative impact of the lateral position for patients with unilateral lung disease. Placing the affected lung in a dependent position can result in an increase in the ventilation–perfusion mismatch and create hypoxemia and hemodynamic instability (Johnson & Mayenburg, 2009). Critical care nurses need to assess the impact (if any) of repositioning and adjust care accordingly. Adjustment could include a less than thirty-degree tilt to the affected side, the use of a different pressure-relieving surface or a rotating bed. In summary, according to the evidence, simple bed mobilization such as the thirty-degree tilt and the use of wedges and pillows are sufficient to reduce the incidence of HAPUs. For the purposes of this study using the above researched based information, therapeutic positioning was defined

as the following five items: head of bed at 30 degrees; side tilt angle of 30 degrees; use of pillows; heels off the bed; and proper body alignment.

Special Barriers to HAPU Prevention Related to Obesity

It is estimated that approximately one third of the ICU patient population is obese (Lowe, 2009). Obesity results in a chronic pro-inflammatory state that may contribute to skin failure and poor healing (Rose, Pokorny, & Drake, 2009). In addition, obesity presents unique barriers to therapeutic positioning. Compounding the challenges related to obesity is the potential impact of nurses' attitudes toward the obese patient. Reto (2003) theorizes that nurses' attitudes toward obesity may create a barrier to care and several authors describe staffing and lack of useful equipment to assist with bariatric patient positioning as significant additional barriers (Davidson, Kruse, Cox, & Duncan, 2003; Johnson & Mayenburg, 2009; Lowe, 2009). Guidelines and the evidence require avoiding friction and shear and to lift rather than pull (National Pressure Ulcer Advisory Panel; European Pressure Ulcer Advisory Panel, 2009), which present particular challenges in the obese patient population. These issues need to be addressed with simple solutions so that therapeutic repositioning is not avoided in this population. In a small study, Theou et al. (2011) measured the impact of a sheet designed to reduce friction. In this study caregiver effort was significantly reduced and friction was reduced by 65 percent. A readily available friction-reducing sheet, like the TAP, would be an appropriate HAPU reduction intervention for the critically ill obese patient. The TAP device manufactured by SAGE was utilized in this study as part of the intervention bundle to aid staff in the turning of obese patients. This device does not interfere with the functioning of the pressure-relieving mattress.

Bundling as a Strategy to Implement EBP

The strategy of bundling interventions began with the Institute of Healthcare Improvement (IHI) in the year 2000 and this strategy has improved outcomes related to ventilator care, sepsis management and the prevention ventilator associated pneumonia, central line infection and urinary tract infection (Resar, Griffin, & Nolan, 2012). The power in a bundle is that it defines three to five evidence-based approaches into a unified care strategy. The bundle is not intended to include all aspects of care. Bundles represent core elements requiring teamwork and are intended to lead to high and sustained compliance (Gallart, 2009; Fulbrook & Mooney, 2003; Resar et al., 2012). Bundles are intended to target specific patient groups and should be designed to allow local input and flexibility (Resar et al., 2012). The HAPU prevention strategies that were bundled were event-based positioning, therapeutic positioning based on the five criteria from the literature, standard pressure relieving surfaces, and use of friction-reducing repositioning sheets for obese patients. The project bundle was finalized after the support from institutional quality and clinical leaders was sought and obtained.

Staff Preparation and Education

The literature provides examples of many HAPU reduction efforts. It appears that any effort meets with some success. Strategies to reduce HAPU found in the literature include establishing turn teams in the ICU, implementation of bundles under the heading of patient safety, implementation of a proprietary pressure ulcer prevention program known as PUPP and utilization of a standardized product formulary and protocols (Dibsie, 2008; Shannon, Brown, & Chakravarthy, 2012; Still et al., 2013; Sullivan & Schoelles, 2013; Van Gaal et al., 2011). A systematic review done by Sullivan and Schoelles (2013) provides a discussion of successful strategies. These include simplification and standardization, involvement of a multidisciplinary

team, leadership support, ongoing staff education and feedback. Other strategies recommended as effective include programs with identifiable themes (SOS: Save Our Skin), the use of unit-based skin champions and bundling of interventions. Specific staff barriers were also identified including lack of motivation, turnover, lack of involvement in the design of the interventions, and lack of feedback about results (Sullivan & Schoelles, 2013).

There are two validated tools related to the evaluation of HAPU reduction programs. The Pressure Ulcer Knowledge Assessment Tool assesses nurses' knowledge in six domains: etiology; development; classification; nutrition; risk assessment; reduction of pressure and shear; and reduction of the duration of pressure and shear (Beeckman, Defloor, Schoonhoven, & Vanderwee, 2011). The Attitude toward Pressure Ulcer Prevention tool (APuP) measures nurses' attitudes about pressure ulcers and measures five domains: personal competency to prevent pressure ulcers; priority of prevention; impact of pressure ulcers; responsibility in prevention; and confidence in effectiveness of prevention (Beeckman, Defloor, Demarre, Van Hecke, & Vanderwee, 2010; Beeckman et al., 2011). Both tools were used to assess HAPU rates in a large study (2105 patients) that examined the impact of knowledge and nursing attitudes on HAPU reduction. In spite of the finding that nurses' knowledge related to HAPUs was inadequate, knowledge was not the most significant factor in prevention. The attitude of the nurses was the factor most directly associated with HAPU rate. The lowest incidence of HAPUs was found in settings where nurses believed that nursing care could prevent HAPUs and that most HAPUs were preventable (Beeckman et al., 2011). This study would support that content designed to influence nurse attitude is an important component of HAPU prevention education.

Standardized Education. The National Pressure Advisory Panel has published a competency-based curriculum for registered nurses. Major areas of content include etiology, risk

assessment, skin care program, positioning, support surfaces, nutrition, documentation and referrals to experts (Piper & Rutliff, 2010).

Education summary. Effective education needs to include strategies to affect both knowledge and attitude. The proposed education will cover the recommended topics as specified by the expert organizations. In addition, the education will promote positive attitude and consider the evidence-based strategies including staff involvement and feedback. The education was developed by the DNP student and included instruction on the implementation of the intervention (a bundle) for the prevention of HAPUs.

Iowa Model

The Iowa Model is ideally suited for managing a quality-driven evidenced based practice change (see Figure 1). The initial steps include triggers for a change and validation that the considered change is an institutional priority. The "Pilot the Change in Practice" step includes project design, methodology, data collection, tools, and plan for analysis of outcomes (Ciliska et al., 2011). These are fully discussed in the following chapter. The model highlights decision points and feedback loops to manage the project effectively. The Iowa Model specifies both knowledge and problem triggers as appropriate for considering an EBP change. This project was triggered by the lag in the evidence related to skin preservation incorporated into practice (knowledge trigger) as well as the issues related to unnecessary resources, pay for performance initiatives and potential institutional image issues related to HAPUs (problem triggers). The model requires the participants to collect, appraise, and synthesize the evidence and to decide if sufficient evidence exists to warrant a clinical practice change. If an EBP change is indicated, the model provides a practical implementation guide that includes collection of baseline data, design of the EBP change and establishment of outcome measures. The model concludes with the

evaluation and dissemination of the results. The Iowa Model is suited to the work and scholarship of the DNP as an advanced practice nurse. Opportunities to demonstrate the scientific underpinnings of practice, system and project leadership, clinical scholarship and the methods of EBP, inter-professional collaboration and improvement in population health are evident in the execution of an EBP change and use of the model.

Conclusion

Based upon the evidence, a practice change using the Iowa Model was implemented as a quality project by staff at the involved hospital for the critically ill patient population to prevent hospital acquired pressure ulcers and to improve the reliability of the repositioning protocol. The elements of the EBP care strategies were bundled and introduced through staff education.

Chapter 3: Methodology

Introduction

The purpose of this chapter is to outline the methodology for this quality project. The project design, the model used, sample, methods, instruments and data analysis plan is discussed.

Project Design and Use of Iowa Model

Project Triggers and Priority Justification

This Quality project is an evidence based practice change project involving a set of interventions to impact patient outcomes and as such, The Iowa Model is ideally suited to guide the project (see Figure 1). There were two triggers for this project. HAPUs are a significant problem-focused trigger because they are considered "never events" and they impact both reimbursement and reputation. In addition, prevention strategies can be ineffective and resource utilization intensive. This project also had a knowledge–focused trigger. The science supporting HAPU prevention has evolved, yet practice has not kept pace with the evidence. There is evidence about repositioning intervals and strategies, staff knowledge and attitude and pressure relieving surfaces that were implemented and evaluated. In consultation with facility leaders, this topic was validated as significant for the organization and patients. The evidence based wound prevention strategies were implemented by the staff at the hospital, with the DNP student serving as consultant and clinical expert and project guide. The two hospital leaders who served as on-site coordinators completed CITI course training prior to beginning the project. This staff executed the following plan and collected the data independent of the DNP student and then shared the de-identified data with the DNP student for analysis.

Synthesis of Literature into Practice Change

The literature was searched based upon the PICOT question: "In the adult intensive care patient (P) how does the implementation of an event-based therapeutic repositioning bundle (I) as compared to usual care (C) affect the incidence of HAPUs (stage I-IV, unstageable and SBI) and the reliability of patient repositioning (O) during the ICU stay? (T). The evidence supported the following practice changes: event based repositioning structured with staff nurse input where turning intervals do not exceed three hours; therapeutic repositioning (repositioning designed to minimize pressure risk and provide adequate postural support and positioning, based on 5 items); use of a basic pressure-relieving surface for all patients admitted with intact skin; provision of a friction reducing sheet for all bariatric patients (TAP); and staff education designed to increase knowledge and promote positive attitude.

Pilot the Change: Outcomes to be Measured

There were two primary outcomes that were measured, HAPU rates and nurse compliance with the policies pre-bundle and post–bundle. The site selected for the project was St. Luke Hospital in Houston Texas. The DNP student coordinated the project with hospital leadership. The Director of Quality served as the on-site project coordinator. A nurse data collector, experienced in wound care provided consistent data collection for the project. The on-site project coordinator followed twenty admissions before the EBP change to establish baseline outcomes and only eight patients were followed after the EBP change to assess bundle outcomes due to time constraints. The definition of HAPU was all pressure injuries including Stage I-IV, suspected deep tissue injury (SDI) and unstageable, not present on admission and thus acquired during the ICU stay (see Table 1). The second outcome, compliance with repositioning protocol before and after the EBP change, was provided by direct observation of compliance with the

policy (both pre-bundle by the clock and post-bundle by event) as well as direct observation of therapeutic repositioning, based on 5 agreed upon criteria: head of bed 30 degrees, angle of tilt 30 degrees, use of pillows, heels off the bed, proper body alignment. Also measured was functioning of the mattress and use of the TAP assistive device. Basic demographic and clinical information was collected for descriptive and comparison purposes (see Appendix B & C; Table 2).

Project Design and Implementation

This was a Quality project design with the intent to evaluate a practice change to reduce the incidence of HAPUs and improve repositioning compliance in the critically ill patient population. This project was implemented at St. Luke Hospital located in Houston Texas. This is a 106-bed community hospital, which opened December 2012. The ICU is a general adult ICU that has twelve beds. The hospital is owned by Catholic Healthcare Initiatives and is part of a local six-hospital system. Facility approvals and Institutional Review Board approval as an expedited review project were obtained. The hospital and ICU leadership were engaged and the staff was involved in finalizing the repositioning protocol, which limited the maximum repositioning interval to three hours to be triggered by predictable, scheduled nurse-patient interactions (see Appendix B). The unit provided standard beds (Stryker-In-Touch), which have the ability to provide low air loss therapy. These beds meet the current pressure reduction-redistribution requirements for patients admitted with intact skin. A repositioning assist device was provided for obese patients (Sage-TAP). The on-site project leadership included the Director of Quality and an experienced wound care Registered Nurse who served as the primary data collector. Both project coordinators completed research ethics training through CITI Course. The

DNP student served as a project consultant but had no direct patient or line staff interaction (see Appendix C).

Phase I: Establishing Baseline HAPU Rate and Compliance: Process and Instrument

This unit had not established a baseline rate for HAPU development; therefore, a baseline rate was established by following 20 patients with intact skin (no HAPUs, SDI, Unstageable Ulcers) admitted sequentially prior to the EBP change. The data collector, under the training of the DNP student, assessed and followed 20 patients with intact skin at the time of admission to the ICU and reassessed for pressure ulcer development at the time of their discharge from the ICU. A standard rate calculation of HAPU development/number of patients x 1000 was planned but not used because no HAPUs developed (see Table 2). In addition, observations of compliance (see Table 3) with the current standard of every two- hour turning, the use of pressure relief and therapeutic repositioning of patients were made. A total of 92 repositioning opportunity observations were completed in the baseline period, covering multiple days and both day and night shifts. A compliance percentage was calculated. A total of 24 mattress checks were made during the baseline period and the mattress was scored as either functioning or not functioning and a percentage was calculated. A total of 34 therapeutic positioning observations were made and patients were scored on a 5 item scale. Data from this observation are rank ordered. Data included which criteria were lacking and a total score for the observation. Each item if completed was scored a one, if not completed was scored a zero. The total score added all items that were successfully completed. Possible scores ranged from zero to five. This data is reported as overall compliance rates with both the act of repositioning and the quality of the repositioning.

Phase 2: Introduction and Learning Phase: Education and Initial Monitoring

Staff was educated about HAPU prevention, equipment (bed and TAP), the protocol and the significance of the problem, including from the perspective of the patient by the on-site project leaders. The DNP student developed and scripted the basic education provided. Staff education was conducted in both day and evening sessions over a period of one week. The education followed the essentials of NPUAP recommended curriculum as well as information available in the literature related to the experience of the patient with HAPU, and included the bundle to be implemented (see Table 4). In addition, education was provided related to the correct use of the bed to be used for all patients and the TAP system to be used for the obese patients. Prior to the initiation of the change, two unit staff were identified and educated to be change leaders to promote the bundle.

Phase 3: Study, Process and Instruments for the Bundle

At the completion of the education, the data collector followed 8 patients sequentially admitted to the ICU with intact skin for the development of HAPU. Further observations were made: 51 observations for compliance with event based turning, 24 observations for bed checks, 51 therapeutic repositioning observations, and 16 observations for the use of TAP with Bariatric patient. Demographic data was also collected, which included age, gender, diagnosis, BMI, and mechanical ventilation. At the conclusion of the data collection period (both baseline and study data collection) all identifying patient information was removed. No patients initially assessed were lost to the study.

Phase 4: Data Analysis

Data was provided by project leaders to the DNP student redacted of all patient identifying information. The two groups of patients, baseline group and study group, were

compared based upon demographic and clinical data collected. Data included age, sex, principle diagnosis, use of mechanical ventilation and BMI. HAPU rates were compared in both groups. A Fishers Exact test was planned to determine differences between groups but was not computed, as there were zero HAPUs in either group. Percentages were calculated and compared for compliance with both turning protocols. In terms of quality of the turn, a Mann Whitney U test was planned to determine if there was a difference in the quality of the turn post implementation of the bundle. However, there was a large difference in the number of observations between the groups so the data was tabulated as percents. The bed compliance data was placed in percentages and compared between groups. Finally, a percentage was calculated to represent the use of TAP in obese patients post bundle. Following the Iowa Model, the final step in this Quality Project was sharing the data analysis with the team at the hospital. This allowed the leaders to make decisions about retaining and extending the bundle.

Conclusion

In summary, this project was a quality project designed to implement evidence-based strategies to reduce HAPUs and improve repositioning compliance in the critical care population. The EBP strategies evaluated were event based therapeutic repositioning, the utilization of a standard pressure-relieving surface, and the use of a friction reducing surface for obese patients. The change was introduced after staff had been provided an opportunity to offer input into the change and after a period of staff education. Baseline HAPU rates and repositioning compliance were determined before any interventions were introduced. These were reassessed and compared after the EBP change was initiated. All data were de-identified and patient confidentiality was protected throughout the project. The Iowa Model was used to guide the project.

Chapter Four: Findings

Introduction

This study was designed to answer the following PICOT question: "In the adult intensive care patient (P) how does the implementation of an event-based therapeutic repositioning bundle as compared to usual care (C) affect the incidence of HAPUs (stage I-IV, non-stageable, and suspected deep tissue injury) and the reliability of patient repositioning (O) during the ICU stay? This question generated the ability to measure several outcomes in two samples of patients in the same ICU. The outcomes measured were the following: description of outcomes with normal care; description of outcomes with the implementation of the event based turning (EBT) bundle including nurses' satisfaction with the bundle; and comparison of outcomes between the two interventions. These results will be identified after a description of both samples is presented.

Samples

Usual care sample. Age was fairly normally distributed in the usual care group. The range of ages was from 33 to 83. The mean age was 58.6 years (see Table 5). Thirty-five percent of the sample was male and 65 percent were female. Thirty percent of this sample had BMIs greater than 30. Sixty-five percent were on ventilators. In terms of medical complexity and threat to tissue integrity, 30 percent had elevated BMIs, were on the ventilator and had medical diagnoses that indicated an oxygenation problem. None in this group, however, was over the age of 70 (see Table 6).

EBT sample. Age was not normally distributed in this sample; it was skewed towards the older ages. The range of ages was from 49 to 84. The mean age was 72.7 years (see Table 5). Eighty-eight percent of the sample were female and 12 percent were male. Eighty–eight percent of this sample had BMIs greater than 30 and were on the ventilator. In terms of medical

complexity and threat to tissue oxygenation, 75 percent had elevated BMIs, were on the ventilator, and had medical diagnoses that indicated an oxygenation issue. Finally, 62.5 percent of this sample had elevated BMIs, were on the ventilator, had an oxygenation diagnosis and were over the age of 70 (see Table 6).

Comparison of samples. The data indicate that the EBT sample were older, more obese, female, and more medically complex than the usual care sample.

Description of outcomes for normal care

HAPU and compliance with pressure relieving surface. The HAPU rate in the normal care (every two-hour turn) was zero (see Table 7). Compliance with the use of the provided pressure-relieving surface was 100 per cent.

Compliance with every two hour turns (Q 2 HT). Compliance with the usual care policy of every two-hour turning was 34.7%. This was calculated by performing ninety-two observations (see Table 8).

Compliance with five criteria for therapeutic positioning. Compliance with all five aspects of therapeutic positioning in the Q 2 HT group was 41 percent. Compliance with at least four of the criteria (5/5; 4/5) was 67 percent (see Tables 9 & 10). All of the patients evidenced at least two of the five criteria. In this group the most frequent criterion missed was the floating of heels (11/92) followed by body alignment (8/92), the appropriate use of pillows (6/92), proper body angle (4/92) and proper head of bed elevation (3/92) (see Table 11).

Description of Outcomes for EBT Bundle

HAPU rates and compliance with pressure relieving surface. There were no HAPUs in this group (see Table 7) and there was a 100 percent compliance with the use and proper functioning of the pressure relieving bed.

Compliance with event based turning. There were 51 observations completed at various times and 43 of the patients were turned according to schedule. This represented an 84.3 percent compliance rate (see Table 8).

Compliance with five criteria for therapeutic positioning. There were 51 observations of proper therapeutic positioning completed using the 5 item scale at various times and 32 patients or 63 percent met all 5 criteria. Additionally, 17 patients or 33 percent met 4 of the 5 criteria. Ninety-six percent of the patients were positioned meeting at least 4 of the criteria (see Tables 9 & 10). The items most missed were head of bed elevation and heels off the bed (see Table 11). There was 100 percent compliance with the use of the TAP system for bariatric patients.

Education. The nurses reviewed the education program favorably. In terms of outcomes, compliance with therapeutic repositioning was higher after the education was completed (See Table 8).

Nurse's satisfaction with bundle. Nurses were asked to write their reaction to the usefulness of the bundle, the TAP system for bariatric patients, the education, and their responsibility related to the prevention of HAPUs. Twelve nurses of sixteen total responded. The following were the results: ten nurses said the bundle made sense and fit better with their work-load; nine nurses said the education was helpful; eleven nurses liked the TAP system; five nurses said HAPUs were preventable; and four said that nurses were responsible for preventing HAPUs.

Comparison of Outcomes Between Groups

HAPU and compliance with pressure relieving surface. There was no difference in HAPU rate between the standard care group (Q 2 HT) and the post-bundle implementation groups. Both groups had a zero HAPU rate (see Table 7). There was no difference in compliance

with the use of required pressure relieving surface. Both groups demonstrated 100 percent compliance in a total of 24 observations for each group.

Compliance with repositioning protocols. There was a difference in percent compliance between the Q 2 HT group and the EBT group with improvement being seen in the EBT group. In the usual care Q 2 HT group, there was a 34.7 percent compliance rate with the "by the clock" policy of turning and repositioning. After the evidence-based change, compliance rose to 84.3 percent (see Table 8).

Compliance with five criteria for therapeutic positioning. The EBT group demonstrated better compliance with the criteria for therapeutic positioning. The usual care group met all five criteria at 41 percent while the post-bundle EBT group met all criteria 63 percent of the time. If scores of meeting both the four or five criteria are considered, the Q 2 HT group was scored at 67 percent compliance and the EBT group was scored at 96 percent compliance (see Tables 9 &10). All of the EBT group had at least three criteria met. Ninety-one per cent of the Q 2 HT group met at least three criteria.

The criteria most often lacking in the EBT group were proper head of bed (10/51) and floating the heels (9/51). The criteria most frequently lacking in the standard care Q 2 HT group were floating the heels (11/34) and proper body alignment (8/34) (see Table 11).

Conclusion

No HAPUs developed in either group. The data analysis revealed that the samples were different in that the EBT sample was medically more complex and older. The EBT group scored better on completing the turns as scheduled and also in achieving the five items of therapeutic repositioning. The nurses positively reviewed the EBT bundle including the use of the TAP

system but a majority of respondents did not believe HAPUs were preventable or the responsibility of the nurse.

Chapter Five: Discussion

A DNP student completed this project using evidenced based practice methods. A clinically relevant PICOT question was generated, a site was chosen for the project, and leadership skills and the IOWA Model were employed to guide, implement, and complete this quality project. This final section of the paper covers the discussion of the findings, limitations of the study, and implications for nursing practice.

Study Summary and Discussion of Findings

EBT Bundle is an Alternative to Usual Care by the Clock Q 2 HT

HAPUs. This study validated the evidence that safe turning and repositioning strategies can include triggers other than the clock for patient repositioning and that the interval can be safely extended beyond every two hours if pressure-relieving surfaces are routinely employed in the prevention of HAPUs (Bates-jensen; Vanderwee, Grypdonk, DeBacquer & Defloor (2006); Defloor, DeBacquer &Grypdonk (2005). Event-based repositioning, that is the use of predictable nurse-patient interactions as triggers for the repositioning in this study resulted in no harm and no evidence of skin breakdown. The interval between repositioning was designed to be no longer than three hours. The group of patients studied, while smaller than the usual care group, represented higher acuity patients. The EBT (event-based turning) group was older, more medically complex and more obese than the usual care group. The conclusion for this study done in this setting is that no harm resulted from the evidence-based change and that this EBT bundle should be evaluated in other settings.

Compliance of positioning and turning. This project also validates what is known from the evidence, that nursing compliance with by the clock turning is low and a clinical issue (Ozdemir, et al (2008); Goldhill, Bodacsoni, Goldhill, Waldman (2008); Vanderwee (2011). This

project in this setting resulted in a marked improvement in compliance with the policy. Compliance with by the clock, usual care turning was 34.7 percent. After the evidence-based change to EBT, compliance rose to 84.3 percent. The EBT change has potential to make an impact in a problematic area of care and should be evaluated in additional settings.

Nurse Satisfaction

The implementation of the EBT bundle resulted in favorable nurse response. Verbally, nurses reported that the policy was now consistent with real-life practice. Enthusiastic support for the use of the TAP system for facilitating repositioning of the obese patient was consistent in feedback provided.

Education Program

The project provided validation that education utilizing existing recommendations is effective in improving the quality of the repositioning performed. There was improvement in the quality of repsositioning, utilizing the elements of therapeutic positioning post-bundle implementation. While the nurses expressed satisfaction with the education related to the EBT change, the education as provided did not result in the majority of nurses having positive attitudes. The majority of the nurses did not believe that HAPU was primarily a nursing responsibility nor did they believe that the majority of HAPUs are preventable. This would suggest the sustainability of the improvements made could be at risk and sustainability strategies should be examined.

Overall Conclusion

As a result of the positive results of this evidence-based quality change, this EBT bundle will be retained in this facility. Leadership discussion of extending the protocol to other areas has also begun.

Limitations

There are two main limitations, sample size and lack of personal oversight of the project. This was a quality project that was designed to have equal subjects in both intervention groups. This did not occur and as a result of this, only descriptive statistics could be used. This limits interpretation and application of results. However, the EBT sample was more medically complex, obese, and older than the usual care group thus strengthening the findings of no harm, and increased compliance with turning and therapeutic positioning.

An additional limitation was that the DNP student could not directly manage or implement the project because it was a requirement of the IRB approval for a quality project. This limited the DNP student in terms of clarifying the project in a real time manner in terms of providing the education directly to the staff, and in terms of continuing to motivate the unit champions. As a result of this, measurements although well done, were not done in terms of providing enough numbers for statistical analysis. Phone calls, no matter how frequent, could not overcome lack of on-site presence in the real world setting. Secondly, the DNP student sent the transcripts for the education but once again, could not deliver these in person or even by the Internet. As a result of this, it is unknown as to how much time if any was spent on influencing nurses' attitudes about prevention and responsibility for HAPU prevention. The nurses, who reviewed the project, favorably rated the education program. What improved after the education was therapeutic positioning of the patient. What remained problematic was the attitude towards nurses' responsibility in the treatment and prevention of HAPUs. Finally, although the unit champions were in place and were committed to the project, the DNP student could not adequately provide the ongoing emotional, intellectual, and on-site support needed for such an

undertaking. Implementing a project in the real world is difficult and inconsistently achieved under any circumstance and not being present increased this difficulty.

Implications

This final section will discuss the implications of this project. Implications for practice, research, education, medical legal risk reduction and financial impact will be identified.

Practice

The implementation of an event-based repositioning bundle represents a practical approach to a clinical challenge. Strategies to improve compliance with current evidence in terms of turning interval, use of pressure relieving surfaces routinely for high risk patients, and attention to proper positioning techniques especially heels and head of bed should be extended into practice in other similar settings by way of evidence-based practice projects.

Research

This project provides validation for effectiveness of using the current evidence, while at the same time exposes some deficits in current knowledge. Research is needed that targets the obese population as a specific sub-group of the ICU population. This project did not examine the impact of interval and quality of repositioning after the initiation of an always-available turn assist device (TAP). This would be important evidence to guide practice. In addition, there is research needed on how to influence nurse attitude since the current evidence supports that this is the most important factor in successful skin preservation. A shocking finding of this project was that nurses, knowingly participating in a HAPU reduction project and who had received targeted education, did not have positive attitudes about their role in HAPU reduction or the ability to prevent HAPU. Evidence-based strategies to address these issues would have potential to greatly improve the results and sustainability of this quality change.

Education

There are three main educational implications. One relates to DNP education. It is fairly clear from this project, that DNP educational programs need to facilitate the direct involvement of the DNP student in the project in order to provide on site, ongoing leadership. Nursing education in general needs to continue to focus not only psychomotor and cognitive learning but needs to focus on the third domain of learning, affective learning. This domain includes attitude, which was identified as a problematic area for the nurses who participated in the study. The third implication would be to stress heels off the bed and proper head of bed position.

Medical-legal

There are very significant medical legal implications for this study. Providing nurses with policies that are not executed places the nurse and the institution at risk for legal action. Providing nurses with policies that are evidence-based and that can be reliably executed would reduce the risk from both lawsuits and adverse regulatory actions.

Financial

Nursing actions have financial implications. Nurses and their health are a valuable resource and their time and physical exertions should be expended on essential, evidence-based activities. This project reduced the repositionings from twelve per day to eight per day with no adverse clinical outcomes.

Conclusions

The EBT bundle did no harm and improved turning and positioning of patients. Nurses favorably reviewed the EBT bundle and the educational program. Nurses' attitudes towards prevention of HAPUs were found to be problematic. As a result of the findings, recommendations for practice, research, education, legal and financial were proposed.

References

Bates-Jensen, B. M. (2012). Pressure ulcers: Pathophysiology, detection and prevention. In C. Sussman, & B. Bates-Jensen (Eds.), *Wound Care: A Collaborative Practice Manual for Health Professionals* (Fourth Edition ed., pp. 230-277). Philadelphia: Wolters Kluwer/ Lippincott Williams and Wilkins.

Beeckman, D., Defloor, T., Demarre, L., Van Hecke, A., & Vanderwee, K. (2010). Pressure ulcers: Development and psychometric evaluation of the attitude towards pressure ulcer prevention instrument (APuP). *International Journal of Nursing Studies* , *47*, 1432-1441.

Beeckman, D., Defloor, T., Schoonhoven, L., & Vanderwee, K. (2011, Third Quarter). Knowledge and attitudes of nurses on pressure ulcer prevention: A cross-sectional multicenter study in Belgian hospitals. *Worldviews on Evidence-Based Nursing*, 166-176.

Black, J. M., Edsberg, L. E., Baharestani, M. M., Langemo, D., Goldberg, M., McNichol, L., & Cuddigan, J. (2011). Pressure ulcers: Avoidable or unavoidable? Results of the National Pressure UlcerAdvisory Consensus Conference. *Ostomy Wound Management, 57(2)*, 24-37.

Black, T. R., Shah, S. M., Busch, A. J., Metcalfe, J., & Lim, H. J. (2011). Effect of transfer, lifting, and repositioning (TLR) injury prevention program on musculoskeletal injury among direct care workers. *Journal of Occupational and Environmental Hygiene*, *8*, 226-235.

Brolmann, F. E., Ubbink, D. T., Nelson, E. A., Munte, K., Van der Horst, C. M., & Vermeulen, H. (2012). Evidence-based decisions for local and systemic wound care. *British Journal of Surgery*, *99*, 1172-1183.

Ciliska, D., DiCenso, A., Melnyk, B. M., Fineout-Overholt, E., Stetler, C. B., Cullen, L., ... Dang, D. (2011). Models to guide implementation of evidence-based practice. In B. M. Melnyk, & E. Fineout-Overholt (Eds.), *Evidence-Based Practice in Nursing and Healthcare: A Guide to Best Practice* (2nd ed., pp. 241-275). Philadelphia: Wolters Kluwer/Lippincott Williams & Wilkins.

CMS, (2012). Hospital acquired conditions and present on admission indicator reporting. Retrieved from http://www.cms.gov

Coleman, S., Goreki, C., Nelson, E. A., Closs, S. J., Defloor, T., Halfens, R., ... Nixon, J. (2013). Patient risk factors for pressure ulcer development: Systematic review. *International Journal of Nursing Studies, 50*, 974-1003.

Davidson, J. E., Kruse, M. W., Cox, D. H., & Duncan, R. (2003). Critical care of the morbidly obese. *Critical Care Nursing Quarterly, 2*, 105-116.

Defloor, T., De Bacquer, D., & Grypdonck, M. H. (2005). The effect of various combinations of turning and pressure reducing devices on the incidence of pressure ulcers. *International Journal of Nursing Studies, 42*, 37-46.

Dibsie, L. G. (2008). Implementing evidence-based practice to prevent skin breakdown. *Critical Care Nursing Quarterly, 31(2)*, 140-149.

Fulbrook, P., & Mooney, S. (2003). Care bundles in critical care: A practical approach to evidence-based practice. *Nursing in Critical Care, 8(6)*, 249-255.

Gallart, H. (2009). Best practice bundles: The new science of Quality Improvement. *Creative Nursing, 15(4)*, 206-208.

Goldhill, D. R., Badacsonyi, A., Goldhill, A. A., & Waldmann, C. (2008). A prospective observational study of ICU patient position and frequency of turning. *Anesthesia, 63*, 509-515.

Hagisawa, S., & Ferguson-Pell, M. (2008). Evidence supporting the use of two-hourly turning for pressure ulcer prevention. *Journal of Tissue Viability, 17*, 76-81.

Harada, C., Shigematsu, T., & Hagisawa, S. (2002). The effect of 10-degree leg elevation and 30-degree head elevation on body displacement and sacral interface pressures over a 2-hour period. *Journal of Wound Ostomy and Continence Nursing*, 143-148.

Hopkins, A., Dealey, C., Bale, S., Defloor, T., & Worboys, F. (2006). Patient stories of living with a pressure ulcer. *Issues and Innovations in Nursing Practice*, 345-353.

Johnson, K. L., & Mayenburg, T. (2009). Physiological rationale and current evidence for therapeutic positioning of critically ill patients. *AACN Advanced Critical Care, 20(3),* 228-240.

Kaitani, T., Tokunaga, K., Matsui, N., & Sanada, H. (2010). Risk factors related to the development of pressure ulcers in the critical care setting. *Journal of Clinical Nursing, 19*, 414-421.

Krapfl, L. A., & Gray, M. (2008). Does regular repositioning prevent pressure ulcers? *Journal of Wound, Ostomy and Continence Nurses Society, 35(6),* 571-577.

Lahmann, N. A., Kottner, J., Dassen, T., & Tannen, A. (2011). Higher pressure ulcer risk on intensive care? Comparison between general wards and intensive care units. *Journal of Clinical Nursing, 21,* 354-361.

Levine, S. M., Sinno, S., Levine, J. P., & Saadeh, P. B. (2013). Current thoughts for the prevention and treatment of pressure ulcers: Using the evidence to determine fact or fiction. *Annals of Surgery*, *257(4)*, 603-608.

Lowe, J. R. (2009). Skin integrity in critically ill obese patients. *Critical Care Clinics of North America, 21*, 311-322.

Lyder, C. H., & Ayello, E. A. (2008). Pressure ulcers: A patient safety issue. In R. G. Hughes (Ed.), *Patient Safety and Quality Care Evidence Based Handbook for Nurses* (pp. I-267-I-299). Retrieved from www.ncbi.com

Lyder, C. H., Wang, Y., Metersky, M., Curry, M., Kliman, R., Verzier, N. R., & Hunt, D. R. (2012). Hospital-acquired pressure ulcers: Results from national Medicare patient survey monitoring study. *Journal of American Geriatric Society, 60*, 1603-1608.

McInnis, E., Jammali-Blasi, A., Dumville, J. C., & Callum, N. (2011). Support surfaces for pressure ulcer prevention (review). *The Cochrane Collaboration. Published by John Wiley and Sons, Ltd.*, (Issue 4), 1-130.

Medical Advisory Secretariat. (2009). Pressure ulcer prevention: an evidence-based analysis. *Ontario Health Technology Assessment Series*, *9(2*), 1-104.

Moore, Z., Cowman, S., & Conroy, R. M. (*20*11). A randomized controlled trail of repositioning, using 30 degree tilt, for prevention of pressure ulcers. *Journal of Clinical Nursing*, 20, 2633-2644.

National Pressure Ulcer Advisory Panel; European Pressure Ulcer Advisory Panel. (2009). Pressure ulcer prevention recommendations. In: Prevention and treatment of pressure ulcers: clinical practice guideline. *Washington(DC): National Pressure Ulcer Advisory Panel*, 21-50. Retrieved from www.hhs.gov

National Quality Forum. (2012). National voluntary consensus standards for developing a framework for measuring quality for prevention and management of pressure ulcers. Retrieved June 3 2013, from http://www.qualityforum.org

National pressure ulcer advisory panel support surfaces standards initiative. (2007). Retrieved from NPUAP.com

Nijs, N., Toppets, A., Defloor, T., Bernaerts, K., Milisen, K., & Van Den Berghe, G. (2008). Incidence and risk factors for pressure ulcers in the intensive care unit. *Journal of Clinical Nursing*, *18*, 1258-1266.

Ostadabbas, S., Yousefi, R., Nourani, M., Faezipour, M., Tamil, L., & Pompeo, M. Q. (2012). A resource-efficient planning for pressure ulcer prevention. *IEEE Transactions on Information Technology in Biomedicine*, *16(6)*, 1265-1273.

Ozdemir, H., & Karadag, A. (2008). Prevention of pressure ulcers: A descriptive study in 3 intensive care units in Turkey. *Journal of Wound Ostomy and Continence Nursing*, *35(3)*, 293-300.

Piper, B., & Rutliff, C. (2010). Registered Nurse Competency Based Curriculum: Pressure ulcer prevention (Based on National Pressure Ulcer Advisory Panel and European Pressure Ulcer Advisory Panel Clinical Practice Guidelines. Retrieved from https://npuap.org

Rappl, L. M. (2012). Management of pressure by therapeutic positioning. In C. Sussman, & B. Bates-Jensen (Eds.), *Wound Care: A Collaborative Practic Manual for Health Professionals* (Fourth Edition ed., pp. 278-308). Philadelphia: Wolters Kluwer/ Lippincott Williams and Wilkins.

Reddy, M., Gill, S. S., & Rochon, P. A. (2006,). Preventing pressure ulcers: A systematic review. *Journal of the American Medical Association*, *296(8)*, 974-984.

Resar, R., Griffin, F. A., & Nolan, T. W. (2012). Using care bundles to improve health care quality. Retrieved from www.IHI.org

Reto, C. S. (2003). Psychological aspects of delivering nursing care to the bariatric patient. *Ctitical Care Nursing Quarterly, 26(2),* 139-149.

Richardson, G. M., Gardner, S., & Franz, R. A. (1998). Nursing assessment: Impact on type and cost of interventions to prevent pressure ulcers. *Journal of Wound, Ostomy and Continence Nursing, 21(1),* 273-280.

Rose, M. A., Pokorny, M., & Drake, D. J. (2009). Preventing pressure ulcers in the morbidly obese: In search of an evidence base. *Bariatric Nursing and Surgical Patient Care, 4(3),* 221-226.

Schurman, J., Schoonhoven, L., Defloor, T., Van Engelshoven, I., Van Ramshorst, B., & Buskens, E. (2009). Economic evaluation of pressure ulcer care: A cost minimization analysis of preventive strategies. *Nursing Economics, 27(6),* 390-415.

Shannon, R. J., Brown, L., & Chakravarthy, D. (2012). Pressure ulcer prevention program study: a randomized, controlled prospective comparative evaluation of 2 pressure ulcer prevention strategies in nursing and rehabilitation centers. *Advances in Skin and Wound Care, 25(10),* 450-464.

Sprigle, S., & Sonenblum, S. (2011). Assessing evidence supporting redistribution of pressure for pressure ulcer prevention: A review. *Journal of Rehabilitation Research and Development, 48,* 203-214.

Still, M. D., Cross, L. C., Dunlop, M., Rencher, R., Larkins, E. R., Carpenter, D. L., ... Coopersmith, C. M. (2013). The turn team: A novel strategy for reducing pressure ulcers in the surgical intensive care unit. *Journal of the American College of Surgeons,* 373-379.

Sullivan, N., & Schoelles, K. M. (2013). Preventing in-facility pressure ulcers as a patient safety strategy: A systematic review. *Annals of Internal Medicine, 158(5),* 410-416.

Terekeci, H., Kucukardali, Y., Top, C., Onem, Y., Celik, S., & Oktenli, C. (2009). Risk assessment study of pressure ulcers in intensive care unit patients. *European Journal of Internal Medicine, 20,* 394-397.

Theou, O., Soon, Z., Filek, S., Brims, M., Leach-MacLeod, K., Binsted, G., & Jakobi, J. (2011). Changing the sheets: A new system to reduce strain during patient repositioning. *Nursing Research, 60(5),* 302-308.

Van Gaal, B. G., Schoonhoven, L., Mintjes, J. A., Borm, G. F., Hulscher, M. E., Habets, H., ... Van Achterberg, T. (2011). Fewer adverse events as a result of SAFE or SORRY? Programme in hospitals and nursing homes. Part I: Primary outcome of a cluster randomised trial. *International Journal of Nursing Studies , 48,* 1040-1048.

Vanderwee, K., Defloor, T., Beekman, D., Demarre, L., Verhaeghe, S., Van Durme, T., & Gobert, M. (2011). Assessing the adequacy of presssure ulcer prevention in hospitals: A national prevalence study. *BMJ Qual Saf, 20,* 260-267.

Vanderwee, K., Grypdonck, M. H., DeBacquer, D., & Defloor, T. (2006). Effectiveness of turning with unequal time intervals on the incidence of pressure ulcer lesions. *JAN:Original Research,* 59-68.

Vollman, K. M. (2012). Hemodynamic instability: Is it really a barrier to turning critically ill patients? *Critical Care Nurse, 32(1),* 70-75.

Voz, A., Williams, C., & Wilson, M. (2011). Who is turning the patients? A survey study. *Journal of Wound Ostomy and Continence Nursing, 38(4),* 413-418.

Appendix A: Significant Terms

1. Pressure Ulcer: A wound that is a result of tissue ischemia due to pressure.
2. Hospital (facility) Acquired Pressure Ulcer (HAPU): A pressure ulcer acquired in the hospital or facility
3. Staging: A system for pressure ulcers only that classifies wounds based upon tissue injury and viable tissue remaining
4. Eschar: Dry, black, brown leathery covering a wound that is non-viable tissue
5. Slough: Yellow, stringy covering of a wound signifying non-viable tissue
6. Braden Scale: Validated risk assessment scale for pressure ulcer development. Rates sensory perception, moisture, activity, mobility, nutrition, friction and shear. Mild risk-score of 15-18; moderate risk-score 13-14; high risk-score of 10-12; very high risk-score of 9 and below
7. Norton Scale: Validated risk assessment scale for pressure ulcer development. Rates physical condition, mental condition, activity, mobility and incontinence. Score 14-mild risk; score 13-moderate risk; score of 12 or below-high risk
8. National Pressure Ulcer Advisory Panel (NPUAP)- The National Pressure Ulcer Advisory Panel (NPUAP) is an independent not-for-profit professional organization dedicated to the prevention and management of pressure ulcers
9. Obesity: Defined as a BMI $\geq$ 30
10. Viscoelastic surface: Alternative to standard foam provides a surface that will contour to patient and redistribute pressure
11. Alternating Pressure Surface: surface of air sacs that inflate and deflate sequentially and redistribute pressure
12. Low Air Loss Surface: surface of air sacs in which warmed air passes to redistribute pressure

13. Never Event: Events defined by CMS as those that should never occur. These events can result in financial penalty and can jeopardize Medicare certification.
14. Event-Based Repositioning: a strategy for repositioning the patient based upon defined and predictable nurse-patient interactions
15. Clock-based Repositioning: a strategy for repositioning the patient based upon time of day
16. Therapeutic Positioning: repositioning designed to promote maintenance of normal function or correction of abnormal function

Appendix B: Protocol Implemented

ST. LUKE'S®

Procedure	
Title:	**Event-Based Therapeutic Repositioning Procedure**
Maintained By:	Manager, ICU
Reviewed By:	Director, Inpatient Operation
Approved By:	Interim Chief Nursing Officer
Effective Date:	February 2014
Next Review Date:	February 2016

REVISION SUMMARY

Date	Referenced Section(s)	Change
February 2014	All	New

SCOPE

Applicable to: St. Luke's Hospital at The Vintage

Department(s): Intensive Care Unit (ICU)

PROCEDURES

1. The Event-Based Therapeutic Repositioning ("ETR") procedure applies to all ICU patients except those who need to be excluded due to serious hemodynamic instability.
   a. For excluded patients, a consultation should be made to the Wound Care specialist for escalated skin prevention strategies.
   b. For patients admitted with pressure ulcers, physician orders should be followed and the Wound Care specialist should be consulted at admission.

2. Skin Assessment
   a. All patients will have a complete skin assessment (front, back, heels, ears and nose) every shift.
   b. If powered bed is being used, assessment includes verification of proper settings (as per manufacturer's recommendations) and validation that patient is not 'bottoming out' on chosen surface.

c. Any assessment findings considered abnormal will be documented in the nursing documentation.
d. New onset pressure ulcers will require a consult to Wound Care specialist.

3. Event-based Repositioning

a. All patients will be repositioned at designated nurse-patient scheduled interactions. The repositioning interval shall not exceed three (3) hours. These scheduled interactions will be:

TRIGGER	**INTERVAL**
Day Shift	
Bedside Report	0700 – 0730
Hygiene/Breakfast/AM medication pass	0930 – 1030
Lunch (Reassessment Time)	1200 – 1300
Afternoon Reassessment	1500 – 1600
Night Shift	
Bedside Report	1900 – 1930
PM medication pass/PM care (Reassessment Time)	2130 – 2230
Second Shift Reassessment	0030 – 0130
Third Shift Reassessment	0330 – 0430

b. The nurse will evaluate tolerance of positions by observation for changes in vital signs, oxygenation, and/or patient's subjective complaint(s) of pain.

4. Therapeutic Positioning

a. Patients will alternate between side-lying and supine positions.
b. When side-lying position is used:
    i. Patients will be placed at a 30-degree tilt by use of a wedge or pillow(s)
    ii. Care will be taken to free sacral and coccyx area of any pressure
    iii. A pillow to maintain shoulder level will support the upper arm
    iv. The upper knee and hip will be slightly flexed and the upper leg supported with a wedge or pillow
c. When supine position is used:
    i. Head of bed will not be higher than 30 degrees (if possible)
    ii. Knees and hips will be flexed by elevating bed at knee location
    iii. Arms should be supported by pillows and dependency avoided
d. Heels

i. Float heels at all times regardless of pressure relieving surface
ii. If heel protectors are used, they must be removed completely for assessment every shift as part of the skin assessment.

e. Lift sheets will be used to assist in repositioning
f. Each activity, such as mobilization in the chair or by ambulation (either by Nursing or Rehab), will serve as one episode of repositioning.

5. Pressure Relieving Surfaces

a. All patients admitted with intact skin (no pressure ulcers) will be placed on a pressure-relieving surface.
b. Bed padding will be kept to a minimum so that pressure-relieving surfaces are effective.

6. Obese/Bariatric Patients (BMI $\geq$ 30)

a. Friction reducing lift sheet and wedges will be used (based on manufacturer's guidelines).
b. Patients will be placed in bariatric bed with pressure relieving mattress/overlay, as required.

Appendix C: Project Time Line

Phase 0: Finalize Protocol

Objective:

- Convert protocol template into EBP repositioning protocol to be implemented

Method:

- Based upon evidence provided, hospital project coordinators will develop a finalized skin preservation bundle that will be introduced to ICU staff. Final Protocol will be included in project proposal.

Time Frame:

- Completed by October 10

Phase 1: Establish Baseline HAPU and Compliance Rate

Objective: Establish baseline HAPU (Stage I-IV and SDI) Establish baseline compliance rate with every 2 hour repositioning (current practice) Establish baseline rates in obese patients for HAPU rates and repositioning compliance as a subset of the overall data Establish rate of proper use of pressure relieving surface, therapeutic repositioning and accuracy of documentation

Method

- Data collector nurse will assess a series of 20 patients admitted with intact skin to the ICU and will re-evaluate the same patients at the time of discharge from the ICU. DNP student will serve as project consultant to ensure consistency of assessments.
- Data collector nurse will perform 6 observations of 5 patients within intervals that would require 2 patient repositionings. This will provide a total of 60

observations. These observations will include both day and night shifts. During these observations, pressure relief, therapeutic nature of repositioning and documentation will also be assessed.

- Minimum of weekly calls with DNP student

Time Frame:

- 20 patient observations completed (hope to complete in 3 weeks after beginning observations)

Phase 2: Introduction and Learning Phase

Objectives:

- Consistency and agreement of data and data collection
- Completion of staff education to include EBP practice change, proper use of pressure relieving feature of beds, use of TAP
- Complete a coaching and monitoring phase before outcomes are evaluated

Methods:

- DNP student will review evidence-based education with on-site project coordinators.
- Project coordinators and product specialists will complete education of nursing staff. Classes will be provided on day and night shift.
- A 2-week coaching and learning period will be provided for nurses by on-site coordinator. These will include 6 sessions of direct observations of nurse knowledge, compliance and documentation. Nurses will be coached about EBP practice change.
- Minimum of weekly calls with DNP student

Time Frame

- 1 week of staff education followed by 2 weeks of coaching

Phase 3: Study Phase

Objectives

- Collect data after EBP change related to HAPU rate and protocol compliance

Method

- Data collector nurse will assess a series of 20 patients admitted with intact skin to the ICU and will re-evaluate the same patients at the time of discharge from the ICU.
- Data collector nurse will perform 6 observations of 5 patients within intervals that would require 2 patient repositionings. This will provide a total of 60 observations. These observations will include both day and night shifts. During these observations, pressure relief, therapeutic nature of repositioning and documentation will also be assessed.
    - Minimum of weekly calls with DNP student

Phase 4: Data Analysis

Objectives:

- Analyze HAPU data pre and post EBP change
- Analyze protocol compliance data pre and post EBP change
- Analyze staff input and outcomes for decision to maintain EBP protocol, modify or return to previous repositioning protocol
- Disseminate results and recommendations to hospital leaders and ICU staff
- Complete written requirements for project

- Defend project

Methods

- Data will be analyzed using simple descriptive statistics to determine impact of EBP change.
- DNP student will present and discuss with project coordinators and determine an effective method to share with staff
- DNP student will complete written project requirements and orally present and defend project

Time Frame

- All completed by the end of April

Table 1

Staging of Pressure Ulcers

Stage	Description
Stage 1	Intact skin with non-blanchable erythema
Stage II	Partial thickness loss of dermis presenting as a shallow, open ulcer with red-pink wound bed, without slough
Stage III	Full thickness tissue loss, subcutaneous fat may be exposed but bone, muscle and tendon are not exposed. Slough may be present but does not obscure the depth
Stage IV	Full thickness with exposed bone, tendon or muscle. Slough and eschar may be present in some areas of the wound bed.
Unstageable	Depth is obscured by slough and eschar
Suspected Deep Tissue Injury	Pressure injury with a bruised appearance that may evolve into tissue loss

Note. NPUAP Guidelines

Table 2

Patient Data Collection Tool

Patient Number	Principle Dx	Age	Sex	BMI	Ventilator	Skin status admission	Skin status discharge

Note. All patient data will be de-identified

Table 3

Compliance Observations and Staff Input

Date/time	R. Timing	R. Technique	Bed	TAP	Documentation
Staff Input					

Note: R. Timing is reposition timing; R. Technique is reposition technique

Table 4

Nursing Staff Education Outline

Topic	Objective	Content
Definition of Pressure Ulcers	State basic pathophysiology as an ischemic injury leading to wounding	Basic pathophysiology with emphasis on irreversible ischemia. Discuss Time-Pressure-Friction-Shear-Moisture
Attitude and Empathy	Discuss impact of nurse attitude on success of pressure ulcer reduction efforts	Use Hopkins: Patient Stories of Living with Pressure Ulcers and Beeckman articles of impact of attitude
Risk Factors	Name and discuss three risk factors unique to the critical care population	Briefly discuss Braden and Norton Scales but emphasize unique risk of ICU patients
Protocol Review	Able to execute protocol at time of implementation	Review in detail-both why and how of the protocol
Documentation/Legal/Regulatory Issues	Explain HAPU as "never event"	Brief discussion

Note. Based in part on 2010 NPUAP Registered Nurse Competency-based Curriculum: Pressure Ulcer Prevention

Table 5

Age Comparison of Normal Care and EBT Groups

Age bracket	Normal care	EBT Group
30-39	3	0
40-49	2	1
50-59	7	0
60-69	4	1
70-79	1	3
80-89	3	3
Mean age	58.6	72.7

Table 6

Comparison of Complexity between Normal Care and EBT Groups

Group	+BMI	+Ventilator	+BMI + Ventilator + O_2 issue	+BMI + Ventilator O_2 issue Age > 70
Normal care	6/20, 30%	13/20, 65 %	4/13, 30.7 %	0
EBT	7/8, 88 %	7/8, 88 %	6/8, 75 %	5/8, 62.5 %

Table 7

HAPU Occurrence

Schedule	# of patients	HAPU
Q 2 HT	20	0
EBT	8	0

Note: Q 2 H T means turning the patient every two hours; EBT means event based turning

Table 8

Results of Compliance with Turning Schedule

Schedule	# of observations	Compliant	% Compliant
Q 2 H T	92	32/92	34.7 %
EBT	51	43/51	84.3 %

Note: Q 2 H T means turning the patient every two hours; EBT means event based turning

Table 9

Compliance with Five Items of Quality of the Turn

Schedule	# of observations	5/5	4/5	3/5	2/5	1/5	0/5
Q 2 H T	34	14/34	9/34	8/34	3/34	0/34	0/34
EBT	51	32/51	17/51	2/51	0/51	0/51	0/51

Note: Q 2 H T means turning the patient every two hours; EBT means event based turning

Table 10

Percent Compliance with Five Quality Items of the Turn

Schedule	# of observations	5/5	4/5	3/5	2/5	1/5	0/5
Q 2 HT	34	41 %	26 %	24 %	9 %	0 %	0 %
EBT	51	63 %	33 %	3 %	0 %	0 %	0 %

Note: Q 2 H T means turning the patient every two hours; EBT means event based turning

Table 11

Items not Completed in Quality of Turn

Schedule	HOB	Angle	Pillows	Heels	Alignment
Q 2 H T	3	4	6	11	8
EBT	10	0	2	9	0

Note: Q 2 H T means turning the patient every two hours; EBT means event based turning

Figure 1: Iowa Model