2021

Decreasing Pressure Injuries With Early Mitigation Strategies for the Elderly in the Intensive Care Unit

Janet L. Wilson

Walden University

College of Nursing

This is to certify that the doctoral study by

Janet Lorraine Wilson

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Patricia Senk, Committee Chairperson, Nursing Faculty
Dr. Geri Schmotzer, Committee Member, Nursing Faculty
Dr. Patricia Schweickert, University Reviewer, Nursing Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2021

Abstract

Decreasing Pressure Injuries With Early Mitigation Strategies for the Elderly in the Intensive Care Unit

by

Janet L. Wilson

MSN, Wichita State University, 1991

BSN, Wichita State University, 1981

Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

May 2021

Abstract

Healthcare acquired pressure injuries (HAPIs) are a serious and debilitating condition in the elderly, and it is therefore critical to reduce the incidence of HAPIs. Mitigation strategies are often implemented for patients who score in the highest risk categories on the Braden Scale for Predicting Pressure Sore Risk©. Yet, the evidence suggests vulnerable older adults who score in the midrange of the Braden Scale, and specifically, the mobility subscale, develop HAPI more frequently. The review question centered on the evaluation of the current evidence for early mitigation strategies in response to Braden Scale midrange mobility subscale scores. The gap addressed was the frequent oversight of mitigation strategies for vulnerable older adults that score in the midrange of the Braden Scale mobility subscale. The Stevens Star Model of Knowledge guided the development of this systematic review. A Preferred Reporting Items for Systematic Reviews and Meta-Analysis flow diagram was used to identify eligible articles. Melnyk and Fineout-Overholt's levels of evidence and critical appraisal of the evidence guided assessment of evidence. There were 21 full text articles assessed for eligibility; 2 studies reviewed the Braden Scale mobility subscale's predictive capability. The results of this systematic review failed to show adequate evidence to suggest the mobility subscale as a reliable, independent pressure injury risk assessment tool. Nonetheless, the mobility subscale score presents opportunity to further evaluate implementation of mitigation strategies to decrease HAPI, decrease cost to the healthcare system, and promote social change with improvement in skin integrity in elderly patients.

Decreasing Pressure Injuries With Early Mitigation Strategies for the Elderly in the Intensive Care Unit

by

Janet L. Wilson

MSN, Wichita State University, 1991

BSN, Wichita State University, 1981

Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

May 2021

Acknowledgments

I am truly thankful to my Lord and Savior Jesus Christ for His grace and new mercies every day. Additionally, I thank my past and current committee chairs Drs. Rosaline Olade and Dr. Patricia Senk respectively for their expert guidance and mentorship throughout this process. I am also appreciative of my committee members Dr. Geri Schmotzer, Methods Expert and Dr. Patty Schweickert, University Research Reviewer, and editor Mr. Steve Lehman for their support and input. Lastly, family was vital to the ongoing pursuit of this educational goal and I am very thankful for their encouragement and tolerance throughout this journey.

Table of Contents

List of Figures

Section 1: Nature of the Project

Introduction

Hospital-acquired conditions (HACs) are medical errors also known as never or serious reportable events. As a secondary diagnosis, HACs are a consequence of the healthcare delivery system that is ordinarily responsive to evidence-based practice (Centers for Medicare and Medicaid Services [CMS], 2018; Agency for Healthcare Research and Quality [AHRQ], 2019). HACs increase the cost of healthcare, increase the length of stay, cause unnecessary suffering and pain, represent a patient safety issue, and serve as a reflection of the quality of care provided by an organization (The Joint Commission [TJC], 2016). According to the Institute of Medicine's (IOM) ground-breaking report, HACs are responsible for almost 100,000 deaths and over $9 billion in annual excess spending (Kohn et al., 2000). When practice is guided by evidence, the efficacy of health care is improved, and the occurrence and burden of HACs is diminished.

Many factors affect the quality of health care delivery**.** According to Porter (2018), in healthcare, quality represents the total patient experience. It is the care provided, the patient's perception of the care, and the objective data obtained through the measurement of indicators reflective of care (Porter, 2018). Healthcare acquired pressure injuries (HAPIs) as an HAC is an outcome indicator influenced by nursing and the entire healthcare team (TJC, 2016). Unwarranted HAPIs are representative of poor quality, increased morbidity, mortality, length of stays, and cost, and cause pain (American Nurses Association, n.d.; Ballard et al., 2014; TJC, 2016).

With the introduction of a value-based prospective payment system, efforts to reduce HACs intensified. High cost or high volume HACs that led to the assignment of a diagnostic related group were required to be identified by section 5001(c) of the Deficit Reduction Act of 2005 (Acquaviva & Johnson, 2014). Furthermore, the Deficit Reduction Act of 2005 provided for the withholding of payments or reimbursement for the cost of care incurred from preventable HACs (Acquaviva & Johnson, 2014; CMS, 2018). HAPIs, as of 2015, are identified as one of the 14 categories of HACs that may impact third-party healthcare reimbursements (CMS, 2018).

HAPIs inherently represent a threat to the achievement of the Institute of Healthcare Improvement's Triple Aim (2019). This project provides evidence for consideration to positively influence social change through improved outcomes, better patient experiences, and less costly care.

Problem Statement

Aging brings with it chronic disease processes and a multitude of other age-related concerns that contribute to the vulnerability of the elderly. Over one-half of the over 65 age group is reported to have at least two chronic disease processes that increase their risk for hospitalization (Office of Disease Prevention and Health Promotion, 2019). Furthermore, Colby and Ortman (2014) stated that the number of older adults is expected to rise. In fact, the over 65 age group will almost double over the next 30 years (Colby & Ortman, 2014). The anticipated medical complexities for this growing group of citizens potentiates the risk for HAPI and amplifies the need to introduce best practices for effective predictive measures to decrease that risk (He et al., 2016).

HAPIs contribute to the high cost of care associated with the United States healthcare delivery system. HAPIs increase the cost of healthcare by over $43,000 per hospitalization, and as the second most litigated claim, the legal system further complicates the economic burden of HAPIs (AHRQ, 2014). Moreover, according to the AHRQ (2014), in the United States, pressure injuries affect over 2 million individuals annually and cause almost 60,000 deaths.

As an indicator of quality with fiscal ramifications, early mitigation strategies to prevent the development of HAPIs is a viable intervention for all healthcare settings with vulnerable adults. According to the AHRQ (2018), between 2014 and 2016 there were improvements in many HACs. However, not identified as improved were pressure injuries. With the associated cost and pain of pressure injuries, one avoidable pressure injury is one too many.

Although not solely responsible, HAPIs are identified as highly sensitive to nursing practice (American Nurses Association, 2018). Studies showed that the Braden Scale (Appendix A), with its six subscales, is an effective assessment tool to determine risk for HAPIs (Mordiffi et al., 2011). Moreover, the mobility subscale has been shown to have an increased affinity for the identification of risk and may predict HAPIs before the cumulative Braden Scale score (Alderden et al., 2017; Gadd & Morris, 2014; Sardo et al., 2018; Tescher et al., 2012). As a process indicator of quality, a systematic review of the evidence that looks at the predictive nature of subscale scores is significant to nursing practice and clinical decision-making for the reduction of HAPIs.

Nature of the Doctoral Project

I conducted a systematic review of the evidence to introduce the concept of midrange scores and particularly the mobility subscale score for consideration as a strategy to mitigate the risk for HAPIs at the point of clinical decision-making. The purpose of the systematic review was to present an unbiased analysis of the available research and provide the best evidence for clinical decision-making (Walden University, 2017, p.4).

Evidence-based practice calls upon the best available evidence in response to clinical practice questions or for clinical decision-making. Systematic reviews are considered a source of high-quality evidence. A review of existing evidence is presented in a summarized and appraised format facilitating the translation of evidence for evidence-based practice. This project is designed to collect, consolidate, summarize, and evaluate evidence that looks at the feasibility of integrating deliberate mitigation strategies in response to midrange Braden Risk Assessment mobility subscale scores.

A systematic literature review is comprehensive. The search is based on clear objectives with a method that is reproducible and designed to maximize findings. Further, the review is systematically presented and synthesized, with an assessment of validity (Walden University, 2017, p. 3). Because the nature of a systematic review includes the capability of reproducibility, the literature search is confined to conventional sources and includes the online databases such as CINAHL, MEDLINE, ProQuest, and PubMed that are available through the Walden University Library.

I conducted the search using the various taxonomies associated with pressure injuries, along with mitigation and risk assessments related to HAPIs. Additionally, I reviewed references made available through various published materials. All credible means to access relevant literature was required to obtain and synthesize the best possible evidence for this project to better support evidence-based practice. Inclusion criteria included adults 65 years old and older in the ICU, use of the Braden Scale for risk assessment with subscale scores provided, and full-text articles in English. I excluded articles that did not capture the inclusion criteria.

To minimize the potential for bias, a defined process for the literature review is necessary for validity and to strengthen the systematic review. The process should be transparent, promote accuracy, and diminish the risk of bias (Cochrane Collaboration, 2011; Grove, 2017). Data collection tools provide a standardized format to consistently summarize key data elements specific to the search strategy and review process, which may facilitate replication efforts (Cochrane Collaboration, 2011). Joanna Briggs Institute tools served as the foundation for data collection (Appendix B) and appraisal (Appendix C) to capture the specific intent of this systematic review and comply with methodical standards (Cochrane Airways, n.d.).

Moreover, in addition to the data collection tool, the inclusion of a study flow-diagram to detail the data extraction process is recommended by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement (Cochrane Collaboration, 2011; Moher et al., 2009). I used Melnyk and Fineout-Overholt's (2011) levels of evidence to determine the hierarchy of the articles selected. It is this disciplined

process that establishes the systematic review as credible and as a high level of evidence in the hierarchy of evidence. Through the detailed precision indicative of a systematic review, relevant evidence is made available for consideration to connect the gap between science and application at the bedside.

Significance

According to Alderden et al. (2017), elderly patients admitted to the ICU are more likely than others to develop pressure injuries. Additionally, age-related changes, nutritional status, immobility, poor physiologic reserve, and other debilitating conditions associated with the ICU contribute to the increased vulnerability of the elderly for HAPIs (Hardin, 2015). As the population continues to age, it is advantageous for the healthcare system and governmental agencies to investigate and implement preventive interventions based on evidence (CMS, 2018).

In the classic reports *To Err is Human* and *Crossing the Quality Chasm*, the IOM declared the need for transformation of the healthcare system and the provision of care steeped in evidence (Kohn et al., 2000; IOM, 2001). Moreover, CMS (2018), asserted that HAPIs are reasonably preventable with evidence-based guidelines, but VanGilder et al. (2017) noted that despite the progress made in the number of reported pressure injuries, HAPIs remain a clinical practice problem.

A risk assessment and the recognition of factors that contribute to their development is the first step of HAPI prevention. Moreover, the evaluation of evidence shows use of the mobility subscale as a predictor may impact patient outcomes and the prevalence of HAPIs. The mobility subscale assesses the degree of clinical risk for

pressure injury based on the inability to change, maintain, and/or control body position (Miller et al., 2020). Although for many years the Braden Scale has been used as a risk assessment tool, more recent studies suggest that the clinical assessment provided by the mobility subscale may offer an advanced opportunity to introduce interventions to reduce the incidence of pressure injury characteristic of the complications of immobility (Tescher et al., 2012; Gadd & Morris, 2014; Alderden et al., 2017; Sardo et al., 2018).

Despite the availability of evidence-based guidelines, HAPIs continue to develop across the continuum of healthcare. Although some organizations reported improvements in HAPIs, according to AHRQ (2018), global improvements were not seen. In fact, in many organizations, the quality indicator for HAPIs now represents the belief that HAPI can be prevented and changed from a decrease in the rate of development to an expectation of zero incidents (Stotts et al., 2013). Moreover, with the systematic review of mitigation strategies linked to the Braden mobility subscale score, this doctoral project will potentially contribute to further improvement in nursing practice and the risk assessment process.

Risk assessments are paramount to any prevention program, and this concept is no different for the prevention of pressure injuries. HAPIs are not isolated to the elderly or the ICU. Therefore, the results of this systematic review, although focused on the elderly**,** can potentially have widespread application to other healthcare settings that provide care to those with limited mobility.

The risk associated with the development of HAPIs remains a concern for the healthcare community. Implications of this project for positive social change is the

introduction of evidence for consideration of the mobility subscale at the point of clinical decision-making. This systematic review provides an opportunity to implement mitigation strategies earlier in response to the mobility subscale score and the patient condition to decrease the prevalence and financial burden of HAPIs on the healthcare system.

Summary

HAPIs are targets for many healthcare organizations and quality improvement programs. In addition to an undesired clinical outcome, HAPIs present an economic burden to the healthcare industry. Elderly adults in the intensive care unit are especially vulnerable to the development of HAPIs and typically have prevention plans implemented according to the Braden Scale total score. However, more recent evidence suggested that the Braden mobility subscale score may warrant special consideration for pressure injury mitigation strategies. As the elderly population increases exponentially, new strategies designed to reduce the occurrence of HAPIs bring value to the healthcare system. This systematic review presents a compilation of the evidence that looks at the feasibility of mitigation strategies in response to the mobility subscale.

Section 2 provides an overview of the framework from which this project stems. Also presented are the most relevant concepts and terms and the relationship of the issue to nursing practice. Lastly, I review my role as the DNP student and the role of the project team.

Section 2: Background and Context

Introduction

The elderly population and the intensive care environment bring unique complexities to consider in the overall pressure injury risk assessment process. The practice-focused review question for this project was:

> PFQ: What is the current evidence for early mitigation strategies in response to moderate to high-risk mobility subscale scores for ICU patients age 65 or older in the development of pressure injuries?

The purpose of this study was to provide a systematic review that evaluated current evidence and the practicability of mitigation strategies in response to moderate to high-risk mobility subscale scores in the development of pressure injuries. It is common practice to use a risk assessment tool to identify those most prone to the development of pressure injuries (PI). Traditionally, the total Braden Risk Assessment Scale is used to guide clinical practice and intervention choices to mitigate the risk for the development of PI. However, limited evidence suggests that the efficacy of mitigation strategies may be more beneficial with consideration of subscale scores (Tescher et al., 2012; Gadd & Morris, 2014; Alderden et al., 2017; Sardo et al., 2018).

To stimulate the use of evidence for clinical decisions, it must be accessible and in a format that promotes usability. According to White et al., (2016), evidence may take years to reach the clinician to support the delivery of high-quality care. A transformed healthcare delivery system requires that evidence is available to guide practice. Evidence-based models are tools that facilitate the translation of knowledge for applicability in

clinical practice (White et al., 2016). Stevens Star Model of Knowledge Transformation provided the umbrella for the direction of this systematic review (Stevens, 2013).

The Star Model

I used the Stevens Star Model of Knowledge Transformation (Star Model) developed by Stevens (2013) at the University of Texas Health Science Center San Antonio as the overall guiding model and approach for the development of this systematic review. The Star Model is based on the proposition that from its availability to application at the bedside, for evidence-based clinical decisions existing research forms the basis for the transformation of knowledge (Stevens, 2013). According to Stevens, the five-point Star Model demonstrates the relationship between stages of the cyclic knowledge transformation process that leads to evidence-based practice (see Figure 1).

The discovery stage represents the identification of new knowledge (Stevens, 2013). Discovery for the purpose of this project was the identification of evidence suggesting midrange subscale scores may be sensitive and predictive of pressure injuries. Synthesized and evaluated evidence forms the basis for the summary of the evidence stage. It is the summary of evidence that serves as a useful tool for the translation of evidence to practice stage. Translation of evidence represents the transformation of science to a format conducive to support clinical recommendations and decisions at the point of care. Integration involves the implementation of care processes that represent the best evidence from scientifically sound sources. Evaluation as part of the cycle validates the characteristics of health care outcomes with the patient experience.

The nature of the systematic review represents the compilation of synthesized evidence and is reflective of the summation of evidence stage of the model; as such, it was the primary point of focus for this project. However, collectively, the interrelated five stages encompass the process for knowledge transformation and the application of scientifically sound recommendations (Stevens, 2013).

Figure 1

Stevens Star Model of Knowledge Transformation

Note. From "The Impact of Evidence-Based Practice in Nursing and the Next Big Ideas" by K. R. Stevens, [Manuscript 4]. *Online Journal of Issues in Nursing, 18(*2). (https://doi.org/10.3912/OJIN.Vol18No02Man04). Copyright 2015 by Kathleen R. Stevens. Reprinted with permission.

Terminology

The most significant terms used center on pressure injuries and the Braden Risk Assessment Scale. In June 2016, the National Pressure Ulcer Advisory Panel (NPUAP) announced that the term *pressure injury* replaced the vernacular pressure ulcer. Pressure injury was adopted to more accurately reflect the physiologic changes across the spectrum of injuries caused by pressure and to decrease confusion associated with the reference of ulcer to intact skin (NPUAP, 2016).

In the literature, pressure ulcer, bedsore, and decubitus ulcer interchangeably describe pressure injuries. I used the term pressure injury for this project to encompass each term regardless of how it is referenced in the source literature.

Relevant Terms

Pressure injury: Localized damage to the skin or underlying soft tissue that is usually located over a bony prominence or related to a medical or other device. The skin may be intact or open. Pressure injuries are often the result of intense or prolonged pressure or pressure in combination with shear (NPUAP, 2016, p. 1).

Furthermore, the NPUAP (2016) stage pressure injuries according to the severity of the injury and the degree of physiologic change. Pressure injuries range from Stage 1 to Stage 4. Both unstageable and deep tissue injuries are also components of the staging nomenclature characterized as pressure injuries in which insufficient visibility of the wound bed prevents staging or the extent of injury is not yet determined, respectively.

Braden Scale for Predicting Pressure Sore Risk (Braden Scale). The Braden Scale developed by B. Braden and N. Bergstrom has six subordinate subscales that predict the

probability of pressure injury development and assist with clinical decision-making at the bedside (AHRQ, 2014). A summation of the six subscales forms the cumulative total Braden Scale score. Scores range from 6 to 23 with lower scores indicating a higher risk for the development of pressure injuries (Bergstrom et al., 1987). A score of less than 18 is suggestive of risk (AHRQ, 2014). Further risk stratification categories are shown below with the representative total Braden Scale score of each:

- Severe-total cumulative Braden Scale score is 9 or less;
- High-total score ranges from 10 to 12;
- Moderate-total score ranges from 13 to 14;
- Mild-total score ranges from 15 to 18; and
- Midrange, which though not a specified Braden category as are the previous four, encompasses a collection of scores from both the high and moderate categories or a subscale score of 2 (Alderden et al., 2017).

Each of the six subscales contributes to the total Braden score with an assessment of a specific risk factor known to increase the development of pressure injuries. Three subscales, sensory perception, activity level, and mobility, are sensitive to the mechanics of pressure while the remaining three scales, moisture, nutritional status, and friction shear, reflect the condition of the skin and tolerance (Miller et al., 2020). Except for the friction shear subscale, which is scored from one to three, each of the other five subscales score from one to four (Bergstrom et al., 1987; Moore & Patton et al., 2019).

Relevance to Nursing Practice

The gap addressed with this project was the consideration of mitigation strategies for vulnerable older adults in the ICU and score in the midrange of the Braden Scale and specifically the mobility subscale. This systematic review places succinct evidence at the bedside to guide evidence-based practice in response to on-going pressure injury risk reduction assessments and strategies.

Pressure injuries are an indicator of both healthcare quality and patient safety. They prolong the length of stays, increase the cost of healthcare, and impact an organization's fiscal well-being with risk to third-party reimbursements coupled with expensive treatment costs (Acquaviva & Johnson, 2014; TJC, 2016). Although TJC (2016) acknowledged that pressure injuries are not solely reliant on nursing care, pressure injuries are still recognized globally as a nurse-sensitive indicator of quality. Mitigation strategies are frequently implemented for those patients who score in the highest risk categories on the total Braden Scale. However, there is evidence that those patients who score in the midrange of both the cumulative and subscale scores had the highest incidence of HAPI development than those in the severe risk category (Alderden et al., 2017).

The Braden mobility subscale is one of six subscales that collectively compose the Braden Scale. It is scored 1 through 4 according to the level of capability to self-manage and control body positioning and includes the following descriptors: completely immobile, very limited, slightly limited, or no limitations (Miller et al., 2020; Mordiffi et al., 2011).

The completion of risk assessments to help guide actions to reduce the probability of HAPIs are a common component of nursing practice in the ICU. The degree of immobility influences the extent of risk for the development of pressure injuries. As a widely accepted risk factor for the development of pressure injuries, in addition to the Braden scale, mobility serves as a variable for multiple other risk assessment tools (Moore & Patton, 2019; Mordiffi et al., 2011). Additionally, studies found a positive correlation between mobility and the preservation of healthy skin, further suggesting the heightened value of the mobility subscale for risk assessment and clinical decision-making (Mordiffi et al., 2011). The evidence provided though this systematic review offers insight for the consideration of strategies to compensate for the increased risks posed by immobility before traditionally triggered.

Local Background and Context

Pressure injuries presented an ongoing challenge for the organization. The corporate skin and wound management program provided evidenced-based assessment guidelines and parameters to deploy risk reduction strategies. Yet, quality management data elements showed the rate of injury exceeded the expected range and triggered a mandate for a focused effort to reduce the occurrence.

Despite the availability of evidence-based guidelines, HAPIs continued to pose problems for the critically ill. The complexity of treatment plans characteristic of the ICU and individuals with little physiologic reserve decrease the ability to manage and control body position or readjust in response to pressure-induced stimuli (Hardin, 2015). Immobility, a consequence of the vulnerable and critically ill, places the older adult at

increased risk for pressure injuries (Alderden et al., 2017; He et al., 2016). The ongoing burden of HAPIs strengthened the value of the evidence presented in the form of this systematic review.

Risk assessments coupled with clinical judgment and implementation of preventive measures can prevent HAPIs (AHRQ, 2014). As the United States healthcare industry is forced to evaluate operations, transform, and become value-driven, poor outcomes such as HAPIs became an indicator of poor quality and safety (TJC, 2016; CMS, 2018). Moreover, as a never-event, payment to healthcare organizations from federal and other third-party payment sources became threatened (AHRQ, 2019). Additionally, as a reported measurement of quality and safety, organizations are at-risk for public scrutiny, loss of market share, and further impact on financial well-being and viability (Acquaviva & Johnson, 2014; CMS, 2018).

Role of the Doctor of Nursing Practice Student

Both the professional and consumer of healthcare are devastated by the development of HAPIs. The IOM's *To Err is Human* is the milestone report that provided the catalyst for change and patient safety (Kohn, Corrigan, & Donaldson, 2000). Moreover, *Crossing the Quality Chasm,* the IOM's follow-on report suggested that clinical decision-making rooted in evidence produced outcomes reflective of the six dimensions of quality (IOM, 2001). As the DNP student, I initiated this systematic review to serve as evidence for consideration and clinical decision-making at the bedside. In consultation with the project team, the project was developed and implemented consistent with academic and professional guidelines.

There is a reason for concern when the anticipated clinical course, coupled with nursing judgment, leads to a less than optimal outcome. This systematic review explored current evidence for mitigation strategies in response to moderate- to high-risk mobility subscale scores in the development of pressure injuries. Patient-centered care strategies supported by evidence lead to experiences that model the IOM's dimensions of quality.

Bias, when minimized, strengthens the validity of a systematic review (Grove, 2017). The documented process that clearly defined the systematic review elements, including the search strategy, inclusion criteria, and appraisal, minimized my inadvertent introduction of bias into the project.

Role of the Project Team

This systematic review represented a high level of evidence for the mitigation of HAPI risk. The project team was paramount to the process and provided expert guidance on subject matter and structure. The primary faculty mentor served as the project chair. The project chair with the project team validated the rigorous application and the demonstrated skills reflective of the DNP Essentials (AACN, 2006). Each project team member and their collective expertise offered insight for a well informed and cohesive document that met or exceeded academic and process standards.

Summary

Guidelines for preventing HAPIs are plentiful yet pressure injuries continue to present challenges to the healthcare team. The Braden Scale is a standard tool used to predict the risk for the development of pressure injuries. However, limited research suggested that the subordinate mobility subscale presented an opportunity for earlier

prevention strategies. The Star Model provided the framework to support the systematic review that looked at this phenomenon. Point two of the model, the summary of evidence, is the foundation for this systematic review. Section 3 presents the sources of evidence for the exploration of the practice-focused review question, the plan for data collection, and the analysis of evidence.

Section 3: Collection and Analysis of Evidence

Introduction

Efforts to alleviate HAPIs remain relevant for the healthcare industry. HAPIs are a clinical practice problem that represent poor quality and a financial burden for healthcare facilities (TJC, 2016). Pain, prolonged hospitalizations, and decreased patient satisfaction stem from HAPIs. Through the synthesis of evidence that evaluates the mobility subscale and the implications of midrange scores, this project addressed the gap that exists between the available knowledge and clinical decisions to enrich HAPI mitigation strategies.

Healthcare reform and the Deficit Reduction Act of 2005 mandate that healthcare delivery systems reevaluate the business and practice of healthcare (Acquaviva & Johnson, 2014). Interventions grounded in evidence improve outcomes, decrease costs, and contribute to the transformation of healthcare. The growing elderly population with the anticipated consumption of healthcare resources suggests the need for interventions based on evidence. More pointedly, age-related changes with other debilitating conditions increase the vulnerability for the development of HAPIs in elderly patients (Alderden et al., 2017; Hardin, 2015).

This section presents the general methodology related to the collection and analysis of the mobility subscale evidence and its relationship to the elderly and HAPI. Also included is the search strategy with key terms and the plan for data collection, analysis, and organization.

The Review Question

As the aging population continues to grow and to rapidly become the largest consumer of healthcare resources, the complexities of chronic health conditions and other vulnerabilities bring increased risks for the development of HAPI. HAPI with evidence-based practice is a largely avoidable healthcare-acquired condition, yet there was no significant progress made during the 2014-2016 reporting cycles in reducing HAPIs (AHRQ, 2018). Alderden et al. (2017), found in their study that more HAPIs developed in patients who scored in the Braden Scale moderate and high-risk ranges than those who scored in the severe risk category. The gap to be addressed with this project was the potential oversight of mitigation strategies based on the sensitive parameters of the Braden mobility subscale. The practice-focused review question was:

> PFQ: What is the current evidence for early mitigation strategies in response to moderate to high-risk mobility subscale scores for ICU patients age 65 or older in the development of pressure injuries?

Evidence-based practice is pivotal to the patient experience and optimal outcomes and ultimately forms the basis for the alignment of this project and purpose. The review question for this systematic review centered on the evaluation of evidence regarding pressure injury mitigation strategies with midrange mobility subscale risk assessment scores. Although the systematic review does not indicate treatment options, it may provide support for clinical decisions that serve to decrease the occurrence of HAPIs for the elderly in the ICU.

Sources of Evidence

Studies related to the treatment and prevention of pressure injuries are plentiful, as are guidelines that suggest methods for pressure injury risk assessments but neglect to specifically address the potential of the mobility subscale. What this project adds is a comprehensive source of the available evidence on the mobility subscale for clinical decisions. A complete review of the literature was required to obtain the best evidence. All credible means to access relevant peer-reviewed literature for analysis and synthesis were necessary for this project.

Literature and studies from the traditional databases available through Walden University and search engines formed the source for the bulk of the evidence. Additionally, professional and specialty organizations contributed to the availability of evidence. To a lesser extent, references cited in other published materials provided another source for evidence.

The methodical collection and analysis of the applicable evidence characterize the systematic review process. The search process, summation, and analysis represent the hallmark of this category of evidence and how the practice focused review question brings value to the clinical setting.

HAPI continues to present challenges to healthcare teams (AHRQ, 2018). As the gold standard of evidence, this project, a systematic review, was well suited to address mobility subscale scores and the development of pressure injuries. Subsequently this project serves as a credible source of evidence to consider for clinical decisions.

Published Outcomes and Research

Preliminary studies suggest the efficacy of the mobility subscale in predicting the risk for pressure injury (Tescher et al., 2012; Gadd & Morris, 2014; Alderden et al., 2017; Sardo et al., 2018). All credible means to access pertinent literature is required to obtain the best possible evidence for clinical decisions at the bedside. The primary databases to build on these findings and for this systematic review included CINAHL, MEDLINE, and ProQuest. Additional options for evidence retrieval were the Cochrane Collection and Joanna Briggs Institute (JBI) databases and the capability made possible through the multiple search engines. The specialty organizations American Association of Critical Care Nurses, National and European Pressure Ulcer Advisory Panels, and the Pan Pacific Pressure Injury Alliance as stakeholders in the populations of interest also represented avenues to evidence pertinent to the review question.

Inclusion criteria are central to focus the search for evidence. Key terms of this study included the various taxonomies associated with pressure injury such as *pressure ulcer, decubitus ulcer,* and *bedsore*. Central to the premise of this project and search was the inclusion of the mobility subscale as related to HAPI for mitigation or risk assessment. Other search parameters were required to capture the specified age population and involved methods to obtain the minimum age limit of 65 and older with verbiage that resembles elderly and geriatric. The scope of the review included primary evidence that ranged from 2011 to 2020. Defining characteristics of the search was essential to limit imposed bias, improve the opportunity for replication, and ensure the validity of the systematic review. Although an independent second reviewer is thought to

improve the value of the literature search process (Walden University, 2017), for this project I did not engage a second reviewer.

The combination of the described search terms and criteria, search instruments and databases, and defined time frame outline the complexity and comprehensive approach to the discovery of evidence. The unique inclusion criteria further limited findings to those relevant for this project.

Analysis and Synthesis

The collection and analysis of evidence in a systematic review should be transparent, promote accuracy, and diminish the risk of bias (Cochrane Collaboration, 2011; Grove, 2017). JBI provides multiple resources for data collection and organization, and the analysis of studies. Characteristically, as part of the data collection and analysis process, this systematic review will use a matrix to facilitate data abstraction and replication. A JBI data extraction tool and critical appraisal form (see Appendices B and C) served as the basis for the matrix of summarized findings and to reduce the risk of bias introduced by outliers and other incomplete results.

Further, the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement recommends the inclusion of a study flow-diagram (see Appendix D) to detail the data extraction process (Cochrane Collaboration, 2011). Moreover, I used Melnyk and Fineout-Overholt's (2011) levels of evidence to determine the hierarchy of the articles selected. It was this disciplined and structured process that establishes the systematic review as a reliable source for the summation of the current evidence to address the knowledge gap posed by the review question.

Guided by the selected search criteria, the traditional databases available through the Walden University Library formed the basis for the search for relevant literature. Databases included CINAHL, MEDLINE, ProQuest, PubMed, and the systematic reviews from the Cochrane Collection and Joanna Briggs Institute. Moreover, Google Scholar was a viable search option used. As with all research-related projects, adherence to ethical standards was applicable. Although there were no perceived ethical concerns with this systematic review, consistent with Walden University (2017) guidelines, the university Institutional Review Board evaluated the study for verification of compliance with ethical standards (Walden University Institutional Review Board approval number 08-07-20-0762875).

Summary

The purpose of this project was to provide a systematic review that evaluated current evidence and the practicability of mitigation strategies in response to moderate to high-risk mobility subscale scores in the development of pressure injuries. Sources of evidence included peer-reviewed articles made available through databases such as CINAHL and MEDLINE available through the Walden University Library. Key search terms consisted of all known nomenclature representative of pressure injuries, Braden Scale and its subordinate subscales, words that captured patients 65 years of age and above, and the ICU.

Transparency of the systematic review process is necessary to decrease bias and increase the validity of the project. Resources made available from the Cochrane Collaboration (2011) and PRISMA (Moher, 2009) supported the data collection and

tracking while Melnyk and Fineout-Overholt's (2011) levels of evidence determined the hierarchy of evidence.

Section 4: Findings and Recommendations

Introduction

A risk assessment for HAPI development is paramount to pressure injury prevention programs, and the Braden Scale is the most frequently used risk assessment tool in the United States (Cox, 2012). Traditionally, mitigation strategies are implemented to reduce the risk for pressure injury development according to the Braden Scale total score. Yet, despite the local availability of policies and procedures grounded in evidence and the Braden Scale's mandated use, standard metrics and evaluation identified an alarming trend in the development of HAPI.

This project examined the gap between the available knowledge, albeit limited, that suggested the Braden mobility subscale is a viable risk assessment tool to aid clinical decision-making. The aberrancy discovered through quality improvement processes prompted the practice-focused review question:

> PFQ: What is the current evidence for early mitigation strategies in response to moderate to high-risk mobility subscale scores for ICU patients age 65 or older in the development of pressure injuries?

This project's purpose, consistent with the established review question, was to provide a systematic review to evaluate the evidence and the practicability of mitigation strategies in response to moderate to high-risk mobility subscale scores in the development of pressure injuries.

Although the Braden Scale is extensively used to assess pressure injury risk, few studies evaluated the mobility subscale's predictive merits for the critical care

environment and the rapidly growing 65 and over population. Peer-reviewed sources were vital to obtain articles for this systematic review. Furthermore, databases available through Walden University, CINAHL, MEDLINE, ProQuest, PubMed, Cochrane Database of Systematic Reviews, and the Joanna Briggs Institute formed the platform to find relevant studies that looked at the mobility subscale's predictive capability.

Set inclusion criteria were necessary to limit the introduction of bias and guide the search process. The inclusion criteria extracted from the review question consisted of pressure injury and relevant synonyms, Braden Scale, mobility subscale, elderly and like terms, and intensive care unit. Abstracts and articles obtained through the search process are annotated on the PRISMA flowchart (Appendix D). Finally, the studies that met the designated inclusion criteria are captured on the summary of evidence matrix (Appendix E).

The two studies that met the inclusion criteria informed the systematic review. Both studies were single site, tertiary care facilities, retrospective in nature, and used health records as the source for data. A combination of analytics, including regression analysis, the receiver operating characteristic curve, OR, modeling, and the goodness of fit evaluated the Braden Scale and mobility subscale's predictive capability.

Findings and Implications

A well-defined search strategy and inclusion criteria were necessary to refine the literature search results to the most relevant studies and minimize the inadvertent introduction of bias. The initial search strategy proved too stringent for the project and produced zero studies. Even though the project population was the 65 and over age

group, including age in the search severely limited the number of studies returned. A subsequent search strategy implemented was broader and omitted a reference to age. This strategy required a more in-depth review of articles to determine if age was delineated when not explicitly annotated in the abstract. Interestingly, during the search process, the name Braden was sufficiently tied to pressure injury, ulcer, and other synonymous terms and saw the use of either term or both return the same studies.

The literature search limited by the study publication period 2011-2020 produced 106 studies, and as recommended by PRISMA, I used a flowchart to diagram the process (Appendix D). As part of the initial screening, 78 articles were removed as multiples consisting of duplicates. Following review of the 28 remaining abstracts, I eliminated seven additional titles that did not meet the inclusion criteria for age, specified study period, or the intensive care environment. Additional cause for rejection included the inability to obtain an English translation or a full-text article. Lastly, following the review of abstracts, the remaining full-text articles were evaluated with 19 of those eliminated after confirmation of omission of the inclusion criteria for either setting, age, or identification of Braden Scale or mobility subscale scores.

I found and considered two systematic reviews. However, the inability to isolate the age group of interest or setting resulted in their exclusion. Although excluded, it was worthy to note both systematic reviews together had 24 unique studies and similarly found that patients with mobility concerns were more likely to develop HAPIs. Furthermore, neither systematic review included the specific mobility subscale score at which patients became more susceptible (Cox 2012, Mordiffi et al., 2011). Only Cox

(2012) reported findings specific to the ICU. Another point of interest with these two systematic reviews was that both referenced multiple studies found in the initial search for this project but were excluded for exceeding the time parameters for inclusion.

Two studies met the criteria for inclusion in this review (Appendix E). Both studies Alderden et al. (2017) and Mordiffi et al. (2018), evaluated the mobility subscale's predictive capability. Whereas the Mordiffi et al. (2018) study looked at only stages 1-4, Alderden et al. (2017) included the full spectrum of stages adding deep tissue injury and unstageable. Both studies excluded pressure injury not defined as HAPI.

Alderden et al. (2017), the more extensive of the two studies (n = 6377), reported findings on all subscales. The Alderden et al. study consisted of a 5-year, single-site retrospective chart review at an academic, level 1 trauma center in the United States. Data analytics incorporated time-dependent survival analysis and time-varying Cox regression statistical methods to evaluate the hazard of and model the relationship of age to the development of pressure injuries. Alderden et al. (2017) found for all ages, those that scored in the moderate to high-risk (score 10-14) Braden Scale categories were more likely to develop pressure injuries than those classified at the most severe level of risk (score $\leq$. 9). Comparatively, with the mobility subscale, when likened to all patients who developed HAPIs, Alderden et al. (2017) reported the over 65 age group classified as very limited (Score 2) was 1.5 times more likely to develop an HAPI than those of any age with more severe deficits (Score 1), and those classified as slightly limited (Score 3; 95% CI; $p < .001$). Similarly, compared to other 65-year-olds, those classified as very limited (Score 2) were up to 4 times more likely to develop an HAPI than the completely

immobile (Score 1). Lastly, when the mobility subscale was compared to the Braden Scale, it was found that for those over 65, the very limited (Score 2) were also almost twice as likely to develop HAPI than the Braden Scale moderate and high-risk categories (Scores 10-14). However, there were too few severe-risk Braden Scale (score $\leq$ 9) cases for a mobility subscale score comparison.

The second study by Mordiffi et al. (2018) used a retrospective case-control design that covered 2 years at a very large tertiary care hospital in Singapore. The case and control groups were harmonious and defined as either the presence or absence of HAPI, respectively. Each group consisted of 100 patients and exceeded the power analysis recommendation by 30%. Analytical processes, including the receiver operating characteristic curve, were used to obtain predictive Braden Scale and mobility subscale cut-off scores. Logistic regression modeling and OR compared each model's predictive capability and the goodness of fit was established. Multiple models based on each scale's natural divisions were developed for testing the most predictive Braden Scale and mobility subscale cut-off scores. The study reported the scores with the most accuracy for predictability as 17 (mild risk) for the Braden Scale and 2 (very limited) for the mobility subscale score. Mordiffi et al. (2018) further reported the receiver operating characteristic curve for each as significant (95% CI; $p < 0.001$) and concluded that the predictive capability of the mobility subscale was comparable to the Braden Scale.

When the consequences of immobility are considered, it makes sense to hypothesize that the most limited individuals would pose the highest degree of risk for developing pressure injuries. However, both Alderden et al. (2017) and Mordiffi et al.

(2018) found otherwise. Both studies surmised that a mobility subscale score of 2 or less was more likely to develop pressure injuries than both the slightly limited (score 3) and the completely immobile (score 1), only Alderden et al. (2017) suggested that this score might predict risk before the total Braden Scale.

Implications

There was not enough evidence to conclusively support the use of the mobility subscale as an independent risk assessment tool. Nonetheless, these findings preliminarily suggested, as concluded in Mordiffi et al. (2011), that there is merit for considering the mobility subscale in conjunction with the total Braden Scale score for implementing pressure injury prevention strategies. Implications for future research include randomized control trials to test the validity of implementing specific and intentional preventive strategies in response to the mobility subscale score.

Social Change

As the 65 and older age group with their inherent vulnerabilities become the largest healthcare consumers, it was prudent to examine methods that might decrease HAPI occurrence. The introduction of evolving science to complement clinical decisions based on consideration of the mobility subscale score promotes improvement in the human and social condition. This systematic review was a deliberate strategy to promote social change through improved healthcare outcomes.

Strength and Limitations

Strengths

Systematic reviews are a high level of evidence and was well suited for the nature of this project. This systematic review's strength was the direct link to a specific clinical issue identified through clinical outcomes and the ongoing evaluation of nationally mandated metrics. Another strength was the existence of new evidence that showed a growing interest in the mobility subscale score for clinical decision-making. Furthermore, this project provided a reference point to inform clinicians and influence clinical decisions based on individualized patient needs. Even though there was not an abundance of studies nor particularly strong evidence to justify a policy change, an additional strength was the opportunity to work through the meticulous process of conducting a systematic review.

Limitations

A benefit of the methodical process inherent to the systematic review is the engagement of an independent second reviewer to decrease the potential to interject bias. Although an independent second reviewer reportedly improves the value of the literature search and analysis process, it was not included (Walden University, 2017). Consequently, the omission of the second reviewer was a limitation to this systematic review. Another limitation was the relatively few articles found with the chosen inclusion criteria. Finally, the undefined characteristics and culture unique to each facility and transcontinental healthcare system further compounded this project's limitations.

Recommendations

It was well documented in the literature that pressure injuries are a consequence of immobility (Alderden et al., 2017; Cox & Schallom, 2017; Mordiffi et al., 2011; Mordiffi et al., 2018). However, too few studies segregated the vulnerable elderly in the critical care environment or isolated the mobility subscale score at which pressure injuries occur. Therefore, future studies should purposefully look at the emerging science of the mobility subscale as a predictor of pressure injury and what score is the most predictable for the 65 and older age group.

Lastly, I recommend that care providers, as part of their organization's pressure injury risk reduction program, carefully assess and consider the mobility subscale scores with the total Braden Scale score as part of clinical decision-making at the bedside. The fact that studies have evolved from the review and reporting of the total Braden Scale score to the consideration of the potential for the mobility subscale's predictive nature, shows a growing field of new knowledge that might help reduce the risk for an old problem, the pressure injury.

Summary

Although studied from multiple perspectives, pressure injuries remain a problem for the most vulnerable, the critically ill older adult. Numerous studies looked at the physiology of pressure injuries, the need to determine risks for the development of pressure injuries, the use of the Braden Scale as a reliable and valid tool for risk assessment, and the evaluation of interventions to decrease the occurrence of pressure injuries. However, lacking was an extensive history that looked at the mobility subscale's

predictive capability as an independent risk assessment tool. This systematic review did not find adequate high-level evidence to suggest the mobility subscale as a reliable tool to serve as an independent predictor of pressure injuries. Conversely, the mobility subscale scale score's sensitivity offers additional insight and is worthy of nursing consideration and evaluation for interventions unique to the patient's identified requirements and experience.

Section 5: Dissemination Plan

The lag time between the discovery of evidence and its availability for clinical decision-making is too long. The timely movement of evidence from the scientist to the clinician to inform care is an ongoing concern in the healthcare industry. It can take over 15 years for evidence to reach the bedside for clinical decisions and to affect evidence-based interventions (Chan et al., 2015; White et al., 2016). Clinical decisions rooted in evidence improves healthcare quality and patient safety. Therefore, the timely scholarly dissemination of findings is necessary to expand the body of knowledge and improve outcomes (Oermann & Hays, 2019).

Plan for Dissemination

Various methods are available to consider for the dissemination of evidence. The organization's ongoing quality improvement program and nationally mandated metrics discovered the identified clinical problem. Consequently, in addition to the caregivers, dissemination is necessary to inform various stakeholders. The nature of this project supports both poster and PowerPoint presentations. Other techniques for future consideration to inform a more diverse audience are journal articles and conference presentations. Professional organizations are other outlets that support the further dissemination of evidence. The National Teaching Institute and Critical Care Explosion and the National Association of Clinical Nurse Specialist Conference are national conferences whose publications add reach and diversity.

PowerPoint slides are the norm and convenient and will serve as a foundation for informing and communicating a high-level overview of the findings to the executive

leadership and trustees who, collectively with the chief nursing officer, are responsible for patient services and strategic guidance. According to Lawson (2013), PowerPoint presentations can also serve as a crutch or distraction, creating an opportunity to miss the intended message. Therefore, to better engage the clinical staff, a poster for ongoing display on the unit with the opportunity for dialog will augment the PowerPoint presentation.

Analysis of Self

Through the span of an already lengthy professional nursing career, I have had the opportunity to serve in multiple positions and have a view of healthcare from the micro, meso, and macro vantage points. This experience, coupled with the DNP journey, gave a unique perspective to assess and provide an analysis of self. As a clinical nurse specialist, my practice, whether at the bedside or administrative positions, was shaped by the education germane to that advanced practice specialty area. By completing this project and leveraging the DNP Essentials, I add a new level of depth and credibility to further contributions to the health care delivery system.

This journey's benefit is the added confidence in identifying and applying evidence to clinical issues and problems. Even though my work as a practitioner is essential, and leadership is necessary to affect change, it is the role of scholar that gives rise to scientific advancement and improves outcomes. Scholarship is my personal most significant area of growth.

Moreover, the detailed process of developing and working through the DNP program and project highlighted the inseparable link between the practitioner, scholar,

and the project manager. Nothing was made more apparent than the requirement for advocacy, oversight, and management of the multiple facets and stakeholders necessary for engagement and implementation of evidence-based practice.

Commitment to scholarship was the most critical part of the project process and, ultimately, the most significant challenge. This commitment to scholarship embraces the systematic approach to change throughout a given system and allows for advocacy and effective healthcare policy. It was also discovered that scholarship coupled with personalities conflicted by competing and evolving priorities represented significant barriers that required agility, flexibility, and leadership to guide through to transformation.

Summary

Despite well-founded policy and procedures steeped in evidence, pressure injuries continue to plague the healthcare industry. The suggestion in the more recent evidence of the mobility subscale's predictability for pressure injury development has the potential to make a difference in outcomes. To realize the potential benefits of the mobility subscale, a planned approach for disseminating evidence is vital for clinicians' timely contemplation.

Moreover, for dissemination plans to be the most effective, I must consider the intended audience and suitable methods and venue. Furthermore, the commitment to scholarship and the advancement of healthcare policy demands professional accountability by accepting the often-neglected responsibility for disseminating evidence.

References

Acquaviva, K. D., & Johnson, J. E. (2014). The quality improvement landscape. In M. Joshi, E. Ransom, D. Nash, & S. Ransom (Eds.), *The healthcare quality book* (3rd ed., pp. 455-493). Health Administration Press.

Agency for Healthcare Research and Quality. (2014). *Preventing pressure ulcers in hospitals.* https://www.ahrq.gov/professionals/systems/hospital/pressureulcertoolkit/putool1.html

Agency for Healthcare Research and Quality. (2018). *AHRQ National scorecard on hospital-acquired conditions updated baseline rates and preliminary results 2014-2016*. https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/quality-patient-safety/pfp/natlhacratereport-rebaselining2014-2016_0.pdf

Agency for Healthcare Research and Quality. (2019). *Never events*. https://psnet.ahrq.gov/primer/never-events

Alderden, J., Cummins, M. R., Pepper, G. A., Whitney, J. D. Yingying Z., Butcher, R., & Thomas, D. (2017). Midrange Braden subscale scores are associated with increased risk for pressure injury development among critical care patients. *Journal of Wound, Ostomy & Continence Nursing*, *44*(5), 420-428. https://doi.org/10.1097/WON.0000000000000349

American Nurses Association. (n.d.). *Nursing-sensitive indicators*. http://web.archive.org/web/20120921021800/http://www.nursingworld.org/Main

MenuCategories/ThePracticeofProfessionalNursing/PatientSafetyQuality/Research-Measurement/The-National-Database/Nursing-Sensitive-Indicators_1.aspx

Aromataris, E., & Munn. Z. (Eds.). (2020). *JBI manual for evidence synthesis*. Joanna Briggs Institute. https://doi.org/10.46658/JBIMES-20-01

Ballard, D. J., da Graca, B., Hopkins, R. S., & Nicewander, D. (2014). Variations in medical practice and implications for quality. In M. Joshi, E. Ransom, D. Nash, & S. Ransom (Eds.), *The healthcare quality book* (3rd ed., pp. 55-82). Health Administration Press.

Bergstrom, N., Braden, B. J., Laguzza, A., & Holman, V. (1988). The Braden scale for predicting pressure sore risk. *Nursing Research*, *36*(4), 205-210. https://doi.org/10.1097/00006199-198707000-00002

Centers for Medicare and Medicaid Services. (2018). *Hospital-acquired conditions.* https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/Hospital-Acquired_Conditions.html

Chan, C. K. Y., Oldenburg, B., & Viswanath, K. (2015). Advancing the Science of Dissemination and Implementation in Behavioral Medicine: Evidence and progress. *International Journal of Behavioral Medicine*, *22*, 277-282. https://doi.org/10.1007/s12529-015-9490-2

Cochrane Airways. (n.d.). *Data collection*. https://airways.cochrane.org/data-collection

Cochrane Collaboration. (2011). *Cochrane handbook for systematic reviews of interventions.* https://handbook-5-1.cochrane.org/front_page.htm

Colby, S. L. & Ortman, J. M. (2014). *The baby boom cohort in the United States: 2012 to 2060 population estimates and projections*. U.S. Census Bureau. https://www.census.gov/prod/2014pubs/p25-1141.pdf

Cox, J. (2012). Predictive power of the Braden Scale for Pressure Sore Risk in adult critical care patients a comprehensive review. *Journal of Wound Ostomy and Continence Nursing, 39*(6), 613-621. https://doi.org/10.1097/won.0b013e31826a4d83

Cox, J. & Schallom, M. (2017). Pressure injuries in critical care: A survey of critical care nurses. *Critical Care Nurse, 37(5*), 46-55. https://doi.org/10.4037/ccn2017928

Deficit Reduction Act of 2005, Pub. L. 109–171, S. 1932, 120 Stat. 4 (2006). https://www.congress.gov/109/plaws/publ171/PLAW-109publ171.pdf

Gadd, M. M. & Morris, S. M. (2014). Use of the Braden Scale for Pressure Ulcer Risk Assessment in a community hospital setting: The role of total score and individual subscale scores in triggering preventive interventions. *Journal of Wound, Ostomy, and Continence Nursing*, *41*(6), 535-538. https://doi.org/10.1097/won.0000000000000066

Grove, S. K. (2017). Evidence synthesis and strategies for implementing evidence-based practice. In J. R. Gray, S. K. Grove, & S. Sutherland (Eds.), *Burns and Grove's The practice of nursing research appraisal, synthesis, and generation of evidence* (8th ed., pp. 453-492). Elsevier.

Hardin, S. R. (2015). Vulnerability of older patients in critical care. *Critical Care Nurse*, *35*(3), 55-61. https://doi.org/10.4037/ccn2015995

He, W., Goodkind, D., & Kowal, P. (2016). *An aging world: 2015: International population reports*. U.S. Census Bureau. https://www.census.gov/content/dam/Census/library/publications/2016/demo/p95-16-1.pdf

Institute of Healthcare Improvement. (2019). *IHI Triple Aim initiative.* http://www.ihi.org/engage/initiatives/TripleAim/Pages/default.aspx

Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st century*. National Academy Press. http://www.nationalacademies.org/hmd/~/media/Files/Report%20Files/2001/Crossing-the-Quality-Chasm/Quality%20Chasm%202001%20%20report%20brief.pdf

Kohn, L. T., Corrigan, J. M., & Donaldson, M. S. (Eds). (2000). *To err is human: Building a safer health system*. National Academy Press. https://doi.org/10.1017/s095026880100509x

Lawson, G. W. (2013). Eliminate PowerPoint in the classroom to facilitate active learning. *Global Education Journal*, *2013*(1), 1-8.

Melnyk, B. M., & Fineout-Overholt, E. (2011). *Evidence-based practice in nursing and healthcare: A guide to best practice* (2nd ed.). Lippincott William & Wilkins.

Miller, M. W., Emeny, R. T., Snide, J. A., & Freed, G. L. (2020). Patient-specific factors associated with pressure injuries revealed by electronic health record analysis. *Health Informatics Journal, 26*(1), 474–485. https://doi.org/10.1177/1460458219832053

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA Statement. *Journal of Clinical Epidemiology*, *62*(10), 1006-1012. https://doi.org/10.1016/j.jclinepi.2009.06.005

Moore, Z. & Patton, D. (2019). Risk assessment tools for the prevention of pressure ulcers. *Cochrane Database of Systematic Reviews*. https://doi.org/10.1002/14651858.CD006471.pub4

Mordiffi, S. Z., Kent, B., Phillips, N., & Chi Tho, P. (2011). Use of mobility subscale for risk assessment of pressure ulcer incidence and preventive interventions: A systematic review. *JBI Library of Systematic Reviews*, *9*(56), 2417-2481. https://doi.org/10.11124/jbisrir-2011-84

Mordiffi, S. Z., Kent, B., Phillips, N. M., & Choon Huat, G. K. (2018). Assessing pressure injury risk using a single mobility scale in hospitalized patients: A comparative study using case-control design. *Journal of Research in Nursing*, *23*(5), 387–403. https://doi.org/10.1177/1744987118762006

Munn, Z., Moola, S., Lisy. K., Riitano, D., & Tufanaru, C. (2015). Methodological guidance for systematic reviews of observational epidemiological studies reporting prevalence and incidence data. *International Journal of Evidence-Based Healthcare*, *3*(3), 147–153. https://joannabriggs.org/sites/default/files/2019-05/JBI_Critical_Appraisal-Checklist_for_Prevalence_Studies2017_0.pdf

National Pressure Injury Advisory Panel. (2016). National Pressure Ulcer Advisory Panel (NPUAP) announces a change in terminology from pressure ulcer to pressure

injury and updates the stages of pressure injury. [Press Release]. https://nswoc.ca/wp-content/uploads/2016/04/NPUAP-Pressure-Injury-Staging-Press-Release-13-April-2016.pdf

O'Conner, D., Green, S., & Higgins, J. P. T. (2008). Defining the review question and developing criteria for including studies. In J. P. T. Higgins & S. Green (Eds), *Cochrane handbook for systematic reviews of interventions*. Wiley-Blackwell & The Cochrane Collaboration. https://books.google.com/books?id=NKMg9sMM6GUC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Office of Disease Prevention and Health Promotion. (2019). *Older adults.* https://www.healthypeople.gov/2020/topics-objectives/topic/older-adults

Oermann, M. H., & Hays, J. C. (2019). *Writing for publication in nursing* (4th ed.). Springer Publishing.

Porter, B. G. (2018). *Building a quality framework: The structure and focus that create a high performing organization.* Huron Consulting Group. https://az414866.vo.msecnd.net/cmsroot/studergroup/media/studergroup/resources/whitepapers/building-a-quality-framework-final.pdf

Sardo, P., Simões, C., Alvarelhão, J., Costa, C., Simões, C. J., Figueira, J., & Simões, J. L., Amado, F., Amaro, A., & Melo, E., (2015). Pressure ulcer risk assessment: retrospective analysis of Braden Scale scores in Portuguese hospitalized adult patients. *Journal of Clinical Nursing*, *24*(21-22), 3165–3176. https://doi.org/10.1111/jocn.12927

Sardo, P. M. G., Guedes, J. A. D., Alvarelhão, J. J. M., Machado, P. A. P., & Melo, E. M. O. P. (2018). Pressure ulcer incidence and Braden subscales: Retrospective cohort analysis in general wards of a Portuguese hospital. *Journal of Tissue Viability*, *27*(2), 95-100. https://doi.org/10.1016/j.jtv.2018.01.002

Stern, C., Jordan, Z., & McArthur, A. (2014). Developing the review question and inclusion criteria. *American Journal of Nursing*, *114*(4), 53-56. https://doi.org/10.1097/01.naj.0000445689.67800.86

Stevens, K. (2013). The impact of evidence-based practice in nursing and the next big ideas. [Manuscript 4]. *Online Journal of Issues in Nursing*, *18*(2). https://ojin.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Vol-18-2013/No2-May-2013/Impact-of-Evidence-Based-Practice.html

Stotts, N. A., Brown, D. S., Donaldson, N. E., Aydin, C., & Fridman, M. (2013). Eliminating hospital-acquired pressure ulcers: Within our reach. *Advances in Skin & Wound Care*, *26*(1), 13-18. https://doi.org/10.1097/01.asw.0000425935.94874.41

Tescher, A. N., Branda, M. E., Byrne, T. J. O., Naessens, J. M. (2012). All at-risk patients are not created equal analysis of Braden pressure ulcer risk scores to identify specific risks. *Journal of Wound, Ostomy, and Continence Nursing*, *39*(3), 282-291. https://doi.org/10.1097/won.0b013e3182435715

The Joint Commission. (2016). *Quick Safety 25: Preventing pressure injuries*. https://www.jointcommission.org/issues/article.aspx?Article=n%2bOspqDzBBeZ%2ftRoyTzpsyZ4GrBDhJpdtlQvqSl5hsQ%3d

VanGilder, C., Lachenbruch, C., Algrim-Boyle, C., & Meyer, S. (2017). The international pressure ulcer prevalence survey: 2006-2015. *Journal of Wound, Ostomy, and Continence Nursing, 44*(1), 20-28. https://doi.org/10.1097/won.0000000000000292

Walden University (2017). *Manual for systematic review*. https://academicguides.waldenu.edu/ld.php?content_id=32773133

White, K. M., Dudley-Brown, S., & Terharr, M. F. (2016). *Translation of evidence into nursing and health care practice* (2nd ed.). Springer.

Appendix A: The Braden Scale for Predicting Pressure Sore Risk©

BRADEN SCALE FOR PREDICTING PRESSURE SORE RISK

Patient's Name _____ Evaluator's Name_____ Date of Assessment

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	**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 the 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. Very 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 non-existent. 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 room at least twice a day and inside room at least once every two 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 Limitation** Makes major and frequent changes in position without assistance.				
NUTRITION usual food intake pattern	**1. Very Poor** Never eats a complete meal. Rarely eats more than ⅓ 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 and/or maintained on clear liquids or IV's 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 per day. Occasionally will refuse a meal, but will usually take a supplement when offered OR is on a tube feeding or TPN regimen which probably meets most of nutritional needs	**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 & 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.					
					Total Score			

Note. Copyright, Barbara Braden and Nancy Bergstrom, 1988. Reprinted with permission. All rights reserved.

Appendix B: Joanna Briggs Institute Data Extraction Form for Prevalence Studies

Citation Details

Authors:

Title:

Journal:

Year:

Issue:

Volume:

Pages:

Generic Study details

Study design:

Country:

Setting/Context:

Year/ timeframe for data collection:

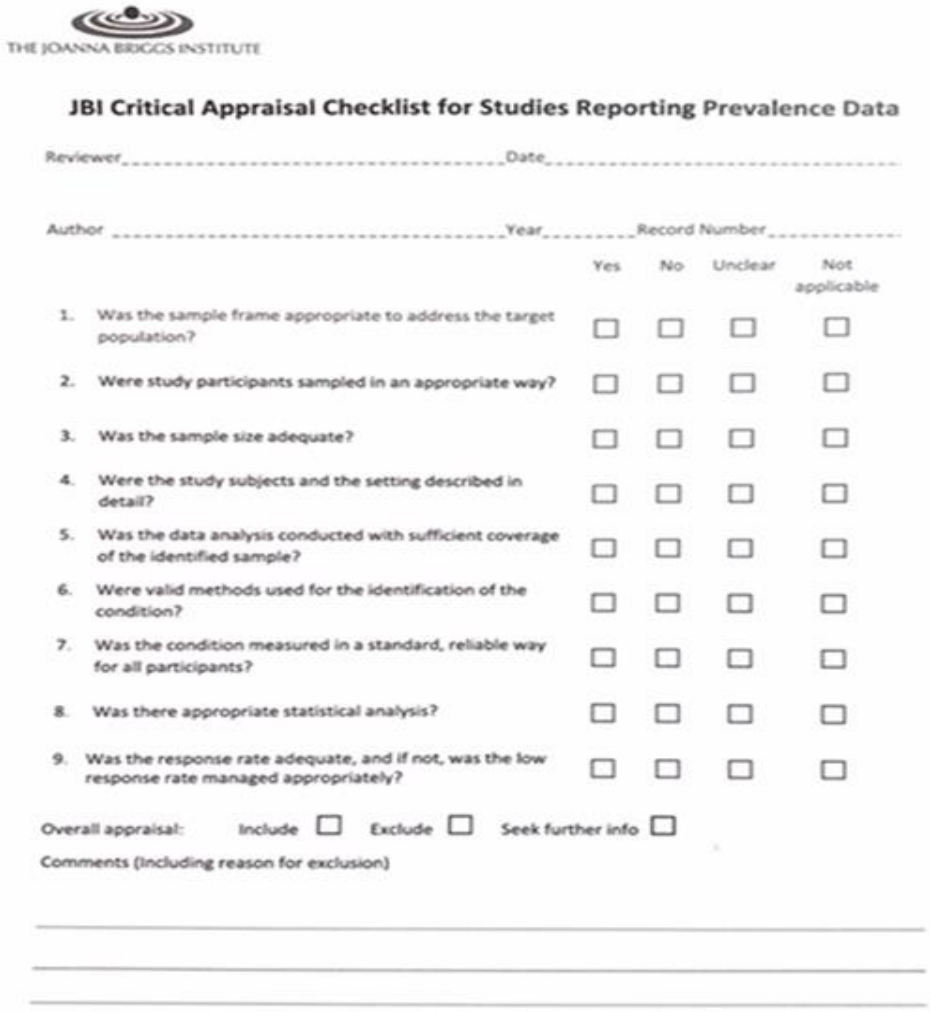
Participant Characteristics (study inclusion/exclusion information):

Condition and measurement method:

Description of main results (n/N):

Note. Munn, Z., Moola, S., Lisy, K., Riitano, D., Tufanaru, C. (2017). Chapter 5: Systematic reviews of prevalence and incidence. In: E, Aromataris & Z. Munn (Eds). *Joanna Briggs Institute Reviewer's Manual*. The Joanna Briggs Institute. Retrieved from https://reviewersmanual.joannabriggs.org. 2019 © Joanna Briggs Institute. Reproduced with permission from JBI.

Appendix C: JBI Critical Appraisal Checklist for Studies Reporting Prevalence Data



THE JOANNA BRIGGS INSTITUTE

JBI Critical Appraisal Checklist for Studies Reporting Prevalence Data

Reviewer_____ Date_____

Author _____ Year_____ Record Number_____

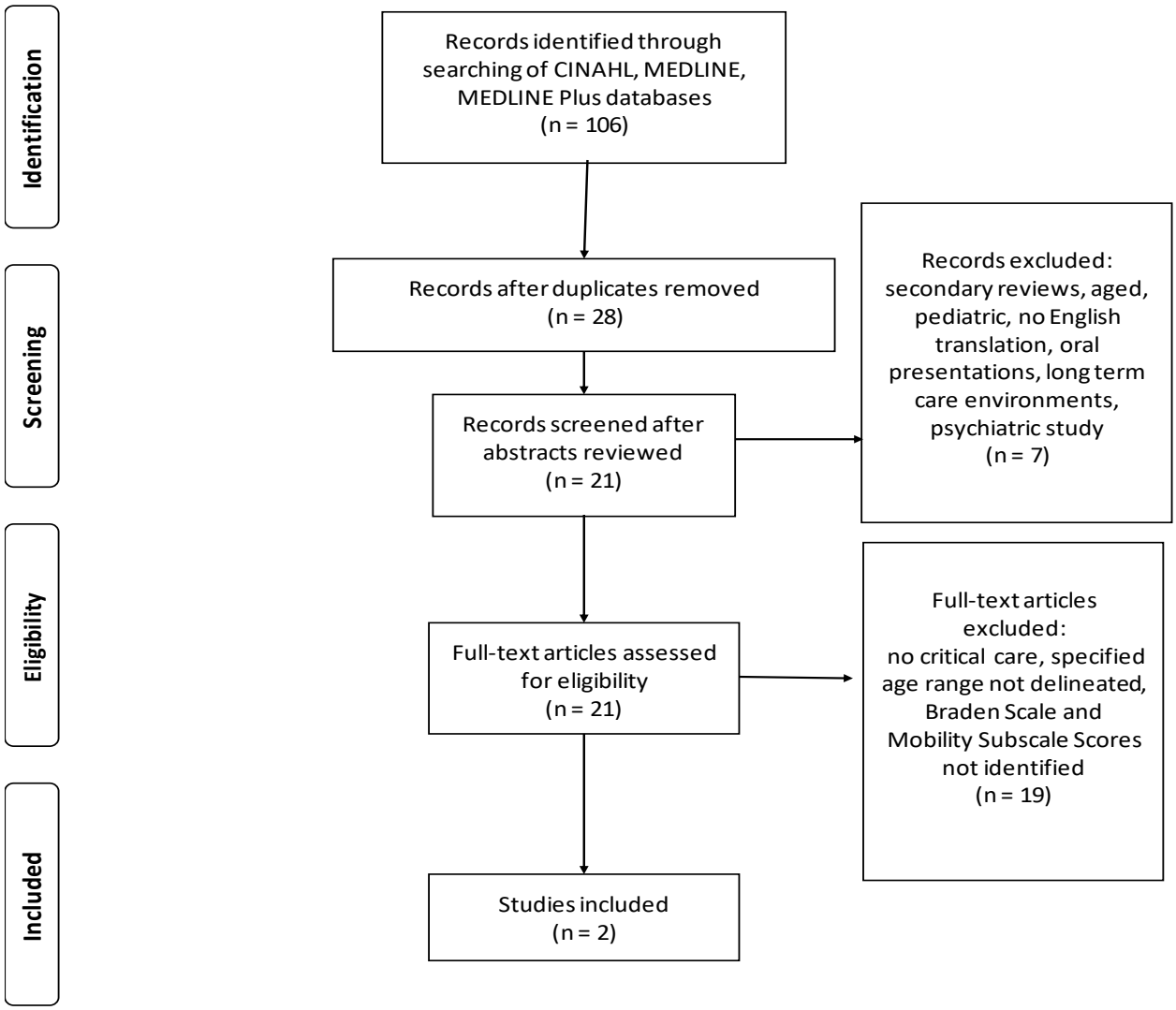
	Yes	No	Unclear	Not applicable
1. Was the sample frame appropriate to address the target population?	☐	☐	☐	☐
2. Were study participants sampled in an appropriate way?	☐	☐	☐	☐
3. Was the sample size adequate?	☐	☐	☐	☐
4. Were the study subjects and the setting described in detail?	☐	☐	☐	☐
5. Was the data analysis conducted with sufficient coverage of the identified sample?	☐	☐	☐	☐
6. Were valid methods used for the identification of the condition?	☐	☐	☐	☐
7. Was the condition measured in a standard, reliable way for all participants?	☐	☐	☐	☐
8. Was there appropriate statistical analysis?	☐	☐	☐	☐
9. Was the response rate adequate, and if not, was the low response rate managed appropriately?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion)

Note. Munn, Z., Moola, S., Lisy, K., Riitano, D., Tufanaru, C. (2015). Methodological guidance for systematic reviews of observational epidemiological studies reporting prevalence and incidence data. *International Journal of Evidence-Based Healthcare, 13*(3), 147–153. Reproduced with permission from JBI.

Appendix D: PRISMA Flow Diagram



Note. From "Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement," by D. Moher, A. Liberati, J. Tetzlaff, D. G. Altman, and The PRISMA Group, 2009, *Journal of Clinical Epidemiology*, *62*(10), pp. 1006-1012 (https://doi.org/10.1016/j.jclinepi.2009.06.005).

Appendix E: Summary of Evidence

Source	Design	*n*	Setting	Age	Braden Scale	SS Score	Findings	LOE
Mordiffi, S. Z., Kent, B., Phillips, N. M., & Choon Huat, G. K. (2018). Assessing pressure injury risk using a single mobility scale in hospitalized patients: A comparative study using case-control design. *Journal of Research in Nursing*, *23*(5), 387–403.	Retrospective Case-Control	200 100/cases 100/ control	Acute Care Facility/ ICU/ High Dependency unit	70/cases 66/ control	Mean 14.9	2	To determine if mobility subscale alone is comparable to use of the total Braden Scale. Very limited mobility or worse were 5.23 times more likely to develop pressure injury than the 'slightly limited' mobility or 'no limitation', conversely 'low risk' or higher were 3.35 (95% CI 1.77-6.33) times more likely to develop pressure injury than 'no risk	IV
Alderden, J., Cummins, M. R., Pepper, G. A., Whitney, J. D., Yingying Zhang, Butcher, R., & Thomas, D. (2017). Midrange Braden subscale scores are associated with increased risk for pressure injury development among critical care patients. *Journal of Wound, Ostomy & Continence Nursing*, *44*(5), 420–428.	Retrospective chart review	6377	ICU	All ages	Y	2	Purpose help clinician plan PI prevention interventions. Except for friction and shear subscales, regardless of age, individuals with scores in the intermediate-risk levels had the highest likelihood of developing pressure injury.	IV

Appendix F: Permissions

Date: January 6, 2020

To: Janet L. Wilson – DNP Student – Walden University

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

RE: Permission to use the Braden Scale*

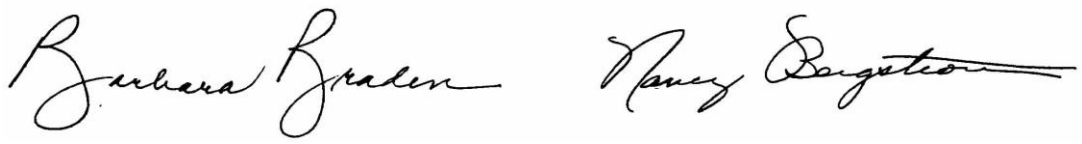
As holders of the official copyright for the Braden Scale, we hereby grant permission for the use of the scale in the appendix of your scholarly project entitled, "Decreasing pressure injuries with early mitigation strategies for the elderly in the ICU." Any use of the scale beyond this use requires permission.

*It is understood that the tool must be printed as it appears on the Braden Scale website (www.bradenscale.com) and that no changes will be made to the following: The title, "The Braden Scale for Predicting Pressure Sore Risk©," the wording and scoring of the tool including the subscales without alterations, and the attribution and copyright information with the acknowledgement, "Copyright, Barbara Braden and Nancy Bergstrom, 1988. Reprinted with permission. All rights reserved."

Permission is granted once restrictions are acknowledged (see below).

I, Janet L Wilson, of Walden University, located in Minneapolis, MN City/State/Province/Country agree to the statements above about printing and utilization of the Braden Scale.

**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 permission might be considered and granted by a new owner.



From: Edoardo Aromataris <ed.aromataris@adelaide.edu.au>
Sent: Wednesday, January 8, 2020 4:45 PM
To: Janet Wilson <janet.wilson4@waldenu.edu>
Cc: JBI Synthesis <jbisynthesis@adelaide.edu.au>
Subject: re: Request for permission

Dear Janet,

Thank you for your query.

You are able to use and reproduce the tools provided by JBI. All should be cited as indicated with each tool available here. You may indicate in your thesis – reproduced with permission from JBI.

I hope all goes well with your review and research.

Regards,

Edoardo
Assoc Prof Edoardo PhD
Director, Synthesis Science
Joanna Briggs Institute
Faculty of Health and Medical Sciences
The University of Adelaide, AUSTRALIA 5005
Ph : +61 8 8313 0124
e-mail: ed.aromataris@adelaide.edu.au

From: Center for Advancing Clinical Excellence <acestar@uthscsa.edu>
Sent: Sunday, January 12, 2020 5:31 PM
To: Janet Wilson <janet.wilson4@waldenu.edu>
Subject: RE: Permission to use the Stevens Star Model

Hi Janet...
I am pleased that you find the Stevens Star Model helpful...and that you wish to use it in your scholarly work.

This email can serve as my confirmation of permission for your using the Model in your project. I am happy to provide permission to you to use/reproduce the Star Model under the fair-use rule for educational uses, with the stipulation that credit is cited, as you indicated. This includes publication of materials on your university site. If later, you are re-publishing the copyrighted material (as in publishing in a journal or book), specific permission is required by the publisher. In that case, there is usually a template letter of permission from the publisher that I will readily sign.

I have attached an image that you may use, indicating my expressed permission.
Note the official name of the model in the PPT... the Stevens Star Model of Knowledge Transformation copyright 2015.

Because I am tracking the uptake and spread of the Model, I am requesting a few items:
Kindly provide the name of your supervising professor and a brief description of how the Model applies to your project.