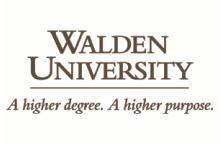

2019

Sleep Deprivation in the Intensive Care Unit: Lowering Elective Intervention Times

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This is to certify that the doctoral study by

La Von Michelle Ross Purdie

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. Rosaline Olade, Committee Chairperson, Nursing Faculty
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2019

Abstract

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by

La Von Michelle Ross Purdie

MSN, University of South Carolina, 2002

BSN, University of South Carolina, 1998

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

November 2019

Abstract

Sleep deprivation is a multifactorial phenomenon, occurring frequently in the intensive care unit (ICU) and linked to adverse patient healthcare outcomes. The key practice question of this project focused on determining if retiming of routine laboratory and imaging testing outside of the designated "quiet time" can improve sleep quality among adult patients in the ICU. The purpose was to evaluate the effectiveness of implementing an evidence-based intervention to improve sleep quality in the ICU setting. The theoretical framework was the plan-do-study-act model, which offered a process for implementing a practice change and reevaluation of the intervention's sustainability within the organization. A thorough literature search of over 100 scholarly journal articles, book references, and expert scholarly reports was completed to gain an understanding of this phenomenon in the ICU setting. The Richards-Campbell Sleep Questionnaire (RCSQ) was the data collection tool used to measure improvement in sleep quality.. There were 72 participants that are included in the project. The Wilcoxon rank sum and chi square tests were used for the statistical analysis. The findings did not show statistical significance in the improvement in the RCSQ scores after implementation of the intervention.. The recommendations include sleep deprivation training for nursing staff and providers, routine use of the RCSQ for data collection, and repeating the study with an increased number of participants and redefined inclusion and exclusion criteria to be more representative of the ICU patient population. The implication for social change is that this project empowers nursing to embrace a leadership role in using evidence-based practice to change clinical guidelines and improve patient outcomes.

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Dedication

This project is dedicated to my sister, Jeanette Foster Marshall, who died before seeing me complete this degree. She was always my strongest supporter. I believe she is sitting in heaven looking with our parents saying “Really Von” as she always did but this time because she knew I was going to finally finish this project. She always teased me about forever being in school. This will be the final chapter of this academic journey, but I will never stop learning and I will never stop hearing your encouragement. Thank you and I love you.

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I would like to acknowledge my husband, Dana C. Purdie, my sons, Justin, Brandon, Necolas, and Taylor Ross, and our family and friends who have supported me through this long process. I must include the numerous colleagues and coworkers who continued to give me encouragement to complete the journey. Thanks to Dr. Kathy Richards for giving permission for me to cite her Richards-Campbell Sleep Questionnaire for the purpose of this DNP project. An extra special thanks to the person who planted the idea in my mind to return to school to further my training and seek out my Doctor of Nursing Practice degree, Dr. Imran Iftikhar. Without his encouragement I don't know that I would have taken up this task but I am glad that I did. A special thanks to Madison Owens, RN, Carla Branham, RN, William Owens, MD, David Schrift, MD, Judson Lewis, MD, and Mohammed Moizuddin, MD – better known as the SILENCE POSSE. To Dr. Martin Durkin, I want to thank you for all your help with the statistical analyses and taking the time to make it clearer for me. Truly without their help and support this project would not have been possible. And last but not least, as I have worked through many hurdles, delays, and setbacks, one of the most positive parts of this process has been my Walden faculty. They include Drs. Rosaline Olade, Amy Wilson, Corinne Wheeler, and Cheryl McGinnis. They have supported me throughout. And a special acknowledgement to Dr. Olade who has been consistent in her support that she has offered with advice, correction, and intervening when appropriate to help facilitate this process. I would not have completed this project without this team of faculty leaders. So, to them I will forever be indebted.

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Section 1: Nature of the Project

Introduction

Although a potentially treatable consequence of the intensive care unit (ICU) setting, sleep deprivation is a phenomenon that occurs frequently in that setting and has been associated with impaired quality of life and discomfort of patients (Weinhouse et al., 2009). There is a misconception among many ICU professionals that sleep deprivation is an inevitable occurrence in the ICU and not a consequence of the care that is given in that setting (Friese, 2008). Sleep disturbances, such as sleep deprivation and delirium, can be consequences of events that impair the patient's ability to meet the quantity of sleep the patient is accustomed to and are often associated with frequent nighttime interruptions resulting in a negative impact on sleep (Vorbeck, Willette-Murphy, Meiers, Rudel, & Alakhras, 2010). Poor sleep quality potentially places critically ill patients at risk of the development of infections (Wilder-Smith, Mustafa, Earnest, Gen, & MacAry, 2013) as well as increases mortality and other healthcare complications (Irwin, Olmstead, & Carroll, 2016). Ideally, developing guidelines that promote noise control and the reduction of nonemergent night-time interventions reduce sleep deprivation and promote good sleep quality (Li, Wang, Wu, Liang, & Tung, 2011). Although many ICU professionals believe that the quality of sleep in the ICU is poor and that this has a negative impact on overall patient outcomes, there still exists a lack of standardized, evidence-based protocols in place in the ICU for promoting improved sleep quality (Kamdar et al., 2016). The generation of these protocols should include feedback

from the nursing staff who spend the majority of their shifts providing care to this population.

Over time, the transition of the nursing role has become more complex than could have been anticipated due to new technology; the increased acuity of the hospitalized patient, particularly in the ICU population; and the broadening of overall nursing responsibilities (Tiffin, 2012). However, with this transition comes the opportunity for nurses to engage in activities that lead to positive social changes within their practice setting and the nursing profession. In the ICU setting, the link between sleep deprivation and critically ill patients remains complicated (Pisani et al., 2015). This complexity poses an opportunity for nursing to impact environmental factors that may influence this link. Nurses are practicing in a multitude of roles that range from the clinician role as the bedside nurse and nurse practitioner provider; to the leadership role as the unit manager, unit director, and nurse executive; to the educator role as the unit educator; and the researcher role that involves those nurses working in quality improvement (QI) departments as well as those previously listed who recognize the utility of research in guiding their clinical practice or the practices of the units they manage. Each group has the potential to positively impact the social change that the nursing profession can make. In this project, I focused on allowing the bedside nurses to become empowered to take on roles in their practice setting that will utilize their skills as clinicians, leaders, educators, and researchers as they develop and implement evidence-based practice (EBP) guidelines to improve short- and long-term patient outcomes. This redefining of the role of the bedside nurse promotes social change through empowering the bedside nurse to take on

these new responsibilities as well as help those outside the nursing field to recognize nurses as change agents in the healthcare arena.

Problem Statement

In the facility where the project was implemented, providers and nurses had made efforts in recent years to address complications associated with delirium in the ICU. This included a reduction in continuous sedation and narcotic drips on the mechanically ventilated population and efforts to reduce noise and sound as environmental disturbances contributing to sleep deprivation. Various units within the facility implemented other measures, such as light and noise control, use of blue lights, and use of ear plugs and eye masks, but no standardized sleep quality initiative had been implemented consistently across all the critical care units in the facility.

This project was part of a larger effort to develop a sleep promotion program for the facility. The identified problem was the negative impact of environmental factors in the ICU on sleep quality in that patient population. The specific piece that this Doctorate of Nursing Practice (DNP) project addressed was the retiming of routine laboratory and imaging tests. In this project, I looked specifically at the retiming of routine laboratory and imaging testing to be obtained outside the scheduled "quiet time" to reduce nonurgent nighttime interruptions in the ICU. This quiet time was designated from 11 p.m. to 4 a.m. The target population was adult, noncomatose, nonventilated patients in a 16-bed ICU. The goal was to provide at least 5 hours of uninterrupted nighttime sleep from 11 p.m. to 4 a.m. Although there was limited evidence-based research evaluating the effectiveness of implementing these strategies in the ICU population (Friese, 2008;

Patel, Baldwin, Bunting, & Laha, 2014), the significance to the nursing field involves the need for nursing empowerment thorugh EBP for better patient outcomes. I expected that the implementation of the specific intervention addressed in this project would present an opportunity to demonstrate nurses' positive efforts towards improving the clinical outcomes of patients in ICU settings.

Purpose

A gap in knowledge exists among ICU providers and nurses pertaining to the effects of sleep deprivation on critical illness and patient outcomes as well as the effectiveness of strategies to improve it in this population (Friese, 2008; Kamdar, Needham, & Collop, 2012). The consequences of sleep deprivation have been primarily studied in healthy patients (Huang et al., 2015). However, the vulnerable nature of critically ill patients makes them more at risk of profound consequences related to sleep deprivation than those of healthier patients (Friese, 2008).

The purpose of the project was to evaluate the effectiveness of implementing a specific environmental intervention in the adult, noncomatose, nonventilated patients in the ICU to improve sleep quality based on the results of the Richard-Campbell Sleep Questionnaire (RCSQ; see Appendix A). The RCSQ is a validated measure of sleep quality that has been used in the ICU setting (Kamdar et al., 2012). The practice-focused question for the project was: Will the retiming of routine laboratory and imaging testing outside of the designated quiet time improve sleep quality among adult patients in the ICU? This project served as a portion of a larger initiative to implement a sleep promotion bundle for the project site to address the gap in practice that existed and was

made evident by the lack of a standardized protocol to improve sleep deprivation in the ICU despite the link to poor ICU and post-ICU healthcare outcomes and increased mortality and morbidity

Nature of the Doctoral Project

The nature of the DNP project is to translate evidence into clinical practice (Zaccagnini & White, 2012). According to the DNP Essentials, the DNP program will prepare the practitioner to plan, implement, and evaluate effective, patient-centered QI projects (Association of Colleges of Nursing, 2006). The project design was a QI project introducing an intervention that could potentially impact the effect of environmental factors on sleep quality in the adult, noncomatose, nonventilated ICU patients. QI projects implemented in healthcare organizations offer an opportunity for stakeholders to examine current practices within their organizational systems to identify problems or potential problems and initiate measures directed at making ongoing improvements in quality and efficiency at all levels of the organization (McEwen & Wills, 2011). This project offered an opportunity for the demonstration of my curriculum training to develop a sustainable QI plan that would address practice problems that impacted the quality of patient care in the practice setting (Association of Colleges of Nursing, 2006). The project supports changes not only at the microsystem level of the nursing unit but through engagement of leadership at the macrosystem levels as well. Leadership engagement is crucial for the successful implementation of changes at the microsystem level that can directly impact patient care throughout all the facility's critical care areas (Parsons & Cornett, 2011).

In this DNP project, I gave the RCSQ questionnaire (see Appendix A) to the nighttime RN to be completed after awakening at shift change between 7:00–8:00 a.m. The RN completed the questionnaire based on the six measures describing the patient's sleep. The RN documented any reason(s) for interruptions between the hours of 11 p.m. to 4 a.m., such as orders requiring frequent monitoring (i.e., neuro-checks, vital sign monitoring, medication titration, etc.); pain assessment and monitoring; frequent lab or imaging studies; acute changes in patient condition, etc. The forms were stored securely on the unit for a designated project team member to retrieve. The Sleep Quality Improvement Questionnaire (see Appendix B) was completed by the nursing staff to collect the following data: primary team, admission date and diagnosis, ventilator status, cardiac arrest status, incarceration status, reasons for interruptions between the quiet time hours, and any interventions completed to promote sleep quality. This form was returned to the designated project team member who presented the de-identified data to me for analysis.

I chose the plan-do-study-act (PDSA) framework as the approach to guide the implementation of this doctoral project. The step-by-step approach of this method allowed for the acquisition of information that built upon the previous step(s) refining the intervention into one with the goal of improving sleep deprivation in this population (Christoff, 2018). In this doctoral project, the gap in practice was the lack of a standardized protocol to improve sleep deprivation in the ICU despite the link to poor ICU and post-ICU healthcare outcomes and increased mortality and morbidity. With the four-step approach of the PDSA model, nursing was empowered to use EBP to

implement a clinical change that had the potential to improve healthcare outcomes in their practice setting. With this project, I evaluated the effectiveness of implementing a specific environmental intervention in the adult, noncomatose, nonventilated patients in the ICU to improve sleep quality based on the results of RCSQ (see Appendix A). This evaluation was expected to lead to a change in clinical practice supported by both nursing and healthcare providers caring for this ICU population.

Significance

Interventions to improve sleep quality require a change in the current practice that involves engaging stakeholders, such as patients, families, ICU providers, nurses, and staff, to incorporate the change in practice. Sustaining these interventions requires reinforcement of these practice guidelines and obtaining support from education and management teams (Kamdar et al., 2012). These measures are expected to improve sleep quality and reduce the risk of delirium, which has been shown to be independently associated with increased ICU and hospital morbidity and mortality (Kamdar et al., 2012; Weinhouse et al., 2009; Xie, Kang, & Mills, 2009).

Sleep disturbances, such as sleep deprivation, are a frequent occurrence in the ICU setting and potentially can lead to delirium (Pisani et al., 2015). Delirium has been associated with increased hospital stay, mortality, and costs (Friese, 2008; Weinhouse et al., 2009). For years, hospital routines have not promoted sleep quality due to frequent nighttime interruptions, including early morning blood draws and diagnostic studies, frequent monitoring, routine patient care interventions, and overall increased noise and

lighting in the ICU environment (Friese, 2008; Honkus, 2003; Hu, Jiang, Zeng, Chen, & Zhang, 2015; Patel et al., 2014).

Sleep deprivation has long been overlooked by healthcare professionals in the ICU as a significant problem (Wang & Greenberg, 2013). Studies have shown that to some degree, the lack of understanding of the consequences associated with poor sleep quality in the ICU by nurses is attributed to a lack of training as well as the lack of implementation of protocols promoting sleep quality (Nesbitt & Goode, 2014). Complications of the ICU stay have ramifications beyond the ICU period in terms of physical, mental, and cognitive impairments (Needham et al., 2012). Due to these complications, initiatives to improve sleep quality are deemed necessary (Pulak & Jensen, 2014).

As patient advocates, nurses are in a position to not only recognize subtle changes in their patient population but to be aware of environmental factors in the unit that may prevent quality sleep from occurring (Honkus, 2003). The role of an empowered nurse offers opportunities for modification to and/or implementation of identified interventions to improve sleep quality in the ICU (Simpson, Lee, & Cameron, 1996). The need to promote staff education and training in the area of sleep and its impact on the ICU experiences is crucial in improving the gap in staff awareness and understanding as well as promoting improved patient outcomes (Ding, Redeker, Yaggi, & Knauert, 2017).

This DNP project offered an opportunity to provide staff education on the consequences of sleep deprivation in the ICU as well as the introduction of interventions to improve sleep quality and reduce risk factors associated with the short- and long-term

effects of the impairment of ICU sleep quality. In addition, this DNP project contributed to field by way of expanding nursing skills from just the role of clinician to the development of skills in the areas of leadership, education, and research. Successfully implementing a change in the project setting and improving the outcomes of this patient population has the potential to promote change within the project site hospital organization, leading to improved outcomes beyond the ICU and hospital admission. The findings of this DNP project can help support the implementation of a standardized sleep protocol that can be transferable to other ICUs within the facility.

The potential implications for positive social change include the empowerment of the nursing staff to take an active role in improving patient outcomes with evidence-based interventions, reducing short- and long-term effects of sleep deprivation after ICU discharge, and transitioning nurses into leadership among their peers as they design, implement, and evaluate evidence-based interventions. Positive change is the result of understanding the need to develop and sustain EBP research (White & Dudley-Brown, 2012).

Summary

In this section, I focused on the problem of sleep deprivation in the ICU setting and the associated short- and long-term consequences for this patient population. In this section, the purpose, which was to evaluate the effectiveness of implementing a specific environmental intervention in the adult, noncomatose, nonventilated patients in the ICU in improving sleep, was also addressed. The intervention under study was to retime the routine labs and diagnostic testing to evaluate the effectiveness in reducing sleep

deprivation as measured by the results of the RCSQ (see Appendix A). Nurses can no longer be regarded as only bedside clinicians. The nursing profession has expanded from bedside clinicians to providers, educators, leadership/executives, entrepreneurs, researchers, politicians, etc., and in alignment with that nurses' training, skills, knowledge, responsibilities, and roles have expanded. With this expansion comes the potential for social change for those within the profession as nurses recognize their potential and for those providers, other healthcare workers, families, and patients outside the profession who recognize nurses as powerful change agents in the healthcare system. This DNP project offered an opportunity to demonstrate how bedside nurses could design, implement, evaluate, and revise a QI project based on evidence-based guidelines and improve patient outcomes. This project aligned with Walden University's mission to establish a network of professionals who have been prepared to function on a higher scholarly level to implement positive social changes in their communities and globally. In the next section, I will discuss the theoretical framework that guided this project, the relevance to nursing practice, the local background and context, as well as my roles as the DNP student and that of the project team.

Section 2: Background and Context

Introduction

The problem identified in this project was the negative impact of environmental factors in the ICU on sleep quality in that patient population. The key question of the project was: Will the retiming of routine laboratory and imaging testing outside of the designated quiet time improve sleep quality among adult patients in the ICU. The purpose of the project was to evaluate the effectiveness of implementing a specific environmental intervention in the adult, noncomatose, nonventilated patients in the ICU in improving sleep quality based on the results of the RCSQ (see Appendix A). The major topics discussed in this section will include the concepts, models, and theories that framed the project development; the relevance of the project to nursing practice; definitions of specific terms related to the project; the general and specific literature review conducted; the local background and context of the project; the role of the DNP student and team members related to the project; and a summary of the section.

Concepts, Models, and Theories

The theoretical framework for the implementation and evaluation of this QI project was the PDSA model. The PDSA model offers a method for implementation of a practice change in a structured and sequential manner (Johnson & Raterink, 2009). The model proposes an effective means for sustaining a continual change in an organization (Lyder, Grady, Mathur, Petrillo, & Meehan, 2004). The PDSA method focuses on the changing of process steps as opposed to the changing of the people involved (Johnson &

Raterink, 2009). My belief was that this type of focus would yield greater success for an intervention change, particularly in this practice setting.

In the plan phase of the model, I recruited key people to work with me to identify the problem and begin implementation of the change process. Their role was to set goals, achievable outcomes, and to brainstorm for solutions for the identified problems (see Varkey & Kollengode, 2011). The primary activities in the plan phase included identifying and meeting with key people (e.g., the nursing management team, physician champions, and nursing team members). From these meetings, the team developed data collection criteria, created a Sleep Quality Improvement education PowerPoint for training providers and nursing staff, created a Sleep Quality Improvement checklist, and identified outcome measures.

The next phase of the model is the do phase. This phase of the model involved implementation of the program and collection of the data (Lyder et al., 2004). The activities in the do phase included identifying participants and obtaining informed consent for participation, collecting and reviewing preintervention RCSQ scores, implementing the interventions, and gathering feedback from the nursing staff and the key people for the project.

The study phase involved analyzing the data and measured outcomes. Analysis at this phase allowed for the evaluation of readiness for progress toward the act phase because the data were reviewed for successfully meeting the expectations versus failure to meet expectations. Along with key people, I returned to the plan phase and made changes to the proposal and implementation process as needed (see Varkey &

Kollengode, 2011). The activities in the study phase involved collecting and reviewing postintervention RCSQ scores, comparing pre- and postintervention RCSQ scores, creating display boards containing data results and the status of outcome measures, and developing measures to promote ongoing education to maintain staff interest and motivation.

The act phase of the model was the final step in implementation. In this phase, the key persons reflect on the project and give feedback on sustainability for continual improvement (Lyder et al., 2004). The activities in this phase included obtaining feedback from nursing team members and provider champions; disseminating results to all stakeholders (e.g. nursing management, team members, nursing educators, and nursing staff); and allowing feedback on maintaining current plan and/or making changes to the plan as indicated. This process could be repeated as an ongoing evaluation for improvement (Johnson & Raterink, 2009)

The appeal of the PDSA process was that it could produce rapid cycles of change within the program to maintain engagement of the nursing staff support of management and stakeholders and provide the momentum needed to change behaviors, policies, and procedures (see Lyder et al., 2004). A systematic review of the effectiveness of using Quality Improvement Collaboratives looked at methods to improve health provider practices and patient outcomes and the PDSA ranked high among the methods seen as most effective among lawmakers and healthcare leaders in terms of effectiveness (Nadeem, Olin, Hill, Hoagwood, & Horwitz, 2013). Varkey and Hollengende (2011)

found that PDSA was again most effective because of the repetitive phases that allowed for small achievements and the continued evaluation/reevaluation process.

The following terms used throughout this project need clarification of the meaning within this specific context. Understanding these terms is crucial is establishing their relevance in nursing practice and to this project.

Delirium: The disturbance of consciousness with inattention, the acute change in cognition that is not associated with dementia, the development in a short time frame with fluctuations over time, and the disturbance is a direct physical consequence of some general medical condition (Morandi & Jackson, 2011).

Richard-Campbell Sleep Questionnaire: A reliable and valid clinical tool to measure sleep quality in the ICU (Kamdar et al., 2012). It is a visual analog measure where nursing gives an observation or patients give a self-report of perceived sleep depth, efficiency, and quality (Kamdar et al., 2012).

Sleep deprivation: The lack of the usual amount of sleep of an individual in a 24-hour period (Chang, Pien, Duntley, & Macones, 2010). It is a stressor with consequences for the brain and other body systems (B. S. McEwen, 2006). It is an insufficient amount of sleep over a specified period and can be the result of poor sleep quality (Pressman, 2013).

Sleep disturbances: Difficulties in falling asleep and poor sleep quality that are common in patients who have been cared for in the ICU (Orwelius, Nordlund, Nordlund, Edell-Gustafsson, & Sjoberg, 2008).

Relevance to Nursing Practice

I established the relevance of this topic to clinical practice with a review of the literature. To locate the extant literature on sleep quality and sleep deprivation, I used search engines, such as Google Scholar, Walden library, CINAHL, SAGE Premier, Elsevier SD Health Sciences, ProQuest Nursing & Allied Health Source New Platform, EBSCOhost CINAHL Plus with Full Text. The keyword search terms, phrases, and Boolean search strings used included *sleep deprivation, ICU patients, environmental interventions to improve sleep quality, non-pharmacologic sleep interventions, sleep quality questionnaires, Richard-Campbell Sleep Questionnaire, RCSQ, sleep deprivation in the ICU, sleep quality in the ICU patient, environmental factors influencing sleep quality in the ICU,* and *delirium in the ICU*. The review of more than 100 journal articles, book references, and expert scholarly reports helped me gain an understanding of sleep deprivation in the ICU setting over a span from 2009–2018.

I also performed a literature review related to QI projects focusing on both a general search relating QI projects to sleep deprivation and a specific focused relating it to the ICU setting. QI projects have been effective in implementing evidence-based interventions in the hospital setting. Areas of focus have included hospital-acquired pressure ulcers (Mallah, Nassar, & Badr, 2015; Padula et al., 2015; Padula, Mishra, Makic, & Valuck, 2014; Tayyib, Coyer, & Lewis, 2015), central line-associated blood stream infections (Blot, Bergs, Vogelaers, Blot, & Vandijck, 2014; Herzer, Niessen, Constenla, Ward Jr., & Pronovost, 2014; Payne, Hall, Prieto, & Johnson, 2018), and hospital falls (Ferguson, Uldall, Dunn, Blackmore, & Williams, 2018; Hshieh et al.,

2015). In the following paragraphs, I focus on the general aspects of sleep deprivation and delirium as well as the interventions used to manage them.

The effects of sleep deprivation on ICU patients have been linked to a multitude of physiological and psychological consequences, such as delirium, anxiety, depression, decreased pain threshold, reduced protein catabolism, hyperglycemia, immune dysfunction, increased cardiovascular risk and development of Type 2 diabetes (Kamdar et al., 2012; Kamdar, Kamdar, & Needham, 2014; Mullington, Haack, Toth, Serrador, & Meier-Ewert, 2009, Wang & Greenbery, 2013). The development of sleep deprivation and its linkage to physiological and psychological consequences potentially can impair healing, increase mortality and morbidity, and lead to an increased length of stay (Eliassen & Hopstock, 2011). This makes promoting quality sleep important to the recovery and overall improved healthcare outcomes of the ICU patient (Boyko, Ording, & Jennum, 2012). According to Kamdar et al. (2014), the American College of Critical Care Medicine has recommended the following strategies to promote sleep in the adult ICU setting: control light and noise, cluster patient care activities to reduce unnecessary interruptions, and decrease stimuli at night. These recommendations have low quality of evidence to support them but have contributed to an increase in awareness directed at implementing the following interventions: minimizing use of sedative medications, preventing delirium, promoting early mobilization, and improving post-ICU neuropsychological outcomes (Kamdar, Kamdar, & Needham, 2014). Developing interventions directed at environmental factors that affect sleep quality in the ICU offers

an opportunity to improve sleep quality in this population, reduce consequences associated with sleep deprivation, and positively impact social change.

Sleep deprivation has been associated with such consequences as poor memory, impaired cognitive thinking, increased aggressiveness, and emotional disturbances (Orzel-Gryglewska, 2010). It also has been linked to increased the risk of poor wound healing and delayed recovery (Tamrat, Huynh-Le, & Goyal, 2014). To understand the importance of sleep deprivation, the normal sleep-wake cycle and the impact of disruptions on patients and health outcomes must be understood. The normal sleep cycle is characterized by alternating phases of rapid eye movement (REM) and nonrapid eye movement (NREM; Kamdar et al., 2012; Kirsch, 2015; Vyazovskiy & Delougu, 2014). The REM phase accounts for 20%–25% of the total sleep time and is characterized by increased brain activity directed at dreaming and learning, while the NREM phase accounts for 75%–80% of the total sleep time and is characterized by progression from light to deep sleep (Kamdar et al., 2012). The typical pattern begins with a short REM phase followed by the stages of NREM that go from light to deep sleep and back to REM, and over the course of the sleep cycle, the REM increases in time and the NREM decreases (Tuck Sleep, 2018). Sleep deprivation during REM sleep can lead to increased excitablity of the brain with only subtle neurologic changes noted, but with chronic cases, more obvious depression-like characteristics have been observed (Riemann et al., 2012). This can lead to delirium, the poor function of attention, and memory dysfunction (Oto et al., 2012).

Sleep deprivation has the potential to have physical, cognitive, and psychological impairments to recovery because post-ICU discharge patients have demonstrated impaired recovery secondary to those sleep disturbances that were present in the ICU (Wang & Greenberg, 2013). Not only do sleep disturbances, such as sleep deprivation, present a substantial public health burden, but they are associated with increased risk of hypertension, diabetes, obesity, cardiovascular disease, cerebrovascular insults, and depression (Altevogt & Colten, 2006). Physiological changes associated with sleep deprivation are related to impaired immune response and hormonal secretion, impaired respiratory muscle function, hypertension, hyperlipidemia, glucose intolerance and obesity, increased risk of obesity, diabetes, and cardiovascular disease (Orzel-Gryglewska, 2010; Pisani et al., 2015). AlDabal and BaHammam (2011) suggested that the linkage between sleep deprivation and these conditions needs additional research because the management of the sleep deprivation may be effective in reducing hypertension and improving glucose control as well as the treatment and potentially prevention of hyperlipidemia. These effects, if not reversed, can lead to the development of cardiovascular disease (Mullington et al., 2009). Franzen et al. (2011) also showed that sleep deprivation when combined with psychological stressors has a potential for a synergistic impact on cardiovascular disease and hypertension. This would suggest that targeting modifiable changes to improve sleep quality and duration could potentially lead to the reduction of hypertension and other cardiovascular risks.

Not only does sleep deprivation impact patients physically but there are psychological and cognitive consequences as well. Psychiatric disturbances are measured

by assessing for posttraumatic stress and delirium (Kamdar, Needham, & Collop, 2012). Sleep deprivation has also been associated with an increase in perception of stressors and feelings of lack of control (Xie et al., 2012). Patients admitted to the ICU are also at risk of cognitive impairments that last for up 1-year post-ICU discharge (Pandharipande et al., 2013). Sleep deprivation has been associated with multiple cognitive impairments such as decreases in alertness, attentiveness, memory, judgment and decision-making abilities (Kilgore, 2010).

The use of sleep promotion bundles that include pharmacologic and non-pharmacologic interventions have shown improvement in reducing the severity of delirium in non-ICU patients (Patel, Baldwin, Bunting, & Laha, 2014) but no clear link to reducing its duration (Siddiqi et al., 2016). Noise reduction with the use of earplugs and eye masks has shown subjective improvement in sleep quality (Hu, Jiang, Zeng, Chen, & Zhang, 2015) and there is evidence that these cost-effective interventions may promote extended periods of sleep (Xie, Kang, & Mills, 2009). Massage therapy is another intervention that has shown some improvement not only with sleep quality but also in improving anxiety and pain among hospitalized oncology patients (Adams, White, & Beckett, 2010). The use of back massages for several days has shown to improve sleep quality in the ICU based on the Modified Groninger's Sleep Quality Assessment Scale (Shinde & Anjum, 2014). Music therapy is a low cost, effective intervention that has shown improvements in sleep quality in both acute and chronic sleep disorders both inpatient and outpatient which can be generalized across a variety of patient types (Wang, Sun, & Zang, 2012).

Once delirium has developed it is more challenging to treat whether with pharmacologic or nonpharmacologic interventions, therefore strategies directed at prevention are crucial (Skrobik, 2011). Skrobik (2011) presented a study that found that the use of non-pharmacologic interventions was effective in delirium prevention in the high-risk geriatric population evaluated outside the ICU setting. The challenge with generalizing these findings to the ICU setting is that the settings are not comparable and sleep abnormalities that are a common occurrence in the ICU may present and be treated differently in the non-ICU setting (Friese, 2008; Skrobik, 2011). But overall, many of the interventions to reduce sleep deprivation and delirium in the non-ICU setting can be utilized into the ICU setting (Brummel & Girard, 2013).

Multiple pharmacologic agents are used in the ICU and non-ICU settings for the management of sleep disturbances. Sleep fragmentation, insomnia and sleep deprivation describe many of the sleep disturbances that are experienced (Medic, Wille, & Hemels, 2017). Many of these medications used for the management of these sleep disturbances have sedating properties that have not shown to improve the sleep-wake cycle (Jaiswal, Malhotra, & Owens, 2016). One exception is melatonin, which increases the total sleep time, decreases the time it takes to fall asleep and improves overall sleep quality (Ferracioli-Oda, Qawasmi, & Bloch, 2013). When compared to earplugs and eye masks, melatonin also has shown effectiveness in improving sleep quality (Huang et al., 2015).

In the ICU setting, the lack of pain control is often a culprit for the development of agitation and treated without a good assessment of the underlying cause for the agitation (Brummel & Girard, 2013). The importance of assessing the cause of the

agitation (i.e. pain, anxiety, delirium, etc.) is crucial to adequately treat the agitation (Huang et al., 2015). Benzodiazepines are often used in the ICU as continuous infusions in mechanically ventilated patients for the sedating properties (Kamdar et al., 2015). Although the use of benzodiazepines may increase the total amount of sleep the patients receive (Beltrami, Nguyen, Pichereau, Maury, Fleury, & Fagondes, 2015), it is not effective in promoting REM sleep which leads to reports of poor sleep quality as well as increased night-time wakefulness (Kamdar, Needham, & Collop, 2012). Opioids are another medication used in the ICU for pain control but can contribute to developing delirium (Field & Wall, 2013) and sleep deprivation (Huang et al., 2015). Because of this, recommendations have been to use opioids and benzodiazepines not as continuous infusions but as bolus dosing based on assessment of need for pain vs sedation management (Kamdar et al., 2015).

Other drugs used in the ICU for sleep disturbances include hypnotics, antidepressants and antipsychotics, in which all of them have the potential to increase the risk of developing delirium (Pisani et al., 2015). There is not much evidence supporting the use of hypnotic and antipsychotics in the ICU setting because of their side effects, which include delirium (Pisani et al., 2015). The next section will look at the review of the literature with a specific focus on the ICU setting and the consequences of sleep disturbances in that population of patients.

The literature on sleep deprivation not only shows a generalized impact on nursing practice but the more specific impact it has on the hospitalized patient, particularly the patient in the ICU. Sleep deprivation has proven to be a frequent and not

well understood occurrence in the ICU (Gabor et al., 2003). The ICU environment is not conducive to promoting sleep quality due to loud noises from staff and monitoring systems, frequent interruptions due to critical care interventions (Cooper & Taqueti, 2004) and has been described as both stressful and traumatic (Scragg, Jones, & Fauvel, 2001). These factors place this population at risk for poor quality of life post-ICU discharge (McKinley, Fien, Elliott, & Elliott, 2016).

ICU delirium is associated with consequences such as higher mortality rates, increased healthcare costs and long-term cognitive dysfunction (Pandharipande, Shintani, Peterson, Pun, & Wilkinson, 2006). Studies looking at those consequences and their relationship to sleep deprivation have not focused on ICU patients (Figueroa-Ramos, Arroyo-Novoa, Lee, Padilla, & Puntillo, 2009). The relationship between sleep deprivation and delirium remains unclear, particularly in the ICU setting (Weinhouse, et al., 2009). A definitive causal relationship between the sleep deprivation and delirium has not been established (Figueroa-Ramos, Arroyo-Novoa, Lee, Padilla, & Puntillo, 2009) but more literature exists looking at sleep deprivation being a risk rather than a cause of the development of delirium (Brummel & Girard, 2013; Weinhouse et al., 2009). Acknowledging sleep deprivation as a risk factor for the development of delirium assumes that it can be linked to the adverse outcomes of delirium such as increased morbidity, mortality, and length of ICU stay (Weinhouse et al., 2009). Xie, Kang, & Mills (2009) not only suggest a link between sleep deprivation and delirium but also a link to disorders of other systems such as respiratory, cardiovascular, and immunologic.

Despite the ongoing research directed at improving sleep quality and reducing the associated consequences, few changes have been made in the ICU setting due to the lack of prior research addressing sleep deprivation and critical care outcomes (Kamdar, Needham, & Collop, 2012). Much more research has been conducted focusing on delirium and its impact on non-ICU patients but there remains little evidence known about delirium in the ICU patient (Girard, Pandharipande, & Ely, 2008). There are both pharmacologic and non-pharmacologic interventions that are used to treat sleep deprivation. The use of benzodiazepines in the ICU for sleep disturbances has shown to be associated with patient perception of poor sleep quality and with the use of it for agitation that also promotes poor sleep quality (Bihari et al., 2012). Benzodiazepine and hypnotic use in managing sleep disturbances have been linked to increased risk of delirium in the ICU setting (Patel, Baldwin, Bunting, & Laha (2014); Weinhouse et al. (2009)). Increased episodes of insomnia have been noted when these medications are withdrawn suddenly as well as their link to the development of delirium associated with their use in the ICU setting (Beltrami, Nguyen, Pichereau, Maury, Fleury, & Fagondes, 2015). The use of Zolpidem, specifically, has been shown to increase the risk of falls in non-ICU patients potentially increasing mortality and hospital costs (Kolla, Lovely, Mansukhani, & Morgenthaler, 2012) Hypnotics and other drugs to increase daytime alertness have been linked to increase incidences of headaches and nausea (Touitou, Reinberg, & Touitou, 2017). Lorazepam showed a direct link to developing delirium (Pandharipande, Shintani, Peterson, Pun, & Wilkinson, 2006).

Other pharmacologic agents such as opiates, antidepressants, antipsychotics, propofol, and dexmedetomidine have been used in the management of sleep disturbances in the ICU. Both benzodiazepines and opiates have shown links to increased days of delirium (Pisani, Kong, Kasl, Murphy, Araujo, & Van Ness, 2009) as well as suppressing the the ability for patients to reach a deep restorative sleep pattern (Weinhouse et al., 2009). Chronic use of opiates can lead to significant impairment to sleep patterns to include decreased sleep time and increased time from wakefulness to sleep (Angarita, Emadi, Hodges, & Morgan, 2016).

Sedating antidepressants have been discouraged in the management of insomnia in the ICU due to side effects such as arrhythmias and hypotension (Kamdar, Needham, & Collop, 2012). Antidepressants not only have a prolonged onset to effect, they have a higher risk of dependency increasing the risk of withdrawal symptoms, and they have no proven effects that improve sleep quality (Bourne & Mills, 2004). Data were controversial in using typical antipsychotics (i.e. haloperidol) and atypical antipsychotics (i.e. olanzapine and risperdal) in terms of increased mortality and survival rates (Pun & Ely, 2007).

Propofol infusions have been found to worsen sleep quality in critically ill, mechanically ventilated patients (Kondii, Alexopoulou, Xirouchaki, & Georgopoulos 2012; Pisani et al. 2015). Again, in controversial findings, Dexmedetomidine has been shown to have increased incidences of delirium in one pilot (Jakob et al., 2012) It has also shown to have a lesser incidence of association with delirium (Kamdar, Needham, & Collop, 2012) when compared to benzodiazepines. Although dexmedetomidine was

shown to preserve the day night sleep pattern by reducing fragmented sleep, it was associated with severe disruption of the overall sleep cycle as evidenced by a lighter sleep perception and poor overall quality sleep (Alexopoulou, Kondili, Diamantaki, Psarologakis, & Kokkini 2014; Oto et al. 2012;. Additional research should be conducted to evaluate the effectiveness of the use of pharmacologic interventions as prophylactic measures to prevent delirium in the ICU setting (Patel, Baldwin, Bunting, & Laha, 2014)

A variety of non-pharmacologic interventions have been studied as single interventions or bundled into a group. Some of these include use of eye masks and earplugs, massage therapy, music therapy, rescheduling routine nursing interventions, etc. Non-pharmacologic intervention strategies may be crucial in the prevention and management of delirium in the ICU setting (Schiemann, Hadzidiakos, & Spies, 2011) with potentially less of the consequences associated with the pharmacologic interventions. Tamrat, Huynh-Le & Goyal (2014) found low quality evidence supporting non-pharmacologic intervention use in improving sleep quality and quantity in the general in-patient population. The limitations included were the lack of use of randomized trials, the similarity among the interventions and outcome measures, and the diversity of the patient populations made it difficult to use these findings to implement practice changes.

ICUs are typically very noisy places from staff/patient/guest conversations, monitor and ventilator alarms, equipment moving, intercom announcements to list a few. Despite clear guidelines from the World Health Organization, it remains a challenge for ICUs to remain below the recommended noise levels (Darbyshire & Young, 2013).

Interventions implemented to improve the impact of light and sounds in the ICU have shown some benefit on improving sleep quality (Bion, Lowe, Puthucheary, & Montgomery, 2017). Ventilator and monitor alarms in the ICU account for a significant number of interruptions to sleep (Elbaz et al., 2017). Routine patient care activities that include turnings, assessments, phlebotomy, bathing, obtaining vital signs, diagnostic tests are just some of the activities that patients report as reasons for night time disruptions contributing to their poor sleep (Pisani et al., 2015).

Hu et al (2015) found that the use of earplugs and eye masks were beneficial but that the quality of the research was limited. This study looked at multiple trials with inconsistent findings and none of the outcome measures looked at cost savings or mortality. Other studies have shown that the use of eye masks and earplugs (Deyse, Daneshmandi, Sharme, & Ebadi, 2011; Mashayekhi, Arab, Pilevarzadeh, Amiri & Rafiei, 2013;) offer effective as well as cost saving interventions to improve sleep quality in the acute coronary patients. In a simulation of the ICU setting (Darbyshire & Young, 2013; Hu, Jiang, Zeng, Chen, & Zhang, 2015), findings showed improvements in sleep quality with the use of earplugs and eye masks with recommendations for their use. Even in less critically ill patients that are not on mechanical ventilatory support and not receiving continuous sedation infusions, there has also been improvements in patient perception of their sleep quality (Pisani et al., 2015).

Massage therapy has shown improvements in sleep quality and reduced fatigue in post coronary artery bypass patients (Nerbass, Feltrim, de Souza, Ykeda, & Lorenzi-Filho, 2010). Slow stroke massages were shown to improve sleep quality although the

study was limited to a small sample size and over a short study period (i.e., 4 weeks) (Shinde & Anjum, 2014). Music therapy is also an inexpensive intervention that has shown to be effective in improving sleep quality in patients with acute and chronic sleep disorders (Wang, Sun, & Zang, 2012). Music and the combination of the use of earplugs and eye masks has been an effective bundle in promoting sleep quality in the ICU setting (Hu, Jiang, Zeng, Chen, and Zhang, 2015).

Gelinas, Arbour, Michaud, Robar, and Cote (2013) suggested that nonpharmacologic interventions should be used adjunctively with pharmacologic treatment of pain in ICU patients and that these non-pharmacologic interventions demonstrate a feasible alternative or adjunct mode of treatment to improve sleep quality, reduce associated short- and long-term consequences, and improve overall healthcare outcomes in the ICU population. Bourne and Mills (2004) suggested appropriate drug use combined with environmental controls to reduce the incidence and effect of sleep disruption in ICU patients.

Limited data exists related to adjusting the timing of phlebotomy and diagnostic testing as an intervention to promote sleep quality with the reduction of unnecessary interruptions during the night. Rescheduling of routine labs and diagnostic tests to outside of a scheduled Quiet Time potentially can promote sleep quality with a reduction in nonemergent, nonurgent interruptions of sleep (Le, Friese, Hsu, Wynne, Rhee, & O'Keefe, 2012). Activities such as phlebotomy and taking vital signs have been among the biggest reported disruptions to sleep in the ICU (Pisani et al., 2015). Stewart and Arora (2018) found that in a bundle with other interventions focusing on light and sound

reduction, the delaying of phlebotomy and passive vital sign monitoring showed some improvements in length of stay, hospital readmission rates and patient perception of mental/emotional health. Very limited research has been done to show the effectiveness of retiming these activities to improve sleep quality in the ICU (Dunn, Anderson, & Hill, 2010). This potentially could be one of the most efficient and cost effective measures in terms of reduction in length of ICU stay, overall hospital costs, and development of long and short term consequences to the ICU patient (Patel, Baldwin, Bunting, & Laha, 2014). Smith and Grami (2017) found that clustering groups of activities into a sleep promotion bundle that included obtaining phlebotomy and diagnostic testing outside of the midnight to 5 a.m. time period was successful in the reduction and prevention of delirium in their critically ill population. This doctoral project can fill this gap-in-practice revealed in the literature by showing the effectiveness of this single intervention in improving sleep quality and then including it into a sleep promotion bundle impacting various modifiable areas contibuting to sleep deprivation and delirium in the ICU.

Local Background and Context

The problem being addressed in this DNP project was the negative impact of environmental factors in the ICU on sleep quality in that patient population. The problem reflected the assumption that environmental factors had a significant impact on sleep quality of critically ill patients in the ICU. Also, the assumption that this negative impact affected short- and long-term outcomes that include length of stay, development of delirium, reintubation rates, and increased use of pharmacologic interventions to prevent

and manage sleep disturbances such as sleep deprivation, insomnia, etc. All evidence used to answer the practice-focused question will be covered in Section 3.

The project was developed out of observations of issues such as delirium, altered mental status, ICU psychosis, etc. in the ICU population. The primary method of management has traditionally been pharmacologic management that often resulted in delirium, reintubation and increased agitation. As current practices were being evaluated as well as long term consequences related to this issue, the need for a change in practice for the unit was becoming more evident. Evaluating the current practices also allowed the opportunity to engage the nursing staff in the process of implementing a practice change with the focus on efforts to improve sleep quality and reduce the short- and long-term consequences of sleep deprivation. Successful implementation of the process changes were expected to improve patient outcomes but also empower the nursing staff to be more engaged in impacting the care and outcomes of their patients. It allowed providers the opportunity to recognize the need to continue evaluation and re-evaluation of practice guidelines and protocols and make adjustments focused on improving outcomes, reduce ICU length of stay and reduce overall hospital costs related to ICU admissions.

The mission and vision for the facility states their commitment focuses on improving the health of the individual and community that is represented, supported and served. This care is based on promoting excellent quality of the service and care provided and demonstrating compassion and integrity towards every member of the organization. The project supported fulfillment of their mission and vision by promoting improved healthcare outcomes in the identified population.

There are a few other terms used in this project that should be clarified for better understanding from a nursing practice standpoint, such as Insomnia and Non-pharmacologic interventions. Insomnia is described as an inability to fall asleep or stay asleep (Sporndly-Nees, Asenlof, & Lindberg, 2017) that leads to impaired functioning during the day (Terauchi et al., 2012). Nonpharmacologic interventions represent alternative measures for treatment that are beneficial and are associated with fewer adverse reactions with efficacy sustained beyond the treatment course (David et al., 2010). These interventions can include sensory, social contact, behavioral therapy, staff training, structured activities, environmental interventions, medical/nursing care interventions, and any combination of these therapies (Cohen-Mansfield, 2001).

The Academy of Sleep Medicine, the National Center of Sleep Disorders Research at the National Institutes of Health, the National Sleep Foundation, and the Sleep Research Society have recognized that sleep deprivation and sleep disorders have significant health consequences (Institute of Medicine, 2006) across all age groups (Perry, Patil, & Presley-Cantrell, 2013). These groups requested that the Institute of Medicine (IOM) review what was currently being done to address sleep disorders and sleep deprivation in the public and academic sectors and to develop a comprehensive plan for education, training, management, and research of sleep disorders. The IOM report discussed the significance of sleep disorders and sleep deprivation. The report concluded that the current scientific and clinical resources available in the field of sleep disorders were not sufficient to improve the problem of sleep disorder and sleep deprivation. The report also suggested that additional strategies were needed to improve awareness of the

problem in both the public and healthcare settings. The report further supported the need for additional research related to sleep deprivation and measures to improve the healthcare outcomes associated with sleep deprivation in public and academic settings that include ICU settings similar to this project site (IOM, 2006). Altevogt and Cohen (2006) recommended that due to the low awareness about the consequences of sleep disturbances, that measures should be implemented to increase awareness as well as improve diagnosis and treatment in improving sleep quality and reducing sleep disturbances. Agencies from the federal government as well as ones in the private and public sector have been working together to implement these IOM recommendations (Perry, Patil, & Presley-Cantrell, 2013). This DNP project falls in line with fulfilling this recommendation.

Role of the DNP Student

I worked as a nurse practitioner provider in the clinical site. Although I had access to the patient care information for the purpose of this project I functioned as the DNP student without access to the patient information directly related to this project. My role as the DNP student was primarily that of project leader for this project. The project leader was responsible for providing the training to the nursing team members, intensivist providers, and management representative. Other specific unit responsibilities included review of the de-identified data collected from the nursing team members, submission of requests for Institutional Review Board (IRB) approvals from Walden University and the partner site, reviewing the data with the statistician, defense of the project validity to the approval committees, and submission of the final abstract for publication. In order to

maintain patient privacy and restrict access to patient protected identifiers, I did not interact with the patients and/or family members/significant others during the practicum experience. Although I cared for the patients on the site unit, I was unaware of which patients were included in the project study and which were excluded and the reason for exclusion. As the DNP student/project leader training was given to the project team nurses who were responsible for providing the training to the unit nurses, patients and families.

The project was chosen because of the perception of nursing and the intensivist team that several patients in the unit had developed sleep disorders to include sleep deprivation, delirium, ICU psychosis, etc. These conditions have often delayed transfers out of the ICU resulting in prolonged ICU stay and in some extreme cases intubation/reintubation related to the delirium or psychosis. There was no established sleep bundle to promote improved sleep quality although the intensivist team has been working on reducing the usage of continuous narcotic and sedation drips to reduce the development of delirium. Each ICU in the hospital system has implemented a variety of interventions to improve sleep quality and/or reduce delirium. This unit for this project has previously evaluated the effect of reduction in noise and light on the unit to improve nursing and patient perception of sleep quality. They had implemented the RCSQ for nursing to document sleep quality perception, but this tool was not consistently being utilized in the other ICUs nor are any of the interventions consistently used across the facility.

One bias of concern for the project was in the collection of the RCSQ data (see Appendix A). The RCSQ form was completed by the night-time nurse based on the nurses' perception of the patients' sleep quality. This bias was related to the potential that the nurses' perception may not have been equivalent to the patient's perception. The RCSQ scores have been collected in other studies based on both nursing and patient perception of the patients' sleep quality and the findings have been variable. Frisk and Nordstrom (2003) found that there was no significant difference in the perception of the nurse vs the patient on the RCSQ form. While Kamdar et al. (2012) found that nurses had the tendency to overestimate the patients' sleep quality based on the RCSQ scores. To limit any bias from the nurse, education focused on the understanding that the nursing documentation reflected the sleep quality of the patients based on the nurses' observation.

Role of the Project Team

I selected a core team of champions that included critical care intensivists, staff nurses and a nurse management representative that worked with me to provide training to the staff on the validity and goals of the project. I provided the core team with training related to short- and long-term consequences of sleep deprivation in the ICU patient. I ensured that the team understood that the goal for the project was to reduce sleep deprivation and the consequences associated with it. The physician champions and nursing team members were selected based on their expressed interest in this quality improvement project, their rapport with their peers, and demonstrated leadership skills based on observation in the critical care setting. Participation was voluntary.

The critical care intensivists supported the project by serving as champions to their physician peers who were a part of medical groups other than the intensivist team. This included the cardiologists and cardio-thoracic surgeons who have admission privileges in this unit. The nursing team members selected the patients that met the inclusion and exclusion criteria, obtained informed consent and ensured the RCSQ (see Appendix A) and Sleep Quality Improvement checklist (see Appendix B) were available for the night-time nurses prior to the beginning of the night shift. The nursing team members were available to answer questions concerning the project from nursing staff, patients, families and others directly involved in the patients' care and they ensured the forms were returned to the secured location for the project leader to pick up. The core team met periodically and reevaluated the need for reinforcement of education to staff and providers, reviewed the data and provide staff with updates regularly of the progress of the project and the overall findings with implications.

The core team members had the opportunity to share their thoughts concerning the process flow via face-to-face discussions or via e-mail. They gave feedback concerning project improvements, the need for process changes, and areas of success, and failure. I was available if the team members were unsure or felt the questions were not being answered satisfactorily or they were unclear of the appropriate response to give.

All information collected by the nursing team members was reported in a de-identified manner to protect patient privacy. Patient identifying information was not shared via e-mail, text messages or in any written format. Because the work schedules

were so variable, I set aside time to meet with each team member on a monthly basis and as needed to discuss concerns, suggestions, successes and failures throughout the project.

The intensivist team added the RCSQ (see Appendix A) to the nursing assessment in the ICU. The forms were reviewed for 2-4 weeks prior to implementation of the project intervention to calculate the preintervention RCSQ scores and averages. I retrieved the forms with de-identified patient information and reviewed them with the nursing team members. After logging the information in a secured database, the forms were destroyed via the hospital secure shredding process so that no patient specific information is compromised. The next step in the process was implementation of the quality initiative, which involved providing staff education of the project intervention. The intervention was to time all routine labs and diagnostic testing outside the Quiet Time period of 11 p.m. to 4 a.m. The intensivist team agreed to have the routine labs and diagnostic testing for their patients completed prior to 11 p.m. or after 4 a.m.. For those patients that are under a primary service of Cardiology, Cardiothoracic Surgery or other off service teams, the routine labs and diagnostic testing were done per the primary team's order. Training was done over a two-week period to ensure that all staff have been educated on the new process.

The post intervention RCSQ forms were collected after training and implementation of the quality initiative. This process continued over a 4-8-week period until the established number of 30 patients has been obtained. Throughout the process, I met with the nursing team members to address any issues, questions or concerns related to completion of the forms, need for further education, staff questions or need for a

change in the process. I retrieved the forms from the nursing team members after the data were de-identified. The postintervention process included review of the patient medical record by the nursing team members to determine if they met the inclusion and exclusion criteria. Results from the project was shared with the unit staff, nursing educators, management team, and intensivist providers at least every 2-3 weeks to update them on the progress and give them an opportunity to address any questions, concerns or need for changes based on their perspectives during the process.

Summary

Due to the limited number of research studies on the use of nonpharmacologic interventions focusing on modifiable environmental factors in improving sleep quality, no one intervention has been shown to generate a higher recommendation over another nonpharmacologic intervention in terms significant improvements (Page, Berger, & Johnson, 2006). The use of interventions focusing on environmental factors, such as the decrease in unnecessary interruptions during the night, reduction in staff noise, decreased lighting during evening hours, the opening of blinds during daytime hours, reduction in patient activities that might disturb sleep, and masking of the sounds in the ICU were found to show some improvement in promoting sleep quality but not necessarily in improving sleep deprivation (Xie, Kang, & Mills, 2009).

This project addressed the clinical problem of sleep deprivation in the ICU and focus on the primary endpoint of improving patient sleep quality in the ICU by evaluating the effectiveness of implementing a specific environmental intervention to reduce nonurgent interruptions during the nighttime. In addition, the project presented an

opportunity to fulfill the DNP Essential VIII: Advanced Nursing Practice through the design and implementation of a QI initiative to improve patient outcomes in the practicum setting. The process allowed for mentoring and empowerment of nursing staff to take an active role in implementing changes to the clinical setting that would improve patient outcomes and increase knowledge and skill of evidence-based nursing practice. In Section 3, I will discuss the project question, sources of evidence as well as the analysis and synthesis of collected data.

Section 3: Collection and Analysis of Evidence

Introduction

The problem that was the focus of this project was the negative impact of environmental factors on sleep quality in the ICU setting. Sleep has been a not well-understood occurrence in the ICU (Wang & Greenberg, 2013). The purpose of this DNP project was to evaluate the effectiveness of implementing a specific environmental intervention in the adult, noncomatose, nonventilated patients in the ICU to improve sleep quality based on the results of the RCSQ (see Appendix A).

Provider champions from the intensivist team shared goals of the quality initiative with their provider peers to gain provider support and compliance. Nursing team members and educators facilitated the sharing of information with their peers, patients, and families about the need to improve sleep quality in this setting. Their responsibilities included reviewing goals, outcomes measures, and nursing responsibilities as well as providing education on the use of the primary measurement tools: the RCSQ (see Appendix A) and the Sleep Quality Improvement checklist (see Appendix B). In this section, I discuss the project question; sources of evidence that supported the practice change; the method of data collection, analysis, and synthesis; and my recommendations to bridge the gap in clinical practice in the project setting.

Practice-Focused Question

The problem identified in this project was the negative impact of environmental factors in the ICU on sleep quality in that patient population. A gap in knowledge existed among ICU providers and nurses pertaining to the effects of sleep deprivation on critical

illness and patient outcomes as well as the effectiveness of strategies to improve it in this population (Friese, 2008; Kamdar et al., 2012). The consequences of sleep deprivation have primarily been studied in healthy patients. The vulnerable nature of critically ill patients may make them at risk of more profound consequences related to sleep deprivation than those of healthier patients (Friese, 2008). The key question of the project was: Will the retiming of routine laboratory and imaging testing outside of the designated quiet time improve sleep quality among adult patients in the ICU.

The purpose of the project was to evaluate the effectiveness of the implemented intervention to improve sleep quality based on improvements in the RCSQ scores. The theoretical framework for this project was the PDSA model that offered a process for implementing a practice change and reevaluation of its sustainability within the organization. The intervention in this project involved a retiming of routine labs and diagnostic testing to outside an established quiet time that was defined as the period from 11 p.m. to 4 a.m. This period promoted a 5-hour period of uninterrupted sleep. In this project, I assessed if implementing this intervention improved the sleep quality in this population at risk of developing sleep deprivation, delirium, or other sleep disturbances that have both short- and long-term consequences on their healthcare outcomes and quality of life during and post-ICU admission.

Sources of Evidence

To identify evidence to address the practice-focused question with, I completed a thorough literature review to gain an understanding of the problem of management of sleep deprivation in the general context as well as a more specific context related to the

critical care setting. Search engines and databases searched included Google Scholar, the Walden University Library, ProQuest, CINAHL, EBSCOhost, and Elsevier. The following key search terms and phrases, were used, individually and in combination: *sleep deprivation, sleep deprivation in the ICU, ICU delirium, non-pharmacologic interventions in ICU/hospital, Richards-Campbell Sleep Questionnaire, sleep quality questionnaire, plan do study act (PDSA), massage therapy and sleep, earplugs and sleep, eye masks and sleep, quality improvement in the ICU, phlebotomy in the ICU and sleep deprivation, noise in the ICU and sleep, lighting in the ICU and sleep, sleep promotion bundles for the ICU, sleep quality improvement in the ICU, environmental factors influencing sleep quality in the ICU,* and *sleep disturbances in the ICU.*

The development of quality initiatives to improve sleep quality in the ICU was challenging, but it was supported by evidence suggesting the need for multiple interventions to reduce sleep disturbances (Kamdar et al., 2013; Kamdar et al., 2012). Although there is variability across ICU settings based on factors, such as staffing, equipment, and facility capabilities, specific initiatives can be implemented focusing on environmental factors in the ICU. These factors include reductions in unnecessary noise and light and unnecessary interruptions by combining patient care interactions as well as the use of nonpharmacologic sleep aid interventions (i.e., eye masks, earplugs, white noise, and relaxation techniques; Kamdar et al., 2012). Noises and sounds include conversations, alarms from monitors and ventilators, phones, pagers and televisions, all of which have been reported as sleep disruptions by patients (Matthews, 2011). Routine nursing interventions, such as completing assessments, obtaining vital signs, bathing,

imaging and laboratory testing, and turnings, have been stated by patients to be more disruptive to them during hospital stays than other external factors, such as noise and light (Honkus, 2003; Pisani et al., 2015). Research on improving sleep quality using healthy ICU subjects or through ICU simulation has found that the use of interventions to improve environmental factors (i.e., earplugs, eye masks, dimming lights, massage therapy, and music therapy) are reasonable strategies (de Niet, Tiemens, Lendemeijer, & Hutschemaekers, 2009; Friese, 2008; Hu et al., 2015; Kamdar et al., 2012; Xie et al., 2009). However, there is limited evidence-based research evaluating the effectiveness of implementing these strategies in the actual ICU population (Friese, 2008; Patel et al., 2014). The lack of evidence in this population supports the need for further study on strategies to reverse these problems. Interventions focused on modifying environmental factors have been shown to be of low risk and less expensive (Brummel & Girard, 2013), which supports the purpose of this project to evaluate the effectiveness of implementing a specific environmental intervention in the adult, noncomatose, nonventilated patients in the ICU in improving sleep quality based on the results of the RCSQ (see Appendix A).

Interventions that influence environmental factors (i.e., minimizing lighting, noise, and nonurgent patient care activities) and behavioral interventions (i.e., relaxation techniques, massages, biofeedback, music therapy, and hypnosis) offer a variety of treatment options to improve sleep quality in the critically ill patient (Friese, 2008). The goal for implementation of the intervention for this DNP project was to show its effectiveness to demonstrate a statistically significant improvement in sleep quality in the ICU. Implementing these types of interventions requires educating patients, families,

providers, and nursing staff on the significance of sleep quality as well as engaging them in the move toward EBP changes to improve overall patient care outcomes (Kamdar et al., 2012). Cooper and Taqueti (2004) recommended additional research to explore the relationship of sleep deprivation to healthcare outcomes (i.e., hospital length of stay, ICU length of stay, ventilator days, infectious complications, nutritional markers, and mortality).

In the next subsection, I discuss the sources of the data generated (i.e., the RCSQ [see Appendix A] and the Sleep Quality Improvement checklist [see Appendix B]), the participant selection process, the process for introduction of the preintervention RCSQ (see Appendix A), education/training of staff and champions, implementation of interventions, introduction of the postintervention RCSQ (see Appendix A) with a Sleep Quality Improvement checklist (see Appendix B), and a statistical analysis of the pre- and postintervention data to determine if the intervention led to statistically significant improvement in the RCSQ scores.

Evidence Generated for the Doctoral Project

In this project, the RCSQ (see Appendix A) was the assessment tool used to collect data from the nursing staff for the intensivist team pre- and postintervention. The RCSQ (see Appendix A) is a feasible and practical tool used to assess sleep in the ICU patients (Menear, Elliott, Aitken, Lal, & McKinley, 2017). The questionnaire assesses six items that evaluate the perception of sleep in terms of sleep depth, sleep latency, awakenings, returning to sleep, sleep quality, and noise (Kamdar et al., 2012). The RCSQ score has been found useful in monitoring sleep quality in prior studies (Kamdar et al.,

2012), and I expected it to offer similar results for this DNP project. The RCSQ (see Appendix A) has been used and validated for reliability in measuring sleep quality in the ICU population (Kamdar et al., 2012). It has been validated as an effective tool for nurses to assess the sleep quality in their ICU patients in the cardiac setting (Rahimi, Amirifar, Feizi, & Masoud, 2017). The questionnaire has also been validated in comparison to polysomnography, which is the standard in assessing sleep quality, and was found to be a valid tool to measure sleep quality with the caveat that it could be completed by the nurse or the alert and oriented ICU patient (Pisani et al., 2015). I extracted the preintervention project data from the assessment tools collected prior to implementation of the intervention. The postintervention data collection began 2 weeks after the education/training period and intervention had been implemented. The data from the RCSQ (see Appendix A) was used to evaluate the effectiveness of the implemented intervention through improvement in the RCSQ scores.

The Sleep Quality Improvement checklist (see Appendix B) was created for this project with the intention to gather general nonidentifying patient information, including the primary team, date of admission, patient mechanical ventilator status, and any factors that disqualified the patient from participation. It allowed the nighttime nurse to document any acute changes overnight, the need for frequent labs, medications requiring titration, uncontrolled pain, and other situations that warranted sleep interruption during the designated quiet time. There was an area on the form to document any interventions that were implemented to improve sleep quality (i.e., earplugs, eye masks, physical therapy following, and lights off and blinds closed by 10 p.m.). These interventions were

optional. The form also documented if labs and imaging were done outside the designated quiet time. I used the data from the Sleep Quality Improvement checklist (see Appendix B) to assess for potential causes of interruptions of sleep during the designated quiet time as well as determine if patients met the inclusion/exclusion criteria. The project found that there was no way to consistently measure if these interventions were actually completed on each patient; therefore, these variables were not included in the data analysis. Other extraneous variables, such as housekeeping, floor cleaning, and other janitorial services, were limited during the quiet time, but there was no way to prevent these factors from potentially interrupting sleep or being documented. Efforts were made to reduce other factors such as intercom announcements of rapid responses, code blues, fire alarms, and other emergency announcements by closing patient doors, but again, these variables were outside of the control of the nursing staff and unable to be measured using the project assessment tools.

Participants. The nursing team members selected patients as the participants from the target population based on the inclusion and exclusion criteria. The target population patients were adult patients admitted to the ICU for at least 24 hours. The inclusion criteria for patient participation in the project were: patients > 18 years old, a length of ICU stay > 24 hours, and any postsurgical procedure > 24 hours. The exclusion criteria included patients who refused to participate; who were prisoners; who had severe traumatic/nontraumatic brain injury; who were neurologically impaired post-cardiac arrest; with a Richmond Agitation Sedation Scale (RASS) > - 4; who required frequent monitoring (i.e., vasopressors, sedation/analgesic drips, insulin drips, continuous renal

replacement therapy, or hypothermia protocol); who were on mechanical support (e.g., ventilators, continuous bilevel positive airway pressure support (BIPAP), Impella, or left ventricular assist device); and who were in hospice/comfort care status. The sample size for the project was 30 participants based on recommendations of the American Board of Internal Medicine (2014) of no less than 25 participants for each quality measure in a QI project. The selected patients met the criteria for adult, noncomatose, nonventilated, ICU patients and were at risk of developing sleep deprivation due to ICU admission > 24 hours (see Wang & Greenberg, 2013).

Procedures. The first step in the process was to secure core team members that consisted of physician champions, nursing team members, management representatives and nursing educators. Physician champions and nursing team members were chosen to offer support and facilitate sharing of information to their respective peers in terms of the purpose of the project, goals/outcomes, implementation strategies and roles of the members of the care team. The next step in the project was gathering the pre-intervention RCSQ scores for evaluation. There were no inclusion or exclusion criteria used for pre-intervention selection subjects for the pre-intervention phase. The RCSQ assessed the patient's sleep quality based on a 6-item questionnaire developed by Dr. Kathy C Richards. The patient or the nighttime nurse can give an assessment of the sleep quality. We chose to be consistent with the nighttime nurses completing the assessment based on his/her perception, but the study has been done with the nursing and/or the patient completing the questionnaire. The questionnaire consisted of questions in six areas: depth, latency, awakening, quality, return to sleep, noise. The higher the total score the

better the quality of sleep for the patient. These scores were reviewed from previous collected data on the RCSQ of the patients in the unit at least 2-4 weeks prior to implementation of the intervention.

The next step was to begin providing education to the nursing staff and intensivist providers. A PowerPoint presentation was created for the following purpose: to review sleep deprivation and the-impact it has in ICU settings; to introduce the intervention that was implemented (i.e. retiming routine labs and diagnostic testing to be completed outside the designated Quiet Time); to review the inclusion and exclusion criteria; to discuss the goal of creating a nurse-driven process to improve outcomes during and after ICU admissions; and to review the evidence for support for implementation of interventions to improve this problem. From the nursing standpoint, each nurse had an opportunity to review the PowerPoint and be introduced to the Sleep Quality Improvement form and the data collection process.

The next step was the implementation of the project intervention which was the retiming of routine labs and diagnostic tests outside the designated Quiet Time. The intensivist team agreed to allow for the retiming of the routine labs and diagnostic testing to outside the designated Quiet Time on those patients that met the inclusion and exclusion criteria where the intensivist team was the primary provider or the consultant. This process continued for two weeks after the PowerPoint training to ensure that nursing had become familiar with the new process. It also allowed for an evaluation period of debriefing to discuss any issues, questions or concerns as nursing team members prepared to move forward with data collection. During that time, the core team members voiced

their concern regarding any needed changes to the process. Once the team members felt all issues, concerns and questions had been addressed then the project moved forward to the next phase.

The postintervention phase began at least two weeks after the PowerPoint training has been implemented. Subjects were chosen for the project based on the inclusion and exclusion criteria. The inclusion criteria included: patients: > 18 years; length of ICU stay > 24 hours; and any postsurgical procedure > 24 hours. The exclusion criteria excluded patients: who refused to participate; who were prisoners, who had severe traumatic/non-traumatic brain injury; who were neurologically impaired post cardiac arrest; with RASS >- 4; who required frequent monitoring (i.e. vasopressors, sedation/analgesic drips, insulin drips, continuous renal replacement therapy, hypothermia protocol); who were on mechanical support (e.g. ventilators, continuous BIPAP, Impella, left ventricular assist device); or were in hospice/comfort care status. The nursing team members reviewed the medical record for appropriateness of the participant selection based on the inclusion and exclusion criteria. Those that met the criteria received a full disclosure of the purpose of the project after which the patient or family member were asked to sign an informed consent agreeing to participate in the project. The nighttime RN assessed the patients' sleep quality based on the six questions on the RCSQ (see Appendix A) at shift change, during the hand-off to the day shift nurse. The nurse answered each of the six questions on the form and score according the questionnaire instructions based on their assessment during the night. The questions focused on the nurses' perception of the patients' sleep depth, sleep latency, awakenings, returning to sleep, sleep quality and noise. The Sleep

Quality Improvement checklist (see Appendix B) was completed at that time as well. The informed consent, the RCSQ (see Appendix A) and the Sleep Quality Improvement checklist (see Appendix B) forms were returned to the secured designated location on the unit for retrieval by the nursing team members and then the de-identified data were submitted to the me.

The two sets of scores were analyzed for improvement in the overall RCSQ score after intervention implementation and then determined if the improvement was statistically significant. The RCSQ (see Appendix A) was used as it was designed and not modified for the purpose of this project. Permission was received from Dr. Kathy C. Richards, the developer of the questionnaire, to use for this QI project (see Appendix C).

Human protections. There were procedural efforts made for the ethical protection of the participants in the project. First no communication or documentation related to this project was shared containing any patient specific information with nonnursing team members. I did not receive any identifying information from the nursing team members. The adult patients admitted to the ICU for more than 24 hours, that met the inclusion and exclusion criteria were included in the project. The patients, and where appropriate family members, were made aware of the sleep quality initiative, the subjects' role in the project, and an informed consent to participate were obtained by the nursing team members. The patients and families had the opportunity to refuse participation if they desired without risk of repercussions from the clinical staff or providers. A nursing team member was available to ensure questions or concerns were addressed as needed.

Although the RCSQ form (see Appendix A) and Sleep Quality Improvement checklist (see Appendix B) didn't include patient identifying information documented, they were discarded after recording of the nonidentifying data. These forms were discarded in the locked hospital shred bin for disposal of documents containing patient identifying information per hospital policy. No communication via e-mail, text message, display boards, PowerPoint slides, etc. contained any patient identifying information. The hospital nor its affiliates were named in this project. Patients, and where appropriate family members, were made aware of the sleep QI project and assured that no treatment would be given or without held from the patients related to this project. The spreadsheet containing the project data (e.g. age, gender, race, and RCSQ scores) contained no patient identifying information and were secured in a password-protected computer dedicated for entering of the data, to ensure patient privacy. Once the data were entered from the RCSQ (see Appendix A), the forms were discarded in a secured shred bind so that the patient information was not compromised. The data stored in the computer on an Excel spreadsheet contained de-identified patient information.

After approval of the proposal, the committee chairperson submitted the proposal for the University Research Review member to review in MyDR. Once that step was approved, the oral defense was scheduled. Once the oral defense step was completed and approved, the Form A was submitted for ethical review of the project by the Walden IRB to ensure that the ethical protection of the participants was maintained. Traditionally QI projects did not require IRB approval as participants were not exposed to risk of harm and no new or experimental intervention was being introduced (Hockenberry, 2014). In

addition to the Walden IRB, the IRB for the partner organization reviewed the project to ensure their approval was obtained prior to the collection of data for the project. The IRB approval number from the project site was Pro00084482. These steps ensured that the risk and benefits to the participants were weighed and that every measure was taken to not cause harm and to provide clear understanding to patients and families before consent was received to participate.

Analysis and Synthesis

The data recorded in a Microsoft Excel spreadsheet was stored on a password-protected computer. The spreadsheet contained information such as: age, race, gender, scores from the RCSQ (see Appendix A), and data from the Sleep Quality Improvement checklist (see Appendix B). The questions were scored on a range of 0 to 100 with the higher score indicating a better perception of each of the measures. The statistical analysis were done using the R software, which is a statistical program used to enter the data variables for statistical computation. It then utilized statistical tests (i.e. *t* test and chi-square tests) to generate a comparison of the *p* values of the outcome variables (i.e. the pre- and postintervention RCSQ scores). The *p* values generated by this system determined statistical significance of the findings which was the evidence needed to support the validity of the intervention in meeting the outcome goal. The data generated was used to develop reports and visual aids of the findings to be shared with stakeholders in the project.

To ensure the integrity of the data collection, a process was implemented for the recording of the data and a procedure established for addressing missing information

from the RCSQ (see Appendix A) and Sleep Quality Improvement checklist (see Appendix B). The data for the pre-intervention RCSQ was entered into the system for all patients in the ICU. These forms were reviewed as well for missing information from the six items on the form, demographic data about each patient, and the clinical information from the Sleep Quality Improvement checklists. Incomplete forms were removed as well as those where the patient did not meet the inclusion and exclusion criteria.

A table was created of the baseline characteristics with age denoted as a continuous variable by intervention group with pre- and postintervention RCSQ scores as the variables. The *p* value was calculated for the continuous variable of age with statistical analysis done by either *t* test or a nonparametric test (i.e. Wilcoxon rank sum-test) based on the met assumptions. The *p* value for the categorical variable of gender was calculated with statistical analysis by chi-square or Fisher's exact test based on the met assumptions. The *p* value was evaluated for significance based on alpha level = 0.05. The primary outcome measure was the change in the RCSQ score with intervention. A mean, median, mode and standard deviation was calculated for each item of the RCSQ tool as well as the total score as well. The results from the pre-intervention RCSQ (see Appendix A) was compared with postintervention results to see if there were statistically significant differences to support the expected outcome based a statistically significant improvement in the primary outcome of RCSQ score postintervention.

Summary

The problem identified was the negative impact of environmental factors in the ICU on sleep quality in that patient population. There exists a gap in knowledge among

ICU nurses and providers as to the impact of sleep deprivation on outcomes during and post-ICU admissions. The purpose of the project was to evaluate the effectiveness of implementing a specific environmental intervention in the adult, noncomatose, nonventilated patients in the ICU with the expected outcome of improving sleep quality based on the results of the RCSQ (see Appendix A). The intervention involved retiming of routine labs and diagnostic testing to be completed outside an established Quiet Time that had been designated from 11 p.m. to 4 a.m. This promoted a five-hour period of uninterrupted sleep. Both physician and nursing champions were recruited to facilitate education to their peers and engage their support for successful implementation of the environmental intervention.

The data were collected in two phases starting with the preintervention phase. The preintervention data were collected from the assessment forms collected prior to sleep quality training and implementation of the intervention. After education had been given to the nursing staff and intensivist team, the intervention was implemented for 2 weeks and then the postintervention phase was initiated with data collection until the sample size reached 30. The data collected included age, race, gender, and pre-, and postintervention RCSQ (see Appendix A) scores.

In section 4, I reported the findings from the analysis and synthesis of the evidence that was collected in the project. The discussion includes any unanticipated limitations and the implications for social change based on the findings of the project. Final recommendations addressed any remaining gaps in knowledge, needed policy changes, and/or future research needs.

Section 4: Findings and Recommendations

Introduction

The problem addressed by this DNP project was the negative impact of environmental factors in the ICU on sleep quality. The problem reflected a not well-studied assumption that environmental factors have a significant impact on sleep quality of critically ill patients in the ICU. Another assumption was that the ICU environment had a negative impact on short- and long-term outcomes, including increased length of stay, the development of delirium, increased reintubation rates, and an increased use of pharmacologic interventions to both prevent and manage sleep disturbances such as sleep deprivation, insomnia, etc. Providers and nurses caring for patients in the ICU have a gap in knowledge related to the impact of sleep deprivation in this patient population. This gap exists due to the lack of evidence-based research into this topic related to the vulnerability of this critically ill population.

The purpose of this project was to evaluate the effectiveness of implementing the intervention to retime routine diagnostic tests and labs to a time that would reduce sleep interruptions. The evaluation was based on the improvement in the results of the RCSQ (see Appendix A) that was administered to adult, noncomatose, nonventilated patients in the ICU. The RCSQ is a tool created to measure sleep quality and had been validated by use in the ICU setting. The practice-focused question for the project was: Will the retiming of routine laboratory and imaging testing outside of the designated quiet time improve sleep quality among adult patients in the ICU? Quiet time was defined as the period from 11 p.m. to 4 a.m. I designed this project to serve as a part of a larger

initiative for the implementation of a sleep promotion bundle for the project site to address the gap in practice that exists. Patel, Baldwin, Bunting, and Laha, (2014) supported the development of a standardized protocol to improve sleep deprivation in the ICU due to the link to poor ICU and post-ICU healthcare outcomes and increased mortality and morbidity.

I used several search engines and databases to locate evidence to support this project. These included Google Scholar, Walden University Library, ProQuest, CINAHL, EBSCOhost, and Elsevier. The keyword terms and phrases used in the literature search included: *sleep deprivation, sleep deprivation in the ICU, ICU delirium, non-pharmacologic interventions in ICU/hospital, Richards-Campbell Sleep Questionnaire, sleep quality questionnaire, plan do study act, massage therapy and sleep, earplugs and sleep, eye masks and sleep, quality improvement in the ICU, phlebotomy in the ICU and sleep deprivation, noise in the ICU and sleep, lighting in the ICU and sleep, sleep promotion bundles for the ICU, sleep quality improvement in the ICU, environmental factors influencing sleep quality in the ICU,* and *sleep disturbances in the ICU*. I used the baseline characteristics of age, gender. and race and the outcome variables of RCSQ scores (i.e., pre- and postinterventions) to create a data analysis table. The variable of age was denoted as a continuous variable, while gender and race were denoted as categorical variables. The *p* value for the continuous variable of age was calculated using the Wilcoxon rank sum test because the test for normality was skewed and a *t* test was not able to be performed because that assumption was not met. The *p* values of the categorical variables were calculated by chi-square test based on the met assumptions.

For the purpose of statistical analysis, the *p* value was evaluated for a significance based on alpha level = 0.05. I identified the primary outcome measure as the change in the RCSQ from preintervention to postintervention. The mean, median, mode, standard deviation, and quartile percentages were calculated for the individual items in the RCSQ score as well as for the total score. Each of these values was evaluated for statistical significance by calculation of the *p* value using the R software.

Findings and Implications

There were 72 total subjects in the study: 40 in the preintervention group and 32 in the postintervention group. The two groups represented two different groups of subjects. The preintervention group was the control group that represented the subjects that were assessed prior to the implementation of the intervention. The postintervention group was the test group that represented the subjects assessed after the implementation of the intervention. There were 25 (62.5%) male participants in the preintervention group and 17 (53.1%) in the postintervention group. There were 15 (37.5% preintervention and 46.9% postintervention) females in both groups. There were 51 (70.8%) White participants, 19 (26.4%) Black participants, and two (2.8%) individuals of other races in the study, with the preintervention group composed of 26 (65%) White participants, 12 (30%) Black participants, and two (5%) participants of other races and the postintervention group comprised 25 (78.1%) White participants, seven (21.9%) Black participants, and no participants of other races. The categorical value of gender and race did not show statistical significance with a *p* value < 0.05 (see Table 1).

Table 1

Categorical Variables of Gender and Race with p Values

	Male	Female	*p* value	Black	White	Other	*p* value
Pre	62.5% n=25	37.5% n=15	0.423	30% n=12	65% n=26	5% n=2	0.363
Post	53.1% n=17	46.9% n=15		21.9% n=7	78.1% n=25	0% n=0	

Note. The categorical variables are gender and race. Pre = preintervention group. Post = postintervention group.

The RCSQ questionnaire was designed by Dr. Richards who used this questionnaire in the ICU setting to assess for sleep quality. It has been validated as a reliable tool in that setting regardless of whether the questions are answered by the patients or the bedside nurses. The analysis for the RCSQ scores was based on the six areas of the questionnaire: sleep depth, sleep latency, awakenings, return to sleep, sleep quality and noise. The score ranged from 0 to 100, with the higher score indicating a more positive response. The bedside nurse scored each measure based on their perception of the patients' response to the associated question. For sleep depth, the question was: "My sleep last night was:" with 0 representing *light sleep* and 100 representing *deep sleep*. For sleep latency, the question was: "Last night, the first time I got to sleep, I:" with 0 representing *just never could fall asleep* and 100 representing *fell asleep immediately*. For awakenings, the question was: "Last night I was:" with 0 representing *awake all night long* and 100 representing *awake very little*. For return to sleep, the

question was: “Last night when I woke up or was awakened I:” with 0 representing *couldn’t get back to sleep* and 100 representing *got back to sleep immediately*. For sleep quality, the question was: “I would describe my sleep last night as:” with 0 a *bad night’s sleep* and 100 representing *a good night’s sleep*. For noise, the question was: “I would describe the noise level last night as:” with 0 representing *very noisy* and 100 representing *very quiet*.

Based on the statistical analysis, the median score did not increase with each RCSQ measure from the preintervention to the postintervention groups. There was an increase in the measures of sleep quality and noise with the remaining four measures showing a decrease from the preintervention RCSQ score to the postintervention RCSQ score. This did not show statistical significance in terms of the median values between the preintervention and postintervention groups because the *p* value consistently exceeded the reference value of 0.05 in each of the six measures (see Table 2.).

Table 2

Wilcoxon Rank-Sum Test Median RCSQ Scores and p value Calculations

Measures	All subjects	Preintervention	Postintervention	*p* value
*Depth	75	85	75	0.348
*Latency	80	90	75	0.541
*Awake	82.5	85	75	0.390
*Return	75	90	75	0.861
*Quality	82.5	82.5	87.5	0.269
Noise	95	90	100	0.386
Total	490	515	462.5	0.754

Note. The Wilcoxon rank-sum test was used to calculate the median scores in each of the six measures with the *p*-value calculation. Depth = Sleep depth, Latency = Sleep latency, Awake = Awakenings, Return =Return to sleep, Quality = Sleep quality, Pre = Preintervention score, and Post = Postintervention score. The RCSQ questionnaire is used with permission of Dr. Richards.

There were several limitations of the study that potentially impacted the results. One unanticipated limitation of the project was the number of patients that were on mechanical ventilator support or continuous BIPAP. This was an exclusion criterion for the project. For the month of May 2019, there were 166 patients on the ventilator documented for the 31 days, and 15 patients on continuous BIPAP. For the month of June 2019, there were 168 patients on the ventilator, and 21 patients on continuous BIPAP. This was an average of 5.4 ventilated patients per day in May and 5.6 in June and 0.5 patients per day on continuous BIPAP in May and 0.7 in June. These were all patients that did not meet the qualification to be included in the project based on mechanical ventilator support and the need for frequent monitoring (i.e., BIPAP monitoring) but represent a population of patients that are frequently admitted to the ICU setting.

Other limitations included an increased observed number of patients on vasopressors and/or requiring continuous renal replacement therapy during this time period. The actual number of patients was not available at the time of the study because it was not a measure that was monitored for the purpose of this study. These patient types were excluded from the project due to the requirement to limit interruptions, but each of the patients in these groups required frequent monitoring, which contributed to the number of nighttime interruptions. It was impossible to predict the higher level of acuity of the ICU population and the impact it would have on recruiting patient participation in the project. Although the inclusion criteria were met, the impact of the exclusion of the higher acuity population in the ICU setting at the time of the project on the statistical analysis is unclear.

Another unanticipated limitation was the limited access I had available, as the DNP student functioning in the role of project leader, to the patient records to gather more specific patient information concerning their medical history, medications, length of stay, diagnoses, etc. This information was not accessible due to stipulations of the project. Going forward, as the project site extends the data collection, the intensivist team will have access to this information because the principal investigators will be members of the rounding teams for the facility and will then be bound by the regulations of the site's IRB department.

Another unanticipated limitation was the extensive exclusion criteria that did not give a true assessment of the types of patients in this ICU. The strict exclusion criteria were based on the initial intent to measure the number of nighttime interruptions, but this

was not achievable due to the lack of means to accurately and consistently measure this outcome. The impact of this on the findings likely skewed the patient population toward a less critically ill group than is typical of this unit.

The implications of the project findings were the same for the individual groups (i.e., patients, providers, and nursing) as well as the intensive care unit/hospital leadership and management teams for the individuals in terms of needing additional research to support the implementation of the proposed change in practice guidelines. The project showed that any improvement after implementation of this intervention did not have statistical significance. But due to several limitations with the project, it is still unclear if this intervention alone or in combination with one or more interventions into a sleep bundle would reach statistical significance in improvement in sleep quality in this patient population if the study was repeated after adjusting for the limitations. In terms of patients and families, the project offers an opportunity to improve the study design to offer a process that would ultimately lead to improved sleep quality and reduction in short- and long-term consequences related to sleep deprivation in the ICU. In terms of the nursing staff, the project increased the awareness that they could take evidence-based research and apply it into their clinical setting to change clinical practice guidelines, improve healthcare outcomes and increase their knowledge in the care of their patients. In terms of nursing leadership, educators, and provider champions, the project demonstrated that more research is needed in the implementation of interventions to improve sleep quality with the recommendation to combine interventions into a sleep quality bundle in an attempt to maximize the benefits of individual interventions to improve sleep quality.

In terms of hospital administration, the project warrants additional study before a standardized protocol can be implemented across the various ICUs within the hospital and even into the larger hospital system.

The nursing administration and the provider team remain committed to improving sleep deprivation and the outcomes of this population. They are committed to continuing the research with the hopes that future studies will show statistically significant improvement so that the bundle can be presented to hospital administration to change standards of care by promoting the implementation of interventions to improve sleep deprivation in the ICU and the short- and long-term outcomes that associated with it. They understood that the goal of the project was multifaceted. The goal involved improving the quality of sleep in the ICU, reducing consequences associated with sleep deprivation and impacting social change through the empowerment of the nursing staff to take an active role in improving patient outcomes with evidence-based interventions that are nurse-driven and directed in the immediate and post-ICU phases.

Recommendations

Several recommendations were proposed as solutions to addressing the gap-in-practice. The first was to add training related to sleep deprivation in the ICU and hospital to nursing education as well as to annual training for providers. By providing information concerning recognition of signs and symptoms associated with sleep deprivation, risk factors for development, associated consequences, and evidence-based treatment options then the problem can be openly discussed and recognized as a legitimate consequence of the ICU and the treatment options are made known. Another recommendation involved

continuing to gather and review data from the RCSQ and Sleep Quality Checklist to allow for evaluation of implemented interventions for success, failures, and limitations to meeting the goals related to improving sleep quality. The RCSQ and Sleep Quality Checklist were reviewed periodically which may be a significant limitation as there was not a standard protocol or policy addressing the problem of sleep deprivation in this ICU setting or across the institution. Finally, additional studies should be conducted involving a combination of interventions into a bundle to promote improved sleep quality and reduce the short- and long-term consequences associated with sleep deprivation post-ICU and posthospital discharge. The recommended implementation and evaluation procedures of this project involved development of a team of nurses who were willing to be the champions on both day shift and night shift to be responsible for obtaining informed project consent from the patient and/or decision maker with explanation of risk and benefits to their participation.

Contribution of the Doctoral Project Team

It was a great learning experience working with the project team. The nursing team represented nurses working in the ICU and they gave the perspective from the bedside of what measures appeared successful, which needed revisions, and which were unsuccessful. They were able to give insight into what environmental factors were noted to be more contributory from the nursing perspective. Working with the doctoral project team allowed me to build on my supervisory skills as I was not involved in the data collection process or in the consent process due to project restrictions to maintain patient confidentiality. This required me to learn to delegate responsibilities to the team members

and await their feedback. It highlighted the role of the DNP to promote the use of EBP in identifying clinical problems and developing a plan of action to promote the improvement in the area of concern.

The nurse team members took on the responsibility of education with their peers; patient selection based on the inclusion and exclusion criteria; and ensuring de-identified data were collected and submitted for analysis. They were responsible for obtaining informed consents from patients and family members and providing project details that included risks and benefits. They were also responsible for gathering the informed consent forms, RCSQ (Appendix A) and Sleep Quality checklist forms daily and placing in a secured location to ensure patient confidentiality.

The project team was vital throughout the entire process of planning, implementation and finalizing the project. After data collection and analysis, I sat down with the project team to discuss the findings and review successes, failures and identify areas for improvement. The provider and nursing team members agreed that the project had significant limitations and warranted repeating the project to include additional interventions in a sleep bundle. The team determined that lack of ongoing education may impact the awareness of the significance of the problem as well as limit the level of urgency to make changes to policies and practices.

The intensivist team had previously looked at light and sound and their effect on sleep quality in the ICU setting. Their goal was to include this data in their overall plan to implement a sleep bundle within the ICU. Other areas that they planned to address included the use of tranquil music, earplugs, and eye masks on all patients. Other

suggestions from the literature supported setting times for lights to be turned off and on; specific times for blinds to be closed and opened; decreasing alarm sounds and decreasing routine assessments/vital signs between 11 p.m. to 4 a.m. on hemodynamically stable patients. These are all under consideration for future studies with the intent to be included in a sleep bundle they plan for implementation in the future.

Strengths and Limitations of the Project

The major strength of the project was the strong support from the provider and nursing champions who are willing to broaden the project in their commitment to improving the outcomes. The intensivist team and the nursing management and staff were supportive from the beginning. The champions from the nursing staff were exceptional in providing the support needed to review patients to ensure they met inclusion and exclusion criteria, obtain the necessary consent forms required by the facility's IRB, and obtain the completed Sleep Quality and RCSQ questionnaire forms. They were available for questions concerning the project details, inclusion/exclusion criteria, data collection, and expectations for improving sleep quality. Nursing management were supportive and hopeful that the project would support a change in practice that would implement a standardized protocol to promote sleep quality. Without these stakeholders being actively engaged in the process, the success of completing the project would have been impossible. They were crucial to moving forward for the facility to broaden their efforts to develop a standardized sleep improvement bundle to promote sleep quality in the ICUs.

Inclusion and exclusion criteria limited the true assessment of the acuity of the patient population. The inclusion criteria for patients for participation in the project included: patients: > 18 years; length of ICU stays > 24 hours; and any postsurgical procedure > 24 hours. While the exclusion criteria included patients: who refused to participate; who were prisoners, who had severe traumatic/nontraumatic brain injury; who were neurologically impaired post cardiac arrest; with RASS >-4; who required frequent monitoring (i.e. vasopressors, sedation/analgesic drips, insulin drips, continuous renal replacement therapy, hypothermia protocol); who were on mechanical support (e.g. ventilators, continuous BIPAP, Impella, left ventricular assist device); and in hospice/comfort care status. The extensive nature of the exclusion criteria placed limitations on the acuity of the patients selected since these patients required increased monitoring that would impact both the patients and nurses' perception of the patients' sleep habits.

In terms of future projects, there were several recommendations that were suggested by the project team. First, the inclusion and exclusion criteria needed to be more reflective of the critically ill patients in the ICU that still were at risk of developing consequences related to their critical illness and sleep deprivation which is known to be a common occurrence. The criteria for inclusion and exclusion in this project did not reflect the typical population composition. The recommendation is to change the inclusion criteria for Glasgow Coma Score to > 8 as a score or 8 or less indicates a comatose patient that meant the patient would not be able to measure sleep quality. Recommended changes to the exclusion criteria were as follows:

1. Patients who refused or unable to give consent, prisoners, documented dementia. NO CHANGE
2. Severe non-traumatic or traumatic brain injury. NO CHANGE
3. Post-Cardiac arrest patients. REVISE
4. RASS score > -4. NO CHANGE
5. History of recent substance abuse within last 7 days or positive urine drug screen on admission. CHANGE to be included within the study.
6. Patients on medications which required frequent adjustments (vasopressors, inotropes, sedation, paralytics). CHANGE to be included within the study.
7. History of any psychiatric illness or on documented home psychiatry medications. History of night shift work during the last 3 years. CHANGE to be included within the study.
8. Documented history of insomnia or severe obstructive sleep apnea > 2 hours sleep documented during the daytime (during current hospitalization). CHANGE to be included within the study.
9. Patients who were being withdrawn from medical care (DNR-5, hospice care). NO CHANGE.

For those patients that have a “NO CHANGE” recommendation, then they would be excluded from future projects. For those patients with a “CHANGE to include within the study”, information would be included to thoroughly describe the patient population types in the participant section of the study. For those patients that have a “REVISE”

recommendation (i.e. post-cardiac arrest), they would be included as long as they are not requiring a hypothermia protocol for neurologic recovery to participate in the study.

A second recommendation for future studies is related to the RCSQ questionnaire. In this project, the nighttime nurse completed the RCSQ based on their assessment of the patient's sleep quality regardless of whether the patient was able to complete the form themselves to reduce any discrepancies. The recommendation was that the nighttime nurses continue to complete the RCSQ on their patients and in addition those patients that are cognitively able to complete the form should do so. The RCSQ had been validated previously to be used in either scenario with little variability. This would be an opportunity to assess patient vs nursing perception of sleep quality as a secondary measure.

A third recommendation was for the study to be conducted over a longer time period to have a larger subject population and be implemented in more than one ICU in this facility. This will give a larger subject pool to choose from in addition to providing a diverse environment. Although the unit used for this project had a variety of ICU patients, their population was primarily those with cardiac issues and some overflow of other medical conditions. Implementing this in differing ICUs would give diversity to the patient population to include surgical and medical ICU patients.

A final recommendation was to have multiple interventions assessed. Multifaceted interventions have been studied and shown to have significant improvements in sleep quality and the development of delirium in the ICU (Kamdar et al.,2013; Kamdar, Kamdar, & Needham, 2014; Patel, Baldwin, Bunting, & Laha, 2014).

Devlin et al. (2018) published a revision of the clinical guidelines for management of pain, agitation, and delirium in the ICU. They recommended multifaceted interventions over single interventions for the management of delirium. The rationale was that the etiology behind delirium had multiple contributing factors and that the most successful treatment would most likely require multiple interventions presented in a bundle. Devlin et al. (2013) also supported this multifaceted, interdisciplinary approach. They suggested that successful implementation of these guidelines will require supporting staff through education, leadership engagement, reminders available on the unit, practice feedback, and continual evaluation and modification of the proposed practice change. Previously the intensivist team assessed if reducing sound and noise would improve sleep quality in this ICU population. Reducing the noise and light in the prior study did not show statistical significance with limitations due to difficulty with direct observations, smaller project size as well as limitations that were common for this project as well that included subject selection. The project team recommended that interventions to reduce noise and sound as well as retiming of labs and imaging studies be implemented together to evaluate the validity of using bundled interventions to show statistically significant improvement.

Section 5: Dissemination Plan

Introduction

The project findings were shared with the stakeholders who included the intensivist team, the nursing unit management, and the nursing staff. The intensivist team received a written report from the project team with the findings and recommendations to repeat the project with a larger population pool, including the medical, surgical, and cardiac ICUs they cover. The nursing director for the project site had asked for a report of the findings once the project was completed. The plan was to present the data analysis in a written report to her with the same recommendations as given to the intensivist team. A meeting was set up to discuss future plans for repeating the project with the recommendations after additional training has been provided to the nursing staff. The nursing staff was given a poster presentation that showed the results, implications, and recommendations for further study. They would be given additional training information during their skills fair to support improving sleep quality in the ICU.

The nature of the project problem presented an opportunity for nursing at every level to address this issue in their practice setting and look for ways to improve sleep deprivation and the outcomes associated with it. Bedside nurses need to recognize and identify ways to change the environment into a setting that promoted good sleep quality. Advanced practice nurses, who serve as providers in the inpatient setting, are expected to recognize that sleep deprivation and poor quality sleep is a problem in the ICUs and on the medical floors. It was also their responsibility to be aware of the signs and symptoms and consider both pharmacologic and nonpharmacologic measures to improve outcomes

associated with poor quality sleep. Nursing administration must promote leadership among their nursing staff and encourage them to take the lead in finding ways within their nursing scope to implement evidence-based measures that improve short- and long-term consequences for patients when they leave the ICU and even the hospital setting.

In terms of dissemination of the project to the broader nursing profession, I plan to submit an abstract of this study for publication to a nursing journal to share the problem, objective, results, and conclusion along with recommendations for future studies. Another venue to present this same information at would be local and state advanced practice nurse practitioner conferences. A local nurse practice support group has educational meetings every other month and would be a great opportunity and place to share the findings and recommendations as well.

Analysis of Self

My role was multifaceted in this DNP project. As a practitioner, I was able to give insight and set expectations that I wanted to see achieved as an intensive care provider. The goals I set were based on my perceptions as a provider caring for critically ill patients that were frequently developing complications related to sleep deprivation, delirium, and psychosis in the ICU setting. My goal was to identify a link between the problems of sleep deprivation with the environment setting in the ICU and to implement strategies to improve outcomes by making a change to a standard practice. As a scholar, I thought my role was different in that I was seeking an opportunity to draw on my clinical experience to develop a project that the literature would support for the goal of obtaining my DNP. I spent hours and hours researching literature to support the clinical question I

was developing and reviewing what had been studied previously for applicability in this setting. As the project manager, I felt my role was to select champions to help get the project goal achieved but also to transfer a sense of empowerment to the nursing staff to take on a more engaged role in impacting the outcomes of their patient population.

What I found was that the role of the project manager bridged with the roles of the practitioner and scholar. As a practitioner, caring for the critically ill is my passion, and I have a desire to improve the healthcare outcomes and the quality of care I provide to my patients. The scholar role allowed me to take my passion and search for evidence to support implementing changes for continued improvement. I recognized that this could be done through the generation of ideas based on what had been previously studied. By embarking on this path to achieving my DNP, I was also taking my experiences, building on the knowledge that was already there, and seeking to bridge an existing gap in knowledge. As the project manager, I was able to take my passion as a nurse practitioner to improve quality care to my patients and combine it with the scholar role of utilizing evidence-based research to identify measures that could be implemented in my practice setting. I did not expect to identify myself in the role of a leader/mentor; however, I became driven with the desire to empower the nurses to look for opportunities to implement changes that could impact not only the short-term consequences in the ICU but also those long-term consequences that extend into the postdischarge period, including delirium, depression, sleep deprivation, posttraumatic stress disorder, anxiety, poor memory, impaired cognitive thinking, increased aggressiveness, and emotional disturbances.

The project has opened a new avenue for my career. It has enhanced my understanding of the importance of linking research and clinical practice to improve the outcomes in a population that had been my passion for providing care for almost 20 years. Not only could I work toward providing good quality care at the bedside, but now I can also impact the generation of practice guidelines and policy changes while empowering nursing to take a more active role in being change agents that begins at the bedside and progresses through the management levels to make institutional practice changes.

One challenge for the project was my limitation in the role of the DNP student, which limited my ability to review patient records because they contained patient identifying information. This limited my access to information related to demographics, medical conditions, medication regimen, etc. Another challenge was related to having to work with IRB teams from both Walden University and the site facility. Their requirements varied and both approvals had to be obtained prior to data collection. There was a delay with gaining both approvals related to establishing the nature of the project. After this was resolved the project data collection began in May 2019. This would not be an issue for future studies of this topic at this facility because they would be driven by one only IRB body and that would be the site facility's committee.

Initially, there was a challenge in getting staff engaged, but key staff members were very vocal of their support and interest in the project and these individuals were identified as champions and were instrumental in getting the project completed in a timely manner and maintaining patient confidentially by ensuring the information they

shared had no identifying patient information attached. These staff members were also instrumental in gaining the support of their colleagues that was so crucial to completion of the project. One solution for future studies on this topic and in general is to involve staff earlier to gain their support and buy-in.

I gained a lot of insight during this scholarly journey. Initially, I was working as though I had to do it all myself. Once I realized that working with staff on two shifts and continuing to work in my professional role would make it almost impossible to get it all done. Instead of providing all the training myself, I utilized the nursing team members to provide the training to their peers. I chose nurses who showed an interest in the project and saw the need for the education as well as the potential of improvement with the knowledge that it provided. The insight I gained was that the group worked as a team in all areas of my practice setting and that this project was no different. This project was not just a means to meet a requirement to obtain my DNP, but it was a means of identifying nurses that would function as leaders in the scholarly arena to promote nursing engagement and empowerment in their clinical setting. It also gave me the opportunity to function in a leadership role by delegating responsibilities to the team members to empower them and nurture their growth as leaders among their peers.

Another insight I gained was the utility of applying research to my clinical practice. I never saw myself as a researcher but more of a clinician. I understand that in my clinical practice I must be both in order to provide the best quality of care to my patients. Gaining an understanding that research drives the practice guidelines that I use daily was crucial. As technology improves and knowledge is gained, I learned I had the

responsibility to stay on top of the current evidence that would support my current practice, identify the need for changes to my current practice, or open opportunities to develop new practice guidelines. One takeaway from this project was that I will continue to look for ways to use this newfound interest in research to improve clinical outcomes in my practice as well as to share this new interest with other provider colleagues and with the nursing staff.

Summary

The key question of the project was: Will the retiming of routine laboratory and imaging testing outside of the designated quiet time improve sleep quality among adult patients in the ICU. The purpose of the project was to evaluate the effectiveness of implementing a specific environmental intervention in the adult, noncomatose, nonventilated patients in the ICU in improving sleep quality based on the results of the RCSQ. The data did not show statistical significance to support a change in practice currently, but the project team did recommend repeating the study with the recommendations they offered. This doctoral project was implemented to meet a requirement for my DNP program. The project evolved into a means for me to continue this interest in utilizing EBP to improve my clinical practice as well as to function in a leadership/mentor role to empower the nursing staff, my students, and nurse practitioner colleagues to embrace their own leadership roles. By doing so, I felt I contributed towards a positive social change for the nursing profession to not only be recognized as skilled clinicians but for their leadership, educational, and research skills as well.

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Appendix A: Richards-Campbell Sleep Questionnaire

SILENCE

Sleep in the **I**ntensive Care Unit: **L**owering Interventions by **E**mpowering **N**urses in the **C**ritical Care **E**nvironment

A Sleep Quality Improvement Project

RICHARDS-CAMPBELL SLEEP QUESTIONNAIRE

MEASURE	**QUESTIONNAIRE**[A]
1. Sleep depth	My sleep last night was: _____ light sleep (0) …deep sleep (100)
2. Sleep latency	Last night, the first time I got to sleep, I: _____ Just never could fall asleep (0) ...feel asleep immediately (100)
3. Awakenings	Last night I was: _____ awake all night long (0) …awake very little (100)
4. Returning to sleep	Last night when I woke up, or was awakened I: _____ couldn't get back to sleep…got back to sleep immediately (100)
5. Sleep quality	I would describe my sleep last night as: _____ a bad night's sleep (0) …a good night's sleep (100)

6. Noise[B] I would describe the noise level last night as: _____

Very noisy (0) …very quiet (100)

[A] Each question is scored by using a 100 m visual analog scale in which a higher scale score is better

[B] Question 6 is not part of the original 5-item Richards-Campbell Sleep Questionnaire (RSCQ) but was included in this project for consistency with other studies that used the RCSQ.

Permission received from Dr. Kathy C Richards to use the RCSQ for this DNP project.

RETURN TO RED SLEEP FOLDER!!!!

Thank you La Von and the SILENCE POSSE

Appendix B: Sleep Quality Improvement Checklist

SILENCE

Sleep in the **I**ntensive Care Unit: **L**owering Interventions by **E**mpowering **N**urses in the **C**ritical Care **E**nvironment

A Sleep Quality Improvement Project

SLEEP QUALITY IMPROVEMENT CHECKLIST

- ❑ **GENERAL INFORMATION**
  - ☐ Admitting Diagnoses: _____
  - ☐ Primary team
    - o PCCM
    - o OTHER: LIST _____
  - ☐ Date admitted to the ICU: _____
  - ☐ Patient on Ventilator: Yes ☐ No ☐ Cardiac Arrest Yes ☐ No ☐

    Prisoner ☐ Yes ☐ No
- ❑ **REASONS FOR INTERRUPTIONS BETWEEN 11 P.M. AND 4 A.M.**
  - ☐ Acute issues overnight: LIST _____
  - ☐ Schedule or frequent labs (i.e. CRRT, insulin drip, post transfusion, etc):
  - ☐ Titrating medications (i.e. pressors, etc): LIST _____
  - ☐ Medications requiring frequent monitoring (i.e. sedation, analgesics, -paralytics drips, etc): LIST _____
  - ☐ Uncontrolled pain
  - ☐ Other (i.e. bath, turning, etc.): LIST _____
- ❑ **DOCUMENT INTERVENTIONS** ☐ Ear plugs ☐ Eye masks

Lights of 10pm ☐ Blinds closed 10 pm ☐ Hallway lights dimmed

Appendix C: Permission from Dr. Kathy C. Richards

SILENCE

Sleep in the **I**ntensive Care Unit: **L**owering Interventions by **E**mpowering **N**urses in the **C**ritical Care **E**nvironment

A Sleep Quality Improvement Project

From: [redacted]
Sent: Thursday, April 9, 2015 10:16 AM
To: [redacted]
Subject: Re: Permisison to cite the Richards-Campbell Sleep Questionnaire

Of course. That would be fine. Good luck with your project.

Sent from my iPhone

On Apr 9, 2015, at 7:57 AM, [redacted] wrote:

Good morning Dr. Richards,

My name is [redacted]. I am an Acute Care Nurse Practitioner at the [redacted] working with the [redacted]. I am also a student at [redacted] University working on my Doctorate of Nursing Practice (DNP). My DNP project will be looking at sleep deprivation in an ICU patient population. I have reviewed several articles on this subject and would like to use your Richards-Campbell Sleep Questionnaire as a tool for my project. I am requesting permission from you to be able to include a copy of the tool in my DNP paper giving credit to you for its development. If you need further information about my project please feel free to call me at [redacted] or email me at either [redacted] or [redacted]. Your assistance would be greatly appreciated.

Sincerely,

[redacted]
DNP Student
[redacted]