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Implementation of a Nonpharmacological Sleep Bundle in a Surgical Intensive Care Unit

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Implementation of a Nonpharmacological Sleep Bundle in a Surgical Intensive Care Unit

A DNP Project

Presented to the Faculty of the

Department of Nursing

West Chester University

West Chester, Pennsylvania

In Partial Fulfillment of the Requirements for

the Degree of

Doctor of Nursing Practice

By

Kristen Talvacchia

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Abstract

Critically ill patients admitted to the ICU frequently experience sleep disturbances. Sleep can be promoted in the ICU by adjusting the patient's environment to lessen noise, light, and patient care interruptions. Given the potential impact of sleep disturbances in both the acute and long-term, promoting quality sleep should be considered an essential component of providing care to patients admitted to the ICU. This DNP project aimed to identify whether implementing a nonpharmacological sleep bundle in a SICU improved patients' perceived sleep quality, as evidenced by their Richards Campbell Sleep Questionnaire scores. The Donabedian model is the theoretical framework that guided the design and implementation of this project. A quantitative, quasi-experimental, pre- and post-intervention design was applied to this quality improvement project. An investigator created a Nonpharmacological Sleep Bundle Checklist, and the validated Richards Campbell Sleep Questionnaire were the tools utilized for this project. A total of $N = 218$ RCSQs were completed, pre and post-intervention. The intervention group ($n = 157$) consisted of those patients who had received the nonpharmacological sleep interventions following implementation. A comparative group ($n = 61$) of patients completed the adapted RCSQ before the sleep bundle's implementation. The statistical analysis results of this QI project showed no statistically significant difference between the comparative group and the postimplementation group [$t\ (N = 218) = -.099$, $p = .461$]. However, the average total RCSQ score was higher for the postimplementation group ($M = 55$, $SD = 29$) when compared to the comparative group.

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Chapter 1: Introduction and Background

Background

Sleep is essential for humans. Its three fundamental functions include restorative, protective, and functional reorganization of the neuronal circuits (Carrera-Hernández et al., 2018). When individuals have inadequate sleep, their health and well-being can be negatively impacted. In acutely ill patients, the ability to sleep is imperative for both cognitive processing and physiological recovery. Hospitalization poses a substantial risk for sleep deprivation during a critical period when a patient's sleep is crucial.

Disturbed sleep in the ICU is a near-universal phenomenon that has been reported to affect 46-100% of patients admitted to critical care units (Honarmand et al., 2020; Showler et al., 2023). Healthcare providers caring for patients in the intensive care unit (ICU) find that ensuring patients receive sufficient sleep an exceptionally challenging task. Factors contributing to sleep disruption in critical care are high levels of light, noise, and interruptions from staff (Mori et al., 2021). The delirious effect of prolonged sleep disturbances on a patient's recovery has been well-reported in the literature, and healthcare providers continue to explore interventions to optimize patient's sleep while hospitalized (Showler et al., 2023).

Significance

As a person sleeps, their brain cycles through four phases. The first three phases are considered non-rapid eye movement (NREM) sleep and are known as "quiet sleep" (Carrera-Hernández et al., 2018). The fourth phase is rapid eye movement (REM) sleep, which is considered "active sleep" (Carrera-Hernández et al., 2018). Each sleep phase has a unique function and role in maintaining the brain's overall performance and function. Altered sleep

patterns and circadian rhythm disruption can negatively impact a person's health and have been associated with multiple short and long-term consequences (Naik et al., 2018).

Sleep in hospitalized ICU patients has been identified as fragmented, lacking restorative phases, and excessive during the day (Cooke et al., 2020; Tonna et al., 2021). A disrupted sleep cycle can increase blood pressure and heart rate and poorer pain control (Lopez et al., 2018; Wilson et al., 2018). Poor sleep in critically ill patients has also been linked to increased rates of delirium, extended hospital stays, impaired metabolic and immune functioning, and an increased risk of infections (Arttawejkul et al., 2020; Cooke et al., 2020; McGough et al., 2018). Nonpharmacological sleep interventions have been recognized as effective strategies for promoting an uninterrupted sleep-wake cycle in patients admitted to the ICU. They are crucial for halting the progression of this impaired cognitive state (Jun et al., 2021).

Implementing nonpharmacological sleep bundles, which alter the environment to make the ICU more conducive to sleep, has been shown to improve patient's duration and quality of sleep (Kang et al., 2018). Disrupted sleep patterns were identified as a patient care concern in a Surgical Intensive Care Unit (SICU) at an urban Veteran Affairs (VA) Hospital in Philadelphia, Pennsylvania. During morning rounds, patients repeatedly discussed with the critical care team that they had trouble sleeping. Patients identified excessive noise, lighting, the strange environment, and pain as the main factors influencing their ability to sleep. This information was discussed with the night shift SICU team, who concurred that sleep disruption was a regular occurrence for the Veterans admitted to the unit. Given the concern for potential increased rates of delirium related to sleep disturbances, the team discussed potential interventions that could be taken to address this clinical issue. It was noted that no

standardized sleep bundle was currently being utilized, and this could be an intervention explored as a quality improvement (QI) project.

Clinical Question/PICOT

This quality improvement (QI) project aimed to answer the following PICOT (Population-Intervention-Comparison Intervention-Time frame) question: In adult patients admitted to an intensive care unit (P), how does a nonpharmacological sleep bundle (I), compared to current practice (no bundle) (C), affect a patient's perceived sleep quality (O), over an eight-week study period (T)?

Goals of Project

This QI improvement project aimed to improve patients' perception of sleep quality while admitted to a Surgical ICU at a local, urban Veterans Affairs (VA) Hospital. An evidenced-based nonpharmacological sleep bundle was developed and implemented to improve patients' reported sleep. Following the deployment of the standardized bundle, the patient's perceptions of sleep were measured using the Richards Campbell Sleep Questionnaire (RCSQ), a standardized and validated sleep questionnaire. It was determined that a successful implementation of the nonpharmacological sleep bundle would be evidenced by a 90% completion of the bundle checklist by registered nurses (RNs) during the study period. In addition, a second outcome evaluated would be a two-point increase in the average RCSQ score compared to data collected pre-implementation.

Change Theory: The Donabedian Model

The Donabedian model is the theoretical framework that guided the design and implementation of this QI project (see Figure 1). According to Avedis Donabedian (2005), structure, process, and outcomes are the underpinnings of a quality care assessment and

inform the components of care to be sampled, data collected, and the development of appropriate standards and criteria. Structure refers to the context in which the care is delivered; process refers to the relations between two parties (the providers and receivers of care); and outcome refers to the effect of a healthcare intervention or delivery of services. "The triad of structure, process, and outcomes have a relationship in that the structural aspects influence the process of care, which in turn influence the effect of care on health status" (CMS, 2022, p. 1).

This project's structure phase includes the setting, population, and resources/personnel/technology. In the process phase, institutional review board (IRB) approvals were obtained, the nonpharmacological sleep bundle was implemented, and data was collected by completing the RCSQ. In the final stage of outcomes, data is analyzed to determine if the patient's sleep perception improved after implementing the nonpharmacological sleep bundle (see Figure 1).

Summary

Sleep pattern disruption is a common occurrence for patients admitted to intensive care units. Improving sleep quality in critically ill patients remains a significant challenge for clinicians working in this environment. Standardized nonpharmacological sleep bundles alter the ICU environment by decreasing light, noise, and exogenous stimulation and have been shown to reduce nighttime awakenings and promote the patient's perception of sleep quality and noise levels (Kang et al., 2018). This QI project aimed to evaluate the effectiveness of a standardized nonpharmacological sleep bundle implemented in a SICU at a local, urban Veterans Affairs (VA) Hospital. The patient's perceived sleep quality was assessed pre- and post-implementation using the validated RCSQ tool. Implementation success was measured

by determining that at least 90% of patients received the aspects of the nonpharmacological sleep bundle while admitted to the SICU. The effectiveness of the nonpharmacological sleep bundle was evaluated by comparing RCSQ scores pre- and post-sleep bundle implementation.

Chapter 2: Literature Review

Introduction

This chapter will discuss studies and quality improvement projects on sleep disruption in critically ill patients, sleep measurement in intensive care unit (ICU) patients, and pharmacological and nonpharmacological interventions to promote sleep in the critically ill. The review is divided into the following sections: terms, concepts, definitions, literature review, summary, and research gaps.

Terms, Concepts, & Definitions

Sleep

For this quality improvement project, sleep is defined as a "reversible, recurrent state of reduced responsiveness to external stimulation accompanied by complex and predictable physiological changes. These changes include coordinated, spontaneous, internally generated brain activity and fluctuations in hormone levels and relaxation of musculature" (Cartwright et al., 2023, p.1). Sleep is a homeostatic process that promotes good health, cognition, mood stability, improved quality of life, and basic human survival (Bani Younis et al., 2019; Morse & Bender, 2019). Healthy adult sleep typically consists of seven to nine hours per night and comprises four to six stages between NREM and REM sleep (Morse & Bender, 2019).

Sleep Disruption

Sleep disruption is an all-encompassing term referring to any change from usual sleep quality, quantity, or circadian rhythm, which can be measured objectively or subjectively (Honarmand et al., 2020). Approximately 50% of adults have experienced an episode of a transient sleep disruption, and 10% of adults carry a diagnosis of a chronic sleep disorder (Morse & Bender, 2019). Disruption of typical sleep patterns can lead to short-term and long-

term sleep disorders. The risk of developing a chronic sleep disruption disorder increases with age and those patients who have chronic medical conditions (Morse & Bender, 2019). Morse and Bender (2019) also describe that admission to a hospital for an acute medical condition places the patient at an increased risk of developing an acute sleep disruption disorder or exacerbating any chronic sleep conditions, which can have deleterious consequences for the patient.

Critical Care, Intensive Care Unit, Critically Ill

The terms critical care and intensive care unit (ICU) are often used interchangeably. Critical care is "the identification, monitoring, and treatment of patients with critical illness through the initial and sustained support of vital organ functions" (Kayambankadzanja et al., 2022, p. 6). Whereas an ICU is defined as "an organized system for the provision of care to critically ill patients that provides intensive and specialized medical and nursing care, an enhanced capacity for monitoring, and multiple modalities of physiologic organ support to sustain life during a period of life-threatening organ system insufficiency" (Marshall et al., 2017, p. 271). While critical care and ICU have similar definitions, many people see critical care as the care being provided and ICU as the location in which care is provided. Lastly, patients who are treated in critical care or admitted to an ICU are considered critically ill. Critically ill is a "state of ill health with vital organ dysfunction, a high risk of imminent death if care is not provided, and the potential for reversibility" (Kayambankadzanja et al., 2022, p. 4).

Sleep Interventions

Sleep interventions are methods used to prevent and treat sleep dysfunctions and improve patient's ability to obtain adequate quantity and quality of sleep (Morse & Bender,

2019). Two types of sleep interventions are pharmacological and nonpharmacological. Sleep disturbances in the acute care setting have traditionally been treated with pharmacological interventions (Cooke et al., 2020). Pharmacological sleep interventions used in the ICU setting often include a mixture of medications, including analgesic, sedative, and hypnotic agents (Cooke et al., 2020). Nonpharmacological methods are any intervention intended to enhance a person's well-being or health, and it does not include the use of any medicine or drugs (Castellano-Tejedor, 2022). Nonpharmacological methods are utilized in the hospital setting to promote sleep, including interventions that alter the patient's environment by reducing noise, light, and sleep interruptions (Aparício & Panin, 2020). Examples of nonpharmacological sleep interventions include the use of eye masks and ear plugs, clustering patient care, music therapy, and implementation of standardized sleep bundles (Tiruvoipati et al., 2019).

Review of Literature

The following PICOT (population, intervention, comparison, outcome, and time) question was developed to guide the literature search: In adult intensive care patients admitted to an intensive care unit, how does a nonpharmacological sleep bundle, compared to current practice, affect a patient's perceived sleep quality, over an eight-week study period?

The following databases: EBSCO CINAHL complete, EBSCO MEDLINE complete, PubMed Central, and Web of Science were utilized. The keywords, or search terms, used included sleep, sleep promotion, sleep disruption, ICU, intensive care, critical care, critical illness, sleep quality, sleep interventions, and nonpharmacological sleep intervention. The inclusion criteria included the primary language as English, peer-reviewed, and published between 2017 and 2023. These years were chosen given the ICU environment, and care

delivery is rapidly changing, and earlier studies may not be relevant to the current ICU setting. Exclusion criteria were publications that included neonatal and pediatric populations and those that did not focus on sleep. Identified article's reference pages were then hand-searched to identify any additional relevant publications.

Sleep Disruption in Critically Ill Patients

Sleep for humans typically consists of four stages lasting between sixty to ninety minutes, during which rapid eye movement and nonrapid eye movement sleep alternate, accounting for approximately seven to eight hours of sleep nightly (Naik et al., 2018). Conversely, sleep in hospitalized ICU patients is excessive during the day, fragmented, and lacks restorative phases (Cooke et al., 2020; Tonna et al., 2021). Studies using objective measures of ICU patients' sleep report that between 67%-100% experience abnormal sleep quality, and those using subjective measures report 47%-59% of these patients have poor sleep (Showler et al., 2023).

In 2018, the Society of Critical Care Medicine published its clinical practice guidelines for preventing and managing pain, agitation, delirium, immobility, and sleep disruption to encapsulate published evidence on this topic (Devlin et al., 2018). These guidelines are referred to as the PADIS guidelines and have altered many aspects of how critically ill patients are cared for. PADIS focuses on limiting sedation in critically ill patients and the importance of early mobilization (Devlin et al., 2018). In addition, the PADIS guidelines discussed the significance of sleep on a patient's recovery from critical illness and how critically ill patients must receive quality sleep to prevent the development of delirium (Devlin et al., 2018). These guidelines discuss how sleep promotion can be achieved by optimizing the patient's

environment, using tactics to control noise and light, reducing nighttime stimuli, and clustering patient care to protect patients' sleep cycles (Devlin et al., 2018).

Altered sleep patterns and circadian rhythm disruption can deleteriously impact a person's health and have been associated with multiple short and long-term consequences. The ability to sleep is imperative for both cognitive processing and physiological recovery (Delaney et al., 2018). Disturbances in sleep can lead to worse cardiovascular outcomes, release of inflammatory cytokines, and poorer immunological response (Naik et al., 2018). While sleep disturbances have been associated with adverse outcomes involving multiple organ systems, the most vital link has been to cognitive impairment and delirium, especially in critically ill patients (Showler et al., 2023). According to Altman et al. (2017), while sleep disruption improves over time, up to 61% of patients discharged from the ICU still experience sleep disruption up to six to twelve months after discharge.

Physiological, psychological, and environmental factors can all negatively impact critically ill patients' sleep. In two systematic reviews, Honarmand et al. (2020) and Morse and Bender (2019) identified pain and discomfort as physiological influences on sleep disturbances in critically ill patients. Other physiological risk factors for poor quality sleep in critically ill patients include older age, male sex, and pre-existing sleep disorders (Showler et al., 2023). In addition, Honarmand et al. (2020) determined that anxiety, stress, and fear of being in an unfamiliar environment are all psychological factors linked to poor sleep for patients admitted to the ICU.

Environmental factors such as noise, artificial light, and clinical interactions from the healthcare team are the most significant influencers on poor sleep in critically ill patients (Morse & Bender, 2019). Clinical interactions and disruptions from hospital personnel are

often necessary when caring for a critically ill patient. Many critically ill patients require intensive monitoring and nursing care twenty-four hours a day, which has been reported as a significant contributor to overnight sleep awakening by patients. In the systematic review by Honarmand et al. (2020), the authors reported that ICU environmental factors such as noise, care activities, light, bed discomfort, and attachment to a medical device are the most disruptive to sleep. The World Health Organization (WHO) recommends that noise within hospitals not exceed 35 decibels during the day and 30 decibels at night (Showler et al., 2023). However, several studies have documented that noise levels are often greater than these recommendations, often ranging from 50-75 decibels, and are associated with sleep disruption being reported by patients (Showler et al., 2023). In a study by Wesselius et al. (2018), noise from other patients and being awakened by hospital staff were two of the most reported hospital-related factors that impacted their sleep while hospitalized.

A primary environmental cue for the human circadian rhythm is the light-dark cycle. Morse and Bender (2019) and Showler et al. (2023) discuss the impact that low light levels during the daytime and peak light levels in the evening hours pose a risk for disruption of circadian rhythm and maintaining a typical sleep-wake pattern. Melatonin plays a crucial role in regulating the sleep-wake cycle, and artificial light during the sleep phase has been found to suppress the human body's natural melatonin production, which can adversely impact a patient's perceived quality of sleep (Delaney et al., 2018).

Measuring Sleep in Critically Ill Patients

Along with the growing interest in sleep promotion in ICUs, there are challenges related to how sleep is measured regarding reliability, accuracy, and feasibility. Various methods of measuring sleep in ICU patients exist, but they do not all measure the exact

dimensions precisely, and therefore, determining accuracy is complex. Objective measurement methods include polysomnography, bispectral index, actigraphy, and clinician observation. Examples of subjective measurement methods are clinician questionnaires and patient questionnaires.

Polysomnography

"Polysomnography (PSG) is a multiparametric recording of the biophysiological changes based on electroencephalographic (EEG) activity" combined with other polygraphic monitoring and parameters that occur during sleep (Richards et al., 2020, p. 2). PSG is considered the gold standard for objectively measuring the quantity and quality of sleep and has been for a while (Darbyshire et al., 2018; Elías, 2021; Jeffs & Darbyshire, 2019; Richards et al., 2020; Schwab et al., 2018). However, the use of PSG in the ICU is often considered impractical as it requires technical expertise for the placement of electrodes, requires specialized interpretation, is costly, and the significant lag time associated with the data collection and reporting of results (Jeffs & Darbyshire, 2019; Schwab et al., 2018). PSG has also been found to be intolerable for most patients in the ICU beyond 24 hours of monitoring (Schwab et al., 2018).

Bispectral Index

Bispectral index (BIS) integrates data from multiple analyses of raw EEG waveforms. BIS provides clinicians with a number between zero and one hundred, which correlates to the patient's sleep level (Elías, 2021). The BIS monitor is commonly used by anesthesia providers to guide the use of anesthetics and to avoid over-sedating and under-sedating the patient. A BIS score of 90-100 is considered awake, 75-90 is light sleep, and 20-70 is slow-wave sleep (Elías, 2021). The benefits of using BIS monitoring over PSG are that BIS monitoring does

not require the presence of a specialty-trained sleep clinician, and the sensors can be easily applied by nursing staff (Elías, 2021). However, like PSG, BIS is also subject to electrical interference and can be just as intrusive to patients' comfort (Elías, 2021). PSG is superior to BIS in that the data provided by the BIS is the patient's sedation level and not their sleep stage. Therefore, BIS monitoring is not recommended for routine monitoring of patients' sleep in the ICU (Elías, 2021).

Actigraphy

Actigraphy uses an accelerometer, a motion sensor detector similar to a wristwatch's size, to assess motor activity (Richards et al., 2020; Schwab et al., 2018). The advantages of using actigraphy to measure sleep include its affordability and unobtrusiveness and its ability to collect data continuously over extended periods (Elías, 2021; Schwab et al., 2018). Richards et al. (2020) discuss how actigraphy can provide valuable metrics across various sleep-wake disorders, but its use is more accurate in healthy populations. Actigraphy measures sleep by quantifying movement; however, the algorithm's ability to estimate the amount of sleep a patient receives is limited (Schwab et al., 2018). Often, critically ill patients have reduced movement due to bedrest, monitoring devices, and medications; therefore, actigraphy overestimates the amount of recorded sleep data (Elías, 2021; Richards et al., 2020). Elías (2021) discusses that "agreement between actigraphy versus polysomnography in the ICU could range as low as 65%" (p.3).

Clinician Observed Sleep

Systematic or structured observation is a method in which researchers collect data without directly involving the study participants (Richards et al., 2020). Richards et al. (2020) review how data is often gathered by individuals who have been trained and are considered

competent to evaluate and recognize behavior for data collection. Observation and data collection by these trained individuals can occur at specific intervals or continuously over a specified period. Observational data collection can occur in real-time, or study participants can be recorded, and the data collectors can review the recordings and code the data later.

Specialized tools allow clinicians, such as nurses, to perform structured observation related to sleep in their ICU patients (Richards et al., 2020). The Edwards and Schuring's Sleep Observation Tool (SOT) is designed for ICU nurses to assess patients at fifteen-minute intervals, record whether they are asleep or awake, cannot tell, and have no time to observe (Elías, 2021). Compared to PSG, nurses utilizing the SOT correctly identified sleep nearly 82% of the time (Elías, 2021). Having nurses perform observed sleep assessments on their ICU patients seems convenient and feasible, and these observations have shown good validity compared to other methods (Richards et al., 2020). However, one must also consider the amount of training that should be provided to the nurses to consider them competent and proficient in gathering appropriate data. In addition, the researcher must also consider the potential for nurses to accidentally awaken the patient during their observation and the inability to blind the nursing staff to the intervention (Richards et al., 2020). It is also essential for researchers to consider the feasibility of nurses having the allotted time to gather sufficient data in addition to their already busy shifts must also be considered (Richards et al., 2020).

Questionnaire-Based Methods

Patients' perception of sleep quality is an integral part of their sleep that objective sleep measures cannot capture. Numerous sleep questionnaires have been developed and are available to clinicians to assess patients' perceptions of sleep in the ICU. The Verran Snyder-Halpern Sleep Scale (VSH) is a visual analog scale that was created and validated for

measuring healthy adults' perception of sleep and now has been validated for use in critically ill patients (Elías, 2021; Richards et al., 2020). Another example includes the Richards Campbell Sleep Questionnaire (RCSQ), which is a brief two-minute questionnaire that uses a five-item visual analog scale to evaluate the perception of sleep in critically ill patients (Darbyshire et al., 2018; Jeffs & Darbyshire, 2019; Richards et al., 2020). The five domains included in the RCSQ are sleep latency, efficiency, depth, number of awakenings, and overall sleep quality (Richards et al., 2020). Each visual analog scale (VAS) represents a separate domain, and each domain is scored by the patient between zero and one hundred. The patient is instructed to place an "X" along each VAS to score the quality of the respective sleep domain (Elías, 2021). The composite score ranges from 0 (poorest quality sleep) to 100 (highest quality sleep). A higher calculated score indicates better sleep quality (Elías, 2021). For patients to complete the questionnaire and provide accurate feedback and information, they must be awake and cognitively able to process the questions. The RCSQ has been tested and validated against the PSG, the gold standard for measuring sleep (Richards et al., 2000). "With excellent internal consistency and moderate correlation with polysomnography, the RCSQ is the most valid and reliable questionnaire when used as a single construct to measure sleep efficiency in patients" (Jeffs & Darbyshire, 2019, p. 758).

Pharmacological Sleep Interventions

Traditionally, sedative-hypnotic pharmaceuticals are often used as a first-line intervention for patients struggling with sleep disruption in the ICU. Some agents, such as ketamine, induce sleep by inhibiting the excitatory pathway, such as N-methyl-d-aspartate (NMDA) receptor agonists (Tiruvoipati et al., 2019). Other agents such as propofol, benzodiazepines, and barbiturates potentiate inhibitory synaptic receptors and mimic gamma-

aminobutyric acid (GABA) neurotransmitters (Tiruvoipati et al., 2019). While pharmacological interventions may improve the quantity of sleep, they have been found to lead to abnormal sleep patterns, inhibit rapid eye movement and deep sleep, and prolong the time patients spend on mechanical ventilation (Chen et al., 2022). In addition, pharmacological sleep interventions have been linked to more extended hospital stays, increased healthcare costs, and can lead to long-term addiction (Chen et al., 2022).

Nonpharmacological Sleep Interventions

Nonpharmacological sleep interventions are safe, noninvasive, cost-effective, and have fewer side effects than pharmaceutical sleep interventions. Several nonpharmacological sleep interventions are discussed below, such as dedicated quiet time, eye masks and ear plugs, music therapy, and standardized sleep bundles.

Quiet Time

Most ICUs are hectic and noisy, leading to sleep deprivation in critically ill patients and subsequent complications. Establishing devoted "quiet times" during the day and night has been identified as a potential nonpharmacological intervention that could improve rest in ICU patients. Six studies were reviewed that implemented the use of dedicated “quiet time” and evaluated its impact on patients’ ability to obtain uninterrupted sleep (Goeren et al., 2018; Hedges et al., 2019; Knauert et al., 2018; Knauert et al., 2019; Lopez et al., 2018; McGough et al., 2018). Goeren et al. (2018), Hedges et al. (2019), and McGough et al. (2018) all implemented "quiet time" practices in various units twice daily, once during the afternoon and another dedicated time block overnight. Whereas Knauert et al. (2018), Knauert et al. (2019), and Lopez et al. (2018) evaluated scheduled "quiet time," but they focused their scheduled blocks on nighttime hours only.

In addition to dedicated "quiet time," the QI projects also ensured that patients were provided the opportunity to receive comfort items (warm blankets, eye masks, earplugs, lights dimmed), toileting, and hygiene before "quiet time" (Goeren et al., 2018; Hedges et al., 2019; Knauert et al., 2018; Lopez et al., 2018; McGough et al., 2018). Goeren et al. (2018) and McGough et al. (2018) each developed "quiet time" signs that the staff displayed in various places in the unit, which educated staff, patients, and visitors about "quiet time" and encouraged voices to be kept to a minimum to allow patients to rest. In addition to the development of signs, Goeren et al. (2018) also encouraged consultants such as physical and occupational therapists to schedule their Neurosurgical ICU patients to receive their therapy sessions before the start of the afternoon "quiet time." A goal for staff was to ensure that care was clustered together, allowing each patient the greatest chance of receiving uninterrupted rest time.

Several methods were used to evaluate the effectiveness of "quiet time" on the noise levels, patients' perception of sleep, and overall satisfaction with their hospital stay related to their ability to rest. Goeren et al. (2018), Knauert et al. (2019), and McGough et al. (2018) each utilized decibel meters to obtain noise readings in the unit pre- and post-intervention. The three study results revealed that the "quiet time" intervention reduced the noise in the unit during that period (Goeren et al.,2018; Knauert et al., 2019; McGough et al., 2018). Knauert et al. (2018), Knauert et al. (2019), and Lopez et al. (2018) recorded the number of room entries that were made during the dedicated "quiet time" hours. The authors reported that room entries decreased by 32% (Knauert et al., 2019) and 8.5% (Lopez et al., 2018). Both Hedges et al. (2019) and McGough et al. (2018) used the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey to evaluate patients'

hospital experience related to quietness at night. Both reported improved HCAHPS survey scores due to the "quiet time" QI initiative (Hedges et al., 2019; McGough et al., 2018). McGough et al. (2018) reported that while their HCAHPS scores increased from 36-40% (pre-intervention) to 51.4% to 61.9% (post-intervention), this did not reach statistical significance; however, the trend demonstrated an increase in satisfaction related-to the noise level on the unit. While each of these six QI projects implemented various methods of "quiet time" and utilized different methods of evaluation, the overarching results of these studies show a positive correlation between the implementation of "quiet time" and the reduction of room entries, noise levels, and ability of the patient to obtain adequate sleep (Goeren et al., 2018; Hedges et al., 2019; Knauert et al., 2018; Knauert et al., 2019; Lopez et al., 2018; McGough et al., 2018).

Ear Plugs and Eye masks

The PADIS guidelines recommend implementing light and noise reduction interventions to improve sleep in patients who are critically ill (Devlin et al., 2018). In a systematic review published by Locihová et al. (2018), nineteen studies were reviewed involving 1,379 participants. Five of the studies evaluated only earplugs; two looked at only eye masks, earplugs, and eye masks in nine studies, and three evaluated earplugs, eye masks, and music (Locihová et al., 2018). Six studies used original questionnaires, and twelve utilized standardized sleep quality questionnaires (Locihová et al., 2018). Locihová et al. (2018) did not analyze the studies that utilized author-developed questionnaires due to the significant variability in the content and focus. Three studies used the RCSQ, five utilized the VSH, the Pittsburgh Sleep Quality Index (PSQI) was used three times, and one used the Speigel Scale. Locihová et al. (2018) reported that despite the heterogeneity of the analyzed

studies, the use of eye masks and ear plugs showed statistically significant improvement in the quality of sleep when used by patients admitted to the ICU.

Arttawejkul et al. (2020), Bani Younis et al. (2019), and Obanor et al. (2021) all utilized the RCSQ to evaluate patient's perception of sleep quality while admitted to the ICU. Bani Younis et al. (2019) reported that the mean sleep quality was 35.29 before eye masks and earplugs were implemented. Following implementation, it increased to 47.2, a statistically significant increase (Bani Younis et al.,2019). In the study completed by Obanor et al. (2021), postintervention RCSQ scores improved from 47.3 to 64.5 postintervention, and the study was stopped early because prespecified criteria for significance were attained. Whereas, in the study performed by Arttawejkul et al. (2020), the results on the RCSQ did not demonstrate any significant difference between the two groups; however, these results could be related to the small sample size (N=17). The polysomnography and actigraphy results reported by Arttawejkul et al. (2020) revealed significantly conflicting results. The researchers noted that the actigraphy results showed increased activity in the intervention group, whereas the polysomnography showed the arousal index to be lower in the intervention group (Arttawejkul et al., 2020). These conflicting findings support the earlier data demonstrating that actigraphy is not as accurate of a tool as polysomnography when evaluating sleep in ICU patients.

Music Listening

Florence Nightingale, a pioneer in nursing, first noticed the effects of music on soldiers' pain during the Crimean War (Murrock & Bekhet, 2016). Nightingale strongly advocated for a healthy environment as an essential component in the healing process, and she believed music helped put soldiers in a healing environment (Murrock & Bekhet, 2016).

"Music has an anti-anxiety effect by inhibiting the sympathetic nervous system and stimulates the release of endorphins by activating memory and the limbic system, which are important factors affecting emotional health" (Chen et al., 2022, p. 8). Research has shown that music is an entertainment activity and a valuable therapeutic tool in the critical care setting (Chen et al., 2022). Many studies have reported using music in healthcare settings to reduce anxiety, depression, and sleep (Murrock & Bekhet, 2016).

Chen et al. (2022) performed a meta-analysis that included eight studies that evaluated the use of music to improve sleep quality in ICU patients. The meta-analysis "suggested that music listening had positive effects on sleep quality, anxiety, depression, and vital parameters" (Chen et al., 2022, p. 8). A meta-analysis by Kakar et al. (2021) also reported that "recorded music significantly improved subjective sleep quality" in the critical care and surgical population. Kakar et al.'s (2021) results were consistent with Chen et al.'s (2022) findings, reporting that listening to music positively impacted patients' reported sleep quality, anxiety, depression, and vital parameters. These two meta-analyses indicate that listening to music effectively reduces psychological-related symptoms of critically ill patients in ICU settings and improves their perception of sleep quality.

Sleep Bundle Protocol

Several studies have been performed that combine non-pharmacological sleep interventions and developed a sleep hygiene protocol, or "sleep bundle," to assist in managing sleep for ICU patients. Through this literature review, several studies have been identified that discussed the implementation of a sleep protocol. As part of implementing a nonpharmacological sleep protocol, several studies displayed signs on the unit to inform and educate staff and patients about the importance of sleep (Douglas et al., 2020; Herscher et al.,

2021; Williams, 2022; Wilson et al., 2017). The authors of these studies found the signs helpful in spreading knowledge regarding the importance of sleep for hospitalized patients and as a visual reminder for visitors and staff to keep minimizing ambient noise to allow patients to rest. Wilson et al. (2017) also utilized sleep posters to obtain patients' nighttime preferences and recorded them for future reference.

Herscher et al. (2021), Tang et al. (2019), Tonna et al. (2021), Williams (2022), and Wilson et al. (2017) all implemented a clustered nighttime routine into their sleep protocol. These nighttime routines included turning off televisions and room lights, closing doors and curtains, offering hygiene and toileting, dimming hallway lights, and administering nightly medications. In addition to the clustered nighttime care discussed, Herscher et al. (2021), Tang et al. (2019), Tonna et al. (2021), and Wilson et al. (2017) provided patients with ear plugs and an eye mask to help facilitate a restful night sleep. Tang et al. (2019) and Tonna et al. (2021) encourage daytime wakefulness to encourage sleep in the overnight hours. These daytime wakefulness interventions included ensuring shades and doors were open, lights were on in their room, administering stimulant medications in the morning, encouraging physical and cognitive activities to prevent napping, and discouraging caffeine later in the day (Tang et al., 2019; Tonna et al., 2021).

Gaps in Literature

This literature review identified several limitations. Many of the studies exhibited significant heterogeneity among the patients enrolled; numerous studies had a short study evaluation period and smaller sample sizes, which lacked randomization and double-blinding. In addition, no literature was found that explicitly focused on the Veteran patient population. However, despite these limitations, the study results showed promising results on

the impact of non-pharmacological interventions on promoting quality sleep in the ICU setting.

Summary

Improving sleep quality in critically ill patients remains a significant challenge for clinicians working in the ICU. Several non-pharmacological interventions have been evaluated and employed to promote sleep in the critical care setting, including dedicated quiet time set aside daily to encourage rest, encouraging the use of eye masks and earplugs by patients, music listening, and bundled sleep protocols that focused on patient comfort while at the same time reducing noise and light. Unfamiliar environment and the stressor of critical illness induce sleep disturbances in ICU patients. Thus, to improve the quality of patients' sleep, routine patient care activities should continue to be evaluated to determine how ICU care can be modified to promote quality sleep while continuing to provide appropriate critical care.

Chapter 3: Methodology

Introduction

This chapter will discuss the methodology used for this QI project, which includes an overview of the discussion of the project design, setting, population, instrument, sampling, data collection, data analysis, Institutional Review Board (IRB) approval, and resources, personnel, and technology.

Design/Change Theory

This QI project aimed to create, implement, and analyze a nonpharmacological sleep bundle's impact on patients' perception of sleep quality while admitted to a SICU. The principal investigator applied a quantitative, quasi-experimental, pre- and post-intervention design for this quality improvement project. The Donabedian conceptual model was used for this project. As discussed in Chapter 1, the Donabedian model provides a framework for evaluating healthcare services and examining the quality of care provided (CMS, 2022). This conceptual model uses three categories by which healthcare services can be evaluated and compared: structure, process, and outcome. Structure describes all factors that affect the context of how care is delivered and is referred to as input measures; it often controls how patients and healthcare providers act (Donabedian, 1988). Facility equipment, financial resources, organizational policies, and other tools made available to healthcare providers are all considered part of the structure portion of the Donabedian model (CMS, 2022). The process segment of the triad is the cumulation of all actions determining how the healthcare system operates and delivers care. Patients' activities in seeking care and carrying out care, as well as the healthcare providers' diagnosis and determination of treatment plans, all fall under the process category of the Donabedian model (Donabedian, 1988). The last portion of

the Donabedian theoretical framework is the outcome measures. Outcome measures represent the impact of care on the patient's health status. In summary, “good structure increases the likelihood of good process, and good process increases the likelihood of a good outcome” (Donabedian, 1988, p. 1745). Chapter three reviews this QI project's structure, process, and outcome measures (see Figure 1).

Structure

Setting

The setting for this practice change initiative occurred in an urban VA Hospital in Philadelphia, Pennsylvania. The hospital is part of the Veterans Health Administration (VHA), the largest integrated healthcare system in the United States. The VHA provides care at 172 medical centers, serving over 9 million Veterans annually (VHA, 2008). The hospital provides healthcare to Veterans in six surrounding counties: Southeastern Pennsylvania, Southern New Jersey, and Delaware (McDonough, 2017). The facility was staffed by 3,036 full-time employees in 2022 and has an annual operating budget of approximately $718 million (Veteran Affairs, 2023). The medical center has 145 acute-care beds and a 135-bed long-term care facility on campus (McDonough, 2017). During 2022, the medical center provided 678,013 outpatient visits and 7,091 hospital admissions (Veteran Affairs, 2023).

This QI project occurred in a SICU with 16 private rooms. Each ICU room has a television, an option for an in-room telephone, two motion-activated sinks, and one automatic flushing toilet. In addition, a Philips IntelliVue MX800 bedside monitor, a staff computer with a barcode scanner for medication administration, and a wall clock are available in each room. All the SICU beds were recently replaced with new Hillrom Progressa Smart+ Beds. Each room has an outside-facing window with adjustable vertical

blinds, sliding glass doors with privacy curtains that separate patient rooms from the ICU hallway, and a light switch on the outside of the room that controls the lights in the room.

Population

In 2022, the hospital served 61,482 Veterans in a seven-county services area (Veteran Affairs, 2023). Males comprise 92.2% of the Veterans who receive healthcare services at this hospital, and 7.8% are women Veterans (Veteran Affairs, 2023). During fiscal year (FY) 2022, 3,331 surgeries were completed at this VA facility. Sixty-seven percent of these surgeries were outpatient procedures, and 33% required an admission of at least one night. Of the 33% of admitted patients, 17% were admitted to the SICU, and 16% were admitted to the ward. The majority of the surgical cases completed at this VA facility were ophthalmology (23%), general surgery (14%), orthopedics (13%), and urology (13%).

Instrument

For this QI project, the primary investigator used the most recently published evidence-based literature on nonpharmacological sleep interventions in ICU patients to create a Nonpharmacological Sleep Bundle Checklist (see Appendix A). The checklist was dual-purposed in that the nurses used it to ensure compliance with all aspects of the bundle and by the primary investigator as a data collection tool. The sleep bundle included a "quiet time" between 2300-0500. During this time, the bedside nurse oversaw the bundle and worked with other staff to reduce or eliminate patient disturbances during "quiet time."
Nonpharmacological sleep promotion interventions that were chosen were separated into two groups: environmental actions and patient care interventions. The environmental actions included closing blinds, curtains, and doors, turning off or dimming lights in the patient's room and hallway, turning off the TV (or lowering the volume if preferred by the Veteran),

ensuring IV pumps were plugged in and medication availability sufficient for the quiet time, and flipping the door sign to “Sleep in Progress” (see Appendix B). The patient care interventions included providing comfort items (hygiene, blankets, etc.), clustering care prior to quiet time initiation (providing meds, taking vitals, sending labs and blood sugar checks), and minimizing room entries during “quiet time.”

As previously stated in the literature review, polysomnography is the gold standard for measuring sleep quantity and quality (Darbyshire et al., 2018; Elías, 2021; Jeffs & Darbyshire, 2019; Richards et al., 2020; Schwab et al., 2018). Due to the complexity of polysomnography, it is not a feasible option for routine ICU practice. However, the Richards Campbell Sleep Questionnaire (RCSQ) is a five-item visual analog scale tool that has been validated against polysomnography and, for this reason, was selected as the most appropriate tool to utilize for this QI project (see Appendix C). Before implementation, the principal investigator received approval from the RCSQ developer to use the tool for this QI project (see Appendix D). The five domains included in the questionnaire are sleep latency, sleep efficiency, sleep depth, number of awakenings, and overall sleep quality (Richards et al., 2020). Each visual analog scale represents a separate domain, and each domain is scored by the patient between zero and one hundred. A higher calculated score indicates better sleep quality (Elías, 2021). Comparative data was collected from an adapted version of the Richards Campbell Sleep Questionnaire (see Appendix E), which had been utilized as a standard of care in the SICU prior to the implementation of this QI project.

Resources, Personnel & Technology

The SICU is staffed 24/7 by surgical intensivists and nurse practitioners (NPs). The NP staff rotate 12- and 24-hour shifts and utilize moonlight coverage during occasional night

shifts as needed. The unit staff consists primarily of registered nurses, with an RN-patient ratio of 1:2-3 (determined by patient acuity). There is also one nursing assistant who primarily works weekdays between 1100 and 2300. The assistant nurse manager and nurse manager for the SICU and a dedicated ICU pharmacist work Monday through Friday during regular business hours. A unit clerk is assigned to the SICU for each shift but may not be on the unit during their duty hours.

This VHA facility utilizes the Computerized Patient Record System (CPRS) as an electronic medical record (EMR). CPRS allows users to enter and review clinical information and update information about a Veteran's care. Within CPRS, labs, medication, radiology studies, and procedures can be ordered, and results reported. The CPRS application also allows providers to document progress notes, treatments, and discharge information. In addition to CPRS, ICU clinicians utilize PICIS Critical Care Manager software. PICIS allows for the automated collection of patient vital signs and other bedside monitor data through the connectivity to medical monitoring devices. In addition, PICIS supports ICU nurses' assessment and documentation of intravenous medication titration, physical exam findings, and assessment tools specific to the ICU setting, such as the CAM-ICU and RASS.

Process

Protection of Human Subjects/IRB

Before collecting data, IRB approval was obtained from the Department of Veteran Affairs (see Appendix F) and West Chester University (see Appendix G). As this QI project involved no more than minimal risk to its participants, both IRBs deemed it exempt and categorized it as non-research. The principal investigator was the only person accessing the collected data results on a government-issued password-protected computer. Only the

principal investigator had authority and access to the computer, and all the data collected will be destroyed after three years of project completion.

Participant Sampling

Subjects for this QI project were adult Veteran patients admitted to the SICU for at least one night. Participants were patients undergoing scheduled and emergent (un-scheduled) surgical procedures or non-operative management of a clinical condition. All patients were considered eligible to receive the nonpharmacologic sleep interventions. However, exclusion criteria were applied to determine patients eligible to complete the post-intervention RCSQ. Patient exclusion criteria for completing the RCSQ included patients on ventilators, non-English speaking patients, CAM-ICU positive (exhibit delirium), RASS of -4/-5 (deep sedation/unarousable), being legally blind, or patients who declined to participate. Consent was not required for this project because assessment of sleep perception and sleep promotion is standard practice, and no patient harm or adverse events were anticipated. The principal investigator performed a G*Power priori power analysis for a two-tailed study, using a power of 0.8, a medium effect size of 0.5, a statistical significance level of $p = 0.05$, and calculated a sample size of 26.

Data Collection

Following IRB approval and implementation of the sleep bundle, data was collected for eight weeks to assess the impact of the nonpharmacological sleep bundle on patients' perceived sleep quality as demonstrated by their reported RCSQ scores. As part of the sleep bundle implementation, the night shift nursing staff completed a nonpharmacological sleep bundle checklist every night for each patient admitted to the SICU. To determine if a SICU patient was eligible to complete the RCSQ, the RN staff completed their standard of care

assessment utilizing the Confusion-Assessment Method for the ICU (CAM-ICU) tool and the Richmond Agitation-Sedation Scale (RASS). The RASS is a standardized sedation assessment and "allows for categorization of patients based on the level of consciousness" (Arumugam et al., p.38, 2017). The CAM-ICU is the most used instrument to assess and diagnose delirium in ICU patients (Rieck et al., 2020). After the CAM-ICU assessment, an individual is determined to be either CAM-ICU positive or negative for delirium. The CAM-ICU and RASS tools were a standard of care used daily by the nursing staff before this QI project; therefore, no education was needed. In addition, no data collection related to the results of these assessment tools occurred, and they were utilized only to determine eligibility to complete the RCSQ. If a patient was determined to be CAM-ICU positive or had a RASS of -4 or -5, the patient was excluded from completing the RCSQ. As discussed earlier, other exclusion criteria for completion of the RCSQ included mechanical ventilation, non-English speaking, being legally blind, or patient declined to participate.

The pre-implementation comparative data was collected using an adapted RCSQ created by the site, which was a 10-point Likert scale. The postimplementation RCSQ used a visual analog scale ranging from 0 mm to 100 mm, and a total score was created by dividing the sum by 5 to achieve an average. Both scales were rated with higher scores representing better sleep. Completion of the RCSQ was done daily by the NP on duty during the day shift for all those patients who did not meet the exclusion criteria discussed prior. The NP would provide verbal instructions to the patient on completing the questionnaire and assist patients with completing the questionnaire as needed. The patient would place an "x" on the line based on how they felt their sleep related to the question. If the patients could not hold a writing instrument, they would point to the area on the line, and the NP would assist them with writing

an “x.” The principal investigator was responsible for scoring each questionnaire, providing internal consistency to the scoring process. The visual analog scale questionnaires were scored by measuring millimeters from the low end of the scale to the “x” placed on the line. The total RCSQ score was calculated by adding the sum of all five questions in millimeters and then dividing by five.

Three Excel spreadsheets were created to manage the collected data: (1) SICU daily census and completed checklists, (2) Sleep Bundle Checklist data extraction, and (3) RCSQ data. The principal investigator manually entered data from the units' census sheets into Excel, collected checklists, and completed RCSQ. All data was de-identified during collection. All completed checklists and RCSQ were kept in a locked filing cabinet in the NP office.

Data was collected on all patients eligible for an RCSQ completion based on the exclusion criteria listed on the checklist. Data was compiled in a Microsoft Excel file for 218 patients (N = 218). The data was examined for missing responses, and only patients who completed an RCSQ were included in the sleep perception analysis. Two data sets of patients were identified. The intervention group (n =157) consisted of those patients who had received the nonpharmacological sleep interventions following implementation. A comparative group (n = 61*)* of patients completed the adapted RCSQ before the sleep bundle's implementation.

The data collected included demographic characteristics such as age, gender, and level of care. The RCSQ was collected on patients from both the comparative and postimplementation samples. Age and the scores of the RCSQ were reported using means, standard deviation, and ranges. Gender and level of care were reported using counts and percentages. The data for N = 218 patients were entered into an SPSS version 29 database for

descriptive analysis and outcome assessment. These demographic and sleep quality measurements were described in the narrative and displayed in tables or figures.

Unit census data collected determined that there was an opportunity for the nursing staff to complete a total of 267 sleep bundle checklists during the project period. Over the eight-week project, 202 sleep bundle checklists were completed. Two data sets of patients were identified. The intervention group (n =157) consisted of those patients who had received the nonpharmacological sleep interventions following implementation. A comparative group (n = 61) of patients completed the adapted RCSQ before the sleep bundle's implementation. A total of N = 218 RCSQs were completed, pre and post-intervention.

Outcome

Data Analysis

Pre- and post-intervention data analyses were performed to evaluate the effect of a nonpharmacological sleep intervention bundle on perceived sleep quality for patients admitted to a SICU. Daily SICU census reports were collected to evaluate for compliance with the nonpharmacological sleep bundle checklists. Pre- and post-intervention RCSQ scores were used to determine the overall sleep quality and compare the groups. Patient's mean scores for each of the five RCSQ items were calculated and evaluated. Data analysis was completed to determine a statistically significant difference between the sleep quality scores in patients who received the nonpharmacological sleep bundle.

Chapter 4: Results

Introduction

This QI project aimed to answer the following PICOT question: In adult patients admitted to an intensive care unit, how does a nonpharmacological sleep bundle, compared to current practice (no bundle), affect a patient's perceived sleep quality over an eight-week study period? This chapter includes the data collection and statistical analysis results of this QI project.

Data Collection

Following IRB approval and implementation of the sleep bundle, data collection started on December 16, 2023, and was completed on February 10, 2024. The independent variable for this QI project was implementing a nonpharmacological sleep bundle. The dependent variable was the level of perceived sleep quality measured using the RCSQ. Six weeks of data collected using the site-adapted 10-point Likert scale RCSQ tool prior to the QI project were used as the preintervention comparative data. Outcome data was measured between these two separate sets of patients. Unit census data collected determined that the nursing staff could complete 267 sleep bundle checklists during the project period. Over the eight-week project, 202 sleep bundle checklists were completed, which was a 76% completion rate.

Statistical Results

The demographics and outcomes were assessed using statistical analysis and an evidence-based method for comparison. Descriptive statistics included describing the average age and RCSQ scores as well as counting the males and females in the sample. The scores of each of the five RCSQ questions were described using means, standard deviation,

and range. The independent sample *t*-test was used to compare the overall RCSQ scores from the patients who had current practice (n = 61) compared to those who had the sleep bundle implemented (n = 157). Each RCSQ score was obtained from one patient between the two data groups. The RCSQ score was a visual analog scale of 100 mm, which the patient would mark and was measured by the primary investigator to obtain the score.

Age was reported in years (see Table 1). The mean age (years) of the comparative group patients was 66.9 years (SD = 10.9), with a range of 35 - 87 years. The mean age of the postimplementation group was 68.3 years (SD = 8.1), with a range of 43 - 91 years. Gender and level of care were described using frequencies and percentages (see Table 2). The comparative patients' gender was 82% male (n = 50) and 18% female (n = 11). The postimplementation patients' gender was 98% male (n = 155) and 2% female (n = 3). The level of care was reported as SICU, Intermediate Surgical Care Unit (ISICU), and ward. In the comparative group, 51 patients were in the SICU (84%), and ten were in the ISICU (16%). In the postimplementation group, 95 patients were in the SICU (60%), 26 patients were in the ISICU (41%), and 22 were in the ward (14%).

The responses to the RCSQ were reported using a 0 – 100-point scale for each question (see Appendix C). The first RCSQ question was: My sleep last night was: Deep Sleep – Light Sleep. The average response for the first RCSQ question from the comparative group was 48 (SD = 28), with a range of 0 – 100. The postimplementation group's average response for the first RCSQ question was 47 (SD = 32), with a range of 0 – 100. The second RCSQ question was: Last night, the first time I got to sleep, I: Fell Asleep Almost Immediately- Never Could Fall Asleep. The average response of the second RCSQ question from the comparative group was 48 (SD = 28), with a range of 0 – 100. The

postimplementation group's average response for RCSQ question number two was 60 (*SD* = 32), with a range of 0 – 100. The third RCSQ question was: Last night, I was: Awake Very Little – Awake All Night Long. The average response of the third RCSQ question from the comparative group was 56 (*SD* = 33), with a range of 0 – 100. The postimplementation group's average response for the third RCSQ question was 56 (*SD* = 32), with a range of 0 – 100. The fourth RCSQ question was: Last night, when I woke up or was awakened, I: Got Back to Sleep Immediately – Couldn't Get Back to Sleep. The average response of the fourth RCSQ question from the comparative group was 56 (*SD* = 31), with a range of 0 – 100. The postimplementation group's average response for the fourth RCSQ question was 53 (*SD* = 35), with a range of 0 – 100. The last RCSQ question: I would describe my sleep last night as: A Good Night's Sleep – A Bad Night's Sleep. The average response of the last RCSQ question from the comparative group was 56 (*SD* = 35), with a range of 0 – 100. The postimplementation group's average response for the last RCSQ question was 58 (*SD* = 33), with a range of 0 – 100. The overall RCSQ score for the comparative group was 54 (*SD* = 27), with a range of 0 – 96. The overall RCSQ score for the postimplementation group was 55 (*SD* = 29), with a range of 0 – 100 (see Table 3).

The RCSQ scores were compared using an independent sample *t* test (see Table 4). This test was used since the data was collected from two sets of patients, one receiving the current practice before implementation and the postimplementation receiving the nonpharmacological sleep bundle. The RCSQ scores for the 61 patients who had received standard care were compared to the RCSQ scores for the 157 postimplementation patients. The pre-implementation scores were standardized to a 100-point scale similar to the 100 mm post-implementation visual analog scale. A significance level of .05 was set for statistical

significance between the scores. The independent sample *t* test showed no statistically significant difference [*t* (*N* = 218) = -.099, *p* = .461] in the RCSQ scores between the comparative (*M* = 54, *SD* = 27) and post-implementation patients (*M* = 55, *SD* = 29). The significance level used for statistical significance was .05, and the *p* level of the *t* test was .461 (see Table 4).

Each RCSQ question from the comparative and postimplementation groups was compared using an independent sample t test. A significance level of .05 was set for statistical significance between the scores. The independent sample t test showed no statistically significant difference in the individual RCSQ question scores between the comparative and postimplementation patients (see Table 5).

Improved sleep quality was demonstrated by the increasing trend of overall RCSQ scores, as demonstrated by the bar graph comparing the comparative and postimplementation patient data (see Figure 2). Figure 2 shows the comparative data in blue and the postimplementation in orange. Increases in sleep quality were measured reliably using the RCSQ although scores were not collected from the same patient before and after implementation of the sleep bundle. Figure 3 also demonstrated an increasing trend in sleep depth, awakenings, sleep efficiency, and sleep quality in the postimplementation group (*n* = 157). However, the comparative group (*n* = 61) had an average response of 48 for sleep latency compared to 47 by the postimplementation group (*n* = 157).

Summary

Descriptive analysis of the study variable revealed that the comparative group's mean age (years) was 66.9 years, and the postimplementation group was 68.3 years. The majority of the patients were male gender, 82% in the comparative group and 98% in the

postimplementation group. The level of care for most of the patients in the QI project data collection was SICU, 84% in the comparative group and 60% in the post-implementation group. The statistical analysis results of this QI project showed no statistically significant difference between the comparative group and the postimplementation group [t (N = 218) = -.099, p = .461]. However, the average total RCSQ score was higher for the postimplementation group (M = 55, SD = 29) when compared to the comparative group.

Chapter 5: Discussion

Review of the Problem

As previously discussed, restorative, protective, and functional reorganization of the neuronal circuits are the fundamental purpose of sleep and are essential for humans (Carrera-Hernández et al., 2018). Sleep disruption can be an acute issue and, when ongoing, can lead to long-term chronic medical conditions. Patients who are hospitalized are at an increased risk of developing acute sleep disturbances as well as exacerbations of chronic sleep disorders. Over 50% of patients who are critically ill or admitted to the ICU have reported disturbed sleep as a result of being hospitalized (Showler et al., 2023). Environmental sleep factors, such as artificial light, noise, and clinical interactions with healthcare teams, have been identified as the most influential factors in disturbed sleep in patients who are critically ill (Morse & Bender, 2019). Circadian rhythm disruption can negatively impact cognitive processing and physiological recovery and has been associated with multiple short and long-term consequences. For these reasons, ICU providers have placed extensive focus on ensuring patients receive adequate sleep while hospitalized to reduce the risk of short-term and long-term aftereffects. Implementing sleep bundles focusing on nonpharmacological interventions has been one way ICU providers have found beneficial in encouraging sleep for critically ill patients.

This QI project sought to determine if implementing a nonpharmacological sleep bundle would positively influence patients' perceptions of sleep quality while admitted to a SICU. The nonpharmacological sleep bundle focused on altering the patient environment and patient care interactions. Dedicated “quiet time” was enforced from 2300-0500. Prior to this block of time, nurses clustered patient care by providing night-time medications, checking blood sugar, and obtaining labs as needed. Clustering routine patient care before “quiet time”

allowed the greatest opportunity for patients to receive uninterrupted sleep. The nursing staff also offered all patients a quiet pack, which included a sleep eye mask and ear plugs. During these hours, staff turned off unnecessary lights by closing blinds and curtains and reduced excessive noises by turning on televisions and closing doors. Visual cues were added to the SICU environment in the form of "Sleep in Progress" signs being posted on the patients' doors as a reminder to staff to keep voices at a minimum. Following the implementation of the nonpharmacological sleep bundle, the NPs in the unit evaluated all eligible patients using the RCSQ. The primary investigator scored each RCSQ, and the score received correlated to the patient's perception of their sleep quality. Scores could range from 0 to 100; a higher score correlated to the patient's better-perceived sleep quality.

The goal for this QI project was a 90% completion rate of the nonpharmacological sleep bundle checklists. Unit census data collected following the implementation of the sleep bundle reported a 76% completion rate of the sleep bundle checklist. The study sample included 218 patients. The intervention group consisted of 157 patients receiving nonpharmacological sleep interventions following implementation. A comparative group of 61 patients completed the adapted RCSQ before the sleep bundle's implementation in the SICU. The second goal for this QI project was a two-point increase in the overall average RCSQ score. An independent sample *t*-test showed no statistically significant difference in the individual RCSQ question scores between the comparative and postimplementation patients (see Table 5). However, improved sleep quality was demonstrated by the increasing trend of RCSQ scores in the post-implementation group by one point.

Limitations of the Project

One limitation of this QI project was the number of incomplete sleep bundle checklists. In retrospect, the wording of the checklist needed to be more apparent to some nursing staff. Listing the exclusion criteria for the RCSQ completion led many staff to believe that if the patient met the exclusion criteria (mechanical ventilation, non-English speaking, being legally blind, or patient declined to participate), they were not eligible for the nonpharmacological sleep interventions. As discussed before, all patients admitted to the SICU were eligible for the sleeping bundle. In the future, disregarding the terms exclusion criteria may be beneficial.

Another limitation was that the comparative data used in the analysis was obtained from an adapted RCSQ that had been used as a standard of care before implementing the nonpharmacological sleep bundle. The adapted RCSQ was a 10-point Likert scale, and the validated RCSQ used following the sleep bundle implementation was a 100-mm visual analog scale. To standardize the scoring process between the two groups, the score from the 10-point Likert scale was converted to a 100-mm scale. It was determined that the correlation of the scores between the two groups would be more valid if the Likert were converted to a 100-mm scale rather than a 10-point scale.

Using a different RCSQ tool during the postimplementation evaluation could be another limitation. Before initiating the sleep bundle, the staff was familiar with the adapted SICU RCSQ. While the originally published RCSQ was a validated tool, the staff being familiar with the adapted version of the tool may have placed some limitations on the comfort level of the tool while being used. Patients in the SICU are familiar with rating

symptoms, such as pain, using a 10-point Likert scale. The ambiguity of placing an “x” on a blank line was challenging for patients at times.

Implications

Nursing Education

Additional efforts will be needed to achieve a sustainable change in practice within the SICU. Ensuring that staff are provided with continued education to reinforce the newly learned knowledge will be imperative to safeguarding this novel practice change. Providing staff with annual competencies focused on monitoring, managing, and preventing sleep disturbances in ICU patients through nonpharmacological sleep-promoting techniques could be one avenue taken to ensure retention of knowledge. In addition, integrating education related to the sleep bundle into new hire orientation may also be beneficial. If promoting patient sleep is incorporated into the unit culture at the beginning, then standardization of sleep promotion in the ICU will be a part of routine patient care.

Nursing Practice

Excessive lighting, noise, and patient care interruptions are most reported by patients as barriers to obtaining adequate quality sleep while admitted to the ICU (Devlin et al., 2018). The PADIS guidelines suggest implementing a sleep bundle as a strategy for patients to obtain uninterrupted sleep. This QI project successfully implemented a nonpharmacological sleep bundle to help improve patients' perceived sleep quality. However, staff involvement in incorporating the sleep bundle into the EHR will be required to sustain this change in practice. In addition, incorporating the RCSQ as part of the routine assessment by nursing staff would significantly impact this practice change. The RASS and CAM-ICU assessments are routinely done by nurses and are integrated into their shift reports and the

data provided during multidisciplinary rounding. Integrating the RCSQ into the EHR as part of the routine assessment will encourage daily habitual discussions surrounding the patient's sleep quality.

Nursing Research

There is a need to perform additional research on promoting sleep specific to hospitalized Veterans. Many Veterans suffer from chronic mental health conditions such as post-traumatic stress disorder, anxiety, and depression. These mental health conditions place this specific patient population at an increased risk of the development of not only acute sleep disruption but also chronic sleep conditions. The use of eye masks and earplugs has been well described in the literature as an effective way to promote sleep for hospitalized patients (Locihová et al., 2018). However, during this QI project, staff recognized that the Veterans admitted to the ICU were not keen on using eye masks and earplugs. During discussions with the Veterans, they shared with the staff that they were trained to use "all of their senses" as soldiers. For this reason, they were not amendable to using the eye masks and earplugs. Further research could focus on another nonpharmacological sleep promotion technique, such as music therapy, which would allow the Veterans to maintain access to all five of their senses.

In addition, research validation of a 10-point Likert scale similar to the adapted SICU RCSQ used before the sleep bundle was implemented could be used to employ the RCSQ in routine practice. Many patients and staff are familiar with using 10-point Likert scales, given their use in discussing pain. Given the familiarity, discussing patients' sleep in a similar fashion could be beneficial.

Conclusion

Critically ill patients admitted to the ICU frequently experience sleep disturbances. Sleep can be promoted in the ICU by adjusting the patient's environment to lessen noise, light, and patient care interruptions. Given the potential impact of sleep disturbances in both the acute and long-term, the promotion of quality sleep should be considered an essential component of providing care to patients admitted to the ICU. Education should be offered routinely to the staff caring for the critically ill and incorporated into the routine care of these patients. Additional research is warranted to evaluate sleep promotion techniques specific to the needs of the Veteran population admitted to the ICU.

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Appendix A

Nonpharmacological Sleep Bundle Checklist

SICU Nonpharmacologic Sleep Bundle Checklist

- *The bedside nurse oversees the sleep bundle and works with other staff to reduce or eliminate patient disturbance levels between 2300-0500, except for emergent situations. The nurse will prevent other room entries that are not urgent.*
- *Collaboration will occur between RN and Respiratory Therapy to cluster care before 2300 or after 0500.*

Date @ start of shift: _____ **Patient:** _____ **Age:** _____ **Gender:** _____

Level of Care: ☐ SICU ☐ ISCU ☐ ward/overflow **RN:** _____

Patient Eligibility for Sleep Survey:

- If any exclusion criteria are checked, the patient is not eligible to complete the RCSQ; however, the patient may still participate in the nonpharmacologic sleep bundle checklist as tolerated. :

Exclusion Criteria for sleep survey:	**Is the patient eligible to complete the RCSQ?**
Non-English speaking ☐ Mechanical Ventilation ☐ CAM-ICU positive ☐ RASS -4/-5 ☐ Legally Blind ☐ Declined to participate ☐	Yes ☐ No ☐

Environmental Actions:

Close Blinds by 2300 ☐	Ensure IV pumps are plugged in ☐
Close curtains by 2300 ☐	Ensure sufficient IV fluids/medications on pump ☐
Dim/Turn off lights in the room by 2300 ☐	Turn the TV off by 2300 ☐ • Lower volume if patient preference ☐
Close door to patient room by2300 ☐	Unit hallway lights dimmed by 2300 ☐
Flip the door sign to "Sleep Zone" by 2300 ☐	

Patient Care Interventions:

Provide comfort items (hygiene, blankets) ☐ Cluster care prior to 2300 ☐ • provide meds, take vitals, send labs and blood sugar checks	Minimize entry into room between 2300-0500 ☐ • *Estimated* room entries between 2300-0500_____
Offer patient eye mask ☐ Not offered ☐ Used ☐ Refused Offer patient earplugs: ☐ Not offered ☐ Used ☐ Refused	

Appendix B

Sleep Bundle Door Sign

SICU Night-Time Sleep Promotion Initiative

Hospitals are, by nature, noisy places and ICU patients often experience disrupted sleep, which can be associated with:

- Delirium/Cognitive impairments
- Decreased pain tolerance
- Depression/PTSD
- Prolonged sleep difficulties (after discharge home)

However, our team is working together to promote high quality sleep and the healing process:

Nursing Specific
• Flip this sign during sleeping hours (11 pm - 5 am) • Minimize noise and remind others to do the same • Turn off/dim room lights, close window blinds, close room door and curtains, dim unit hallway lights • Clustering care before 11 pm: check vital signs, provide medications, draw blood for labs/glucose checks • Offer eye mask and earplugs • Minimize room entries • Promote daytime activities: ambulating or sitting in the chair, lights on, blinds open, limit daytime napping
Visitor Specific
• Place cell phones on silent/vibrate and please have phone conversations outside of the SICU • Limit phone calls to patients during sleeping hours • Encourage patients to move and spend as much time as possible outside of their bed during the day • Communicate any specific bedtime routines the patient practices at home and we will do our bed to accommodate

SLEEP IN PROGRESS

Appendix C

Richard Campbell Sleep Questionnaire

Richards Campbell Sleep Questionnaire

Date Completed: _____	Score completed by Primary Investigator: _____

Each of these questions is answered by placing an "X" on the answer line. Place your "x" ***anywhere*** on the line you feel ***best*** describes your sleep last night.

1. My Sleep Last night was:

Deep Sleep _____ **Light Sleep**

2. Last night, the first time I got to sleep, I:

Fell Asleep _____ **Never Could**
Almost immediately **Fall Asleep**

3. Last night I was:

Awake _____ **Awake All**
Very Little **Night Long**

4. Last night, when I woke up or was awakened, I:

Got Back To _____ **Couldn't Get Back**
Sleep Immediately **To Sleep**

5. I would describe my sleep last night as:

A Good _____ **A Bad Nights**
Night's Sleep **Sleep**

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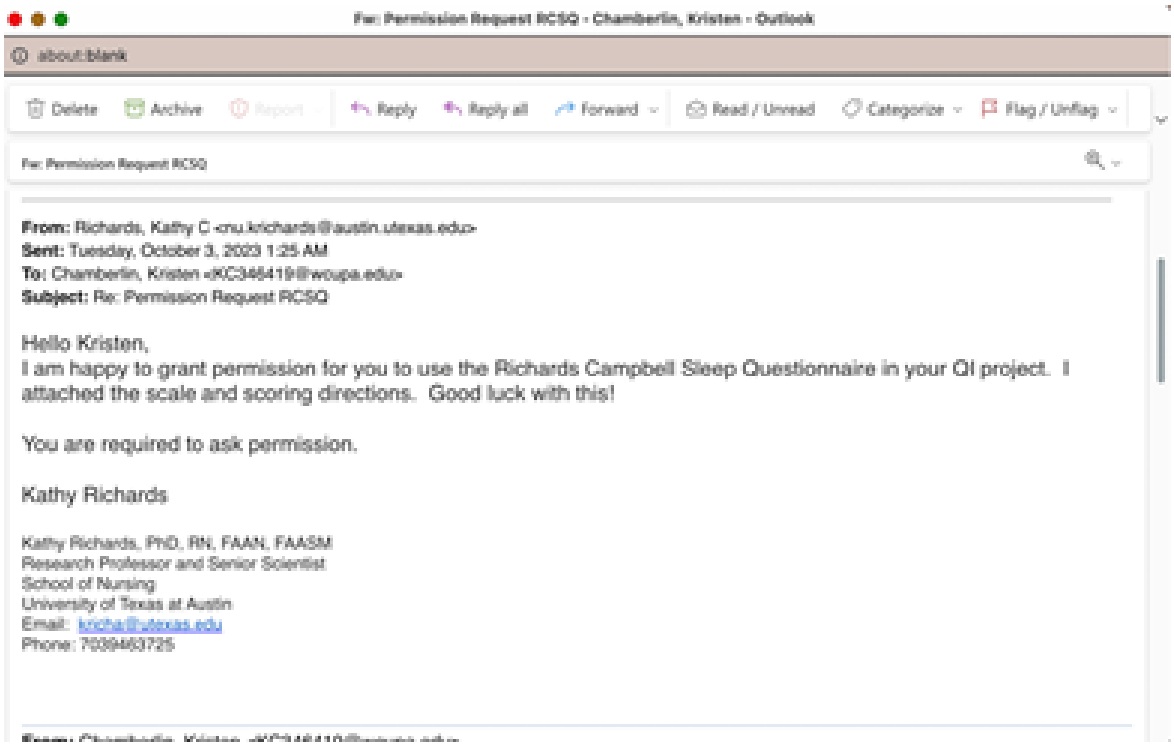
Appendix D

Permission for Use of Tool



Re: Permission Request RCSQ - Chamberlin, Kristen - Outlook

about:blank

Delete | Archive | Report | Reply | Reply all | Forward | Read / Unread | Categorize | Flag / Unflag

Re: Permission Request RCSQ

From: Richards, Kathy C <cnu.krichards@austin.utexas.edu>
Sent: Tuesday, October 3, 2023 1:25 AM
To: Chamberlin, Kristen <KC346419@wcupa.edu>
Subject: Re: Permission Request RCSQ

Hello Kristen,
I am happy to grant permission for you to use the Richards Campbell Sleep Questionnaire in your QI project. I attached the scale and scoring directions. Good luck with this!

You are required to ask permission.

Kathy Richards

Kathy Richards, PhD, RN, FAAN, FAASM
Research Professor and Senior Scientist
School of Nursing
University of Texas at Austin
Email: krichs@utexas.edu
Phone: 7039463725

Appendix E

SICU Adapted Richard Campbell Sleep Questionnaire

SICU Patient Sleep Questionnaire

Date: _____ Patient: _____ Total Score: _____

Patients are excluded from the questionnaire if they meet any of the following criteria:

- (1) Intubated (2) CAM-ICU positive (2) declined to participate (3) non-English speaking (4) Blind

Using an "X", rate the following statements concerning the quality of your sleep last night on the scale below:

1. My sleep last night was:

_____

Light sleep *Deep sleep*

2. Last night, the first time I got to sleep, I:

_____

Was not able to fall asleep *Fell asleep almost immediately*

3. Last night, I was:

_____

Awake all night long *Awake very little*

4. Last night, when I woke up or was awakened, I:

_____

Couldn't get back to sleep Got *back to sleep immediately*

5. I would describe my sleep last night as:

_____

A bad night's sleep *A good night's sleep*

Appendix F

IRB Approval Letter from Facility

DEPARTMENT OF VETERANS AFFAIRS
CMCVAMC IRB
Corporal Michael J. Crescenz VA Medical Center

Date:	**September 29, 2023**
From:	**CMCVAMC IRB/Terri Laufer, MD**
To:	**Kristen Talvacchia, MSN, CRNP**
Protocol Title:	**[1774817-1] Implementation of a Nonpharmacological Sleep Bundle in a Surgical Intensive Care Unit**
Submission Type:	**Research/Human Subjects Research Determination**
Review Type:	**Administrative Review**
Action:	**Determination Decision**

Dear Kristen Talvacchia:

The project listed above was submitted for a determination of the whether the project constituted research, and if it did, whether the research was also considered human subjects research IAW 38 CFR 16. After review of the submitted documents, a determination was made that the project:

DOES NOT CONSTITUTE RESEARCH ACTIVITIES and no further research regulatory review is required. The reviewer commented: This is a straightforward QA/AI project to improve sleep in the ICU and is approved as such.

This letter does not grant permission to start the project. **Please contact the *Quality Management Service at our VA* for further instructions.**

This project may be published, but it must be listed as QI/QA project and NOT research.

Any modifications in submitted documents or the addition of new documents could change this decision. Contact **CMCVAMC IRB** via email at **ellen.fritch@va.gov** for any questions regarding the determination decision.

Sincerely,
Ellen Fritch, MS.Ed.
IRB Coordinator

Documents Reviewed:

- Application Form - CMCVAMC_IRB_form115_Talvacchia.docx (UPLOADED: 09/19/2023)

Appendix G

IRB Approval Letter from West Chester University

Date: 10-31-2023

IRB #: IRB-FY2024-96
Title: Implementation of a Nonpharmacological Sleep Bundle in a Surgical Intensive Care Unit
Creation Date: 10-9-2023
End Date:
Status: Approved
Principal Investigator: Kristen Talvacchia
Review Board: West Chester University Institutional Review Board
Sponsor:

Study History

Submission Type	Review Type	Decision
Initial	Exempt	Exempt

Key Study Contacts

Member Veronica Wilbur	Role Co-Principal Investigator	Contact VWILbUR@WCUPA.EDU
Member Veronica Wilbur	Role Co-Principal Investigator	Contact VWILbUR@WCUPA.EDU
Member Kristen Talvacchia	Role Principal Investigator	Contact kc346419@wcupa.edu
Member Kristen Talvacchia	Role Primary Contact	Contact kc346419@wcupa.edu

Table 1

Frequency Characteristics of Patient Sample

Baseline characteristic	Comparative (n = 61)		Postimplementation (n = 151)	
	N	*%*	*N*	*%*
Gender				
Female	11	18	3	2
Male	50	82	155	98
Level of Care				
SICU	51	84	95	60
ISCU	10	16	41	26
Ward	0	0	22	14

Note. N = 218, SICU (Surgical Intensive Care Unit), ISCU (Intermediate Surgical Care Unit)

Table 2

Demographic Characteristics of Patient Sample

Baseline characteristic	Comparative (*n* = 61)			Postimplementation (*n* = 158)		
	M	*SD*	*Range*	*M*	*SD*	*Range*
Age (years)	66.9	10.9	35 - 87	68.3	8.1	43 – 91

Note. $N = 218$

Table 3

Responses to Richards Campbell Sleep Questionnaire

Baseline characteristic	Comparative (*n* = 61)			Postimplementation (*n* = 158)		
	M	*SD*	*Range*	*M*	*SD*	*Range*
My Sleep Last night was Deep Sleep – Light Sleep	48	28	0 – 100	47	32	0 – 100
Last night, the first time I got to sleep, I Fell Asleep Almost Immediately- Never Could Fall Asleep	56	33	0 – 100	60	32	0 – 100
Last night, I was awake Very Little – Awake All Night Long	54	31	0 – 100	56	32	0 – 100
Last night, when I woke up or was awakened, I Got Back To Sleep Immediately – Couldn't Get Back to Sleep	56	35	0 – 100	53	35	0 – 100
I would describe my sleep last night as A Good Night Sleep – A Bad Night Sleep	54	32	0 – 100	58	33	0 – 100
Total Richard Campbell Sleep Questionnaire Score	54	27	0 - 96	55	29	0 – 100

Note. $N = 218$. Scores were standardized to a 0 – 100 point scale

Table 4

Independent Samples t-Tests Between Comparative and Postimplementation Groups

	Comparative (n = 61)		Postimplementation (n = 157)			
	M	*SD*	*M*	*SD*	*t (217)*	*P*
Richards Campbell Sleep Questionnaire	54	27	55	29	-.099	.461

Note: N = 218, **P* < .05 -statistically significant

Table 5

Independent Samples t-Tests of RCSQ Questions Between Comparative and Postimplementation Groups

	Comparative (n = 61)		Postimplementation (n = 157)			
	M	*SD*	*M*	*SD*	*t (217)*	*P*
Richards Campbell Sleep Questionnaire	54	27	55	29	-.099	.461
Q1 : Sleep Depth	48	28	47	32	.108	.457
Q2 : Sleep Latency	56	33	60	32	-.707	.240
Q3 Awakenings	54	31	56	32	-.471	.319
Q4 Sleep Efficiency	56	35	53	35	-.682	.248
Q5 Sleep Quality	54	32	58	33	-.284	.388

Note: N = 218, **P* < .05 -statistically significant

Figure 1

Use of the Donabedian Model for this Project

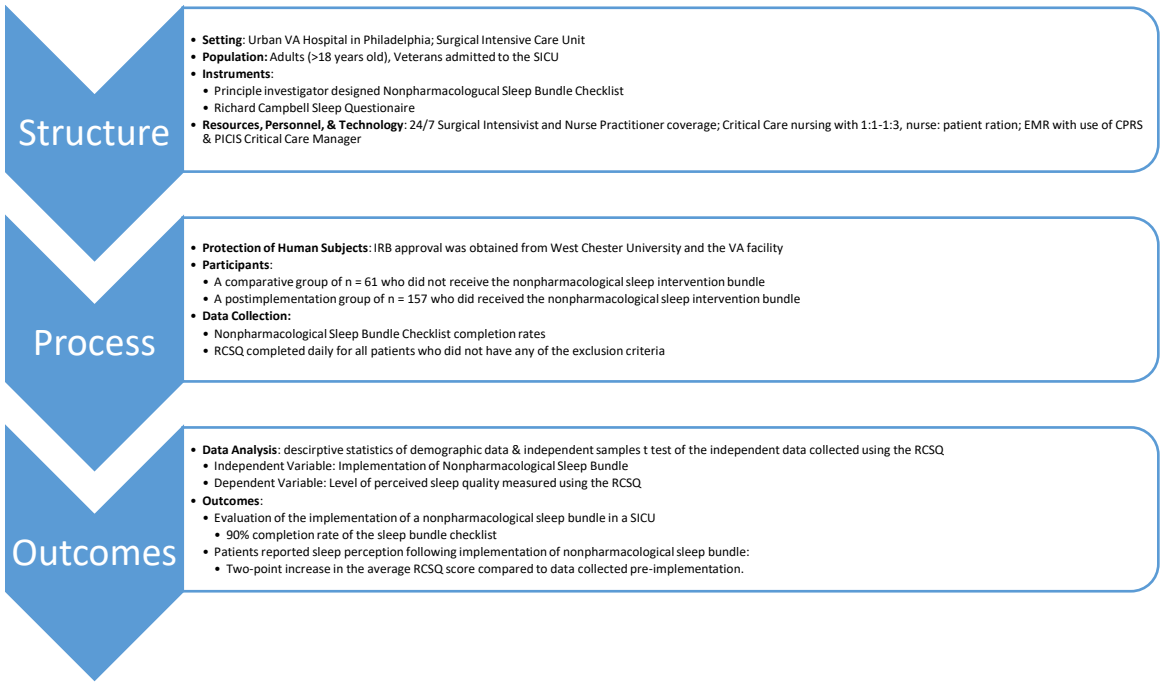


Figure 2

Mean Scores of Richards Campbell Sleep Questionnaire Patient Responses

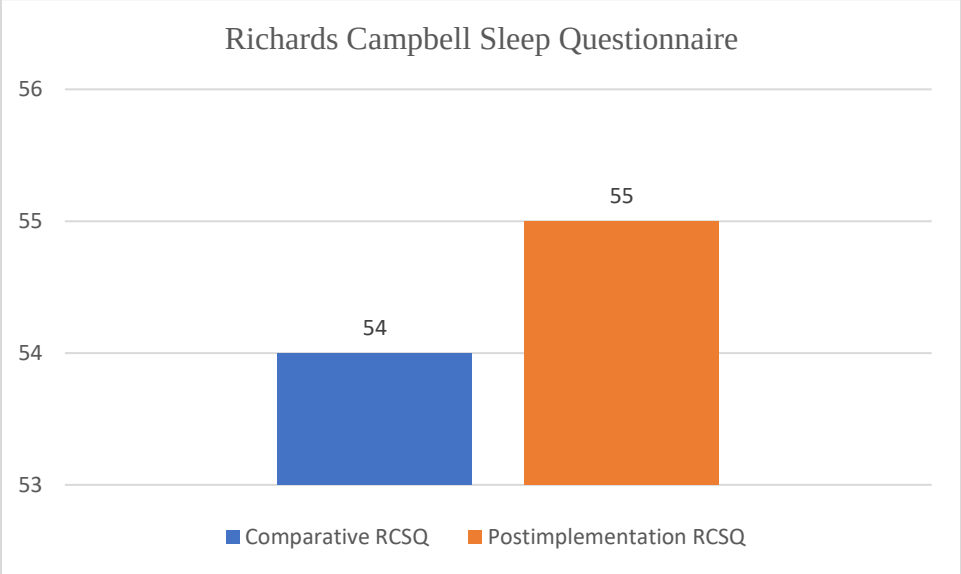
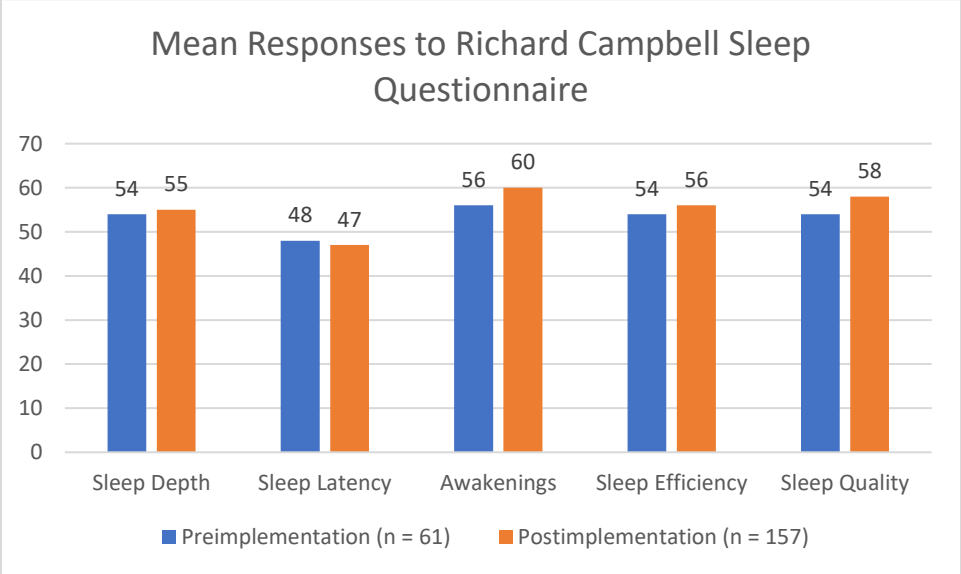


Figure 3

Mean Responses to the Richard Campbell Sleep Questions



Note: RCSQ measured in millimeters.