Enhancing Inpatient Sleep Quality in Patients on an Intermediate Care Unit Through Healthcare Staff Education: A Quality Improvement Project

Avery B. Drouin
University of New Hampshire, Durham, avery.drouin@unh.edu

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Enhancing Inpatient Sleep Quality in Patients on an Intermediate Care Unit Through Healthcare Staff Education: A Quality Improvement Project

Avery B. Drouin

Department of Nursing, University of New Hampshire

NURS 958: Clinical Nurse Leader Capstone

Elizabeth Evans

July 21, 2024
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Abstract

Background
In the Intermediate Care Unit (IMCU), patients often suffer from poor sleep quality due to continuous overnight care and inherent hospital environment noise. Poor sleep can adversely affect recovery, especially for cardiac patients, who constitute a significant portion of the IMCU population. Improving sleep quality in these patients is essential for their recovery and overall well-being.

Local Problem
Despite the importance of adequate sleep, only 47% of patients in the hospital that houses the microsystem reported a quiet environment at night using the Hospital Compare online survey platform. Disruptions from alarms, phones, and care activities significantly impact sleep quality, leading to prolonged hospital stays and adverse health outcomes.

Methods
A quality improvement project was implemented to enhance sleep quality for IMCU patients through healthcare staff education. The project involved a literature review, identification of effective non-pharmacological interventions, and the development of an educational program for healthcare staff. Interventions included the use of earplugs, eye masks, music therapy, and sleep hygiene education for both staff and patients. The project’s effectiveness was measured using healthcare staff surveys on perceived patient sleep quality.

Results
The interventions led to an improvement in healthcare staff perceived sleep quality among IMCU patients to 61% compared to the pre-intervention score of 40.80%. Healthcare staff knowledge surrounding the importance of sleep, and their confidence in sleep promoting skills both revealed improvement. The use of earplugs and eye masks, combined with staff education on sleep hygiene, were particularly effective in enhancing sleep quality.

Conclusions
Implementing non-pharmacological interventions and educating healthcare staff about sleep hygiene can significantly improve sleep quality for patients in the IMCU. Future projects should focus on sustaining these interventions and exploring additional strategies to enhance inpatient sleep quality.

Keywords
Intermediate Care Unit, sleep quality, sleep promotion, healthcare staff education, non-pharmacological interventions
Introduction

Problem Description

In the inpatient setting of the Intermediate Care Unit (IMCU), patients receive around the clock care. The unit is equipped with 25 private rooms, half of which are dedicated to patients who are recovering from cardiac surgery. The average stay is 3-5 days before transfer to a different unit or discharge but can be longer for more critical patients. Patient rooms are surrounded by two central nurses’ stations, both equipped with a telemetry monitor, phones, and multiple computers. Depending on the patient’s stability, they must keep their room door open or closed for the nurses to monitor them. Patients on this unit require assessment of vital signs every four hours, cardiac monitoring, continuous intravenous fluids/tube feeds, central line care, and various medications. These factors on an inpatient setting often lead to disrupted sleep patterns, or a lack of sleep compared to the patients’ normal at-home routine.

Constant noise from call bells, phone calls, alarms from telemetry monitors, infusion pumps, and fall risk devices have been shown to keep patients awake at night while they are attempting to rest in between treatments. According to an online survey of the hospital that houses the microsystem, only 47% of patients reported that their surroundings were quiet throughout the night (Centers for Medicare and Medicaid Services, 2024). Other contributing factors to poor sleep can include the patient’s age, as older patients tend to be aroused more easily by stimuli, increased stress levels, pain, and acute illness (Stewart and Arora, 2019). This environment can prevent patients from achieving a full rapid eye movement (REM) sleep cycle which takes around 90-120 minutes of uninterrupted rest (Morse and Bender, 2019). As cited in the Journal of Clinical Sleep Medicine by Ramar et. al (2021), adequate sleep for an adult is around 7-9 hours uninterrupted and is essential for metabolic processes, cardiovascular health,
cerebrovascular health, mental health, and cognitive function. Without adequate sleep patients can experience negative effects that prolong their hospital stay such as high blood pressure, increased blood glucose, and hospital delirium (Stewart and Arora, 2018). As many patients on the IMCU are recovering from a cardiac condition, it is a main goal of the healthcare team to regulate the patients’ blood pressure with both pharmaceutical and non-pharmaceutical interventions to prevent exacerbations of their illness.

A cycle of deficient sleep that leads to worsened patient conditions, can increase their length of stay and continue to negatively affect their sleep patterns. To increase positive patient outcomes at the IMCU, it is essential that factors causing poor sleep are identified, proper education about the importance of sleep is provided to patients, along with the means to achieve the best quality of sleep possible.

Available Knowledge

Hospitalization can be a difficult time for patients as they are out of their regular routines, their homes, and away from their families. To make things increasingly difficult for these patients, they often do not get enough sleep during the night due to around the clock care and noisy hospital environments. Long periods of sleep deprivation or an altered sleep cycle can lead to negative patient outcomes and often lengthen their hospital stays (Beswick et al., 2023). The research included in this literature review will compile evidence that can be used to educate healthcare staff on ways to improve the sleep of patients on an intermediate care unit to further improve upon patient outcomes. The population, intervention, comparison, outcome, and timeframe (PICOT) question of focus is as follows: in patients on an intermediate care unit, how does increasing education on sleep hygiene for healthcare staff, affect the quantity and quality of the patient’s perceived sleep, over a period of 14 days?
A literature review was conducted to assess the current evidence on inpatient sleep promotion. The databases that were used were Cumulative Index to Nursing and Allied Health Literature (CINAHL) Complete, MEDLINE, and Google Scholar. Key words utilized included inpatient, hospitalized patients, acute care patients, sleep deprivation, sleep disturbance, sleep disruption, sleep quality, reduced sleep, lack of sleep, and sleep interventions. Using these key words, 463 records were identified from a database search as well as through other sources.

To condense the wide variety of available knowledge, limits were used throughout the research process. Limits included articles that were full text, articles that were in English, and have been peer reviewed, written between 2014 and 2024 to ensure current, up-to-date evidence to support the research. This brought the total articles from 463 to 44 articles that fit the limit guidelines as seen in the PRISMA diagram located in the Appendix on Figure A. The remaining 44 articles were further screened by title and abstract for relevance to the PICO question using detailed inclusion and exclusion criteria.

**Inclusion and Exclusion Criteria**

Because the quality improvement project focuses on patients who are on an intermediate care unit, there was other criteria to be considered in the study to mirror the microsystem as closely as possible. Inclusion criteria for the research consisted of ages 45 and older, patients on inpatient care units such as an acute care setting or intermediate care unit, articles on post operative patients, patients with cardiac arrythmias, or other medical patients, to mirror the patient population on the intermediate care unit microsystem. The exclusion criteria removed patients under the age of 44, as most patients on the unit are ages 45 and above. This eliminated any articles surrounding pediatric care that were not relevant to the specific microsystem population. Lastly, articles involving evidence with grades lower than level 4 evidence on the
Joanna Briggs Institute (JBI) Levels of Evidence Model (found under Figure 2 in the appendix) were excluded from the review to ensure reliable levels of evidence (Joanna Briggs Institute, n.d.). Above level 4 evidence includes systematic reviews and meta-analysis, one or more randomized controlled trials (RCTs), controlled trials (no randomization), and case controlled or cohort studies (Joanna Briggs Institute, n.d.).

After carefully analyzing the remaining articles that fit the inclusion/exclusion criteria, 7 articles were incorporated into the literature review to secure high-quality evidence to support the PICO question. The included articles were evaluated for their chosen methods, strengths, weaknesses, and their implications towards evidence-based practices.

**Critical Appraisal of Article 1**

In the article “Sleep disturbance after hospitalization and critical illness: a systematic review” Altman et al. (2017) identified key factors for sleep disturbance following hospitalization for those on a critical care unit. A noted strength of this study is that it is ranked as level 1 evidence on the JBI model as it is a systematic review of literature. The review included 22 studies comprised of subjective questionnaires, polysomnography, and actigraphy all found using PubMed, MEDLINE, and EMBASE. The study found that in-hospital factors that put patients at increased risk for sleep disturbances are the unit environment, the intensity of the patient’s pain, the severity of their illness, their pain medication usage, and their perceived stress levels. Other factors that affected sleep patterns were chronic comorbidities and pre-existing sleep abnormalities such as the need for continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BiPAP) (Altman et al., 2017). Using the results from the polysomnography and actigraphy test, the study also reported that 50-66.7% of patients found they had continued poor sleep regulation for one month following their hospital discharge.
(Altman et al., 2017). Altman et al. (2017) concluded that inpatient risk factors and poor quality of sleep lead to decreased quality of life and was also associated with newly acquired psychological comorbidities in some patients.

Limitations to this systematic review are that there was no consistency in the way each study measured sleep quality or how each study environment was set up. Other limitations include that the patients in this study were only from critical care units and did not include following patients to step down units which limits generalizability. Lastly, the patient sample size of each study ranged from 20 to 911 and could have included studies with larger sample sizes. Strengths for the systematic review included their ability to collect both subjective and objective data regarding sleep quality to ensure copious relevant data, their analysis of sleep disruption risk factors across each study, the high level of evidence and the study outcomes as they relate to the PICO question. Altman et al. (2017), suggest that further research needs to be done on the effects of sleep deprivation on patient quality of life and healthcare outcomes.

**Critical Appraisal of Article 2**

In the article “Effect of Nighttime Earplugs and Eye Masks on Sleep Quality in Intensive Care Unit Patients” authors demonstrate ways healthcare staff can help improve the sleep of hospitalized patients on an intensive care unit (Arttawejkul et al., 2020). This article is a randomized control trial and is ranked as a level 2 evidence piece on the JBI model shown in the appendix. The study included 17 patients in the trial and 8 of these patients were randomly chosen to receive both earplugs and eye masks to use for a length of 5 days. The remaining 9 patients were given no interventions to help improve sleep. Sleep quality was measured using polysomnography to study arousal index, wrist actigraphy to study activity and subjective perceived sleep quality surveys over 5 nights. Patients with the ear plugs and eye mask were not
permitted to remove them at night for longer than 10-minute periods to communicate with hospital staff regarding their treatment. Results of the study demonstrated a lower arousal index in the group that received the interventions (21.15) compared to the control group (42.10) which demonstrated the ability these interventions had on reducing the sensory input for patients during their sleep (Arttawejkul et al., 2020). The study also showed that there was increased activity with the use of ear plugs and eye mask but determined that the actigraphy was an inaccurate way to collect data as it is less reliable for tracking sleep in disturbed sleep settings (Arttawejkul et al., 2020). Arttawejkul et al. (2020), suggests more research be done to find better ways to decrease arousal index in hospitalized patients.

Limitations to this study include the small sample size led to insignificant data points. To make this study more reliable, a larger sample size with a longer period of study is needed. Other limitations include that the wrist actigraphy is not an accurate way to measure sleep quality according to Arttawejkul et al., (2020) and that the patients in the ICU had varying diagnosis and severity of illness. Strengths for the study include that the patients had very similar hospital environments as it was the same unit and they used multiple ways to study sleep quality including subjective questionnaires and polysomnography. With a larger sample size, it could be concluded that the ear plugs, and eye mask did have the ability to significantly reduce arousal index.

**Critical Appraisal of Article 3**

A similar article known as “Effect of Using Eye Mask on Sleep Quality in Cardiac Patients: A Randomized Controlled Trial” was written by Babaii et al. in 2015. This article was also a randomized control trial and is ranked a level 2 on the JBI evidence model. This research was conducted on a cardiac care unit with a sample size of 60 patients who met the study criteria.
of having no prior sleep disorders and an ejection fraction of greater than 40% (Babaii et al., 2015). Of these 60 patients, 30 were randomly selected to receive an eye mask for 3 nights while the other control group did not. This study measured sleep quality using the Pittsburgh Sleep Quality Index (PSQI) which measures habitual sleep efficiency, sleep quality, sleep duration, sleep disturbances, sleep latency, use of sleeping medications, and daytime dysfunction (Babaii et al., 2015). Researchers found that at the end of the study the PSQI were significantly lower in the categories sleep quality, sleep latency, sleep duration, habitual sleep efficiency, and sleep disturbances for those receiving the intervention compared to those of the control group (Babaii et al., 2015). Babaii et al. (2015) concluded that the use of an eye mask during the night significantly improved participants sleep quality in cardiac patients due to the amount of decreased light getting to the patient’s eyes.

Limitations of this study included the small sample size, the consistency of the routine nighttime care each patient received, and they did not assess if the patient had any psychological factors or prior sleep habits that could have affected their sleep quality. Other limitations included that the study only relied on subjective data and did not collect any objective data using a polysomnography like previous articles. Strengths of this article are that they excluded patients that were receiving any type of sedation or sleep aid medication and that they assessed for prior sleep disorders to be included in the trial. These factors strengthen the reliability of their results. Babaii et al. (2015), suggest that further studies should be done to determine ways to reduce other environmental stimulation such as noise during the nighttime stay of hospitalized patients.

**Critical Appraisal of Article 4**

The article “The efficacy of nursing interventions on sleep quality in hospitalized patients: A systematic review of randomized controlled trials” was written by Bellon et al. in
2021. Authors demonstrate different interventions that were analyzed to determine their effectiveness on improving the sleep quality of patients on acute and semi-acute hospital units. A strength of this article is that it is ranked as a level 1 piece of evidence on the JBI evidence model scale as it is a systematic review of randomized control trials. Seventeen studied were included in this review that met the inclusion/exclusion criteria. Of these seventeen articles, four categories were made to divide up non-pharmaceutical interventions implemented with the goal of improving sleep quality. The categories of interventions included those modifying the environment, physical, behavioral, and combined. These studies used both PSQI, polysomnography, and actigraphy to measure patient sleep quality. Interventions included were introduction of an eye mask, acupressure, addition of an essential oil diffuser in the room, ear plugs, providing a mixture of warm milk and honey before bed, a white noise machine, and music therapy. Different studies used different combinations of interventions.

Based on the analysis from both objective and subjective results, five of the studies found that addition of music therapy combined with eye masks or ear plugs significantly increased the patients sleep quality; all with p values of less that 0.05 (Bellon et al., 2021). Patients reported that the use of essential oils or aromatherapy helped improve their sleep in the patient report survey instruments, but it was found that this was not supported by the results on the polysomnography in these trials. Bellon et al. (2021), reported that two of the studies showed a significant improvement in sleep quality from both subjective questionnaire and actigraphy readings following application of acupressure compared to the control groups. Lastly, the study found that when educational programs were provided to patients, there was better adherence to sleep hygiene protocols and improve scores on subjective sleep questionnaires.
Limitations of this systematic review are that many of the studies included had small sample sizes, variability among how they measured quality of sleep and length of each trial. Other limitations were that some studies only collected subjective data regarding sleep quality and did not collect objective data making them less reliable. The use of both acute and semi-acute care settings was a strength of the article to show how different interventions worked amongst different settings to enhance generalizability. Other strengths of this article were that combination of methods was measured to analyze better outcomes to support the PICO question. Bellon et al. (2021), reports that more studies need to be conducted collecting objective data to further assess effectiveness of different interventions to promote sleep quality in hospitalized patients.

Critical Appraisal of Article 5

A similar article “The effectiveness of non-pharmacological sleep interventions for improving inpatient sleep in-hospital: A systematic review and meta-analysis” was written by Beswick et al. in 2023. This piece of literature is ranked as level 1 evidence on JBI evidence scale because it is a systematic review and meta-analysis which is a noted strength of the article. Beswick et al. looked at how different sleep interventions affected the patients sleep quality, length of stay and adverse events (2023). This review included 76 studies involving 5,375 patients with 85 different interventions that focused on improving sleep. These studies included settings such as intensive care units, coronary care units, post anesthesia care units, intermediate care units and palliative wards. Sleep quality was assessed using subjective questionnaires in all studies and 22 studies included length of stay and adverse events measurements. Beswick et al., (2023) found that the meta-analysis reported sleep quality was significantly improved when using physical sleep aids such as eye mask, relaxation techniques, music therapy and manual
therapies or a combination; each with a p value of less than 0.00001. Interventions like psychological counseling, light therapy, and instilling sleep protocols did not have significant improvements on reported patient sleep quality. The meta-analysis also demonstrated that the most effective intervention was the use of both eye mask and ear plugs as diminishing environmental factors had the best effect on sleep (Beswick et al., 2023).

Limitations for this systematic review include that a small portion of studies included data on length of stay or adverse events making it difficult to compare to the other pieces of literature for the interventions. Other limitations include the variability of the care settings, the patient diagnosis, and illness severity. Lastly, the use of very few objective forms of data analysis such as actigraphy could make the data of the studied unreliable. Strengths for the study include the wide variety of interventions that were explored, the large sample size of the study, and the high level of evidence that this review provides for the PICO question. Beswick et al. (2023) suggest that further studies need to research how to address barriers to sleep such as patient preferences with a more controlled patient environment setting.

**Critical Appraisal of Article 6**

Miranda-Ackerman et al. (2020) wrote a cohort study titled “Associations between stressors and difficulty sleeping in critically ill patients admitted to the intensive care unit: a cohort study” that aims to determine the relationship between decreased sleep quality and environmental factors among patients in an intensive care unit or stepdown unit. This study is ranked as level 4 evidence as it is a prospective cohort study on the JBI evidence level scale. This study used the Richard-Campbell Sleep Questionnaire to assess the quality of sleep of 71 patients with a mean length of stay of 8 days. The patients were also asked if their disturbed sleep was due to biological factors or environmental factors. Additionally, at three points during
each day: morning, afternoon and night, noise was assessed on the unit using a microphone with a sensitivity range of 0-100dB. This study found that 96.9% of patients that stayed at least 5 days in the ICU reported disturbed sleep, 32.4% of patients reported sleep disturbance due to noise, 19.70% of patients reported sleep disturbance due to lighting, 28.2% of patients reported disturbance due to anxiety and 22.5% of patients reported disturbance due to pain (Miranda-Ackerman et al., 2020). The noise levels analyzed throughout the day were found to be 62.5 dB in the morning, 62.88 dB during the afternoon and 61.89 during the night shift. For reference, the World Health Organization states that during the daytime in a hospital the noise level should be 35 dB and 30 dB during the night (Berglund et al., 1999).

Miranda-Ackerman et al., (2020) found that noise level was significantly related to sleep disturbance in patients who reported pain as a biological factor at night (p= 0.037). This can be related to the sound levels of the units being relatively similar throughout a 24-hour period and not significantly lessened at night. It was also found that rooms near an entrance or closer to a nursing station had significantly more sound than more isolated rooms (Miranda-Ackerman et al., 2020). This study was included in the literature review because it brings to light that anxiety is also an important factor affecting patients sleep quality as it was the second most common disturbance reported by patients. Other studies look at environmental disturbances and this study includes biological imbalances such as anxiety and pain.

Limitations to this study include a small sample size, subjective analysis of sleep quality and the lower scale level of evidence as it is a prospective cohort study. Other limitations include that noise on the unit was only measured three times a day and not continuous for 24 hours to show more detailed variation. Lastly, the measurement of the patients’ anxiety level was a limitation as they relied on patient report and did not use a specific scale. Strengths for the study
include the quantitative measurement of unit noise, patients with similar severity of illness, and
the information it provides in relation to the PICO question. To improve the study, a larger
sample size could be included, a polysomnography could be utilized to measure sleep quality and
anxiety level could be assessed using a uniform scale. Miranda-Ackerman et al. (2020), concludes
that healthcare workers should aim to decrease environmental noise and focus on anxiety/pain
reduction techniques to improve patient sleep quality.

**Critical Appraisal of Article 7**

The systematic review written by Tamrat et al. in 2014 known as “non-pharmacologic
interventions to improve the sleep of hospitalized patients: a systematic review” aims to find
effective non-pharmacological interventions to improve patient sleep quality and quantity. This
article is ranked as a level 1 piece of evidence on the JBI evidence scale as it is a systematic
review of literature. The review analyzed 13 different studies involving a total of 1,154
participants of medical or surgical ailments. Three groupings of interventions were created:
relaxation techniques (massage, music therapy, aromatherapy, white noise), environmental
interruption reduction, and finally introduction of light therapy during the daytime.

Four of the studies showed that patients receiving relaxation sleep aid interventions had
an overall improvement in sleep quality. In one of the studies, reducing environmental
interruptions and promoting sleep hygiene by eliminating daytime napping improved overall
sleep quantity by 5%. Finally, daytime bright light exposure improved sleep quality in patients
by 7-18% according to data from patient’s wrist actigraphy (Tamrat et al., 2014). Researchers
stated that they expected to see a higher percentage of improve sleep quality following decreased
environmental interruptions and that this could be due to poor adherence to protocol, and
differences in degrees that the interruptions were reduced (Tamrat et al., 2014). This study was
included because it mentioned other interventions such as eliminating daytime napping and daytime light therapy that could be used to improve patient sleep quality and quantity.

Limitations of the study included that sleep quality was measured in a variety of ways for each study and was not consistent throughout and the low levels of evidence included in the study. Another limitation included that not all studies measured sleep quantity as its own category making the intervention success difficult to compare. Strengths of the study include the large sample sizes, and the risk of bias assessments that increase the article’s reliability. Tamrat et al. (2014), suggest that further studies should create a standardized protocol for eliminating sleep interruptions to decrease variability between the studies.

**Evidence Synthesis**

Sleep interruption is a prevalent problem in hospitalized patients and although there is plenty of research available regarding this topic, patients still struggle to get adequate rest due to environmental and biological factors. Altman et al. (2017) states that continually interrupted sleep patterns can lead to adverse outcomes such as seizures, cognitive impairment, depression, cardiovascular disease and even mortality. Because of that, it is important healthcare staff does everything they can to promote inpatient sleep. The evidence from the discussed articles shows that addressing these factors can improve both the patients sleep quality and quantity, but overall, more high-quality research needs to be done in this area of medicine.

As stated by Miranda-Ackerman et al. (2020) the most common factors that cause patients to have poor sleep quality are environmental noise, anxiety, pain, and environmental lighting and often patients experience a combination of these factors. To improve patients’ sleep it is most beneficial to address the factors that are directly influencing them. Different interventions that have found success in promoting sleep quality are providing the patient with
Eye masks and ear plugs to reduce the environmental stimuli during the night (Beswick et al., 2023). Other successful interventions according to patient report for improved sleep quality included music therapy, aromatherapy, or white noise machines to promote relaxation for hospitalized patients (Bellon et al., 2020). Other more uncommon methods that can be used are education about promoting sleep hygiene by eliminating daytime napping, regulating a sleep-wake schedule, and exposing patients to light during the day to regulate their sleep cycle (Tamrat et al., 2014). Educating patients on ways they can improve their own sleep helps them determine why they should adhere to a sleep schedule or use their sleep interventions such as an eye mask.

Sleep quality is difficult to consistently measure. Many articles used subjective patient data through questionnaires which can be unreliable information as the patient may have a skewed perception of their sleep quality. Other researchers used objective data points by measuring noise levels, polysomnography, and wrist actigraphy which can more accurately outline the quality and quantity of sleep the patients receive, but not all institutions have access to this equipment. Due to the wide variability of data collection, research with only subjective data was less reliable than those that include both subjective and objective data to support the authors' thesis. To make the data more reliable, every study could use a polysomnography in addition to patient subjective questionnaires to provide quantifiable statistics. Other ways to improve viability would be to create standardized protocols when implementing interventions to ensure consistency in research. These studies were included because they had strict patient inclusion criteria to ensure less variability in larger participant pools. Although this evidence is sufficient to support the PICO question, as many of the authors have stated, it is important more research is done on this topic as adequate sleep is an important part of the healing journey.
Implications to the Quality Improvement (QI) Project

The research reveals there is a profound lack of knowledge in healthcare staff on the effects of interrupted sleep patterns and interventions that can be applied to help improve patient sleep. Findings from this literature review helped identify factors that negatively affect sleep, which interventions have found the most success, and helped to find ways to effectively apply that evidence-based practice into nursing education. When looking to improve a patient’s sleep quality or quantity it is important to address which factors are affecting them whether it be environmental or biological to determine which interventions will be the most effective. Evidence throughout this review conveys that if the focus is on environmental factors, provision of an eye mask and ear plugs could improve sleep (Babaii et al., 2015). However, if the factors are biological in nature, pain management or relaxation techniques can help improve sleep (Beswick et al., 2023). This evidence-based review helped create an educational program to provide nurses on an intermediate care unit with ways they can think differently to improve patients’ overall sleep and healthcare outcomes as related to the PICO question.

Rationale

This QI project was guided by the quality improvement model known as the Plan-Do-Study-Act (PDSA) cycle that was created by the Institute for Healthcare Improvement (IHI., 2017). The current state of the microsystem was analyzed in the “Plan” phase using the 5P assessment to identify the problem and contributing factors. The “Do” phase was completed using the interventions previously listed to improve sleep hygiene knowledge. The success of the interventions implemented was assessed in the “Study” phase as outlined in the proposed study of the intervention and analysis techniques. In the “Act” phase adjustments were made to better
the project outcomes to ensure continued improvement and results will be disseminated to stakeholders. Using this model helped in keeping the initiative organized and time efficient.

**Global Aim**

The global aim of this quality improvement project was to improve perceived patient sleep in the setting of an intermediate care unit. The process begun with surveying night shift healthcare staff and ended with administration of an education pamphlet on sleep promotion.

**Specific Aim**

The specific aim of this quality improvement project was to increase night shift healthcare staff perceptions of the quality of patient sleep to 80% by July 27, 2024. Survey methods and staff report determined the success of the QI project.

**Methods**

**Context**

The focus of the QI project was an Intermediate Care Unit (IMCU), containing both a step-down unit from the Intensive Care Unit (ICU) and the Cardiac Surgical Stepdown Unit (CSSU). The patients on the unit are those who are in recovery from various types of heart surgery and those who do not require ICU level care but are too high of acuity for regular inpatient care, usually with a cardiac or pulmonary diagnosis. Many different professionals including physicians, registered nurses (RN), licensed nursing assistants (LNA), occupational/physical therapy, laboratory technicians, and more, continuously collaborate on this unit to ensure their patients are receiving well rounded care during their stay. The usual age range for patients on this unit are ages 40 and up and their length of stay is dependent on their diagnosis, but averages from 3-5 days according to a nurse on the unit (S. Litostanksy, personal
correspondence, February 2, 2024). Currently there are 25 beds on this unit with beds 1-14 dedicated to patients with a cardiac diagnosis. There are two main nurses’ stations, with one being in the CSSU portion of the unit. Many rooms on the unit are left empty in case of admissions from the emergency department.

There are many different processes, and environmental factors that occur in this microsystem that affects the quality of sleep the patients receive. Patients on the IMCU require continuous care throughout the night because of their acuity level. This includes vital sign assessments every four hours, nighttime medications/treatments, and morning specimen collections. In the few hours patients have between interruptions for care, they often find themselves still struggling to sleep due to lights, noise, stress, or pain. Studies have shown that lack of quality sleep can lead to adverse outcomes such as increased blood pressure, rising blood glucose and increased chance of experiencing hospital delirium (Stewart and Arora, 2018). Small changes can be made in the course of a patient’s care to support the notion that they can receive a more restful sleep throughout their stay. At night, the staff on the microsystem that usually enter the patient’s room are RNs, LNAs, and laboratory technicians. These staff members are vigilant about the amount of noise and light they use but must ensure safe patient care. The introduction of interventions to promote sleep could help staff members change the course of their patient care.

Cost Benefit Analysis

A cost benefit analysis of the proposed interventions was completed to analyze financial benefits and encourage the microsystem administration to support the initiatives of this quality improvement project. According to Liang et al. (2020), in 2016 the average cost of a hospital stay for a patient in the United States was $11,700 and among the most expensive conditions are
acute myocardial infarction, heart failure, and respiratory failure which are commonly treated in this microsystem. Additional days in the hospital due to hospital delirium or increased blood pressure can cost the patient and the hospital extra money for the continued need for resources spent on the patient. This includes extra medications, food, treatments, care interventions and monitoring services. Hospital delirium caused by lack of sleep or multi-organ failure has shown to increase length of stay from an average of 16.00 days to an average of 22.30 days according to a study done by Dziegielewski et al. (2021). Dziegielewski et al. (2021) found that the mean cost for an ICU admission for a patient with delirium and extended length of stay was $3,921 more compared to a normal patient. It was also found that the cost for the delirium patient was significant at $5,936 compared to patients without a lengthen stay due to altered mental status.

The actual cost of the proposed interventions was $11.79 for one ream of paper to print out informational posters for the microsystem education, and the survey platform used to collect data did not add any additional cost. The hospital organization already has the supplies needed for this intervention available on other units. The opportunity cost of the quality improvement project benefited from improved patient outcomes and decrease their length of stay due to adverse events. The opportunity cost greatly outweighed the actual cost and proved to be financially beneficial for the microsystem.

**Interventions**

The proposed interventions sought to improve the perception of inpatient sleep quality. The goal of the quality improvement project was to increase the education and knowledge nurses have surrounding the promotion of patient sleep and good sleep hygiene. An educational poster created for the healthcare staff was posted at each nurses’ station and in the breakrooms with an announcement at each shift huddle about the introduction of the pamphlets. The poster included
information on how to assess the factors that are interrupting patient sleep, interventions that can help promote sleep such as cluster care or shutting patient doors when available, and different physical materials that can be distributed such as an eye mask, or ear plugs. The nighttime staff was encouraged to review the pamphlets and begin incorporating the strategies into their routine care.

The team members involved in promoting this quality improvement initiative was the project lead, the charge nurses, the unit RNs and LNAs. The project lead was responsible for creating/distributing the surveys, collecting the information, creating the educational pamphlet, and distributing the pamphlet throughout the microsystem. The project lead also oversaw discussing the addition of eye masks and ear plugs to the clean utility closet with the unit coordinator to ensure the supplies are readily available. The charge nurse made the announcement at huddle to remind the staff members to incorporate the new information into their care, and the RN’s and LNA’s were responsible for performing the changes on the unit and noticing any differences. To ensure the implementation of the interventions is successful, participation amongst the healthcare team was essential. Without adequate participation in both the surveys and the introduction of the new knowledge into care, the results could have potentially become unreliable.

**Study of Intervention**

The measures utilized to determine the effectiveness of the intervention was the aggregate quantitative and qualitative data of the post-intervention surveys, compared to the pre-intervention surveys on the Qualtrics™ online platform. In the beginning stages of the project, a survey was distributed to the night shift staff. This survey assessed the current knowledge staff has surrounding sleep promotion, and the current strategies they used to provide care during the
nighttime hours. This survey also assessed the nurse’s perspective of the prevalence of disturbed sleep throughout the unit. This pre-intervention survey was done using an online survey platform, known as Qualtrics™, and was distributed by email and by QR code to the night shift staff. Two weeks after the posters had been distributed, a post-intervention survey was distributed to the night shift staff via email and QR code. This post-intervention survey asked the staff about their adherence to the sleep promotion interventions, if they had noticed a change in their patients sleep quality and asked about the effectiveness of the information available in the educational posters distributed. The pre- and post- intervention survey responses were analyzed for the effectiveness of the interventions. The pre-intervention survey and the post-intervention survey had similar questions to help establish that the outcomes were directly related to the interventions and not an outlier. The survey also had a qualitative portion where the staff members can enter their perceptions on how the interventions either promoted or hindered patient sleep and any suggestions they may have had. Using both the qualitative and quantitative data it was determined that the outcome is related to the educational interventions provided by the team leader.

Measures

The Qualtrics™ survey platform is the instrument that was used to study the effectiveness of the intervention completed on the microsystem. This platform allowed for visual data representation to support the goal of the quality improvement project. The survey method was chosen because it is a less expensive alternative to measuring patient sleep quality by polysomnography in the microsystem. This survey also allowed the staff to elaborate on the introduction of the interventions and how they viewed their effectiveness. The pre-intervention survey allowed for a visualization of the baseline knowledge between the healthcare staff and
helped determine their starting point. Doing a pre- and post-intervention survey allowed for there to be quantifiable results to report rather than doing staff interviews or focus groups which would yield mostly qualitative data. The categories of the survey questions were demographics such as years of nursing experience, position, and title. The next portion included questions on sleep promotion knowledge, and intervention effectiveness. Along with categorical data, a Likert scale was used to further analyze the intervention effectiveness and make the data quantifiable.

The operational definition of perceived sleep promotion was defined as how the healthcare staff views their patient’s sleep. Healthcare staff enters the patient rooms multiple times a night and can determine if the patient is sleeping soundly or is restless and awake for long periods of time. The post-survey data in comparison with the pre-survey determined how the staff viewed the effectiveness of the interventions on a scale of 0-10 (10 being the most effective) in helping promote sleep among their patients. The data also measured the change in knowledge the staff had surrounding sleep compared to before the educational poster was introduced onto the unit. This category was assessed using a Likert scale to range if the staff obtained new knowledge from the posters. Terminology among the survey and poster remained the same throughout the duration of the project to eliminate confusion on the operational definitions to the staff. Using these survey measures of comparison of pre- and post-intervention knowledge and staff perception of intervention effectiveness it was determined if the quality improvement project was successful. Although subjective survey questions can be an unreliable form of collecting data, this method was used in place of measuring sleep quality with a polysomnography or actigraphy due to financial feasibility and time restrictions.

Staff participation in both the survey and intervention implementation contributed to the efficiency of this intervention. With adequate staff buy-in into the importance of sleep while in
recovery, the interventions may prove to be continually beneficial and adopted into routine care following the end of the quality improvement project. Promotion of awareness of the project from the unit management also encouraged the staff to complete their surveys to ensure pre- and post- survey numbers were similar to allow for an effective comparison. If there was a significant number of post- surveys that remain uncompleted, it must be determined why staff did not take the post-intervention survey or if there were large portions of the surveys left without answers. Staff had one week to complete their post surveys following the two weeks of education implementation. During that remaining week, the team leader and charge nurse emailed out reminders to complete the post survey to keep numbers constant throughout.

Analysis

The mixed methods approach of both qualitative and quantitative data collected from the pre- and post-intervention surveys was broken down into categorical data where a frequency and percentage were utilized to determine the results of each section. A range of each Likert scale data question was collected and shown in the results to help simplify the data points and represent project validity. The survey questions were reviewed by a nurse on the unit to assess for content validity as the nurse with experience is caring for patients with sleep disturbances. The qualitative data of the survey was included to analyze themes and patterns among the project to help support the interventions’ goal. The staff was encouraged to leave comments for further improvements of the project and additional interventions that were used to promote patient sleep that are not listed in the educational pamphlet.

Ethical Considerations

Ethical considerations allow the project implementers to establish if there was any potential harm that could come to the patients relative to the value of the outcomes. Patients had
the right to decline the offer if they did not want any type of sleep aid like an eye mask or earplugs and were not coerced into participating in the project. The value that this quality improvement project provided this microsystem far outweighs the possible harm that could have come of the staff education of sleep promotion. The staff participation was voluntary and their privacy remained intact throughout the initiative. The surveys and data representations were anonymous to ensure that the staff was protected. The staff was educated on the goals of this initiative, so they were aware of the objective the project is aiming towards.

Other sources of bias had the potential to alter the validity of the results. One source of potential response bias is that the team leader implementing this quality improvement project had recently accepted a job offer on this unit. This could have affected how their peers viewed the project and answered the survey questions as they could show courtesy towards the project. To determine if this quality improvement project meets the criteria to be exempt from full review by the Institutional Review Board (IRB), the UNH Department of Nursing Quality Review Committee thoroughly examined this proposal to ensure that it exceeds all ethical and institutional considerations needed to begin this initiative. Only after approval of the proposal is receive were the interventions be introduced into the microsystem.

Results

Initial Steps

The initial steps and the timeline of the proposed intervention were as follows. Throughout the steps of the process, announcements were made at shift change huddle to help gain adequate staff participation in the quality improvement project. Results showed that 10 staff
members participated in the pre-intervention survey and 9 staff members participated in the post-intervention staff survey.

*Figure 1: Evolution of the Intervention*

Modifications were not made to the timeline. Smaller modifications were made to the informational poster to ensure accuracy and adherence to the hospital protocol for approval to distribute, but these modifications did not affect the timeline. Surveys were distributed by QR code to bring the participants to an online survey that they could access from their smart phones.

**Process Measures and Outcomes**

Process measures were collected using Qualtrics survey suite to identify the effectiveness of the intervention. Both the pre- and post-intervention survey contained a disclaimer to protect the participants’ rights. Three different questions were asked to assess the staff members’ demographic information. These questions included how many years they have been employed
on the unit, what was their licensure was, and their employment status. These sections were then followed by questions surrounding sleep promotion and inpatient sleep perception.

The informational poster was distributed throughout the unit (Appendix A). These posters demonstrated how to assess what factors are causing poor sleep in the individual and gave evidence-based interventions to apply based on the individual assessments. To gain staff awareness, a picture of the poster was posted in the microsystem group email message and staff members were encouraged at shift change huddle to look at the poster by the project leader. The staff had one week to review the informational poster and then were encouraged to implement the knowledge into their practice. Finally, a post-intervention survey was distributed.

**Contextual Elements**

Contextual elements of the project included staff participation in the pre- and post-intervention survey. To determine the success of the project, it was vital that many staff members complete the surveys to collect a wide range of data. The distribution of survey QR codes and networking the project allowed for awareness to be created for the initiative. Elements that affected staff participation included the length of the survey, if their current workload permitted time for participation, and the rotating schedule of staff. The survey time was made to be completed in less than 5 minutes. To overcome the rotating schedule and reach as many members of the microsystem as possible; announcements were made at multiple shift-change huddles. It was noted in the disclaimer that staff would not be compensated for participation in the quality improvement project. Another contextual element included obtaining the approval of the microsystem nurse manager to distribute the informational posters. Obtaining this approval involved meeting with the nurse manager and reviewing the informational poster to ensure that
the knowledge being discussed was aligned with the goals of the microsystem. This approval was obtained.

**Observed Associations**

The results of the pre-intervention survey showed that of the 10 participants, 8 were RN’s on the unit and 2 were LNA’s. Of those participants 80% were full-time staff members and 60% of them had worked in the microsystem for at least one year. Half of the participants in the pre-intervention survey reported that their patients slept for 3-4 hours a night, and the remaining half reported their patients slept 5-6 hours per night. It was reported that 0% of patients received more than 6 hours of sleep per night. When assessing knowledge surrounding sleep promotion (Figure 2), 10% reported that they were not confident in their current knowledge, 70% reported that they felt neutral about their sleep promotion knowledge and 20% reported that they were confident in their sleep promotion knowledge. Whereas 50% of healthcare staff reported their understanding of the risk associated with poor sleep promotion was “good” (Figure 3).

*Figure 2: Healthcare Staff Perception of Knowledge Surrounding Sleep Promotion*
Result indicated that 40% of the participants felt that noise was the factor that most impacted sleep quality, 10% felt that the leading factor was pain and 50% found that the factor most affecting sleep quality was “other”. This was verbally reported to be the vital sign checks and nighttime medication passes/nursing interventions by staff on the unit. It was reported that the average percentage of patients who receive quality sleep during the night was 40.80% (Figure 4).

**Figure 3: Healthcare Staff Understanding of Risk Associated with Poor Sleep Quality**

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
</tr>
<tr>
<td>20%</td>
</tr>
<tr>
<td>Good</td>
</tr>
<tr>
<td>50%</td>
</tr>
<tr>
<td>Average</td>
</tr>
<tr>
<td>30%</td>
</tr>
<tr>
<td>Poor</td>
</tr>
<tr>
<td>0%</td>
</tr>
<tr>
<td>Terrible</td>
</tr>
<tr>
<td>0%</td>
</tr>
</tbody>
</table>

**Figure 4: Percentage of Patients Who Receive Quality Sleep Pre-Intervention**

<table>
<thead>
<tr>
<th>% of patient who receive quality sleep</th>
<th>Average</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>40.80</td>
<td>16.00</td>
<td>70.00</td>
<td></td>
</tr>
</tbody>
</table>
Participants of the post survey included 7 RN’s and 2 LNA’s with 77.7% being full-time staff members and 55.5% having worked there for at least one year. Following the intervention, results show that 66.67% of staff felt their patients had slept 5-6 hours per night compared to the pre-intervention survey where 50% of staff felt their patients only slept 3-4 hours per night. Still, 0% of the participants reported that their patients slept more than 6 hours a night. Results indicated 56% of healthcare staff reported that they felt strongly confident in their knowledge surrounding sleep promotion following the implementation of the informational poster (Figure 5) and 67% of participants reported they had excellent understanding of the risk associated with poor sleep quality (Figure 6).

Figure 5: Healthcare Staff Perception of Knowledge Surrounding Sleep Promotion Post-Intervention

<table>
<thead>
<tr>
<th>Q5 - How confident do you feel in your knowledge surrounding inpatient sleep promotion following the review of the sleep promotion pamphlet?</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Not Confident</td>
<td>0%</td>
</tr>
<tr>
<td>Not Confident</td>
<td>0%</td>
</tr>
<tr>
<td>Neutral</td>
<td>11%</td>
</tr>
<tr>
<td>Confident</td>
<td>33%</td>
</tr>
<tr>
<td>Strongly Confident</td>
<td>56%</td>
</tr>
</tbody>
</table>

Figure 6: Healthcare Staff Understanding of Risk Associated with Poor Sleep Quality Post-Intervention.
Survey results following the intervention showed that the leading factor in sleep disturbance was now “other” at 66.67%, followed by noise at 33.33%. The “other” was verbally reported to continue to be the mandatory vital sign checks, medication passes and nursing interventions. Healthcare staff reported an average of 61% of patients received quality sleep throughout the night following the addition of the informational poster to the unit (Figure 7). Finally, on a scale of 1-10 (10 being the most effective) the average of 44% (4/9) of healthcare staff reported that the proposed interventions on the informational poster were rated as a 7/10 in helping them promote quality sleep patterns in their patients.

*Figure 7: Percentage of Patients Who Receive Quality Sleep Post-Intervention*

*Figure 8: Effectiveness of Proposed Interventions on a Scale of 1-10*
Unintended Consequences

Unintended consequences associated with the quality improvement project included the unexpected cost of the intervention. This included printing cost for the informational posters as they had to be printed on a larger paper. Other costs included the printing fees for the QR codes associated with the pre-intervention and post-intervention surveys. A positive unintended consequence included the benefit of the permanent addition of the eye mask and ear plugs to the clean utilities closet for patient use. Previously, these items were not readily available on the unit and had to be searched for throughout the hospital. There were no unintended failures associated with the quality improvement project.

Missing Data

The variability in participation between the pre-intervention survey and the post-intervention survey led to a portion of missing data to test the effectiveness of the interventions. It was shown that 9/10 participants completed the post-intervention survey compared to the original 10 participants who took the pre-intervention survey. Other missing data included an option to describe what “other” factors were causing poor patient sleep quality in the survey. This was reported verbally by the healthcare staff on the unit.
Discussion

Summary

Key Findings

After carefully analyzing the results of the pre-intervention and post-intervention survey, several key findings can be determined. The first key finding being the growth in healthcare staff confidence surrounding their skills in sleep promotion. Following the addition of the informational poster, 56% of healthcare staff reported that they felt strongly confident in their sleep promotion knowledge compared to 10% of staff pre-intervention. An unexpected outcome was shown to be that 10% of healthcare staff continued to feel “neutral” about their sleep promotion skills following the intervention. This could be improved by additional informational sessions about sleep promotion and evidence-based interventions to implement. Overall, there was an increase in healthcare staff knowledge which could be beneficial to the patients of the microsystem.

Another important key finding was the improvement in healthcare staff knowledge surrounding the risk associated with poor sleep quality. As noted in the results, following the implementation of the informational poster in the “Do” phase of the PDSA, 67% of healthcare staff participants reported that their knowledge about risk associated with poor sleep was excellent. This was an increase from the pre-intervention where 20% of staff reported that their knowledge was “excellent”. With more knowledge about the harmful effects of poor sleep quality, healthcare staff can ensure that sleep promotion is a priority in their care plan to help promote positive outcomes. Post-Intervention results show that 10% of participants continued to have “Average” knowledge about poor sleep risk following the review of the informational poster.
The addition of the informational poster to microsystem led to an increase in perceived patient sleep quality compared to the pre-intervention survey results. Pre-Intervention healthcare staff reported that an average of 40.80% received quality sleep during the night throughout their stay on the microsystem. Following the intervention, healthcare staff reported that an average of 61% of patients under their care received quality sleep throughout their stay in the microsystem. The actual increase can be calculated as a 49.51% increase in patients receiving quality sleep following the addition of the informational poster to the microsystem. This can be correlated with the 44% of the healthcare staff rating that the proposed interventions were a 7/10 in effectiveness to promote sleep as noted in the results section. Through an informal healthcare staff interview, it was noted that although the interventions may have been effective, the mandatory treatments and vitals throughout the night continued to cause lack of sleep.

*Relevance to the Rationale*

The quality improvement model used the Plan-Do-Study-Act (PDSA) Model. Only one PDSA cycle was performed during the project. The results revealed there was in an increase in healthcare staff confidence in their abilities to implement interventions to provide their patients with quality sleep. There was also an increase healthcare staff knowledge surrounding the risk associated with poor sleep quality following the addition of the informational poster in the “Do” phase. Lastly, there was an increase in patients who received quality sleep as perceived by the healthcare staff. The “Study” phase shows that the informational poster was effective in promoting inpatient sleep but did not reach the specific aim of the quality improvement project. In the “Act” phase, adjustments can be made to the promotion of the quality improvement project to gain more participants to collect a wider range of data.
Relevance to Specific Aim

Although there was an increase in perceived patient sleep quality as noted in (Figure 4), from the pre-intervention survey to the post-intervention survey, it did not meet the specific aim. The specific aim of the quality improvement project was to have healthcare staff report that they perceived 80% of patients received quality sleep during their stay in the microsystem. Many factors could have affected the effectiveness of the intervention including the mandatory overnight vital sign checks that disrupt continuous patient sleep. Other factors could have included the correct implementation of the proposed interventions, patient conditions/acuity, and hospital environment.

Strengths of the Project

One strength was that the project was practical and easy to follow, this allowed the project timeline to maintain intact throughout the initiative. Another strength of the project was the accessibility and length of the surveys to promote healthcare staff participation. A shorter survey allowed for busy healthcare staff to find time to complete the survey and participate in the project. The QR code allowed for quick access to the survey with a smart device. Other strengths of the project include in the diligent, detailed planning that went into the “Plan” phase of the PDSA cycle. This detailed planning ensured that the project was fully prepared to be introduced onto the unit. The last strength of the project was the buy-in from the management of the microsystem. The management is constantly looking for ways to improve patient sleep and patient outcomes. Their input and assistance in the quality improvement project was a noted strength.

Interpretation

Associations Between the Interventions and the Outcomes
Perceived patient sleep quality increased from the pre-intervention survey to the post-intervention survey but did not meet the goal of the specific aim of 80% of patients receiving quality sleep. This increase in patients who received perceived quality sleep can be possibly correlated with the increase in healthcare staff’s knowledge about the risks associated with poor sleep quality, and the increase in healthcare staff’s confidence in sleep promotion interventions. The addition of the informational poster to the nursing stations on the unit proved to be an effective way to improve patient sleep in patients of the healthcare staff participants in the QI project. The information was communicated clearly and was shown to effectively increase knowledge surround sleep promotion on the unit. More work can be done to further benefit patient sleep and improve the perceived patient sleep percentage to meet the specific aim.

**Comparison of the Results**

When comparing the results to available knowledge, there was no literature that mirrored this quality improvement project’s timeline and intervention. However, similar interventions such as an addition of an eye mask, ear plug, music therapy, and sleep regulation introduced on the informational poster, proved to be advantageous when promoting patient sleep. These results correspond with the information collected from the literature review. For example, Babaii et al. (2015) concluded that the use of an eye mask during the night significantly improved participants sleep because of the decreased light getting to the patient throughout the night. With the addition of the eye mask and ear plugs on the unit, these interventions became readily available to patients to be used during the night and was reported to be effective by healthcare staff. Similarly, Bellon et al. (2021), reported that addition of music therapy combined with eye masks or ear plugs significantly increased the patients sleep quality. Music therapy was a suggested intervention promoted on the informational poster to improve patient sleep quality. The
combination of the interventions was also suggested to healthcare staff to find what works for their patient individually. This allowed their approaches to the tailored to each patient. Miranda-Ackerman et al., (2020) found that noise level was significantly related to sleep disturbance in patients and that rooms near an entrance or closer to a nursing station had significantly more sound than more isolated rooms. Unlike this research noise decibels were not able to be measured on the unit. However, in the pre-intervention survey 40% of healthcare staff reported that noise was a leading factor affecting their patients sleep. These results confirm Miranda-Ackermann et al. (2020) proposal of how sleep is significantly affected by a noisy healthcare environment. Results were difficult to compare to the literature that used polysomnography and actigraphy to measure sleep as those methods are more direct and reliable than healthcare staff surveys.

Impact of the Project on People and Systems

There were many areas of impact from the implementation of the quality improvement project. The first area of impact being the permeant addition of the eye mask and ear plugs to the clean supply room. Previously, these items were not available on the microsystem, but were available in other units of the hospital such as the Emergency Department, the Labor and Delivery Unit, and the Progressive Care Neuro Trauma Unit. With these items readily available to the healthcare staff, they are more apt to offer them to their patients to promote quality sleep. Other impacts of the project include the increase in perceived quality patient sleep. Lack of sleep has been shown to lead to adverse patient outcome as increased blood glucose, blood pressure and hospital delirium, (Stewart and Arora, 2018) ultimately leading to increased length of stay. Results indicated more patients were perceived to be receiving quality sleep by the healthcare staff which could decrease their chances of adverse outcomes related to lack of sleep. The final
impact of the quality improvement project was on the healthcare staff of the microsystem. The addition of the informational poster provides easily accessible current knowledge for sleep promotion staff can refer to when struggling with promoting quality sleep or needed a knowledge refresher.

**Reasons for Differences Between Observed and Anticipated Outcomes**

There were many differences in what was anticipated and what was observed in the data collected from the surveys. The main difference was the anticipated specific aim of 80% of patients perceived to be getting quality sleep following the addition of the intervention. The actual observed outcome of 61% was an increase from the pre-intervention survey but did not meet the aim. Reasons for this discrepancy could be that the proposed interventions did not impact the mandatory nighttime vital sign checks and treatments. These interventions prove to wake patients up at night even if the patient has an eye mask or ear plugs, because of the need to consent to the treatments. These interventions are mandatory to monitor the status of the patient and treat their conditions appropriately.

Other differences included the anticipated participation of the quality improvement project compared to the actual participation. With 10 healthcare staff completing the pre-intervention survey and 9 completing the post-survey, this led to a small data pool to draw conclusions from. More participation from staff could have led to more data to draw reliable results from. Another difference included the 11% of staff reporting they continued to feel “neutral” about their confidence in their skills surrounding inpatient sleep promotion. The intervention was anticipated to show results reporting only “confident” and “strongly confident”. This could have been from the different learning styles of each participant. The informational poster only tailored to one learning style, visual learners and did not cater to other types of styles.
Cost and Strategic Trade Offs

Because the intervention of the quality improvement project was focused on education through the informational poster, cost associated were relatively low. These costs included printing materials for the informational poster and the QR codes for each survey. Cost for the microsystem remained minimal as the completion of both surveys took 10 minutes of the healthcare staff’s time and did not require them to dedicate work hours towards participation in the project. Following the intervention, the microsystem could potentially see opportunistic costs from the increase in patient sleep quality from decreased adverse patient outcome and length of stays. After analysis of the quality improvement project timeline and implementation, there were no strategic tradeoffs associated with the initiative.

Limitations

Limits to the Generalizability

The quality improvement project encountered many limitations. This included the generalizability of the work. This specific microsystem differs from others in that the microsystem has patients that are higher acuity and require continuous care/monitoring throughout the night. Other healthcare units could find the intervention to be effective depending on their specific environments. This intervention was not generalized to other microsystems and their healthcare staff. This intervention is also limited to microsystems that care for patients overnight due to a medical diagnosis for extended periods of time. This eliminates any outpatient surgery centers, and acute psychiatric facilities because of their differing courses of treatments.

Factors Limiting Internal Validity

Other factors that limited internal validity included survey validity, healthcare staff participation in the quality improvement project, and perception of the patient’s sleep by the
healthcare staff. The surveys that were distributed did not undergo validity testing and did not use a previously established sleep index survey. The project also did not include any scientific monitoring such as polysomnography or actigraphy to validate the results of the surveys. With only 9 participants, this led to a small data pool and decreases the validity of the results. This could be due to the rotating schedule of healthcare staff, as some may not have known about the project, or due to the workload of the healthcare staff not having enough time to participate in the project.

Another limitation is the difficulty to accurately measure sleep quality. This project relied on the perception of sleep quality from healthcare staff, these results could have been skewed by how the staff member views quality sleep, how often they were monitoring the patient in the room, and if the patient verbalizes their difficulties sleeping. The timeline of the quality improvement could have also been a limiting factor. The staff members were only given one week to implement the interventions before taking the post survey. This limited the number of patients they could have practiced the proposed sleep promotion techniques on and skewed the results further. Personal bias could have been a limiting factor that affected the results as the project lead had recently accepted a job offer on the unit.

**Efforts Made to Minimize and Adjust for Limitations**

Efforts were made to minimize the impact of the limitations on the overall success of the quality improvement project. To increase the surveys validity, the surveys were reviewed by a staff member on the unit and a nursing instruct to ensure the questions catered to the microsystem and made sense to the reader. These did not eliminate the invalidity of the survey questions but did lessen the impact. Other efforts made included adding the informational poster to the microsystem group email to reach as many participants as possible. This was done so that
staff members who were absent on the days of the announcements still had the opportunity to be notified of the quality improvement project and its goals. To eliminate personal bias, the QR code was passed out throughout the unit so participants could complete the surveys on their own time with their identity protected. This helped decrease the impact of the personal bias associated with the implementation of the project. Although there were many unexpected limitations, this did not have a profound effect on the results of the project.

Conclusion

*Usefulness of the Work*

In inpatient units, sleep is an important aspect of recovery, and it is the healthcare staffs’ duty to ensure patients have environments that promote sleep. This implementation of this project was useful for the microsystem because it helped staff identify key factors that affect patient sleep and practice evidence-based interventions to promote sleep. This project also helped grow staff knowledge about the importance of sleep and consequences that can arise from lack of it. Results of the project convey an increase in staff confidence in their ability to promote quality inpatient sleep. An important outcome of the project was the permeant addition of the eye mask and ear plugs to the unit to allow staff easy access to these items for patients who are struggling with sleep. Lastly, this project highlighted a main cause for lack of sleep being the mandatory nighttime treatment interventions. This information can be helpful in the next steps of a sleep promotion project in the microsystem to target ways to decrease the incidence of sleep interruption.

*Sustainability*

To ensure the sustainability of the goals of the quality improvement project, it is important that staff members stay current on the most up-to-date evidence-based interventions to
promote inpatient sleep. As more information comes in about the importance of sleep-in patient outcomes, healthcare members can use the new practices they learn to continue to work towards the aim of the initiative. Other ways to sustain the growth of the project include management buy-in to encourage staff to be consistently assessing the quality of their patients sleep and ways to improve it. Continued re-stock of the ear plugs and eye mask in the utility closet is crucial to the continued sustainability of the project as those interventions were reported in most literature to be the most effective sleep promotion intervention. With the continuation of these factors, then the change brought on by the quality improvement project can become sustainable.

**Potential for Spread to Other Contexts**

Information gained by the quality improvement project could prove to be useful in other inpatient units across the hospital. As sleep conditions may differ in each unit because of condition severity, these principals of reduced environmental stimulation, pain and stress can be achievable in many different areas of medicine. Overall, these proposed interventions could benefit the macrosystem by reducing cost associated with increased length of stay due to lack of sleep related outcomes such as hospital delirium or increased blood pressure.

**Implications for Practice and For Further Study in the Field**

Implications of the quality improvement project include the benefits of increased healthcare staff knowledge for the promotion of inpatient sleep. This knowledge can be used in other microsystems to guide their attempts to improve patient sleep quality and implement the interventions found in the informational poster into their practice. To ensure positive patient outcomes, healthcare staff must continuously assess sleep quality and search for ways to comfort their patients. Other implications include the individual centered care seen throughout the quality
improvement project. Each patient has a different hospital experience and sleep obstacles, the importance lies in assessing the individual to find what will work best for them.

As stated in many of the available literature, more research needs to be done in the field of sleep promotion and the effects poor sleep can have on the body. With more knowledge, healthcare can find non-pharmaceutical interventions to provide their patients with the quiet, undisturbed environment they need for rest. Other ways the field of sleep promotion can be improved is a better way to more accurately measure sleep using cost effective monitoring systems, for both the microsystem noise level and the patient sleep quality, to have more reliable results in other sleep studies.

**Suggested Next Steps**

Results of the quality improvement project indicate that although the addition of the informational sleep promotion poster on the microsystem was helpful, sleep quality continues to be affected by mandatory nighttime treatments. Next steps of the project could be creating an outline that determines which patients are eligible for less frequent vital sign monitoring if their condition continues to improve. This would decrease the amount of sleep interruption patients experience throughout the night to provide them with more sleep, which could in turn speed up their recovery. To do this, interprofessional collaboration would need to take place to determine what signifies a patient to be eligible for telemetry monitoring throughout the night only.
References


Appendix

Figure 1. PRISMA Diagram

PRISMA 2009 Flow Diagram

Records identified through database searching (n = 460)

Additional records identified through other sources. (n = 3)

Records after duplicates removed (n = 463)

Records screened (n = 463)

Records excluded (n = 36)

Full-text articles assessed for eligibility (n = 427)

Full-text articles excluded, with reasons (n = 235 for publish prior to 2014) (n = 150 for not full text availability)

Studies further screened (n = 42)

Studies further excluded (n = 35 for ages younger than 44, psychiatric inpatient settings, and below level 4 evidence)

Studies included (n = 7)


For more information, visit www.prisma-statement.org.
Figure 2. Joanna Briggs Institute (JBI) Levels of Evidence Model

| Level 1: Systematic Reviews & Meta-analysis of RCTs; Evidence-based Clinical Practice Guidelines |
| Level 2: One or more RCTs |
| Level 3: Controlled Trials (no randomization) |
| Level 4: Case-control or Cohort study |
| Level 5: Systematic Review of Descriptive and Qualitative studies |
| Level 6: Single Descriptive or Qualitative Study |
| Level 7: Expert Opinion |
Figure 3. Inpatient Sleep Promotion Informational Poster

INPATIENT SLEEP PROMOTION

1. DETERMINE THE FACTORS THAT ARE AFFECTING YOUR PATIENT’S SLEEP...
   Biological/Factors: Pain or Stress?
   Environmental Factors: Noise or Lights?
   Do they have any preexisting sleep conditions?
   “Tell me more about what’s causing your lack of sleep?”

2. INTERVENTIONS TO REDUCE PAIN
   Non-pharmacological:
   • Deep breathing
   • Position changes
   • Heat/cold therapy
   • Massage therapy (per hospital protocol)

3. INTERVENTIONS TO REDUCE STRESS
   Non-pharmacological:
   • Music therapy
   • Meditation
   • Aroma therapy (per hospital protocol)
   • Therapeutic communication

4. INTERVENTIONS TO REDUCE LIGHTS
   • Close the window shades
   • Turn off the TV
   • Shut the patients door (if applicable)
   • Offer the patient an eye mask

5. INTERVENTIONS TO REDUCE NOISE
   • Shut the patients door (if applicable)
   • Offer the patient ear plugs
   • Provide music therapy
   • Advocate for a room change if necessary

6. OTHER INTERVENTIONS TO TRY
   • Cluster Care: Cluster your treatments in order to provide uninterrupted rest.
   • Educate the patient to avoid napping during the day.
   • Open the patient’s window shades during the day.
   • Educate the patient to limit screen usage 30 min before bed.

7. ASSESS YOUR PATIENT'S SLEEP!
   Lack of sleep can lead to negative patient outcomes that include increased blood pressures, increased blood sugar levels, and increased risk for hospital delirium. It is important healthcare staff continue to find ways to promote quality patient sleep.

AFTER IMPLEMENTING THESE TIPS
PLEASE TAKE THE POST-SURVEY LOCATED AT: