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The effects of non-pharmacological interventions consisting of earplugs and eye masks, reducing environmental factors to improve self-reported sleep quality in ICU Patients

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In partial fulfillment of the requirements for the degree of Doctor of Nursing Practice

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Abstract

Background: Intensive Care Units (ICU) are noisy environments that hinder sleep. Sleep disruption may have negative affects in ICU patients' recovery.

Aims/Objectives The aim was to determine the feasibility, patient's comfort level, and the effects of ear plugs, eye masks, and limiting nursing interventions on self-reported sleep quality during ICU stay.

Methods: This quality improvement project was conducted in a community hospital using a quasi-experimental design. Patients in the intervention group wore earplugs and eye masks with limited nursing interventions during nighttime hours compared to patients in the control group who received routine care. Patients subjective sleep quality was measured using a validated sleep scale and open-ended questions were used to assess factors that effected sleep.

Results: 38 patients (21 in the control group, and 17 in the intervention group) participated in the project. No statistically significant differences were found between groups. However, the effect sizes were moderate for several sleep items, showing that patients in the intervention group reported higher quality of sleep than those in the control group. Patients reported that ear plugs, and eye masks were comfortable and improved their sleep. Both groups reported that noise, equipment, and nursing intervention were factors that hindered their sleep.

Conclusion: Our study demonstrated that non-pharmacological interventions had a clinically meaningful, moderate effects in improving ICU patients' sleep in the first 24-48 hours. Using ear plugs and eye masks, and controlling environmental noise are low-cost strategies that can improve sleep in ICU patients

Background and Significance

The noise level and the amount of light exposure during nighttime hours has been cited to cause sleep disruption for patients admitted in the ICU setting (Demoule, et al., 2017; Hu, et al.,2015; Litton, et al.,2017 & Yarzdannik, et al., 2017). There is a correlation between noise and sound levels in the suppression of the Rapid Eye Movement (REM) stage of sleep, increased patient awakenings, and reduced sleep time (Demoule et al., 2017). Environmental factors that have led to sleep disruption include alarms and the amount light exposure during prime sleeping hours. However, lights are required to obtain accurate assessments, patient observations, medication administration, and nursing care interventions. Strategies that have been used to control noise and light exposure in the ICU include quiet time protocols, minimizing care activities, and limiting visitors during the highest probability when sleep can occur have been effective. These interventions have improved sleep, noise and light levels; however, there are still factors that affect patient's sleep quality while in the ICU. A strategy that has the greatest opportunity to improve sleep quality for ICU patients include, application of earplugs and eye masks while limiting environmental factors.

Sleep disruption has been studied in healthy and critically ill subjects and found to cause several adverse effects. Adverse effects from sleep disruption have led to increased oxygen and carbon dioxide production, reduction in attention, short term memory, and problem solving (Richardson, et al., 2007). Also, sleep disruption in the critical care setting has substantial consequences that have been shown to cause respiratory failure and immune system suppression making patients more susceptible to infection (Richardson, et al., 20012). Another impact from sleep disruption is the onset of delirium. Several studies have hypothesized that sleep disruption is a significant factor for the onset of delirium (Patel, et

al., 2014; Von Pompey et al., 2012). Incidences for delirium in the ICU setting range from 20% and highest up to 80% (Von Rompaey, et al., 2012). Delirium is characterized by a variation in thinking, changes in level of consciousness, and confusion. Although, sleep disruption and onset of delirium have been inconclusive to date, we wanted to determine if interventions to reduce environmental stimuli such as utilizing eye masks and earplugs may provide benefit to improve sleep quality and have the potential to limit the onset of delirium.

Problem Statement

It is known that adult patients admitted into the ICU setting experience poor sleep quality where numerous environmental factors contribute to patients sleep disruption (Scatto, et al., 2009). Noise and light levels, care activities, severity of the condition, and side effects from medications are all factors that are affecting patients sleep quality while in the ICU. Additional evidence has been documented that poor sleep leads to delirium, cognitive delays, impaired healing, and poor respiratory muscular endurance (Richardson, et al, 2012; Von Rompey, et al., 2012). Studies have found that non-pharmacological interventions have the potential to improve patients' sleep quality during the ICU stay (Richardson et al., 2012 & Yazdannik et al., 2014). The use of earplugs and eye masks to minimize the noise and light levels, also limiting environmental factors have shown to improve sleep quality for patients in the ICU (Demoule, et al., 2017; Hu et al.,2015; Jones & Dawson, 2012; Litton, et al., 2017; Richardson et al., 2007 Scatto et al., 2009).

Purpose

Our long-term goal is to implement strategies to improve sleep quality in ICU patients. The purpose of this project was to determine the effects of non-pharmacological interventions consisting of eye masks, ear plugs, and reducing environmental factors to improve self-reported sleep quality for adult patients admitted to the ICU. We examined the differences between an intervention group who

applied eye masks and ear plugs with limiting activities and the routine care group on their self-reported sleep quality. We also compared sleep quality scores between male and female patients. Lastly, we assessed comfortability level of patients who applied ear plugs and eye masks during the sleep period.

Specific Aims`

The primary aim was to determine the feasibility, patient's comfort level, and the effects of earplugs, eye masks, and limiting interventions on self-reported sleep quality during the first 24-48 hours in the ICU. A secondary aim was to examine the differences in sleep quality between male and female ICU patients.

Research Questions

1. Does an intervention consisting of eye masks, ear plugs, and reducing environmental factor improve self-reported sleep quality?
2. Is there a difference in sleep quality scores between male and female patients while in the ICU ?

Review of Literature

The literature search for this project was completed between October 2018 through February 2019. To optimize the articles included for this project, the literature search was conducted with the assistance from a research librarian at George Washington University using Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline, Pubmed, Scopus, and Google Scholar databases. The following key search terms were included: non-pharmacological interventions, earplugs, eye masks, sleep, sleep quality, and intensive care unit (ICU).

Several studies used a combination of eye masks and earplugs that demonstrated positive results for improving quantity and sleep quality during the ICU stay. Demoule et al., (2017) conducted a Randomized Control Trial (RCT) which divided patients into two groups; a control group, which

received routine care, and an intervention group, which received routine care plus eye masks and earplugs during the night. They used Polysomnography to measure the length of sleep. They reported that individuals who wore the eye masks and earplugs during the night experienced higher quantity of sleep and less frequent prolonged awakening. Richardson et al., (2012) conducted a quasi-experimental trial aimed at controlling the light and noise levels in order to improve quantity and quality of sleep in an ICU environment. The study included two groups; an intervention group, which included patients wearing eye masks and earplugs during the night, and a control group, which received routine care. They found individuals in the intervention group self-reported higher quantity of sleep and rated the quality of sleep higher compared to the control group. Jones & Dawson (2012), used a pre-test and post-test intervention that assessed sleep quality before and after wearing eye mask and earplugs during the night, which showed higher quantity of sleep when using the eye masks and earplugs. Two studies by Yazdannik, et al., (2014) and Hu, et al., (2015), found that patients assigned to wear eye masks and earplugs self-reported significantly higher sleep quality scores compared to groups who did not. However, one difference between the two studies is that Hu et al, (2015) in their study provided eye masks and earplugs to the intervention group pre-operatively before scheduled open-heart surgery.

Studies that only used earplugs during the night showed comparable results for improving quantity of sleep compared to those studies where patients used both earplugs and eye masks. In the quasi-experimental study by Scatto, et al., (2009), patients were randomly assigned to wear earplugs during the night. They showed patients in the intervention group self–reported they slept more deeply, longer periods, and awoke more satisfied. An RCT by Von Rompaey, et al., (2012), found that patients who wore earplugs reported improved sleep quality during the first night in the ICU; however, no differences were shown if considering the entire duration of the ICU stay.

One study found non-pharmacological interventions that consisted of controlling environmental factors and limiting nursing intervention improve sleep quality. A quasi -experimental study by Patel et

al., (2014), evaluated the effectiveness of a bundle approach, which consisted of non-pharmacological interventions to improve sleep quality that included lowering environmental noise, limiting interventions, and reduction of overhead light during the night. They found an overall improvement in mean sleep quality scores for the intervention group and more time asleep at night with fewer interruptions. Additional findings within the study demonstrated that ear plugs, and eye masks provided a method to control environmental factors such as noise and light

Several studies described the comfortability level of wearing ear plugs and eye mask throughout the night. In the study by Litton, et al., (2017) the authors concluded that earplugs provided a feasible noise-abatement strategy that improved sleep quality while in the ICU environment; however, it is dependent upon participant acceptability. Additional findings found that most patients rated earplugs and eye masks as comfortable non-invasive intervention that limited the environmental factors and enhanced patients sleep. Jones & Dawson (2012), and Hu et al., (2015), reported that most individuals rated earplugs and eye masks as comfortable or very comfortable. In both studies conducted by Demoule et al. (2017) and Richardson et al. (2007), individuals rated the comfort level for eye masks and earplugs from satisfactory to very comfortable.

The gold standard of measurement for sleep is Polysomnography, however, its expensive, requires technical expertise and availability of equipment may be difficult. A more practical method for measurement of sleep is through a a self-administered questionnaire (Youris et al., 2019). In most studies individuals were able to complete a visual analog scale that measured self-reported sleep quality, comfort, and perception on length of sleep.

EBP Translation Model

The RE-AIM framework was used to guide this project. RE-AIM stands for reach the target population, effectiveness of intervention, adoption by the team or organization, and implement

strategies to ensure sustainability (White, Dudly-Brown, & Terhaar, 2016). The target population is adult patients admitted to the ICU setting with medical and surgical diagnosis. Effectiveness of the intervention was evaluated quantitatively by the patient's self-reporting of sleep quality, patient's comfort level wearing earplugs and eye masks, and qualitatively by completing an open-ended questionnaire to assess factors that affecting and helping patients sleep. Opened ended questions were used to identify factors promoting and hindered sleep A team of stakeholders was formed to promote adoption by the organization that included bedside staff, formal and informal leaders of the ICU, Chief Nursing Officer, Director of Performance Improvement, and Vice President for quality. Implementation began with education for the frontline staff on the project goals, aims, objectives, procedures, and inclusion criteria for enrollment of subjects. Additional focus would was with nurses to assist patients with inserting earplugs, applying the eye masks and implementing a checklist to include interventions to minimize environmental factors. Sustainability will focus on developing nursing policy that will promote sleep promotion for ICU patients.

Methods

We used a mixed method design with both a quantitative and qualitative aspect. The quantitative part we employed a quasi-experimental design and assigned participants to interventions or control group based on the location of rooms. The qualitative part involved patients answering open-ended questions and individual interviews. We chose a sample size of 42 participants; 21 in the intervention group and 21 subjects for the control group based on a statistical power analysis with the aim of detecting a large effect size, with 80% power and an alpha level of 0.05 was chosen. Subjects were recruited if they met the following inclusion criteria: 1) 21 years or greater; 2) if they were admitted in the ICU for greater than 6 hours and the length of stay was greater than 24 hours and less than 48 hours; 3) patients admitted with the following diagnosis, general medical, post-surgical, respiratory failure, or vascular surgery; 4) were able to read and understand English; 5) cognitively

intact and not agitated with a Glasgow Coma Score 13 or greater and RASS score between -1 to + 1. Patients were excluded if they had 1) Any neurocognitive delay's, 2) intubated in the last 24 hours, and/or had an acute neurological diagnosis.

Recruitment

The student investigator screened and approached patients who met the inclusion criteria in the early evening and explained the purpose, goals, and what is expected in completing the sleep questionnaire and interview after the sleep period. For participants in the intervention group the student investigator explained the risk and benefits and how the ear plugs, and eye masks would be applied by the bedside night nurse. After answering their questions, patents were asked to sign the consent form.

Setting

The project was conducted in a 16 bed Surgical ICU/ Neurological Critical Care Unit in a community hospital. The unit is U-shaped with all private rooms inlcudes large windows, sliding glass doors leading into the room, and a stationary monitor attached to the wall.

Intervention

Patients

The intervention group patients were asked to apply ear plugs and eye masks from 11:30 pm until 5:30 am. The patients could remove eye masks and earplugs for 10 minutes or less during the night and during necessary procedures. After the sleep period, patients in both groups were asked to complete an 8-item visual analog questionnaire about the previous night's sleep. Each participant was asked to circle a point on a scale of 0 to 100. Both groups were interviewed to determine factors that hindered and helped their sleep. To assess comfortability level for eye masks and ear plugs, patients in the intervention group were asked to compete a Likert comfort rating scale.

Nurses

The bedside night nurses assisted the patient in applying ear plugs and eye masks at 11:30 pm and removed them at 5:30 am. To ensure treatment compliance, the night nurses were asked to follow and complete a safety checklist that included: 1. Document the time earplugs and eye masks were applied; 2. Document the total time eye masks and earplugs were worn during the night; 3. Adjusting the bedside alarms twenty percent above or below the baseline; 4. Administered medications before 11:30 pm and after 5:30 am; 5. Perform bathing, nursing interventions, and draw non-emergent labs before 11:00 pm or after 5:30 am; 6. Pulled the curtain, door pulled ¾ way closed; 7. Complete physical and pain assessments before 11:00 pm and after 5:30 am; 8. Continueing hourly observations and vital sign measurement during the sleep period.

Nursing care for the control group continued with routine nighttime workflow which included assessment every four hours, medication administration, nursing interventions throughout the night, hourly observation, and vital sign requirement, and lab draws and bathing between 3 – 6 am.

Instruments

We used the Verran- Snyder Halpern (VSH) Sleep scale questionnaire to measure participants subjective sleep characteristics. The VSH was designed to measure subjects sleep pattern which consisted of eight items to characterize sleep quality, including, number of awakening during the sleep period, estimation on the amount of movement during the night, the time from settling down for sleep until awakening in the morning, the time from settling down until falling asleep, estimation of depth of sleep, how rested the subjects felt in the morning, spontaneity in which subject awakens in the morning, and overall satisfaction and quality of sleep. The VSH had a Chronbach's alpha of 0.82 and the construct validity was also supported (Snyder-Halper & Verran, 1987).

We created a tool to measure the demographic information, including age, gender, race, marital status, diagnosis, ICU length of stay, Glascow Coma score, and Richmond agitation sedation score.

Data Analysis

Sleep scores and demographic information were collected by student investigator and entered in IBM SPSS 26.0 software and analyzed. Descriptive statistics were used to examine each study variable. For interval level variables or higher, the mean and standard deviation were calculated. For categorical variables, frequency and percentages were calculated. Sleep quality scores between the intervention group and control group, differences between male and female were compered using independent t-test using an alpha of .05. A Cohen's d was also calculated to determine the effect of the intervention. Lastly, for factors that affected sleep, themes were identified and summarized.

Ethical Considerations

An approval from the community health care systems Institutional Review Board (IRB) granted permission for the project. Study participation was voluntary. Patients were divided into two groups based on location of rooms; patients in room 1-8 were in the intervention group; patients in room 8-16 were in the comparison group. Each participant who met inclusion criteria was consented by the student investigator to participate. Data was collected by the student investigator, de-identified, entered, into Excel spreadsheet stored on a password protected laptop, in a locked room at the primary site. The data file was uploaded into SPSS 26 solely by the student investigator for storage and analysis. The excel spreadsheet was kept in an password protected external hard drive. Data will be kept for six year after the study as required.

Results

We screened 335 patients from August 2019 through January 2020 and 59 patients met inclusion criteria. The student investigator approached 49 patients, 40 patients agreed and consented to

participate. However, 19 patients were not enrolled due to various reasons such as discharged out of the ICU before the study period and 10 patients changed their minds and refused to participate. Two patients had to drop out due to medical conditions.

A total of 38 patients participated in the project, 21 in the non-intervention group and 17 in the intervention group. In the intervention group, 5 patients did not wear either ear plugs or eye masks during the study period. In the analysis, we used intention to treat and included all 17 patients, whether they adhered to the treatments or did not apply them.

Of all the 38 participants, the mean age was 60 years, majority were females (*n*=21, 55%), half of them were Caucasian (*n*=19, 50%), and mostly married (*n*=24, 63.2%). The most common diagnosis was vascular surgery, (*n*=14, 36.8%), followed by general surgery (*n*=9, 23.7%), then medical (*n*=12, 31.6%), and *n*=3, 7.9% respiratory failure. Majority of patients (*n*=26, 68.4%) experienced pain during the study period. Lastly, the intervention group had a higher length of stay (*M* 114.35 hours, SD= 142.87 hours) than the control group, however there were three outliers and the difference was not statistically significant. None of the demographic and diagnosis data were statistically significant between two groups. (**See Table 1.0)**

We evaluated mean sleep quality scores between the intervention and the control group. None of sleep scores were statistically significant between intervention group and control group. However, Cohen's d showed moderate effect size for several items. For the estimated number of awakening during the sleep period, d= 0.48 indicating a close to moderate effect size. The control group mean number of awakening scores was 53.8 (*SD*=29.74) while the intervention group was 39.71 (*SD*=29.38). This is clinically significant that the control group perceived more awakening during the sleep period (although p value was 0.23). For the time settling down to awakening in the morning, d=0.54, indicating moderate effect size. The mean score of time settling down for sleep until awaking in

morning was higher in the intervention group than in the control group (50, *SD*=28.94 vs. 37.1, SD 28.94). This was clinically significant. The depth of sleep score showed a moderate effect size of d= 0.55. The intervention group mean depth of sleep score was 59.41(*SD*=38.96) while the control group mean sleep score was 40.24 (*SD*=29.68), which indicated the intervention group slept more deeply, although the p value was .10. Overall sleep satisfaction, sleep quality, and disturbance showed a moderate effect size of d=.56. Sleep satisfaction, quality and disturbance mean score was higher in the intervention group 67.06 (*SD*= 39.17) than in the control group (47.25, *SD*= 31.76. This indicated overall higher sleep quality and satisfaction for the intervention group than in the control group, although the p value did not reach significance (0.10). (**See Table 2.0)**

Next, we separated the sample for patients who wore ear plugs and eye masks during the entire sleep period to assess differences in sleep scores (*n*= 33). There were several sleep scores that were significant between the intervention group and the control group. The number awakening during the sleep period mean score in the intervention group was 20.0 (*SD*=27.62) while the control group 53.81 (*SD*= 29.75). This was significant (t=3.2, p =.0003) which indicated that the intervention group had less awakening during the sleep period. The total time from settling down for sleep until awakening in morning mean score for the control group was 37.14 (*SD*=17.64) while the intervention group was 62.5 (*SD*=21.79). This was significant (t= 23.43, p =0 .0003) which indicated the intervention group did have more sleep time during the study period. The amount of time from settling down to sleep until falling asleep mean score for the intervention group was 17.5 (*SD*= 28.05) while the control group mean score was 40.95 (*SD*= 28.62). This was significant (t=2.3, p=0.31) which indicated that the intervention group perceived they fell asleep faster and slept longer than the control group. The depth of sleep mean score for the intervention group was 71.0 (*SD*=34.01) while the control group was 40.24 (*SD*= 29.68). This was significant (t= 2.7, p = 0.015) indicating that the intervention group slept deeper than the control group. Lastly, the overall sleep satisfaction, sleep quality and disturbance mean score

for the intervention group was 79.0 (SD=29.0) while the control group mean score for satisfaction was 47.86 (SD=31.08). Again, this was significant (t=2.9, p= .008) indicating that patients in the intervention group was more satisfied with sleep and quality of sleep.

Next, we pooled the sample to evaluate differences in sleep quality scores between male and female patients. There were several sleep scores that were statistically significant between males and females. For the number of awakening, male mean score was 34.71 (*SD*=28.5) while the female was 57.86 (*SD*=36.78). The difference between male and female awakening scores was significant (t= 2.2, p= .03) which indicated males had less awakenings during the sleep period. Males mean score for an estimation the amount of movement during the sleep period was 22.94 (*SD*= 20.86) while females were 51.90 (*SD*=40.53). The difference in total mean scores for movement between males and female was statistically significant (t test= 2.8, p= 0.008) which indicated females perceived more movement during the sleep period than males. For the estimation of how rested upon awakening in the morning, male mean score was 61.76 (*SD*=30.39) while females mean score was 40.0 (*SD*=34.46), t= 2.2, p= .03. This indicated that males felt more rested in the morning than females. For overall sleep satisfaction, sleep quality, and disturbance, the mean score was 70.88 (*SD*=26.23) for males and 44.0 (*SD*=39.52) for females, t= 2.5, p= .02. This indicated that males were overall more satisfied with their sleep. Lastly, we evaluated the difference in spontaneity in awakening after the sleep period between males and females. Spontaneity upon awakening mean score for males was 61.18 (*SD*= 30.39) and was 33.81 (*SD*= 33.68) for females, t = 2.6, p=.01. This indicates that males awoke more spontaneously while females awoke more abruptly after the sleep period. **(See Table 3.0)**

Comfortability level of the earplugs and eye masks was evaluated on Likert scale from very uncomfortable to very comfortable (1 to 5). Ear plugs mean score was 4.08 (*SD*=1.08), the mean score for eye masks comfortability level was 3.42 (SD=1.31). This indicated that most of the patients found

that ear plugs, and eye mask ranged from satisfactory to comfortable to wear during the sleep period. However, several patients n= *5* experienced either claustrophobia, anxiety, felt uncomfortable, too warm, or did not feel it was necessary to wear either ear plugs or eye masks during the sleep period.

We identified factors that helped patients sleep, stopped patients from sleeping and potentially improve for both the intervention group and the control group. The most common factor that helped patients sleep in the intervention group were eye masks and ear plug while in the control group, improving comfort and pain medication were the main factors. Main factors that stopped patients from sleeping in both the intervention group and control group was environmental noise, equipment, and nursing interventions. Factors that could improve sleep in both the intervention and control group was improving comfort, such controlling environmental factors, and pain medication.

Discussion

Poor sleep is common among patients admitted into the ICU and can potentially affect patient's recovery. In this project we implemented a multi-faceted intervention using ear plugs, eye masks, and limiting nursing interventions to improve patients self-reported sleep quality during ICU stay. The results did not reach statistical significance; however, the effect sizes showed a moderate clinical benefit.

Our findings were consistent with what has been reported in the literature. First, the number awakening during the night were less in the intervention group compared to the control group, which is consistent with the results reported by Scatto, et. al., (2009) in that the number of awakenings in patients wearing ear plugs was less and statistically significant ($p = <0.05$) than those not wearing it. Similarly, a study by Yazdannick, et al., (2014), showed that patients had less sleep disturbance in the intervention group wearing ear plugs and eye masks (M=17.44) compared to a control group (M=

50.64). Our results showed a close to moderate effect size (d=.48), suggesting that using ear plugs, eye masks and limiting environmental factors reduced sleep interruptions during the sleep period.

We found a moderate clinical effect in the total hours from settling down for sleep until awakening; intervention group 50.0 (*SD*=28.9) which is consistent with several studies by Scatto, et. al, (2009); Richardson, et al, (2007). Both studies revealed a statistically significant difference in the intervention group who wore ear plugs and eye masks. We also found that patients in the intervention group reported higher depth of sleep scores and overall sleep satisfaction and quality. Our results were similar with several studies by Patel, et.al, (2014); Scatto, et al, (2009); Yazdannick, (2014) & Von Rompaey, et. al., (2012). Patel, et. al, (2015) used a bundle of interventions that limited environmental factors during the sleep hours that consisted of closing the door, dimming all lights, and grouping nursing interventions. The authors reported the interventions improved patients sleep quality scores and overall sleep satisfaction. Scatto, et al., (2009), showed statistically significant results that patients slept more deeply when wearing ear plugs. Interestingly, the authors did not find any difference in overall sleep satisfaction and quality. Van Rompaey et al., (2012) reported that patients who wore ear plugs in the first 24 hours reported higher sleep scores. Lastly, a study by Yazdannick, et. al., (2014) showed patients who wore ear plugs and eye masks improved their sleep effectiveness. Again, no surprise, after controlling environmental factors and wearing ear plugs and eye masks improved the depth of sleep, reduced the amount of disturbances, and overall sleep quality for stable ICU patients.

Based on our literature search no other study evaluated the differences in self-reported sleep quality between gender. We found significant differences between men and women in several sleep categories and that men tended to report higher sleep quality scores compared to women. We found that men self-reported less awakening during the sleep period, less movement, felt more rested, awoke more spontaneously, overall reported more satisfied with sleep quality. Additional exploration and research

are needed to identify factors that affect sleep quality and explain the differences between gender. Additional research is needed to identify and implement strategies that can improve females sleep quality while in the ICU.

In both groups the most common issues that hindered ICU patients sleep were environmental factors. Our results were consistent with studies by Jones & Dawson (2012) & Richardson, et al. (2009). Both studies identified noise as the main factor affecting patients sleep.

In our study, patients in the intervention group reported that ear plugs, eye masks, and limiting environmental factors was the most significant intervention that promoted sleep. Our results were supported by several studies, Richardson et. al; (2009); Scatto et al., (2009); Patel et al. (2012). Richardson et al., (2009), reported that eye masks was a main factor that helped patients sleep longer. Patel et al., (2014), showed that by controlling the noise levels, dimming lights, and grouping care increased patients sleep quality scores. Scatto, (2012), showed a greater satisfaction with sleep experience using the ear plugs. Even though the sample size was low, our study showed evidence that controlling the light and noise levels can improve patients sleep quality. Applying ear plugs and eye masks can be added interventions that can greatly enhance patients sleep experience during patient's ICU length of stay.

We also looked at the comfortability level and feasibility for using ear plugs and eye masks. Five patients refused to wear both ear plugs and eye masks at the time of study period. Patient reported they did not need them at the time of the sleep period, felt claustrophobic, and too hot to wear. This was consistent with several studies by Demoule et. al., 2017; Hu et. al., 2015 & Richardson, et. al., 2009. In their studies, discomfort, anxiety, and felt claustrophobic were reasons why patients refused to wear ear plugs and eye masks. In our study, an interesting finding was that patients in the intervention group reported that the ear plugs, and eye masks did not completely reduce the noise level from

environmental factors. This supports the findings by Richardson et. al. (2009) that ear plugs did not completely block the noise. However, most patients did rate them as comfortable or very comfortable. Based on our results and the limited number of patients who wore both ear plugs and eye mask we cannot completely determine the effect of ear plugs and eye mask in reducing environmental factors to promote sleep. We also agree that that the feasibility of wearing eye masks and ear plugs depends on the agreement of the patient to commit in wearing them during the sleep period.

Limitations

There were several limitations in our project. We did not randomly assign patients; thus our study has limited internal validity as we could not control the confounding variables. The project was conducted in a single center and a small ICU; for this reason, our sample size was small. Expanding the project to a larger ICU and a broader patient population would improve the generalizability of results. We focused on sleep quality in the first 24-48 hours length of stay in the ICU. As patient's condition changes while in the ICU puts patients at risk for adverse effects; an ideal project would measure sleep quality over several days. Due to the project timeline we did not measure clinical outcomes such the effect on blood pressure, heart and respiratory rate, delirium, and pain scores. Our project used subjective self-reported sleep quality scores. The gold standard for objective sleep measurement is PSG. We did not exclude patients who were taking narcotics to relieve pain or anxiety which could have inconsistencies in how the tool was filled out. Also, patients who have chronic illness are pre-disposed to sleep disruptions were not excluded from the project.

Plans for Sustainability and Future Scholarship

Our project found that non-pharmacological interventions that consisted of ear plugs and eye masks, reducing environmental factors did improve several aspects of patent self-reported sleep quality during ICU stay. We also discovered new knowledge that there are differences in sleep quality between

gender. We will disseminate the findings to key stakeholders within the organization that include chief nursing officer, assistant chief nursing officer, chief clinical officer, nursing leadership, and nursing educators. Additional dissemination will occur at local, regional, and national critical care conferences.

Based on our findings, we encourage nurses to control environmental factors that promote sleep by consistently offering patients ear plugs and eye masks, grouping non-emergent nursing interventions, controlling noise and light levels. We also recommend education for frontline clinicians on the importance of sleep, the adverse effects, and how to improve nursing practice by implementing strategies that promote sleep for patients while in the ICU. Lastly, developing a sleep order set to be initiated in the Electronic Health Record on admission and utilized when patients meet inclusion criteria will assist in promoting sleep among ICU patients

We did not focus on other clinical outcomes. Future research is needed to assess the effects of non-pharmacological intervention on bio-physiological parameters, delirium, and long-term cognitive effects and pain. Due to the limited time frame we were not able to recruit enough sample size, therefore we had low power to fully determine effect of the intervention, therefore we recommend continuing to recruit subjects for the next several months. We did discover new knowledge in differences in sleep quality between gender indicating further research is needed to why these differences exist and factors that affect sleep quality between gender.

Conclusion

Our study demonstrated that non-pharmacological interventions had a clinically meaningful, moderate effects in improving ICU patients' sleep in the first 24-48 hours. Using ear plugs and eye masks, and controlling environmental noise are low-cost strategies that can improve sleep in ICU patients. A combination of wearing eye masks and ear plugs and limiting environmental factors such as noise and light levels offer ICU patients an opportunity to improve sleep experience by limiting the

number awakenings, increasing the amount of total sleep, having less disturbance, and more depth of sleep, and improving overall satisfaction and sleep quality. We discovered differences between gender in several different aspects in sleep quality. Based on these finding, future studies are needed to explain these differences and factors that affect sleep quality between men and women. Based on our results, ICU nurses and physician should implement strategies that can improve sleep quality by offering eye mask and ear plugs. Lastly, clinicians should continue to be cognizant of behaviors and interventions that can hinder patients sleep while in the ICU.

References

Alway, A., Halm, M., Shilhanek, M., & St. Pierre (2013), Do earplugs and eye masks affect sleep and delirium outcomes in the critically ill. *American Journal of Critical Care* (22) 4. 357-360.http://ajcc.aacnjournals.org.

Dearholt, S. & Dang. (2017) *Johns Hopkins Nursing Evidence-Based Practice Model and Guidelines*. Indianapolis, IN: Sigma Theta Tau International

Demoule, A., Carreira,S., Lavauit, S., Palanca, O., Morawiec, E., Mayaux, J., Amuf, I., Similowksi, T. (2017). Impact of earplugs and eye mask on sleep in critically ill patients: a prospective randomized study. *Critical Care* (21) 1 -9. https://www.ncbi.nlm.nih.gov.wrlc.proxy.gwu.edu

Hata, R., Han, L., Slade, J., Miyahira, A., Passion, C., Ghows, M., Izumi, K., & Yu, M. (2014). Promoting sleep in the adult surgical intensive care patients to prevent delirium. *The Nursing Clinics of North America* (49) 3. 383-397. https://www-sciencedirect-com.proxygw.wrlc.org.

Hu, R., Jiang, X., Hegadoren, K., & Zhang, Y. (2015) Effects of earplugs and eye masks combined With relaxing music on sleep, melatonin and cortisol level in ICU patient: a randomized controlled trial. *Critical Care* (19) 1. 1-9. http://web.b.ebscohost.com.proxygw.wrlc.org.

Jones, C., Dawson, D. (2012). Eye masks and earplugs improve patient's perception sleep. *Nursing in Critical Care* (17) 5. 247-254. http://web.b.ebscohost.com.proxygw.wrlc.org/

Litton, E., Elliott, R., Ferrier, J., & Webb., S. (2017). Quality of sleep using earplugs in the Intensive care unit. *Critical Care and Resuscitation* (19) 2., 128-133. https://www-scopus-com.proxygw.wrlc.org/

References

Mabasa, V., Sughoorowski, K. Thomas, C. Su, G. (2018) A standardized structured approach to improving sleep quality in the intensive Care unit: SLEEP MAD. *The Canadian Journal of Critical Care Nursing* (29) 2 62-64. http://web.b.ebscohost.com.proxygw.wrlc.org/ehost/

Patel,J., Baldwin, J., Bunting, P.,& Laha, S. (2014) The effect of a multicomponent multidisciplinary bundle of interventions on sleep and delirium in medical and surgical on sleep and intensive care patients. *Anesthesia.* (69) 6. 540-549. https://www.ncbi.nlm.nih.gov.proxygw.wrlc.org

Richardson, A., Allsop, M.,Coghill, E & Turnock, C. (2012) Earplugs and eye masks: Do they improve critical care patients sleep? *British Association of Critical Care Nurses.* (12) 6, 278-286. https://onlinelibrary.wiley.com.wrlc.proxy.gwu.ed

Sandoval, C. (2017). Nonpharmacological interventions for sleep promotion in the intensive care unit. *Critical Care Nurse*. (37) 2. 100-102. http://ccn.aacnjournals.org

Scatto, C. McClusky, C., Spillman, S & Kimmel, J. (2009). Earplugs improve patients' subjective Experience of sleep in critical care. *Nursing in Critical Care*. (14) 4. 180-184. Retrieved from: https://onlinelibrary-wiley-com.proxygw.wrlc.org

Snyder-Halpern, R. & Verran, J. (1987). Instrumentation to describe subjective sleep characteristic in healthy subjects. Research in Nursing and Health. (10). 155-163. Retrieved from: https://docs2go.himmelfarb.gwu.edu

Reference

Von Rompey, B., Elseviers, M., Van Drom, W., Fromont, V & Jorens, P (2012). The effects of earplugs During the night on the onset of delirium and sleep perception: A randomized controlled trial in Intensive care patients. *Critical Care* (16) 3 1-10. https://www.ncbi.nlm.nih.gov.wrlc.proxy.gwu.edu

White, K., Dudly-Brown, S., & Terhaar, M (2016). *Translation of Evidence into Nursing and Health Care* New York, NY: Springer Publishing, 2nd edition

Yazdannik A., Zareie, A, Kashefi, P. (2014). The effect earplugs and eye mask on patients perceived sleep quality in intensive care unit. Iran Journal of Nurse Midwifery (19) 6. 673-678. https://www.ncbi.nlm.nih.gov/

Youris, M., Hayajneb, F., Batiba, A. (2019). Measurement of nonpharmacologic management of sleep disturbance in the intensive units. *Critical Care Nurse Quarterly* (42) 1 75-80. https://insights.ovid.com

Table 1.0

Demographic characteristics and clinical background of the sample

Variable	Total Sample n= 38 n = (%)	Control Group n= (%)	Intervention group n =(%)
Gender			
Male	17 (44.7%)	10 (47.6%)	7 (41.2%)
Female	21 (55.3%)	11(52.4%)	10 (58.8%)
Age	60 (SD = 17.0)	62.38 (SD= 17.83)	58 (SD=16.20)
Race			
Caucasian	19 (50%)	12 (57.1%)	7 (41.2%)
African- American	16 (42.1%)	8 (38.1%)	8 (47.1%)
Other	3 (7.93%)	1 (4.8%)	2 (11.8%)
Marital Status			
Married	24 (63.2%)	14 (63.2%)	10 (58.8%)
Not Married	14 (36.8%)	7 (33.3)	7 (41.2%)
Diagnosis			
General Medical	12 (31.6%)	7 (32.3%)	5 (9.4%)
Respiratory Failure	3 (7.9%)	3 (14.3%)	0 (0%)
General Surgery	9 (23.7%)	2 (9.5%)	7 (29.4%)
Vascular Surgery	14 (36.8%)	9 (42.9%)	5 (41.2%)
Pain or Discomfort			
Yes	26 (68.4%	16 (76.21%)	10 (58.8%)
No	12 (31.6%)	5 (23.8%)	7 (41.2%)
	M (SD)	M(SD)	M(SD)
Age	60 (SD=17.0)	62.38 (SD=17.83)	58 (SD=16.20)
Length of Stay(Hour)s	84 (SD=101)	60.57 (37.65)	114.35 (142.87)

Table 2 Comparison of sleeping scores (n=38)

Does an intervention consisting of eye masks, ear plugs, and reducing environmental factor improve self-reported sleep quality?

Variable	Control Group M (SD)	Intervention group M(SD)	*t=test*	*p*=value	effect size Cohen's d
Number of awakenings' During sleep period	53.8 (29.74)	39.71 (29.38	1.2	0.23	0.48
Estimate the Amount of Movement during Sleep	38.57 (34.24)	39.41 (38.96)	0.07	0.94	0.02
Total (hours) from settling down for sleep to awakening	37.14 (17.64)	50.0 (28.94)	1.6	0.12	0.54
Amount of time from settling Down to falling asleep	40.95 (28.61)	33.53 (39.51)	0.65	0.52	0.21
Estimate depth of sleep	40.24 (29.68)	59.41 (38.96)	1.67	0.10	0.55
Estimate how rested upon awakening	45.24 (27.68)	55.29 (37.26)	0.92	0.36	0.31
Spontaneity with which Subject awakens in morning	41.90 (30.92)	51.45 (39.19)	0.79	0 .43	0.27
Estimate sleep satisfaction, Quality, and disturbance	47.27 (31.76)	67.06 (39.17)	1.67	0.56	0.56

Table 3 Comparison of sleeping scores between gender (n=38)

Is there a difference in sleep quality scores between male and female patients while in the ICU ?

Variable	Male M (SD)	Female M(SD)	*t=test*	*p*=value
Number of awakenings' During sleep period	34.71 (28.5)	57.86 (36.78)	2.2	.03
Estimate the Amount of Movement during Sleep	22.94 (20.86)	51.90 (40.53)	2.8	.008
Total (hours) from settling down for sleep to awakening	46.47(22.34)	40.0(25.29)	.83	.41
Amount of time from settling Down to falling asleep	31.18 (24.97)	42.86 (39.18)	1.1	.27
Estimate depth of sleep	54.71 (31.84)	44.0 (37.47)	.95	.35
Estimate how rested upon awakening	61.76 (30.39)	40.0 (34.46)	2.2	.03
Spontaneity with which Subject awakens in morning	61.18 (30.39)	33.81 (33.68)	2.6	.01
Estimate sleep satisfaction, Quality, and disturbance	70.88 (26.23)	44.0 (39.52)	2.5	.02

Appendix A

Article #	Author & Date	Evidence Type	Sample, Sample Size, Setting	Study finding that help answer the EBP	Observable Measures	Limitations	Evidence Level & Quality
1	Demoule, A., Carreira,S., Lavauit, S., Palanca, O., Morawiec, E., Mayaux, J., Amuf, I., Similowksi, T. (2017).	RCT	64 patients in a general ICU. 32 pts enrolled in intervention which included wearing Ear plugs and eye masks and 32 received routine care	Pts length of sleep was longer in the intervention group. Prolonged wakening was less in the intervention group in the first few days of ICU admission Interruptions were less in the intervention group. Overall, after discharge from ICU showed no difference in Self-reported sleep quality	Sleep stages determined by Polysomnography. Comfort measured by a Visual analog scale Self-Assessed sleep quality score	9 patients did not wear eye masks and earplugs during the night. Pts Reported anxiety, feeling hot and sweaty, feeling claustrophobic.	Level I Quality B

2	Hu., R., Jiang, X., Hegadoren, K., Zhang, Y. (2015)	RCT	Total patients n=45 Experimental group (n=20) which applied ear plugs and eye masks and relaxing music and control group (n=25) in 21 bed cardiac surgery ICU	Subjective sleep quality scores were higher in the intervention group Patient's perceptions of noise were lower in the experimental group.	Subjective sleep quality was measured by the Richards-Sleep questionnaire Depth of sleep Time to fall asleep Number of awakening Perceived Quality Perceived night time noise	Subjective Sleep quality was assessed 1-2 days following transfer out of the ICU. Overall, sleep quality was measured by self-reporting Reports were measured in first 24-hours rather than over the first 48 hours 5 patients dropped out because of illness, refusal to wear eye masks, and listen to music	Level I Quality A
3	Jones, C., Dawson, D. (2012).	A pre and post interventional design	A total of n= 100 pts n=50 intervention group received ear plugs and eye masks n = 50 received	Pts reported they slept longer using eye masks Both groups identified that noise, light and intervention were significant factors in	A self-reported tool to rate quantity and quality of sleep Quantity of sleep Measures that included Helping pts to sleep and preventing them to sleep	Study did not demonstrate differences in sleep quality between groups	Level II Quality C

			standard of care	preventing patients to sleep	Factors promoting sleep Comfort level of wearing ear plug		
4	Litton, E., Elliott, R., Ferrier, J., Webb., S. (2017).	Quasi-Experimental	10 bed ICU in large private hospital 40 patients randomized: Experimental group (n=20) wore ear plugs and control group (n=20)	The average time patients wore ear plugs was 7.5 hours in the first night, 6.2 hours in the second night. 12/19 patients reported ear plugs as comfortable or very comfortable Results showed that ear plugs showed a feasible noise abatement strategy No difference between groups	Self- reported sleep quality score using the Richards-Campbell sleep questionnaire. Quantity of sleep Self-rated comfort level for ear plugs	Post-Cardiac surgery patient Single center Open-label study	Level II Quality C

				in overall sleep quality score			
5	Patel, J., Baldwin, J, Bunting, P. Laha, S. (2014).	Quasi-Experimental	24 bed mixed ICU in teaching hospital 171 patients included a bundle of interventions reducing interruption and environmental factors such noise and light 169 patients were included before interventions implemented 59 pts completed a self-reported sleep questionnaire	Intervention group showed improved sleep depth, spent more time asleep, reported feeling less sleepy during the day. Improved self-reported sleep efficiency index, which increased the patient's perception of sleep. Improved sleep quality	Sleep Quality assessed by self-report using the Richards-Campbell sleep questionnaire. Depth of sleep Time to fall asleep Number of awakening Perceived Quality Perceived night time noise	Single center Self-reflective and assessment of sleep. Staff were aware that the study was conducted	Level II, Quality B.

6	Richardson, A., Allsop, M.,Coghill, E & Turnock, C. (2012)	Quasi-Experimental	A total n= 64 patients. n= 34 patients in the intervention group tried earplugs and eye masks. The Setting was within a Cardiothoracic ICU	Pts wearing ear plugs and eye masks self-reported longer sleep than non-intervention group Intervention group reported sleep "more than average" and "much more than average" Eye masks and ear plugs helped the patients with reducing noise and light levels Pts in the intervention group were found to sleep longer	Sleep was measured by a tool that assessed self-reported measures of sleep that included hours of sleep and normal or average sleep A Comfort rating scale	Study numbers prevented valid statistical analysis Comfort level with eye mask and ear plugs varied Polysomnography was not used Only 64 pts which limited internal validity	Level II Quality C
7	Scatto, C. McClusky, C., Spillman, S., Kimmel, J. (2009).	Quasi-experimental	Patients were divided into two groups (n=88)	Patients who wore ear plugs reported falling asleep easier, less awakening	Subjective sleep quality scores using Verran-snyder visual analog scale	Most subjects completed the study in the 2nd night in the ICU. `	Level II Quality C

			Experimental group (n=49 wore ear plugs and control group (n=39) Setting included 2 ICU's, First ICU, admits both surgical and medical pts; 2nd ICU mostly cardiac pts, but has overflow	and tossing and turning Pt in the intervention group slept more deeply, longer periods of time, and awoke more refreshed.	Quantity of sleep Satisfaction with sleep Amount of time to fall asleep Time needed to fall asleep	12 subjects dropped out because ear plugs fell out and felt the ear plugs were uncomfortable Small sample size	
8	Von Rompey, B., Elseviers, M., Van Drom, W., Fromont, V & Jorens, P (2012).	RCT	n = 69 patients in the intervention group wore ear plugs n= 67 in control group Setting was in a 45 bed ICU divided between 7-15 beds in each unit with patients	Patients who wore ear plugs reported better sleep after first night due to the noise reduction Half of the patients in control group reported poor sleep. Only ¼ of patients in the	A dichotomous questionnaire that assessed self-reported sleep quality. Quantity of sleep	Patients were observed over 5 days which was longer than the control group Patients who wore earplugs reported less sleep quality after the 2nd and 3rd night. Study took place in an ICU that would not be generalizable outside the ICU	Level I Quality C

			treating cardiac surgical, medical, and surgical	control group reported good sleep, therefore ¾ of patient did not experience good sleep			
9	Yazdannik A., Zareie, A, Kashefi, P. (2014).	Quasi-Experimental	n= 50 patients total Randomized into 2 groups Group A wore ear plugs and eye masks in the first night and did not wear in the 2nd night Group B Did not wore ear plugs	Results demonstrated that earplugs and eye mask had a positive effect on sleep supplementation that lead to less naps during the day Mean sleep scores increased with eye masks and earplugs.	A Verran and Snyder Sleep tool to measure the quality of sleep. The tool measures sleep effectiveness, sleep disturbance, and supplemental sleep.	An effect of sleep effectiveness and sleep disturbance was not confirmed in this study. Convenience sample	LevelII Quality C
Non-experimental Studies							
10	Mabasa, V., Sughoorowski,K Thomas, C. Su, G. (2018)	Non-experimental	N/A	Standardize approach to improve sleep for patients in the ICU	A standardized pneumonic provides a structured approach to improve sleep	Non-experimental	Level V Quality C

				Strategies include reducing light and to further reduce noise levels the use of ear plugs are mentioned as an intervention To promote sleep reducing environmental factors such as clustering activities, avoiding diagnostic tests and minimizing un-necessary interruptions			
11	Youris, M., Hayajneb, F., Batiba, A. (2019).	Literature Review	N/A	Reviewed several subjective sleep questionnaires that revealed mild- moderate inter-rater reliability	Review of literature	Non-experimental	Level V Quality A

				The review supported the use of ear plugs and eye masks as important strategy to decrease sleep disturbances Overall, the literature revealed that quality of sleep in poor in ICU patients and several non-pharmacological can benefits pts			

Appendix B

(Verran Harper-Snyder Sleep scale)

Number of awakenings during the sleep period?

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Didn't wake----------Awake off and on

Estimate of the amount of movement during sleep

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Didn't move----------tossed all night

Total time (hours) from settling down for sleep to awakening in morning

0 -------1---------2----------3---------4---------5-------6--------7-------8-------9---------10

No sleep ---------- Ten hours of sleep

Amount of time from settling down to sleep until falling asleep

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Fell asleep immediately----------Did not fall asleep at all

Estimate the depth of sleep

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Slept lightly----------Sleep Deeply

Estimate of how rested subject is upon awakening

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Awoke Exhausted----------Awoke Refreshed

Spontaneity with which subject awakens in morning

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Awoke abruptly—----------Awoke Spontaneously

Estimate of sleep along dimensions of satisfaction, quality, and disturbance

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Bad night----------Good night

Appendix C

Data Collection tool for Intervention group

Age	Answer	This section to filled by investigator	Answer
Gender (Male or Female)		Length of Stay	_____hours
Race 1. Caucasian 2. African American 3. other		GCS Score RASS Score	
Marital Status 1. Married 2. Not Married			
Diagnosis (circle one)	General medical		
	Respiratory Failure		
	Vascular Surgical		
	General Surgical		
	Other		

Have each subject rate their comfort level with earplugs and eye masks

1= very uncomfortable 2= uncomfortable 3= Satisfactory 4= Comfortable 5= Very Comfortable

Have each of subjects describe the following questions

1. What factors helped you to sleep.

2. What factors stopped you from sleeping?

3. Were you in pain or discomfort?

4. Can we do anything to improve sleep?

Appendix D

Number of awakenings during the sleep period?

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Didn't wake----------Awake off and on

Estimate of the amount of movement during sleep

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Didn't move----------tossed all night

Total time (hours) from settling down for sleep to awakening in morning

0 -------1---------2----------3---------4---------5-------6--------7-------8-------9---------10

No sleep ---------- Ten hours of sleep

Amount of time from settling down to sleep until falling asleep

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Fell asleep immediately----------Did not fall asleep at all

Estimate the depth of sleep

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Slept lightly----------Sleep Deeply

Estimate of how rested subject is upon awakening

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Awoke Exhausted----------Awoke Refreshed

Spontaneity with which subject awakens in morning

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Awoke abruptly—----------Awoke Spontaneously

Estimate of sleep along dimensions of satisfaction, quality, and disturbance

0 -------10---------20----------30----------40---------50-------60--------70-------80-------90---------100

Bad night----------Good night

Appendix E

Data collection tool for Non-intervention (Comparison) group

Age	Answer	This section to filled by investigator	
Gender (Male or Female)		Length of Stay	_____hours
Race 1. Caucasian 2. African American 3. other		GCS score RASS Score	
Marital Status 1. Married 2. Not Married			
Diagnosis (circle one)	General medical		
	Respiratory Failure		
	Vascular Surgical		
	General Surgical		
	Other		

Circle one

Have each of subjects describe the following questions

1. What factors helped you to sleep.

2. What factors stopped you from sleeping?

3. Were you in pain or discomfort

4. Can we do anything to improve sleep?

Appendix F

SWOT Analysis

A SWOT analysis was conducted to identify the feasibility of the project and the availability of resources. The results demonstrated the organization has a strong focus and mission for serving the poor and underserved. The organization has experienced executive and nursing leadership staff demonstrates a commitment to the organization and quality patient care. Conversely, the organization faces significant barriers for planned change, which include high nursing turnover, large number of associate degree prepared nurses, lack of Evidence-Based practice resources, inadequate knowledge and skills of staff to support evidence-based practice. These may affect the translation of new knowledge into practice. Additionally, reimbursement challenges and the shift of care delivery to the community setting may impact patient volume to recruit subjects for this project. The organization can strengthen its opportunity for planned change by involving staff from the quality assurance department to support data collection for quality and performance improvement activities. An additional opportunity is to strengthen the infrastructure to support the translation of evidence into practice by the forming partnerships with schools of nursing, improve resources for evidence-based practice (EBP), and the formation of an EBP nursing council.

Appendix G

RE-AIM Framework