Improving Sleep Quality in the Adult Intensive Care Unit

by

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Abstract

Problem: Intensive care unit patients are at increased risk for poor sleep quality due to high incidences of night time nursing interventions, leaving little time for restorative sleep. Poor sleep can arise from stress, pain, and misaligned circadian rhythms as well. Sleep deprivation is harmful and can cause cognitive, ventilatory, cardiovascular, hormonal, and immune problems. The prevalence of perceived poor sleep quality was determined in the adult intensive care unit over a 3-month period. Most patients (54%) rated their sleep quality as less than average.

Purpose: The purpose of this quality improvement project is to improve sleep quality for stable adult intensive care unit patients by placing them on a multi-component sleep protocol that provides a 4-hour window of uninterrupted sleep.

Methods: A multi-component sleep protocol was implemented over a 12-week timeframe which prioritized a disturbance free 4-hour sleep window between midnight and 4 a.m. Staff were educated through a poster board presentation and by email. Protocol components included offering sleep masks and ear plugs to the patient, hanging a sleep protocol sign on room doors, re-timing routine medication and blood draws, and nurses serving as gatekeepers to prevent in-room disturbances. Patient's self-reported sleep quality was charted afterwards in the electronic medical record. Ancillary departments (phlebotomy, pharmacy, and respiratory care) were notified of the new practice change as well. Weekly run charts were used to analyze and track data on percent of staff educated, patient's sleep quality, and nursing staff compliance rates.

Results: Results show that 100% of night shift nurses were educated on the protocol, 84% of nurses documented patient's stated sleep quality in the electronic health record, and of the 106

sleep observations performed, 70% were rated as good or excellent. Fifty-eight patients total were placed on the sleep protocol during the 12-week project.

Conclusions: Sleep disturbances are multifactorial. A multi-component sleep protocol was shown to improve sleep quality for adult intensive care unit patients. Therefore, a sleep protocol that diminishes or eliminates preventable disturbances is beneficial to the overall health of critically ill patients and should be a part of standard practice.

Introduction

Intensive care unit (ICU) patients often experience poor sleep quality due to shortened sleep times, increased daytime sleep, and disrupted circadian rhythms (Ding et al., 2017). Sleep deprivation is harmful to the body and can cause cognitive problems, an increase in heart rate and blood pressure, muscular complications, a depressed immune system, and gastrointestinal motility changes (Grimm, 2020; Stewart et al., 2016). Sleep disturbances may originate from environmental reasons causes such as clinician interaction and noise, or psychological reasons like worry and fear, or it may be a mixture of the two (Ding et al., 2017). A high incidence of nursing interventions occur at night which contributes to environmental disturbances and leaves very little time for restorative patient sleep (Grimm, 2020).

The Richards Campbell Sleep questionnaire (RCSQ) was administered to 31 alert and oriented patients approximately midway through their ICU stay at a mid-Atlantic ICU between November 2019-February 2020 to determine the prevalence of perceived poor sleep quality by the patients at this facility. Most patients (54%) rated their sleep quality as less than average and experienced less sleep than usual. The most frequently cited causes of sleep disturbance (from highest cause to lowest cause) were labs, x-rays, alarms, bright lights, pain, and nursing care.

The purpose of this quality improvement (QI) project was to implement and evaluate a non-pharmacologic multi-component sleep protocol that decreased environmental sleep disturbances for all eligible adult ICU patients over a 12-week timeline. It is comprised of providing a disturbance free four-hour sleep window between 12 a.m. to 4 a.m. at the patient's ICU bedside for eligible patients. The anticipated outcome is an improvement in self-reported sleep quality for patients in the adult intensive care unit.

Literature Review

A synthesis of the evidence was conducted to support the implementation of a sleep protocol in the ICU. The evidence, including a clinical practice guideline published by the Society of Critical Care Medicine (SCCM) (Delvin et al., 2018) for prevention and management of sleep disruptions in adult patients in the ICU, revealed that a sleep promotion protocol using multiple strategies can reduce in-room disturbances and was beneficial for ICU patients in improving sleep quality (Delvin et al., 2018; Faraklas et al., 2013; Li et al., 2011; Karaman Ozlu & Ozer 2017; Patel et al., 2018).

Similarities found in the review between the studies were the use of a multi-component protocol with a multi-disciplinary approach to decrease environmental disturbances in the ICU (Faraklas et al., 2013; Li et al., 2011; Karaman Ozlu & Ozer 2017; Patel et al., 2018). Multi-component protocols were determined to be the most effective in reducing sleep disturbances in the ICU (Delvin et al., 2018). All sleep protocols included a sleep window where in-room hospital staff disturbances were kept to a minimum or stopped all together except for emergencies. Noise and lights were diminished with the use of eye masks, earplugs, or white noise machines, combined with decreasing central alarm volumes and unit lighting (Faraklas et al., 2013; Li et al., 2011; Karaman Ozlu & Ozer 2017; Patel et al., 2018). A multi-disciplinary approach was used that included input and cooperation from patient technicians, pharmacy, radiology, and phlebotomy staff to decrease environmental disturbances (Delvin et al., 2018; Knauert et al., 2018; Li et al., 2011; Patel et al., 2018). Furthermore, The Richard Campbell Sleep Questionnaire, which has been validated against polysomnography, the gold standard for

sleep quality measurement, was used to evaluate patient reported sleep quality in most studies (Faraklas et al., 2013; Karaman Ozlu & Ozer 2017; Li et al., 2011; Patel et al., 2018).

Notable differences among the studies include the study by Faraklas et al., (2013) which restricted caffeine intake after 3 p.m.; Karaman Ozlu & Ozer (2017) provided clean and smooth bedding and eliminated foul odors; Patel et al., (2018) and Knauert et al., (2018) emphasized clustering care and used nurse champions to support and promote the sleep protocol.

The level of evidence for these studies was determined as a level III (Melnyk, 2011) and the overall quality was a B, except for Knauert et al., (2018), which was given an overall quality of a C. The *p*-values of studies that used statistical measures were all significant. The SCCM guideline recommendation for use of a multi-component sleep promoting protocol was made based on a literature review of expert panelists. Despite lower quality evidence from possible bias, the guideline recommends a sleep protocol due to the potential of reduced delirium and minimal anticipated harm (Delvin et al., 2018).

Theoretical Framework

The American Association of Critical-Care (AACN) Nurses Synergy Model is the theory chosen to support the implementation of the sleep protocol. The core concept of the model is that nursing competencies are based on patient need (Curley, 2007). An alignment or "synergy" between patient, nurse, and systems is needed to achieve optimal outcomes. Current nursing care practices are not allowing ICU patients sleep needs to be met. Care practices need to change in order to improve sleep quality for ICU patients. Improved synergy between the patient and nursing care competency is needed. The nurse competencies that are part of this model include

clinical judgement, advocacy and moral agency, caring practices, collaboration, systems thinking, response to diversity, facilitation of learning, and clinical inquiry.

The concepts of the AACN Nurses Synergy Model was used to support the proposed practice change. An important aspect of the sleep protocol was re-timing iatrogenic sleep disturbances and clustering care to allow patients a window of time of undisturbed sleep. This involved modifying the current chaotic night environment to a sleep conducive one, and nurses incorporating systems thinking by recognizing which aspects of patient care are a priority. Specifically, focusing on measures which promoted a restful environment for the patient amidst the unpredictable ICU setting by anticipating patient's needs and minimizing entrances into the patient's room. Modifications in care activities were clustered together, rescheduled, or delegated to daylight hours. Competent nursing clinical assessment, judgment, caring practices, collaboration, and systems thinking provided the ground work for a protracted period of patient sleep. The AACN Nurses Synergy Model provided a framework for the nursing actions implemented to improve patient sleep quality and improved synergy between patient, nurse, and systems.

Methods

The setting for this QI project was a 24-bed mixed-specialty adult ICU. Thirty night shift nurses and four night shift patient care technicians were involved in the project implementation. The contextual elements that were considered included implementation during a COVID-19 pandemic, staff communication during night shift rounds and during handoff report, and leadership support for the project. Ethical considerations to ensure no patients were excluded from the sleep protocol involved identifying all patients that were stable, alert, oriented, and able to communicate.

The implementation team included the night shift bedside nurse who served as gatekeeper to prevent unnecessary in-room disturbances, patient technicians who helped provide care before and after the sleep window, and the intensivist who helped verify that the patient was eligible for protocol. Ancillary staff like respiratory care and phlebotomy who work night shift also played an important role because they had to be cognizant to not disturb the sleep protocol patients during the sleep window. Pharmacy helped reschedule medications that fell in the sleep window.

During the implementation period, night shift rounds included assessing whether a patient was eligible for the protocol. If eligible, medications and routine labs were rescheduled if needed. A nursing communication was placed in the chart that stated “patient on ICU sleep protocol, please do not disturb from midnight – 4 a.m.” The patient was offered an eye mask and ear plugs. Routine care was done before or after the sleep window. Before midnight, the nurse communicated to the patient that they would have a 4-hour sleep window without interruption while continuing their vital sign monitoring. If the patient needed assistance during the sleep window, they were instructed to signal the nurse with the call light. The unit lights were dimmed, curtains and door were closed, and a sign was hung outside the patient’s door as a visual reminder to not disturb the patient. See Figure 1 for doorway sign. After the patient awoke, the nurse asked and documented the patient’s sleep quality (excellent, good, fair, or poor), whether anything disturbed them during the night and what disturbed them under the psychosocial assessment flow sheet. Documentation components included hours slept, sleep quality, awakened during last night’s sleep, did pain interfere with sleep, and what would help patient to sleep. All categories allowed for free text and usage of eye masks and earplugs were documented in the sleep quality free text box. See Figure 2 for protocol components.

The structure measure used to track implementation progress was the percent of night shift staff educated on the sleep protocol. An in-service sign in sheet located next to the poster board presentation tracked the night shift nurses who reviewed the sleep protocol (see Appendix A for sign in sheet). Multiple education methods were used as an implementation strategy and tactic for the structure measure for staff education. In addition to the poster board presentation, education methods included staff emails, huddle reminders, and unit flyers. All full time and part time night shift nurses and patient technicians were included in the sleep protocol education. See Figures 3 and 4 for photos of the unit flyer and poster presentation. A mandatory online learning module which highlighted the importance of sleep for ICU patients by decreasing environmental stimuli was available for staff to complete about a month after the start of the project. It was originally created by the clinical site representative for other purposes but was incorporated into this project to increase education opportunities for staff.

The process measure used to track compliance was the percent of nurses completing daily documentation of patient sleep quality. Chart reviews were done to verify that every patient who had a nursing communication order for the sleep protocol also had their sleep quality documented in the psychosocial assessment flowsheet. A readily visible electronic sticky note was added to the patient's electronic medical record (EMR), as a tactic to increase compliance. A mid-point project email was sent to all night shift nursing staff to reinforce daily sleep documentation for patients on the sleep protocol.

The outcome measure used to track progress and assess intervention impact was percentage of patients on the sleep protocol who reported their sleep as good or excellent. Implementation strategies and tactics of the outcome measure consisted of nursing education regarding the sleep protocol components, placing eligible patients on the protocol, assessing and

treating pain prior to the sleep window, and asking patients their sleep quality upon awakening. Nurses were reminded in person weekly by unit champions and project leader and via email twice during the project to offer eye masks and ear plugs and to assess pain to address the most frequent complaint of sleep disturbance. A data collection tool was used to gather process and outcome measure data elements (see Appendix B).

Data variation from sleep quality and nursing staff compliance was visualized by plotting data collected weekly from audit tool onto run charts. The number of patients on the sleep protocol in a week, their length of stay, admission diagnosis, and hiring of travel nurses who did and did not receive education regarding the protocol all contributed to variation in the data. Measures taken to protect human subjects included not collecting identifying patient information, assigning patients a pseudo identifier and recording it on the patient identifier tool (see Appendix C), storing data on a password protected computer, and reference or link to the medical center provided only with prior permission. The project was submitted to the Human Research Protections Office at the University of Maryland and received non-human research determination by the hospital's Institutional Review Boards prior to implementation.

Results

All (100%) of the nurses and patient technicians received education on the sleep protocol following review and completion of the sleep protocol poster board presentation as evidenced by staff sign in sheet. See Appendix D for run chart. Thirty night shift nurses and four patient care technicians were educated in total. Changes in practice that were made to improve patient reported sleep quality included addressing sleep protocol eligibility during multidisciplinary rounds, placing eligible patients on a sleep protocol that provided a 4-hour disturbance free window of sleep, and documentation of sleep quality data in the psychosocial assessment

flowsheet. Data collected from chart audits showed that 84% percent of nurses were compliant with the processes measure of documenting patient's stated sleep quality in the EMR for patients who were placed on the sleep protocol. See Appendix E for nursing documentation of patient reported sleep quality compliance run chart. Regarding the outcome measure of patient reported sleep quality, 70% of the sleep observations were rated as good or excellent. See Appendix F for patient reported sleep quality run chart. A total of 58 patients were placed on the sleep protocol and 106 sleep observations were done during the 12-week project. Seventy-four sleep periods were rated as good or excellent, 21 were rated as fair, and 11 were poor (see Appendix G for visual representation).

Observed associations among sleep protocol interventions and sleep quality outcomes revealed that when environmental disturbances were diminished, the top reasons for sleep disturbance became pain followed by toileting, noise, lab draws, and staff interaction. The patients who listed toileting as a reason for sleep disturbance still rated their sleep quality as good or excellent. Five out of six patients who listed pain as a reason for sleep disturbance consequently rated their sleep quality as fair or poor. Staff were cognizant of the sleep protocol sign placed outside eligible patient's rooms and accordingly, disturbances from staff were documented as one of the lowest reasons for sleep disturbance. Only six patients used eye masks and ear plugs. Among those who did use them, four patients rated their sleep as good or excellent.

Facilitators for the project included the cardiothoracic team who were enthusiastic about the protocol and placed most of their progressed open-heart patients on the protocol. The night time patient technicians were also facilitators of the protocol because they aided the nurses by prepping patients for bed and helped hang sleep protocol signs on patient rooms. Barriers to the

protocol included inconsistency regarding addressing eligibility of patients for the sleep protocol during morning multidisciplinary rounds and not having a sleep protocol order set built into the EMR, which would have made it easier for providers to place patients on the protocol. Other problems encountered included an increase in travel nurses hired to help with the COVID-19 pandemic who were not present during the initial education campaign and therefore did not advocate for their patient to be placed on it due to lack of knowledge. There were no failures, unexpected consequences, or extra costs encountered with the sleep protocol

Discussion

The association between the sleep protocol interventions and sleep quality outcomes showed that optimizing the hospital setting for restful sleep by decreasing environmental disturbances does improve patient stated sleep quality. Before the initiation of the protocol, 46% of patients rated their sleep as good or excellent via the RCSQ. Post protocol implementation, this percentage increased to 70%. Data collected via run charts showed a drop in compliance regarding nurses charting patient-reported sleep quality about a month into the project. Reminders from night shift charge nurses and unit champions helped steadily improve compliance rates throughout the remainder of the project, which contributed to project success. Data collected showed that sleep disturbances are multi-factorial. Patients who reported being disturbed during their sleep listed pain, toileting, noise, lab draws, and staff interaction as the top five reasons for sleep disturbances. A visualization of different sleep disturbances is presented in Appendix H.

Improved sleep quality in the presence of a sleep protocol is in line with comparable studies (Brito et al., 2020; Faraklas et al., 2013; Karaman Ozlu & Ozer 2017; Li et al., 2011; Patel et al., 2018). A decrease in environmental noise and provider interaction also correlates to

results found in studies (Li et al., 2011; Patel et al., 2018). The top documented reason for suboptimal sleep quality was pain while this was the second to last reason gathered from pre-implementation data. This result correlates to findings by Faraklas et al., (2013), who also observed that post intervention patients complained of pain more than pre intervention patients. This finding could be a result of a shift in focus to pain when environmental sleep disturbances were lessened.

The rating of good or excellent sleep quality was not reported by all the patients placed on the sleep protocol for a variety of unavoidable or unpredictable reasons such as noise from adjacent rooms due to emergencies like code blues during the sleep window. Large HEPA filters were installed in all the patient rooms due to the COVID-19 pandemic and some patients complained the noise from the filters were too loud even after ear plugs were provided. Patient's toileting schedules were unpredictable and sleep disruption stemming from toileting was often unavoidable, however patients who had to toilet during the sleep window still rated their sleep quality as good or excellent.

The generalizability of these findings is limited due to the specific target population and setting of this project. Limiting factors included not screening for and excluding patients with previously diagnosed sleep disorders and using a different questionnaire to gather pre-project data and implementation data. Efforts made to adjust for limitations included only gathering data from the EMR psychosocial assessment flowsheet that were worded similarly to the pre-project RCSQ.

Conclusion

Environmental disturbances play a large role in sleep disruption and ICU patients are frequently disturbed at night for a variety of reasons. This QI project shows that changes such as clustering care and staff mindfulness for the sleep needs of the patient helps improve sleep quality. Sustainability measures of the implemented practice changes include a section in the EMR to document sleep assessment, readily available eye masks and earplugs, continued enthusiasm from the nurse manager who helped champion this project, ease of implementing sleep protocol, and interest from providers for having a sleep protocol order set built into the EMR.

Implications for practice include understanding that sleep disturbance is multifactorial. Environmental disturbances often can be controlled, and an increased effort should be made to make the chaotic ICU environment as conducive to sleep as possible. Nursing education regarding the importance of sleep, care clustering strategies, and individualization of a sleep regimen to fit the needs of the patient are important. Future education opportunities include education patients on the importance of sleep hygiene and early mobility. Future quality improvement projects can address correlation between sleep quality in the ICU, patient satisfaction scores, and length of stay.

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Table 1

Evidence Review Table

Citation: Devlin, J. W., Skrobik, Y., Gélinas, C., Needham, D. M., Slooter, A. J., Pandharipande, P. P., ... & Balas, M. C. (2018). Clinical practice guidelines for the prevention and management of pain, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU. *Critical Care Medicine*, *46*(9), e825-e873. https://www.ncbi.nlm.nih.gov/pubmed/30113379					Level (Melnyk) II
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
To update and expand the 2013 Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the intensive care unit (ICU).	Thirty-two international experts, four methodologists, and four critical illness survivors collaborated at least monthly online. Group sections assembled face-to-face at annual Society of Critical Care Medicine congresses. Additionally, teleconferences and electronic discussions among subgroups and the whole panel were held. A general content review was completed face-to-face by members in January 2017.	**Sampling Technique:** A literature review was conducted by a university-based librarian using five electronic databases. Articles published between 1990 to October 2015 were used based on priority topics voted on by the panel. The librarian and panel refined search terms. Articles based on these prioritized topics were collected. Found publications were then evaluated for their methodologic rigor, which helped determined the highest quality of evidence available per outcome and question	**Intervention**: offering earplugs, eyeshades, music, clustering care to minimize overnight interruptions, environmental changes, and early mobilization.	**DV**: sleep stages; sleep duration; sleep fragmentation; circadian rhythm; delirium; duration of mechanical ventilation; mortality, length of stay (ICU and hospital); patient experience. **Measurement tools in studies included**: Richard Campbell sleep questionnaire (RCSQ), seven-item scale measures participants' perceptions of their sleep along the following dimensions: (1) sleep depth, (2) falling asleep, (3) awakenings, (4) return to sleep, (5) quality of sleep and (6) perceived level of noise.	Although the quality of evidence is low due to risk of confounding, potential risk of bias, and imprecision, the panel has made a conditional recommendation for the use of a sleep-promoting multicomponent protocol in critically ill adults based on the potential for benefit such as a reduction of delirium and minimal foreseen harm. Moreover, the patients reported improved sleep quality when placed on a sleep protocol.

		Included studies: 538 studies were used to develop recommendations for the guideline. Four studies of these studies were used to help answer "Should promoting protocol be used to improve sleep in critically ill adults" (p. 858). The sleep-promoting protocols included in this review all had different components. All included availability of earplugs and eyeshades to patients. One had a pharmacologic guideline that discouraged using sedating medications. None of the studies specifically looked at a subset of patients known to have poor sleep quality. **Total number of patients in the four studies**: 707 patients		A visual analogue scale (VAS) scored from 0 (bad sleep or very noisy) – 100 (good sleep or very quiet) was used for all items - a reliable and valid tool to measure sleep quality in ICU patients with a Cronbach's alpha of 0.90 Sleep in the Intensive Care Unit Questionnaire (SICUQ), a 27-item questionnaire used to evaluate perceived level of sleep interruptions from environmental factors in the ICU to monitor sleep quality; decibel meter to monitor noise level; tools to monitor number of in room disturbances caused by care team Confusion Assessment Method in the ICU (CAM-ICU) to screen for delirium; polysomnography to measure sleep variables like time, efficiency index, onset, rapid eye movement, stages of sleep, and arousal	

				index; urine to measure melatonin levels	
Citation: Li, S. Y., Wang, T. J., Vivienne Wu, S. F., Liang, S. Y., & Tung, H. H. (2011). Efficacy of controlling night-time noise and activities to improve patients' sleep quality in a surgical intensive care unit. *Journal of Clinical Nursing*, *20*(3-4), 396-407. https://www-ncbi-nlm-nih-gov.proxy-hs.researchport.umd.edu/pubmed/21219521					Level (Melynk) III
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"The aim of the study was to test the efficacy of sleep care guidelines for controlling night-time noise and improving sleep quality of patients in a surgical intensive care unit."	Quasi-experimental pre/post design	Convenience sampling of surgical patients were recruited from an surgical ICU (SICU) in Taipei Taiwan **Eligible**: 60 patients **Accepted**: 55 patients completed the study and were included in analysis **Control**: 27 patients **Intervention**: 28 patients **Power analysis:** G-power software. The Cohen rule of 0.8 as a large effect size were the parameters used for calculating sample size. Twenty-one participants in each group would be required to have 80% power to detect between group differences	**Control:** The control group received usual care **Intervention Protocol:** Decreasing the noise level and dimming the lights from 22:00 – 05:00; closing the room door at 22:00; diming the room lights to 40 lux; decreasing the telephone ring volume to 40 dB; lower the volume of the bedside monitor/alarm to 50 dB at 2200; check IV fluids and tube feeds and replace if needed to prevent pump alarms; respond to an alarm within one minute; change the timing of chest X-rays from midnight to between 19:00–22:00; change AM lab draws from	**DV: Noise** Noise was measured using a decibel meter. A decibel meter was placed 30 cm away from the head of the bed to measure environmental noise of each patient's room and the other decibel meter was placed at the nursing station. **DV: Sleep Quality** The Sleep in the Intensive Care Unit Questionnaire (SICUQ) by Freedman et al. (1999). Twenty of the 27 questions were used in this study and the Cronbach's alpha of the 20 items was 0.80. A higher the score meant better sleep quality, less sleepiness during day light hours, and less sleep interruptions at night.	**Noise** There was less noise for the experimental than in the control group, monitored both at bedside and the nursing station ($p<0.001$) **Sleep Quality** For the RCSQ, the SEI scores of the experimental group were higher than control group ($p = .047$), 69.3% for control and 72.2% for experimental. The SEI of the experimental group was less than 85% indicating compromised sleep in ICU patients even after guidelines were implemented.

		A t-value of 1.96 was set as the critical value for statistical errors. **Inclusion criteria:** at least 18 years old; having undergone chest, abdominal or other major surgeries. **Exclusion criteria:** having a head injury, seizures, mental disease, hearing problems, alcoholism, current use of a sedative or narcotic, having sleeping problems, and taking sleeping pills on a regular basis **Group homogeneity:** majority of participants were male (67.3%), married (58.2%), with an average age of 50, and an education level greater than elementary school (69.1%). There was no statistically significant difference between the groups regarding demographics or disease characteristics other than previous ICU experience at baseline. Patients in the control group had significantly	05:00 to 06:30; staff conversation volume lowered after 22:00. Two trained and experienced nurses collected the data consistently using the study questionnaires. The questionnaires were read to each participant and the nurse gave appropriate standardized explanations. Study participants were asked to answer each question by themselves on day three of admission to the SICU. Five one-hour teaching sessions were provided to train the nursing staff the study protocol. The training focused on introducing the importance of sleep for ICU patients and how to prevent sleep interruptions from environmental stimuli. A research assistant, using a checklist, evaluated whether the nursing staff implemented the study protocol as prescribed.	The RCSQ was used to measure patient's sleep quality. The RCSQ score can also be converted into an estimation of the sleep efficiency index (SEI). An SEI greater than 85% indicates good sleep quality	SICUQ results show that sleep quality in the ICU was better for the experimental group than the control group (p=.027)

		more previous ICU experience (p = .023)	After five training sessions, the fidelity of implementing the study protocol was 98.6%. A decibel meter was used to monitor noise levels continuously from 22:00 –07:00 at both the bedside and the nursing station of the SICU.		
Citation: 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 intensive care patients. *Anaesthesia*, *69*(6), 540-549. https://onlinelibrary.wiley.com/doi/full/10.1111/anae.12638					Level (Melynk) III
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"We investigated whether the implementation of a bundle of non-pharmacological interventions, consisting of environmental noise and light reduction designed to reduce disturbing patients during the night, was associated with improved sleep and a reduced incidence of delirium"	Quasi-experimental pre/post design	**Setting**: 24-bed adult mixed surgical/medical ICU in a teaching hospital **Total**: 338 **Control group**: 167 patients **Intervention group**: 171 patients **Inclusion criteria**: patients over 18 years of age who spent one or more nights in the ICU	**Control**: Baseline data on environment, sleep, and delirium incidence pre-intervention **Intervention**: Protocol was a multicomponent bundle of interventions designed to be multidisciplinary. It included noise and light reduction, clustering care, decreasing clinician caused sleep disturbance, as well as lessen risk factors for delirium. Staff	**DV: Sleep quality** RCSQ, a validated measure for assessing sleep, was completed by patients each morning during their ICU stay. The SEI index used to estimate the sleep efficiency index (SEI). Shortly after discharge, the Sleep in Intensive Care Unit Questionnaire (SICUQ) was given to the patients who completed the RCSQ This questionnaire allows patients to rate	**Sleep Quality** Increased in SEI, via RCSQ questionnaire, 60.8 before vs 75.9 after ($p < 0.001$). Increase in sleep quality via SICUQ, four before vs seven after ($p < 0.001$) **Noise**

		Exclusion criteria: pre-existing history of sleep pathology, severe visual or hearing impairment, alcohol addiction or illicit drug abuse; dementia, traumatic brain injury, stroke, hepatic encephalopathy; previous discharge from the ICU in this hospital admission; neurosurgical patients; development of delirium at any point during the study (a single positive result on the Confusion Assessment Method for the ICU); having received sedative medications within 24 hours **Power analysis:** No reported papers were published at the time to help generate a power calculation to determine a sample size. Therefore, all appropriate ICU patients were screened for delirium and all patients who met the inclusion/exclusion criteria were asked to	education and training sessions held several times a day. Poster displays throughout clinical and non-clinical areas supplemented the training sessions. Champions were used to help train and promote the protocol. Noise control consisted of closing doors when appropriate and decreasing alarm volumes of bedside monitors and telephones. Eye masks and ear plugs were given to all patients with a Richmond Agitation Sedation Scale (RASS) score greater than -4 (deep sedation). Night-time care activities were done with dimmed lighting where possible and screens were darkened/switched off when not in use. Patient care activities were encouraged to be clustered to reduce the number of individual disturbances. Clocks were placed in each	their overall sleep quality before and during ICU admission, their levels of daytime sleepiness, and potential sleep disruptive factors on a scale of 1–10 **DV: Noise levels** Two CEM DT-8820 environmental meters placed centrally for the during the whole study **DV: Number of awakenings caused by care activities** Nursing staff monitored the number of patient-care activities performed during their shift and the number of times patients were woken as a result of these activities **DV: Incidence of delirium** All patients with a RASS score of less than - 4 were screened by a research team member for delirium using the Confusion Assessment Method for the ICU at 8 a.m., 2 p.m., 6 p.m. and at 2 a.m. if necessary. This is both a sensitive and specific	Noise level was reduced 68.8 dB before vs 61.8 dB ($p = 0.002$) **Number of awakenings caused by care activities and staff interactions** Reduced staff-patient interactions overnight, 33.6 before vs 23.4 after ($p = 0.045$). Reduced number of times patients were woken due to staff interventions, 11 before vs nine after ($p = 0.003$) **Incidence of delirium** Reduced incidence of delirium, 33% before vs 14% after ($p< 0.001$)

		participate. Fifty-nine of these patients (30 before the intervention and 29 after) completed the Richards Campbell Sleep Questionnaire during their ICU admission **Group Homogeneity**: Overall, the baseline characteristics of the two cohorts were similar. There was no difference between the two cohorts regarding median sleep quality before hospital (p = 0.107).	room to allow patients to see the time. Nurses orientated patients every eight hours to place, time, and date. Nurses were reminded during handover to perform protocol activities. Baseline data was collected in June 2012 regarding sleep, the environment, and the incidence of delirium. A 21-day period followed where implementation of the multicomponent bundle of interventions was done and daily staff training sessions were held. Data collection was repeated to evaluate the effect of the intervention bundle (July/August 2012)	tool for detecting delirium	
Citation: Le, A., Friese, R. S., Hsu, C. H., Wynne, J. L., Rhee, P., & O'Keeffe, T. (2012). Sleep disruptions and nocturnal nursing interactions in the intensive care unit. J*ournal of Surgical Research*, *177*(2), 310-31. https://www-sciencedirect-com.proxy-hs.researchport.umd.edu/science/article/pii/S0022480412004696					Level (Melynk) IV
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results

"In our current study, our primary objective was to analyze the frequency and the nature of nocturnal nursing interactions (NNIs) among five ICUs of differing types. We hypothesized that the number and the type of NNIs vary among the different ICU types. Our secondary objective was to identify differences in the proportions of these interactions that could be safely omitted. We hoped that we would be able to use our data to identify best practices that could then be harmonized across different ICUs".	Prospective observational cohort study	Study took place at an academic medical center in Arizona. Five ICUs were included: medical, surgical, cardiothoracic, pediatric, and neonatal. **Accepted**: 200 ICU patients, 40 from each ICU, were enrolled over 51 separate nocturnal time periods. Of those 200 patients, 53 (26.5%) were mechanically ventilated; 12.5% received sedative infusions; and 23.0% received narcotic infusion. **Exclusion criteria**: Patients receiving sedative drips of more than 10 mg/h for Ativan, or 25 mcg/h of propofol and/or narcotic drips of more than 10 mg/h for morphine or 100 mcg/h for fentanyl **Group homogeneity:** The proportion of male patients ranged from	The questionnaires recorded the number, approximate length, and type of NNIs from 22:00 to 06:00 nightly for each enrolled patient. The NNIs were then classified into four groups: patient care activity, nursing intervention, nursing assessment, or patient-initiated contact. The nursing staff indicated which NNIs could have been safely omitted without negatively affecting patient care and thus allowing the patient more time for uninterrupted sleep. The same questionnaires were given to the nursing staff of all units studied	A mixed-effects logistic regression model and a linear mixed-effect model was used to analyze percentages of NNIs and lengths of NNIs that could have been omitted safely after adjusting for the patient's age and gender. Percentages represent proportions and continuous variables as means	The SICU recorded the most NNIs (471; 25.7%). The most common type of NNI was nursing assessment in the PICU and CTICU (158 and 133 respectively), nursing intervention in the MICU (172), and patient care activity in the SICU (224). Overall, among all five ICUs, the most common type of NNI was nursing assessment, with an average of 123 such interactions. Study showed that older patients tended to have more nocturnal interactions with no gender differences. The authors concluded that the ICU environment can be made more advantageous to sleep by rescheduling non-essential patient care activity to daylight hours and clustering NNIs to minimize sleep disruptions. In addition,

		35.0% in the MICU to 57.5% in the NICU and CTICU. The average age of all study patients was 35 years old.			routine nighttime care (linen changes, bathing, medication administration, routine radiology testing, and blood draws) can be deferred or rescheduled to daylight hours where possible
Citation: Karaman Özlü, Z., & Özer, N. (2017). The effect of enhancing environmental factors on the quality of patients' sleep in a cardiac surgical intensive care unit. *Biological Rhythm Research*, *48*(1), 85-98. https://www.tandfonline.com/doi/full/10.1080/09291016.2016.1232462?scroll=top&needAccess=true					Level (Melnyk) III
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
The aim of this study was to investigate the effect of enhancing environmental factors on the duration and quality of sleep among patients in a cardiovascular surgery intensive care unit (CSICU)	Quasi-experimental pre/post design	Study conducted in the CSICU at a research hospital in Turkey **Total**: 100 patients **Control group**: 50 patients **Intervention group**: 50 patients **Sampling Technique**: Nonprobability sampling to either experimental or the control group. No randomization performed **Power analysis**:	**Control**: Demographic and sleep variables obtained from control group. Environmental factors that negatively affect nocturnal sleep in the CSICU form and RSCQ were administered to the control group. **Intervention**: A researcher informed the patient the purpose of the study and verbal consent was obtained. The next night at 21:00, the researcher turned	**DV: Environmental Factors That Negatively Affect Nocturnal Sleep in the CSICU** A 16-item form was used to determine the environmental factors that may interrupt nighttime sleep. Yes/no statements included: was the bed or pillow uncomfortable; were the linens dirty or untidy; was there a noticeable odor or too much light; was the room hot, cold, or noisy; were there alarms, ringing phones, or voices of the personnel, visitors or	**Environmental factors**: Fewer patients in the experimental group answered "yes" to eight of these items than in the control group. Authors say this result is statistically significant. Individual p-values are given for each of the 16 items, but no overall p-value for "environmental factors that negatively affect nocturnal sleep in CVICU" stated in article. The negative environmental factors that were amended in

		The power analysis results concluded the study would be 99% with .05 alpha level and 95% reliability levels with 50 or more participants. Thus, a total of 50 patients were assigned to the control or the experimental group **Inclusion criteria**: 18 years or older; having undergone planned open-heart surgery; no post-operative complications; having only mild pain; using the same drugs as part of their medical treatment; having undergone extubation in the CSICU on the day of their operation; having spatial and temporal orientation; being conscious and able to communicate; being hospitalized for two nights; having scored 15 points on the Glasgow Coma Scale and 0–6 points on the APACHE II scale.	down the telephone volume, turned off the television, did not allow unnecessary coming and going into/out of the unit, and discouraged non-essential conversations. Backup fluids were placed next to the intravenous pumps, suction units were turned off, dirty linens were replaced, and bedding was kept smooth. Patients room lights were turned off and hallway lights were dimmed. The unit had semi-private rooms, therefore the curtain between beds were kept closed for privacy.	other patients that were disturbing; was nursing care performed during sleeping hours **DV: Quality of sleep** The six item RCSQ questionnaire was used to assess quality of sleep. In the present study, the Cronbach α reliability coefficient was 0.91.	the experimental group included comfort of the bed and pillow, odors, too much light or noise, and receipt of care **Sleep Quality**: The RSCQ score indicated that the quality of sleep in the control group – mean (SD) – was 44.43 (12.86) and in the experimental group was 66.57 (7.12), a difference that was statistically significant ($p < 0.001$)

		Exclusion criteria: not agreeing to participate in the study; a history of sleep disorders; having interrupted sleep in the CSICU because another patient received emergency care during sleep hours; unable to say how many hours they slept in the CSICU **Group Homogeneity**: No statistically significant differences in demographic variables between the groups were found ($p > 0.05$)			
Citation: Faraklas, I., Holt, B., Tran, S., Lin, H., Saffle, J., & Cochran, A. (2013). Impact of a nursing-driven sleep hygiene protocol on sleep quality. *Journal of Burn Care & Research*, *34*(2), 249-254. https://academic.oup.com/jbcr/article/34/2/249/4565879					Level (Melnyk) III
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"The purpose of this study was to evaluate the impact on sleep quality of a nursing-driven sleep hygiene protocol (SHP) instituted in a single	Quasi-experimental pre/post design	**Setting**: single burn-trauma intensive care unit **Total patients**: 131 patients	**Control**: Standard burn trauma ICU care. Specifics of this were not explicitly stated in article **Intervention:**	**DV: Sleep quality** Sleep quality was measured using the RCSQ. Investigators who were not part of the patient's care	Comparison analysis was performed for each of the following subgroup dyads: burn vs soft-tissue injury, acute vs non-acute injury, patients with a

burn-trauma intensive care unit"		**Control group**: 81 patients **Intervention group**: 49 patients **Inclusion criteria**: Patients who were not delirious, who were able to respond verbally, and had not received general anesthesia were approached to participate in the survey **Power analysis**: no power analysis stated in study **Group Homogeneity**: Acute and reconstructive burn admissions constituted 60% of the survey participants. Most patients were men. Post survey patients were more likely to be acute admissions, older, and more frequently used sleeping pills at home.	SHP is designed to minimize environmental stimuli and limit disruptions during the night for stable patients. Written orders to not disturb the patient for vital signs, lab draws, or clinician pre-rounding between midnight and 6 am. Patients were asked what their normal night-time routines were and tried to provide consistency with that routine. Decreased environmental stimuli included closing patient doors, turning lights and TVs off if appropriate, reviewing all intravenous pumps and preventing alarms. Evening wound care was done by 23:00. Visitors were asked to limit visitation after 23:00. Patients were encouraged to limit caffeine intake after 15:00.	team administered the survey. The RCSQ was administered from May to September 2010 prior to implementation and the post protocol survey was administered from January to August 2011. Patients may have been surveyed multiple times but analysis includes only the first survey response from each patient. **DV: Did anything bother the patients during the night?** An open-ended question where alarms, noise, lab draws, and dressing changes were combined into one clinician disruption category.	history of mental illness vs those with no mental illness history, and patients with sleep problems prior to admission vs those with no sleep history issues. Pre and post comparison analysis for each subgroup completed as well. **Statistical Methods**: Every reason listed in response to the open-ended question, "Did anything bother you during the night" was analyzed as a separate variable using Chi squared test. Wilcoxon rank-sum test was used for continuous variables. Fisher's exact test was used for any comparisons with sample sizes less than 10. A $p<0.05$ was considered significant. **Clinician disruption:** Post survey patients complained significantly less about clinician disruption than

					pre survey patients (p = 0.012). Post survey patients reported falling asleep faster than pre patients (p = 0.022) **Sleep Quality:** Subgroup analysis: Non-acute post survey group endorsed a deeper level of sleep than the pre group (p = 0.11). Post patients with mental illness were more likely to fall asleep faster than pre patients (p = 0.042). Patients with reported sleep difficulties prior to admission was the subgroup showing the most change between pre and post protocol intervention. A significant improvement in falling asleep quickly and being able to return to sleep if awakened post protocol was found (p = 0.002).
Citation: Knauert, M. P., Redeker, N. S., Yaggi, H. K., Bennick, M., & Pisani, M. A. (2018). Creating Naptime: An Overnight, Nonpharmacologic Intensive Care Unit Sleep Promotion Protocol. *Journal of Patient Experience*, *5*(3), 180–187. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6134539/					Level (Melynk) III

Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
"Our objective is to describe the development, pilot implementation, and revision of a medical ICU sleep promotion protocol"	Cohort study	This study took place between August 2013 and June 2013 in a medical intensive care unit in an academic tertiary medical center. The patient-nurse ratio is 1:1 or 2:1. **Accepted**: 26 patients. Average age of patients was 62.3. **Group Homogeneity**: Twenty five percent of patients had sepsis, 28% had acute respiratory failure, 34% were intubated, and 74% were on vasopressors. Mean length of stay was 4.1 (SD 2.9) days. *Naptime* enrollment was agreed upon by the primary team and bedside nurse in all cases.	Control: Currently, there is a hospital wide quiet time protocol from 23:00 to 06:00 that includes dimming hallway lights and limiting overhead pages. On admission, patients receive a quiet pack that includes headphones, earplugs, eye masks, and an explanation card emphasizing the importance of sleep. Workflow by pharmacy, laboratory, and environmental services are modified during the hospital wide quiet time to minimize environmental disturbances. Intervention: a multifaceted, nonpharmacologic sleep promotion intervention called	Nonurgent lab draws and urgent or timed critical care activities were the most frequent reasons for protocol violation. A totally uninterrupted four hour period was difficult to achieve but interruptions can be minimized to a significant degree. Participation of all stakeholders and frequent protocol re-assessment are needed for efficacious adoption of an overnight rest period.	Survey responses indicated the following estimates of the number room entries: "None" 8%, "1-2 times" 21%, "3-4 times" 38%, and "5 or more times" 33%. Urgent or timed critical care activities were the most frequently cited reason for room entrance (58%).

		Power analysis: not available	*Naptime* was developed in conjunction to the hospital wide protocol to help address ICU sleep disruption. Naptime includes a four hour sleep window (00:00 to 04:00) with bedside nurses as gatekeepers to minimize in-room disturbances during these hours, clustering time sensitive or frequent care, and rescheduling routine care that falls in the window. A checklist of care activities that should be done before *Naptime* was developed to assist with implementation and standardization.		
Citation: Brito, R. A., Viana, S. M. D. N. R., Beltrão, B. A., de Araújo Magalhães, C. B., de Bruin, V. M. S., & de Bruin, P. F. C. (2020). Pharmacological and non-pharmacological interventions to promote sleep in intensive care units: a critical review. *Sleep and Breathing*, *24*(1), 25-35. https://link.springer.com/article/10.1007/s11325-019-01902-7					Level (Melynk) I
Purpose/Hypothesis	Design	Sample	Intervention	Outcomes	Results

"Although it is generally recognized that poor sleep is common in the intensive care unit (ICU), it is still unclear which interventions can effectively improve sleep in this setting. In this review, we critically analyze the various pharmacological and non-pharmacological measures that have been proposed to tackle this problem."	Systematic Review of mostly randomized control trials	A search was conducted using the terms "Sleep" and "Intensive Care Unit" in the following databases: Medline, the Brazailian Virtual Library in Health (ILACS & BNDEF) and SciELO. Articles that included pharmacological and non-pharmacological interventions to promote sleep in adult ICU's or simulated environments were included. **Eligible studies:** 1,921articles **Excluded:** 1869 **Included**: 41 articles (28 RCT, 13 are a mixture of quasi-experimental & Non-random prospective)	**Control:** Conventional Care **Non-pharmacological interventions included**: modes of ventilation; mechanical ventilatory type; reduce noise and lighting, eye masks, earplugs, music, quiet time, acupuncture, aromatherapy, relaxation, guided imagery, bundles that included reducing noise and lighting, bundles that included eye masks, earplugs, music, and a pharmacological method **Pharmacological interventions included**: melatonin (1, 6, or 10 mg), flunitrazepam bolus, propofol infusion, dexmedetomidine infusion **Combined intervention**: eye mask, earplugs, melatonin 3 mg	**DV:** Improved Sleep for adult ICU patients	Use of eye masks, earplugs, bundles to reduce noise and lighting, clustering care, oral melatonin, & dexmedetomidine infusion can improve sleep in the ICU. Assist control ventilation is shown to be the most beneficial for sleep quality.

Table 2

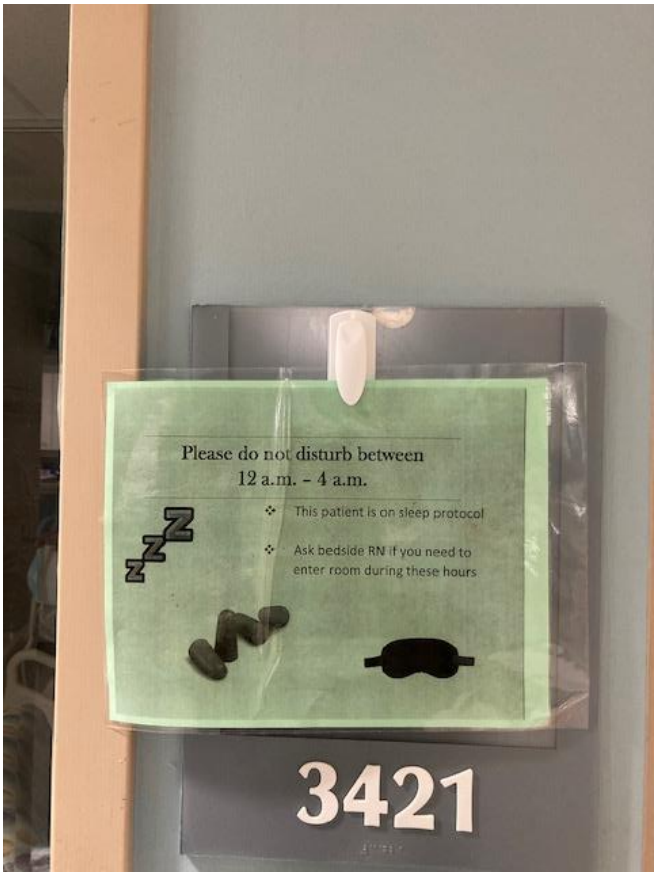
Synthesis Table

Evidence Based Practice Question (PICO): Does a multicomponent non-pharmacological sleep protocol improve sleep in the intensive care unit patient?			
Level of Evidence	**# of Studies**	**Summary of Findings**	**Overall Quality**
I	**1**	There are both pharmacologic and non-pharmacological measures available to promote sleep in the ICU setting. Non-pharmacologic bundles that include eye masks, ear plugs, noise reduction, and clustering care work well. Melatonin and night time dexmedetomidine infusions are good pharmacological agents. Assist control ventilation mode improves sleep quality the most compared to other ventilation modes.	B, there are many articles included in this systematic review, many of which are randomized control studies, and many use a subjective sleep quality rating tool like the RCSQ. Limitations include small sample sizes, heterogeneity in patient profiles, and use of objective sleep evaluation techniques which may introduce bias. Risk of a confounding variable such as an unpredictable sleep environment such as that of an ICU setting is a possibility as well.
II	**1**	Panel of 32 international experts, four methodologists, and four critical illness survivors recommended hospitals to have a sleep promoting multicomponent protocol for critically ill adults. Protocol components of studies included in evidence review included using ear plugs and eye shades, relaxing music, clustering care, and early mobilization.	C, the highest quality evidence were included in this clinical practice guideline. The sleep protocol section of the practice guideline included evidence from four publications, one randomized control trial, and three observational studies. The panel stated that the overall quality of the evidence is low due to the risk of confounding, bias, and imprecision but that the risk of harm was low to the sleep protocol interventions.
III	**5**	Li et al., (2011), Patel et al., (2014), Karaman Ozlu et al., (2017), and Faraklas et al., (2013) found improved sleep quality post multicomponent sleep protocol implementation. Same measurement tool (RCSQ) was used in all studies to measure sleep quality. The two studies that measured sound levels found a decrease in sound level (Patel et al., 2014; Li et al., 2011). The two studies that measured and/or counted factors that cause sleep disturbances found a decrease in these factors (Karaman Ozlu et al., 2017; Faraklas et al., 2013). The Knauert et al., (2018) study showed that nighttime interruptions can be minimized significantly if a sleep protocol	B, Li et al., (2011), Patel et al., (2014), Karaman Ozlu et al., (2017), and Faraklas et al., (2013) studies used the RCSQ to evaluate quality of sleep, which has been validated against polysomnography, the gold standard for sleep quality measurement. Improved sleep results reached statistical significance, studies had a sample size of 55 patients or greater, and there was group homogeneity between pre and post intervention groups in all studies. All studies included a control group, inclusion and exclusion criteria, or did a subgroup analysis to strengthen internal validity and decrease confounding variables. C, study by Knauert et al., (2018) had a small sample size (26), no control group and did not use a standardize tool to evaluate patient's perception of *Naptime*. However, it included a comprehensive literature review, a checklist for

		is implemented in the ICU setting. A sleep protocol must be individualized for the patient and unit needs.	standardization of activities to be done before *Naptime*, and reasonable conclusions were drawn that clustering care and re-timing routine medications and interventions reduces frequency of night time disruptions.
IV	**1**	In the Le et al., (2012) article, nursing assessment was found to be the most common nocturnal nursing interactions and where feasible, interactions can be clustered, postponed or delegated to daylight hours to reduce sleep interruption.	C, Low quality as this is an observational study with convenience sampling. Bias may have been introduced due to willingness of nursing staff to assist with the research. However, study included in evidence review as it provided validation that nighttime assessments can be minimized or even eliminated in patients with continuous monitors in place and nurses have the power to reduce sleep disruptions by clustering care at night.

Figure 1

Sleep Sign



Note. Laminated sign hung next to the door of a patient on sleep protocol to alert staff that patient is on the protocol.

Figure 2

ICU Sleep Protocol

The ICU sleep protocol provides an undisturbed sleep window between the hours of 12 a.m. – 4 a.m. for *stable* and *alert* patients who do not require hourly assessments. During night shift rounds, ask if frequency of assessments can be changed making it possible to place patient on protocol! Add a sticky note and a nursing communications order stating "patient on ICU Sleep Protocol, do not disturb between 12 a.m.- 4 a.m." The protocol does not limit emergent, urgent or time sensitive care. Unit standards and your clinical judgment always come first.

Before midnight, the following activities can be done for patients on sleep protocol

- Nursing assessment, toileting, & bathing
- Reschedule medications that will be due during the sleep window if possible
- Ensure IV fluids will not run out during sleep window
- Q4 hour blood sugar checks can be done right before midnight
- **Offer patients eye masks and ear plugs**
- Place call bell within reach
- **Let patient know they are still being monitored and will be left alone to sleep for four hours.**
- **Serve as gatekeeper to prevent unnecessary in-room disturbances**
- **Place "Sleep Protocol" sign on patient's door**

After 4 a.m.

Collect blood for A.M. labs

Blood sugar check if needed

Morning chest x-ray if ordered

Ask patient their sleep quality during sleep window and chart in Epic under psychosocial assessments

Chart what disturbed the patient if applicable

***We do many of these things already but the bolded items are new!**

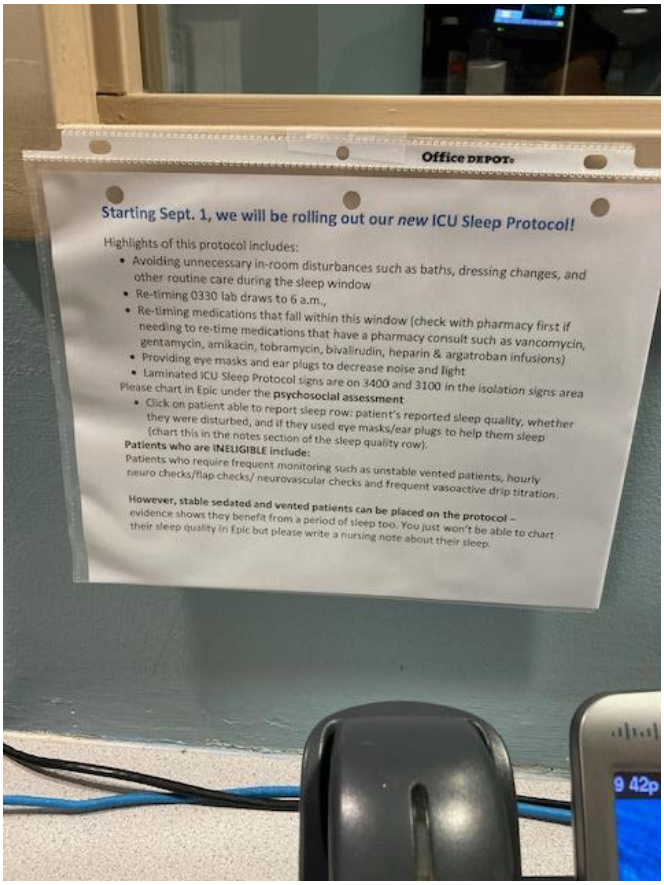
Avoid between 12 – 4 a.m.	Permitted between 12 – 4 a.m.
Routine bathing, changing linens, wound care, & dressing changes	Urgent laboratory or diagnostic studies
Routine patient assessment	Urgent procedures
Bedside supplies, trash, laundry, and cleaning	Urgent medications
Scheduled and PRN medications with dose intervals greater than 4 hours	Patient call light response
Routine or non-urgent laboratory or diagnostic studies	All emergency care required by patient
Blood sugar check & insulin sliding scale coverage (perform at 11:30 pm and 4:30 a.m.)	

References: Delvin et al., (2018); Knauert et al., (2018); Patel et al., (2014)

Note. Components of the ICU sleep protocol

Figure 3

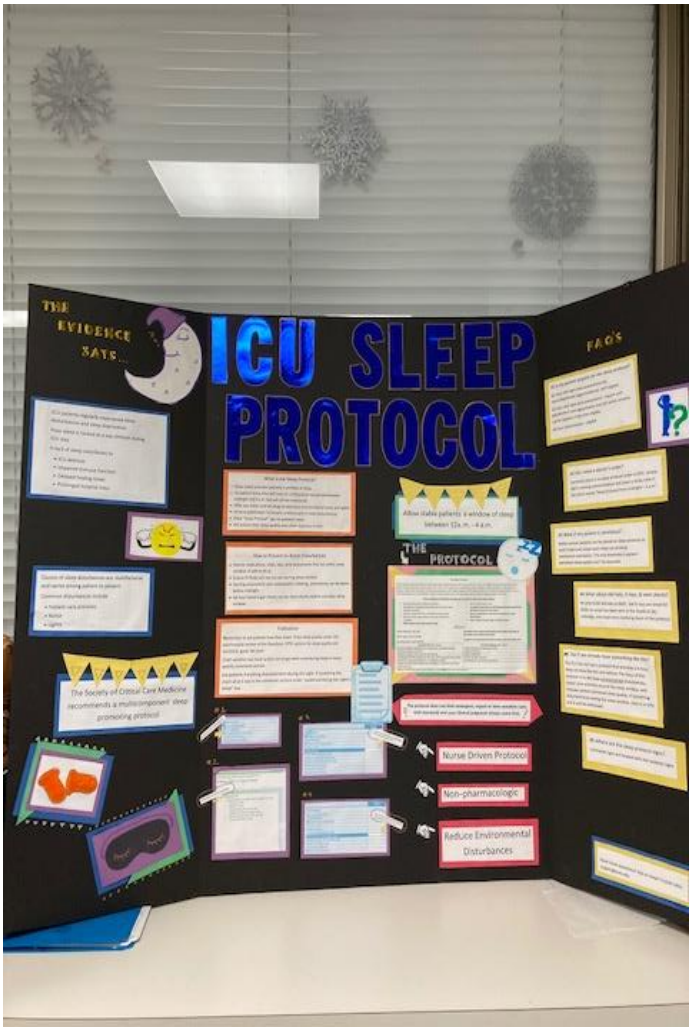
Unit Reminder Flyers



Note. Flyer placed throughout unit highlighting the main aspects of the sleep protocol

Figure 4

Education



Note. Educational poster presentation located in staff break room

Appendix A

Sleep Protocol In-Service Sign in Sheet

Name	Date

Appendix B

Sleep Protocol Data Collection Tool					
Pseudo identifier	Was patient disturbed between the hours of Midnight – 4 a.m.? (Epic Data) (Options: Yes or No)	If patient was disturbed, what was the reason for it? (Epic Data) (Free text box in Epic - options can include: noise, lights, medication administration, repositioning and/or bathing by bedside staff, phlebotomy blood draw, morning chest x-ray, and/or pain)	Patient's stated sleep quality (Epic Data) (Options: Excellent, Good, Fair, Poor)	Did patient receive eye mask and ear plugs? (Epic Data) (Options: Eye mask and ear plugs were used, only eye mask was used, only ear plugs were used, neither were used)	Compliance with charting sleep quality (Charted, Not charted – RN reminded to chart, Not charted)
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					

Appendix C

Sleep Protocol Patient Identifier Tool

Pseudo-identifier	Patient Information (Age & Diagnosis)
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
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12.	
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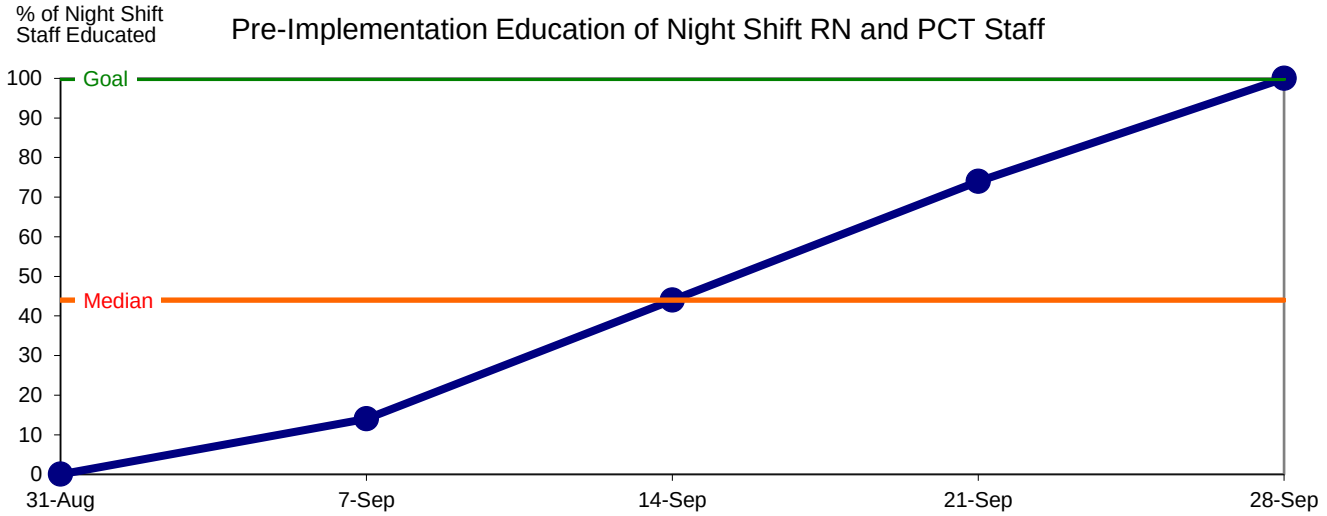
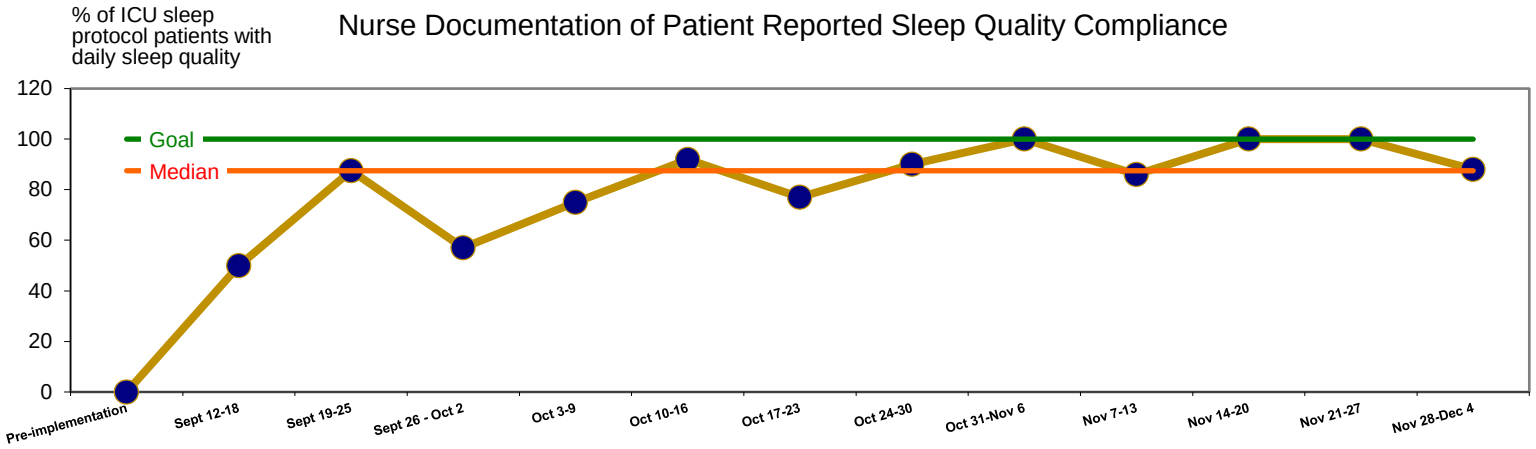
20.	

Appendix D



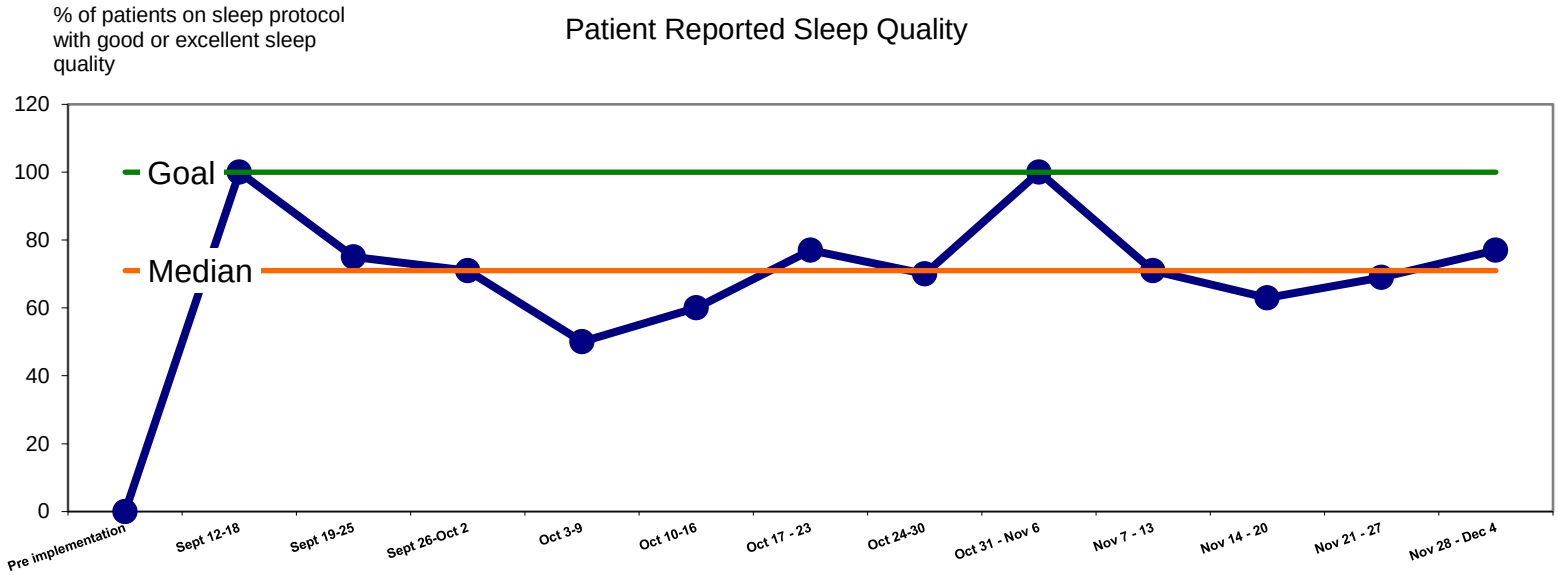
Appendix D. Run chart showing percent of night shift nurse and patient technicians educated during the pre-implementation period of August 31, 2020 – September 28, 2020. Thirty-four staff members educated in total. Median value is 44%.

Appendix E



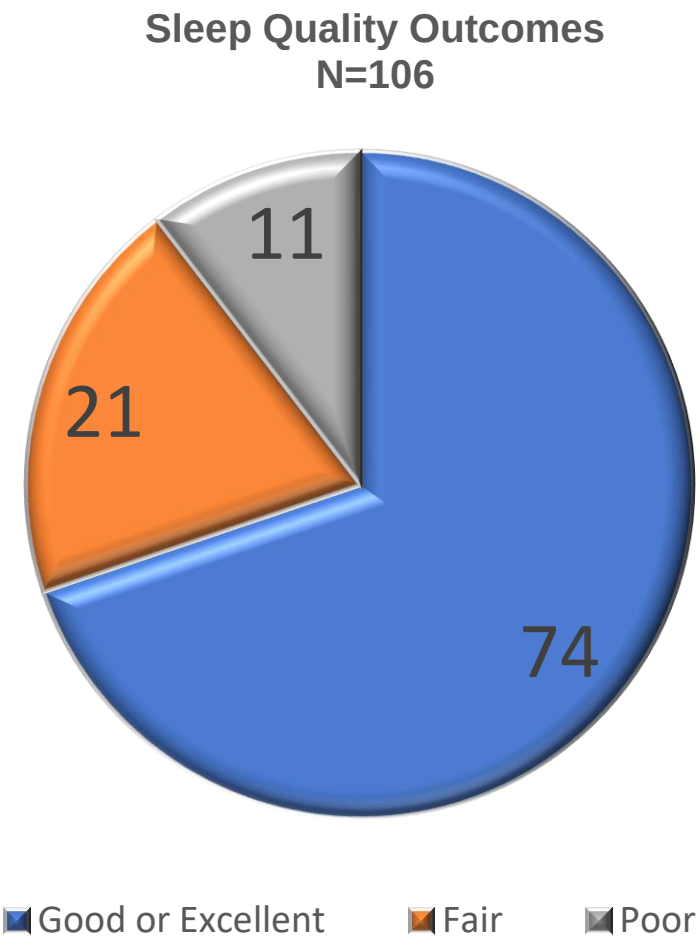
Appendix E. Run chart showing the percent of nurses documenting patient sleep quality for patients placed on sleep protocol. Average percent of nurses who documented sleep quality is 84%. Median value is 88%,

Appendix F



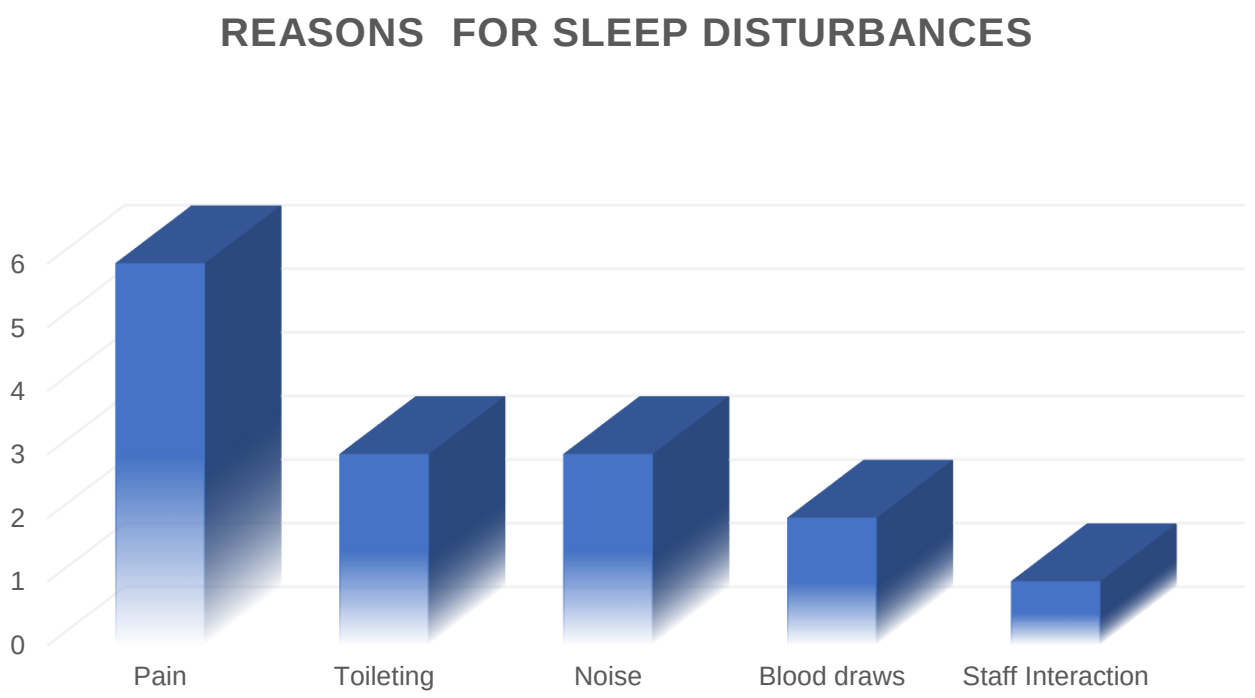
Appendix F. Run chart showing percent of patients placed on sleep protocol who rated their sleep quality as good or excellent. Median value is 71%.

Appendix G



Appendix G. Pie chart of sleep quality outcomes. A total of 106 sleep observations were performed. Seventy-four observations were rated as good or excellent. Twenty-one were rated as fair. Eleven were rated as poor.

Appendix H



Appendix H. Sleep disturbances are multifactorial. Among the patients who complained of being disturbed during the night, six patients said the reason for disturbance was due to pain, three said it was due to having to use the bathroom, three said it was because of noise, two said it was due to morning labs, and one said it was due to staff interaction.