

Sleep hygiene Protocol to Improve Sleep and Delirium  
In a Surgical Intensive Care Unit

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### Abstract

**Background:** In a special report published in 2015 by the American Geriatrics Society (AGS), a postoperative delirium expert panel was chosen and gave recommendations for best practice for the reduction of delirium. The Institute of Medicine supported the following ten behavioral and nonpharmacological strategies for prevention of delirium:

1. Sensory enhancement (ensuring glasses, hearing aids, or listening amplifiers)
2. Mobility enhancement (ambulating at least twice per day if possible)
3. Cognitive orientation and therapeutic activities (tailored to the individual)
4. Pain control with scheduled acetaminophen if appropriate
5. Cognitive stimulation (if possible, tailored to the individual's interests and mental status)
6. Simple communication standards and approaches to prevent the escalation of behavior
7. Nutritional and fluid repletion enhancement
8. Sleep enhancement (daytime sleep hygiene, relaxation, non-pharmacologic sleep protocol, and nighttime routine)
9. Medication review and appropriate medication management
10. Daily rounding by an interdisciplinary team to reinforce the interventions

The best practice statement was reviewed by both surgical and nonsurgical experts in the field of geriatric medicine and surgery and was accepted. The best practice statement is a call for change in the care of post-operative patients 65 years and older. The AGS Geriatric for Specialist Initiative (AGS-GSI) recognized delirium as the most common surgical complication in older adults, occurring in 5% to 50% of older patients after an operation. In the United States more than one-third of inpatient surgeries are performed on patients 65 years or older (Hall &

DeFrances, 2010) making it imperative that clinicians caring for surgical patients understand optimal delirium care. Delirium is a serious complication for older adults because an episode of delirium can begin a cascade of deleterious clinical events, including other postoperative complications, prolonged hospitalization, loss of functional independence, and reduced cognitive function and death (Robinson & Raebirm, 2009). Cost to patients includes impact on long-term cognitive ability and loss of preoperative quality of life. Furthermore, cost to the health care system is estimated at \$150 billion annually (Leslie & Marcantonio, 2008). This proposal will examine the implementation of the eighth recommendation which is the behavioral and nonpharmacological strategies for prevention of delirium; sleep enhancement with the introduction of a best practice sleep hygiene protocol (appendix I).

## **Section One: Nature of the Problem**

### **Introduction to the Problem**

Advances in healthcare allow for survival of patients who have catastrophic injuries and life-threatening disease processes. These events often result in hospitalization within an Intensive Care Unit (ICU) setting. Unfortunately, the treatments needed for patients to survive within the ICU can potentially impede their sleep cycle contributing to a diagnosis of delirium. Delirium increases the patient's length of stay, and also results in an increased cost of medical care (\$150 billion annually) due to long term cognitive disabilities (Stevens, 2007). In order to effectively decrease episodes of delirium, sleep quality and quantity must be improved (Mistraletti, 2008). One strategy to improve sleep is the implementation of a best practice for the reduction of delirium recommended by the Institute of Medicine (IOM). According to an article by Phillips (2014), he defines sleep hygiene as "a set of practices, habits, and environmental influence that promotes quality sleep" (p.22). This Evidence Base Practice (EBP) project will look at the eighth recommendation of the IOM ; which is enhancement of sleep. Quality sleep requires a minimum increment of 90 minutes of uninterrupted sleep. To provide environments conducive to sleep, the ICUs have implemented 2- hours of "quiet" hours during the day and a sleep period at night, starting at midnight to 0400 a.m. to coincide with the natural circadian rhythm (Dennis & Lee, 2010).

### **Background**

Before delirium can be effectively treated, an understanding of what caused a change in the normal process of the body is needed. Pain has been documented as one of the leading causes of the intrusion in the sleep cycle often resulting in episodes of delirium. Critically ill patients are

are the greatest risk for delirium due to required around the clock care resulting in the disruption of sleep. Delirium impedes the patient's sleep which in turn decreases the body's ability to regulate the inflammatory process, glucose regulation and increases the amount of cortisol released. The inability to regulate these processes increases the rate of mortality/morbidity associated critical illness (Seeling, 2009).

Limited pharmaceutical agents exist that can decrease the episode of delirium. Antipsychotic agents are commonly used especially for delirium accompanied with agitation. The Society of Critical Care Medicine (SCCM) recommends the use of Haloperidol (Stephkovitc, 2008), however, there is based on limited data in a mixed ICU population (Milbrandt & Kersten, 2005). A more recent study by Pun & Boehm (2001) did not find the use of Haloperidol to improve the number of days alive nor did the use decrease the number of days on a mechanical ventilator. Mortality rates were also not decreased by the use of Haloperidol (Pun & Boehm, 2001). Quetiapine, another atypical antipsychotic has shown equivalent success in the treatment of delirium with haloperidol, while having fewer side effects (Devlin & Roberts, 2010). Both Quetiapine and Haloperidol may be considered an add-on therapies to aid in the reduction of delirium.

The American College of Critical Care Medicine also recommended the use of a standardized assessment tool for the diagnosis of delirium. The Richmond Agitation Sedation Scale (RASS) in conjunction with the Confusion Assessment Method-Intensive Care Unit (CAM-ICU) are the recommended tools. The confusion assessment method of the CAM-ICU is one of the most commonly used, reliable, and valid tools to diagnose delirium in a time-efficient manner. The CAM-ICU (Inouye, 1994), was designed to allow non-psychiatric clinicians to diagnose delirium

quickly and accurately following brief formal cognitive testing. The CAM-ICU instrument (appendix A) assesses, and the presence, severity and fluctuation of nine delirium features and the diagnostic algorithm is based on four cardinal features of delirium. The CAM-ICU demonstrates sensitivities from 94-100%, specificities from 90-95%, positive predictive accuracy of 91-94%, negative predictive accuracy of 90-100%, interrater reliability ranging from 0.81-1.00; and convergent agreement with other mental status tests including the Mini-Mental State Examination (MMSE) (Folstein 1995) at diagnosing delirium. Due to its accuracy, brevity, and ease of use by clinical staff, CAM-ICU has become the most widely used standardized delirium instrument for clinical and research purposes over the past 16 years.

In addition to the CAM-ICU delirium assessment evaluation The Richmond Agitation-Sedation Scale (RASS) is used to assess a patient's level of arousal using standardized, validated arousal scales, known as sedation-agitation scales. The Richmond Agitation-Sedation Scale (RASS), developed by Sessler and others, (Sessler & Gosnell, 2002), helps with the diagnosis of stupor, which is a gray zone between coma and alertness, it helps with the diagnosis of delirium by determining the patient's wakefulness. When the two instruments are used congruently there is a high interrater reliability (98%), reproducibility, and the potential bias are minimized (Khan & Guzman, 2012).

## **Sleep Hygiene**

Sleep is important for the healing process, yet sleep deprivation in acutely ill patients remains a common issue within hospital settings (Fontana & Pittiglio, 2015). Physical illness, emotional stress, environmental changes, nonoptimal lighting and high environmental noise are factors that can cause sleep deprivation in hospitalized patients (Fontana et.al., 2015). Creating a quiet

hospital environment is one component in promoting and improving the quality of sleep for hospitalized patients (Fontana et al., 2015). However providing a restful environment is particularly challenging for patients who are in the ICU setting. The frequent alarms, in addition to constant nursing and medical interventions make uninterrupted sleep almost impossible. Patients in the ICU, because of their medical acuity and decreased ability to cope with stress, are at a high risk for delirium, a condition aggravated by sleep deprivation (Gairard & Jackson, 2010). As many as 73% of Surgical Intensive Care Unit (SICU) patients may be affected by delirium (Girard, et al., 2010). Delirium is associated with an increase in mortality (17% increase in those patients diagnosed with delirium) and an increase length of stay by three days in the hospital (Klouwenberg & Zaaldelete, 2014). In addition, patients who develop delirium in the ICU may have cognitive impairment for up to one year after hospitalization (Gairard, et al., 2010). In 2013 the Society of Critical Care Medicine Clinical Practice Guidelines for Pain, Agitation and Delirium (PAD), recommended “promoting” sleep in adult ICU patients to optimize patients’ environment by clustering or bundling care (Barr & Fraser, 2013). Flannery and Oyler (2016) performed a synthesis of sleep-delirium research within the ICU setting. These researchers noted that eight of the ten studies demonstrated significant improvements in delirium or confusion when the patient’s sleep was improved. Furthermore, four of the studies that were reviewed evaluated sleep bundles demonstrating improvement in delirium.

## **Delirium**

Delirium is defined as a sudden, fluctuating and usually reversible disturbance of mental functioning resulting in a lack of sleep, and circadian rhythm melatonin disorder (Berian, 2017). In addition, if there are changes in environment, for example frequently changing physical locations, and a lack of natural daylight, the syndrome of delirium is increased and may result in agitation (Lorenzo, 2012).

Unfortunately, critical care illness leading to an Intensive Care Unit (ICU) admission creates and proliferates a syndrome of sleep loss, poor sleep quality and circadian rhythm disturbances which in turn leads to delirium (Knauert, 2014). Delirium has been shown to increase morbidity (Van den Boogarrd & Kamper, 2017) and mortality (Ely & Shintani, 2014) in the ICU population. Episodes of delirium are associated with increased risk of clinical issues including longer mechanical ventilation, aspiration, nosocomial pneumonia, decubitus ulcers, and venous thromboembolic disease (Seeling & Staus, 2009). Long term consequences of delirium increase the disruption on the immune, respiratory, muscular and endocrine systems (Dinges & Lim, 2007); (Meier-Ewert & Ridker, 2004). This results in neuropsychological deficits thereby leading to aggressive behavior (Jackson, 2010). Staff morale is affected resulting in reduction of job satisfaction that is experienced when attempted high quality care is halted due to a patient's agitation and what may be perceived by the staff as non-complaint behavior (Ugras & Babayigit, 2015). Therefore the improvement of sleep for the ICU patient is an important clinical goal that can have a positive impact on patients by potentially decreasing long term cognitive impairment and the length of stay in the ICU (Klouwenberg, 2014).

### **Purpose of the Project**



The purpose of this EBP was to implement a best practice sleep hygiene protocol to decrease the episodes of delirium within a surgical ICU.

The project objectives were:

1. Maintain Confusion and Assessment for the Intensive Care Unit (CAM-ICU) negative on those patients who are scored as negative on admission (appendix A).
2. Maintain patients with a RASS of 0 to +2 ( no delirium)
3. Improvement of the state of delirium for patient scoring below 0 on the RASS, move from a negative to positive RASS score.
4. Improvement of CAM-ICU score (no longer scoring as delirious)

### **Setting**

The proposed project did take place in an Adult Surgical Intensive Care Unit (SICU) located in a university affiliated academic healthcare organization that admits and cares for approximately 7751 patients per year (The Ohio state University Hospital Patient Days by Nursing Unit).

Based on the average daily census of 21 patients there was approximately 225 patients in the SICU who did receive the sleep hygiene standard of care. The patients who were considered were non-intubated with an expected length stay (LOS) of five days or greater. The project did consist of a sleep hygiene protocol which allows for a two hour quiet period from 2 p.m. to 4 p.m. as well as sleep hours from midnight to 4 a.m. with limited interruptions.

## **Section Two: Review of the Literature**

### **Clinical practice problem statement**

The clinical practice problem that this DNP project did address was: In the adult Surgical Critical Care population (P), how does the creation of a nurse driven sleep hygiene protocol (I), compare to no sleep hygiene protocol (C), improve delirium (O), over two months (T) ?

### **Evaluation/Summary of the evidence from the literature**

The key words used for the literature search were: sleep, sleep disruption, delirium, sleep deprivation, ICU delirium and long term cognitive changes (appendix B). Several databases were used to search to the literature: including Cumulative Indexes to Nursing and Allied Health Literature (CINAHL), PubMed, Cochrane Review and Ebrase. The publication years included in the search were 1992 to present; with key words; sleep hygiene, decreasing the episodes of delirium and implementing a nurse driven protocol. The articles and studies reviewed were focused on adults and complete publications only. The exclusion criteria were level of evidence below V. The literature search resulted in 45 articles of which 20 were duplicate, 10 did not have relevant material, which left 15 articles for use (appendix C). The Rapid Critical Appraisal form from the Center for Transdisciplinary Evidence-based Practice was used for review of all articles.

### **Critical appraisal of the evidence**

The review of the literature shows that the diagnosis of delirium has been a concern of healthcare providers due to the long term cognitive effects on patients. This was first noted by Treloar and Macdonald in 1997, Inouye in 1998, Rockwood and Cosway in 1999, Leslie and Marcantonio in 2005, and Jackson in 2006, all looking for a best practice for the reduction of

delirium. A higher morbidity (17%), a higher mortality (17%), and a longer length of stay (three days) in the hospital (Klouwenberg & Zaal, 2014) were noted in the intensive care unit. There was also noted deterioration in the cognitive processes and a higher cost of treatment (\$150 billion annually) linked to delirium (Stevens & Nyquist, 2007).

The review of the literature revealed that the development of delirium has a multi-factorial predisposition. Van Pompaeyab-Marieke et al. (2009), Aldemir, Oden et al. (2009) and Klouwenberg et al. (2014) reviewed the evidence examining both modifiable and non-modifiable factors. The common thread was to reduce the modifiable facts to have better outcomes related to delirium. Van-Pompaeyab-Marieke et al. (2009) ranked non-modifying factors such as dementia, respiratory disease, age and alcohol abuse as causing a patient's a predisposition to delirium. Aldemir (2001) presented the following modifiable factors tight glucose control, and reduction of sleep deprivation. The evidence presented by Aldemir, Oden, et al. (2009) and Van Pompaeyab-Mariek et al. (2009) revealed that there was also predisposing factors associated with delirium. The factors they discovered were the same as those by Van Pompaeyab-Marieke with the addition of nutritional compromised, burns and traumas.

Klouwenberg et al., (2014) examined a prospective cohort and also found both modifiable and non-modifiable factors effect delirium. Their work continued to support the concept that reducing the modifiable risk factors improves outcome. The study by Klouwenberg et al. (2009), they too looked at the delirium diagnosis using the Richmond Agitation and Sedation Scale (RASS) and the Confusion Assessment Method-Intensive Care Unit (CAM-ICU) and established these tools should be consistently used as the tools for diagnosis of delirium. The Society of Critical Medicine emphasized the importance of using a standard evaluation tool to diagnosis

delirium as well. The use to the RASS and CAM-ICU took out the bias of the evaluator and consistently diagnosed delirium (Khan, et al.2012).

Salluh (2015) found that in patients diagnosed with delirium who survived their ICU stay scored worse on their activities of daily living twelve months after the diagnosis of delirium. This study revealed modifiable as well as non-modifiable impact delirium in the ICU. Salluh (2015) did state that the studies by Van Pompaeyab-Marieke (2009) and Klouwenberg (2014) had major practical implication such as reviewing modifiable and non-modifiable to reduce episodes of delirium in the ICU. As well Salluh (2015) provided an evidentiary basis for the recommendation of the PAD (pain, agitation, and delirium) guidelines set forward by the American College of Critical Care Medicine (AAMC) in 2015 to reduce delirium and improve outcomes in the ICU. The burden according to the AAMC of delirium could be reduced by a range of interventions such as appropriate titration of sedation, early mobility and promotion of sleep. In conclusion the initiation of a best practice sleep hygiene protocol to reduce delirium and improve outcomes in the ICU is supported by robust evidence and should be initiated as a standard of care.

### **Presentation of theoretical basis**

The conceptual frame work for this EBP project was a mid-range theory. June Larrabee (2004) published an article in the Journal of Nursing Care Quality blending research utilization and EBP models to portray the process in six overarching sequential steps. Each of the six steps must be completed in order due to their inter-dependency. Each step builds on the next, if the evidence is judged to be sufficient to warrant a practice change, the project concludes with the dissemination of information about the project. Larabee and Rosswurm Evidence Base Practice

model as seen in the appendixes (appendix D) was the model that guides this EBP project. The model has six dimensions (Larabbe, 2004); four of the six dimensions that are congruent with the proposed project are: research, healthy communities, education and healthcare delivery.

This evidence based EBP project was focused on promoting a healthy community by attempting to improve sleep while patients are in the SICU. The ultimate outcome should result in no change in long term cognitive abilities by eliminating delirium while in the SICU. Education was the base that this potential practice model is built upon. The staff was educated on the importance of sleep and the long- term effect that may result from sleep deprivation; this resulted in the creation of a Healthcare Delivery model that was based in evidence and was nurse driven.

This EBP project used both The Larabee EBP (2004) model along with Lewin's Change Theory (2016) to help with implementation and dissemination of the project.

1. Design a change/driving forces/unfreezing

This started with the question of inquiry. What is causing the patient's delirium? Examination of the evidence found one of the common denominator was patient's sleep deprivation (Van Pompaeyab, 2009), (Klouwenberg, 2004) and (Salluh, 2005). Next the QI project was directed a change in practice, to improve the patient's environment to mimic the natural circadian rhythm. Research by Elliott and McKinley in 2014 and by Elliott and Cistulli in 2010 had been completed on sleep protocols in an ICU in Australia with positive results; this type of change was implemented for this project. A collaborative approach by nursing, to engage staff

was utilized to formalize a sleep protocol to help provide the patient's restorative sleep and reduce episodes of delirium.

2. Evaluate practice/refreezing stage

The education was provided to all care givers who may interact with the patient. Care givers received the information with the intent to assure that the protocol was followed with the intent to improve sleep. Families were also educated in the weekly orientation to the SICU regarding the protocol and were provided opportunities to ask questions.

3. Evaluate practice/refreezing stage

Once the data from the trial phase of the protocol is completed the results was given to the staff during the monthly staff meeting. The results from the trial long with the bedside nurse's recommendations were used to change or refine the protocol. Without this final stage, it can be easy for the protocol to be forgotten by the care givers and return to the old practice.

### **Utility/Feasibility**

The evidence supports the feasibility for the EBP project and further indicates this practice needs to be taken to the bedside to support a healing environment for patients. The nursing staff struggles with delirium on a daily basis. In a survey by Yue, & Wang, (2015) over 50% of the nursing staff found one of the most emotional aspects of their job was caring for patients who were confused or agitated due to the lack of restorative sleep. In a study by Elliott, McKinley and Cistulli, (2014) in the intensive care unit a clinical practice protocol was established called

“Sleep in the ICU, bundling of care was established in order to improve the patient’s sleep environment. The study by Elliott (2014) correlates with this EBP project, to educate the nursing staff on the importance of sleep and to provide opportunity for rest and sleep to maintain no delirium or to move patient with delirium to a state of less delirium. In a study by Flannery, Oylar & Weinhouse, (2006) the results showed positive effects of sleep interventions were associated with improved neurocognitive ICU outcomes, notably a reduction in the occurrence rate and duration of delirium. Limiting the disruption of sleep was a factor in improving sleep pattern, anxiety and reducing delirium. The objective of this EBP project was to maintain or attain a CAM-ICU negative score and RASS score of 0 to +2. Flannery (2006) supports the positive effects on the improvement. The same study reflected a positive effects on the improvement of the state of delirium from a negative score (delirium) to a less negative score (less delirium) as well as showed less delirium with length of stay longer than five day by providing a healing environment with opportunities for restorative sleep. Positive improvement in sleep will improve the CAM-ICU and RASS scores to denote a decrease in delirium.

In order to implement a standardized sleep hygiene protocol the nurses were educated. In-services were provided to the unit’s charge nurses (CN) at their monthly meeting. This is a consistent group of nurses who can then be the champions for the sleep hygiene protocol. This meeting occurred in the SICU conference room and is led by the project lead. The following are points that were presented by the project lead. See appendix G for the power point presentation.

- The evidence behind the sleep hygiene protocol
- The times for both the afternoon rest period and the sleep hours at night
- Why bundling of care is important

- The protocol and how to follow it
- The tic sheets and the importance of accuracy in completion. (appendix F).
  - Medical emergency will be placed on tic sheet
  - Call light response was placed on tic sheet
  - Necessary treatment and/or therapies that could not be schedule outside of sleep period.
- Expected outcomes
- The importance of assessing the patient's delirium/neuro cognitive status every eight hours (per ICU standard of care)
- Review of both RASS and CAM-ICU (appendix A).

The education program was delivered by the project lead. See Appendix (appendix G) for the power point presentation.

### **Recommendations**

The literature supports consistent sleep hygiene as a method to decrease delirium thereby reducing the state of agitation in the ICU population. The American College of Critical Care Medicine (2013) recently revised their ICU pain, agitation, and delirium (PAD) guideline. This revision examined both non-modifiable factors and modifiable factors to help decrease the patient's episodes of delirium. The recommendation for bundling care, early mobility and improved sleep hygiene are now linked to potential benefits of PAD management to other ICU best practices. The American College of Critical Care Medicine also recommends the use of a standardized assessment tool for the diagnosis of delirium, the RASS, in conjunction with the CAM-ICU are the recommended tools.



### **Section Three: Methods**

#### **Recommendations for Implementation of Practice Change**

Evidence has shown positive increase in quality and quantity of sleep with sleep hygiene that limits the disruption of sleep to decreased delirium. Elliott and McKinley (2014) developed a clinical practice protocol (CPG) to improve the ICU patient's sleep based on the current evidence. The driver of the new CPG was the decrease of sleep in the ICU patient based on PSG (polysomnography) finding and the increase in delirium episodes as the quality of sleep decreased in this patient population. Delirium has shown to increase morbidity (Van den Boogaard & Kemper 2012) and mortality (Ely & Shintani, 2004) in the ICU population. Poorer outcomes may be lessened through use of a sleep hygiene protocol as these lessen the effect of sleep deprivation and disruption on the immune, respiratory, muscular and endocrine (Dinges & Lim, 1994); (Seeling & Straus, 1994) (Meier-Ewert & Ridker, 2004); by improvement in sleep. Therefore the improvement of sleep for the ICU patient was an important clinical goal that did improve a decrease in episodes of delirium leading to improved outcomes. This practice change allowed for a best practice formalized sleep hygiene protocol to promote sleep and aid in the reduction of episodes of delirium, for both the individual patient and the unit.

#### **Implemented**

##### **Setting and Population**

This EBP initiative took place in a large academic medical center. This project aligns with the organization's 2017 Strategic Plan; the values of driving breakthrough healthcare solutions to improve people's lives (OneSource, 2017) (appendix H) The RASS and CAM-ICU are already tools used by the organization and are part of the critical care nurse's yearly

competencies. The setting was a twenty-six bed surgical intensive care unit. The average daily census of this unit was twenty-one patients per day, however, only the non intubated surgical patients were included in the sleep hygiene protocol. The SICU at this academic medical setting was chosen due to a recent increase in the length of stay (LOS) thereby increasing the overall cost to the patient and the organization. It was further denoted that there was an increase in the number of delirium episodes as demonstrated by the RASS scores.

The EBP project excluded all burn and trauma populations because of their potential for multifactorial pain. Other exclusion criteria were: a history of sleep disorders psychiatric illness requiring medication and known diagnosis of dementia. The surgical non intubated population was chosen due to the nature of their pain is typically of a known origin. The inclusion criteria were: non intubated patients, greater than 16 years old, and likely to be treated in ICU for > 24 hours, ability to provide a detailed history of sleep patterns seen in the patient's data base, post traumatic stress disorder or any physical condition that disrupts the sleep pattern .

### **Measurement methods/tools**

#### **Tools**

The Confusion Assessment Method for Intensive Care Units (CAM-ICU) which was developed by Inouye, (1994) demonstrates high interrater reliability (0.79-0.96) and addresses an acute onset of mental status changed or fluctuating course, inattention, disorganized thinking and altered level of consciousness to assess delirium. The CAM-ICU is a reliable and validated tool and was one of the most widely used tools for assessing delirium in a time-efficient manner. It is easy to administer and is the current standard of practice in the SICU. The CAM-ICU (Inouye, 1994), was designed to allow non-psychiatric clinicians to diagnose delirium quickly and

accurately in their patients following brief formal cognitive testing. The CAM-ICU instrument (appendix A) assess the presence, severity and fluctuation of nine delirium features and the diagnostic algorithm is based on four cardinal features of delirium. The CAM demonstrates sensitivities from 94-100%, specificities from 90-95%, positive predictive accuracy of 91-94%, negative predictive accuracy of 90-100%, interrater reliability ranging from 0.81-1.00; and convergent agreement with other mental status tests including the Mini-Mental State Examination (MMSE) (Folstein, 1995). Due to the CAM-ICU accuracy, brevity, and ease of use by clinical staff, the CAM has become the most widely used standardized delirium instrument for clinical and research purposes over the past 16 years (Khan, Guzman & Campbell, 2012). In addition to the CAM-ICU delirium assessment evaluation the Richmond Agitation-Sedation Scale (RASS) is used to assess a patient's level of arousal using standardized, validated arousal scales, known as sedation-agitation scales. The Richmond Agitation-Sedation Scale (RASS), developed by Sessler and others, (Sessler, & Gosnell, 2002), helps with the diagnosis of stupor, which is a gray zone between coma and alertness which helps with the diagnosis of delirium by determining the patient's state of wakefulness. When the two instruments are used congruently there is a high interrater reliability (98%) and reproducibility and the potential bias is minimal (Khan, et al., 2012).

Other variables accounted for, such as sleep disruption by families or an emergent medical need. This was accounted for by a tic sheet placed in each patient room, the sheets had the date and hours of the prescribe sleep time as well as the tic sheets were consecutively numbered. The RN place a tic mark by the hours the interruption occurred during the hours of midnight to 0400 a.m. (appendix F).

The organization and unit where the EBP project occurred already had an informal sleep hour. This EBP project expanded the time line as best practice initiation. The unit medical director was supportive of the need to increase sleep among patients and to formalize a sleep hygiene protocol. The nursing staff was currently using the CAM-ICU and RASS to determine episodes of delirium and documents such episodes every four hours as indicated by the critical care documentation standards. Both the CAM-ICU and RASS are tested during the unit's annual competencies by the critical care CNS, so interrater reliability should not be an issue as this did not vary from the current unit expectation.

### **Data collection process and logistics**

The charge nurses were at the monthly January Charge Nurse (CN) meeting. The formalized sleep hygiene protocol was distributed and explained followed by a question and answer sessions (appendix G). Keeping with the current unit educational model this was a time to identify barriers for initiating the protocol for improving sleep. This is currently how new information is disseminated and this process allows for identification of barriers with the charge nurses prior to the initiation of the protocol for improving sleep.

Following the CN education, a lunch and learn was provided for all the staff. Each attendee was eligible to receive 0.5 Continuing Education Units for participation (appendix E). The Larabee EBP (appendix D) model was used to enable the nurses to have an understanding of the framework for initiating the new protocol. This enabled the nurses to have an in-depth knowledge of the Sleep Hygiene Protocol and process for implementation as well as answers for any patient and /or family member questions. Attendance at the CE session was voluntary;

however, those RNs who do not attend the CE session received one-on-one instruction by the project lead to eliminate any variation with the practice

### **Plan for Data Analysis**

The new sleep hygiene protocol (appendix I) was assessed using the pre-existing CAM-ICU and RASS scores, and satisfaction scores. Pre- protocol scores were obtained for a two-month period from November and December for 2017. The post protocol scores were obtained for February and March 2018.

### **Data Collection process and logistics**

The data consisted of the CAM-ICU and RASS scores provided by the Informational Warehouse (IW) to assure deidentification and accuracy of data. A request was submitted so the information can be obtained from the IW two months prior to the start of the protocol and then weekly for the first two months after the protocol has been initiated. Once received this data were secured and stored on a password protected University secured website. The goal of this project was to see if the use of a sleep hygiene protocol would decrease episodes of delirium in the SICU population. Meaning that the CAM-ICU scoring would be negative and positive would improve to a negative score as sleep hygiene is promoted. The RASS score of patients admitted that were between 0 - +2 should remain the same. For those patient who scores are above +2 or below 0, does the promotion of sleep hygiene move their scores towards less delirium.

### **Proposed budget, time and resource plan**

The budget for this project was absorbed by the day to day management of the unit in which the project occurred. The education was part of the staff work week, therefore no additional

hours was accrued. Any ad hoc education was the project lead's responsibility therefore cost neutral.

The below was the time line for this project.

Week of January 15 <sup>th</sup>	Submit Proposal	Letter to ONA regarding Staff Nurse Involvement in PI project	
Week of January 29 <sup>th</sup>	Awaiting CAM-ICU and RASS scores from IW		
Week of February 5 <sup>th</sup>	Education of Charge nurses on sleep protocol		
Week of February 5 <sup>th</sup>	Education of Staff nurses regarding sleep protocol		
Week of February 19 <sup>th</sup>	Project starts with Sleep protocol		
Week of February 26 <sup>th</sup> through March 23 <sup>rd</sup>	Continuation of sleep protocol		
March 24 <sup>th</sup> & 25 <sup>th</sup>	Analysing data from protocol		

A consultation with a statistician from the College of Nursing was obtained. The unit's CNS was asked to help with the entering and retrieval of the data.

#### **Section Four: Findings**

The purpose of this EBP project was to implement a Sleep Hygiene protocol from midnight to 4 a.m. with limited interruptions and provide an environment conducive for sleep to reduce episodes of delirium. Episodes of delirium are based on a twenty-four hour time frame. RASS and CAM-ICU assessments were completed every four hours per unit protocol and resulted in six possible assessments of delirium. Episodes of delirium were counted for each non-intubated

patient within the SICU every day they met the inclusion criteria. The number of interruptions were captured only during the prescribed sleep hours. Before implementation on average six interruptions occurred between the hours of midnight and 4 a.m. for each non-intubated patient for reasons such as: pain medication, call lights, change of IV rate (most frequent was heparin) and dressing changes. The number of interruptions, RASS, CAM-ICU and the episodes of delirium were evaluated prior to and after the implementation of the Sleep Hygiene protocol.

### **Sleep Interruptions**

The episode of sleep disruption by families or an emergent medical need was monitored using a “tic sheet” approach. The tic sheet’s purpose was to uncover the actual number of episodes of interruptions within the four hour post protocol block of midnight to 4 a.m. designated for sleep. In February there was a total number of 194 patients that qualified for the post protocol. There were 267 total actual sleep interruptions noted out of a possible 776 based on the 4 hour pre protocol implementaiton process (Appendix L). There were 35% less interruptions during the prescribed protocol sleep hours. In March there were a total numnber of 195 patients. March data showed 134 interruptions out of a possible 780 oppotuninty for interruptions or 18% interruptions during the 4 hours prescribed sleep hours (Appendix M). These results continued to show a connection between the decrease in sleep interruptions and the decrease in delirium. This was a reduction of 17% interruptions during the prescribed sleep hours.

### **Episodes of delirium**

The pre-data (Appendix J) revealed for November were : 181 (46%) episodes of delirium; 155 (39%) episodes of no delirium and 57 (15%) episodes of unable to assess (UTA) a RASS score of -4 or -5).

December data (Appendix K) revealed out of a sample 25 patients meeting the inclusion criteria. The results were as follows: 284 (60%) episodes of delirium, 119 (25%) episodes of no delirium and 70 (15%) UTA.

February's post protocol data revealed a sample size of 21 non-intubated patients that met the inclusion criteria. There were 385 possible opportunities for delirium within this sample size. Out of 385 opportunities there were 160 (46%) episodes of delirium; 172 (49%) episodes of no delirium and 16 episodes of UTA (appendix L).

March's post protocol data revealed a sample size of 22 non-intubated patients that met the inclusion criteria. There were 286 possible episodes of delirium within the sample size. Out of the 286 opportunities, there were 124 (54%) episodes of delirium, 146 (54%) episodes of no delirium and 12 episodes of UTA (appendix M).

### **CAM and RASS scores**

The new sleep hygiene protocol was further assessed using the pre-existing CAM-ICU and RASS scores. Pre-protocol scores were obtained for a two-month period from November and December for 2017. The post protocol scores were obtained for February and March 2018. To test the effect of the protocol on delirium episodes we used a chi square test. A chi square test assumes independence of observations. In our setting this means that each observation was obtained from a different patient. This was not the case. However, given the large number of observations we were able to obtain, we assume that the chi square test will be robust to this violation and not lead to a meaningful difference between the actual and the nominal type I error rate.



Table 1 displays the counts of delirium / no delirium episodes both before and after the protocol implementation. Before the protocol implementation, about 54% of episodes were associated with delirium. After the protocol implementation, the percentage of delirium episodes dropped to about 47%.

Table 1: Delirium

Protocol	Delirium episode		Total
	No Delirium	Delirium	
<b>Before protocol</b>	252	300	552
	45.65%	54.35%	
<b>After protocol</b>	318	284	602
	52.82%	47.18%	
<b>Total</b>	570	584	1154

Table 2 displays the results of a chi square test of an association between episode type and use of protocol. The test was statistically significant with a p value of 0.01, supporting the hypothesis that the protocol results in relatively fewer delirium episodes.

Table 2 Pearson Chi-Square

Pearson Chi-Square Test	
Chi-Square	5.9252
DF	1
P value	0.0149

### Protocol Education

Appendix Q shows the overall UTA episodes for the RASS (-4 or -5) scores for November, December, February and March. February's data revealed a sample size of 21 non-intubated

patients that met the inclusion criteria. There were 385 possible opportunities for delirium within this sample size. Out of 385 opportunities there were 160 episodes of delirium; 172 episodes of no delirium and 16 episodes of unable to assess. The RASS Scores that were documented as unable to assess revealed that 15 of the sample size of 16 were appropriate, or the patient had a RASS score of -4 or -5 therefore a CAM-ICU was unable to be assessed per policy. This decrease in inappropriate RASS scores being obtained by staff is a direct evaluation of the education given in January.

### **Discussion**

The November and December data highlighted a large number of UTA in obtaining CAM-ICU scores for some patients with RASS scores despite this being a standard of practice and policy. Further inquiry of the omission of CAM-ICU scores exposed a knowledge deficit in process of assessment and an opportunity for additional education, which was addressed in January education with the staff. As a result in February of the 12 episodes of unable to assess 9 has appropriate episodes had a RASS Score of -4 or -5 which met the criteria of not obtaining a CAM-ICU. Following the staff education a decline in the documented UTA episodes is noted. This showed continued improvement of appropriate assessment as a result of the education completed in January.

Overall, the more impressive results were the increase in the no delirium episodes; from a low of 119 episodes of delirium in December to a high of 139 episodes of no delirium in March. It should also be noted that the unable to assess went from 70 episodes in December to a low of only 3 episodes in March. This indicates a change in practice for the nursing staff, to have an

increase knowledge base and assess for not only hyper-delirium but hypo-delirium as well. The evidence has shown that hypo-delirium is most often missed and this is where the greatest opportunity lays in preventing long term cognitive harm. Therefore The Sleep Hygiene Protocol facilitated a decrease in delirium from a high of 219 episodes of delirium in December to a low 109 episodes of delirium in March.

### **Results/Outcomes**

The outcomes indicated that when patients are given a dedicated sleep hygiene protocol and an environment that promotes sleep, delirium can be decreased. The project also revealed a knowledge deficit for what RASS score prohibits the assessment of a CAM-ICU score. This knowledge deficit was corrected with the education given to the nursing staff in January. This evidence revealed that when nurses are made aware of practice issues they come into alignment with standard of care i.e seen in the appropriate CAM-ICU scores being assessed when re-educated on what RASS scores prohibit a CAM-ICU score from being assessed (Appendix N). Also, the reduction in interruptions during the prescribed sleep hours of midnight to 4 a.m. was directly related to the collaboration between disciplines i.e. nurses, pharmacy, respiratory therapy, house keeping and physicians, to do what is best for the patient. The data illustrated that when there are defined uninterrupted sleep hours that patients have a decrease in delirium episodes (Appendix O & P).

Anecdotal evidence revealed two very important findings: 1). that families appreciated and expressed gratitude for the 2 p.m. to 4 p.m. quiet time. Multiple families expressed “that this time gave them the “permission” to leave their loved one and perform their own self care, i.e. eating, sleeping or simply leaving the area to place current events in prospective; 2). The nursing

staff stated that when the lights were dimmed at 2 p.m. they felt their own anxiety and stress level decrease. This result were especially pertinent in the light of recent articles discussing burn-out of the bedside nurse which is due to an increase in anxiety and stress levels, resulting in nurses leaving the bedside for less stressful environments in nursing. The nursing staff also expressed gratitude for this time as a way to “catch up” on documentation, work on plans of care, or have professional discussions with their peers regarding patients, therapies, or strategies to facilitate the latest guidelines such as early mobility and ventilatory weaning protocols. This appears to be a win/win for the patient, patient’s family and the bedside nurse.

### **Conclusions**

The issue of delirium is a very real and potentially life altering diagnosis for any patient who requires a critical care admission. The IOM and AGS-GSI have recognized delirium as the most common surgical complication in older adults, occurring in 5% to 50% of older patients after an operation. Delirium increases the patient’s length of stay and long term cognitive disabilities which results in an increased cost of medical care of \$150 billion annually (Stevens, 2007). In order to effectively decrease episodes of delirium, sleep quality and quantity must be improved (Mistraletti, 2008). One strategy to improve this is the implementation of a best practice for the reduction of delirium recommended by the Institute of Medicine (IOM). This DNP project demonstrated that with the implementation of a best practice Sleep Hygiene Protocol implemented by the nursing staff.

The Florence Nightingale’s pledge speaks to nursing practice “not knowingly do harm”. Research has shown that delirium causes harm to our patients and the evidence demonstrates a way to decrease if not to eliminate this harm by use of a Sleep Hygiene Protocol.

**Limitations**

The limitations within this project were: gender nor age were incorporated into the data set. Therefore, we do not know if either has a correlation with delirium episodes. The diagnosis was not included as part of the data set; therefore we do not know if some patients are at higher risks due to there injuries i.e. do patients undergoing abdominal surgeries have more delirium than those undergoing vascular surgeries. The tic sheets used to track sleep interruptions do not consistently document why the interruptions were occurring, so there is no valid way to determine how to further limit interruptions. In addition these results are not generalizable to other units.

The plan is to disseminate this information to the staff nurse, who can take this data and make changes in their practice to promote sleep hygiene. This will be completed during charge nurse meetings, staff meetings and one to one conversations with the nursing staff. This information will also be disseminated at the monthly Critical Care Department meetings. This meeting includes the critical care units' managers, assistance nurse managers, CNSs and nurse educators. Sleep deprivation and delirium is just not a Surgical ICU issue it is an issue in all critical care units. Therefore, this evidence can be replicated in other critical care areas such as medical intensive care units and neuro-critical care units.

**Section Five; Recommendations and Implications for practice****Project Summary**

This EBP project looked at the cause and effect of sleep deprivation in a Surgical Intensive Care Unit. The research showed that the lack of resortative sleep had a direct correlation to the rates of delirium. The evidence showed that when a prescribed sleep hygiene protocol was put into place,

sleep improved and delirium decreased. These same results were also observed in two Australian medical intensive care centers and reported in articles published in 2014 and 2017. The unit chosen for this project was a Surgical Intensive Care Unit in an academic medical center similar to the sites used in the Australian studies. Pre and post data were compared to see if education of the nursing staff using tools already in place and the implementation of a sleep hygiene protocol could reduce the rate of delirium. The results showed an 8% reduction in the rate of delirium. However, more importantly the collaboration seen on a multidisciplinary level to decrease the interruptions during the prescribed sleep hours of midnight to 4 a.m was crucial to achieving these results. The other important data point was the improvement of the assessment of a CAM-ICU score for the appropriate RASS score. This improvement in the assessment of the RASS score showed a reduction in the inappropriate use of the Unable to Assess scoring. Since delirium can be both hyper and hypo, it is easy for clinicians to overlook episodes of hypodelirium due to the patient's appearance of sleep or quietness. Delirium must first be diagnosed appropriately before it can be treated and a missed diagnosis is a missed opportunity to provide treatment, this is why an appropriate RASS Score is so vital for the reduction of delirium.

### **Implications for practice and DNP Essentials**

It will be recommended that this protocol be continued in the surgical intensive care unit and be initiated in the other intensive care units throughout the hospital. The implications are as follows: using a sleep hygiene protocol decreased the episodes of delirium, and improved collaboration within the multidisciplinary teams by setting mutual goals. These implications are important to improving patient outcomes. There was also a notable decrease in anxiety and stress experienced by the bedside nurse as well as a feeling of "permission" for families to leave the

bedside and engage in self care. Additionally, an improved compliance with the organization's standard of care was identified by the implementation of a sleep hygiene protocol. Re-education on the correct process to obtain a CAM-ICU score promoted the ability for delirium to be recognized and treated in a more timely manner. The organization's 2018 strategic plan speaks of inclusiveness, working together for a common purpose and embracing the power of connection through multidisciplinary collaboration and this project parallels that plan. This project will need to go to the Critical Care Quality Improvement Council for discussion for dissemination to other critical care units. There are three DNP essentials that are showcased in this project. Essential #2: Organizational and Systems Leadership for Quality Improvement and System Thinking. We will change the way we view sleep and its' importance to health, remembering that the body must have a resortative time to self heal. Essential # 3: Clinical Scholarship and Analytical Methods for Evidence-Base Practice. This project was based on the evidence found in the literature, showing that a prescribed time for sleep could improve sleep quality and reduce the episodes of delirium. Essential #6: Interprofessional Collaboration for Improving Patient and Population Health Outcomes. The literature and evidence has shown the importance of sleep to reduce delirium. However, the care of the patient in the intensive care unit involves the cooperation of many different disciplines. This project showed that by using the synergy of an interprofessional team, a prescribed sleep time could be orchestrated between pharmacy, nursing, respiratory therapy, physicians and housekeeping. This process allowed for an environment to improve sleep quality to reduce interruptions and reduce episodes of delirium.

### **Identify methods for dissemination**

This information will be disseminated at staff meetings, charge nurse meetings and the department of critical care department bi-monthly meetings. These venues were chosen so that managers and directors could see the results and decide if and how they should implement this protocol on their units. The information will also be presented at the SICU communication meeting. This meeting is where representatives from all departments that work within the SICU receive updates, assess issues and help make practice changes. It is here that our respiratory therapist, physical therapist, pharmacist and dietician will hear the results and see how our collaboration resulted in positive changes for our patients. I hope that by reaching this wide audience the word will spread on how something as simple as sleep can make a positive outcome for our patients. Members of this group are leaders throughout the entire medical center, so they can become ambassadors to promote this new protocol and to speak to the importance of sleep, healing and overall wellness of our patients.



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## Appendix A

### RASS and CAM-ICU Worksheet

#### Step One: Sedation Assessment

##### The Richmond Agitation and Sedation Scale: The RASS\*

Score	Term	Description
+4	Combative	Overtly combative, violent, immediate danger to staff
+3	Very agitated	Pulls or removes tube(s) or catheter(s); aggressive
+2	Agitated	Frequent non-purposeful movement, fights ventilator
+1	Restless	Anxious but movements not aggressive vigorous
0	Alert and calm	
-1	Drowsy	Not fully alert, but has sustained awakening (eye-opening/eye contact) to <i>voice</i> (>10 seconds)
-2	Light sedation	Briefly awakens with eye contact to <i>voice</i> (<10 seconds)
-3	Moderate sedation	Movement or eye opening to <i>voice</i> ( <b>but no eye contact</b> )
-4	Deep sedation	No response to <i>voice</i> , but movement or eye opening to <i>physical</i> stimulation
-5	Unarousable	No response to <i>voice or physical</i> stimulation

##### Procedure for RASS Assessment

###### 1. Observe patient

a. Patient is alert, restless, or agitated. (score 0 to +4)

###### 2. If not alert, state patient's name and say to open eyes and look at speaker.

a. Patient awakens with sustained eye opening and eye contact. (score -1)

b. Patient awakens with eye opening and eye contact, but not sustained. (score -2)

c. Patient has any movement in response to voice but no eye contact. (score -3)

###### 3. When no response to verbal stimulation, physically stimulate patient by shaking shoulder and/or rubbing sternum.

a. Patient has any movement to physical stimulation. (score -4)

b. Patient has no response to any stimulation. (score -5)

If RASS is -4 or -5, then **Stop** and **Reassess** patient at later time

If RASS is above -4 (-3 through +4) then **Proceed to Step 2**

\*Sessler, et al. AJRCCM 2002; 166:1338-1344. Ely, et al. JAMA 2003; 289:2983-2991.

**Step Two: Delirium Assessment**

**Feature 1:** Acute onset of mental status

And

**Feature 2:** Inattention

And

**Feature 3:** Disorganized

OR  
= **DELIRIUM**

**Feature 4:** Altered Level of



## CAM-ICU Worksheet

### Feature 1: Acute Onset or Fluctuating Course

Positive if you answer 'yes' to either 1A or 1B.

#### Positive Negative

**1A:** Is the pt different than his/her baseline mental status?

Or

**1B:** Has the patient had any fluctuation in mental status in the past 24 hours as evidenced by fluctuation on a sedation scale (e.g. RASS), GCS, or previous delirium assessment?

**Yes No**

### Feature 2: Inattention

Positive if either score for 2A or 2B is less than 8.

Attempt the ASE letters first. If pt. is able to perform this test and the score is clear, record this score and move to Feature 3. If pt. is unable to perform this test or the score is unclear, then perform the ASE Pictures. If you perform both tests, use the ASE Pictures' results to score the Feature.

#### Positive Negative

**2A: ASE Letters:** record score (enter NT for not tested)

Directions: Say to the patient, *"I am going to read you a series of 10 letters. Whenever you hear the letter 'A,' indicate by squeezing my hand."* Read letters from the following letter list in a normal tone.

**S A V E A H E A R T**

Scoring: Errors are counted when patient fails to squeeze on the letter "A" and when the patient squeezes on any letter other than "A."

**Score (out of 10):** \_\_\_\_\_

**2B: ASE Pictures:** record score (enter NT for not tested)

Directions are included on the picture packets.

**Score (out of 10):** \_\_\_\_\_

### Feature 3: Disorganized Thinking

Positive if the combined score is less than 4

#### Positive Negative

**3A: Yes/No Questions**

(Use either Set A or Set B, alternate on consecutive days if necessary):

#### Set A Set B

1. Will a stone float on water? 1. Will a leaf float on water?
2. Are there fish in the sea? 2. Are there elephants in the sea?
3. Does one pound weigh more than 3. Do two pounds weigh more than one pound?
4. Can you use a hammer to pound a nail? 4. Can you use a hammer to cut wood?

**Score** \_\_\_ (Patient earns 1 point for each correct answer out of 4)

#### 3B: Command

Say to patient: "Hold up this many fingers" (Examiner holds two fingers in front of patient) "Now do the same thing with the other hand" (Not repeating the number of fingers). \*If pt. is unable to move both arms, for the second part of the command ask patient "Add one more finger"

**Score** \_\_\_ (Patient earns 1 point if able to successfully complete the entire command)

#### Combined Score (3A+3B):

\_\_\_\_\_ (out of 5)

### Feature 4: Altered Level of Consciousness

Positive if the Actual RASS score is anything other than "0" (zero)

#### Positive Negative

**Overall CAM-ICU (Features 1 and 2 and either Feature 3 or 4): Positive Negative**

**Appendix B**

## Table of Research

<b>Database</b>	<b>Keywords/Phrases</b>	<b>Inclusion Criteria</b>	<b>Exclusion Criteria</b>	<b>Number of Citations retrieved</b>	<b>Numbers of Citations to be used</b>
CINAHL	Sleep, Sleep disruption, Delirium	Adults only	Below III	7	6
PubMed	Delirium preventions	2010-2017 Adults Only	Level of evidence below III duplicate of article already retrieved	20	7
Cochran Library	Sleep hygiene	2010-2017	Level of evidence below III	1	1
Embase	Bundle care and sleep	2010-2017 Adults only	Level of evidence below III Duplicate of article already retrieved	5	1

## Appendix C

## Critical appraisal of the evidence

Evidence/Summary table

Study Citation (Authors and Date)	Sample (characteristics and size) and Setting	Design/ patient or subject selection	Intervention	Findings/ author conclusions	Level/ Quality Rating	Reviewer's comments (strengths and limitations)
Barr, J et al. (2013)	13 studies (n=1551)	Meta-analysis	Following Pain, Agitation, and Delirium Guideline (PAD)	Implementation of the ICU PAD guidelines results in large-scale improvement in ICU patient outcomes and decrease in costs	II	S= large n and used hospitalized patients. L = did not have base line or questionnaire as what "normal" sleep was to them.
Olson et al (2001)	239, 118 control group. 121 intervention group	Observational study. To determine if reduction of external environmental stimuli is associated with increased frequency of sleep in neuro-critical care units.	Noise and light reduction from 02:00 h to 04:00 h. Data collected at 02:45h, 03:30h, 14:45h PM and 15:30h from patients with GCS of 10 or greater. 1446 observations in the control group, 1529 observations in the intervention group.	Intervention group had more sleep than the control group- reduction of environmental stimuli was associated with increased sleep time.	II	S= large n and ease of study. L = single center study. One type of patients. Observational study hence likely more focused on quantity than quality of sleep. Done over specific short periods of time.
Tamburri et al. (2004)	50 records from 4 ICUs.	Randomized retrospective review of medical records. Establish common causes of	50 medical records were reviewed for care activities from 7 PM to & AM retrospectively in 4 critical	Data were based on 147 nights. Mean interaction of care was 42.7. Most frequent at midnight and least frequent at 01:00 h. Only 9	II	S = large number of n. L = there was room for assumption because the study was a retrospective review of medical records. Patients

		sleep deprivation in critically ill patients. Discuss nocturnal care that impact on sleep in ICU. Describe interventions to increase opportunities for sleep in critically ill patients.	care units. Established frequency, types and pattern of nocturnal care interactions with patients in the 4 ICUs. Analyzed relationships among the interactions and patient variables, i.e. age, sex acuity. Analyzed the difference in style of nocturnal care among the 4 ICUs.	had 2-3 h uninterrupted hours for sleep out of 147 nights of study. Increased frequency of care at night gave patient with fewer periods for uninterrupted sleep.		were neither assessed nor interviewed. Difficult to account for quality of sleep.
Franzen et al. (2008)	Pilot study. Examined relationships between effects of sleep deprivation on subjective and objective measures of sleepiness and effect, and psychomotor vigilance performance.	15 sleep deprived group. 14 non-sleep deprived healthy group.	Controlled lab. Conditions data collected following day. Subjective reports mood and sleepiness (multiple sleep latency test) and spontaneous oscillations in pupil diameter effective reactivity/regulation and psychomotor vigilance performance.	All 9 domains were subjectively and objectively affected.	II	S = all groups were equal in terms of demographics, disease characteristics, and scores of anxiety and pain at the baseline. L = Small sample size. Not ICU based study. Quality and quantity of sleep. Self-reporting could have been influenced by individual traits.
Freedman et al. (2001)	Effects of environmental noise on sleep disruption in ICU.	20MV patients. 2 non-MV.	Continuous PSG and environmental noise measurements	Abnormal sleep cycle in patients. TST 8.8 +/- 5.0 h raises fragmented sleep and non-	III	S= improvement in all participants. No results or adverse effects. L = no control

			for 24-48 h.	consolidated environmental noise responsible for 11.5-17% of arousal and xxx from sleep respecting qualitative sleep is disrupted even though quantity of sleep is not		group.2 center study, small sample
Parthasarathy and Tobin (2002)	Effect of ventilator mode on quality of sleep on y ill patients to determine whether presence of a back rate on assist-control ventilation would reduce apnea-related arousal and improved quality of sleep	11 critically ill patients.	Puritan Bennett 7200 ventilator was initially set in the assist-control mode with a backup rate of 4 breaths per minute and tidal volume (VT) of 8 ml/kg. Over 5-10 min of quiet wakefulness, the patient's respiratory rate on the ventilator was measured. The backup rate on assist-control ventilation was ten set at 4 breaths below the patient's respiratory rate and kept at that setting for the rest of the study. Pressure support adjusted to achieve a VT equivalent to that during	More arousal and awakenings in patients on PSV than on patients on ACV (79 $\pm$ 7 as compared to 54 $\pm$ 7 events per hour). More central apneas and heart failure in the 6 patients on PV as compared to patients on ACV (83% as opposed to 20%) Central apneas reduced to 44% from 83% with additional dead space.	I	S = First time ventilation mode was considered. L = Sample size was small (n=11) Single center study. One type of ventilator...

			<p>assist-control ventilation – 8ml/kg. Randomized patients to receive at least 2h each of the following three modes; assist-control ventilation, pressure support alone, and pressure support with dead space. PSG, CO2 monitors EEG pulse oximetry. End-tidal studies done performed between 22:00h and 0600h apneas, electroencephalogram (EEG) arousal and awakenings manually scored. Elastance and resistance of the respiratory system were measured. Mechanical inspiratory time (TI), expiratory time (ET), total respiratory cycle time (Tot), end tidal CO2 and VT measured</p>			
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			breath by breath. Apnea threshold was determined from the end tidal CO <sub>2</sub> of the breath immediately before the onset of an apnea.			
Dyer, J. et al (2016) Stanchina et al. (2005)	Observational study. White noise added to the ICU environment would lower arousal by reducing the magnitude of changing noise levels,	4 patients.	PSG under 2 based line exposure to ICU noise. 3 exposures to ICU noise and inject frequency white noise. Peak noise levels recorded for each arousal.	Results, 1178 arousal index. Increased during noise but did not lower with white noise ICU noise might ICU noise and white noise versus ICU noise condition 14.7 $\pm$ 0.4h 17.5 $\pm$ 0.3h Peak noise was not the main determinant of sleep disruption from ISU noise	II	S = all had similar issues of sleeplessness and pain. L= small number of patients. Noise levels could have been amplified because they were recorded. Study did not take place in a real ICU environment. Healthy subjects.
Flannery M et al (2016)	10 Studies that looked at the relationship between sleep disruption and delirium	Meta-analysis of 10 Sleep intervention studies	Sleep interventions to improve sleep and decrease delirium	Interventions included; delirium assessment, bundling care, white noise and earplugs	II	S = 3 studies showed decrease in delirium. 2 studies decrease LOS. L= bias issues, varying methodologies and multiple confounders.
Limpawatsana, P et al (2016)	99 patients admitted to an adult ICU.	Control trail without randomization.	Looking at risk factors associated with delirium which could be modified	Risk factors that were reduced; use of Physical restraints; sleep deprivation and use of a bladder catheter	III	S = total number of patients significant. Founding supported the importance to reduce risk factors L = assessment for delirium only once / 24h
Weinhouse, G et al (2009)	Literature review of the connection	Systematic review of the literature	Sleep deprivation research has	Sleep deprivation may play a role in the	V	S = Correlation between sleep deprivation and

	between sleep deprivation and delirium		revealed many similarities, both clinically as well as experimentally, with delirium.	pathogenesis of some cases of delirium by affecting those areas of the CNS associated with delirium.		delirium. L= could not determine the exact role sleep deprivation plays in its pathogenesis.
Kamdar, B et al (2016)	327 consecutive MICU patients completed $\geq 1$ assessment of perceived sleep quality.	Prospective observational study	Perceived sleep quality was assessed using the Richard-Campbell Sleep Questionnaire (RCSQ) and delirium was assessed using the Confusion Assessment Method (CAM-ICU)	Perceived sleep quality was not associated with poor PT, however delirium was noted to have negative effects on PT.	V	S = large number of patients. Control group L = used only to follow PT intervention.
Van Rompaey ab-Marieke, B. et al. (2007)	Correlation between DSM-IV, CAM-ICU and NEECHAM to rate patient's risk of delirium and the correlation with sleep deprivation.	Systematic review	6 systematic reviews each used CAM-ICU to screen for delirium.	The review showed 25 risk factors for delirium, sleep deprivation was in each of the 6 reviews	V	S = n was large, same tool was used. L= different types of ICU
Aldemir, M., et al (2001)	Patients admitted to the SICU between 1996-1997 were screened for delirium	Control trials without randomization	90 of the 818 patients became + for delirium.	Modifiable risk factors were found to be common in all delirious patients including sleep deprivation.	III	S = n was good as was the range in ages. L = no randomization
Klouwen berg, P. et al. (2014)	1112 consecutive adults admitted to an ICU for a minimum of 23 hours.	Prospective cohort study	558 patients developed at least one episode of delirium with a median duration of 3	Delirium prolong LOS, however, when risk factors was normalized it did not cause death. Sleep deprivation was	IV	S = n was large, use of only one ICU was used so cohort was homogeneous. L=post hoc analyses



			days. Mortality was 17% for the patients with delirium and 7% for those without delirium.	one of the modifiable factors noted		
Salluh, J. et al (2015)	Review showed 5280 out of 16595 had a diagnosis of delirium.	Review and meta-analysis	Nearly 1/3 of patients developed delirium, which increase their risk of dying during admission, longer LOS and cognitive impairment after discharge.		I	S = all patients were in an ICU and all patients with delirium had adverse outcomes. L= difference tools for diagnosis of delirium and frequency of assessing for delirium.

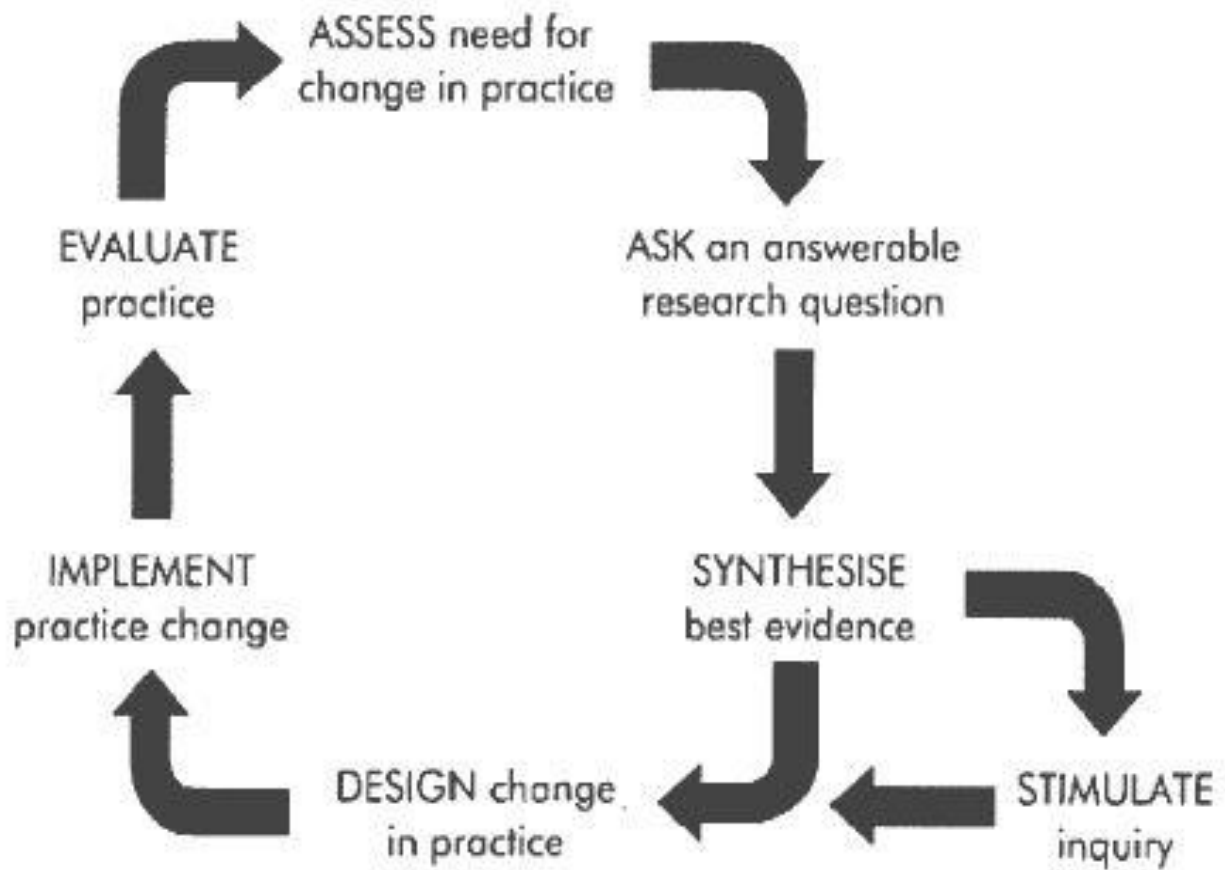
S = strengths  
L = limitations

From:

Worral, P., Levin, R., & Arenault, D. (2010). Documenting an EBP project: Guidelines for what to include and why. *Journal of the New York State Nurses Association*, 12-19.

Appendix D

Larabee Model for EBP practice change



Adapted from Rossburn MI, and Larabee JH. *Image J Nurs Sch* 1999; 31: 317-22.

Appendix E  
Mockup of CE



**Ohio Nurses Association  
Activity Documentation Form for Approved Provider Units based on 2015 Criteria  
Adopted for OSU Provider 057-2/1/19**

Health System Nursing Services  
CE Activity Data Form

**10 business days prior to the event:**

- **Your documentation packet must be completed and saved to the shared location**
- **When CE Activity planning is finished, complete the template Communication - Request for Certificate and save it to the program folder. Email it as attachment to Nursing CE Office and Lynne Genter.**

**Send all communication regarding your program to NursingCEOoffice (Outlook)**

**Health System Nursing Services Use Only. Please do not enter information in this box.**

RN Planner: \_\_\_\_\_  
 Program Number: \_\_\_\_\_

Meets CE criteria                       Does not meet CE criteria

Date first certificates awarded \_\_\_\_\_      Content met criteria for:  
 Total hours of instruction \_\_\_\_\_       Non-certified CNS  
 Total contact hours awarded \_\_\_\_\_       APRN with prescriptive authority  
 Category A contact hours awarded \_\_\_\_\_  
 APRN with Prescriptive Authority contact hours awarded \_\_\_\_\_  
 Quality Evaluator, if assigned \_\_\_\_\_

**Demographic Data**

1. **Title of Learning Activity:** Why Sleep Matters?
2. **Program Number:** 2018-0024
- 3a. **Contact Hours Requested:** 0.5
- 3b. **Total Hours of Instruction:** .30
4. **Department Responsible for Event:** Critical Care Nursing

**Appendix F**

Please Make a Mark every time there is an interruption to the patient's restorative rest/sleep time between the hours of Midnight and 0400; i.e. medical emergency; call light response or necessary treatment and/or therapy.

Date\_\_\_\_\_

Sheet Number\_\_\_\_\_

**Midnight Night**

**0100**

**0200**

**0300**

**0400**

Thank you for your support as we improve the quality of our patient's restorative rest/sleep to improve outcomes.

## Appendix G

### Charge Nurse Education



## Sleep Hygiene Practice

K. Ashworth

## Appendix H

### 2017 Strategic Plan

#### Values

We embody the Buckeye Spirit in everything we do through our shared values of:

- Inclusiveness
- Determination
- Empathy
- Sincerity
- Ownership
- Innovation

**A deeper dive:** These are the shared principles we embody in every task we do and in every encounter we have.

#### **INCLUSIVENESS**

We believe in...

- Working together with common purpose.
- Embracing the power of connection through multidisciplinary collaboration.
- Valuing the diversity of people and different points of view with respect and fairness.

#### **DETERMINATION**

We believe in...

- Reaching our highest potential despite obstacles.
- Attracting and retaining high-performing people who want to change the world.
- Fearless pursuit of one's potential to make a meaningful contribution through our work.

#### **EMPATHY**

We believe in...

- Caring deeply and acknowledging the feelings and experiences of self and others.
- Prioritizing the needs of others.
- Valuing and serving each other and our community.

#### **SINCERITY**

We believe in...

- Adhering to high ethical standards.
- Speaking and acting truthfully.

2017 Strategic Plan Continue

- Being responsible to always uphold the integrity of the organization.

**OWNERSHIP**

We believe in...

- Taking care of our medical center, even when no one is watching.
- Protecting and enhancing our reputation and legacy at all times.
- Being good stewards of our resources.

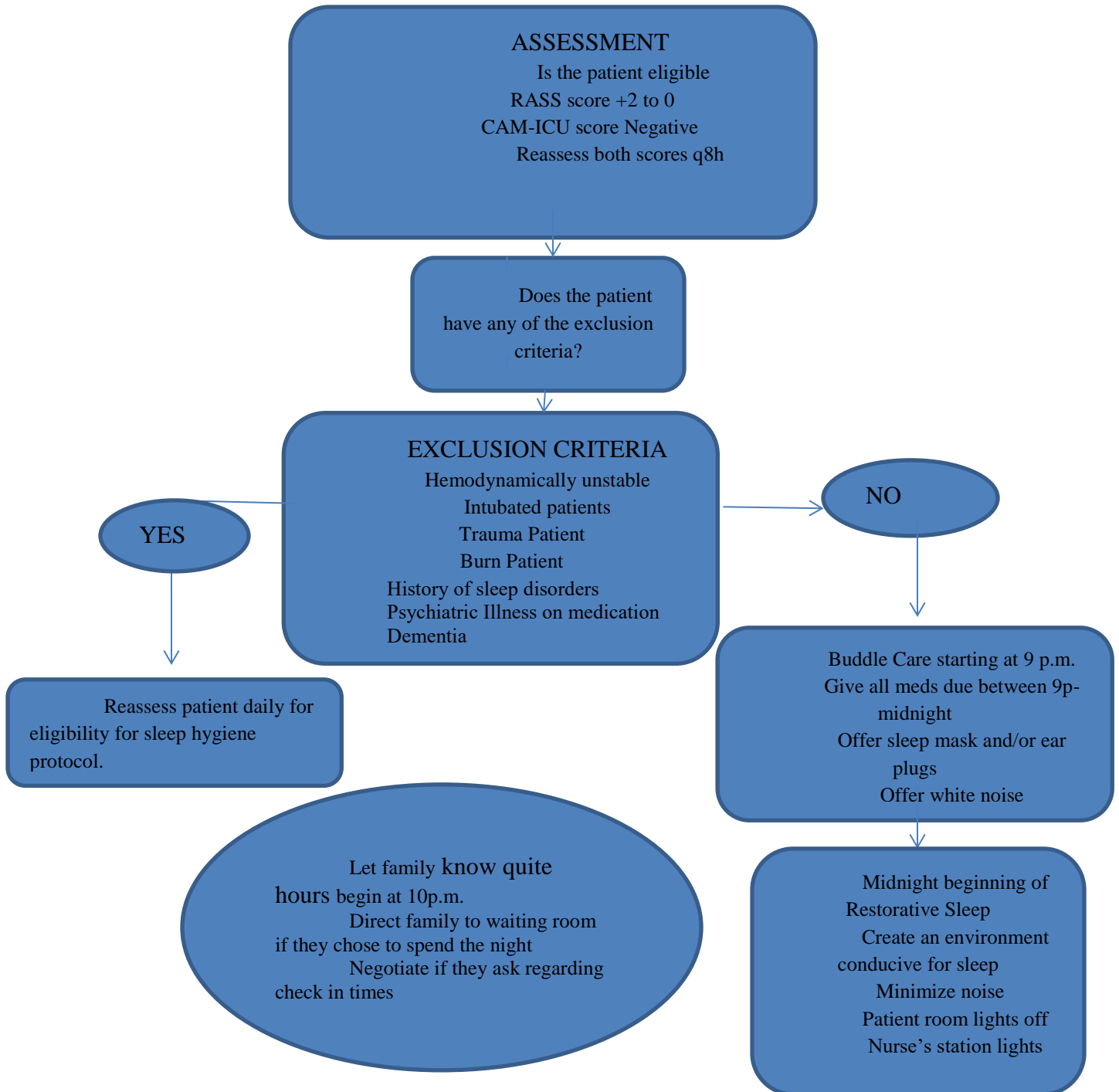
**INNOVATION**

We believe in...

- Creating original ideas/new concepts and putting them into practice.
- Being curious about new perspectives and ideas.
- Continual growth and change.

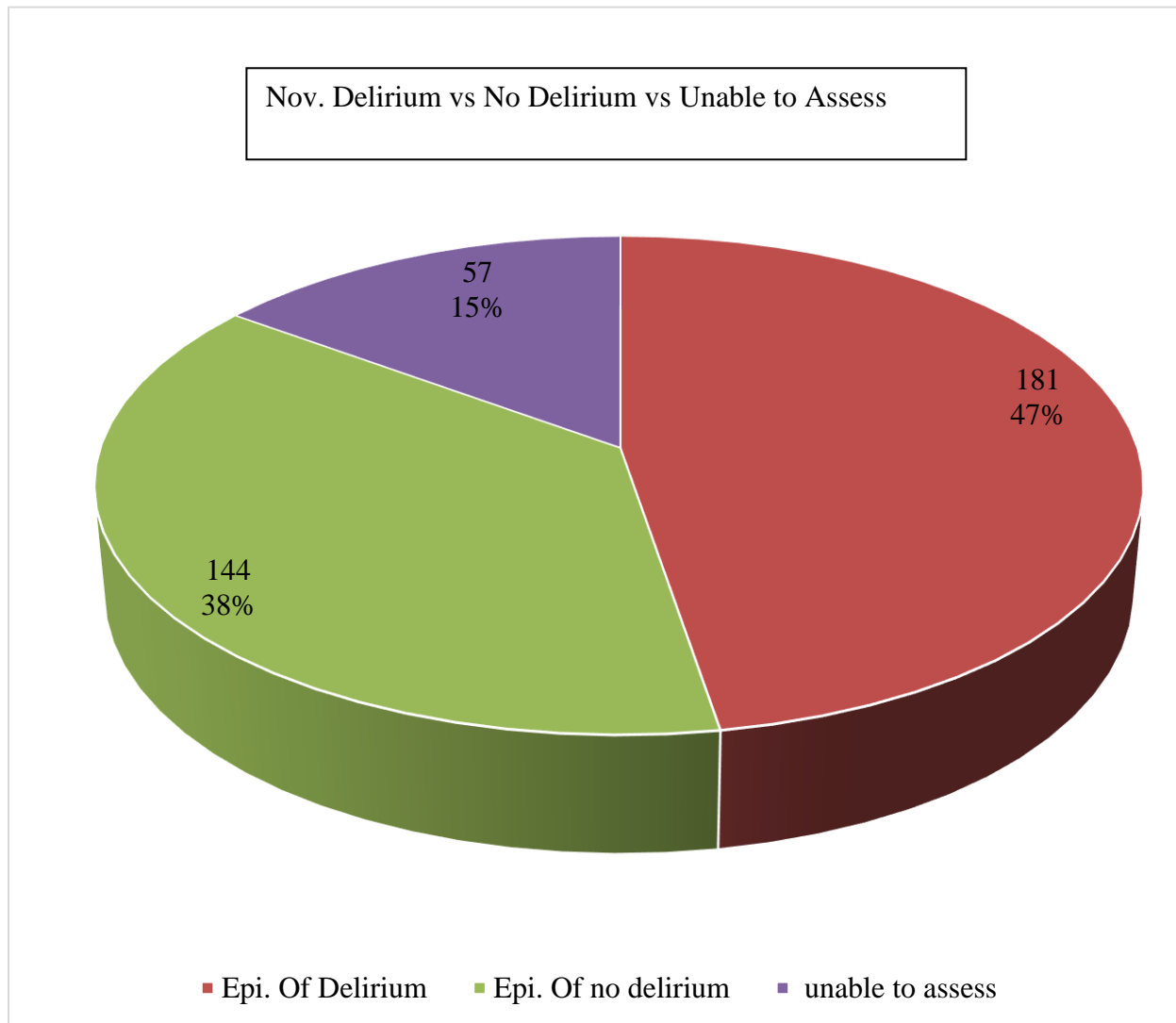
Appendix I

Sleep Hygiene Protocol



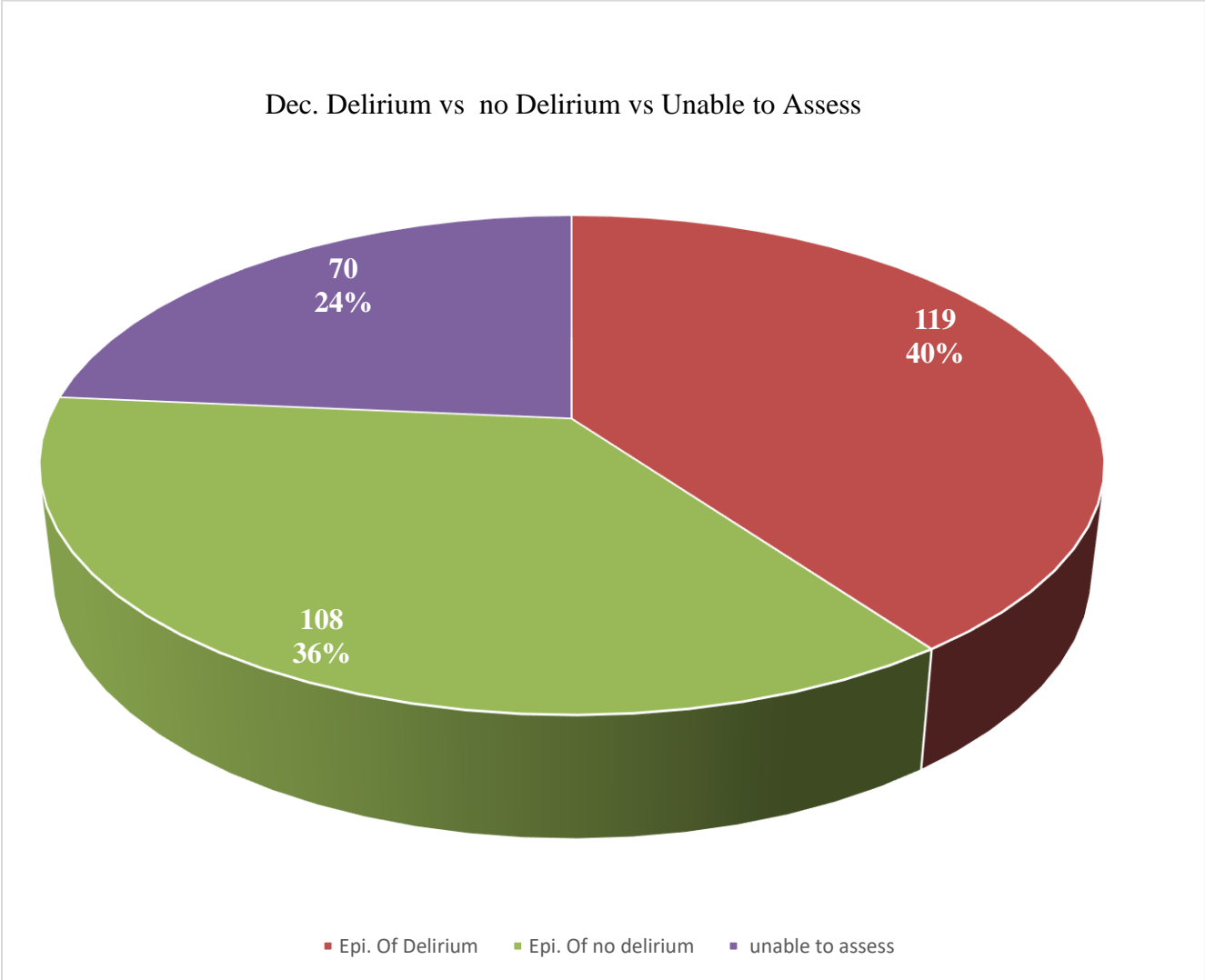


**Appendix J**



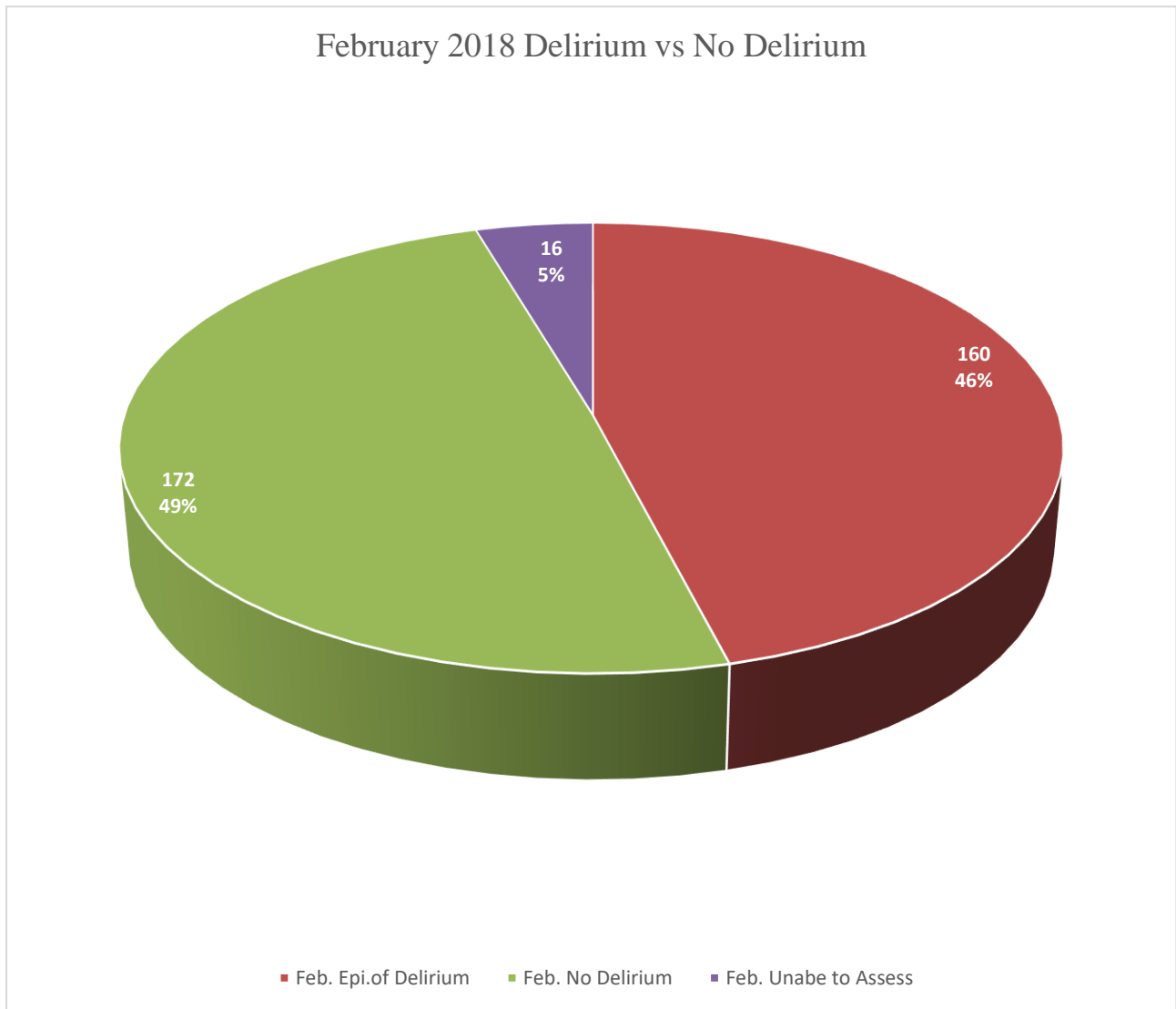
**Epi = Episodes**

**Appendix K**



**Epi. = Episodes**

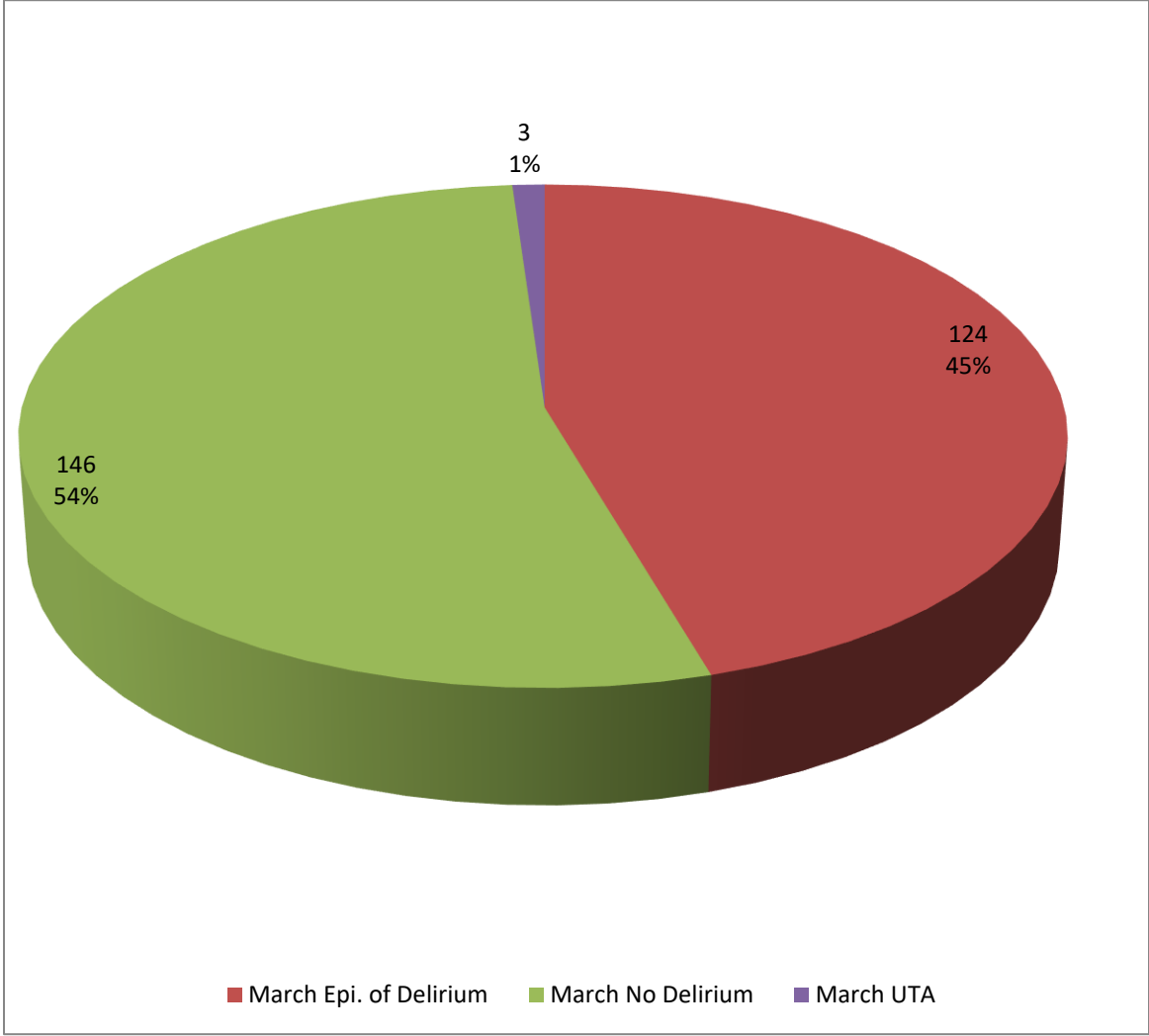
**Appendix L**



**Epi. = Episodes**

**Appendix M**

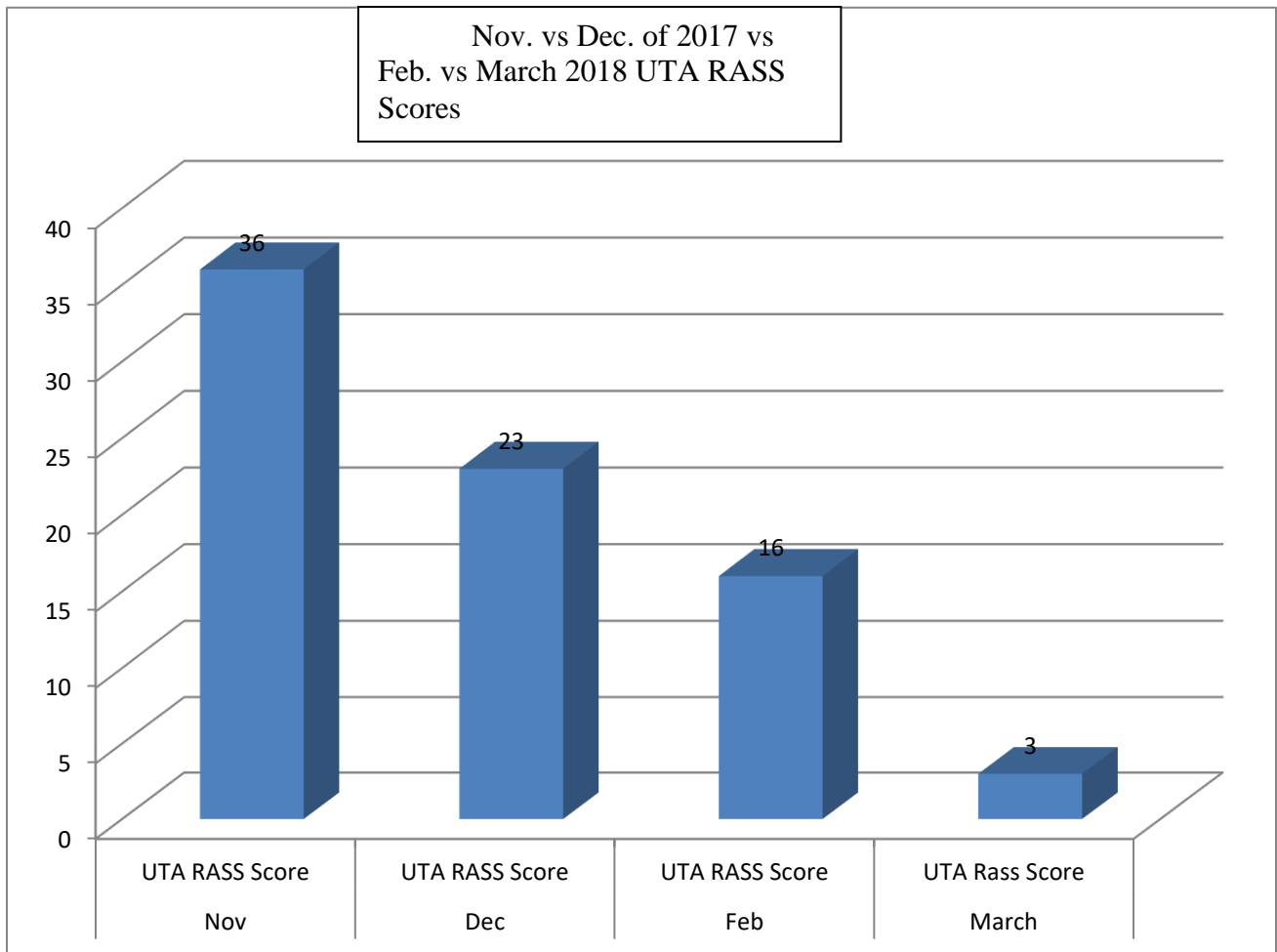
March 2018 Delirium vs No Delirium vs Unable to Assess



**Epi. = Episodes**

**Appendix N**

**Decrease of Inappropriate RASS Scores as UTA**

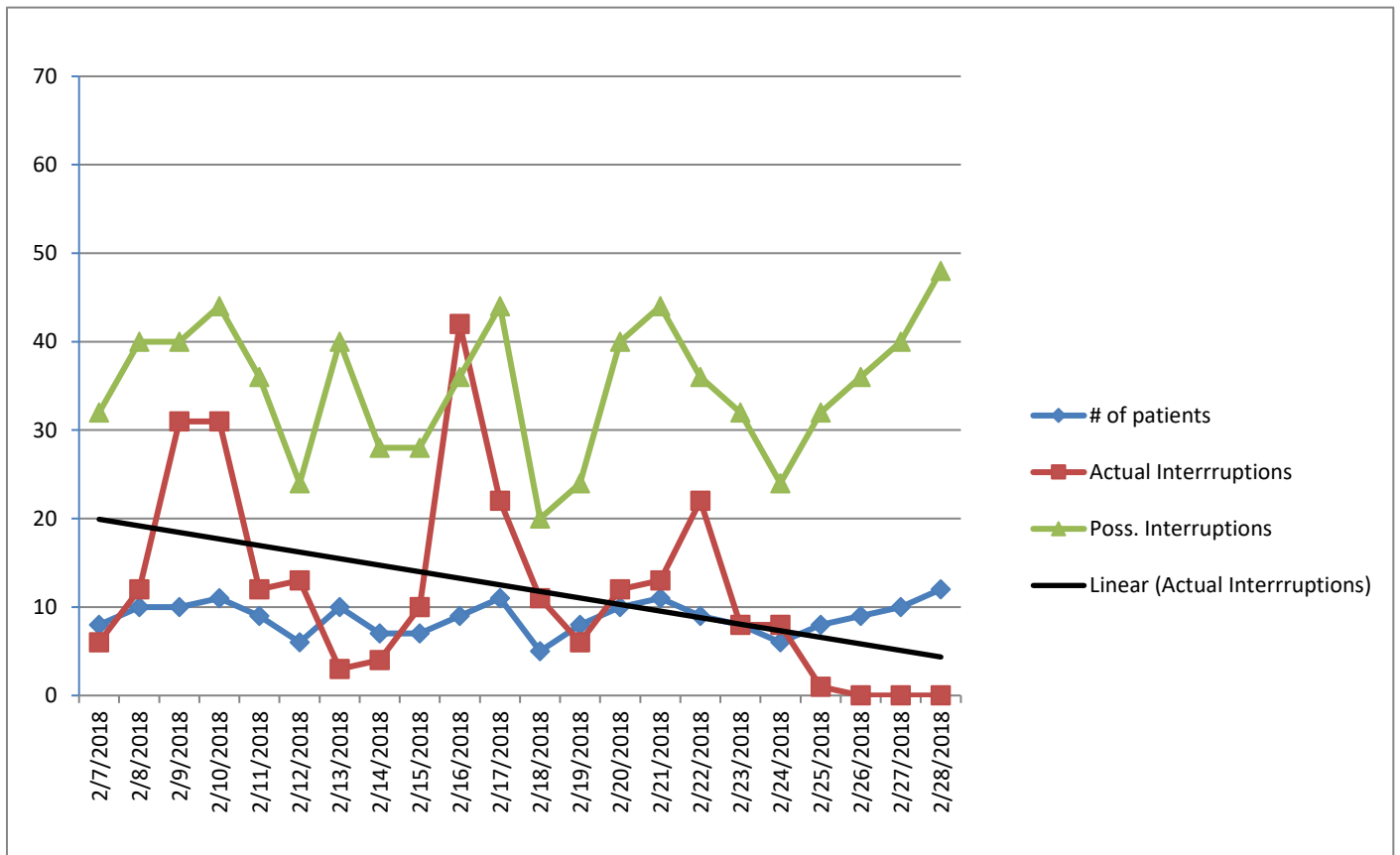


**UTA = Unable to Assess**

Appendix O

Tic Sheet for February

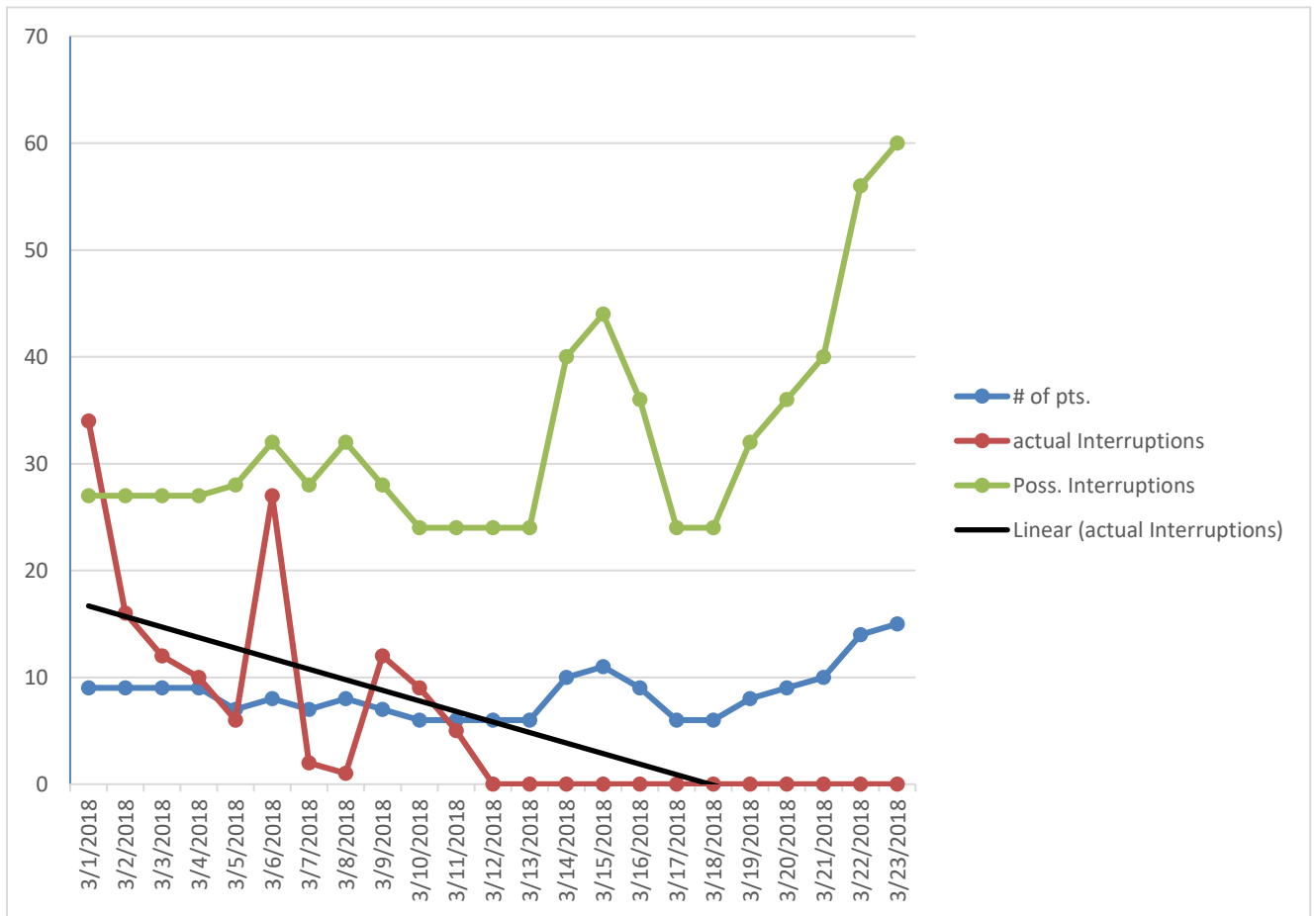
Number of patients with sleep interruption vs no interruptions during Midnight to 4a.m.



Appendix P

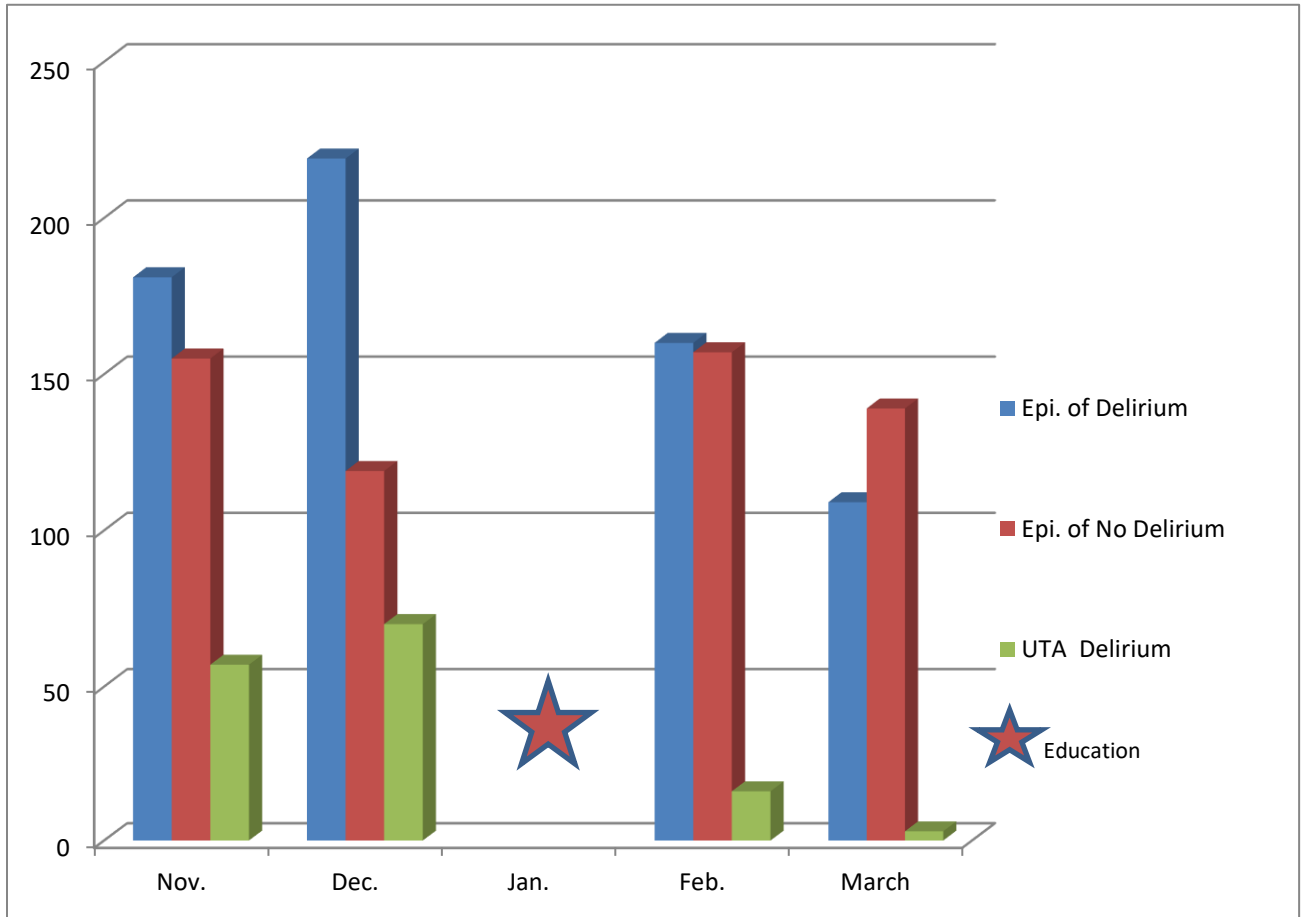
Tic Sheet for March

Number of patients with sleep interruption vs no interruptions during Midnight to 4a.m.



**Appendix Q**

**Comparison of Nov. vs. Dec. vs Feb. vs March episodes of delirium vs episodes of No delirium vs UTA**



**Epi. = Episodes**

**UTA = Unable to Assess**



**Table 1**

<b>Exposure</b>	<b>Delirium episode</b>		<b>Total</b>
	<b>No Delirium</b>	<b>Delirium</b>	
<b>Before protocol</b>	252	300	552
	45.65%	54.35%	
<b>After protocol</b>	318	284	602
	52.82%	47.18%	
<b>Total</b>	570	584	1154

**Table 2****Pearson Chi-Square Test**

<b>Chi-Square</b>	5.9252
<b>DF</b>	1
<b>P value</b>	0.0149