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PREVENTION OF ICU DELIRIUM THROUGH IMPLEMENTATION OF A SLEEP PROMOTION
BUNDLE

By

Victoria Bennett

Bachelors of Arts, Skidmore College, 2012

CAPSTONE PROJECT

Submitted to the University of New Hampshire

in Partial Fulfillment of

the Requirements for the Degree of

Master of Science

in

Nursing

September, 2015

This Capstone Project has been examined and approved.

Pamela DiNapoli PhD, RN, CNL
Committee Chairperson

Date

DEDICATION

This quality improvement project is dedicated to my mother, Kimberly Balfour Bennett, RN who has been a constant inspiration to me as both a parent and a nurse.

ACKNOWLEDGEMENTS

I would like to acknowledge the nurses of the Blake 12 ICU for their hard work and participation in this project. Special thanks goes especially to Stephanie Kwortnik DNS, RN, for her mentorship in implementing this project and Nursing Director Mary McAuley MS, RN for her support. Finally, I would like to thank Dr. Pamela DiNapoli PhD, RN, CNL for her guidance throughout the course of this quality improvement project.

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ABSTRACT

PREVENTION OF ICU DELIRIUM THROUGH IMPLEMENTATION OF A SLEEP PROMOTION
BUNDLE

By

Victoria Bennett, BA, RN

University of New Hampshire, September 2015

Background: Intensive care unit (ICU) delirium is the prevalence of delirium in ICU patients who do not have a history of drug/alcohol abuse, an admission for a mental status change, or an admission to the ICU for less than 24 hours. Serious adverse outcomes have been linked to the presence of ICU delirium resulting in overall longer hospital lengths of stay, longer duration of mechanical ventilation, higher rates of mortality, and long-term neuropsychological deficits after discharge. At the site of this quality improvement project, the prevalence of ICU delirium was 92.3% in a population determined to be high risk using the PRE-DELIRIC screening tool.

Aim: The aim of this quality improvement project was to decrease the prevalence rate of ICU delirium ICU through the implementation of a sleep-wake cycle bundle.

Methods: The process began with screening new admissions within twenty-four hours of admission to determine whether intervention is needed. Intervention ended at their discharge from the unit, death, or the designation of “comfort measures only (CMO)” by the physician. The site of this quality improvement project was a surgical/trauma ICU in a large urban teaching hospital. ICU delirium prevalence rates were determined through a retrospective chart review over a period of thirty days. Using the PDSA framework, new admissions to the ICU were screened using the PRE-DELIRIC model over a period of 30 days to determine their percent risk of developing delirium. Patients with a score of greater than 40% were enrolled in the project and had a sleep promotion bundle initiated. These patients were followed throughout their ICU stay and presence of delirium was tracked. Compliance with the sleep promotion bundle was also tracked.

Results: The 30 day rate of ICU delirium was reduced by 47.3% ($p = 0.019$).

Conclusion: Limitations and implications of this quality improvement project will be discussed. Recommendations for practice will be made and the role of the Clinical Nurse Leader (CNL) will be addressed.

Key Words: *Intensive Care Unit Delirium, Sleep Promotion, Quality Improvement, PRE-DELIRIC, Critical Care*

PREVENTION OF ICU DELIRIUM THROUGH IMPLEMENTATION OF A SLEEP PROMOTION BUNDLE

Introduction

For patients who are critically ill in the ICU, the occurrence of ICU delirium can have detrimental effects on their already fragile body. ICU delirium is defined by the American Association of Critical Care Nurses (AACCN) as “an acute change in consciousness that is accompanied by inattention and either a change in cognition or perceptual disturbance” (Bell, 2011). This acute change often goes undetected and untreated in this population of patients with an estimate that up to 80% of ICU patients suffer from ICU delirium (Bell).

Global Problem

ICU delirium has implications on patient outcomes. Patients who develop ICU delirium have longer length of stay in both the ICU and hospital, have longer duration of mechanical ventilation, higher rates of mortality, and suffer from long-term neuropsychological deficits after discharge (Ely, 2001, 2004; Girard, 2010; Hopkins, 2006). Furthermore, the cost of ICU delirium and its associated outcomes is enormous with estimates of \$4-16 billion being spent annually (Bell, 2011). To address this problem, early identification of at risk patients is needed in order to trigger preventative nursing interventions.

While some cases of delirium are related to pre-existing dementia or alcohol/drug withdrawal, those two patient populations are easily identifiable and typically have treatment

protocols already in place. Drug withdrawal treatment depends on the source of the withdrawal and management of the symptoms to drive treatment. For pre-existing dementia, psychiatry is consulted within 24 hours of admission to determine how to best manage care. However, even after excluding these patient populations, there are a high number of patients who experience delirium in the ICU.

Local Problem

At the site of this quality improvement project a retrospective chart review was conducted to determine the prevalence of ICU delirium. After eliminating patients with pre-existing dementia, patients with an ICU stay of less than 24 hours, patients admitted for mental status changes, and patients undergoing alcohol/drug withdrawal, it was determined that 29.6% of patients admitted over a thirty day period (March 2015) suffered from ICU delirium as evidenced by nursing notes, confusion assessment method for ICU (CAM-ICU) score, physician notes, and the use of atypical antipsychotics prescribed for delirium.

In this ICU, early mobility is an intervention that is implemented well through physical therapy consultations within 24 hours of admission and a culture that encourages patients to mobilize. However, implementation of a strict sleep-wake cycle has not yet been done on this unit. Currently, patients who are on mechanical ventilation receive their baths at approximately 3 AM and have their spontaneous breathing trials (SBT) at 4 AM. Furthermore, while the lights in patient rooms are largely kept off, nurses often leave the door and curtain open allowing light and noise to enter the room. All of these factors contribute to poor rest during the night, which can then contribute to fatigue during the day and daytime napping. Evidence shows that having

a sleep schedule of strict sleep periods and strict periods of being awake is preferable to the current process that results in disjointed napping and rest periods over 24 hours, lack of REM sleep, and poor sleep quality (Weinhouse, 2015).

Literature Review

The purpose of this review of the literature was to explore the correlation between sleep deprivation and ICU delirium. To begin evaluating the current literature in this area of research, the UNH library article search engine was used. The terms “ICU”, “delirium”, “sleep”, and “promotion” were used for the search with further criteria of full text only, year of publication between 2010 and 2015, and English language only; this yielded three articles. One of the three articles was eliminated because it was a proposal for a study that had yet to be published.

The first article, titled “Bundling sleep promotion with delirium prevention: ready for prime time?” tested a sleep promotion bundle that included bundling care, minimization of noise and light, and the use of eye masks and ear plus. Prior to the implementation of the bundle the unit of interest had a delirium prevalence rate of 33% (Kamdar & Needham, 2014). After the intervention, the delirium rate dropped to 17% and the duration of delirium was determined to have decreased from a pre-intervention duration of 3.4 days to 1.2 days (Kamdar & Needham). Though the study had a large sample size of 338 patients, there is a significant limitation to this study due to the fact it is a single center study that only examined this intervention in one hospital on one unit. Furthermore, other delirium prevention measures were initiated at the same time as the sleep promotion intervention including daily medication chart review, early mobilization, and minimization of sedation; it is difficult to say without a doubt that the decrease in delirium can be attributed to the sleep promotion bundle, these other interventions, or a combination (Kamdar & Needham). Despite this limitation, the study does provide evidence

that the implementation of a sleep promotion bundle is beneficial to patients and in combination with these other interventions, can significantly reduce the rate of ICU delirium.

The second article by the same principle investigator discussed a quality improvement project undertaken in a medical ICU at John Hopkins Hospital. The aim of the project was to determine the feasibility of implementing sleep promotion measures in an ICU with the aim of increasing sleep quality (Kamdar et al, 2014). Three classes of interventions were used to improve sleep: environmental interventions (drawing blinds, noise reduction), non-pharmalogical interventions (ear plugs, eye masks, calming music), and pharmalogical interventions (reducing medications known to contribute to delirium and alter sleep patterns, give zolpidem or haloperidol for sleep) (Kamdar). While delirium rates were not an outcome measure in this study, the process was measured by determining the compliance rates of each shift of nursing staff for each intervention. The authors used nurse champions and clerks to remind staff to initiate these interventions and follow the checklist; when comparing compliance of nursing staff when no reminders were given as opposed to compliance when nursing champions and clerks reminded them, compliance was significantly increased (Kamdar). Limitations that were discussed included that this study was only completed in one unit and that the quality of sleep was not measured objectively by polysomnography due to financial constraints which would have been the gold standard measurement (Kamdar). While this limitation possibly means that these interventions had no impact on improving sleep, the study still met its aim of determining whether implementing a strict sleep protocol is possible in an ICU where staff is often focused on other problems. They concluded that personal interaction and involvement with staff was the most successful in ensuring compliance. Interventions used in this study included: control of light exposure through curtain/blind use, caffeine avoidance after 3 PM, discouragement of

daytime napping, prevention of unnecessary alarms, optimized room temperature, adequate pain control, television off at night, eye mask/ear plug use, medication given that is favorable for sleep, and dimming of hallway lights (Kamdar). It was determined that it was far more difficult for night staff to implement interventions since they simply had more interventions to implement but that with support from clerks to remind them to maintain these changes, their compliance rate was soon equivalent to the day staff compliance rate.

Global Aim

The global aim of this quality improvement project was to decrease the prevalence of ICU delirium in ICU patients who do not have a history of drug/alcohol abuse, who were not admitted for a mental status change, and who are admitted to the ICU for greater than 24 hours.

Specific Aim

The specific aim of this quality improvement project was to implement a sleep-wake cycle bundle in this ICU. The process begins with screening new admissions within twenty-four hours of admission to determine whether intervention is needed and the intervention will be maintained for the duration of their ICU stay.

Methods

Patients will be screened using the PRE-DELIRIC screening tool to determine their percent risk of determining ICU delirium with a score greater than 40% constituting high risk. While the PRE-DELIRIC tool usually uses >50% as a measure for high risk, upon analysis of this population of patients during the first 30 day evaluation, 40% was determined to be a more appropriate cut-off point. These high risk patients will have a sleep promotion bundle

implemented and will be monitored for the development of ICU delirium for the duration of their stay.

Setting

The unit in which the project was conducted is an eighteen-bed surgical and trauma intensive care unit (ICU) at a large city hospital. While this critically ill population is primarily made up of surgical and trauma patients, this unit does take medical patients as well when the medical ICU is at capacity. Length of stay for these patients varies greatly depending on each individual patient's condition but can range from as brief a stay as a few hours to as long as several weeks or months. Patients are usually discharged to an inpatient floor within the hospital or transferred to a rehab facility. While not as frequent, patients can also be discharged to home although it is not a regularly occurring event.

Intended Improvement

The intended improvement to the sleep cycles of patients in the ICU would result from the implementation of a sleep-wake cycle bundle aimed at decreasing the prevalence of ICU delirium in high-risk patients. Patients were identified for inclusion using the PRE-DELIRIC screening tool (Van den Boogaard, 2012, 2014). Once identified as patient at high-risk for ICU delirium, these patients had a sign (Appendix) posted on their door alerting staff to their high-risk status with instructions on what actions to take during the night and during the day. During the night, instructions included light reduction (shades closed, lights off, offer eye-mask), noise reduction (close door, minimize conversations in room perimeter, offer ear plugs), minimizing stimulation (bundle nursing care, give baths during the day, SBT during the day), and promoting

comfort (adequate pain control). During the day, instructions included maintaining light levels (shades open, lights on), increasing stimulation (encourage interaction, frequent reorientation, keeping door open), and limiting daytime napping. When appropriate, nurses are encouraged to discuss with the patient when they would like to go to sleep and at what time they would like to wake up to begin their day. Having this conversation with alert and oriented patients will allow for more patient centered care and allow for a more natural sleep cycle similar to their normal cycle to occur.

Screening Tool

Being able to identify at risk patients is integral to creating interventions intended to prevent ICU delirium. Several tools have been created as awareness of ICU delirium has increased and risk factors identified. One tool, known as the PRE-DELIRIC (Prediction of Delirium in ICU patients) tool, has been recalibrated and validated across six countries and uses ten risk factors to calculate the chance in percent that a patient has of developing delirium during their ICU stay (Van den Boogaard, 2012, 2014). The ten risk factors that this study identified as impacting the development of ICU delirium include age, APACHE II score (which indicates severity of illness), admission group (surgical, medical, trauma, or neurology/neurosurgery), presence of coma (medically induced, non induced, or a mixture of both), presence of infection, presence of metabolic acidosis, use of sedatives (such as benzodiazepines), use and dosage of morphine, urea concentration, and whether the admission was urgent or scheduled (Van den Boogaard). Use of this tool was statistically more accurate for prediction of ICU delirium development when compared to healthcare providers predictions, which is the current method of

anticipating ICU delirium (Van den Boogaard). Over the course of two studies, 5908 patients were studied using this prediction method across thirteen ICUs in six countries; the scoring system was recalibrated after the second study to allow for more precise predictive values (Van den Boogaard).

Theoretical Framework

The theoretical framework that was used for this quality improvement project was the Plan-Do-Study-Act (PDSA) framework (IHI, 2015). This framework consists of four phases. First, in the planning phase, the objective is determined along with how the project will be carried out. Next, in the do phase, the intervention is implemented. Third, in the study phase, the results from doing the intervention are analyzed and the results are summarized. Finally, in the act phase, the process is assessed and recommendations for the next cycle are made. In the planning phase, a baseline prevalence rate of ICU delirium was determined, a literature review and research was conducted, and data collection was planned. In the doing phase, the data was collected by screening patients with the PRE-DELIRIC tool and implementing a sleep protocol. Presence of delirium and compliance with the interventions was assessed. In the studying phase, the data collected was compared to the baseline data to determine whether this intervention was successful in achieving the aim. In the act phase, recommendations were made for further work and practice.

Data Analysis Plan

The baseline prevalence of ICU delirium will be compared to the current rate of ICU delirium in the entire unit. The baseline prevalence of ICU delirium in high-risk patients will be compared to the current rate of ICU delirium in all high-risk patients. Finally, the baseline prevalence of ICU delirium will be compared to the current rate of ICU delirium in high-risk

patients who maintained compliance with the intervention. A two tailed T-Test will be used to determine statistical significance.

Results

For the eleven patients that scored greater than 40% on the PRE-DELIRIC screening tool, Table 1 shows that five became delirious yielding a 45% rate of delirium in this population over the month of June. When compared to the month of March, twelve out of the thirteen patients became delirious yielding a 92.3% delirium rate, Table 1 shows this is an improvement of 47.3% ($p = 0.019$) and is statistically significant $p < .05$.

Table 1. Comparison of Delirium Rates

	Number of Patients with PRE-DELIRIC Score above 40%	Number of patients with score >40% who became delirious	Delirium Rate for patients scoring >40%
Pre-Intervention	13	12	92.3%
Post-Intervention	11	5	45%

Discussion

An improvement in the rate of ICU delirium in this population suggest that through the promotion of sleep, nursing staff can prevent the onset of delirium in high risk patients.

Decreasing delirium rates could have implications for length of stay, duration of mechanical ventilation, neuropsychological deficits, and mortality (Ely, 2001, 2004; Girard, 2010; Hopkins,

2006). Being able to decrease delirium and therefore these associated outcomes would not only have a positive impact on patients, but also decrease the cost of care. While these four outcomes were not measured in this study, further work could be done to determine the exact effect delirium reduction has on this population in this setting. Based on the results of this quality improvement project, it is recommended that certain changes be made to the standard process on this unit. First, bathing of patients (including those that are intubated) should either be moved to the day shift or be done by the night shift early on or late in their shift. Trying to maintain a period of minimal disturbance from midnight to 5 AM is recommended. Second, keeping with this period of minimal disturbance, spontaneous breathing trials should be limited between the hours of midnight and 5 AM. Coordination with respiratory therapy and the medical team would be necessary for this change but it is one that is important when preventing delirium. Third, a culture of delirium prevention and sleep promotion should be maintained. Early on in this project, there was resistance to change; however, throughout the course of the project, staff began to see the positive impact the interventions were having on their patients and nurses began independently implementing sleep promotion interventions for patients who were not part of this project. Finally, physicians and nurses may find the implementation of a screening tool for delirium useful in identifying patients who need extra attention. Providing them with a tool such as the PRE-DELIRIC tool may be useful in the identification and prevention of delirium.

Implications for the Clinical Nurse Leader

While this unit does not have a Clinical Nurse Leader (CNL), this project is an example of how one could be beneficial. To begin this pilot project, the assessment of actual and anticipated health risks to both individuals and populations was required. Delirium is not well understood among the nursing and medical community so a thorough examination was required

to help nurses identify delirium and determine the best way to identify which population of patients was at high risk. To intervene for this population of high-risk patients, facilitation of the modification of nursing interventions based on the current evidence was required. For many nurses, there was a misconception that for patients on continuous sedation (such as propofol), a normal sleep-wake cycle was not important. Bringing this to light and working with nurses to modify their workflow was necessary and reflective of the CNL role. Finally, it is the goal of the CNL to make an impact on patient outcomes in a positive way and to do so in a cost effective manner. While data was not collected on length of stay, mortality, or other outcomes, there is evidence that by reducing delirium rates, hospital costs related to associate adverse outcomes will decrease. (Ely, 2001, 2004; Girard, 2010; Hopkins, 2006) By reducing the rate of these outcomes, hospitals will not only have better served their patient population, but done so in a cost effective manner as well.

Limitations

Translation of the findings of this study has limited generalizability because of the small sample size with only eleven patients meeting the criteria to be enrolled in this project. Further work should be aimed at engaging other members of the healthcare team such as respiratory therapy, physical therapy, and the medical team to focus on other factors that contribute to delirium such as medications, restraint use, early mobilization, and the coordination of spontaneous breathing trials with spontaneous awakening

Conclusion

Through the screening of patients using the PRE-DELIRIC tool and the implementation of a sleep promotion bundle, ICU delirium was reduced by 47.3% ($p=0.019$) in high-risk patients.

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APPENDIX

Poster for Patient Rooms

PLEASE NOTE: THIS PATIENT IS PART OF A PILOT PROGRAM

**DAYTIME**

BEGINNING NO LATER THAN 08:00 (when appropriate, discuss with patients their desired bedtime and wake up time)

1. **LIGHT**
 - a. Shades open
 - b. Lights on
2. **NOISE**
 - a. Doors open
3. **ACTIVITY**
 - a. Encourage activity/time up in a chair as appropriate
 - b. Limit daytime napping as appropriate
4. **CAREGIVING**
 - a. Encourage interaction and conversation when in the room to promote orientation
 - b. Bathing for patients in this study will be performed during the day

**NIGHTTIME**

BEGINNING NO LATER THAN 20:00 (when appropriate, discuss with patients their desired bedtime and wake up time)

1. **LIGHT**
 - a. Shades down
 - b. Lights kept off as much as possible
 - c. Offer patients eye masks when appropriate
2. **NOISE**
 - a. Doors closed
 - b. TV/music off
 - c. Reduce staff conversation in room perimeter
 - d. Offer patients ear plugs when appropriate
3. **ACTIVITY**
 - a. Limit activity/ambulation as appropriate
4. **CAREGIVING**
 - a. Bundle care as much as possible to limit stimulation
 - b. Bathing for patients in this study will be performed during the day
 - c. Please try to refrain from SBT between 00:00-05:00