Reducing Delirium in Hospitalized Adults Through a Structured Sleep Promotion Program

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ABSTRACT

Background: Delirium affects approximately 1 in 4 patients during their hospitalization and is associated with numerous complications. Sleep deprivation is a significant risk factor for developing delirium and is a patient dissatisfier.

Problem: An internal assessment revealed that up to 25% of all patients on medical-surgical units had a diagnosis of delirium while in the hospital.

Approach: An evidence-based practice project was implemented to reduce the development of delirium through sleep promotion on 2 inpatient units. A dedicated time was selected, and key strategies were identified to promote sleep with minimal interruptions.

Outcomes: Delirium decreased by 33% and 45% on the 2 units over 1 year. Overall, patient satisfaction for quietness at night survey responses also increased ($P = .0005$; CI, 0.05 to 0.67) with ongoing sustainment.

Conclusions: Implementation of a dedicated period to sleep was associated with a reduction in delirium and increased patient satisfaction for quietness at night.

Keywords: dedicated period to sleep, delirium, evidence-based practice, quietness at night, sleep

Delirium is characterized as an acute disturbance in cognitive functioning and attention that develops over a short period and may fluctuate over the course of the day.[1] Delirium is highly prevalent in hospitalized patients, with more than 2.6 million patients older than 65 years developing delirium each year.[2] Up to 30% of patients on a general medical-surgical unit will develop delirium during their hospitalization.[3] Delirium is a significant problem in the inpatient hospital setting especially for older adults and contributes to long-term cognitive and functional impairment, and increases length of stay, morbidity, mortality, and costs.[4] There are many factors that place patients at a high risk of developing delirium, which is preventable in 30% to 40% of cases.[2] Examples of nonmodifiable risk factors for delirium include older than 65 years, baseline dementia or cognitive impairment, history of delirium, vision or hearing impairment, and examples of modifiable risk factors include pain, immobility, indwelling urinary catheter, anticholinergic medications, and sustained sleep deprivation.[5]

The Iowa Evidence-Based Practice (EBP) Model was used as the framework guiding the EBP program.[6] A literature search was conducted through PubMed, Cumulative Index of Nursing and Allied Health Literature, and Google Scholar in June 2017 for interventions to promote sleep in the hospital.

Sleep deprivation is pervasive in hospitalized patients and is a key contributor for developing delirium. Poor sleep has been associated with decreased mobilization and patient satisfaction, increased delirium and daytime sleepiness, and longer recovery from surgery.[7-9] On average, patients sleep less than 4 hours per night in the hospital.[10] Furthermore, sleep is fragmented into short intervals with frequent interruptions.[10] On

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average, patients experience a mean of 13 awakenings per night preventing them from reaching deeper levels of restorative sleep.[10] Causes of sleep disturbances include excessive noise, light exposure, health care needs, pain, stress, and environmental temperature.[7,9,11,12] A nationwide single-day study, in the Netherlands, found that both the quantity and the quality of sleep of hospitalized patients were significantly reduced, with patients experiencing more than 3 times the number of awakenings in the hospital compared with home.[12] Strategies for sleep promotion reported in the literature include noise reduction,[13-17] clustering patient care activities,[14] light reduction,[14,15,17] promoting patient comfort,[14] and changing medication times.[18,19] The aim of this study was to reduce the frequency of delirium on 2 medical-surgical care units through the creation of a program to allow for a period of uninterrupted sleep and evaluate the impact on costs.

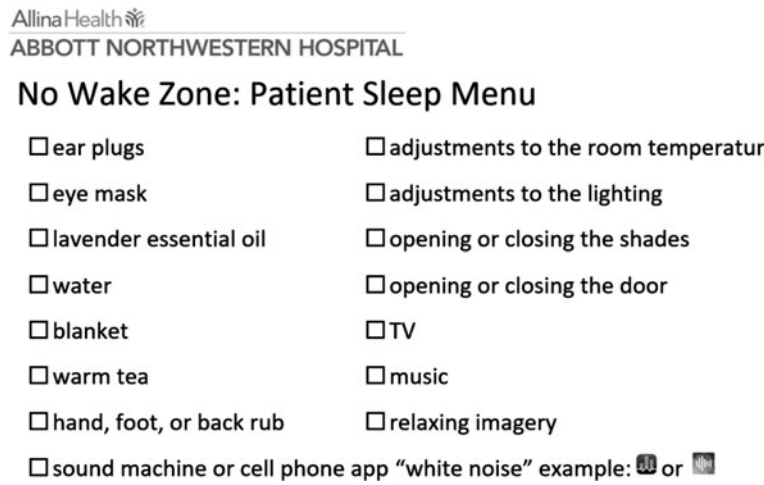
METHODS

An interprofessional team was formed, consisting of nursing, pharmacy, internal medicine, laboratory, and respiratory therapy at a metropolitan quaternary medical center in the upper Midwest region in the United States. This team was in support of pursuing a period of uninterrupted sleep for patients. The interprofessional team evaluated the various units across the hospital where delirium reduction would have the most impact based on patient volume and potential for cost avoidance. Subsequently, a nursing subgroup was formed, consisting of frontline nurses and support staff from both units, nursing leadership, and the physician champion.

The 2 medical-surgical inpatient units were selected based on the feasibility of implementation within differing patient populations. The 30-bed medical oncology unit was selected due to the high risk for developing delirium in a patient population with more variability in patient trajectory and longer length of stay. The 34-bed surgical spine unit was selected due to the risk of developing delirium with the consequence of delaying the expected milestones of postoperative recovery.

The sleep promotion program to reduce delirium consisted of: (1) guidelines for patient selection (eg, 24 hours after surgery, stable vital signs); (2) sleep menu (Figure), (3) patient education, (4) staff and provider education, (5) environmental assessment, (6) electronic order, (7) staff responsibilities by shift and role, and (8) hospital-wide communication plan.

The nursing subgroup reviewed the evidence, designed, and branded the sleep promotion program components as the No Wake Zone (NWZ).[20] The 5-hour timeframe from 1 AM to 6 AM was selected to maximize sleep and balance the needs to allow the nurse to have sufficient time to conduct essential patient assessments and provide needed nursing interventions at the beginning of the 8-hour shift, which starts at 11 PM. Next, the nurses identified barriers to sleep at night through completing a fishbone diagram and selected top focus areas to minimize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No Wake Zone: Patient Sleep Menu

- ☐ ear plugs
- ☐ eye mask
- ☐ lavender essential oil
- ☐ water
- ☐ blanket
- ☐ warm tea
- ☐ hand, foot, or back rub
- ☐ adjustments to the room temperature
- ☐ adjustments to the lighting
- ☐ opening or closing the shades
- ☐ opening or closing the door
- ☐ TV
- ☐ music
- ☐ relaxing imagery
- ☐ sound machine or cell phone app "white noise" example: or

Figure. Patient sleep menu options. Copyright Allina Health, October 2017. Reprinted by permission.

sleep disruptions. A key initial step was to conduct an environmental assessment of each unit to identify loud noises that could wake a patient; the facilities department was consulted to remedy the loud noises. For example, in the medical oncology unit the positive air pressure handler was being reset daily at 2 AM, described by patients as sounding like a jet airplane taking off, consistently waking patients from sleep. The air handler was successfully rescheduled to reset instead at 2 PM when patients are typically awake.

Intervention

During the selected period of 1 AM to 6 AM, patients have minimal to no interruptions to allow for sleep unless medically necessary. Patients are identified as candidates for the NWZ if they are medically stable and have a minimum of 24 hours after admission or surgery. A provider enters an order in the electronic medical record (EMR) for the NWZ. Obtaining the NWZ order was addressed during multidisciplinary rounds. Nurses assess the patient prior to the beginning of the NWZ, and the nursing team members establish a sleep plan with the patient that includes bundling patient care activities, medication, laboratory timing, and bathroom needs. While the patient sleeps, nurses continue to perform safety assessments without waking the patient.

Specific patient education on the importance of sleep was provided to patients (see the Supplemental Digital Content Figure, available at: http://links.lww.com/JNCQ/A735). Patients also received the sleep menu to allow them to select interventions that work best for them (see the Figure). Other health care team members were alerted that the patient was on the NWZ via a magnet posted outside the patient's room. The pharmacist reviewed each patient's medication administration record (MAR) to identify any medications during the NWZ that could be retimed to promote sleep. Sleep supplies were stocked on the pilot units including patient education handouts, sleep menus, eye masks, ear plugs, aromatherapy, sound machines, fans, and the NWZ magnet. Both the nurses and nursing assistants distributed the patient-selected sleep supplies. The NWZ was launched in October 2017.

The nurses helped develop and deliver educational content to their colleagues through staff meetings, the unit-based practice council, email newsletters, nursing huddles, and 1:1 education. The education delivered at staff meetings consisted of a background of delirium, causes and consequences of sleep deprivation, interventions to promote sleep, the components of the NWZ program, and staff roles. Providers were educated at monthly provider meetings by the physician champion.

Measures

Both outcome and process measures were identified and monitored using an electronic database. The outcome measures include positive delirium screening, cost savings, and patient satisfaction. The process measures include several individual nursing interventions causing interruptions at night. The NWZ pilot was implemented in October 2017 and transitioned without interruption from pilot to permanent practice in January 2018, when initial preliminary data were encouraging. All patients admitted to the 2 pilot units were included for the data analysis.

The primary outcome measure was the rate of positive delirium screening by nursing through the Nursing Delirium Screening Scale (NuDESC)[21] documented in the EMR for patients older than 65 years and excluded those who had an intensive care unit (ICU) stay of more than 24 hours, were mechanically ventilated, or died during their hospitalization. The benefit of using the NuDESC as an outcome measure as opposed to provider-coded diagnosis of delirium is that nurses consistently and reliably screen patients for delirium once per shift while performing the required head-to-toe assessment. The NuDESC has been validated for screening patients for the risk of delirium in postoperative inpatient settings and has a sensitivity of 98% and a specificity of 92%.[21] Its main limitation, however, is that as a screening tool and compared with the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) *DSM-IV* criteria, the NuDESC may not fully capture those patients with or without delirium.[21]

The cost savings outcome measure was obtained through coded delirium (*International Classification of Diseases, Tenth Revision* [*ICD-10*] F05, F06.8, and R41.0) and encephalopathy (*ICD-10* G93.41, G93.40, G93.49, G91.61, G91.62, and G91.63) diagnoses for patients older than 65 years excluding those with an ICU stay of more than 24 hours. The cost savings is specific to each unit's average variable cost due

to impacts of longer lengths of stay associated with delirium. The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient satisfaction survey for quietness at night asked patients "During this hospital stay, how often was the area around your room quiet at night?" and was measured by those answering the question with "always" using a Likert scale.

The process measures include the 4 most frequent causes of sleep interruptions that could be extracted from the EMRs. These interruptions include medication administration, laboratory draws, blood glucose measurement, and bladder scan assessments occurring in the NWZ. While these process measures do not necessarily capture all the causes of the interruptions to a patient's sleep, this method does not rely solely on counting individual interruptions throughout the night. To ensure that there was not a delay in recognizing patient deterioration, rapid response calls were tracked as a balancing metric.

Analysis

The HCAHPS quietness at night data was analyzed using an interrupted time series with Newey-West estimation with the data analyses completed using STATA 15 (StataCorp, College Station, Texas) statistical analysis software. The change in positive delirium risk screening data was analyzed using the χ^2 test of independence. The delirium cost avoidance was calculated by the change in delirium rate from 2016 to 2018 and the average variable cost attributed to delirium. The data were not adjusted for other factors that could influence the results. The project was not submitted to the institutional review board, as it was determined to be a quality improvement initiative and human subjects' protection was not needed.

RESULTS

Demographic data are reported in the Supplemental Digital Content Table (available at: http://links.lww.com/JNCQ/A736) and demonstrate consistency in patient characteristics before and during implementation of the NWZ. The HCAHPS quietness at night showed a statistically significant increase ($P = .0005$; CI, 0.05-0.67), as shown in the Supplemental Digital Content Figure (available at: http://links.lww.com/JNCQ/A737). Positive delirium risk screening decreased from 26.3% to 17.9% ($P < .00001$) on the medical oncology unit and from 14.1% to 7.8% ($P < .00001$) on the surgical spine unit. The cost avoidance for 2018 was $160 505 and $241 802, respectively, for the 2 units (Table).

DISCUSSION

Comparable to national studies, the hospital's internal delirium data showed that 13% to 26% of patients older than 65 years on medical-surgical units had a delirium diagnosis according to discharge data. In the nursing subgroup, the fishbone diagram identified causes of sleep disruptions consistent with those that have been previously reported and included noise from other patients, pain, hospital equipment, and hospital staff.[12,22]

An interprofessional team approach was beneficial to the implementation and ongoing sustainment of the NWZ initiative. Involvement of frontline nurses and support staff provided valuable insight to the barriers of continuous

Table. Frequency of Positive Delirium Screening and Cost Avoidance

Units	Delirium Positive Screening[a] 2016 Baseline n (%)[b]	2017 n (%)	2018 n (%)	Percent Decrease	Estimated Cost Avoidance[c] (2018)
Medical oncology	201/764 (26.3)	186/1074 (17.3)	202/1129 (17.9)	33 ($P < .00001$)	$160 505
Surgical spine	144/1025 (14.1)	166/1851 (9.0)	168/2165 (7.8)	45 ($P < .00001$)	$241 802

[a] *Patients 65 years or greater who scored positive with the NuDESC delirium screening, without an ICU stay of more than 24 hours. Patients who received mechanical ventilation or who expired were excluded.*

[b] *Number of patients with delirium/total patients (total percentage of patients with delirium).*

[c] *Cost avoidance calculated by subtracting the total cost of care for patients who developed delirium compared with those who did not.*

sleep and helped champion the work with their colleagues and patients. The team anticipated a cross-over effect on all patients regarding sleep promotion practices, not only those who had the NWZ ordered. This may have had a positive effect to overall unit improvements in delirium reduction and increased patient satisfaction.

Pharmacists' review of each patient's MAR resulted in few adjustments to medication retiming. The automatic process of pharmacist review of the MAR transitioned to consult-as-needed by the nurse when the NWZ expanded to additional medical-surgical units throughout the hospital. On the surgical spine unit, adoption of the NWZ was easily standardized to integrate into a predictable postsurgical course. The primary spine surgeon group had an advanced practice nurse practitioner who ordered the NWZ consistently once patients met eligibility criteria.

One challenge to the pilot work on the medical oncology unit was the difficulty in identifying when patients were medically appropriate to initiate the NWZ due to their complexity of condition and nebulous trajectory. Another challenge was prompting the provider to order the NWZ for eligible patients, given the weekly rotation of hospitalist coverage. Furthermore, leadership support was required to proactively identify eligible patients and guide adoption.

Another limitation was the evidence-based practice framework that was used. This lacks the rigor and control of a formal research study and did not adjust for other variables that can impact delirium. However, the interrupted time series statistical analysis was used to help mitigate some the potential for other variable influences.[23]

Possible next steps may include a research study to evaluate subgroups that may benefit the most from the NWZ. Additional next steps for reducing the risk of developing delirium include expanding the NWZ throughout the hospital and to hospitals across the health system, making the NWZ nurse initiated rather than provider ordered, and expanding the targeted nonpharmacological delirium prevention strategies to promote cognitive stimulation.

CONCLUSIONS

Implementation of an NWZ and dedicated period for restorative sleep was associated with a reduction in delirium and increased patient satisfaction for quietness at night. Collaboration between the interprofessional team members was key to success in development of the NWZ. The NWZ is a low-fidelity and easily adaptable intervention requiring low-to-moderate effort.

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