



Articles

Nurse-Led Prevention and Early Identification of ICU Delirium: A Quality Improvement Project

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Delirium

Background

Delirium prevention and early identification in the intensive care unit (ICU) are challenges for hospital systems focused on optimizing patient outcomes. The bedside nurse's consistent presence at the bedside and influence of the patient environment places them in an ideal position to positively impact ICU delirium rates. This project aimed to implement nurse-led interventions to reduce the incidence of ICU delirium and improve early recognition of delirium in a subset of adult patients receiving ICU-level care in a 20-bed neuroscience ICU (NSICU) at a large academic medical center.

Methods

An Early Delirium Intervention (EDI) protocol was created by synthesizing existing delirium prevention literature. Nurses in the NSICU received education on the EDI protocol, including evidence-based measures to prevent delirium and guidelines on performing the Confusion Assessment Method for the ICU (CAM-ICU) and promptly reporting positive results. Dedicated nursing training included peer demonstration and CAM-ICU assessment practice in a simulated setting to improve nurse confidence. Nurse knowledge scores, CAM-ICU completion rates, and patient outcomes from the intervention period were compared to pre-intervention baseline data.

Results

Nursing competency with CAM-ICU completion increased from the pre-implementation phase (M = 74.4%) to the post-implementation (M = 89.1%) phase ($t(47) = 4.02361$ $p = 0.000206$). The nurses' perceptions of comfort with utilizing the CAM-ICU and EDI protocol also increased following education ($p = 0.0001$). Consistent completion of delirium screening with the CAM-ICU increased among day-shift nurses ($p = 0.004$) while remaining stable among night-shift nurses ($p = 0.224$). The delirium prevention measures that were most feasible for the nursing staff, with improved utilization following education, included keeping the room lit during daytime hours ($p = 0.012$), television on during the day ($p = 0.02$), and patient activity engagement during the day ($p < 0.001$).

Conclusion

An evidence-based, nurse-led protocol for preventing and detecting ICU delirium proved to be a feasible quality improvement project that increased nursing knowledge of delirium and comfort with the CAM-ICU assessment. Implementing nurse-driven delirium prevention and early identification strategies empowers nurses to play a crucial role in promoting positive outcomes for critically ill patients.

INTRODUCTION

Delirium is a change in mental status that can cause acute cognitive changes that fluctuate with time. It is an under-recognized problem in the medical setting that contributes to poor patient outcomes.¹ Delirium occurs in all hospital units; however, the intensive care unit (ICU) carries the highest number of patients experiencing delirium. Decades of studies have illustrated the prevalence of ICU delirium

affecting 11%-87% of ICU patients worldwide.² Patients who experience ICU delirium have increased hospital days, more ventilator hours, higher healthcare costs, longer rehabilitation times, and an increased mortality rate than those who do not experience ICU delirium.³

The ICUs at an urban teaching hospital in the Midwest United States relied on the delirium subsection of the Society of Critical Care Medicine's ICU Liberation Bundle (ABCDEF)⁴ to address the assessment, prevention, and

management of ICU delirium. The delirium section of this bundle states that the nurse will perform the Confusion Assessment Method for ICU (CAM-ICU) scale once per shift and treat the patient's pain.⁴ This bundle's directives ensure patients are screened for ICU delirium. However, hospital ICUs had not previously educated nurses regarding delirium or ensured competent CAM-ICU assessments.

This quality improvement project aimed to a set of evidence-based delirium prevention strategies by creating a nurse-led Early Delirium Intervention (EDI) protocol for the neuroscience ICU (NSICU). The project built upon current evidence-based practices and delirium prevention research to mitigate the development of ICU delirium by applying the principles to patients admitted to a neuroscience ICU.⁵⁻⁸ The EDI protocol provides a list of delirium prevention strategies that should be implemented for every patient. It then guides ICU nurses through performing a delirium assessment using the CAM-ICU and responding to the result. This project's measurable outcomes included (a) describing the fidelity of the EDI protocol, (b) examining the effect of the EDI protocol on NSICU patient outcomes, and (c) comparing NSICU nurses' pre- and post-intervention knowledge and comfort with the CAM-ICU.

METHODS

DESIGN

The hospital's institutional review board determined that the project satisfied the requirements of a quality improvement project. This project utilized the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework to develop and implement sustainable interventions to combat ICU delirium.⁹ The SQUIRE guidelines guided the project's methodology and data reporting.¹⁰

SETTING AND PARTICIPANTS

This project was implemented in a 718-bed academic medical center's 20-bed NSICU. The sample included all adult NSICU patients, regardless of hospital length of stay before project implementation. Intubated patients in the sample had orders to maintain their Richmond Agitation Sedation Scale (RASS) > -3, as the neurosurgery team's orders for those with a RASS ≤ -3 were paired with a "no stimulation" order. Minors, age 18 and younger, and those with a RASS ≤ -3 were excluded from data collection.

EARLY DELIRIUM INTERVENTION PROTOCOL

The EDI protocol (see [Figure 1](#)) was created using current evidence to ensure the best patient outcomes.^{4,7,8,11-14} The EDI protocol directed the initiation of nurse-driven methods for preventing delirium, including the following daytime interventions: (a) keeping lights on, (b) blinds open, (c) televisions on to channels that may maintain orientation such as news programs, (d) orienting the patient with each interaction, (e) ensuring use of hearing aids, glasses, and dentures, and (f) providing cognitive stimulation activities such as puzzles, crosswords, coloring books, and fid-

get toys.¹⁵ Nighttime interventions called for keeping lights off, the door closed, televisions off, and a quiet environment free of interruption. The protocol prompted nurses to complete the CAM-ICU on all patients once every 12 hours, triggering a provider notification for positive CAM-ICU scores.

INTERVENTION

The EDI protocol was implemented in the NSICU for 8-weeks. Target outcomes were compared to an 8-week pre-implementation baseline.

NURSING EDUCATION

Education on the nurse-led EDI protocol was provided to nurses daily during the week preceding the implementation of the EDI protocol. Nursing education included a live presentation with visual aids to illustrate the importance of delirium screening, including a review of the adverse outcomes associated with ICU delirium. A delirium screening competency was created for the NSICU nurses, which began with an exemplary demonstration of an experienced NSICU nurse performing a CAM-ICU on a simulated patient with a negative and positive screening result. The nurses received further reinforcement of the importance of prompt provider notification of a positive CAM-ICU screening. After each educational session, the nurses were provided time to practice the CAM-ICU and ask questions. The EDI protocol was posted in the staff break room and at the nurses' stations for ongoing reference. A follow-up electronic communication to the nursing staff highlighted expectations associated with the EDI protocol.

DATA COLLECTION

Before receiving education on the EDI protocol, NSICU nurses completed the American Nurses Association's Delirium Survey to assess their comfort in recognizing ICU delirium (see [Figure 2](#)).¹⁶ At the same time, a Delirium Knowledge Assessment captured the NSICU nurses' knowledge of current evidence and hospital policies on delirium (see [Figure 3](#)). After receiving education, the nurses repeated the two surveys to assess for changes in their knowledge of and comfort with the CAM-ICU.

Lead nurses on each shift audited all NSICU hospital rooms during the pre-and post-implementation period for evidence of the EDI-protocol-driven delirium prevention measures. During the eight weeks preceding and eight weeks following the implementation of the EDI protocol, the following information was extracted from the electronic medical record of patients meeting project inclusion criteria: (a) CAM-ICU screening documentation, (b) total ventilator hours per patient, (c) ICU length of stay per patient, (d) provider notification of positive CAM-ICU results, and (e) new prescriptions for Seroquel (quetiapine).

Early Delirium Intervention (EDI) Protocol

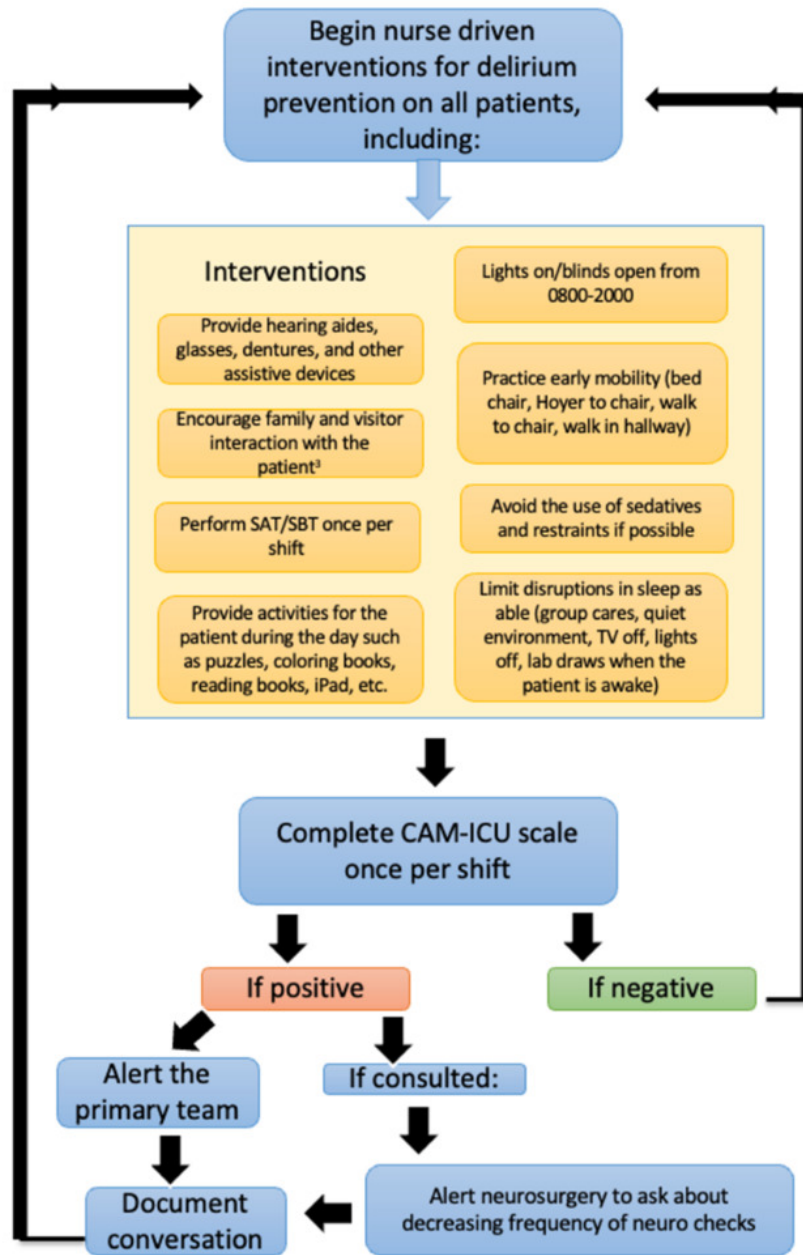


Figure 1. Early Delirium Intervention Protocol

DATA ANALYSIS

The six Likert-scale items for rating the NSICU nurses' perceptions of comfort with the CAM-ICU were averaged. We used a Kruskal-Wallis rank sum test to compare responses in the pre-implementation phase to the post-implementation phase. To assess staff competency with the CAM-ICU, we used a between-subjects t-test to compare scores on the 10-question knowledge assessment. A between-subjects test was selected because staff identity was not collected to preserve anonymity.

Generalized linear mixed models were used to test whether the EDI protocol improved CAM-ICU checklist

scores, nesting pre versus post between individual ICU rooms. CAM-ICU scores were averaged within a day and fit to a Gaussian distribution. If significant, individual CAM-ICU items were analyzed separately and fit into a binomial distribution.

RESULTS

SAMPLE DEMOGRAPHICS

Of the 50 NSICU nurses eligible for EDI protocol education, 70% (n = 35) received face-to-face teaching, and all received electronic communication of the EDI protocol expectations.

How comfortable or confident do you feel in (0-4):

1. Identifying/detecting persons at risk for delirium?
2. Implementing preventive measures for delirium?
3. Recognizing early signs and symptoms of delirium?
4. Providing nursing interventions to minimize complications of delirium?
5. Assisting with interdisciplinary team-based approaches to reduce delirium?
6. Assisting family members, friends, and caregivers to support the person with delirium?

0= very uncomfortable or not confident at all

1= somewhat uncomfortable or not very confident

2=somewhat comfortable or somewhat confident

3= comfortable or confident

4= very comfortable or very confident

Figure 2. American Nurses Association's Delirium Survey

Figure 2 shows a 6-question Likert scale for comfort with CAM-ICU given to nurses before and after EDI Protocol education.

The pre-and post-intervention patient samples were similar in size (pre: $n = 185$ vs. post: $n = 190$) and mean age (pre: $M = 62.04$ years vs. post: $M = 60.3$ years). However, there was a disparity in gender, with a 58.3% male population in the pre-intervention group and 44.7% in the post-intervention group (see [Table 1](#)).

NURSE EDUCATION

The NSICU nurses' ANA Delirium survey results increased from pre-implementation (median = 3) to post-implementation (median = 4) ($K-W \chi^2 = 14.864$, $p = 0.0001156$). Delirium Knowledge Assessment scores increased from pre-implementation ($M = 74.4\%$) to post-implementation ($M = 89.1\%$) ($t(47) = 4.02361$, $p = 0.000206$).

DELIRIUM PREVENTION MEASURES

The nursing staff completed a mean of 57% of the evidence-based delirium prevention measures daily during the project implementation interval, compared to 49.7% during the pre-implementation interval. Adherence to the delirium prevention measures of keeping the lights on during the day ($\chi^2 = 6.3396$, $df=1$, $p = 0.01181$), television on during the day ($\chi^2 = 5.099$, $df=1$, $p = 0.02394$), and cognitively stimulating activities ($\chi^2 = 16.043$, $df=1$, $p < 0.001$) increased during the post-implementation phase, as compared to the pre-implementation phase. Completion of checklist items was similar between the pre-implementation (89.8%) and post-implementation (93.0%) phases.

DELIRIUM SCREENING DOCUMENTATION

Nurse documentation of CAM-ICU screenings improved during the day shift hours in the project's post-implementation phase compared to the pre-implementation phase ($F(1,25.193) = 9.9765$, $p = 0.004088$). The night shift CAM-ICU documentation performance was unchanged from the pre- to post-implementation phases ($F(1,28.122) = 1.5462$, $p = 0.224$).

PROVIDER NOTIFICATION OF DELIRIUM

The nursing staff documented provider notification in 0.11% of positive CAM-ICU results in the pre-intervention period ($n=2$), which was stable compared to 0.03% in the post-intervention group ($n=2$).

PATIENT OUTCOMES

The ICU length of stay decreased from 4.41 days pre-implementation to 3.15 days post-implementation ($p=0.0666$). The ventilator hours decreased from 100.83 hours pre-implementation to 68.22 hours post-implementation ($p=0.1315$). The proportion of patients in the sample with a new Seroquel (quetiapine) prescription increased from 1.62% to 5.79.

DISCUSSION

Day-shift completion of the CAM-ICU scale and fidelity to the EDI protocol improved significantly during this project, indicating an enhanced overall adoption of the EDI Protocol among the day-shift nursing staff. Night-shift CAM-ICU completion rates were unchanged. Delirium prevention

1. How many mistakes equal a positive result when asking a patient to squeeze your hand on the letter "A" (Miranda et al, 2018)?
 - a. Any mistake
 - b. More than 1 mistake
 - c. **More than 2 mistakes**
 - d. The patient MUST miss every "A" for a positive result
2. How do you ask yes/no CAM-ICU questions to a patient with dysphagia (Miranda et al, 2018)?
 - a. Ask the questions slowly
 - b. Have the patient act out their answer
 - c. **Have the patient hold up 2 fingers, then ask them to repeat on the other side**
 - d. You skip this part of the exam
3. Who should be given coloring pages, puzzles, family visitation, and/or other cognitive stimulants during the day (Rosa et al., 2019)?
 - a. A 76-year-old woman admitted for a R MCA occlusion with a flaccid left upper extremity
 - b. A 30-year-old man admitted for a SAH who is confused about why he is in the hospital
 - c. A 59-year-old man who underwent a thrombectomy earlier today and is neuro intact
 - d. A 61-year-old woman on the ventilator with minimal sedation
 - e. **All of the above**
 - f. None of the above
4. How often are you required to perform the CAM-ICU screening on your patients (Nebraska Medicine Policies and Procedures, 2022)?
 - a. Q 24 hours
 - b. **Q shift**
 - c. Q 4 hours
 - d. Q 8 hours with I&Os
5. You are performing the CAM-ICU on your patient during your first neuro check. During report, you were told that the patient was confused and restless for the last three hours, but their current RASS is 0. What would you score the patient's mental status on question 1 of the CAM-ICU (Miranda et al, 2018)?
 - a. Negative
 - b. **Positive**
6. You are following the EDI protocol. You completed the CAM-ICU on your vented ICH patient and it resulted positive. What is your next step?
 - a. Turn up sedation
 - b. Don't do anything, this is expected
 - c. **Alert CCM White and document the conversation in Epic**
 - d. Request that any visitors leave as they are likely causing the delirium
7. You are performing the CAM-ICU on a 46-year-old female patient who just arrived to the unit. You were told by the ER nurse that she is currently intubated as she had a witnessed seizure when she arrived to the ER two hours ago. Her current RASS score is 0 and she is on minimal sedation. When you asked her to squeeze your hand on the letter "A", she made two mistakes. She also nodded yes that a stone floats on water, however, she answered the rest of the yes/no questions correctly. Is her CAM-ICU score positive or negative (Miranda et al, 2018)?
 - a. Positive
 - b. **Negative**
8. What are some methods to prevent delirium? Select all that apply (Malik & Subramaniam, 2021).
 - a. **Turn on the lights during the day**
 - b. Keep a continuous low level of sedation whenever the patient is intubated
 - c. **Allow family visitation and personal items when able**
 - d. **Ensure the TV is off at night**
 - e. Do not allow patients to wear glasses if neurosurgery has performed any kind of surgery
 - f. **Reorient the patient if he/she is confused**
 - g. **Make a photocopy of one of the crosswords in the activities basket in the break room so the patient can keep busy**
9. If your patient has orders to remain RASS -4 to -5, the CAM-ICU scale is not required to be completed (Miranda et al, 2018).
 - a. **True**
 - b. False
10. Surgical patients are not at risk for ICU delirium because they are usually only admitted for a day or two.
 - a. True
 - b. **False**

Figure 3. Delirium Knowledge Assessment

Figure 3 lists the Neuroscience ICU-specific knowledge assessment that nurses were given during their EDI Protocol education.

measures require consistent implementation, and this project's outcomes highlight the importance of increased engagement with night-shift nurses to identify barriers to delirium prevention and screening measures. Night shift overall participation could be improved by increasing the presence of the nurse manager, supervisor, or educator at night to encourage adherence to the EDI protocol, including multidisciplinary teams such as phlebotomy to draw labs in daylight hours, or requesting that providers order extended intervals of quiet time at night to promote sleep.

One of the focuses of the EDI Protocol was early provider notification of a positive CAM-ICU screening. Nevertheless, nurse documentation of provider notification was poor in the pre- and post-implementation periods. Although the rate of provider notification documented for positive delirium scores was low, it is possible that nurses did notify providers without documentation, and particular providers preferred medication for delirium treatment.

The identified increase in the use of Seroquel could be due to provider preference, more patients being admitted with Seroquel as a home medication, increased need for an-

Table 1. Early Delirium Intervention Protocol Outcomes

	Pre-Intervention (n = 185)	Post-Intervention (n = 190)	p-value
Patient Gender			
Male	108	85	
Female	77	105	
Patient Age (mean)	62.04	60.3	
ICU Length of Stay (days)	4.41	3.15	0.0666
Ventilator Duration (hours)	100.83	68.22	0.1315
Patients with a New Seroquel Prescription (%)	1.62	5.79	0.032

tipsychotic medication in patients with acute neurological conditions, or reasons not captured through data collection. The increased use of Seroquel in the NSICU population during the intervention period is concerning, as there is a lack of solid data to suggest that the use of antipsychotics improves the outcomes of patients with delirium.¹⁷

Plans within this facility are to implement the EDI protocol in the hospital's five ICUs and include specific one-on-one education with all nurses and begin EDI education with nursing assistants when they begin employment in one of the ICUs. Yearly in-person competencies allow space for continued CAM-ICU and delirium prevention education. In replicating this project, the authors recommend dedicating data collectors and not relying on nursing staff to collect data. Education for nursing assistants and other multidisciplinary specialties who spend significant time at patients' bedsides would increase adherence to delirium prevention measures. Lastly, the authors recommend educating ordering providers about the expectations of the EDI protocol and ways they can support nursing, such as limiting medications that affect mental status, following Beers Criteria in older adults, and transferring patients out of ICU as soon as they are medically stable to facilitate better outcomes.¹⁸

STRENGTHS AND LIMITATIONS

Implementing the EDI Protocol provided nurses with a robust knowledge of delirium and a set of interventions they could implement on patients to prevent the development of delirium. The methods of delivering nursing education on delirium prevention and early recognition were a strength of this project. Along with the education presented, nurses observed and practiced CAM-ICU assessments, which yielded a statistically significant improvement in nurses' knowledge of delirium and comfort with the CAM-ICU. Nurses maintain a consistent presence at the bedside, ideal for preventing and ensuring prompt recognition of ICU delirium. The brisk improvement in nurses' knowledge and comfort scores following the educational intervention exemplifies the importance of in-person nursing education on delirium, including the opportunity to ask questions and practice delirium assessment skills.

This project's outcomes were limited by a 70% nurse education rate, as travel nurses, new hires, and nurses who floated to the NSICU from other units did not receive in-

person education on the EDI Protocol. All NSICU nurses received a follow-up email with a summary of educational points, but there was no method to ensure that the nurses read and understood the information. Gaps in the reach of nursing education may have adversely impacted nurse adoption and the protocol's fidelity. Additionally, the lack of consistency in charge nurse audits of the delirium prevention measures may have adversely affected the reporting and reinforcement of the delirium prevention measures delineated in the EDI Protocol.

CONCLUSION

This quality improvement project demonstrated the feasibility of nurse-led delirium prevention measures in the ICU. The project's educational intervention included demonstrating the CAM-ICU assessment and dedicated time for nurses to practice this assessment skill. Project outcomes showed a statistically significant improvement in CAM-ICU documentation, nurses' knowledge of delirium, and nurses' comfort with the CAM-ICU assessment. Implementing nurse-driven delirium prevention and early identification strategies empowers nurses to play a crucial role in promoting positive outcomes for critically ill patients.

AUTHOR CONTRIBUTIONS

Megan Schoepke, DNP, AGACNP-BC, was responsible for conceptualization, investigation, and writing the original draft.

Theresa A. Jizba, DNP, AGACNP-BC, ACHPN, was responsible for supervision, writing, review, and editing.

Jack Taylor, PhD was responsible for data curation and formal analysis.

DISCLOSURE/CONFLICT OF INTEREST

The authors have no financial relationships relevant to this article and no conflicts of interest to disclose.

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INSTITUTIONAL REVIEW BOARD APPROVAL

The project was reviewed by the University of Nebraska Medical Center and the Creighton University IRB (submission #2004188-01). Both IRBs determined that the project

satisfied the requirements of a quality improvement project and did not require further IRB oversight.

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