

University of Missouri, St. Louis

IRL @ UMSL

Dissertations

UMSL Graduate Works

7-12-2023

Effect of Confusion Assessment Scores on Identifying Delirium in Intensive Care Patients

Kayla Jacobs

University of Missouri-St. Louis, kjcx@umsystem.edu

Follow this and additional works at: <https://irl.umsl.edu/dissertation>



Part of the [Critical Care Commons](#), [Critical Care Nursing Commons](#), [Interprofessional Education Commons](#), [Other Mental and Social Health Commons](#), [Preventive Medicine Commons](#), [Quality Improvement Commons](#), [Surgery Commons](#), and the [Trauma Commons](#)

Recommended Citation

Jacobs, Kayla, "Effect of Confusion Assessment Scores on Identifying Delirium in Intensive Care Patients" (2023). *Dissertations*. 1337.

<https://irl.umsl.edu/dissertation/1337>

This Dissertation is brought to you for free and open access by the UMSL Graduate Works at IRL @ UMSL. It has been accepted for inclusion in Dissertations by an authorized administrator of IRL @ UMSL. For more information, please contact marvinh@umsl.edu.

**Effect of Confusion Assessment Scores on Identifying Delirium in Intensive Care
Patients**

Kayla T. Jacobs

B.S. Nursing, Goldfarb School of Nursing, 2018

B.S. Exercise Physiology, University of Louisville, 2016

A Dissertation Submitted to the Graduate School at the University of Missouri - St. Louis
in partial fulfillment of the requirements for the degree
Doctor of Nursing Practice with an emphasis in Family Nurse Practitioner

August 2023

Advisory Committee

Susan Dean-Baar, PhD, RN, CENP, FAAN
Chairperson

Jennifer Vines, DNP, RN

Carrie Sona RN, MSN, CCRN, CCNS, ACNS-BC, FCCM

Copyright, Kayla T. Jacobs, 2023

Abstract

Delirium in intensive care unit (ICU) patients can lead to increased length of stay in the hospital, increased risk of complications, increased polypharmacy, family distress and increased rate of mortality (Vasilevskis et al., 2018). Research has shown that addressing modifiable risk factors can improve survival rate by up to 15%, and routine screening for delirium in ICU patients leads to decreased patient anxiety, reduced in-hospital mortality, early recognition, and treatment of delirium (Krewulak et al., 2021 ; Vasilevskis et al., 2018). This quality improvement project used evidence-based intervention to increase accurate documentation of the confusion assessment method in the ICU (CAM-ICU) to identify patients at risk for delirium. In addition to retrospective chart review, an observational descriptive design was used to evaluate comfort and knowledge of nursing staff in addressing delirium. 40 nurses participated in the presurvey, and 43 participated in the post survey. Results indicated no significant improvement in comfort or knowledge in self-administered reflections of nurses, however behaviors of documentation dramatically increased. Total number of encounters for April was 725 and total for November was 322. A random sample of 159 from each month was used to determine rate of appropriate CAM-ICU documentation. Pre survey (November), 100 of the 159 were accurately documented resulting in 62.9% whereas in the post survey period (April) the rate increased with 137 of 159 appropriate documentation with a rate of 86.2%. The rate in which the CAM-ICU was accurately and appropriately documented in the electronic health record (EHR) was found to be statistically significant ($p < .001$) indicating positive change in documentation.

Effect of Confusion Assessment Scores on Identifying Delirium in Intensive Care Patients

Delirium is defined as a severe disturbance in mental abilities that can lead to reduced awareness of the environment, cognitive impairment, and behavior and emotional changes (Devlin et al., 2018). These disturbances can begin within a few hours or over a few days. Symptoms include the inability to focus, disorientation, difficulty with speech, hallucinations, restlessness, or agitation, being overly quiet or withdrawn, anxiety, irritability, apathy, and personality changes (Devlin et al., 2018). Delirium may present as hypoactive, hyperactive, or mixed. Due to these different types of delirium, recognition can be complex as there is not one set of symptoms seen throughout the delirious patient population. Screening for delirium can result in early identification and treatment to decrease adverse outcomes.

Unfortunately, delirium is common in critically ill adults during an Intensive Care Unit (ICU) stay and can be associated with adverse short- and long-term outcomes. Adverse short-term outcomes include prolonged ICU and/or hospital stays and increased mortality rates during inpatient and post-discharge. In addition, ICU delirium can lead to post-intensive care syndrome (PICS) (Krewulak et al., 2021). PICS is the syndrome that includes health problems that remain past the ICU stay and even after a patient has returned home. Symptoms associated with PICS include muscle weakness, cognitive impairment, and problems with memory and thinking (Davidson et al., 2013). Hospital delirium burden independently predicts mortality at two and a half years of follow-up with worse long-term functional neurological outcomes when compared to those who were without hospital delirium (Paixao et al., 2021).

PICS occurs in 30-80% of all critically ill patients. Marra et al. (2018) found that six of every ten survivors of critical illness had PICS problems up to a year after their ICU admission. With a rate of 60% of patients qualifying as PICS, using the CAM-ICU score is a first-line method to address a severe modifiable risk factor. Delirium is part of the Society of Critical Care Medicine's (SCCM) ABCDEF bundle with the "D" defined as Delirium: Assess, Prevent, and manage (Devlin et al., 2018). The cost of not addressing delirium can impact hospitalization and post-ICU discharge. Vasilevskis et al. (2018) found that an increased cost associated with delirium in patients in the ICU is about \$600 more per day than those without delirium. This increased cost is not just based on a prolonged stay; the total includes broader availability and depth of interventions, higher frequency of monitoring, pharmacologic interventions, and addressing symptoms of delirium. The monetary increase is just one of the costs associated with delirium, as increased length of stay in the ICU, increased risk of complications, increased polypharmacy, family distress, and increased mortality rate all contribute to the adverse outcomes of delirium (Vasilevskis et al., 2018). By addressing these modifiable risk factors using the ABCDEF bundle, Pun et al. (2019) demonstrated a 15% improvement in survival and rate of days without delirium when increasing the use of the bundle by 10%. Vasilevskis et al. (2018) estimate a cost savings of \$440 per day for delirium reduction. Studies have concluded that routine delirium screening in ICU patients is associated with decreased patient anxiety, reduced in-hospital mortality, early recognition, and treatment of delirium (Krewulak et al., 2021). The Confusion Assessment Measurement in the intensive care unit (CAM-ICU) is a scoring method that

has been demonstrated to be a valid and reliable method to determine the presence and severity of delirium in ICU patients (Khan et al., 2017).

CAM-ICU was created to be a bedside assessment tool to evaluate for delirium. The scoring is based on four criteria: acute onset or fluctuating course, inattention, altered level of consciousness, and disorganized thinking. By addressing these four criteria, hypoactive and hyperactive delirium can be determined and addressed (Ely, 2016). CAM-ICU relies on the facility using the Richmond Agitation Sedation Scale (RASS) as an additional assessment for patients. RASS scoring is focused on a patient's alertness and is scaled from a +4 of combative to -5 of unarousable. Once RASS is addressed, the CAM-ICU can be performed unless the patient is a RASS of -4 or -5, indicating comatose (Sessler., et al., 2002).

Due to the validity of the CAM-ICU scoring, using this tool should aid identification of ICU delirium. Staff nurses are taught to assess CAM-ICU and RASS during their daily assessment. In addition to this being built into the assessment tab of the EHR, these are both supposed to be addressed in daily rounds. Prior to this quality improvement project, a laminated copy of the CHUGG, a form used to discuss systems on rounds, was zip tied to each patient door. The purpose of this quality improvement project was to increase the accurate documentation of the CAM-ICU assessment performed by the nursing staff in surgical and trauma patients aged 18 and older admitted to a surgical intensive care unit (SICU). The aim was to increase the correct use and documentation of the CAM-ICU scoring tool by nurses 80% of the time on appropriate patients. Appropriate patients included those with a RASS score of -3 or greater. Patients determined to have a RASS of -4 or -5 were ineligible for inclusion in this study. Focused

outcomes included the accuracy rate of CAM-ICU scores completed by nurses each 12-hour shift. This project aimed to answer the study question: In adults over 18 years old hospitalized in the SICU, what is the effect of accurately documenting the CAM-ICU score on identifying patients at risk for delirium?

To determine the project's feasibility, a literature review was performed. The study took place in a SICU that provides care to surgical, medical, neurological, and occasionally cardiothoracic patients; thus, the literature review was not focused solely on surgical patients but rather on using the CAM – ICU tool. Although there are other screening tools for delirium, this facility uses RASS and CAM-ICU, with the documentation included in the EHR at the facility, supporting the focus of this project on the implementation of the CAM-ICU.

Review of Literature

A literature review was conducted to evaluate the use of CAM-ICU scores in surgical ICU patients regarding delirium outcomes. The following databases were searched: CINAHL, CINAHL- plus, Medline, and Consumer Health Complete. Terms included delirium, intensive care unit, and confusion assessment method. Variation terms were used, including ICU, critical care, critical care unit, acute confusion, confusion, disorientation, and ICU psychosis. Boolean operators AND and OR were used for these variations of terms. The initial search in total yielded 998 total publications. To further refine this search, inclusion criteria included the following: published in the English language, publication date 2018 to present, peer-reviewed, full text, and incorporated adults 19 years of age and older. Exclusion criteria included if the article focused on the perioperative phases of care, children, family members or caregivers, alcohol withdrawal,

COVID-19, music therapy interventions, and studies related to care outside the ICU setting. After inclusion and exclusion criteria were incorporated, the number of articles included was 44 across all databases. The initial literature review incorporated research articles if the discussion of delirium scoring in an ICU explicitly using the CAM-ICU tool was addressed. A total of 11 publications were identified based on the inclusion of the CAM-ICU scoring on adults in the ICU setting (Appendix A).

The most important theme from the literature was the strengths of screening for delirium concerning long-term adverse effects. Paixao et al. (2021) found that the delirium burden is associated with a four-time increase in mortality at 2.5 years following ICU stay. The delirium patients also presented worse functional neurological outcomes based on the Glasgow Outcome Scale at discharge, 3, 6, and 12-month follow-ups (Paixao et al., 2021). Pun et al. (2019) also found that completing the ABCDEF bundle with delirium screening indicated a lower likelihood of death at any given time and a higher likelihood of ICU discharge and hospital discharge. Additional findings included a reduced likelihood of ICU readmission by 54% and a 36% lower likelihood of discharge to a facility rather than home (Pun et al., 2019). Devlin et al. (2018) found that accurate and routine completion of the CAM-ICU is a valid and reliable screening tool that allows for early recognition of delirium and subsequent early intervention.

Due to the nature of critical care patients, delirium can be difficult to differentiate, and responsibility for assessment is heavily placed on the nursing staff. The nurses' comfort level with scoring and identifying at-risk patients can significantly change the long-term outcomes of these patients (Paixao et al., 2021). Risk factors for delirium were not found to be specific to a patient population. Instead, a mixture of factors plays a role

in the possibility of delirium development. Clinical and environmental factors play a role in the risk of delirium (Simeone et al., 2018). Paixao et al. (2021) and Simeone et al. (2018) found that age, illness severity, and comorbidities significantly influence delirium risks. In addition, they identified that exposure to sedation, analgesia, insomnia, and mechanical ventilation had been attributed to an increased risk of ICU delirium with long-term effects. Both studies were limited to once-daily CAM-ICU assessments but enhanced an understanding of risk factors for delirium beyond variables such as ICU stay, age, and gender.

A delirium assessment tool that provides a score is common but is only sometimes appropriately used or well-known by the nursing staff. Ramoo et al., 2018 studied a group of ICU nurses' knowledge of ICU delirium and the delirium assessment and found that less than 47% of nurses understood these concepts before intervention. Post-intervention results found that nearly 70% of nurses felt comfortable with delirium following a set educational program, including in-person classroom learning, demonstrations, and hands-on practice using the CAM-ICU. Similarly, Kresevic et al. (2020) used a mixed sample of MICU and SICU nurses to determine comfort and knowledge of ICU delirium. A retrospective study of the documentation in the EHR found that before education, less than 50% of CAM-ICU scores were completed in the ICU, with postintervention charting at 99% consistently documenting scores. Kresevic et al. (2020) and Ramoo et al. (2018) found that nursing years of experience independently indicated the comfort level of nurses performing delirium screenings. Awan et al. (2021) studied shift documentation and found that day-shift assessments were more likely to have a documented CAM-ICU score than the night shift. Four studies (Awan et al., 2021;

Blevins & DeGennaro., 2018; Kresevic et al., 2020; Ramoo et al., 2018) used education of nursing staff to enhance the use of delirium screening and were successful in increasing both the confidence in nurses performing these scores and the documentation of results. These studies were conducted in smaller ICUs with 12-20 bed units and may be difficult to replicate in an ICU with more beds and staff members.

Results indicate that the use of education regarding the CAM-ICU tool has been effective in enhancing the rate of delirium screening and confidence in recognizing the signs of delirium. Devlin et al. (2018) indicated that the usefulness of the CAM-ICU tool is limited by nurses' ability to complete the assessment accurately. Confidence and knowledge are the two most significant limiting factors to successfully completing the CAM-ICU tool. To further evaluate delirium education, Blevins & DeGennaro (2018) and Oh et al. (2022) investigated the effectiveness of multimodal education tools for ICU nurses to enhance their knowledge regarding ICU delirium. Both studies resulted in increased knowledge of the nursing staff and comfort with performing delirium assessments. However, both needed more large-scale implementation and recommended increased sample size in larger units.

Delirium scoring tools vary based on facility and EHR system. Included articles focused on the CAM-ICU tool as this is the tool used at the institution for the project. A subset of ICU patients has been shown to not benefit from the CAM-ICU and RASS scoring tools and will be excluded from the study. However, knowing what types of patients will be excluded is essential. Von Hofen-Hohloch et al. (2020) focused on neurocritical care and stroke units to determine the specificity and sensitivity of the CAM-ICU tool for this population. Results indicated that sensitivity was 66.9% and

specificity was 93.3% when using the CAM-ICU tool. Findings indicated a significant association between positive delirium screening and neurological deficits and the need for a specific tool for neurocritical patients. Awan et al. (2021) used a medical ICU (MICU) to determine the correct documentation for CAM-ICU in the EHR related to patients with a RASS of -4/-5 indicating deep sedation. With a RASS of -4/-5, the patient is considered unarousable; thus, questions in the CAM-ICU cannot be evaluated as participation is unavailable. Results from Awan et al. (2021) indicate a need for further studies and adaptations for screening patients who cannot participate in the CAM-ICU assessment. Reznik et al. (2020) focused on the post-stroke population. They found similar results to von Hofen-Hohloch et al. (2020) and Awan et al. (2021) in the possible gaps in the detection of delirium for patients unable to participate in their care. In all three studies, the patients deemed unable to assess with a RASS of -4 or -5 indicated a need for continued delirium education and assessment for non-participatory populations. However, Khan et al. (2017) studied MICU, SICU, and progressive ICU patients to determine CAM-ICU validity with a wide variety of patients. With 518 participants, the CAM-ICU was found to be a reliable delirium severity assessment across many critically ill patients indicating CAM-ICU may have some value in addressing delirium for populations who cannot participate. Due to these varying results for comatose and non-participatory populations, more research is needed on this subset of ICU patients. With limited neurocritical patients in the SICU, those who score a RASS of -4/-5 will be excluded from the current study.

This project used a Plan-Do-Study-Act (PDSA) cycle framework. PDSA was used due to data collection efficiency, increased confidence in the change, and minimized

resistance when change is implemented (Leis & Shojania, 2017). This project is part of an ongoing initiative in the SICU with the overall goal of addressing delirium and eventual standardization of order sets for treatment. Previous work included the audit of multidisciplinary rounds on each patient to determine if delirium was discussed. Results indicated there needed to be more discussion during rounds; however, many other parts of the ABCDEF bundle were addressed. The goal of this previous cycle was to determine a baseline of discussion regarding the CAM-ICU. The current practice is to chart CAM-ICU in the EHR and a need for more consistency with proper RASS scoring was identified. Due to the rates of positive delirium scoring, the key stakeholders felt that the CAM-ICU being performed correctly should be included as part of the next PDSA cycle. Nurses were educated on the proper conduction of the CAM-ICU, where to chart in the EHR, and how to address scores during rounds confidently. Post-education data collection was used to evaluate the scores charted by nurses every shift.

Based on the current literature review, implementing CAM-ICU scoring was anticipated to aid nurses and providers in identifying delirium. Parallel education was performed for providers by the MD Fellows who are part of the larger initiative. At the end of all PDSA cycles, the goal is to increase awareness of delirium among SICU staff and enhance the ability to treat and prevent delirium in patients.

Methods

Design

This project was a quality improvement project using evidence-based interventions to increase the accurate documentation of the CAM-ICU assessment performed to identify patients at risk for delirium. An observational descriptive design

was used to evaluate the comfort level and knowledge of nursing staff in completing RASS and CAM-ICU scoring.

Setting

This project took place in a 36-bed surgical/burn/trauma intensive care unit (SICU) in a Midwestern suburban academic teaching hospital with a level 1 trauma center designation.

Sample

A convenience sample of the SICU bedside nursing staff was used for the project. The unit includes 102 nurses. Currently there are additional agency nurses that are also part of the unit that were not included in the sample of pre and post surveys but were included in the education. This is due to the lack of orientation and “staff” title. Additionally, nearly 60 nurses are full time while the rest are part-time or PRN.

Procedure

To re-engage staff weekly emails, huddle boards, shift huddles, and nursing stations had information regarding the upcoming project including the QR code linked to the pre-survey and focused on increasing completion of the CAM-ICU and RASS assessments and discussing results during daily rounds. The pre-survey (Appendix B) was accessed through a QR code, discussed during huddles, and posted throughout the unit, to allow for easy access to this survey. The pre-survey was open for two weeks.

After the pre-survey was closed, the education began and lasted 15 days. A multimodal approach was used for re-education of nursing staff regarding CAM-ICU. Educational posters (Appendix C) were displayed throughout the unit including at the front desk next to the daily assignment, each nursing station, on the huddle boards, and

discussed in each shift huddle. PowerPoint slides that rotated through on monitors throughout the unit displayed education on completing these assessments (Appendix C).

Data collected for charted RASS scores and CAM-ICU scores were accessed by the IT department and a report was generated that excluded patients who were on comfort care, being prepped as an organ donor, or who were prone/paralyzed. RASS and CAM-ICU scoring items are to be documented at least once per shift with full assessments and thus two CAM-ICU assessments per day were evaluated, one on the day shift and one on the night shift. RASS may be scored throughout the day as titration of medication can be ordered as such, but data was only used if the CAM-ICU was documented in the same hour. Only the first RASS score of each shift (day and night) was included in cases where patients had multiple RASS score documented. RASS and CAM-ICU data from November 2022 included 322 encounters while April 2023 had 725 encounters. A random sample of 159 encounters in each data period was selected using a number randomization tool.

A link to the post-survey, identical to the pre-survey (Appendix B), was provided in the exact manner as the pre-survey using a QR code. The post-survey was open for two weeks. The post survey became available 16 days after the pre survey closed and one day after the end of education.

Data Collection/ Analysis

RASS scoring was collected as the actual score for the assessment completed. CAM-ICU is a five-item assessment that results in either positive or negative score and was collected as either “positive” or “negative” on data reports.

Data analysis included descriptive and inferential statistics (t-tests, Chi-square, and Mann Whitney) to evaluate differences in the pre- and post-surveys groups and changes in nurses perceptions related to content included in the education provided to staff nurses. Descriptive and chi-square statistics were used to evaluate for changes in the completion rate of CAM-ICU assessments.

Approval Process

This project included care and documentation of care already in place in the organization and included no additional risks to patients. Staff surveys did not include any identifiable data to protect the confidentiality of the nurses completing the pre and post surveys. Approval was first sought out by the SICU manager and the Delirium Committee within the unit. The project was reviewed by the IRB at UMSL and deemed a QI project not requiring IRB approval. Following that review, the project was reviewed by the hospital QI department where it was also approved to be conducted in the SICU.

Results

Staff Survey

Demographics

The survey of nursing staff included 40 staff completing the pre survey and 43 the post survey. Table 1 shows the frequency of length of time in critical care and employment status for both groups. There was no significant difference in the pre and post staff survey groups for these variables.

Table 1*Nursing Demographics*

Variable	Pre Survey (n = 40)	Post Survey (n = 43)	Chi Square
Length of time in Critical Care			
< 1yr	7	8	$\chi^2(4) = 0.08, p = .999$
1-3 years	16	18	
3-5 years	2	2	
5-10 years	8	8	
> 10 years	7	7	
Employment status			
Full Time	37	40	$\chi^2(2) = 0.01, p = .996$
Part Time	2	2	
PRN	1	1	

To evaluate if this sample was an accurate representation of the employed staff, comparative data for all staff was gathered from the unit managerial staff. This report indicated at the time of the surveys there were 102 staff nurses employed. With 102 staff eligible to complete the surveys, the 40 and 43 responses respectively, resulted in a 39.2% response rate in the pre survey and 42.2% response rate in the post survey. Table 2 shows that there is no significant difference in the length of time in critical care in the pre, post, and total nurse groups, although it did approach significance at $p=0.063$.

Table 2*Participation in Survey*

Variable	Pre-Survey (n=40)	Post Survey (n=43)	Employed (n=102)	Chi square
Critical care				
< 1	17.5% (7)	18.6% (8)	23.5% (24)	
1-3	40% (16)	41.86% (18)	20.6% (21)	$\chi^2(8) =$
3-5	5% (2)	4.64% (2)	18.6%(19)	14.81, $p = .063$
6-10	20%(8)	18.6% (8)	23.5% (24)	
> 10	17.5% (7)	16.28% (7)	13.7%(14)	

Barriers

The surveys included items that were barriers to conducting the CAM-ICU during bedside nursing shifts. Table 3 shows the identified barriers in the pre and post survey groups. In both groups “no barrier” was identified the most frequently. There were no significant differences found for any of the barriers when comparing the pre and post groups.

Table 3*Barriers to CAM-ICU*

Barrier	Pre-Survey (n = 40)	Post Survey (n = 43)	Chi Squared
None	15	15	$\chi^2(1) = 0.06, p = .804$
Time	14	15	$\chi^2(1) = 0.00, p = .946$
Epic Workflow	11	12	$\chi^2(1) = 0.01, p = .914$
Environment	6	6	$\chi^2(1) = 0.01, p = .927$
Language	3	3	$\chi^2(1) = 0.00, p = .951$
Knowledge	2	2	$\chi^2(1) = 0.00, p = .960$
Other	1	1	$\chi^2(1) = 0.00, p = .959$

Staff Knowledge and Comfort

The remainder of the survey included questions regarding the comfort and knowledge staff had regarding the topic of CAM-ICU. These questions were rated on a Likert scale with 1 being the least present and 5 being the most present. Each question, as listed in table 4, self-identified the nurses' knowledge, comfort, adequate prior training, and knowledge of nonpharmacological management. Additionally, the unit uses a form to ensure topics are discussed in rounds each day using a "CHUGG" sheet and nurses were asked their knowledge of the CAM-ICU item on this sheet to evaluate for discussion of delirium during rounds. The documentation location of where to chart these scores in the EHR was also asked to evaluate for documentation ease and location accessibility. The means for each item were high in the pre-survey (ranging from 3.30 to 4.62). These questions were evaluated using a Mann-Whitney test and the mean ranks for the pre and post survey periods and ranged from 42.16 – 43.31 in the pre-survey and from 40.78 – 41.85 in the post-survey indicating answers being between very comfortable and extremely comfortable. No significant differences were noted on any of these items (Table 4).

Table 4*Staff Knowledge and Comfort*

Question	Pre-Survey Mean Rank (n=40)	Post Survey Mean Rank (n=43)	Mann Whitney
How do you rate your knowledge of ICU delirium?	43.04	41.03	$z = -41, p = .679$
My prior training and education on ICU delirium was adequate.	42.71	41.34	$z = -0.29, p = .774$
I am comfortable assessing delirium in ICU patients.	43.12	40.95	$z = -0.46, p = .649$
I routinely assess my patients for delirium.	43.24	40.85	$z = -0.52, p = .604$
I have enough time and support to assess delirium in my patients.	43.31	40.78	$z = -0.53, p = .596$
I know where and how to document RASS and CAM-ICU scores in EPIC.	42.16	41.85	$z = -0.07, p = .941$
I know where delirium is addressed on the CHUGG.	42.84	41.22	$z = -0.33, p = .739$
I feel comfortable with the non-pharmacological management of delirium	42.77	41.28	$z = -0.30, p = .762$
I feel comfortable addressing delirium during rounds	42.96	41.10	$z = -0.37, p = .711$

Use of RASS and CAM-ICU

A random sample of 159 encounters in each data period was used for data analysis. Table 5 shows the frequency of the CAM-ICU encounters with a positive result, negative result, and encounters where the CAM-ICU could not be assessed as well as the distribution of the encounters between the day and night shifts. There were no significant differences between the two groups for these variables.

Table 5

CAM-ICU and Shifts

Variable	Pre-Intervention (n= 159)	Post Intervention (n =159)	Statistics
CAM-ICU			
CAM-ICU +	78	79	
CAM-ICU -	74	77	$\chi^2(2) = 0.19, p = .909$
CAM-ICU UTA	7	3	
Shift			
AM shift	82	85	$\chi^2(1) = 0.11, p = .736$
PM shift	77	74	

Note: CAM-ICU + indicates a positive delirium score. CAM-ICU – indicates a negative delirium score indicating the patient is not delirious. CAM-ICU UTA indicates the patient sedation/arousable responses were unable assess appropriately.

Table 6 shows the data related to the frequency of appropriate charting of the CAM-ICU and RASS scoring in the pre and post interventions encounters. Due to small number in several of the cells a Fisher Exact Test was used for the analysis. There was a significant difference in the appropriate documentation of the RASS and CAM-ICU between the pre and post intervention groups.

Table 6*CAM-ICU & RASS*

Variable	Pre-Intervention (n=159)	Post- Intervention (n=159)	Fisher's exact
RASS & CAM-ICU documented appropriately	94	135	
RASS not document, CAM-ICU documented	45	14	<i>p</i> < .001.
RASS and CAM-ICU documented; CAM-ICU not appropriate	13	7	
RASS documented; CAM-ICU appropriately not documented	6	2	
RASS documented; CAM-ICU not documented	1	1	

Discussion

The purpose of this quality improvement project was to increase the appropriate use of the CAM-ICU tool to accurately identify patients at risk for delirium. The project was completed in a SICU and evaluated the knowledge, comfort, and documentation of the CAM-ICU by nurses. This project included a pre survey, education, post survey, and chart review to analyze documentation.

Surveys included two demographic questions that evaluated participants on their years in critical care and employment status. Analysis of the length of time in critical care comparing the pre survey, post survey, and total nurses in the SICU found a difference approaching significance ($p=0.063$). A review of the data suggests the pre- and post-survey groups were disproportionately represented on the years of experience when compared to the total unit RN group. Specifically, the 3-5 years of experience group was greatly underrepresented with the total unit RN group in this category comprising 18.6% of the nurses while the pre and post survey groups were comprised of 5% and 4.64% respectively. The greater than 10 years' experience group participated at a higher rate and was comprised of 17.5% and 16.28% in the pre and post survey

with only 13.7% of the employed RNs being in this category. The less than one year was closer in percentage on the surveys (17.5% pre and 18.6% post) compared to employed rate of 23.5%. The group of one-to-three-years was disproportionately higher than the employed rate at 40% and 41.86% as compared to an employed rate of 20.6%. This increased proportions of years of experience being overrepresented may have led to the higher self-evaluation of knowledge and confidence with the CAM-ICU. Noting that orientation lasts from 3-6 months, nurses reaching the one year plus mark may have significantly increased confidence after being on their own for several months.

Barriers in the ability to perform the CAM-ICU were also included in the survey to understand how to better support nursing in successful assessment of the CAM-ICU during their bedside shifts. A few nurses indicated “no barrier” and choose additional barriers, most frequently time was the additional barrier.

Other questions asked during the survey were focused on comfort levels of nurses with the performance and documentation of the CAM-ICU. On both pre and post surveys the prior training question had the lowest means and the knowledge of how to document the CAM-ICU remained the highest. Surprisingly the post survey had lower mean ranks than the pre survey on a few items which is the opposite of what was expected. Although no causal effect can be determined by this data, three more individuals participated in the post survey ranging from less than a year to three years of experience. This demographic of less critical care experience in the post survey data could have also contributed to the lower results.

Following completion of the pre-intervention survey, education was performed to enhance the knowledge of nursing staff regarding what the CAM-ICU is, how to assess it, how to document it appropriately, and when to bring this to the attention of providers. Education was conducted during a staff meeting and twice daily during shift huddles for two weeks. These sessions were successful in being able to reach nurses from all different shifts, and employment types. Limits to education included nurses not attending huddles, inability to reach all PRN (as

needed) staff members who are required to work only three shifts in a six-week period leading to a lack of presence on a regular basis in huddles, and the lack of knowledge regarding RASS scoring. Potentially the largest hurdle in education was the continued response of staff stating lack of understanding and knowledge that a RASS score is needed regardless of sedation medication orders. The RASS score indicates the patient's alertness level and is required for the first question of the CAM-ICU which states "Is there an acute change from mental status baseline OR has the patient's mental status fluctuated during the past 24 hours?". The ability to evaluate a RASS is independent of sedation medications and the CAM-ICU scoring. Prior to starting the education, this unknown ability to assess a RASS on any patient was not considered when making the posters and education materials. In the yearly unit education provided to all staff they are taught to assess RASS once per shift regardless of sedation and thus it was presumed that staff were already doing this prior to the CAM-ICU education. Although the printed educational materials stayed the same, the information that was provided verbally in huddles changed slightly to add this missing information to ensure staff was able to successfully assess delirium.

Although the educational pre and post survey results did not indicate significant increase in comfort and knowledge of delirium, the EHR review was more revealing. These results are consistent with the findings of Awan et al., 2021; Blevins & DeGennaro, 2018; Kresevic et al., 2020; and Ramoo et al., 2018, who found an increase in performance of documentation of delirium assessment results after educational intervention. Results found in this quality improvement project varied from the literature due to the starting high rate of knowledge and comfort prior to education. Blevins & DeGennaro (2018) and Oh et al. (2022) investigated multimodal approaches to education for nurses to enhance knowledge and comfort of nursing staff but were smaller scale units. Again, variance was indicated in this quality improvement project due to the lack of increase in knowledge noted in pre and post survey results. Perhaps the most relevant, Devlin et al. (2018), identified the need for correct and complete assessments of

the CAM-ICU tool to identify patients accurately and appropriately at risk for delirium which was also indicated by the results of the EHR review data.

EHR chart review was conducted to evaluate for changes in accurate documentation of the CAM-ICU and RASS scoring tools from November 2022 to April 2023. To accurately compare data, randomization of 159 entries from each of these months was evaluated. Documentation accuracy significantly increased in the post intervention chart review and was deemed statistically significant via a Fisher Exact test indicating $p < .001$. This random sample of pre and post education charting indicated an increase in accurate identification and documentation for patients at risk for delirium indicating successful education interventions. In the pre intervention sample, only 100 or 62.9% of encounters got both the RASS and CAM-ICU charted appropriately, whereas 137 or 86.2% were documented appropriately in the post intervention sample. This indicates that the number of incomplete or inaccurate documentations of RASS and CAM-ICU decreased after the completion of education. The increase of accurate documentation will contribute to the accurate identification of patients with and at risk for delirium.

Limitations

Although many participants were involved in this project, with only 40 and 43 responses in the pre and post surveys respectively, this was under half the employed nursing staff. This response rate is indicative of the difficulty engaging staff in the project. Education was successfully completed during huddles, but many staff did not attend daily huddles limiting the educational outreach. In addition, the requirement for nursing staff to attend staff meetings is only once per quarter of the year thus not all the staff were present during the presentation in the monthly staff meeting.

Even with a great increase in documentation compliance, there were some difficulties with the EHR workflow. Under the CAM-ICU there is no option for unable to assess (UTA) and thus nurses must write this in. Many of the encounters assessed that had the RASS of negative 4

or 5 continued to document a CAM-ICU even though this is not the appropriate way to chart. This was perhaps due to the lack of UTA as an option when documenting.

Conclusions and Recommendations

The purpose of this quality improvement project was to assess the impact of accurately documenting the CAM-ICU score of identifying patients at risk for delirium in the SICU. The project involved evaluating nursing staff comfort and knowledge as well as a chart review for appropriate documentation. Although the self-evaluated knowledge did not change, the behavior of nursing changed and the documentation of appropriate CAM-ICU scores significantly improved. In the pre-survey 62.9% of the time CAM-ICU and RASS were documented appropriately, and post-survey increased to 86.2%.

For the future of the CAM-ICU projects in the SICU, with the increase in documentation of the CAM-ICU and RASS scoring appropriately in the post survey, next steps should include evaluating the discussion of these scores on each patient. The surveys indicated nurses are comfortable with assessment and documentation, along with discussing this topic during daily rounds. Being able to evaluate if this is being discussed would aid in the next step of utilizing the scores that are being documented. Although this was an increase in the post survey period of documentation accuracy this was the focus of the huddle for 16 days' time. To keep engagement for delirium in the unit, including the teaching a few days per month during huddle could aid as a reminder to the staff. Although this method may not reach the masses, the ongoing education could aid in consistent documentation and discussion. Another addition would be to enhance the education for the incoming nurses regarding the CAM-ICU scoring. Belvins & DeGennaro (2018) and Oh et al. (2022) found increased knowledge of the nursing staff and comfort with performing delirium assessments when in cooperating multimodal education tools. In cooperating these tools with the newer hires may result in higher confidence and knowledge pertaining to the CAM-ICU with less critical care experience.

References

- Awan, O. M., Buhr, R. G., & Kamdar, B. B. (2021). Factors Influencing CAM-ICU Documentation and Inappropriate "Unable to Assess" Responses. *American Journal of Critical Care*, 30(6), e99-e107. DOI: [10.4037/ajcc2021599](https://doi.org/10.4037/ajcc2021599)
- Blevins, C. S., & DeGennaro, R. (2018). Educational intervention to improve delirium recognition by nurses. *American Journal of Critical Care*, 27(4), 270-278. DOI: [10.4037/ajcc2018851](https://doi.org/10.4037/ajcc2018851)
- Davidson, J., Hopkins, R., Louis, D., & Iwashyna, T. (2013). *Post-intensive care syndrome*. Society of Critical Care Medicine (SCCM). Retrieved from <https://www.sccm.org/MyICUCare/THRIVE/Post-intensive-Care-Syndrome>
- Dearholt, S. L., Bissett, K., Ascenzi, J., & Whalen, M. (2021). *Johns Hopkins Evidence-Based Practice for Nurses and Healthcare Professionals: Model and Guidelines, Fourth Edition* (4th ed.). Sigma Theta Tau International.
- Devlin, J. W., Skrobik, Y., Gélinas, C., Needham, D.M., Slooter, A. J. C., Pandharipande, P. P., Watson, P. L., Weinhouse, G. L., Nunnally, M. E., Rochweg, B., Balas, M. C., van den Boogaard, M., Bosma, K. J., Brummel, N. E., Chanques, G., Denehy, L., Drouot, X., Fraser, G. L., Harris, J. E., Joffe, A. M., . . . Alhazzani, W. (2018). Clinical practice guidelines for the prevention and management of pain, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU. *Critical Care Medicine*, 46(9), e825-e873. <https://doi.org/10.1097/CCM.0000000000003299>
- Ely, E.W (2016). *Confusion assessment method for the ICU (CAM-ICU) - webflow*. Critical Illness, Brain Dysfunction, and Survivorship (CIBS) Center. Retrieved

from <https://uploads->

ssl.webflow.com/5b0849daec50243a0a1e5e0c/5bad3d28b04cd592318f45cc_The-Complete-CAM-ICU-training-manual-2016-08-31_Final.pdf

Khan, B. A., Perkins, A. J., Gao, S., Hui, S. L., Campbell, N. L., Farber, M. O., Chlan, L.

L., & Boustani, M. A. (2017). The Confusion Assessment Method for the ICU-7 Delirium Severity Scale: A Novel Delirium Severity Instrument for Use in the ICU. *Critical care medicine*, 45(5), 851–857.

<https://doi.org/10.1097/CCM.0000000000002368>

Krešević, D. M., Miller, D., Fuseck, C. W., Wade, M., Whitney, L., Conley, M., Rimac,

J., Jacono, F., O'Leary-Wilson, H., & Burant, C. J. (2020). Assessment and management of delirium in critically ill Veterans. *Critical Care Nurse*, 40(4), 42–52. DOI: [10.4037/ccn2020137](https://doi.org/10.4037/ccn2020137)

Krewulak, K. D., Hiploylee, C., Ely, E. W., Stelfox, H. T., Inouye, S. K., & Fiest, K. M.

(2021). Adaptation and Validation of a Chart-Based Delirium Detection Tool for the ICU (CHART-DEL-ICU). *Journal of the American Geriatrics Society*, 69(4), 1027-1034.[DS2]

Leis, J.A., & Shojania, K.G. (2017). A primer on PDSA: Executing Plan-Do-Study-Act

cycles in practice, not just in name. *BMJ Quality and Safety*, 26(7), 572-577. <http://dx.doi.org/10.1136/bmjqs-2016-006245>[DS3]

Marra, A., Pandharipande, P. P., Girard, T. D., Patel, M. B., Hughes, C. G., Jackson, J.

C., ... & Brummel, N. E. (2018). Co-occurrence of post-intensive care syndrome problems among 406 survivors of critical illness. *Critical care medicine*, 46(9), 1393. doi:10.1097/CCM.0000000000003218[DS4]

- Oh, E. S., Rosenberg, P. B., Wang, N. Y., Sieber, F. E., & Neufeld, K. J. (2022). Delirium detection methodologies: Implications for outcome measurement in clinical trials in postoperative delirium. *International journal of geriatric psychiatry*, 37(3). DOI: [10.1002/gps.5695](https://doi.org/10.1002/gps.5695)
- Paixao, L., Sun, H., Hogan, J., Hartnack, K., Westmeijer, M., Neelagiri, A., Zhou, D. W., McClain, L. M., Kimchi, E. Y., Purdon, P. L., Akeju, O., & Westover, M. B. (2021). ICU delirium burden predicts functional neurologic outcomes. *PloS one*, 16(12), e0259840. <https://doi.org/10.1371/journal.pone.0259840>
- Pun, B. T., Balas, M. C., Barnes-Daly, M. A., Thompson, J. L., Aldrich, J. M., Barr, J., ... & Ely, E. W. (2019). Caring for critically ill patients with the ABCDEF bundle: results of the ICU liberation collaborative in over 15,000 adults. *Critical care medicine*, 47(1), 3. doi:10.1097/CCM.0000000000003482[DS5]
- Ramoo, V., Abu, H., Rai, V., Surat Singh, S. K., Baharudin, A. A., Danaee, M., & Thinagaran, R. R. R. (2018). Educational intervention on delirium assessment using confusion assessment method- ICU (CAM- ICU) in a general intensive care unit. *Journal of clinical nursing*, 27(21-22), 4028-4039. DOI: [10.1111/jocn.14525](https://doi.org/10.1111/jocn.14525)
- Reznik, M. E., Daiello, L. A., Thompson, B. B., Wendell, L. C., Mahta, A., Potter, N. S., Yaghi, S., Levy, M., Fehnel, C., Furie, K., & Jones, R. N. (2020). Fluctuations of consciousness after stroke: Associations with the confusion assessment method for the intensive care unit (CAM-ICU) and potential undetected delirium. *Journal of Critical Care*, 56, 58-62. <https://doi.org/10.1016/j.jcrc.2019.12.008>
- Sessler, C. N., Gosnell, M. S., Grap, M. J., Brophy, G. M., O'Neal, P. V., Keane, K. A., Tesoro, E. P., & Elswick, R. K. (2002). The Richmond Agitation-Sedation Scale:

validity and reliability in adult intensive care unit patients. *American journal of respiratory and critical care medicine*, 166(10), 1338–1344.

<https://doi.org/10.1164/rccm.2107138>

Simeone, S., Pucciarelli, G., Perrone, M., Teresa, R., Gargiulo, G., Guillari, A., Castellano, G., Tommaso, L.D., Niola, M., & Iannelli, G. (2018). Delirium in ICU patients following cardiac surgery: An observational study. *Journal of clinical nursing*, 27(9-10), 1994-2002. <https://doi.org/10.1111/jocn.14324>

Vasilevskis, E. E., Chandrasekhar, R., Holtze, C. H., Graves, J., Speroff, T., Girard, T. D., ... & Ely, E. W. (2018). The cost of ICU delirium and coma in the intensive care unit patient. *Medical care*, 56(10), 890.

[doi:10.1097/MLR.0000000000000975](https://doi.org/10.1097/MLR.0000000000000975)[\[DS7\]](#)

von Hofen-Hohloch, J., Awissus, C., Fischer, M. M., Michalski, D., Rumpf, J. J., & Classen, J. (2020). Delirium screening in neurocritical care and stroke unit patients: a pilot study on the influence of neurological deficits on CAM-ICU and ICDS-C outcome. *Neurocritical care*, 33(3), 708-717.

<https://doi.org/10.1007/s12028-020-00938-y>

Appendix A: Evidence Table

CITATION	Level of Evidence*	PURPOSE / BACKGROUND	PARTICIPANTS / SETTING	METHODS / DESIGN	RESULTS / LIMITATIONS / RECOMMENDATIONS
<p>Awan, O. M., Buhr, R. G., & Kamdar, B. B. (2021). Factors Influencing CAM-ICU Documentation and Inappropriate “Unable to Assess” Responses. <i>American Journal of Critical Care</i>, 30(6), e99-e107. DOI: 10.4037/ajcc2021599</p>	<p>Level V: QI</p>	<p>To identify patient, clinical and workplace factors that may impede or facilitate appropriate delirium assessment through use of the CAM-ICU, specifically documentation and inappropriate “unable to assess” responses</p>	<p>Academic medical ICU (MICU) nurses’ documentation. Evaluated patient, clinical and workplace factors using multivariable regression.</p>	<p>Electronic health record-based data set used to quantify CAM ICU documentation and inappropriate “unable to assess” responses over 24 months</p>	<p>22% of patient screened positive for delirium during ICU stay</p> <p>CAM ICU documentation was higher during the day shift and for patients requiring physical restraints and dexmedetomidine.</p> <p>Dexmedetomidine was the only infusion associated with higher rates of CAM ICU documentation ($p < .05$)</p> <p>Higher rates of UTA in older >80y/o and non-white (all $p < .05$)</p> <p>Limit: unmeasured confounding and missing or inaccurate data</p> <p>Strengths: First study to describe geographic and shift-based imbalances in delirium assessment.</p>

CITATION	Level of Evidence*	PURPOSE / BACKGROUND	PARTICIPANTS / SETTING	METHODS / DESIGN	RESULTS / LIMITATIONS / RECOMMENDATIONS
					<p>Retrospective allowed for no risk of Hawthorne effect.</p> <p>Future: needs to be reduplicated in other ICU setting due to only medical patients in this study</p>
<p>Blevins, C. S., & DeGennaro, R. (2018). Educational intervention to improve delirium recognition by nurses. <i>American Journal of Critical Care</i>, 27(4), 270-278. DOI: 10.4037/ajcc2018851</p>	<p>Level II – Quasi experimental</p>	<p>Under cognition of healthcare professional (about delirium) contributes to poor outcomes for patients.</p> <p>Evaluate the effectiveness of a multimodal educational intervention for nurses in the MICU to improve their knowledge and skills regarding delirium and delirium recognition</p>	<p>Convenience sample of MICU nurses in a 28 bed ICU on the East Coast of the US in an academic medical center</p>	<p>Educational intention. Quasi-experimental design</p>	<p>Results: 1 group (n=34) completed 15 educational sessions with 56% holding a bachelor's degree with 1-5 years of experience (59%). Mean scores and knowledge differed significantly (p<.001) from pre and post intervention.</p> <p>Confirmed benefits to educational program regarding delirium.</p> <p>Limits: Case study analysis of intervention was specific to MICU</p> <p>low participation rate of 32% of nurses Lack of randomization</p>

CITATION	Level of Evidence*	PURPOSE / BACKGROUND	PARTICIPANTS / SETTING	METHODS / DESIGN	RESULTS / LIMITATIONS / RECOMMENDATIONS
					<p>Strength: additional validation that multimodal educational interventions improve nurses' knowledge of delirium</p> <p>Recommendations: further studies need to determine most effective strategies to improve nurses' knowledge of tools and scales for delirium</p>
<p>Devlin, J. W., Skrobik, Y., Gélinas, C., Needham, D. M., Slooter, A. J. C., Pandharipande, P. P., ... Alhazzani, W. (2018). Clinical practice guidelines for the prevention and management of pain, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU. <i>Crit Care Med</i>, 46(9), e825-e873. https://doi.org/10.1097</p>	<p>Level IV – Clinical Practice Guidelines</p>	<p>Purpose: to update and expand Clinical Practice Guidelines for management of Pain, agitation, and delirium in Adult Patients in the ICU</p>	<p>32 international experts, four methodologists, four critical illness survivors met virtually monthly to develop policies. Final general content review was completed in person.</p>	<p>Five sections of the guidelines: Pain, Agitation/sedation, Delirium, Immobility, and sleep were accounted for. Each section created population, intervention, comparison, and outcomes based on perceived clinical relevance. Searched best practice guidelines and ranked as “strong”, “conditional” or “good” to aid in development</p>	<p>Results: Issued 37 recommendations for updating clinical practice guidelines Limitations: Full process was 3.5 years and more information may have been studied that was no included. Development of guidelines does not ensure use Multiple gaps in diagnostics, critical illness as a diagnosis, and individual needs are not able to be accounted for. Strengths:</p>

CITATION	Level of Evidence*	PURPOSE / BACKGROUND	PARTICIPANTS / SETTING	METHODS / DESIGN	RESULTS / LIMITATIONS / RECOMMENDATIONS
/ccm.0000000000003299				and evaluation of principles.	<p>Did not limit publications to English only – thus may be more beneficial world-wide.</p> <p>Recommendations: bridge gap between knowledge and application of guidelines.</p>
<p>Khan, B. A., Perkins, A. J., Gao, S., Hui, S. L., Campbell, N. L., Farber, M. O., Chlan, L. L., & Boustani, M. A. (2017). The Confusion Assessment Method for the ICU-7 Delirium Severity Scale: A Novel Delirium Severity Instrument for Use in the ICU. <i>Critical care medicine</i>, 45(5), 851–857. https://doi.org/10.1097/CCM.00000000000002368</p>	Level III: Observational cohort study	Delirium severity is independently associated with length of hospital stay, nursing home placement and death outside of the ICU. Study was designed to assess reliability and validity of CAM-ICU-7 severity scoring.	Medical, surgical, and progressive ICUs of three academic hospitals. 518 adult patients (18 years or older).	Observational Cohort study	<p>Results: CAM-ICU is a valid and reliable tool</p> <p>Higher scores were associated with increased length of ICU stay (p=.0001).</p> <p>Limitations: Inability of CAM-ICU-7 to capture the severity of every symptom of delirium.</p> <p>Timeframe between delirious patients and study enrollment was up to 48 hours</p> <p>Strengths: Used a large, diverse patient population.</p> <p>Equal weight to hyper and hypoactive delirium states</p>

CITATION	Level of Evidence*	PURPOSE / BACKGROUND	PARTICIPANTS / SETTING	METHODS / DESIGN	RESULTS / LIMITATIONS / RECOMMENDATIONS
					Recommendations: Further studies to facilitate evaluation of delirium severity as an outcome of clinical trials in reducing the delirium burden.
Krešević, D. M., Miller, D., Fuseck, C. W., Wade, M., Whitney, L., Conley, M., Rimac, J., Jacono, F., O'Leary-Wilson, H., & Burant, C. J. (2020). Assessment and management of delirium in critically ill Veterans. <i>Critical Care Nurse</i> , 40(4), 42-52. DOI: 10.4037/ccn2020137	Level V: quality improvement	To describe a nurse led interdisciplinary quality improvement initiative to increase nurses' knowledge of delirium, documentation of delirium assessment and patient mobility	VA northeast Ohio healthcare system including 12 SICU and 16 MICU/CICU beds	Quality improvement, educational intervention	Documentation of CAM ICU improved from less than 50% to consistently 99% Mobility of patients who are mechanically ventilated increased Strengths: enhanced nursing knowledge and collaboration with interdisciplinary delirium team and use of templates Limits: may not generalize to other populations Recommendations: studies on different unit types to identify educational and equipment needs based on length of stay of patients
Oh, E. S., Rosenberg, P. B., Wang, N. Y.,	Level I: Randomi	Characterize the properties of the measures obtained in a	Secondary analysis from STRIDE which included	Secondary analysis of the randomized trial	Consensus panel diagnosis was more sensitive.

CITATION	Level of Evidence*	PURPOSE / BACKGROUND	PARTICIPANTS / SETTING	METHODS / DESIGN	RESULTS / LIMITATIONS / RECOMMENDATIONS
<p>Sieber, F. E., & Neufeld, K. J. (2022). Delirium detection methodologies: Implications for outcome measurement in clinical trials in postoperative delirium. <i>International journal of geriatric psychiatry</i>, 37(3). DOI: 10.1002/gps.5695</p>	<p>zed trial analysis</p>	<p>randomized controlled trial to document relationship to the DSM based diagnosis of postoperative delirium</p>	<p>200 consecutive hip fracture repair patients >65 y/o</p>	<p>STRIDE (strategy to reduce the incidence of postoperative delirium in elderly patients</p>	<p>Strength: detailed description of how to operationalize training of delirium assessors and a consensus panel</p> <p>Provides estimate of how delirium assessments by well trained personnel can perform compared to standard</p> <p>Limits: Sample size</p> <p>Further studies: rating processes as independent use</p>
<p>Paixao, L., Sun, H., Hogan, J., Hartnack, K., Westmeijer, M., Neelagiri, A., Zhou, D. W., McClain, L. M., Kimchi, E. Y., Purdon, P. L., Akeju, O., & Westover, M. B (2021). ICU delirium burden predicts functional neurologic outcomes. <i>PloS one</i>,</p>	<p>Level II – Prospective cohort study</p>	<p>Investigate the effect of delirium burden in mechanically ventilated patients, beginning in the ICU and continuing throughout hospitalization on functional neurologic outcomes up t 2.5 years following critical illness.</p>	<p>MICU or SICU at Mass general Brigham</p>	<p>Prospective cohort study</p>	<p>In-hospital delirium burden independently predicts mortality at 2.5 years of follow up</p> <p>Worse long term functional neurological outcomes after adjusting for age, illness severity, medical comorbidities, and exposure to sedative and analgesic medications</p> <p>Strengths: in hospital delirium is a strong</p>

CITATION	Level of Evidence*	PURPOSE / BACKGROUND	PARTICIPANTS / SETTING	METHODS / DESIGN	RESULTS / LIMITATIONS / RECOMMENDATIONS
16(12), e0259840. https://doi.org/10.1371/journal.pone.0259840					independent predictor of survival and functional neurological status Limits: once daily CAM ICU assessments Future: twice daily assessment
Pun, B. T., Balas, M. C., Barnes-Daly, M. A., Thompson, J. L., Aldrich, J. M., Barr, J., ... & Ely, E. W. (2019). Caring for critically ill patients with the ABCDEF bundle: results of the ICU liberation collaborative in over 15,000 adults. <i>Critical care medicine</i> , 47(1), 3. doi:10.1097/CCM.0000000003482	Level II: cohort study	Intensive care patients experience a variety of distressing symptoms including pain, agitation, delirium, weakness, and sleep deprivation. Aim to evaluate the ABCDEF bundle performance and patient centered outcomes in critical care setting	68 academic, community and federal ICUs used for data collection. Sample included 15,226 adults with at least one day of ICU	Prospective. Multicenter, cohort study Defined ABCDEF bundle performance in two ways: 1) complete performance (patient received every eligible bundle element on any given day) and 2) proportional performance (percentage of eligible bundle elements performed on any given day)	Results: Completed ABCDEF bundle was associated with lower likelihood of hospital death within 7 days, next day mechanical ventilation, coma, delirium, restrain use, ICU readmission, and discharge to facility rather than home. consistent dose-response relationship between higher proportional bundle performance and improvements in each of the above-mentioned clinical outcomes (all $p < 0.002$). Significant pain was more frequently reported as bundle performance proportionally increased ($p = 0.0001$)

CITATION	Level of Evidence*	PURPOSE / BACKGROUND	PARTICIPANTS / SETTING	METHODS / DESIGN	RESULTS / LIMITATIONS / RECOMMENDATIONS
					<p>Limitations: Not a randomized study design. Outcomes are not independent of one another. Did not collect uniform severity of illness Strengths</p> <p>Recommendations: study the unmeasured benefits of the ABCDEF bundle such as the effect that full integration of the ABCDEF bundle has on ICU care</p>
<p>Ramoo, V., Abu, H., Rai, V., Surat Singh, S. K., Baharudin, A. A., Danaee, M., & Thinagaran, R. R. R. (2018). Educational intervention on delirium assessment using confusion assessment method-ICU (CAM- ICU) in a general intensive care unit. <i>Journal of clinical nursing</i>, 27(21-22), 4028-4039.</p>	<p>Level I: Randomized control trial</p>	<p>To assess ICU nurses' knowledge of ICU delirium and delirium assessment before and after an educational intervention</p>	<p>Malaysian ICU in a 1200 bed teaching hospital. Unit consisted of 23 beds in a general adult ICU</p>	<p>Single group pretest – posttest design</p>	<p>Mean age of nurses = 27.2</p> <p>Only 30% of nurses had more than 5 years of critical care nursing</p> <p>Knowledge pre test = 47.6% Post intervention = 66.9%</p> <p>Highly significant for “impacts of ICU delirium during hospital stay,” “CAM-ICU interpretation,” “validity of CAM ICU screening tool” Strengths: provides valuable information that a simple educational intervention can</p>

CITATION	Level of Evidence*	PURPOSE / BACKGROUND	PARTICIPANTS / SETTING	METHODS / DESIGN	RESULTS / LIMITATIONS / RECOMMENDATIONS
DOI: 10.1111/jocn.14525					<p>improve ICU nurses' knowledge on ICU delirium and the assessment tools</p> <p>Limits: small sample size</p> <p>Recommendations: Evaluate in other countries</p>
<p>Reznik, M. E., Daiello, L. A., Thompson, B. B., Wendell, L. C., Mahta, A., Potter, N. S., Yaghi, S., Levy, M., Fehnel, C., Furie, K., & Jones, R. N. (2020). Fluctuations of consciousness after stroke: Associations with the confusion assessment method for the intensive care unit (CAM-ICU) and potential undetected delirium. <i>Journal of Critical Care</i>, 56, 58-62. https://doi.org/10.1016/j.jcrc.2019.12.008</p>	Level I: explanatory mixed method	Aim to examine the associations between fluctuating consciousness and CAM-ICU in stroke versus non-neurological patients	Measurements occurred in one institution with 546 stroke patients and 1586 sepsis patients.	<p>Retrospective Cohort study</p> <p>Linked all recorded CAM-ICU assessments with corresponding RASS measuring in patients with stroke or sepsis.</p>	<p>Post stroke delirium may go undetected by CAM-ICU due to increased "unable to assess" charting with fluctuations in the RASS scoring.</p> <p>Limitations: relied on data from a single clinical center with only focus on stroke and sepsis patients.</p> <p>Strengths: Identified that fluctuations in consciousness may change CAM-ICU scoring validity for neurological patients.</p> <p>Recommendations: prospective studies to further characterize the challenges with the CAM-ICU assessment</p>

CITATION	Level of Evidence*	PURPOSE / BACKGROUND	PARTICIPANTS / SETTING	METHODS / DESIGN	RESULTS / LIMITATIONS / RECOMMENDATIONS
<p>Simeone, S., Pucciarelli, G., Perrone, M., Teresa, R., Gargiulo, G., Guillari, A., Castellano, G., Tommaso, L.D., Niola, M., & Iannelli, G. (2018). Delirium in ICU patients following cardiac surgery: An observational study. <i>Journal of clinical nursing</i>, 27(9-10), 1994-2002. https://doi.org/10.1111/jocn.14324</p>	<p>Level III: non-experimental studies</p>	<p>Observe clinical and structural factors that can be associated with the post operative onset of delirium in patients who have undergone heart surgery</p>	<p>ICU Post operative cardiac surgery unit</p>	<p>Observational design Linear model of regression was used to identify the predictors of delirium in patients</p>	<p>Identified clinical and environmental risk factors that may be responsible for delirium Insomnia will lead to more delirium – exposure to artificial light changed the patient sleep-wake cycle Limits: sample size. Once daily assessment Strengths: Use of light exposure Further studies: subjective and structural factors that predispose to the onset of delirium</p>
<p>von Hofen-Hohloch, J., Awissus, C., Fischer, M. M., Michalski, D., Rumpf, J. J., & Classen, J. (2020). Delirium screening in neurocritical care and stroke unit patients: a pilot study on the</p>	<p>Level I: Pilot study / RCT</p>	<p>Delirium is a common complication of critically ill patients. Aim is to address if neurological deficits affect the outcome of the CAM-ICU tool.</p>	<p>123 patients with daily CAM-ICU screenings over a 1 month period.</p>	<p>Prospective, observational, single-center pilot study. Applied the CAM-ICU and ICDSC in a mixed cohort of neurocritical patients.</p>	<p>Sensitivity and specificity assessed against the clinical evaluation were 66.9% and 93.3% for screening with CAM-ICU. delirium incidence of 18.7% Strengths: all screeners were trained in the recognition of delirium. patients were screened consecutively over</p>

CITATION	Level of Evidence*	PURPOSE / BACKGROUND	PARTICIPANTS / SETTING	METHODS / DESIGN	RESULTS / LIMITATIONS / RECOMMENDATIONS
influence of neurological deficits on CAM-ICU and ICDS outcome. <i>Neurocritical care</i> , 33(3), 708-717. https://doi.org/10.1007/s12028-020-00938-y					the time frame of one month. Limitations: screening once daily. Study was a pilot and thus results should be interpreted with caution. Recommendations: Delirium screening tools for neurological patients' needs tailoring to this patient population.

*Level of evidence based on: Dearholt, S. L., Bissett, K., Ascenzi, J., & Whalen, M. (2021). *Johns Hopkins Evidence-Based Practice for Nurses and Healthcare Professionals: Model and Guidelines, Fourth Edition* (4th ed.). Sigma Theta Tau International.

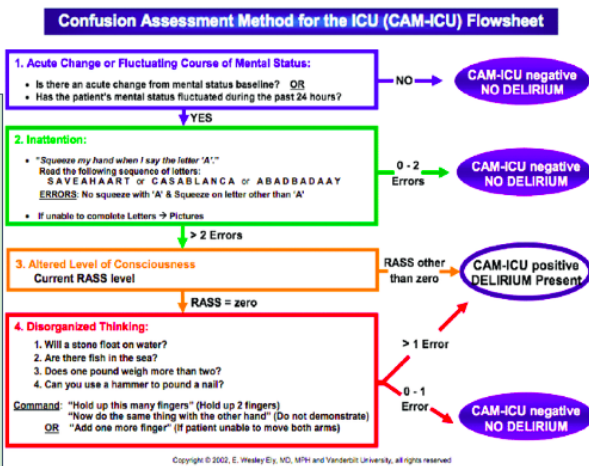
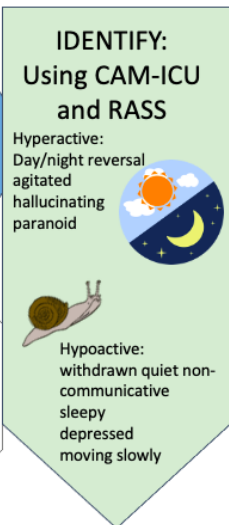
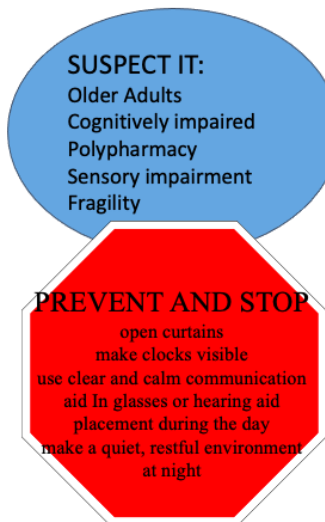
Appendix B
Pre/Post Survey questions

I have been working in Critical Care for	<ul style="list-style-type: none"> a. <1 year b. 1-3 years c. 3-5 years d. 6-10 years e. >10 years
I am a nurse who is	<ul style="list-style-type: none"> a. Full time b. Part time c. PRN d. Agency e. Float
How do you rate your knowledge of ICU delirium?	<ul style="list-style-type: none"> a. None at all b. Slightly thorough and complete c. Moderately thorough and complete d. Very thorough and complete e. Extremely thorough and complete
My prior training and education on ICU delirium was adequate	<ul style="list-style-type: none"> a. None at all b. Slightly thorough and complete c. Moderately thorough and complete d. Very thorough and complete e. Extremely thorough and complete
I am comfortable assessing delirium in ICU patients	<ul style="list-style-type: none"> a. Not at all b. slightly comfortable c. moderately comfortable d. very comfortable e. extremely comfortable
I routinely assess my patients for delirium	<ul style="list-style-type: none"> a. never b. rarely c. sometimes d. often e. always
I have enough time and support to assess delirium in my patients	<ul style="list-style-type: none"> a. never b. rarely c. sometimes d. often e. always
I know where and how to document RASS and CAM-ICU scores in EPIC	<ul style="list-style-type: none"> a. not at all aware b. slightly aware c. moderately aware d. very aware e. extremely aware

What are your barriers to assessing delirium (pick all that apply)	<ul style="list-style-type: none"> a. no barriers b. time and support c. lack of knowledge d. EPIC workflow e. Physical environment f. Language barrier g. Other: Please explain
I know where delirium is addressed on the CHUGG	<ul style="list-style-type: none"> a. not at all aware b. slightly aware c. moderately aware d. very aware e. extremely aware
I feel comfortable with the non-pharmacological management of delirium	<ul style="list-style-type: none"> a. Not at all b. slightly comfortable c. moderately comfortable d. very comfortable e. extremely comfortable
I feel comfortable addressing delirium during rounds	<ul style="list-style-type: none"> a. Not at all b. slightly comfortable c. moderately comfortable d. very comfortable e. extremely comfortable

Appendix C Educational Slide

Yes we CAM dream



ADDRESS IT:

- ICU delirium Increases time In the ICU is associated with higher likelihood of returning to the ICU.
- Initiate Discussion in Rounds
- Ask for Orders