8-13-2019

Evidence Based Practice Implementation of the Delirium Portion of the ABCDEF Bundle

Jessica Sumner
Bellarmine University, bluejessrn@aol.com

Evidence Based Practice Implementation of the Delirium Portion of the ABCDEF Bundle

Jessica Sumner

Bellarmine University

Abstract

Background: Delirium is a common complication in the ICU setting and has serious long-term consequences. Increased mortality and long-term cognitive issues are associated with under-recognition and lack of treatment for delirium. Nursing staff must identify delirium and manage the event, in addition to providing care to other assigned patients.

Purpose: The purpose of this evidence-based project was twofold. First, the project set out to determine if implementation of the delirium portion of the ABCDEF bundle promoted delirium recognition and decreased ICU length of stay and ventilator days. Second, the project examined if the use of a structured delirium education program improved nursing knowledge of delirium risk-factors and incidents in ICU patients.

Methods: Manual chart audits of 368 ICU patients was completed post-implementation of the delirium portion of the ABCDEF bundle. Screening variables included: (1) number of times delirium screening was completed, (2) number of opportunities for screening, (3) delirium incidence, and (4) screening compliance. Outcome variables were calculated by comparing 2018 and 2019 data (Jan.–April). Outcome variables included: (1) ICU length of stay, (2) mortality, (3) ventilator days, (4) number of patient days, and (5) illness severity. Descriptive statistics were calculated for items on a nursing delirium knowledge survey pre and post-implementation.

Results: Delirium screening compliance was 62.2% post-implementation, with 31.5% of patients screening positive. ICU length of stay decreased 11.41% and patient days decreased 5.34%. The average number of ventilator days decreased 13.86% while the severity of illness increased 2.83%, and ICU mortality increased 4.3%.

Conclusions: Use of the delirium portion of the ABCDEF bundle, along with staff education, improved ICU outcome measures as well as increased delirium recognition.

Introduction

The purpose of this paper is to describe the implementation of an evidence-based delirium screening tool in the intensive care unit (ICU) as part of a staged implementation of the ABCDEF bundle. Delirium in the ICU has a significant and costly impact to the patient, ICU, and the hospital system. Estimates indicate that up to 80% of ICU patients are affected by ICU delirium (Khan, Zawahiri, & Campbell, 2012; Barr et al., 2013). The patients affected by delirium have a considerably higher intensity of care in the ICU. Vasilevskis et al (2018) found the cumulative 30-day cost of unremitting delirium is around $18,000 per patient. Other cost estimates related to delirium treatment and care ranges from $16-152 billion per year (Barr et al., 2013; Coyle, Burns, & Traynor, 2017; Leslie & Inouye, 2011).

Delirium in the general hospital setting contributes to increases in hospital length of stay (LOS), morbidity and mortality, as well as institutionalization post hospital stay (Avendano-Cespedes et al., 2016; Rosenbloom & Fick, 2014). In the ICU setting, the literature strongly supports a link between delirium and increased ICU length of stay (LOS), hospital LOS, ventilator days, morbidity and both ICU and hospital mortality (Barr et al., 2013; Barr & Pandharipande, 2013; Ely et al., 2004; Pisani et al., 2009; Pun & Ely, 2007; Salluh et al., 2010; Salluh et al., 2015). Delirium also plays a part in falls, sepsis, and harmful behaviors such as unplanned line removals (Hasemann et al., 2016; Thomas et al., 2014). The impact of delirium does not end with the initial hospital stay. Delirium is associated with 30-day readmissions, ED visits within the 30-days post discharge, and discharges to locations other than home (LaHue et al., 2019).

Post-intensive care syndrome (PICS) can occur after an ICU stay and result in new or worsening mental health, cognitive health, or functional disability for the critical illness survivor.

Delirium has been established as a risk factor for PICS (Rawal, Yadav, & Kumar, 2017; Harvey & Davidson, 2016). Cognition, executive function, and impaired information processing have all been found to be affected in patients 3-months to 12-months post ICU discharge (Pandharipande et al., 2013; Mitchell, Shum, Mihala, Murfield, & Aitken, 2018; Girard et al., 2010). The duration of delirium has been associated with worsening cognitive deficits (Girard et al., 2010; Mitchell et al., 2018). Functional deficits, reduced quality of life, and a 3-fold increase in mortality at 6 months have been found to be results of ICU delirium (Barr & Pandharipande, 2013; Barr et al., 2013; Pun & Ely, 2007; Girard et al., 2010; Vasilevskis et al., 2010; Van den Boogaard et al., 2012).

Delirium is characterized by a sudden and acute onset of changes in mental status that can wax and wane. According to The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (American Psychiatric Association, 2013), delirium includes a change in attention or awareness. There can be a change in cognition that is not from a preexisting dementia. Delirium typically appears over hours to days and fluctuates throughout the day. Diagnostic examination often connects the cause of delirium to the medical condition, drugs or alcohol, prescribed medications, or a combination of factors.

There are three presentations of delirium – hypoactive, hyperactive, and a mixed type. Hypoactive delirium is characterized by a decrease in motor activity, apathy, lethargy, sleepiness, and at times a catatonic state. Hypoactive delirium, though the most common type, is frequently un-recognized without routine monitoring (Pandharipande et al., 2007; Vasilevskis, Han, Hughes, & Ely, 2012). The patient is typically non-demanding, requiring minimal attention, which often leads to healthcare providers missing the underlying problem. The impact of this missed diagnosis leads to higher mortality and poor prognostication (Lin, Chen, & Wang,

2015; Palaciso-Cena et al., 2016). Hypoactive delirium is independently associated with old age (Peterson et al., 2006). Hyperactive delirium, however, is frequently recognized because it is characterized by disorientation, hallucinations, delusions, agitation, restlessness, paranoia, and increased activity. The final type is the mixed state in which the patient rapidly alternates between hypoactive and hyperactive states (Coyle et al., 2017; Rice et al., 2011). Krewulak et al. (2018) completed a meta-analysis of 18 articles about the subtypes of delirium and found that hypoactive delirium incidence was approximately 11% [95% CI, 8-17%], mixed delirium was second at 7% [95% CI, 4-11], and hyperactive delirium had the lowest incidence at 4% [95%, CI 2-6] (Krewulak, Stelfox, Leigh, Ely, & Fiest, 2018).

Risk factors associated with delirium vary, but three main factors have been identified including; patient factors, illness, and the environment. Patient factors include age, alcohol and drug use, pre-existing dementia, cognitive impairment, visual or hearing impairment, and a history of hypertension or alcoholism (Zaal, Devlin, Peelen, & Slooter, 2015). The illness itself is a factor and includes markers such as acidosis, anemia, untreated pain, infection or sepsis, hypotension, metabolic disorders, respiratory illness, or the severity of the illness (Zaal et al., 2015; Mehta et al., 2015). The ICU environment also has an impact and includes immobility, mechanical ventilation, urinary indwelling catheters, medications (particularly benzodiazepines and opiates), noise, and sleep disturbances (Banerjee, Girard, & Pandharipande, 2011; Barr et al., 2013; Girard, Pandharipande, & Ely, 2008; Calvo-Ayala & Khan, 2013; Lin et al., 2015; Mehta et al., 2015; Palaciso-Cena et al., 2016; Salluh et al., 2010; Xing et al., 2019; Zaal et al., 2015).

In the healthcare and ICU settings, delirium is often under-recognized and misdiagnosed (Rice et al., 2011). One study found that approximately 65% of the ICU delirium days were missed by nurses in their regular assessments (Spronk, Riekerk, Hofhuis, & Rommes, 2009).

Wand et al. (2014) found that even after educational intervention, nursing staff only recognized delirium about 23% of the time. Failure to correctly identify delirium leads to failure to treat correctly. The patient and family are left to deal with a frightening event and the nursing staff are overwhelmed trying to meet their needs. Since nurses are at the bedside 24-7, they are in a prime position to assist with both delirium prevention and identification; however, standard assessment methods lead to under-recognition, so there is a need for a systematic assessment method. Interventions to prevent or shorten the duration of delirium are needed to help decrease the incidence of poor critical illness outcomes (Brummel et al., 2015).

Review of Literature

A search of the literature was completed using Medline, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, and Cochrane databases. The key words used were delirium, ICU, screening, prevention, ABCDE bundle, and ABCDEF bundle. Literature between 2008 and 2019 were included in the search and were limited to English language and adult populations. The search results were screened via the titles and abstracts for relevance. The remaining materials were retrieved and reviewed for applicability to the subject matter.

Screening

Screening for delirium is an important component of improving delirium management. ICU professionals using clinical judgement, as opposed to a screening tool, can miss delirium (Guenther et al., 2012). A Dutch study compared physician identification of delirium with validated screening tools. The physician's clinical judgement missed approximately 75% of the delirium cases that the screening tool identified (Van Eijk et al., 2009). In a separate study, nurses scored the presence of daily delirium using their clinical judgement. A total of 46 patients were evaluated with a sensitivity of 34.8% and a specificity of 98%. Even though the nurses

were accurate when they identified delirium, they missed delirium occurrences 35% of the time (Spronk, Riekerk, Hofhuis, & Rommes, 2009). Clinical judgement alone is insufficient to identify delirium.

Screening tools assist with delirium recognition and timely treatment (Barr et al., 2013; Van den Boogaard et al., 2012; Van den Boorgaard et al., 2009). However, in the ICU environment, tools are not always completed routinely. Ely et al. (2004) completed a study evaluating screening. They found that 40% of the healthcare providers surveyed had some sort of process to screen for delirium, yet only 16% were utilizing a formal assessment tool. A follow-up study was completed in 2009 that revealed an increase in screening to 59%, with 33% using a validated method (Patel et al., 2009). Devlin et al. (2008) surveyed 601 critical care nurses and found that about 10% assessed for delirium at least once in their 12-hour shift. However, 53% never or rarely assessed for delirium. Screening compliance was an issue even with unit guidelines for formal delirium assessment in place (Devlin et al., 2008). Best practice would be to routinely utilize screening tools that are validated for sensitivity and specificity to assist with early delirium recognition and treatment.

CAM-ICU Screening Tool

Several screening tools are available to assess for the presence of delirium. The most commonly utilized are the Confusion Assessment Method for ICU (CAM-ICU) (Ely et al., 2001) and the Intensive Care Delirium Screening Checklist (ICDSC) (Bergeron, Dubois, Dumont, Dial, & Skrobik, 2001). Both tools screen for the presence of delirium, but the CAM-ICU is more specific for its presence.

The ICDSC, first published in 2001, is an eight-item screening tool that uses DSM criteria for delirium diagnosis (Bergeron et al, 2001). The ICDSC has a pooled sensitivity of

80.1% and pooled specificity of 74.6% with a SROC of 0.89 (Gusmao-Flores, Figueira Salluh, Chalhub, & Quarantini, 2012; Neto et al., 2012). Information is collected over an extended period throughout a nurse's shift and is reliant on the observational skills and proper interpretation of the symptom definitions by the nurse (Brummel et al., 2013). Training that is focused on these nuances is essential for nursing staff to screen proficiently.

The CAM-ICU was first published in 2001 and has been translated into over 20 languages (Ely et al., 2001; Ely et al., 2001; Ely, 2002; Ely, 2016). The tool has a sensitivity of 80%, specificity of 95.9%, SROC of 0.97, and interrater reliability of 0.79 to 0.95 (Ely et al., 2001; Ely et al., 2001; Gusmao-Flores, Figueira Salluh, Chalhub, & Quarantini, 2012; Neto et al., 2012; Gelinas et al., 2018). The CAM-ICU tool is highly specific for delirium. A limitation of the CAM-ICU is that the assessment is a single spot in the patient's day (Brummel et al., 2013). The frequency of the assessment must be included in the delirium protocol. The tool has an established step by step algorithm to guide providers and nurses through the assessment. However, it does require that the person completing the screening be trained (Ely, 2016). The tool takes about 3 minutes for an experienced provider to complete.

The CAM-ICU assessment begins with assessment of consciousness. This includes assessing level of consciousness. The Richmond Agitation-Sedation Scale (RASS) was originally utilized during the CAM-ICU validation (Ely et al., 2001). RASS is a tool used in the ICU to determine the level of sedation or agitation a person may be experiencing. The levels are +1 to +4 for a person experiencing agitation, 0 for a calm patient and -1 to -5 for levels of sedation (Sessler et al., 2002; Ely et al., 2003; Khan et al., 2012). If the patient has a RASS of -4 or -5, the CAM-ICU is stopped. However, if the score is -3 or higher, assessment continues, and clarity of thinking is assessed. The next steps include acute changes, assessment for inattention,

RASS changes, and disorganized thinking. The assessment is scored as either positive or negative (Ely, 2016).

Perceptions of delirium and screening

Since nurses are at the bedside 24 hours a day, 7 days a week, they are in a prime position to positively influence delirium through risk-reduction strategies, early recognition, and the facilitation of timely treatment. Nurses have noted that delirium impacts their patients and that underdiagnoses and undertreatment are common occurrences in the ICU (Devlin et al., 2008). However, there is a lack of screening in the ICU setting even when delirium screening protocols and tools are in place (Ely et al., 2004; Devlin et al., 2008; Patel et al., 2009). In a survey completed by Eastwood et al. (2012), 88% of nurses felt delirium was important but only 75% felt that the CAM-ICU was worth the time to assess the patient. Failure to assess patients despite the recognized importance of delirium detection suggests a need for further education (Elliott, 2014).

Reasons for lack of screenings are complex and many. Nurses cite that keeping patients alive is a higher priority than caring for patients' mental health concerns (Zamoscik et al., 2017). The nature of the illness is challenging as well, especially if the patient is intubated (Devlin et al., 2008; Zamoscik et al., 2017). If the illness does not get in the way, the patient themselves could be an issue. Nurses found patients to be emotionally challenging, frustrating, physically demanding, and sources of unrest and stress (Zamoscik et al., 2017; Palaciso-Cena et al., 2016; Jung et al., 2013). They attempt to keep patients from harming themselves via self-extubation or the removal of other needed medical devices. Nurses also felt that care of delirious patients requires constant intervention to keep them safe and provide effective care (Palaciso-Cena et al., 2016). Even though family can be helpful in dealing with the delirious patient, they can also be a

source of stress when the nurses finds themselves having to be positive and provide continual reassurance (Zamoscik et al., 2017; Jung et al., 2013; Rivosecchi, Smithburger, Svec, Campbell, & Kane-Gill, 2015). The challenges are increased by nurses not feeling that there is adequate support for dealing with the delirious patient, especially the hyperactive patient (Palaciso-Cena et al., 2016; Zamoscik et al., 2017).

Delirium prevention and screening is often perceived as busy work (DiLibero, O'Donoghue, DeSanto-Madeya, & Ninobla, 2016; Zamoscik et al., 2017). However, Zamoscik et al. noted that nurses who used screening tools reported that the tools helped to better understand a patient's status and improved the nurse's confidence when discussing a patient's status with a physician (2017). The surveyed nurses also felt that the assessment was not used in a meaningful manner to change patient treatment, so they did not consistently complete the assessment (Zamoscik et al., 2017; DiLibero et al., 2016). While these findings are noteworthy, data collection was cross-sectional and may not have fully captured nurses' perceptions.

Multicomponent Prevention

The care of the ICU patient is complex and requires looking at the patient holistically. Non-pharmacological techniques are interventions that can be individualized to the patient and have potential to prevent delirium. These techniques address specific risk factors that have been shown to lead to delirium. Risk factors for development of delirium include dementia, older age, comorbidities, illness severity, poor activities of daily living (ADL) function, immobility, urinary catheterization, polypharmacy, and length of hospital stay (Ahmed, Leurent, & Sampson, 2014). In general, bundled interventions address risk factors by addressing orientation, sensory deficits, sleep promotion, mobility, hydration, nutrition, medication, oxygenation, elimination, pain control, and encouraging family involvement (Avendano-Cespedes et al., 2016; Hasemann et al.,

2016; Jung et al., 2013; Rosenbloom & Fick, 2014; Rivosecchi et al., 2015; Martinez, Donoso, Marquez, & Labarca, 2017; Thomas et al., 2014; Zamoscik et al., 2017). Avendano-Cespedes et al. (2016) found that the use of these multi-component interventions led to a decrease in delirium prevalence from 48.3% to 33.3% and a significantly lower delirium severity score in the study group (35 vs. 65). Martinez et al. (2017), also found that using a multicomponent intervention reduced delirium from 38% to 24%. These studies demonstrate that multicomponent non-pharmacological interventions have potential to decrease delirium.

ABCDE(F) Bundle

Variations in nursing and physician practices can lead to problems with delirium prevention efforts and delirium treatment. Nurses surveyed regarding delirium management felt that because there was not an established practice, different physicians treated patients differently. They cited that this was especially true on night shift when physicians did not provide needed orders or prescribed less than the recommended dose of needed medications (Palaciso-Cena et al., 2016). Evidence-based delirium protocols or bundles are needed to ensure consistency across different disciplines involved in the care of ICU patients.

One method to prevent delirium or identify delirium earlier is the use of the ABCDEF bundle (Devlin & Pohlman, 2014; Pandharipande, Banerjee, McGrane, & Ely, 2010; Marra, Ely, Pandharipande, & Patel, 2017). The Institute for Healthcare Improvement (IHI) defines a bundle as a set of three to five evidence-based practices, that when combined, impact patient outcomes (Institute for Healthcare Improvement [IHI], 2017). ABCDEF stands for assess, prevent, and manage pain (A), both awakening and breathing coordination (B), choice of analgesia and sedation (C), delirium assessment, monitoring, and management (D), early exercise and mobility (E), and family engagement (F) (Marra et al., 2017). This bundle includes many of the

interventions previously mentioned that help prevent delirium. Pain assessment and management is aimed at controlling pain. Awakening and breathing coordination are accomplished using spontaneous awakening trials and spontaneous breathing trials to extubate patients sooner and decrease the need for prolonged mechanical ventilation. A focused effort is made to decrease levels of sedation and control pain with special efforts to avoid polypharmacy. The level of consciousness is assessed with a sedation score and delirium is assessed with either the CAM-ICU or ICDS. Early mobility is promoted to get the patient moving sooner, even ambulating while on mechanical ventilation. In 2013, the Society of Critical Care Medicine (SCCM) added the letter F to the ABCDE bundle for family engagement (Society of Critical Care Medicine [SCCM], 2017). Individually each component of the bundle has rigorous quality research that shows its ability to impact ICU care (Ely, 2017).

The components of the bundle must be implemented together to achieve the best outcomes. The ABCDEF bundle is supported by the Society for Critical Care Medicine (SCCM) through their ICU Liberation campaign (Society of Critical Care Medicine [SCCM], n.d.). The bundle was built out of the Pain, Agitation, Delirium (PAD) guidelines from the Society for Critical Care Medicine (SCCM) (Barr et al., 2013). The PAD guidelines were updated in 2018 to include immobility and sleep disturbances which are contributors to delirium (Devlin et al., 2018). The ABCDEF bundle is a multidisciplinary, multi-component evidence-based intervention. Together the various components are aimed at the causes of delirium and synergistically assist with decreasing delirium incidence and severity.

Implementation of the ABCDEF bundle requires coordination of resources and care across a multidisciplinary team (Barnes-Daly, Phillips, & Ely, 2017; Carrothers et al., 2013; Kram, DiBartolo, Hinderer, & Jones, 2015). This coordination of care requires clear

communication among all team members. The team is composed of the physician, registered nurse (RN), respiratory therapist (RT), and physical therapist (PT) to coordinate the bundle implementation. The awakening and breathing trials are a coordinated effort between the RT and RN. The RN manages the sedation and analgesia levels and completes the spontaneous awakening trial. The RT then completes the spontaneous breathing trial to determine if the patients can breathe on their own and assess patient readiness for extubation. The RN completes a delirium screen with the CAM-ICU or ICDS after determining level of consciousness utilizing the RASS. The PT and RN coordinate to determine the patient's eligibility for early mobility and mobilize the patient if appropriate. Family involvement in the care of the patient is encouraged. During daily multidisciplinary rounds, the team discusses the sedation and analgesia patients are receiving, status of the spontaneous awakening trial and spontaneous breathing trial, the presence of delirium, and possible reasons and potential strategies to treat delirium (Bounds et al., 2016; Barnes-Daly, Phillips, & Ely, 2017; Olsen et al., 2012; Kram, DiBartolo, Hinderer, & Jones, 2015; Balas et al., 2014).

Delirium is a high priority for the American Association of Critical Care Nurses (AACN). In 2016, The AACN published a practice alert. Recommendations include risk factor assessment, routine screening with a validated tool, caution with benzodiazepine use, multidisciplinary team approach, family involvement, and suggested implementation of the ABCDEF bundle (Pun, 2016).

Patient outcomes

The ABCDEF bundle can decrease the incidence of delirium and improve other ICU outcomes such as delirium duration and ICU length of stay. Balas et al. (2013) noted that prior to implementation of the bundle, 62.3% of the patients experienced delirium; after

implementation the delirium was significantly decreased to 48.7%. In the same study, bundle implementation was an independent predictor of decreased delirium rates (Balas et al., 2013). Bounds et al. (2016) noted that delirium prevalence significantly decreased from 28% to 23% with implementation. Delirium duration also significantly decreased after implementation of the bundle from 3.8 to 1.72 days (Bounds et al., 2016). There was a 15% increase in delirium free coma free days with every 10% increase in partial compliance with the bundle, i.e. the nurse only did part of the measures (IRR 1.15, 95% CI, 1.09-1.22; $p<0.001$) (Barnes-Daly et al., 2017). In patients who developed delirium, the median ICU stay was 9.5 days compared to 4 days in patients without delirium (Birge & Aydin, 2017).

Implementation

Multidisciplinary collaboration and communication were noted to help facilitate bundle implementation (Barnes-Daly et al., 2017; Carrothers et al., 2013; Kram et al., 2015). This was particularly noted during coordination of care that required communication between disciplines. Multidisciplinary rounds attended by all team members was also discussed. RT relies on nursing staff to perform the spontaneous awakening trial and to lighten sedation. They also depend on clear communication among the PT, RN, and RT when completing the spontaneous breathing trial for the bundle to be successful (Barnes-Daly et al., 2017; Carrothers et al., 2013; Kram et al., 2015). The team must be on the same page with the goals required for the bundle to be successful.

Staff often request that guidelines and standardized treatment approaches be implemented; however, a potential facilitator or barrier is the training and support staff receive (Zamoscik et al., 2017). Balas et al. (2014) found that staff did not understand the bundle and felt the process was confusing. They reported that they did not feel they had received adequate

education prior to implementation, even though a multi-faceted education approach which Kram, et al (2015) found to be successful was used. Staff preferred having ready access to an expert user (Carrothers et al., 2013) to assist them with trouble shooting the delirium screening process. Ready access to resources such as pocket cards and unit displays facilitated education about the bundle (Balas et al., 2014). For implementation to be successful, it is recommended that time and energy be spent on increasing education to the interprofessional team about delirium and the tools needed for delirium assessment (Palaciso-Cena et al., 2016).

Balas et al (2013) conducted a focus group and found that staff believed the ABCDEF bundle would benefit patients. The participants felt that daily rounds, standardized screening tools, and education all helped with bundle implementation. They also believed the ABCDEF bundle improved communication between team members. Their concerns revolved around the correct time to complete spontaneous awakening trial and spontaneous breathing trial, and whether completing the spontaneous awakening trial might cause the patient to have increased pain or other adverse treatment outcomes. These concerns point to the need for clear and consistent feedback to demonstrate the impact of ABCDEF implementation on patient outcomes. Rounding on team members and listening to their concerns can aid in addressing barriers as they arise. Successful implementation requires a multi-disciplinary team, multi-component education, open communication and quick access to super-users.

Clinical Practice Problem

Assessment of a 225-bed, non-teaching, community hospital identified that there was no process to prevent or recognize delirium nor was there a formal definition of delirium. The assessment also found that in patients who exhibited delirium symptoms, those symptoms were often associated with a diagnosis other than delirium. A total of 543 patients were admitted to

two ICU units January through March of 2018. Of those, 17% (94/543) had documented delirium symptoms associated with an alternate diagnosis such as metabolic encephalopathy, post-ICU psychosis, confusion, disorientation, agitation, inappropriate behavior, delusions, inattention, and altered mental state. The assessment demonstrated that when symptoms of delirium were recognized, they were not formally defined as delirium, even when the patient met criteria. These findings are consistent with evidence demonstrating that the absence of a formal delirium program leads to the misdiagnosis of delirium symptoms (Lin, Chen, & Wang, 2015; Wells, 2012).

A random chart review was completed to establish a baseline picture of delirium in the ICU using 5% of the 543 patients admitted to the ICU during the first quarter of 2018. Inouye et al. (2005) described a chart-based review method that reviewed interprofessional documentation for signs of delirium. They compared the chart review findings to actual screening with the confusion assessment method for the ICU (CAM-ICU). The chart-based review instrument that was tested by them had a sensitivity of 74% and a specificity of 83% (Inouye et al., 2005). Of the charts reviewed, 36% (9/25) of the charts had nursing, physician, or rehabilitation staff documentation that would have qualified the patient for a diagnosis of delirium based on the instrument criteria (mental status changes, confusion, inattention, disorientation, hallucinations, inappropriate behavior, or agitation) during their ICU stay. However, only one patient had a formal diagnosis that included altered mental state. Physician and nursing documentation for most patients reflected the patient was alert and oriented; however, rehabilitation notes stated that the patient was confused and inappropriate. This further highlights the lack of a formal process for delirium recognition.

ABCDEF status

The ABCDEF bundle implementation has been implemented in a stagewise fashion with the pain assessment and management protocols, sedation protocols, and spontaneous awakening and breathing trial protocols already in place. The next step in the bundle implementation was the delirium portion. The hospital changed the electronic medical record in June 2019. With that implementation, the nursing staff was required to address delirium screening utilizing the Confusion Assessment Method for ICU (CAM-ICU). The CAM-ICU was also utilized in the ICU setting as part of the falls risk score to determine a patient's risk of falling which was implemented in spring of 2019. Because of these changes, it was imperative that a formalized process for delirium prevention and recognition was instituted in the ICU.

Purpose

The purpose of this evidence-based implementation project was to answer two questions. (1). In the adult ICU patient, does the use of the delirium portion of the ABCDEF bundle promote delirium recognition and decrease ICU length of stay and vent days and (2). Among ICU nurses, does the use of a structured delirium education program improve understanding of delirium in ICU patients?

Theoretical Framework

The Synergy Model for Patient Care from the American Association of Critical Care Nurses (AACN) was used as the theoretical framework for this project. The theory assumes that the patient needs will be best met when their needs and characteristics are matched with the nurses' competencies. Patient characteristics include factors such as resiliency, vulnerability, stability, complexity, resource availability, ability to participate in care and decision making, and predictability. Eight different nursing competencies including clinical judgement, advocacy,

caring practices, collaboration, systems thinking, diversity response, learning facilitation, and clinical inquiry are needed to provide patient care (American Association of Critical Care Nurses [AACN], 2000). The competency used by the nurses is dependent on the situation. However, the nurse's competencies must be linked with patient characteristics to have positive patient outcomes (Hardin & Hussey, 2003; Kaplow, 2002). Delirium places the patient in a vulnerable position requiring increased resources. The nurse caring for the patient would need to utilize clinical judgement, advocacy, and collaboration competencies to adequately care for the patient.

Methods and Procedures

Setting

The setting for this project was a 225-bed, non-teaching, community hospital located in the midwestern region of the United States. The facility has two Intensive Care areas totaling 32 beds. One unit is a mixed medical-surgical unit and the other specializes in cardiac surgery. The intervention took place in the 16-bed mixed medical-surgical unit. The average length of stay in this unit is 3.31 days. The most common diagnoses seen in the unit include sepsis, postoperative care, heart failure, COPD, pneumonia, and stroke.

Implementation of the Delirium Portion of the ABCDEF Bundle

An interprofessional team including nursing, medicine, administration, and information technology worked to format the RASS and the CAM-ICU into the electronic health record. The RASS was implemented to determine patient level of consciousness and the CAM-ICU was implemented to screen for delirium each shift. The electronic delirium screening tools were implemented in February 2019.

Variables of Interest. Screening-related variables of interest for this project included number of patients screened, number of times screening was performed, number of opportunities

for screening, incidence of delirium, and screening compliance. Delirium incidence was the number of patients that were screened positive at least once during their ICU stay. Delirium duration was the number of days that a patient screened positive. Screening compliance was the number of times screening was not documented divided by the number of times screening could have been performed. ICU related variables of interest included ICU length of stay, mortality, ventilator days, number of patient days, and illness severity.

Data Collection. Post-implementation data was collected via manual chart audit using a convenience sample of all patients admitted to the ICU in February, March, and April 2019. Baseline data was collected through randomized chart audits of patients admitted to the ICU during the same months in 2018 for comparison. Data collection included screening-related variables and ICU-related variables of interest.

Analysis. Data analysis was conducted using Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics including means and frequencies were used to describe sample characteristics. Pre-implementation and post-implementation ICU data (ICU length of stay, ventilator days, number of patient days, illness severity, and ICU mortality) was calculated to determine the percentage of change between 2018 and 2019.

Nurse's Understanding of Delirium in ICU Patients

All registered nurses (n=66) working in the ICU were given the opportunity to participate in the pre and post-implementation survey. The survey was originally developed in 2001 to determine attitudes around delirium and delirium management in the ICU (Ely et al., 2004). In 2006, it was reformatted from open-ended questions to multiple choice questions with additional questions added from an informal survey at Vanderbilt (Patel et al., 2009). A search of Medline was conducted with the terms sedation, delirium, and ICU to obtain other possible questions.

Psychometric experts helped to revise the survey. Two pilot projects were completed to ensure content and face validity. The survey covers 11 items and uses Likert responses and multiple-choice questions (Patel et al., 2009). Permission was obtained from E. Wesley Ely to use the tool. The tool covers delirium incidence, screening practices, delirium treatment, and attitudes towards delirium.

Intervention. Multi-component education was completed in January 2019. Prior to class attendance, participants were given an introductory packet that included a refresher on the ABC portion of the bundle and introduced the delirium portion. They were also given a pre-test to ensure completion of the packet. The education sessions included videos, didactic content, and opportunities to apply the knowledge via case studies. A notebook with tip sheets and CAM-ICU instructions were provided at the nurse's stations. In addition, posters about delirium screening and rounding with the brain roadmap were located at the nurse's stations. Individualized education was provided during rounding sessions after implementation.

Data Collection. Prior to implementation of delirium related education, the survey was distributed to all nurses working in the ICU. Web-based technology was used to provide the survey. The survey was sent through email with the purpose of determining baseline knowledge and perception of delirium. The web-based survey was redistributed in May 2019 to measure nurse's understanding of delirium after education and implementation were completed. Due to poor response rates, an addendum was submitted to IRB, and the survey was also distributed via paper.

Analysis. Data analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were calculated to describe nursing years of experience,

years of ICU experience, age, and shift worked. A comparison of the pre-post survey questions was completed utilizing descriptive data.

Ethical Considerations

Institutional Review Board approval was obtained prior to project implementation. Informed consent and a letter of explanation (Appendix A) were sent with the survey (Appendix B). Participants were asked to provide a confidential unique identifier on each survey to match pre and post-surveys.

Results

Demographics of screened patients

A total of 368 patients were screened post-implementation (Table 1). Of these patients, the majority were female (54.1%). The mean age was 65.7 and the average length of stay for screened patients was 3.38 days. Mechanical ventilation was present in nearly one-third (32.9%) of patients.

Delirium Screening and Incidence

There were 2,046 opportunities to screen for delirium post-implementation (Table 1). Screening was completed 62.3% (1274) of the times. However, 24.8% (508) of the opportunities did not have screening documentation present. In 12.9% (264) of the opportunities, nursing staff documented that they were unable to assess (UTA). However, supporting documentation for the UTA ratings, such as a qualifying RASS of -4 or -5, was not present during chart audit.

Of the 368 patients that were screened, 31.5% (116) screened positive for delirium. Documentation of the results (positive or negative) was not present in 13.9% (51) of the patients and the remaining patients screened negative. In the patients with ICU mortality, 63.5%

screened positive for delirium. Delirium duration could not be calculated due to missing documentation.

ICU statistics

ICU statistics including ICU length of stay, mortality, ventilator days, number of patient days, and illness severity are included in Table 2. Pre-implementation, the average length of stay (LOS) was 3.33 days. Post-implementation, the average length of stay decreased 11.41% to 2.95 days. There were 1,723 patient days during the time frame reviewed pre-implementation and 1,631 patient days during the post-implementation time frame, a 5.34% decrease. The average number of vent days pre-implementation and post-implementation was 700 and 603, respectively. This was a 13.86% decrease in vent days between the two periods. However, the severity of illness went from 3.18 pre-implementation to 3.27 post-implementation, a 2.83% increase. Finally, ICU mortality was 10% pre-implementation and 10.43% post-implementation, a 4.3% increase.

Nursing Survey Demographics and Participation

The pre-implementation survey response rate was 25%, with 17 of 66 nurses participating. The post-implementation response rate was 18%, with 12 of 66 nurses participating. Demographics of the staff participating in the survey are listed in Table 3. Participants were encouraged to use a confidential unique identifier for pairing of the surveys. Only one participant completed both the pre and post surveys. All other participants were separate individuals. Most nurses who completed the pre and post-implementation surveys held a baccalaureate degree, at 70.6% (12) and 75% (9) respectively. The majority had 5 years or less of nursing experience in the ICU setting (64.7% and 58.3%) and more night shift nurses (41.2%)

participated in the pre-implementation survey compared to the post-implementation survey (8.3%).

Nursing perception and knowledge of delirium

The perception of the number of patients that experienced delirium changed from the pre-survey to the post-implementation survey (Table 5). Pre-implementation, 35.3% thought that only 11-25% of mechanically ventilated patients experienced delirium. Post-implementation, 58.3% thought that 51-75% of vented patients experienced delirium. In the non-mechanically ventilated patient, there was also a change in perception of the number that experienced delirium. In the pre-implementation survey, 35.3% thought that only 11-25% experienced delirium. After the intervention, 50% thought that 26-50% of the non-mechanically ventilated patients experienced delirium.

The nurses were presented with a variety of knowledge statements about delirium. The following questions had the most change post-implementation when compared to pre-implementation. Nurses felt that delirium is a problem that requires active intervention (58.3% versus 83.3%). The perception that delirium is largely preventable changed from 58.8% to 83.3% agreeing with the statement. Delirium as a preventable event changed from 23.5% in agreement to 50% post-implementation. Hospital acquired pneumonia being a risk of delirium changed from 47.1% to 75% agreeing with the statement. Patients having an increased risk of reintubation was agreed with 64.7% of the time pre-implementation and 83.3% post-implementation. However, the statement we over-sedate most of our patients in the ICU which had 47.1% in agreement changed to 58.3% disagreeing with the statement post-implementation.

Discussion

Screening assists with timely recognition and treatment of delirium (Barr & Pandharipande, 2013; Van den Boogaard et al., 2012; Van den Boogaard et al., 2009; Bounds et al., 2016). This project suggests that the implementation of education and delirium screening most likely increased recognition of delirium with 31.5% of the patients being positive for delirium during the post-implementation phase compared to 0 patients being diagnosed with delirium pre-implementation. Project compliance with the screening process was 62.2% with a 31.5% delirium incidence. The rate of positive delirium screens is in line with other ICU studies using the CAM-ICU where the rates of delirium incidence ranged from 22-87% (Neto et al., 2012).

The use of the ABCDEF bundle and the delirium component has been associated with a decrease in ICU LOS (Birge & Aydin, 2017). Although this project did not test for association, we found that the ICU LOS decreased from 3.33 to 2.95 post implementation which was an 11.41% decrease. A decrease in LOS may have been related to a decrease in ventilator days from 700 to 603 days post-implementation. However, LOS decreased despite an increasing illness severity (2.83% increase) and increased ICU mortality (4.3% increase), which may have been related to improved clinical care through delirium risk-reduction and early identification.

The results of the knowledge statements imply that education increased nurse's knowledge that delirium needs active intervention, is a preventable problem, and is a risk factor for reintubation. Nurses also perceived that they did not over-sedate patient's post-implementation. The poor response rate may have resulted in response bias and may not accurately reflected the nursing staff.

The implementation period was very challenging for staff since multiple changes were in progress concurrently. The facility was preparing to transition to a new EMR. This meant that the staff had to participate in multiple education initiatives in addition to the practice change of using the CAM-ICU for delirium screening and the use of a new falls scale. Staff reluctance may have contributed to the number of missed screening opportunities and missed documentation (21%). Screening compliance is a concern even in facilities with delirium screening guidelines (Ely et al., 2004; Devlin et al., 2008; Patel et al., 2009; Elliott, 2014). The challenges in delivering quality care in a dynamic healthcare system are forever present, precluding the best time to implement practice changes. However, further research is needed to assist with understanding why screening compliance is challenging, as well as methods to successfully address compliance.

Despite an engaged informatics specialist, the design of the documentation for the CAM-ICU presented documentation challenges. In the early implementation period, additional changes were made to the screening documentation. However, the flow of the documentation and lack of built-in prompts continued to hamper documentation.

Poor documentation design can be a barrier to adoption of change (Collinsworth, Masica, Priest, & Berryman, 2014). Documentation is an important part of the infrastructure needed for successful implementation. However, due to the upcoming EMR implementation, further redesign work was not a priority during the project period.

The documentation design could have contributed to the number of opportunities where staff documented that they were unable to assess (UTA). According the CAM-ICU, UTA should be reserved for patients with a RASS of -4 or -5 meaning the patient is deeply sedated or unarousable (Ely, 2016). During chart audits completed in this project, documentation

sometimes reflected that the patient was able to communicate effectively, meaning that the UTA was in error. Other research has found that assessing the mechanically ventilated patient is challenging and a contributor to UTA ratings (Terry, Anger, & Szumita, 2015). Swan (2014) utilized a focused education on patient arousal to decrease inappropriate ratings. After implementation, they found a 41% less likelihood of UTA ratings. Further research is needed to understand why staff utilize UTA ratings, as well as the best method to assist staff better utilizing screening tools.

The Synergy Model guided the implementation of this project. Patients experiencing delirium are in a vulnerable state. They are complex and require nurses to use multiple competencies in assisting patients and families navigating the challenges of delirium. Clinical judgement is involved in the screening process. Thus, nurses must work collaboratively with the interdisciplinary team in order to prevent delirium development and minimize the duration of delirium if it develops.

Nursing knowledge of delirium did increase as a result of the educational intervention. Initial education utilized a multicomponent design that consisted of a self-study packet and classroom time comprised of didactic, videos, and interactive case studies. Balas et al. (2013) used additional methods to help sustain change that included the initial education, a presentation at grand rounds, and staggered education over a 9-month period that included in-services, direct observation, physician education, and an 8-hour ABCDEF bundle education day. Sharing real-life patient case-studies can help staff understand how delirium can change patient outcomes and encourage compliance (Pun, Balas, & Davidson, 2013). Continuing education is important to sustain and improve delirium screening.

The use of the ABCDEF bundle and the delirium component was associated with changes in ICU outcome measures as well as increased delirium recognition. Successful implementation of the bundle requires a coordinated effort by the interdisciplinary team involved in the ICU patient's care. Multicomponent education assists with the integration of the why behind the changes. However, real-time chart auditing with individualized one-on-one education is needed to assist with delirium related skills, competencies and staff adoption of the change.

This project adds to the body of knowledge in critical care patients surrounding the use of the ABCDEF bundle and the delirium component. Application to other settings needs to take into consideration that the facility in this project is a community hospital in the early stages of implementation. In addition, many other factors impact project outcomes such as maturation of the intervention, staff turnover, and data integrity related to changes in the electronic health record. Thus, findings from this project may not be applicable to other settings such as those with higher acuity or teaching facilities.

Although the educational component of this project appeared to improve nurse's knowledge regarding the importance of delirium screening, there was a poor response rate for the nursing survey. However, the screening compliance rate of 62.2% reflects that most nurses do understand the importance of screening. Ongoing education will be needed to reach a compliance rate >90%. In addition, increased efforts to solicit survey responses may increase survey response rates. Pre-notification of the survey, incentives, and personalization are all methods that have been shown to improve response rates (Kaplowitz, Hadlock, & Levine, 2004; Sauermann & Roach, 2013).

There is always the possibility that the project results were confounded by several factors. The facility implemented a closed ICU with dedicated intensivists in the fall of 2017. The

intensivist group has worked with the facility to institute new sedation practices as well as the spontaneous awakening and breathing trials to assist with weaning from the ventilator. These practice changes could have played a factor in the decrease in mechanical ventilation seen in this project. The data from 2018 reflected a particularly severe influenza season. A high severity of illness and rate of mechanical ventilation was seen during this period. However, the 2019 data reflected a higher severity of illness score along with higher patient mortality. The 2019 changes may also be reflective of a heightened focus on appropriate throughput which means only the sickest of patients remain in the ICU. It may also be a result of improved documentation practices from the intensivist group which more effectively capture the severity of illness.

Barriers and Facilitators

There were several barriers (new EMR transition, competing staff education related to the EMR implementation, protocol and product changes to prepare for the new EMR, and this project) to implementation and sustainability that were identified early in the project. The biggest challenge was also a facilitator for the project. In June 2019, the facility transitioned to a new EMR. Education for the new EMR was occurring during the time of implementation. With the new EMR, there were multiple protocol changes that occurred. The new EMR meant that the facility would also be in line with the remainder of the healthcare system, so multiple product changes also occurred during this time period. Change can be challenging and although staff were aware of the importance of delirium, they were reluctant to take on an additional process change.

The nursing education survey was emailed to staff members since this is the primary form of communication at the facility. However, staff do not always read their email in a timely manner. In addition, the email system was migrated to a new system during this time, with some

staff having difficulty accessing their email. A decision was made to make the post-implementation survey available electronically and via paper and pencil. Response to this format increased participation but overall the response rate remained poor. This makes it unclear whether the survey results were representative of the group.

Leadership support of the project was crucial to the success of the project. Leadership approval and support was obtained prior to project implementation and evidenced throughout the project. The intensivist group at the facility supported the project as did the ICU pharmacist. The respiratory therapy manager and ICU pharmacist participated in the education and protocol development. Information Technology assisted with the electronic design of the CAM-ICU documentation. As others have previously noted, involving the interprofessional team was necessary to coordinate all of the resources needed to facilitate care and implement the delirium portion of the ABCDEF bundle (Barnes-Daly, Phillips, & Ely, 2017; Carrothers et al., 2013; Kram, DiBartolo, Hinderer, & Jones, 2015).

For others considering implementing the full bundle or portions of the bundle, assessment of the unit's readiness to change is necessary. If the unit is overwhelmed with change, implementation may not be successful (Balas et al., 2014). Leadership and organizational support are essential to ensure that staff have the needed resources to implement the bundle changes. Setting the stage for the needed change needs to be accomplished by understanding the current practices as well as the desired future state. Taking time to accomplish these tasks would help facilitate desired changes and obtain buy-in from other interprofessional team members.

Conclusion

Delirium in the ICU is challenging for the nursing staff, the patient and family, as well as the hospital system. It contributes to the development of post-intensive care syndrome, reduced

quality of life, and increased mortality after critical illness (Rawal et al., 2017; Harvey & Davidson, 2016; Pandharipande et al., 2013; Barr & Pandharipande, 2013; Pun & Ely, 2007; Girard et al., 2010; Vasilevskis et al., 2010; Van den Boogaard et al., 2012). Following implementation of the delirium component of the ABCDEF bundle, 4-month project outcomes reflected increased documentation of delirium screening, increased delirium recognition, reduction of ventilator days and decreased length of stay. Although no inferences can be made, delirium screening likely contributed to increased recognition of delirium in this project setting.

Next steps for the facility must involve working with critical care staff to increase delirium recognition by improving skills and competencies in using delirium screening instruments such as the CAM-ICU. In addition, the electronic screening tool needs to be refined to improve the documentation process. These steps will assist in recognizing delirium in a timely manner and assist with ensuring appropriate treatment for all patients.

References

Across the Life Span. (n.d.). Retrieved from American Association of Critical Care Nurses: https://www.aacn.org/~/media/aacn-website/clincial-resources/practice-alerts/delirium2016practicealert.pdf

Ahmed, S., Leurent, B., & Sampson, E. L. (2014). Risk factors for incident delirium among older people in acute hospital medical units: a systematic review and meta-analysis. *Age and Ageing*, *43*, 326-333.

American Association of Critical Care Nurses. (2000). Appendix C: the synergy model. In *Standards for Acute and Critical Care Nursing Practice* (pp. 47-55). Aliso Viejo, CA: American Association of Critical Care Nurses.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington DC: American Psychiatric Association.

Avendano-Cespedes, A., Garcia-Cantos, N., Gonzalez-Teruel, M. D., Martinex-Garcia, M., Villarreal-Bocanegra, E., & Oliver-Carbonell, J. L. (2016). Pilot study of a preventive multicomponent nurse intervention to reduce the incidence and severity of delirium in hospitalized older adults: MID-Nurse-P. *Maturitas*, *86*, 86-94.

Balas, M. C., Burke, W. J., Gannon, D., Cohen, M. Z., Colburn, L., Bevil, C., ...Vasilevskis, E. E. (2013, September). Implementing the ABCDE bundle into everyday care: Opportunities, challenges and lessons learned for implementing the ICU pain, agitation and delirium (PAD) guidelines. *Critical Care Medicine*, *41 (9*), S116-S127.

Balas, M. C., Olsen, K. M., Vasilevskis, E. E., Schmid, K. K., Shostrom, V., Cohen, M. Z., ... Burke, W. J. (2014, May). Effectiveness and safety of the awakening and breathing

coordination, delirium monitoring/management, and early exercise/mobility bundle. *Critical Care Medicine*, *42 (5*), 1024-1036.

Banerjee, A., Girard, T. D., & Pandharipande, P. (2011, April). The complex interplay between delirium, sedation, and early mobility during critical illness: Applications in the trauma unit. *Current opinion in Anesthesiology*, *24(2)*, 195-201.

Barnes-Daly, M., Phillips, G., & Ely, E. W. (2017, February). Improving hospital survival and reducing brain dysfunction at seven California community hospitals: implementing PAD guidelines via the ABCDEF bundle in 6,064 patients. *Critical Care Medicine*, *45 (2*), 171-178.

Barr, J., Fraser, G. L., Puntillo, K., Ely, E. W., Gelinas, C., Dasta, J. F., ... Jaeschke, R. (2013, January). Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the Intensive Care Unit. *Critical Care Medicine*, *41(1*), 263-306.

Barr, J., & Pandharipande, P. P. (2013, September). The pain, agitation, and delirium care bundle: synergistic benefits of implementing the 2013 Pain, Agitation, and Delirium Guidelines in an integrated and interdisciplinary fashion. *Critical Care Medicine*, *41*, S99-115.

Bergeron, N., Dubois, M. J., Dumont, M., Dial, S., &Skrobik, Y. (2001, May). Intensive Care Delirium Screening Checklist: evaluation of a new screening tool. *Intensive Care Medicine*, *27 (5*), 859-864.

Birge, A. O., & Aydin, H. T. (2017). The effect of nonpharmacological training on delirium identification and intervention strategies of intensive care nurses. *Intensive and Critical Care Nursing*, *41*, 33-42.

Bounds, M., Kram, S., Speroni, K. G., Brice, K., Luschinski, M. A., Harte, S., & Daniel, M. G. (2016, November). Effect of ABCDE bundle implementation on prevalence of delirium in Intensive Care Unit patients. *American Journal of Critical Care*, *25 (6*), 535-544.

Brummel, N. E., Balas, M. C., Morandi, A., Ferrante, L. E., Gill, T. M., & Ely, E. W. (2015, June). Understanding and reducing disability in older adults following critical illness. *Critical Care Medicine*, *43(6)*, 1265-1275.

Brummel, N. E., Vasilevskis, E. E., Han, J. H., Boehm, L., Pun, B. T., & Ely, E. W. (2013). September. *Critical Care Medicine*, *41(9)*, 2196-2208.

Brummel, N. E., Vasilevskis, E. E., Han, J. H., Boehm, L., Pun, B. T., & Ely, E. W. (2013, September). Implementing delirium screening in the intensive care unit: secrets to success. *Critical Care Medicine*, *41(9)*, 2196-2208.

Calvo-Ayala, E., & Khan, B. (2013). Delirium management in critically ill patients. *Journal of Symptoms and Signs*, *2 (1*), 23-32.

Carrothers, K. M., Barr, J., Spurlock, B., Ridgely, M. S., Damberg, C. L., & Ely, E. W. (2013, September). Contextual issues influencing implementation and outcomes associated with an integrated approach to managing pain, agitation, and delirium in adult ICUs. *Critical Care Medicine*, *41 (9*), S128-S135.

Collinsworth, A. W., Masica, A. L., Priest, E. L., & Berryman, C. D. (2014). Modifying the electronic health record to facilitate the implementation and evaluation of a bundled care program for intensive care unit delirium. *Generating Evidence & Methods to improve patient outcomes*, *2(1*).

Coyle, M. A., Burns, P., & Traynor, V. (2017). Is it my job? The role of RNs in the assessment and identification of delirium in hospitalized older adults. *Journal of Gerontological Nursing*, *43(4*), 29-37.

Devlin, J. W., &Pohlman, A. S. (2014, May). Everybody, every day: An "Awakening and Breathing Coordination, Delirium Monitoring/Management, and Early Exercise/Mobility" culture is feasible in your ICU. *Critical Care Medicine*, *42 (5*), 1280-1281.

Devlin, J. W., Fong, J. J., Howard, E. P., Skrobik, Y., McCoy, N., Yasuda, C., & Marshall, J. (2008, November). Assessment of delirium in the intensive care unit: nursing practices and perceptions. *American Journal of Critical Care*, *17(6)*, 555-565.

Devlin, J. W., Skrobik, Y., Gelinas, C., Needham, D. M., Slooter, A. J., Pandharipande, P. P., ... Alhazzani, W. (2018, September). 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.

DiLibero, J., O'Donoghue, S. C., DeSanto-Madeya, S., & Ninobla, A. (2016, March/April). An innovative approach to improving the accuracy of delirium assessments using the Confusion Assessment Method for the Intensive Care Unit. *Dimensions of Critical Care Nursing*, *35(2)*, 74-80.

Eastwood, G. M., Peck, L., Bellomo, R., Baldwin, I., & Reade, M. C. (2012). A questionnaire survey of critical care nurses' attitudes to delirium assessment before and after introduction of the CAM-ICU. *Australian Critical Care*, *25*, 162-169.

Elliott, S. R. (2014, December). ICU delirium: a survey into nursing and medical staff knowledge of current practices and perceived barriers towards ICU delirium in the intensive care unit. *Intensive and Critical Care Nursing*, *30(6)*, 333-338.

Ely, E. W. (2002). Confusion assessment method for the ICU (CAM-ICU) flowsheet. Retrieved from http://icudelirium.org/docs/CAM_ICU_flowsheet.pdf

Ely, E. W. (2016). Confusion Assessment Method for the ICU (CAM-ICU) The complete training manual. Retrieved from http://www.icudelirium.org/docs/CAM-ICU-training-manual-2016-08-31_Final.pdf

Ely, E. W. (2017, February). The ABCDEF bundle: Science and philosophy of how ICU liberation serves patients and families. *Critical Care Medicine*, *45 (2*), 321-330.

Ely, E. W., Inouye, S. K., Bernard, G. R., Gordon, S., Francis, J., May, L., ... Dittus, R. (2001, December). Delirium in mechanically ventilated patients: validity and reliability of the confusion assessment method for the intensive care unit (CAM-ICU). *JAMA*, *286 (21*), 2703-2710.

Ely, E. W., Margolin, R., Francis, J., May, L., Truman, B., Dittus, R., ... Inouye, S. K. (2001, July). Evaluation of delirium in critically ill patients: validation of the Confusion Assessment Method for the Intensive Care (CAM-ICU). *Critical Care Medicine*, *29(7*), 1370-1379.

Ely, E. W., Shintani, A., Truman, B., Speroff, T., Gordon, S. M., Harrell Jr, F. E., ...Dittus, R. S. (2004, April). Delirium as a predictor of mortality in mechanically ventilated patients in the intensive care unit. *JAMA*, *291 (14*), 1753-1762.

Ely, E. W., Stephens, R. K., Jackson, J. C., Thomason, J. W., Truman, B., Gordon, S., ... Bernard, G. R. (2004, January). Current opinions regarding the importance, diagnosis,

and management of delirium in the intensive care unit: a survey of 912 healthcare professionals. *Critical Care Medicine*, *32(1)*, 106-112.

Ely, E. W., Truman, B., Shintani, A., Thomason, J. W., Wheeler, A. P., Gordon, S., ... Bernard, G. R. (2003, June). Monitoring sedation status over time in ICU patients - Reliability and validity of the Richmond Agitation-Sedation Scale (RASS). *JAMA*, *289 (22*), 2983-2991.

Gelinas, C., Berube, M., Chevrier, A., Pun, B. T., Ely, E. W., Skrobik, Y., & Barr, J. (2018, February). Delirium assessment tools for use in critically ill adults: A psychometric analysis and systematic review. *Critical Care Nurse*, *38(1)*, 38-49.

Girard, T. D., Jackson, J. C., Pandharipande, P. P., Pun, B. T., Thompson, J. L., Shintani, A. K., ... Ely, E. W. (2010, July). Delirium as a predictor of long-term cognitive impairment in survivors of critical illness. *Critical Care Medicine*, *38 (7*), 1513-1520.

Girard, T. D., Pandharipande, P. P., & Ely, E. W. (2008). Delirium in the intensive care unit. *Critical Care*, *12 Suppl 3*. Retrieved from http://ccforum.com/content/12/S3/S3

Guenther, U., Weykam, J., Andorfer, U., Theuerkauf, N., Popp, J., Ely, E. W., & Putensen, C. (2012, January). Implications of objective vs subjective delirium assessment in surgical intensive care patients. *American Journal of Critical Care*, *21(1*), e12-e20.

Gusmao-Flores, D., Figueira Salluh, J. I., Chalhub, R. A., & Quarantini, L. C. (2012). The confusion assessment method for the intensive care unit (CAM-ICU) and intensive care delirium screening checklist (ICDSC) for the diagnosis of delirium: a systematic review and meta-analysis of clinical studies. *Critical Care*, *16*(). Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3580690/pdf/cc11407.pdf

Hardin, S., & Hussey, L. (2003, February). AACN Synergy Model for Patient Care. *Critical Care Nurse*, *23(1*), 73-76.

Harvey, M. A., & Davidson, J. E. (2016, February). Postintensive care syndrome: right care, right now...and later. *Critical Care Medicine*, *44(2)*, 381-385.

Hasemann, W., Tolson, D., Godwin, J., Spirig, R., Frei, I. A., & Kressig, R. W. (2016). A before and after study of a nurse led comprehensive delirium management programme (DemDel) for older acute care inpatients with cognitive impairment. *International Journal of Nursing Studies*, *53*, 27-38.

Inouye, S., Leo-Summers, L., Zhang, Y., Bogardus, S. T., Leslie, D. L., & Agostini, J. V. (2005, February). A chart-based method for identification of delirium: Validation compared with interviewer ratings using the confusion assessment method. *Journal of the American Geriatric Society*, *53(2*), 312-318.

Institute for Healthcare Improvement. (2017). What Is a Bundle? Retrieved from http://www.ihi.org/resources/Pages/ImprovementStories/WhatIsaBundle.aspx

Jung, J. H., Kim, J. H., Kim, E. J., An, H. C., Kang, M. K., Lee, J., ... Lee, S. M. (2013). The experience of delirium care and clinical feasibility of the CAM-ICU in a Korean ICU. *Clinical Nursing Research*, *22(1)*, 95-111.

Kaplow, R. (2002, June). Applying the synergy model to nursing education. *Critical Care Nurse*, *22(3)*, 77-81.

Kaplowitz, M. D., Hadlock, T. D., & Levine, R. (2004, March). A Comparison of web and mail survey response rates. *Public Opinion Quarterly*, *68(1)*, 94-101.

Khan, B. A., Guzman, O., Campbell, N. L., Walroth, T., Tricker, J. L., Hui, S. L., ... Boustani, M. A. (2012, July). Comparison and agreement between the Richmond Agitation-Sedation Scale and the Riker Sedation-Agitation Scale in evaluating patients' eligibility for delirium assessment in the ICU. *Chest*, *142(1)*, 48-54.

Khan, B. A., Zawahiri, M., & Campbell, N. L. (2012). Delirium in hospitalized patients: Implications of current evidence on clinical practice and future avenues for research - A systematic evidence review. *Journal of Hospital Medicine*, *7 (7*), 580-589.

Kram, S. L., DiBartolo, M. C., Hinderer, K., & Jones, R. A. (2015). Implementation of the ABCDE bundle to improve patient outcomes in the Intensive Care Unit in a rural community hospital. *Dimensions of Critical Care Nursing*, *34*, 250-258.

Krewulak, K. D., Stelfox, H. T., Leigh, J. P., Ely, E. W., & Fiest, K. M. (2018, December). Incidence and prevalence of delirium subtypes in an adult ICU: A systematic review and meta-analysis. *Critical Care Medicine*, *46(12)*, 2029-2035.

LaHue, S. C., Douglas, V. C., Kuo, T., Conell, C. A., Liu, V. X., Josephson, S. A., ... Brooks, K. B. (2019, April). Association between inpatient delirium and hospital readmission in patients > 65 years of age: A retrospective cohort study. *Journal of Hospital Medicine*, *14(4)*, 201-206.

Leslie, D. L., & Inouye, S. K. (2011, November). The importance of delirium: Economic and societal costs. *Journal of the American Geriatrics Society*, *59*, S241-S243.

Lin, W., Chen, Y., & Wang, J. (2015, December). Factors associated with the development of delirium in elderly patients in intensive care units. *The Journal of Nursing Research*, *23(4)*, 322-328.

Louzon, P., Jennings, H., Ali, M., & Kraisinger, M. (2017, February 15). Impact of pharmacist management of pain, agitation, and delirium in the intensive care unit through participation in multidisciplinary bundle rounds. *American Journal of Health-System Pharmacy*, *74 (4*), 253-262.

Marra, A., Ely, E. W., Pandharipande, P., & Patel, M. B. (2017, April). The ABCDEF bundle in critical care. *Critical Care Clinic*, *33(2)*, 225-243.

Martinez, F., Donoso, A. M., Marquez, C., & Labarca, E. (2017, December). Implementing a multicomponent intervention to prevent delirium among critically ill patients. *Critical Care Nurse*, *37(6)*, 36-47.

Mehta, S., Cook, D., Devlin, J. W., Skrobik, Y., Meade, M., Fergusson, D., ... Burry, L. (2015, March). Prevalence, risk factors, and outcomes of delirium in mechanically ventilated adults. *Critical Care Medicine*, *43(3)*, 557-566.

Mitchell, M. L., Shum, D. H., Mihala, G., Murfield, J. E., & Aitken, L. M. (2018). Long-term cognitive impairment and delirium in intensive care: A prospective cohort study. *Australian Critical Care*, *31*, 204-211.

Neto, A. S., Nassar, A. P., Cardoso, S. O., Manetta, J. A., Pereira, V. G., Esposito, D. C., ... Slooter, A. J. (2012). Delirium screening in critically ill patients: A systematic review and meta-analysis. *Critical Care Medicine*, *40(6)*, 1946-1951.

Olsen, K., Burke, W., Peitz, G., Gannon, D., Stothert, J., Jawa, R., ...Balas, M. (2012). The ABCDE bundle reduces the incidence of delirium in non-mechanically ventilated patients [Abstract]. *Critical Care Medicine*, *40 (12*), 1-328.

Palaciso-Cena, D., Cachon-Perez, J. M., Martinez-Piedrola, R., Gueita-Rodriguez, J., Perez-de-Heredia, M., & Fernandez-de-las-Penas, C. (2016). How do doctors and nurses manage delirium in intensive care units? A qualitative study using focus groups. *BMJ Open*, 6(). http://dx.doi.org/10.1136/bmjopen-2015-009678

Pandharipande, P., Banerjee, A., McGrane, S., & Ely, E. W. (2010). Liberation and animation for ventilated ICU patients: the ABCDE bundle for the back-end of critical care. *Critical Care*, *14*, 157-159.

Pandharipande, P., Cotton, B., Shintani, A., Thompson, J., Costabile, S., Truman, P. B., ... Ely, E. W. (2007, October). Motoric subtypes of delirium in mechanically ventilated surgical and trauma intensive care patients. *Intensive Care Medicine*, *33*, 1726-1731.

Pandharipande, P. P., Girard, T. D., Jackson, J. C., Morandi, A., Thompson, J. L., Pun, B. T., ... Ely, E. W. (2013, October). Long-term cognitive impairment after critical illness. *New England Journal of Medicine*, *369(14)*, 1306-1316.

Patel, R. P., Gambrell, M., Speroff, T., Pun, B. T., Okahashi, J., Strength, C., ... Ely, E. W. (2009, March). Delirium and sedation in the intensive care unit: survey of behaviors and attitudes of 1384 healthcare professionals. *Critical Care Medicine, 37(3*), 825-832.

Peterson, J. F., Pun, B. T., Dittus, R. S., Thomason, J. W., Shintani, A. K., & Ely, E. W. (2006, March). Delirium and its motoric subtypes: a study of 614 critically ill patients. *Journal of the American Geriatric Society*, *54*, 479-484.

Pisani, M. A., Kong, S. Y., Kasi, S. V., Murphy, T. E., Murphy, K. L., & Van Ness, P. H. (2009, December). Days of delirium are associated with 1-year mortality in an older intensive care unit population. *American Journal of Respiratory and Critical Care Medicine*, *180(11*), 1092-1097.

Pun, B. T., Balas, M. C., & Davidson, J. (2013, February). Implementing the 2013 PAD guidelines: Top ten points to consider. *Seminars in Respiratory and Critical Care Medicine*, *34*, 223-235.

Pun, B. T., & Ely, E. W. (2007, August). The importance of diagnosing and managing ICU delirium. *Chest*, *132(2)*, 624-636.

Rawal, G., Yadav, S., & Kumar, R. (2017, Apr-Jun). Post-intensive care syndrome: An overview. *Journal of Translational Internal Medicine*, *5(2*), 90-92.

Rice, K. L., Bennett, M., Gomez, M., Theall, K. P., Knight, M., & Foreman, M. D. (2011, November/December). Nurses' recognition of delirium in the hospitalized older adult. *Clinical Nurse Specialist*, 299-311.

Rivosecchi, R. M., Smithburger, P. L., Svec, S., Campbell, S., & Kane-Gill, S. L. (2015, February). Nonpharmacological interventions to prevent delirium: an evidence-based systematic review. *Critical Care Nurse*, *35(1)*, 39-50.

Rosenbloom, D. A., & Fick, D. M. (2014). Nurse/family caregiver intervention for delirium increases delirium knowledge and improves attitudes toward partnership. *Geriatric Nursing*, *35*, 175-181.

Salluh, J. F., Wang, H., Schneider, E. B., Nagaraja, N., Yenokyan, G., Damlui, A., ... Stevens, R. D. (2015). Outcome of delirium in critically ill patients: systematic review and meta-analysis. *The BMJ*, *350*. https://doi.org/10.1136/bmj.h2538

Salluh, J., Soares, M., Teles, J. M., Ceraso, D., Raimondi, N., Nava, V. S., ... Rocha, M. G. (2010). Delirium epidemiology in critical care (DECCA): an international study. *Critical Care*, *14*(R210). Retrieved May 28, 2019 from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3220001/

Sauermann, H., & Roach, M. (2013, February). Increasing web survey response rates in innovation research: An experimental study of static and dynamic contact design features. *Research Policy*, *42(1)*, 273-286.

Sessler, C. N., Gosnell, M. S., Grap, M. J., Brophy, G. M., O'Neal, P. V., Keane, K. A., ... 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*, 1338-1344.

Society of Critical Care Medicine. (2017). Building a Better ICU by the Letter: the ABCDEF Bundle Improvement Collaborative. Retrieved from http://www.sccm.org/Communications/Critical-Connections/Archives/Pages/Building-a-Better-ICU-by-the-Letter-the-ABCDEF-Bundle-Improvement-Collaborative.aspx

Society of Critical Care Medicine. (n.d.). ABCDEF Bundle. Retrieved from http://www.sccm.org/ICULiberation/ABCDEF-Bundles

Spronk, P. E., Riekerk, B., Hofhuis, J., & Rommes, J. H. (2009, July). Occurrence of delirium is severely underestimated in the ICU during daily care. *Intensive Care Medicine*, *35(7)*, 1276-1280.

Swan, J. T. (2014, January). Decreasing inappropriate unable-to-assess ratings for the confusion assessment method for the intensive care unit. *American Journal of Critical Care*, *23(1)*, 60-68.

Terry, K. J., Anger, K. E., & Szumita, P. M. (2015). Prospective evaluation of inappropriate unable-to-assess CAM-ICU documentations of critically ill patients. *Journal of Intensive Care*, *3*.

Thomas, E., Smith, J. E., Forrester, D. A., Heider, G., Jadotte, Y. T., & Holly, C. (2014). The effectiveness of non-pharmacological multi-component interventions for the prevention of delirium in non-intensive care unit older adult hospitalized patients: a systematic review. *JBI Database of Systematic Reviews & Implementation Reports*, *12(4*), 180-232.

Van den Boogaard, M., Picckers, P., Van der Hoeven, H., Roodbo, G., Van Achterberg, T., & Schoonhoven, L. (2009, August). Implementation of a delirium assessment tool in the ICU can influence haloperidol use. *Critical Care, 13(4)*. https://doi.org/10.1186/cc7991

van den Boogaard, M., Pickers, P., Slooter, A. J., Kujper, M. A., Spronk, P. E., van der Voort, P. H., & Schoonhoven, L. (2012). Development and validation of PRE-DELIRIC (PREdiction of DELIRium in ICU patients) delirium prediction model for intensive care patients: Observational multicentre study. *British Medical Journal*, *344*, e420. http://dx.doi.org/doi:10.1136/bmj.e420

van Eijk, M. M., van Marum, R. J., Klijn, I. A., de Wit, N., Kesecioglu, J., & Slooter, A. J. (2009). Comparison of delirium assessment tools in a mixed intensive care unit. *Critical Care Medicine*, *37(6)*, 1881-1885.

Vasilevskis, E. E., Chandrasekhar, R., Holtze, C. H., Graves, J., Speroff, T., Girard, T. D., ... Ely, E. W. (2018, October). The cost of ICU delirium and coma in the intensive care unit patient. *Medical Care*, *56(10)*, 890-897.

Vasilevskis, E. E., Ely, E. W., Speroff, T., Pun, B. T., Boehm, L., & Dittus, R. S. (2010, November). Reducing iatrogenic risks: ICU-acquired delirium and weakness--crossing the quality chasm. *Chest*, *138(5)*, 1224-1233.

Vasilevskis, E. E., Han, J. H., Hughes, C. G., & Ely, E. W. (2012, September). Epidemiology and risk factors for delirium across hospital settings. *Best Practice & Research Clinical Anaesthesiology*, *26(3*), 277-287.

Wand, A. P., Thoo, W., Sciuriaga, H., Ting, V., Baker, J., & Hunt, G. E. (2014). A multifaceted educational intervention to prevent delirium in older inpatients: A before and after study. *International Journal of Nursing Studies*, *51*, 974-982.

Wells, L. G. (2012). *Why don't intensive care nurses perform routine delirium assessment? A discussion of the literature*, *25*, 157-161.

Whitehorne, K., Gaudine, A., Meadus, R., & Solberg, S. (2015, November). Lived experience of the intensive care unit for patients who experienced delirium. *American Journal of Critical Care*, *24 (6*), 474-479.

Xing, J., Yuan, Z., Jie, Y., Liu, Y., Wang, M., & Sun, Y. (2019). Risk factors for delirium: are therapeutic interventions part of it? *Neuropsychiatric Disease and Treatment*, *15*, 1321-1327.

Zaal, I., Devlin, J., Peelen, L., & Slooter, A. J. (2015, January). A systematic review of risk factors for delirium in the ICU. *Critical Care Medicine*, *43(1)*, 40-47.

Zamoscik, K., Godbold, R., & Freeman, P. (2017). Intensive care nurses' experiences and perceptions of delirium and delirium care. *Intensive and Critical Care Nursing*, *40*, 94-100.

Table 1

Post-Implementation Screening Data (n=368)

Screening Variable	Descriptive *n* (%)
Sex	
Male	169 (45.9%)
Female	199 (54.1%)
Screened	
Positive	116 (31.5%)
Negative	201 (54.6%)
Result not documented	51 (13.9%)
Documented confusion w/ negative screen	
Yes	60 (16.3%)
No	308 (83.7%)
Vent	
Yes	121 (32.9%)
No	247 (67.1%)
Delirium status in Mechanically ventilated	
Positive	73 (60.3%)
Negative	30 (26.4%)
Not documented	18 (14.9%)
ICU Mortality	
Alive	338 (91.8%)
Expired	30 (8.2%)
Delirium Status in ICU Mortality	
Positive	33 (63.5%)
Negative	10 (19.2%)
Not documented	9 (17.3%)
Hospital Mortality	
Alive	316 (85.9%)
Expired	52 (14.1%)
Age	M = 65.7, SD = 15.1
ICU LOS	M = 3.38, SD = 3.53

Table 2

ICU Statistics

ICU Variable	January-April 2018 (*n*=518)	January-April 2019 (*n*=550)	% change
Average Patient Days	430.75	407.75	-5.34%
Total Patient Days	1723	1631	-5.34%
Average Vent Days	175	150.75	-13.86%
Total Vent Days	700	603	-13.86%
Vent Ratio	.405	.3625	-10.49%
ICU LOS	3.33	2.95	-11.41%
Severity of Illness	3.18	3.27	+2.83%
ICU Mortality	10%	10.43%	+4.3%

Table 3

Survey Demographics

Demographics	Pre-Implementation Survey (*n*=17)	Post-Implementation Survey (*n*=12)
Age		
20-29	5 (29.4%)	5 (41.7%)
30-39	5 (29.4%)	4 (33.3%)
40-49	4 (23.5%)	2 (16.7%)
50-59	3 (17.6%)	1 (8.3%)
Degree		
Associates	4 (23.5%)	2 (16.7%)
Baccalaureate	12 (70.6%)	9 (75%)
Masters	1 (5.9%)	1 (8.3%)
Years as an RN		
Less than 1	1 (5.9%)	1 (8.3%)
1-5	7 (41.2%)	6 (50%)
6-10	2 (11.8%)	1 (8.3%)
11-15	1 (5.9%)	2 (16.7%)
16-20	1 (5.9%)	1 (8.3%)
21-30	5 (29.4%)	1 (8.3%)
Years in the ICU		
Less than 1	3 (17.6%)	0
1-5	8 (47.1%)	7 (58.3%)
6-10	2 (11.8%)	2 (16.7%)
11-15	1 (5.9%)	1 (8.3%)
16-20	1 (5.9%)	2 (16.7%)
21-30	2 (11.8%)	0
Shift worked		
7a-7p	8 (47.1%)	8 (66.7%)
7p-7a	7 (41.2%)	1 (8.3%)
Mix of both shifts	2 (11.8%)	2 (16.7%)

Table 4

Delirium Survey

	Pre-Implementation (*n*=17)	Post-Implementation (*n*=12)
On average, what percentage of your mechanically ventilated patients experience delirium?	1 (5.9%)	
<10%	6 (35.3%)	3 (25%)
11-25%	4 (23.5%)	2 (16.7%)
26-50%	2 (11.8)	7 (58.3%)
51-75%	0	0
76-100%		
On average, what percentage of your non-mechanically ventilated patients experience delirium?	5 (29.4%)	
<10%	6 (35.3%)	5 (41.7%)
11-25%	2 (11.8%)	6 (50%)
26-50%	0	1 (8.3%)
51-75%	0	0
76-100%		
Does your unit routinely screen patients for delirium?		
Yes	2 (11.8%)	11 (91.7%)
No	11 (64.7%)	1 (8.3%)
If yes, how many times per day is delirium assessed		
<1	3 (17.6%)	0
1	0	2 (16.7%)
2	1 (5.9%)	6 (50%)
3	0	1 (8.3%)
4+	1 (5.9%)	2 (16.7%)
What tool do you use to screen patients for delirium?		
None	8 (47.1%)	
CAM-ICU	0	11 (91.7%)
Delirium rating scale	0	
Delirium screening checklist	0	1 (8.3%)
General clinical assessment	4 (23.5%)	
MMSE	0	
Other	1 (5.9%)	

Note. *Totals do not equal 100% due to missing values

Table 5

Delirium Survey – Knowledge
(pre-survey *n* = 17; post-survey *n* = 12)

	Agree	Neutral	Disagree
Delirium is an under-diagnosed syndrome			
Pre	13 (76.4%)		
Post	9 (75%)	2 (16.6%)	1 (8.3%)
Delirium is a normal part of ICU hospitalization			
Pre	1 (5.88%)	3 (17.6%)	9 (52.9%)
Post	2 (16.7%)	3 (25%)	7 (58.3%)
Delirium is a problem that requires active intervention			
Pre	10 (58.8%)	3 (17.6%)	
Post	10 (83.3%)	2 (16.7%)	
Delirium is largely preventable			
Pre	4 (23.5%)	8 (47%)	1 (5.9%)
Post	6 (50%)	5 (41.7%)	1 (8.3%)
We over-sedate most of our patients in the ICU			
Pre	8 (47.1%)	4 (23.5%)	1 (5.9%)
Post	4 (33.3%)	2 (16.7%)	7 (58.3%)
Delirium impairs extubation from the ventilator			
Pre			
Post	11 (64.7%)	2 (11.8%)	
	9 (75%)	3 (25%)	
Delirium is a risk factor for hospital-acquired pneumonia			
Pre	8 (47.1%)	5 (29.4%)	
Post	9 (75%)	1 (8.3%)	1 (8.3%)
Delirium is a risk factor for dementia in patients over 65			
Pre	10 (58.8%)	2 (11.8%)	1 (5.9%)
Post	7 (58.3%)	3 (25%)	1 (8.3%)
Delirium is a risk factor for dementia in patients under 65			
Pre	7 (41.2%)	5 (29.4%)	1 (5.9%)
Post	4 (33.3%)	4 (41.7%)	1 (8.3%)
Delirium in the ICU prolongs hospital stay			
Pre	13 (76.5%)		
Post	11 (91.7%)	1 (8.3%)	
Delirium increases reintubation rates			
Pre	11 (64.7%)	1 (5.9%)	
Post	10 (83.3%)	1 (8.3%)	1 (8.3%)
Delirium is a risk factor for sepsis			
Pre	7 (41.2%)	4 (23.5%)	2 (11.8%)
Post	5 (41.7%)	3 (25%)	3 (25%)

Self-inflicted patient injury is a complication of delirium			
Pre	12 (70.6%)	1 (5.9%)	
Post	9 (75%)	3 (25%)	

Appendix A

Informed Consent

Project Title: EBP Implementation of the Delirium Portion of the ABCDEF Bundle

Principal Investigator: Heather Owens

Email: howens@bellarmine.edu Phone: (812) 595-3561

Co-Investigator: Jessica Sumner

Email: Jessica.Sumner@bhsi.com Phone: (502) 609-4043

You are invited to participate in a voluntary online survey about delirium. The purpose of the study is to determine nursing knowledge and perception of delirium. We estimate that it will take approximately 15 minutes to answer the survey questions. Completing the survey indicates that you are willing to participate in this study. If you have previously completed the survey, please complete it again so we can learn how delirium screening and education has changed how you interact with delirium.

Please create a four-digit confidential identifier. This allows us to maintain your privacy, while being able to compare surveys taken at different times. Even if this is your first survey, please calculate your confidential identifier. We ask that you calculate the following number and place it on the survey. *Add the last four of your social security number and last four of your telephone number. If your telephone number has changed, please use the number you previously used. Place the total of these numbers on the survey*. If your number has more than four digits, record only the last four. You do not need to share this number with anyone else.

You may refuse to answer any question at any time without consequence. If you do not wish to answer a question you may exit the survey at any time and none of your response will be recorded, or you may skip over any questions you choose. The study will present no greater risk than what one encounters in daily life.

By completing the following information, you consent to participate in this study.

Appendix B

Survey

Confidential identifier: _____

Age:

☐ 20-29 ☐ 30-39 ☐ 40-49
☐ 50-59 ☐ 60-69 ☐ Over 70

Highest nursing degree

☐ Diploma ☐ Associates ☐ Baccalaureate
☐ Masters

Which unit do you work in?

☐ ICU ☐ CVCU ☐ Both

How many years have you been a nurse?

☐ Less than 1 ☐ 1-5 ☐ 6-10
☐ 11-15 ☐ 16-20 ☐ 20-30
☐ Greater than 30

How many years have you worked in an ICU setting?

☐ Less than 1 ☐ 1-5 ☐ 6-10
☐ 11-15 ☐ 16-20 ☐ 20-30
☐ Greater than 30

Do you work?

☐ 7a-7p ☐ 7p-7a ☐ Mix of both

Please note that the following survey has not been altered from its original state.

Please indicate whether you are a:

☐ Physician ☐ Nurse ☐ Respiratory care practitioner
☐ Pharmacist

How many years have you been practicing in critical care medicine?

☐ 1-5 years ☐ 6-10 years ☐ 11+ years

Please indicate your main practice setting:

☐ Academic medical center ☐ VA medical center ☐ Community hospital
☐ Nonacademic tertiary care referral center

Which of these types of patients do you care for in your primary area? (Check all that apply)

☐ Medical ICU ☐ Pediatric ICU ☐ Neuro/neurosurgical ICU
☐ General surgical ICU ☐ Cardiac surgical ICU ☐ Burn ICU
☐ Trauma ICU

How many beds are there in your ICU?

☐ 1-10 ☐ 11-20 ☐ 21-30

☐ >31

What is the average occupancy rate in your ICU?

☐ <50% ☐ 51-75% ☐ 76-85%
☐ 86-100%

What percentage of patients is mechanically ventilated on average?

☐ <10% ☐ 11-25% ☐ 26-50%
☐ 51-75% ☐ >75%

1. Does your unit have a sedation protocol?
   ☐ Yes (If YES, please answer the following questions, if no skip to #2)
   ☐ No

   a. Which of the following sedation scales do you use?
      ☐ None, we do not use a sedation scale ☐ RASS ☐ SAS
      ☐ MAAS ☐ Ramsay ☐ Other (please specify

   b. How many times per day is sedation level assessed and a sedation target established?
      ☐ <1 ☐ 1 ☐ 2
      ☐ 3 ☐ 4+

   c. How often does your ICU comply with the protocol?
      ☐ Never ☐ Occasionally <20% ☐ Frequently 20-70% ☐ Routinely >70%

   d. Do you use physiological monitors (e.g. BIS EEG) to assess sedation?
      ☐ Never ☐ Occasionally <20% ☐ Frequently 20-70% ☐ Routinely >70%

   e. How often are patient's sedation targets discussed during rounds?
      ☐ Never ☐ Occasionally <20% ☐ Frequently 20-70% ☐ Routinely >70%

2. To improve sedation care, ICU's should:

	Strongly disagree				Strongly Agree
	1	2	3	4	5
Adopt a written protocol for sedation drugs					
Adopt a standardized sedation scale					
Track target levels of sedation:					
Train nurses to monitor delirium routinely					
Train physicians to monitor delirium routinely					
Have interdisciplinary rounds with a PharmD:					

3. Our ICU rounds include: (check all that apply)
   ☐ Physician ☐ Nurse ☐ Respiratory Therapist
   ☐ Pharmacist ☐ Dietician ☐ Social Worker

4. Which of the following medication(s) are **routinely** used for sedation in your ICU? (check all that apply)
   - ☐ Benzodiazepines
   - ☐ Narcotics
   - ☐ Atypical anti-psychotics *
   - ☐ Propofol
   - ☐ Dexmedtomidine
   - ☐ Haloperidol
   - ☐ Other (please specify)

   *Atypical antipsychotics are Clozapine, Risperidone, Olanzapine, Quetiapine, Ziprasidone, and Aripriprazole

5. In your unit do you routinely practice spontaneous awakening trials (i.e. drug holidays)?
   - ☐ Yes (If YES, please answer the following questions)
   - ☐ No

   a. If "Yes", approximately what percentage of ICU days are sedative medications completely stopped in mechanically ventilated patients?
      ☐ <10% ☐ 11-25% ☐ 26-50% ☐ 51-75% ☐ 76-100%

Delirium is defined as an acute change or fluctuation in the course of a patient's mental status as well as inattention, and either disorganized thinking or an altered level of consciousness. Hallucinations by the patient are not required for a diagnosis of Delirium.

6. On average, what percentage of your *mechanically ventilated* patients experience delirium?
   ☐ <10% ☐ 11-25% ☐ 26-50% ☐ 51-75% ☐ 76-100%

7. On average, what percentage of your *non-mechanically ventilated* patients experience delirium?
   ☐ <10% ☐ 11-25% ☐ 26-50% ☐ 51-75% ☐ 76-100%

8. Does your unit routinely screen patients for delirium?
   - ☐ Yes (If YES, please answer the following questions)
   - ☐ No

   a. If "Yes", how many times per day is delirium assessed:
      ☐ <1 ☐ 1 ☐ 2 ☐ 3 ☐ 4

9. What tool do you use to screen patients for delirium?
   - ☐ None
   - ☐ CAM-ICU
   - ☐ Delirium rating scale
   - ☐ Delirium screening checklist
   - ☐ General clinical assessment
   - ☐ MMSE
   - ☐ Other (please specify)

10. Which of the following medication(s) are used for **delirium** in your ICU? (check all that apply):
    ☐ Benzodiazepines ☐ Narcotics (opiates) ☐ Dexmedetomidine

☐ Atypical anti-psychotics ☐ Propofol ☐ Haloperidol
See #4 for list
☐ Other (please specify)

11. Rate the following statements:

	Strongly disagree				Strongly agree
	1	2	3	4	5
Delirium is an under-diagnosed syndrome:					
Delirium is a normal part of ICU hospitalization:					
Delirium is a problem that requires active intervention:					
Delirium is largely preventable:					
We over-sedate most of our patients in the ICU:					
Delirium impairs extubation from the ventilator:					
Delirium is a risk factor for hospital-acquired pneumonia:					
Delirium is a risk factor for dementia in patients *over* 65:					
Delirium in patients is a risk factor for dementia in patients *under* 65:					
Delirium in the ICU prolongs hospital stay:					
Delirium increases reintubation rates:					
Delirium is a risk factor for sepsis:					
Self-inflicted patient injury is a complication of delirium:					

Thank you for your valuable time!

Survey – used with permission; survey is unaltered (Patel et al., 2009).