Effect of ABCDE Bundle Implementation on Prevalence of Delirium in Intensive Care Unit Patients

By Mandy Bounds, RN, MSN, CCRN, Stacey Kram, RN-BC, DNP, PCCN, CCRN, Karen Gabel Speroni, RN, PhD, MHSA, Kim Brice, RN, MSN, CCRN, Mary Anne Luschinski, RN, CCRN, Stephanie Harte, PT, MPT, and Marlon G. Daniel, MHA.

**Background** The ABCDE bundle incorporates multidisciplinary measures to improve and/or preserve patients’ physical, functional, and neurocognitive status through awakening and breathing coordination, delirium prevention and management, and early physical mobility.

**Objectives** To quantify the prevalence and duration of delirium in patients in the intensive care unit (ICU) before and after implementation of the ABCDE bundle.

**Methods** Delirium prevalence was defined as the percentage of patients who had at least 1 positive delirium score on the Intensive Care Delirium Screening Checklist (ICDSC) during the ICU stay; delirium duration was the number of days during the ICU stay that a positive ICDSC score was noted. Retrospective data were collected from before and after implementation of the ABCDE bundle.

**Results** Of the 159 records reviewed (80 before and 79 after bundle implementation), most were for white men (mean age, 66.3 years). After implementation of the ABCDE bundle, the prevalence of delirium decreased significantly (from 38% to 23%, \( P = .01 \)) and the mean number of days of delirium decreased significantly (from 3.8 to 1.72 days, \( P < .001 \)). The number of patients with delirium-free stays increased after bundle implementation.

**Conclusions** Implementation of the ABCDE bundle led to significant decreases in the prevalence and duration of delirium in ICU patients. (American Journal of Critical Care. 2016;25:535-544)
Delirium in the intensive care unit (ICU) affects 60% to 80% of patients receiving mechanical ventilation and 20% to 50% of patients who are not receiving mechanical ventilation.1-8 Patients in the ICU with delirium are at a greater risk for prolonged mechanical ventilation, catheter removal, self-extubation, use of restraints, longer hospital stays, increased hospital costs, and death.3,9-15 The odds of being discharged to another institution rather than being discharged to home also are higher for patients who have delirium while hospitalized.12,16-20

Because of the multiple associated risks and adverse outcomes that may result from delirium, strategies to reduce the prevalence and duration of delirium should be implemented in ICUs. Delirium prevalence is defined as the percentage of patients who had at least 1 positive delirium screening during the study period.22 Delirium duration is defined as the number of ICU days with a positive delirium assessment.22 A not-for-profit, rural, 2-hospital community health care system with a total of 18 ICU beds had a mean delirium prevalence of approximately 24% based on monthly prevalences of 21% to 32% between December 2012 and July 2013.

At a national critical care conference in 2012, the research team heard of an evidence-based bundle of care to improve patients’ outcomes and wanted to deliver best practices and optimal care for patients in this rural health care system. The research team also wanted to prevent and manage delirium in the ICUs because of its harmful and long-term effects on patients. Because of the varying prevalence of delirium at our hospitals, evidence-based methods to prevent and manage delirium for ICU patients were needed. Before initiation of this study, these medical centers did not quantify the duration of delirium.

A review of the literature was completed by searching CINAHL, MEDLINE, Cochrane, and PubMed databases from 2009 to 2014. Search terms used were delirium, intensive care unit, ICU, ABCDE protocol, and restraints. Additional studies found in the reference lists of the research articles examined during the literature review also were reviewed. The body of evidence regarding the prevention and management of delirium strongly suggested implementation of the ABCDE bundle. The bundle incorporates multidisciplinary measures to improve and/or preserve patients’ physical, functional, and neurocognitive status: awakening and breathing coordination, delirium prevention and management, and early physical mobility; some institutions adopt choice of sedation and analgesia for the C component as well.1,23 Incorporation of each of the ABCDE bundle components into practice on a daily basis in the ICU setting is an evidence-based strategy to effectively prevent delirium or minimize the prevalence of delirium.21,24-27

Table 1 provides additional information on the ABCDE bundle components summarized from Balas and colleagues.1,8,21-23,25-29

Although the ABCDE bundle is effective, the data demonstrating the bundle’s effectiveness in reducing delirium prevalence and duration are limited, particularly in smaller/rural hospital settings, where the bundle can be more complex to implement because of its requirements for participation of professionals from various disciplines. Further research was warranted to evaluate use of the ABCDE bundle in a rural hospital system. Although components of the bundle had been implemented or partially implemented within the ICUs at both system hospitals, the ABCDE bundle had not yet fully been implemented within the interprofessional team (Table 2) in either ICU. The interprofessional team

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A, Sedation awakening trial (SAT)

All patients receiving mechanical ventilation have an SAT at a minimum of every 24 h after a successful SAT safety screening.

A patient has a successful SAT safety screening if the following criteria are met:
- No active seizures
- No alcohol withdrawal
- No agitation
- No paralytic agents/neuromuscular blockers
- No myocardial infarction in past 24 h
- Normal intracranial pressure (ICP)

A patient has an unsuccessful SAT if any of the following criteria are met:
- Anxiety, agitation, or pain
- Respiratory rate > 35/min
- Peripheral oxygen saturation (SpO₂) < 88% for more than 5 min
- Acute cardiac arrhythmia
- 2 or more signs of respiratory distress

If a patient has a successful safety screening, start the SAT. If a patient has an unsuccessful SAT safety screening, the SAT will be completed at a minimum in 24 h.

All patients receiving mechanical ventilation receive an SBT at a minimum of every 24 h after successful SAT and SBT safety screenings.

A patient has a successful SBT safety screening if the following criteria are met:
- Oxygen saturation > 88%
- Fraction of inspired oxygen (FiO₂) < 0.50
- Positive end-expiratory pressure (PEEP) < 8 cm H₂O
- Minute ventilation < 15 L/min
- Stable airway
- No agitation
- No myocardial infarction in past 24 h
- No changes in ICP (ICP > 15 mm Hg or suspected high ICP)
- No neuromuscular blockade
- Systolic blood pressures > 90 mm Hg and < 160 mm Hg
- Increasing titration of vasopressors

A patient has an unsuccessful SBT if any of the following criteria are met:
- Respiratory rate > 30/min or < 12/min
- Oxygen saturation < 88%
- Hypertension or hypotension
- Apnea > 60 s
- Mental status change
- Anxiety or agitation, significant or unresolved
- Acute cardiac arrhythmia
- 2 or more signs of respiratory distress

If the patient has a successful SBT, the patient will continue on current sedation and settings for consideration of extubation; this will be discussed during interprofessional rounds. If the patient has an unsuccessful SBT, the patient is placed on previous settings and plans are discussed during rounds.

The SAT and SBT are coordinated between the registered nurse and the respiratory care practitioner daily and occur within 90 min of interprofessional rounds.

Pain assessed every 4 h and as needed.
Agitation and sedation assessed every 4 h and as needed, by using the Richmond Agitation-Sedation Scale (RASS).
Pain management first priority.
Minimal sedation toward a targeted RASS score by using a sedation protocol.
Pain and sedation discussed at interprofessional rounds.

Delirium screening assessment every 12 h using the Intensive Care Delirium Screening Checklist (ICDSC).
Delirium score discussed at interprofessional rounds.
Nonpharmacological interventions used for prevention and management of intensive care unit delirium: assessment for catheter removal, bed alarms, bundling of care to allow rest periods, cognitive stimulation, covering catheters, tubes, and dressings, educating family/support system, maintaining sleep/wake cycle, reviewing medications, minimizing environmental stimuli, assessing pain, reorientation, range-of-motion exercises, and sensory aids.

Continued
that conducts daily rounds on all patients admitted to the ICU is composed of the intensivist, a registered nurse, a physical therapist, a respiratory care practitioner, an occupational therapist, a pharmacist, and a nursing care coordinator. Interprofessional rounds are conducted twice a day. As the result of a system-wide interprofessional task force, the ABCDE bundle was initiated in September 2013.

The objective of this study was to quantify the prevalence and duration of delirium in ICU patients before and after implementation of the ABCDE bundle. The hypothesis was that the prevalence and duration of delirium would be lower after implementation of the ABCDE bundle than before implementation.

**Methods**

In this retrospective study, electronic medical records were reviewed to collect data for the same 3 months before (December 2012-February 2013) and after (December 2013-February 2014) implementation of the ABCDE bundle. To account for variations in admissions of ICU patients, such as influenza, the post-implementation period was the same 3 months exactly 1 year after implementation of the ABCDE bundle. The study was reviewed by the institutional review board and was deemed exempt.

The study setting was a rural hospital system’s general medical/surgical ICUs, part of University of Maryland Shore Regional Health. University of Maryland Shore Medical Center at Dorchester has 8 ICU beds and University of Maryland Shore Medical Center at Easton has 10 ICU beds. Both of these hospitals have been designated Magnet hospitals by the American Nurses Credentialing Center. Inclusion criteria were that patients be 18 years of age or older and have stayed in the ICU more than 24 hours. Exclusion criteria were as follows: intracranial pressure increased more than 50% from first ICU measure for hospitalization; quadriplegia; score on Glasgow Coma Scale less than 8 without use of sedatives; comfort measures only as documented in the medical record by medical orders for life-sustaining treatment and/or palliative care; and cardiopulmonary arrest resulting in death.

Standard procedures were followed for all patients. Research procedures included documentation of the following study-related data: demographics; ICU primary and secondary admitting diagnoses; body mass index (calculated as weight in kilograms divided by height in meters squared); length of stay in the ICU and hospital; days of mechanical ventilation; Intensive Care Delirium Screening Checklist (ICDSC) scores; completion and number of awakening/sedation vacation trials; completion and number of spontaneous breathing trials; Richmond Agitation Sedation Scale (RASS) scores; analgesics and sedatives used; early mobility; and other factors reported to be associated with delirium, such as use of restraints and falls.

A total of 80 patients met study eligibility criteria before implementation of the ABCDE bundle. Of the 81 patients who met the eligibility criteria after implementation, 2 were excluded because of incomplete documentation, generating a sample...
### Table 2
Difference between ABCDE bundle components before and after bundle implementation

<table>
<thead>
<tr>
<th>Bundle component</th>
<th>Before implementation (December 2012-February 2013)</th>
<th>After implementation (December 2013-February 2014)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Awakening</strong></td>
<td>Sedation awakening trial (SAT) coordination between nurse and RCP in conjunction with spontaneous breathing trial (SBT). Success or lack of success of trials discussed at interprofessional rounds.</td>
<td>SAT coordination between nurse and RCP in conjunction with SBT. SAT to occur within 90 min of interprofessional rounds. Success or lack of success of trials discussed at interprofessional rounds.</td>
</tr>
<tr>
<td><strong>Breathing</strong></td>
<td>SAT coordination between nurse and RCP in conjunction with SBT for every patient undergoing mechanical ventilation unless clinically contraindicated. Success or lack of success of trials discussed at interprofessional rounds. Standing order for SBT by intensivist for every patient undergoing mechanical ventilation if safety screening is successful and patient has been intubated &gt;24 hours. After SBT, patient placed on pre-SBT ventilator settings.</td>
<td>SAT coordination between nurse and RCP in conjunction with SBT for every patient undergoing mechanical ventilation unless clinically contraindicated. Success or lack of success of trials discussed at interprofessional rounds. Standing order for SBT by intensivist for every patient undergoing mechanical ventilation if safety screening is successful. Patient remains on weaning settings until interprofessional rounds unless condition declines as indicated by bundle parameters. SBT to occur within 90 min of interprofessional rounds.</td>
</tr>
<tr>
<td><strong>Coordination</strong></td>
<td>Coordination of SAT and SBT between nurse and RCP daily on every patient undergoing mechanical ventilation unless clinically contraindicated.</td>
<td>Coordination of SAT and SBT between nurse and RCP daily on every patient undergoing mechanical ventilation unless clinically contraindicated.</td>
</tr>
<tr>
<td><strong>Choice of analgesia and sedation</strong></td>
<td>Sedation protocol followed. Sedation and analgesia not part of interprofessional rounding tool.</td>
<td>Sedation protocol revised to be a sedation and analgesia protocol with inclusion of pharmacological practices, including titration of sedatives to targeted Richmond Agitation Sedation Scale (RASS). Sedation and analgesia part of interprofessional rounding tool.</td>
</tr>
<tr>
<td><strong>Delirium prevention and management</strong></td>
<td>Delirium screening with Intensive Care Delirium Screening checklist (ICDSC). Delirium screening status discussed at interprofessional rounds and in place on rounding tool.</td>
<td>Delirium screening with ICDSC. Delirium screening status discussed at interprofessional rounds and in place on tool. Education of intensive care unit (ICU) nurses regarding standard of practice for provision of and documentation of nonpharmacological nursing interventions for ICU patients with delirium (eg, assess for catheter removal, ensure bed alarm present, bundle care to allow periods of rest, cognitive stimulation, cover catheters, tubes, and dressings, early mobilization, education of patient’s family and support system, maintain sleep/wake cycle, review medications, minimize environmental stimuli, assess pain, reorient patient frequently, do range-of-motion exercises, and have sensory aids available)</td>
</tr>
<tr>
<td><strong>Early physical mobility</strong></td>
<td>Incorporated daily physical therapy and occupational therapy on ICU patients with intensivist order.</td>
<td>Incorporated daily physical therapy and occupational therapy on every ICU patient who had a successful early mobility safety screening.</td>
</tr>
</tbody>
</table>

**Team member type**
- Nurse
- RCP
- Intensivist
- Pharmacist
- Physical therapist
- Occupational therapist
of 79 patients. Thus a total of 159 patients were
included in the final sample for analysis.

Primary variables of interest in this analysis were delirium duration and prevalence, length of stay in the ICU and hospital, and days of mechanical ventilation. Delirium prevalence was operationalized as the percentage of patients with at least 1 positive ICDSC delirium score during their ICU stay. Delirium duration was operationalized as the number of days a patient had a positive ICDSC delirium score while in the ICU. Delirium was measured once per 12-hour shift at specific times of 5 AM and 5 PM. The ICDSC has 99% sensitivity, 64% specificity, and more than 97% interrater reliability and was the screening tool used for delirium screening in the ICUs at this hospital.30 The ICU nurses caring for the patients each shift measured the ICDSC score. The direct-care nurses received extensive training in delirium screening, which included delirium education and validated screening tools, ICDSC live education sessions, handouts, self-learning modules, and competency assessment case studies for user validation. The education was provided initially with the rollout of delirium screening in the ICUs in July 2012, with competency validation occurring in November 2012 before the start of the ABCDE study.30

Means and frequencies were used to describe the sample. Both \( \chi^2 \) and 2-sample \( t \) tests were used to assess bivariate statistical associations. Multivariable linear and logistic regression models were used to test for associations between the main independent variable of interest (before and after implementation of the ABCDE bundle) and selected dependent variables while adjusting for predetermined confounders such as age, sex, Charlson Comorbidity Index, and dementia history. Statistical assumptions were tested to ensure validity of the models. Post hoc pair-wise comparison error rates were adjusted by using Bonferroni methods. All statistical assumptions were tested and validated. All analyses were 2-tailed with an \( \alpha \) of .05. Analysis was done by using SAS version 9.3 (SAS Institute, Inc) and StatXact version 9 (Cytel Inc).

Results

In this retrospective study of 159 patients (80 before and 79 after implementation of the ABCDE bundle), most were white men (mean age, 66.3 years). Primary ICU admitting diagnoses were for

Table 3
Demographics of study population

<table>
<thead>
<tr>
<th>Demographic characteristic</th>
<th>Before bundle implementation (n = 80)</th>
<th>After bundle implementation (n = 79)</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male sex</td>
<td>44 (55)</td>
<td>49 (62)</td>
<td>.87</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>61 (76)</td>
<td>65 (82)</td>
<td>.10</td>
</tr>
<tr>
<td>African American</td>
<td>18 (22)</td>
<td>12 (15)</td>
<td>.08</td>
</tr>
<tr>
<td>Other</td>
<td>1 (1)</td>
<td>2 (3)</td>
<td>.39</td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>67.2 (14.6)</td>
<td>65.3 (15.5)</td>
<td>.45</td>
</tr>
<tr>
<td>Primary diagnosis for admission to intensive care unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory</td>
<td>28 (35)</td>
<td>27 (34)</td>
<td>.13</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>13 (16)</td>
<td>12 (15)</td>
<td>.18</td>
</tr>
<tr>
<td>Neurological</td>
<td>10 (12)</td>
<td>13 (16)</td>
<td>.14</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>12 (15)</td>
<td>10 (13)</td>
<td>.18</td>
</tr>
<tr>
<td>Sepsis</td>
<td>5 (6)</td>
<td>6 (8)</td>
<td>.23</td>
</tr>
<tr>
<td>Metabolic</td>
<td>4 (5)</td>
<td>6 (8)</td>
<td>.21</td>
</tr>
<tr>
<td>Renal</td>
<td>1 (1)</td>
<td>2 (2)</td>
<td>.39</td>
</tr>
<tr>
<td>Other</td>
<td>7 (9)</td>
<td>3 (4)</td>
<td>.12</td>
</tr>
<tr>
<td>Body mass index, mean (SD)</td>
<td>29.66 (8.00)</td>
<td>28.15 (8.65)</td>
<td>.25</td>
</tr>
<tr>
<td>History of dementia</td>
<td>2 (2)</td>
<td>3 (4)</td>
<td>.69</td>
</tr>
<tr>
<td>No. of diagnoses at admission, median (interquartile range)</td>
<td>4.00 (2.00-5.00)</td>
<td>4.00 (2.00-5.00)</td>
<td>.53</td>
</tr>
<tr>
<td>Charlson Comorbidity Index, mean (SD)</td>
<td>3.03 (2.48)</td>
<td>5.88 (2.85)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

a Values in the second and third columns are number (%) unless otherwise indicated in the first column.

b Diagnoses are not mutually exclusive.

c Calculated as weight in kilograms divided by height in meters squared.
conditions categorized as respiratory, cardiovascular, neurological, and/or gastrointestinal. Neither demographic characteristics nor potential confounding baseline variables for history of dementia differed significantly between the groups from before and after implementation of the ABCDE bundle (Table 3). However, patients in the group after implementation of the ABCDE bundle had significantly higher Charlson Comorbidity Indexes ($P < .001$). Other confounding variables for delirium were compared between the 2 groups. Before bundle implementation, 4 total patients were admitted with conditions that may have influenced the development of delirium, including alcohol withdrawal, drug overdose, and encephalopathy. After bundle implementation, 6 total patients were admitted with these same conditions that may have influenced delirium.

The prevalence of delirium decreased significantly after implementation of the ABCDE bundle (from 38% to 23%, $P = .01$). The mean number of days of delirium decreased significantly (from 3.8 to 1.72 days, $P < .001$). The number of patients with delirium-free stays increased significantly after bundle implementation (from 62% to 77%; $P = .01$; Table 4). After implementation of the ABCDE bundle, significant decreases in both delirium prevalence (from 69% to 31%; $P < .001$) and duration (from 2.96 to 0.56 days, $P < .001$) were apparent in ICU patients who were receiving mechanical ventilation who had delirium-free stays increased significantly (from 31% to 69%; $P < .001$; Table 4) after implementation of the ABCDE bundle.

Length of stay in the ICU or hospital and total days of mechanical ventilation did not differ significantly from before to after bundle implementation (Table 5). Also, the mean number of daily sedation awakening trials (SATs) was the same (2.8) before and after bundle implementation. The SATs were completed 89% of the time in the eligible patients both before and after bundle implementation. The mean daily spontaneous breathing trials (SBTs) increased slightly after bundle implementation (from 2.8 to 3.3). The SBTs were completed 96% of the time in the eligible patients before bundle implementation and 88% of the time after bundle implementation. The mean daily RASS score changed slightly after bundle implementation (from -1.01 to -0.72, $P = .21$), indicating slightly less sedation.

Use of sedation and analgesics administered did not change significantly from before to after bundle implementation. Propofol was the primary medication used for sedation both before (41%, 1.7 days) and after (39%, 1.8 days) bundle implementation. The mean number of analgesia days increased significantly after bundle implementation.

### Table 4
Prevalence and duration of delirium and score on Richmond Agitation-Sedation Scale (RASS) before and after implementation of the ABCDE bundle

<table>
<thead>
<tr>
<th>Delirium and sedation outcomes</th>
<th>Before implementation (n = 80)</th>
<th>After implementation (n = 79)</th>
<th>$P^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with delirium, No. (%)</td>
<td>30 (38)</td>
<td>18 (23)</td>
<td>.01</td>
</tr>
<tr>
<td>No. of days of delirium, mean (SD), range</td>
<td>3.8 (2.9), 1.0-14.0</td>
<td>1.72 (0.8), 1.0-4.0</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Patients with 0 delirium days, No. (%)</td>
<td>50 (62)</td>
<td>61 (77)</td>
<td>.01</td>
</tr>
<tr>
<td>Patients receiving mechanical ventilation, No. (%)</td>
<td>32 (40)</td>
<td>32 (40)</td>
<td>.49</td>
</tr>
<tr>
<td>Patients receiving mechanical ventilation who had delirium, No. (%)</td>
<td>22 (69)</td>
<td>10 (31)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Days of delirium in patients receiving mechanical ventilation, mean (SD), range</td>
<td>2.96 (3.3), 0-14</td>
<td>0.56 (1.0), 0-4</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Patients receiving mechanical ventilation who had 0 days of delirium, No. (%)</td>
<td>10 (31)</td>
<td>22 (69)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Patients not receiving mechanical ventilation who had delirium, No. (%)</td>
<td>8 (17)</td>
<td>8 (17)</td>
<td>.71</td>
</tr>
<tr>
<td>Days of delirium in patients not receiving mechanical ventilation, mean (SD), range</td>
<td>0.42 (1.0), 0-4</td>
<td>0.28 (0.7), 0-2</td>
<td>.23</td>
</tr>
<tr>
<td>Daily RASS score, mean (SD), range</td>
<td>-1.01 (0.8), -3.2 to 0.83</td>
<td>-0.72 (1.3), -3.3 to 2.0</td>
<td>.21</td>
</tr>
</tbody>
</table>

* Adjusted for age, sex, history of dementia, and Charlson Comorbidity Index at admission.
Secondary outcomes | Before implementation (n = 80) | After implementation (n = 79) | P
---|---|---|---
Days in intensive care unit, mean (SD), range | 4.02 (5.0), 1.0-43.0 | 4.62 (5.1), 1.0-29.7 | .47
Days in hospital, mean (SD), range | 9.7 (7.3), 1.7-43.0 | 11.11 (8.5), 1.4-52.9 | .15
Days of mechanical ventilation, mean (SD), range | 4.6 (7.3), 0.3-42.0 | 5.26 (6.5), 0.3-28.2 | .78
Patients with 0 ventilator days, No. (%) | 48 (60) | 47 (59) | .55

(from 1.37 to 2.51; P = .03). The increase in the percentage of patients who received analgesics was not statistically significant (from 44% before to 54% after, P = .48). Early mobility and falls also were compared. The number of patients assisted to a sitting position, either placed in a chair position using the bed or sitting on the edge of the bed, increased significantly (from 1% to 10%, P = .01) after the ABCDE bundle was implemented. Neither the percentage of patients assisted out of bed during their ICU stay (35% before vs 33% after, P = .62) nor the percentage of patients who did not receive any components of the early mobility intervention (14% before vs 13% after, P = .19) changed significantly from before to after bundle implementation. No falls were documented before and 1 fall was documented after implementation of the ABCDE bundle. Delirium was not present at the time of the fall, and this was a fall without injury.

**Discussion**

Findings from this retrospective analysis demonstrating reduced prevalence and duration of delirium after implementation of the ABCDE bundle are consistent with published reports. Balas and colleagues reported lower prevalence and duration of delirium after implementation of the ABCDE bundle in 5 adult ICUs in a prospective cohort study. Needham and colleagues reported decreased prevalence of delirium in their ICU as a result of a quality improvement project that focused on reducing heavy sedation and increased staffing with physical and occupational therapists with new consultation guidelines. In a randomized controlled trial, Schweickert and colleagues reported decreased duration of delirium in the ICUs as a result of an early mobility intervention.

In our study, we did not find a significant increase in ventilator-free days as researchers in other studies have reported. Girard and colleagues reported that patients experiencing the SAT and SBT coordination were discharged from the ICU and hospital earlier. We attribute the absence of a significant increase in ventilator-free days from before to after implementation of the ABCDE bundle to the fact that our ICU was already doing SATs and SBTs before the ABCDE bundle was implemented (Table 2).

Regarding the increased use of analgesia after the ABCDE bundle was implemented, these findings were consistent with results reported by Balas et al, who also reported a trend toward increased use of opiates after implementation of the ABCDE bundle. As for early mobility, although implementation of the ABCDE bundle led to a statistically significant increase in the number of patients in the chair position in bed or sitting on the edge of the bed, it did not lead to an increase in the number of patients out of bed. Balas et al reported that ICU patients spend more than 65% of ICU days in bed, even with the early mobility intervention as part of the bundle. A more intensive mobility program may result in better outcomes for ICU patients. More research is needed to determine multidisciplinary barriers to early mobilization and strategies to decrease barriers.

Several components of the ABCDE bundle were partially implemented before this study, to which we attribute the absence of significant changes in length of stay in the ICU and hospital and the lack of increase in the number of ventilator-free days. The major components of the bundle implemented as part of the study included enhanced collaboration between nurses and respiratory care practitioners during SATs and SBTs, a revised sedation protocol with a physician-ordered targeted RASS score and a focus on analgesia, enhanced focus on nonpharmacological management and prevention of delirium, incorporation of daily physical and occupational therapy for every ICU patient who had a successful safety screening for early mobility, and interprofessional collaboration on all components of the bundle at daily rounds (Table 2). The research team attributes the significant outcomes in delirium prevalence and duration to the education and focus on...
nonpharmacological methods of preventing and managing delirium that were implemented as part of the bundle and to the scientific and robust methods that work together in a bundle to synergistically affect patients’ outcomes.31 Since the start of this research study, the ABCDE bundle has been revised to the ABCDEF bundle.32 The changes to the bundle include the following: A, assess, prevent, and manage pain; B, both spontaneous awakening trials and spontaneous breathing trials; C, choice of analgesia and sedation; D, delirium: assess, prevent, and manage; E, early mobility and exercise; and F, family engagement and empowerment. The research team implemented all components of this bundle for this research study except for the focus on family engagement and empowerment. Additional research to evaluate use of the revised bundle with respect to delirium prevalence is warranted.

Limitations of this analysis include the retrospective nature of the electronic medical record and hence a lack of random assignment. Although it is complex to effectively provide ABCDE in smaller or rural hospitals, the results of this study demonstrate the effectiveness of the bundle. Data in this setting, however, remain limited. Also, the patients in this study were from a rural hospital’s general medical/surgical ICU, so our results may not be generalizable to other types of ICUs. In addition, practice changes (beyond ABCDE) over time are critical unmeasured variables that may explain differences in outcomes from before to after implementation of the ABCDE bundle. Another limitation of this study is the potential variability among nurses regarding delirium screening with the ICSD.

Conclusions

This retrospective analysis quantifying differences in the prevalence and duration of delirium in ICU patients before and after implementation of the evidence-based ABCDE bundle in a rural setting demonstrated significant decreases. Length of stay in the ICU and hospital and days of mechanical ventilation did not differ significantly from before to after implementation of the ABCDE bundle. From the perspective of evidence-based practice, findings from this analysis are consistent with the findings from other research that indicate that the multidisciplinary ABCDE bundle may be effective in optimizing care delivery to improve patients’ outcomes. Results of this study also show that the ABCDE bundle can be successfully implemented with an interprofessional team in a rural hospital system.

REFERENCES

Notice to CE enrollees:
This article has been designated for CE contact hour(s). The evaluation tests your knowledge of the following objectives:

1. Identify the individual components of the ABCDE bundle.
2. Discuss the burden of delirium on health care organizations and the community.
3. List possible nonpharmacological interventions used for the prevention and management of intensive care unit delirium.

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