

# Critical Care Nurses' Role in Implementing the "ABCDE Bundle" Into Practice

Michele C. Balas, RN, PhD, APRN-NP, CCRN  
 Eduard E. Vasilevskis, MD  
 William J. Burke, MD  
 Leanne Boehm, RN, MSN, ACNS-BC  
 Brenda T. Pun, RN, MSN, ACNP  
 Keith M. Olsen, PharmD  
 Gregory J. Peitz, PharmD, BCPS  
 E. Wesley Ely, MD, MPH

Imagine working in an environment where all patients undergoing mechanical ventilation are alert, calm, and delirium free. Envision practicing in an environment where nonvocal patients can effectively express their need for better pain control, repositioning, or emotional reassurance. Picture an intensive care unit where a nurse-led, interprofessional team practices evidence-based, patient-centered care focused on preserving and/or restoring their clients' physical, functional, and neurocognitive abilities. A recently proposed bundle of practices for the intensive care unit could advance the current practice environment toward this idealized environment. The Awakening and Breathing Coordination, Delirium Monitoring and Management, and Early Mobility (ABCDE) bundle incorporates the best available evidence related to delirium, immobility, sedation/analgesia, and ventilator management in the intensive care unit for adoption into everyday clinical practice. (*Critical Care Nurse*. 2012;32[2]:35-38,40-48)

## CE Continuing Education

This article has been designated for CE credit. A closed-book, multiple-choice examination follows this article, which tests your knowledge of the following objectives:

1. Identify factors that place critically ill patients at high risk for developing delirium and weakness; their impact on long-term physical, functional, and cognitive outcomes; and the potential societal burdens associated with these conditions
2. Describe the essential components of the ABCDE bundle of evidence-based practice
3. Discuss the role of critical care nurses in implementation of the ABCDE bundle

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 doi: <http://dx.doi.org/10.4037/ccn2012229>

**G**rowing evidence reveals that most critically ill patients are at risk of development of 2 common, dangerous, and potentially iatrogenic conditions: intensive care unit (ICU) delirium and weakness. ICU-acquired delirium and weakness not only influence a patient's ability to survive critical illness,<sup>1,2</sup> but are associated with poor long-term physical, functional, and cognitive outcomes.<sup>3-6</sup> The societal burden of these conditions

is daunting. For example, the cost estimates of caring for delirious patients receiving mechanical ventilation in the United States alone is from \$6.5 to \$20.4 billion annually.<sup>7,8</sup> Strategies to prevent and/or treat ICU-acquired delirium and weakness are urgently needed to improve both outcomes for ICU patients and the resulting societal burdens (Figure 1).

Recently, a novel, interprofessional, bundled approach to managing ICU-acquired delirium and weakness has been proposed. A "bundle," according to the Institute for Healthcare Improvement,<sup>9</sup> is a set of evidence-based practices—generally 3 to 5—that, when performed collectively and reliably, improve patients' outcomes. The Awakening and Breathing Coordination, Delirium Monitoring and Management, and Early Mobility (ABCDE) bundle incorporates the best available evidence related to delirium, immobility, sedation/analgesia, and ventilator management in the ICU and tailors the pharmacological and nonpharmacological interventions used in



**Figure 1** Family in intensive care unit.

prior clinical trials into a bundle that can be adopted into everyday clinical practice.<sup>10-13</sup> The foundation of the ABCDE bundle primarily depends upon 3 principles: (1) improving communication among members of the ICU team, (2) standardizing care processes, and (3) breaking the cycle of oversedation

and prolonged mechanical ventilation that can subsequently lead to delirium and weakness.<sup>10</sup>

This article summarizes the evidence behind the ABCDE bundle. Additionally, we aim to explain the individual components of the ABCDE bundle and provide readers with an example of an ABCDE policy. Finally,

we discuss the unique role of registered nurses in implementing the ABCDE bundle into clinical practice.

## Evidence Supporting Nurse-Implemented Sedation Protocols and Daily Awakening

Most critically ill patients require some form of analgesic or sedative therapy during their ICU stay—most often, various combinations of opioids, benzodiazepines, hypnotics, and antipsychotics.<sup>14</sup> Nurses administer these medications to facilitate mechanical ventilation, improve tolerance of invasive procedures, protect patients and staff from harm caused by aggressive or agitated behavior of patients, and relieve pain and anxiety.<sup>15,16</sup> As with any procedure, some adverse events are associated with sedation and analgesia, including respiratory depression, hypotension, renal failure, and deconditioning.<sup>14</sup> Moreover, several studies highlight the relationship between ICU-acquired delirium and the use of potent sedative and analgesic agents, with a notable increased risk of delirium with benzodiazepines.<sup>17-19</sup> These safety concerns have generated a surge of interest in broadly implementing strategies to decrease patients' exposure to sedative medications.

Nursing implemented, protocol-directed sedation is a strategy for reducing patients' exposure to potentially harmful medications. In a randomized, controlled trial, Brook and colleagues<sup>20</sup> found that protocol-directed sedation during mechanical ventilation reduced the duration of mechanical ventilation, decreased ICU and hospital lengths of stay, shortened the duration of continuous infusion of sedatives, and lowered

## Authors

*Michele C. Balas is an assistant professor at the University of Nebraska Medical Center, College of Nursing in Omaha and a former John A. Hartford Foundation Building Academic Geriatric Nursing Capacity predoctoral scholar and postdoctoral fellow.*

*Eduard E. Vasilevskis is an assistant professor at Vanderbilt University Medical Center and at the Geriatric Research, Education and Clinical Center of the VA Tennessee Valley Healthcare System in Nashville.*

*William J. Burke is a professor of psychiatry and vice-chair for research at the University of Nebraska Medical Center.*

*Leanne Boehm is a research nurse with the ICU Delirium and Cognitive Impairment Study Group at Vanderbilt University Medical Center in Nashville.*

*Brenda T. Pun is a program clinical manager at Vanderbilt University Medical Center.*

*Keith M. Olsen is professor in and chair of the Department of Pharmacy Practice at the University of Nebraska Medical Center.*

*Gregory J. Peitz is a pharmacy coordinator and a clinical assistant professor in the Department of Pharmacy Practice, University of Nebraska Medical Center.*

*E. Wesley Ely is a professor at Vanderbilt University School of Medicine and associate director of aging research for the Tennessee Valley Veterans Administration Geriatric Research Education Clinical Center in Nashville.*

*Corresponding author: Michele C. Balas, RN, PhD, University of Nebraska Medical Center, College of Nursing, 985330 Nebraska Medical Center, Omaha, NE, 68198-5330 (e-mail: mbalas@unmc.edu).*

*To purchase electronic or print reprints, contact The InnoVision Group, 101 Columbia, Aliso Viejo, CA 92656. Phone, (800) 899-1712 or (949) 362-2050 (ext 532); fax, (949) 362-2049; e-mail, reprints@aacn.org.*

tracheostomy rates of patients compared with patients treated with non-protocol-directed sedation. Since that time, many sedation protocols and algorithms have incorporated the evaluation and management of pain and agitation within a single algorithm,<sup>16</sup> with management intended to be under the direction of the bedside nurse. Beneficial outcomes linked to the use of nurse-managed sedation/analgesia algorithm(s) or protocol(s) in controlled studies include the following: more “on-target” sedation,<sup>21</sup> less pain and agitation,<sup>22</sup> reduced direct drug costs or medication use,<sup>23</sup> less patient-ventilator asynchrony,<sup>21</sup> and decreased incidence of ventilator-associated pneumonia.<sup>24</sup>

Another innovative way to reduce sedation in adult ICU patients is the practice of daily interruption of sedation. In 2001, Kress and colleagues<sup>25</sup> conducted a single-center, randomized controlled trial of 128 patients undergoing mechanical ventilation, comparing usual care against a sedation strategy that involved daily interruption of infusions of sedatives (midazolam or propofol) and analgesics (morphine), until the patient was awake, able to follow 3 or 4 simple commands, or agitated. They found that daily interruption of sedation, now often referred to as spontaneous awakening trials (SATs), led to a significant decrease in the duration of mechanical ventilation, shorter ICU stays, and use of fewer diagnostic tests for unexplained changes in mental status.

A retrospective analysis of this study revealed that patients treated with SATs also experienced significantly fewer overall complications (eg, ventilator-associated pneumonia, upper gastrointestinal hemorrhage,

bacteremia, barotrauma) than experienced by patients treated with usual care.<sup>26</sup> To evaluate the impact of SATs on long-term psychological outcomes, Kress and colleagues<sup>27</sup> also compared the development of symptoms of posttraumatic stress disorder (PTSD) in each group. Patients whose daily sedation was interrupted had significantly fewer symptoms of PTSD after critical illness, suggesting that not only are SATs safe, but they may have other beneficial effects on long-term outcomes of patients receiving mechanical ventilation.<sup>28</sup>

### **Evidence Supporting Respiratory Therapist-Driven Protocolized Spontaneous Breathing Trials**

Just as SATs are used to determine a patient’s need for sedation, spontaneous breathing trials (SBTs) are used to determine if a patient receiving mechanical ventilation is ready to breathe on her or his own.<sup>28</sup> Support for the use of SBTs was garnered more than 10 years ago when Esteban et al<sup>29</sup> reported that this strategy was associated with reduced time to successful weaning. Subsequently, Ely and colleagues<sup>30</sup> reported that a respiratory care-driven weaning protocol that included SBTs significantly shortened time to extubation compared with physician-driven weaning. The data generated by those studies established the use of SBTs as an effective way of achieving early liberation from mechanical ventilation.<sup>28</sup>

### **Evidence Supporting the Pairing of SATs and SBTs: Awakening and Breathing Trial Coordination**

The Awakening and Breathing Controlled (ABC) Trial conducted

by Girard and colleagues<sup>31</sup> advanced the science of sedation and ventilator management by integrating nurses’ role in sedation management with respiratory therapists’ role in ventilator management by studying the pairing of SATs with SBTs. This randomized controlled trial included 336 patients at 5 medical centers in North America. The intervention group in the ABC trial was managed with the “wake up and breathe” protocol, consisting of protocolized coordination of nurse-directed SATs and respiratory therapist-directed SBTs, whereas the control group received patient-targeted sedation according to “usual care” combined with SBTs. The SBTs were accomplished by allowing the patient to breathe through either a T-tube circuit or a ventilator circuit with continuous positive airway pressure of 5 cm H<sub>2</sub>O or pressure support ventilation of less than 7 cm H<sub>2</sub>O. Patients in the intervention arm spent significantly more days breathing without ventilator assistance, were discharged from the ICU and hospital earlier, had shorter duration of coma, and experienced a 14% absolute reduction in the risk of death up to 1 year after study enrollment. Although more patients in the intervention group self-extubated than in the control group, the number of patients who required reintubation was similar. Few other differences were noted between groups in in-hospital adverse events<sup>31</sup> or long-term cognitive or psychological outcomes.<sup>32</sup>

### **Evidence Supporting Delirium Monitoring and Management**

Research conducted in the past decade has consistently shown that

delirium, often referred to as acute brain dysfunction, is a significant problem in ICUs. The prevalence of delirium in adults receiving mechanical ventilation is as high as 83%.<sup>1</sup> Delirium in the ICU is associated with multiple unfavorable outcomes, including higher ICU and hospital costs,<sup>7</sup> longer ICU admissions and overall length of stay,<sup>33,34</sup> greater use of continuous sedation and physical restraints,<sup>35</sup> increased self-removal of catheters and self-extubation,<sup>36</sup> and higher ICU mortality.<sup>2</sup> Additionally, the impact of delirium extends to the postdischarge period. Postdischarge sequelae of delirium include greater likelihood of discharge to a

ventilation in surgical and trauma intensive care units, respectively.<sup>18</sup>

Fortunately, a number of valid and reliable tools are available to screen for delirium in the ICU. Two of the most widely used tools<sup>39</sup> include the Confusion Assessment Method-ICU (CAM-ICU)<sup>40</sup> and the Intensive Care Delirium Screening Checklist (ICDSC).<sup>41</sup> Developed for use in critically ill, nonvocal patients, the CAM-ICU defines delirium in terms of 4 diagnostic features. Delirium is deemed present when a patient displays an acute change or fluctuating course of mental status (feature 1), inattention (feature 2), and either an altered level of consciousness

enrollment (intervention) or to standard care (n=55) with physical therapy and occupational therapy delivered as ordered by the primary care team. Both groups were managed by goal-directed sedation and underwent daily interruption of sedation. Patients in the intervention group had significantly shorter duration of delirium and coma and more ventilator-free days during the 28-day follow-up period than did control patients.

Schweikert et al also reported that intervention patients were more likely to return to independent functional status at hospital discharge than were control patients. This liberation

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## Patients whose daily sedation was interrupted had significantly fewer symptoms of PTSD after critical illness.

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place other than home,<sup>3</sup> greater functional decline,<sup>3</sup> higher 6-month and 1-year mortality,<sup>14</sup> and long-term neurocognitive impairment.<sup>5</sup>

It is essential that providers routinely use valid and reliable tools to assess sedation and screen for delirium. Multiple studies<sup>37,38</sup> report that without the use of these instruments, clinicians miss the vast majority of ICU delirium cases. One potential reason clinicians fail to notice delirium in critically ill patients is because the syndrome is frequently “invisible.” For example, the hypoactive form of delirium, characterized by a depressed level of consciousness and lack of psychomotor agitation, was far more prevalent (64% and 60%) than the mixed (9% and 6%) or purely hyperactive (0% and 1%) forms in patients receiving mechanical

(feature 3) or disorganized thinking (feature 4). The ICDSC contains 8 items that are scored as either 1 (present) or 0 (absent). A total score of 4 or greater is considered positive for delirium. Extensive information on how to use these quick delirium-screening tools successfully is available at [www.icudelirium.org](http://www.icudelirium.org).<sup>42</sup>

### Evidence Supporting Early Mobility

A strategy for whole-body rehabilitation, accomplished by the use of SATs and early exercise and mobilization, was recently reported to be safe and well tolerated by critically ill patients.<sup>6</sup> Schweickert and colleagues<sup>6</sup> randomly assigned subjects to exercise and mobilization (with physical and occupational therapy, n=49) beginning on the day of

and animation strategy led to improvements in functional and cognitive outcomes even though only 33% of intubated patients moved from bed to chair and 15% ambulated. Active movements in bed, dangling, and grooming were the most frequently performed animation activities with intubated patients, actions that the nurse can incorporate into usual care measures such as bathing and repositioning.<sup>43</sup>

Significant improvements in patients' outcomes also were found in a recent quality improvement project that involved the formation of a multidisciplinary team focused on reducing heavy delivery of sedatives, conducting delirium screenings, and increasing the functional mobility of patients receiving mechanical ventilation.<sup>44</sup> The major changes

involved in this project included (1) modifying the standardized medical ICU admission orders to change the default activity level from “bed rest” to “as tolerated,” (2) encouraging a change in sedation practice from using continuous intravenous infusions to “as needed” bolus doses, (3) establishing and disseminating simple guidelines for physical and occupational therapy consultations, (4) developing safety-related guidelines, (5) changing staffing to include a full-time physical therapist and occupational therapist and a part-time rehabilitation assistant, (6) consulting a physiatrist for medical ICU patients receiving rehabilitation therapy, and (7) increasing consultations with neurologists for medical ICU patients with muscle weakness that was deemed severe or prolonged.

When compared with the preintervention period, the quality improvement project demonstrated that benzodiazepine use decreased markedly, patients had improved sedation and delirium status, the median number of rehabilitation treatments per patient was greater with a higher level of functional mobility (treatments involving sitting or greater mobility), and length of stay in the ICU and in the hospital was shorter. This project further demonstrates that a multicomponent, interdisciplinary approach, which includes early mobility, is an important consideration for any ICU.

### **Pulling the Evidence Together: The ABCDE Bundle**

Despite the accumulating evidence of the benefits of SATs, SBTs, delirium monitoring and management, and early mobility protocols

in the past decade, this evidence has not been widely applied in the ICU.<sup>10</sup> For example, a recent survey of 1384 ICU physicians, nurses, respiratory therapists, and pharmacists indicated that 40% of participants did not screen for delirium and almost one-third of the respondents did not use a sedation protocol.<sup>45</sup> Very few (22%) ICU health care providers in this survey reported using SATs on a daily basis, with most reporting SATs occurring on fewer than 75% of all ICU days.<sup>45</sup> Similarly, the use of SBTs among academic ICUs appears low, with rates from 31% to 42%.<sup>46</sup> The use of exercise and early mobility protocols in the ICU is also lacking. For example, a study<sup>47</sup> of critically ill patients showed that 20% of patients received no physical activity and another 15% of patients received only passive range-of-motion exercises during their ICU stay.

To address these deficiencies, leading critical care researchers have promulgated a unified approach to managing ICU-acquired delirium and weakness. First proposed as a model for preventing acute and chronic brain dysfunction in young and elderly ICU patients,<sup>11</sup> the overarching purpose of the ABCDE bundle is to reduce the frequency and magnitude of the adverse outcomes associated with ICU-acquired delirium and weakness. Several guiding principles are behind the ABCDE bundle.<sup>10</sup>

In order for the ABCDE bundle to have its full impact,<sup>10</sup> we recommend that health care providers consider using the bundle every day, in every adult patient admitted to an ICU. In the context of a hospital’s busy ICU care environment, there

will be some patients on any given day that, for legitimate medical or even psychological reasons, may need to refrain or be excluded from participating in certain components of the ABCDE care bundle. Fortunately, the ABCDE bundle was developed in such a way that these patients can be identified safely.

Use of the ABCDE bundle should not depend on an individual physician’s order but rather should be structured as a daily part of care with clearly defined safety guidelines (eg, an “opt-out” rather than “opt-in” approach to care delivery).<sup>10</sup> These safety guidelines should be based on prior research while maintaining enough flexibility for institutions to adapt them to meet the needs of their special populations (eg, neurosurgical or burn unit patients). When medically indicated, the prescriber can opt out of individual components of the ABCDE protocol. Documentation of the individual reasons will further enable the implementation team to understand potential barriers to implementation and will allow for iterative modification of the protocol or training to meet the needs of the local environment. The default must be delivery of the full ABCDE bundle, which puts a premium on coordinated, interdisciplinary care.

Successful implementation of the ABCDE bundle requires effective, frequent communication among a number of different ICU team members and an evolution in critical care team roles.<sup>10</sup> The evidence that sedation, mechanical ventilation, and physical therapy protocols driven by nurses, respiratory therapists, and physical therapists are safe and effective is compelling.<sup>10,20,26,48</sup> The

contribution of a clinical pharmacist is essential not only in developing ICU sedation guidelines, but may assist in monitoring and improving compliance with such guidelines.<sup>49</sup>

As stated previously, the ABCDE bundle comprised 3 distinct, yet highly interconnected, components, including (1) coordination of awakening and breathing trials, (2) monitoring and management of delirium, and (3) early mobility. The interventions in the ABCDE bundle are operationalized. The bundle contains several essential elements that must be carried out for the bundle to be effective. However, the bundle is flexible enough for adaptations needed to meet the needs of patients and staff. In the following section, we outline the essential elements of the ABCDE bundle and give examples of how one institution is currently implementing policies regarding the ABCDE bundle.

### **Procedure for Coordination of Awakening and Breathing Trials**

According to the ABCDE bundle, every patient receiving mechanical ventilation should be evaluated with the ABC protocol (Table 1, Figure 2). This requires establishing a coordinated routine that relies on a number of team members making informed decisions. For example, a registered nurse is primarily responsible for performing the SAT. A respiratory therapist is primarily responsible for performing the SBT. A licensed prescriber makes the decision to extubate the patient. Effective, frequent communication among professionals is necessary for successful implementation of the coordinated SAT and SBT.

The process of coordinating the awakening and breathing trials has 4 major steps (Table 1). The evidence supporting the ABCs is mainly derived from the Awakening and Breathing Controlled Trial.<sup>31</sup> Step 1 is the SAT safety screen. In this step, a nurse determines if it is safe to interrupt sedation by responding to a set of predefined safety questions (Table 1). If any of the SAT safety screen questions are answered yes, the nurse should conclude that it is not safe to shut off the patient's continuous sedative infusions. In the case it is determined to be unsafe, the nurse should continue the patient's sedation regimen and reassess in 24 hours. The interdisciplinary team should also discuss the patient's condition during rounds. If all of the SAT safety questions are answered no, the nurse will conclude that it is safe to perform a SAT and proceed to step 2.

Step 2 involves the nurse performing an SAT. An SAT involves the nurse shutting off all continuous sedative infusions. Continuous analgesic infusions are maintained only if needed for active pain. During the SAT, the nurse should also withhold all sedative boluses. If the patient should complain or show signs or symptoms of pain while the continuous sedative infusion is shut off, the nurse may administer bolus doses of analgesics as needed or ordered.

Next, the nurse determines if the patient tolerated interruption of sedation by assessing if the patient demonstrates any of the criteria for SAT failure described in Table 1. If the patient displays any of those criteria, the nurse should conclude that the SAT has failed. The nurse should then restart the patient's sedation, if

necessary, at half the previous dose, then titrate to the sedation target. The nurse will repeat step 1 in 24 hours. The interdisciplinary team will determine possible causes of the SAT failure during rounds.

At the point that the patient is able to open his or her eyes to verbal stimulation while tolerating the sedatives being turned off (ie, without failure criteria), regardless of trial length, the nurse will conclude that the patient has passed the SAT and ask the respiratory therapist to immediately perform an SBT safety screen. An SAT is also considered "successful" in those patients who after 4 hours do not respond to verbal stimulation, but do not display any of the failure criteria. In this case, the nurse would also ask the respiratory therapist to proceed to step 3.

Step 3 is the SBT safety screen. In this step, the respiratory therapist will determine if it is safe to perform an SBT by responding to a set of predefined safety questions (Table 1). If any of the SBT safety screen questions are answered yes, the respiratory therapist will conclude that it is not safe to perform an SBT. The respiratory therapist will continue mechanical ventilation and repeat step 3 in 24 hours. The respiratory therapist will ask the nurse to restart sedatives at half the previous dose only if needed, and titrate to the lowest necessary dose to maintain the sedation target. The interdisciplinary team will discuss the patient's condition during rounds. If all of the questions are answered no, the respiratory therapist will conclude that it is safe to perform an SBT and proceed to step 4.

Step 4 involves performing an SBT. In this step, the respiratory

**Table 1** Steps involved in coordinating awakening and breathing trials<sup>a,b</sup>

**Step 1. Spontaneous Awakening Trial (SAT) Safety Screen, Nurse-Driven: The nurse will determine if it is safe to interrupt sedation by responding to a set of predefined safety screening questions. For example,**

1. Is patient receiving a sedative infusion for active seizures?<sup>a</sup>
2. Is patient receiving a sedative infusion for alcohol withdrawal?<sup>a</sup>
3. Is patient receiving a paralytic agent (neuromuscular blockade)?<sup>a</sup>
4. Is patient's score on the Richmond Agitation Sedation Scale (RASS) >2?<sup>a</sup>
5. Is there documentation of myocardial ischemia in the past 24 hours?<sup>a</sup>
6. Is patient's intracranial pressure (ICP) >20 mm Hg?<sup>a</sup>
7. Is patient receiving sedative medications in an attempt to control intracranial pressure?<sup>b</sup>
8. Is patient currently receiving extracorporeal membrane oxygenation (ECMO)?<sup>b</sup>

**Step 2. Perform SAT—Nurse-Driven: The nurse will determine if the patient tolerated interruption of sedation by assessing if the patient demonstrates any predefined criteria for SAT failure. For example,**

1. RASS score >2 for 5 minutes or longer<sup>a</sup>
2. Pulse oximetry reading <88% for 5 minutes or longer<sup>a</sup>
3. Respirations >35/min for 5 minutes or longer<sup>a</sup>
4. New acute cardiac arrhythmia<sup>a</sup>
5. ICP >20 mm Hg<sup>b</sup>
6. 2 or more of the following symptoms of respiratory distress<sup>a</sup>:  
Heart rate increase 20 or more beats per minute, heart rate less than 55 beats per minute, use of accessory muscles, abdominal paradox, diaphoresis, dyspnea

**Step 3. Spontaneous Breathing Trial (SBT) Safety Screen, Respiratory Therapist-Driven: The respiratory therapist will determine if it is safe to perform an SBT by responding to a set of predefined safety questions. For example,**

1. Is patient a long-term/ventilator-dependent patient?<sup>b</sup>
2. Is patient's pulse oximetry reading <88%?<sup>a</sup>
3. Is patient's fraction of inspired oxygen (FiO<sub>2</sub>) >50%?<sup>a</sup>
4. Is patient's set positive end-expiratory pressure (PEEP) >7 cm H<sub>2</sub>O?<sup>a,b</sup>
5. Is there documentation of myocardial ischemia in the past 24 hours?<sup>a</sup>
6. Is patient's ICP >20 mm Hg?<sup>a</sup>
7. Is patient receiving mechanical ventilation in an attempt to control ICP?<sup>b</sup>
8. Is the patient currently taking vasopressor medications?<sup>a,b</sup>
9. Does the patient lack inspiratory effort?<sup>a</sup>

**Step 4. Perform SBT, Respiratory Therapist-Driven: The respiratory therapist will determine if the patient tolerated the SBT by assessing if the patient demonstrates any predefined criteria for SBT failure. For example,**

1. Respiratory rate >35 breaths per minute for 5 minutes or longer<sup>a</sup>
2. Respiratory rate <8/min<sup>a</sup>
3. Pulse oximetry reading of <88% for 5 minutes or longer<sup>a</sup>
4. ICP >20 mm Hg<sup>b</sup>
5. 2 or more of the following symptoms of respiratory distress<sup>a</sup>
  - a. Use of accessory muscles
  - b. Abdominal paradox
  - c. Diaphoresis
  - d. Dyspnea
  - e. Abrupt changes in mental status
  - f. Acute cardiac arrhythmia

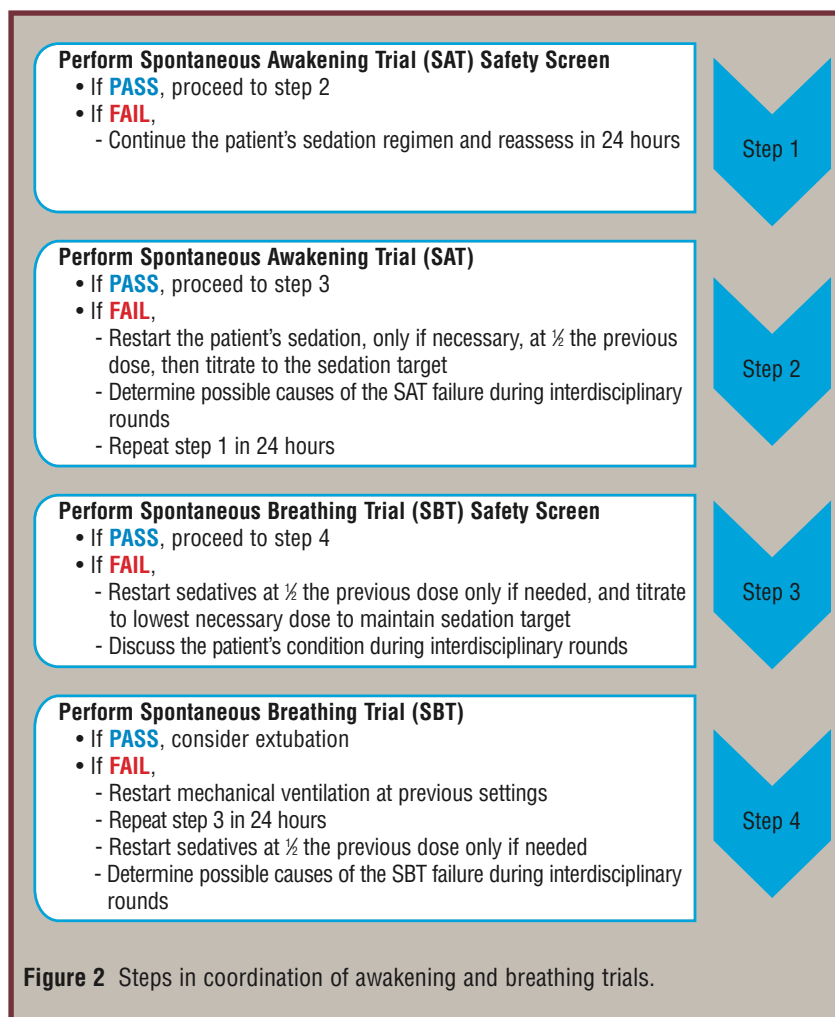
<sup>a</sup> Criteria used in the Awakening and Breathing Controlled Trial (evidence-based).<sup>31</sup>

<sup>b</sup> Criteria added by example institution after interdisciplinary discussion.

therapist will start the patient on an SBT (eg, change ventilator settings to continuous positive airway pressure support 5, positive end-expiratory pressure 5, use T-piece). The respiratory therapist will determine if the patient tolerated the SBT by assessing if the patient exhibits any of the criteria for SBT failure (Table 1). If the

patient displays any of the criteria for SBT failure, the respiratory therapist will conclude that the SBT has failed and restart mechanical ventilation at previous settings. The respiratory therapist will inform the nurse of the SBT failure and remind the nurse to restart sedatives at half the previous dose only if needed.

The nurse and respiratory therapist will evaluate the patient again in 24 hours, starting with step 1. The interdisciplinary team will determine possible causes of the SBT failure during rounds. If the patient tolerates spontaneous breathing for 30 to 120 minutes without failure criteria, the respiratory therapist will inform



the nurse and the physician that the patient's SBT was successful. The ABC trial used the 2-hour time frame for establishing extubation readiness, whereas Esteban and colleagues<sup>11</sup> reported that patients who were extubated after successfully completing a 30-minute SBT had reintubation rates similar to the rates for patients who were not extubated until they completed a 120-minute

trial. At this time, the physician should consider extubation.

### Essential Elements of Delirium Monitoring and Management

According to the ABCDE bundle, every patient admitted to an adult ICU should undergo routine sedation/agitation and delirium assessment by using standardized, validated assessment tools. We suggest that the nurse use a validated sedation scale and record the results every 2 to 4 hours along with vital signs. We also suggest that the nurse perform and record the results of the delirium assessment (CAM-ICU or ICDS) at least once per shift and

whenever a patient experiences a change in mental status.

To facilitate communication among the interdisciplinary team, the ICU team should set a "target" sedation/agitation score at which the patient should be maintained for the following 24 hours. Each day during interdisciplinary rounds, the nurse will inform the team of the patient's: (1) "target" sedation score, (2) actual sedation/agitation score, (3) delirium status, and (4) exposure to sedative and analgesic medications (Figure 3). A number of valid and reliable tools can be used to facilitate goal-directed titration of doses of sedative medications, including the Richmond Agitation Sedation Scale,<sup>50</sup> Sedation-Agitation Scale,<sup>51</sup> Adaption to the Intensive Care Environment,<sup>52</sup> Motor Activity Assessment Scale,<sup>53</sup> Vancouver Interaction and Calmness Scale,<sup>54</sup> and others.

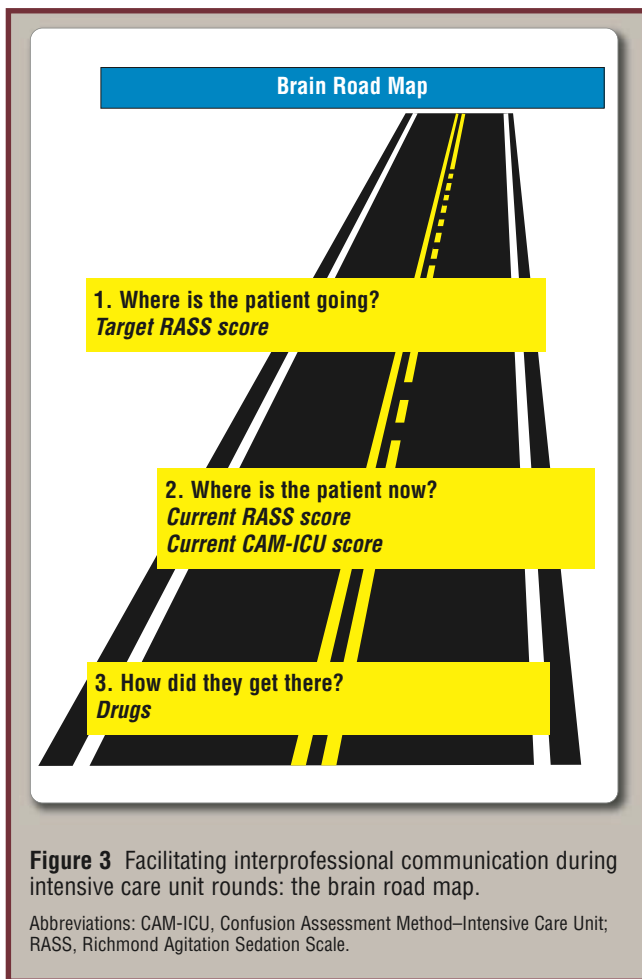
Because the management of delirium is focused on identifying and treating the actual cause of the syndrome, each day during interdisciplinary rounds, the team should also discuss possible causes of the patient's delirium. One useful acronym for the team is to "THINK" when a patient is delirious (Table 2), a cognitive script meant to prompt the team to think of the underlying cause(s) contributing to the patients newly developed or ongoing delirium.

Finally, although it is beyond the scope of this article to address the nonpharmacological management of delirium, a number of excellent references specifically address this issue.<sup>55,56</sup> Although most nonpharmacological interventions for delirium have been studied in geriatric



To learn more about caring for nonvocal patients in the critical care setting, read "Nurse-Patient Communication Interactions in the Intensive Care Unit" by Happ et al in the *American Journal of Critical Care*, 2011;20:e28-e40. doi:10.4037/ajcc2011433. Available at [www.ajconline.org](http://www.ajconline.org).





populations, they should still be considered in the routine care of all critically ill patients. We suggest that the interdisciplinary team should always consider the use of nonpharmacological strategies and modification of risks first when caring for a patient with delirium.

### Essential Elements of Early Mobility

In the ABCDE bundle, patients are candidates for mobilization when they meet certain criteria (Table 3). These criteria were developed from some of the evidence supporting early mobility protocols.<sup>44,47,57,58</sup> We suggest that exceptions to these criteria should be permitted only by specific written order by the prescriber (eg,

**Table 2** What to “THINK” when your patient is delirious

Toxic situations and medications: congestive heart failure, shock, dehydration, new organ failure (eg, liver, kidney), deliriogenic medications

Examples of deliriogenic medications include benzodiazepines, anticholinergic medications, and steroids

Hypoxemia

Infection/sepsis (nosocomial), inflammation, immobilization

Nonpharmacological interventions

K+ [potassium] or other electrolyte interventions

skin integrity issues). The interdisciplinary care team assesses the patient’s readiness for mobility. The team includes a physical therapist who assesses the patient’s physical ability to participate, a nurse who assesses physiological stability, and a respiratory therapist

who is responsible for maintaining the patient’s airway.<sup>59</sup> In addition, a critical care physician confirms that no clinical contraindications to physical activity are present.

A number of resources describing early mobility procedures can be found in the ICU literature.<sup>58,60-62</sup> An example protocol that incorporates the best of this evidence is provided by the Agency for Healthcare Research and Quality.<sup>59</sup> According to this protocol, each patient is assessed upon admission to the ICU, and patients who qualify immediately begin the protocol. Those who are not eligible are reassessed during

**Table 3** Minimum criteria for early mobility protocol<sup>a,b</sup>

N – Neurological

- a. Patient responds to verbal stimulation (ie, RASS score > -3)<sup>a</sup>
- (1) Activity not started in comatose patients (RASS score -4 or -5)<sup>a</sup>

R – Respiratory

- a.  $FiO_2 < 0.6^a$
- b. PEEP < 10 cm H<sub>2</sub>O<sup>a</sup>

C – Circulatory/central catheters/contraindications

- a. No increase dose of any vasopressor infusion for at least 2 hours<sup>a</sup>
- b. No evidence of active myocardial ischemia<sup>a</sup>
- c. No arrhythmia requiring the administration of a new antiarrhythmic agent<sup>a</sup>
- d. Not receiving therapies that restrict mobility (extracorporeal membrane oxygenation, open-abdomen, intracranial monitoring/drainage, femoral arterial catheter)<sup>b</sup>
- e. No injuries in which mobility is contraindicated (eg, unstable fractures)<sup>b</sup>

Abbreviations:  $FiO_2$ , fraction of inspired oxygen; PEEP, positive end-expiratory pressure; RASS, Richmond Agitation Sedation Scale.

<sup>a</sup> Criteria used in prior studies by Needham et al,<sup>44</sup> Thomsen,<sup>47</sup> and Bailey et al.<sup>57</sup>

<sup>b</sup> Criteria added by institution after interdisciplinary discussion.

**Table 4** Examples of criteria for halting early mobility<sup>a</sup>

Symptomatic decrease in mean arterial pressure  
Heart rate <50 or >130 beats per minute for 5 minutes  
Respiratory rate <5 or >40 breaths per minute for 5 minutes  
Systolic blood pressure >180 mm Hg for 5 minutes  
Pulse oximetry reading <88% for 5 minutes  
Marked ventilator dyssynchrony  
Patient distress  
New arrhythmia  
Concern for myocardial ischemia  
Concern for airway device integrity  
Fall to knees  
Endotracheal tube removal

<sup>a</sup> Developed from studies by Needham et al,<sup>44</sup> Bailey et al,<sup>57</sup> and Morris et al.<sup>58</sup>



**Figure 4** Early mobility hierarchy.



**Figure 5** Rounds in intensive care unit.

daily rounds. If activity has been halted because of an acute event (see examples in Table 4), the patient is reevaluated each day until the protocol can be reinstated. Each eligible patient is encouraged to be mobile at least once a day, with the specific level of activity geared to his or her readiness. Patients progress through a 3-step process, embarking on the highest level of physical activity they can tolerate, as outlined in Figure 4. The authors suggest

that the use of the protocol ends when the patient is discharged from the ICU, at which point the accepting team assumes responsibility for determining the patient's physical and cognitive needs.

### **Conclusion: Nurses' Unique Contribution**

Successful implementation of a complex bundle requires (1) high-quality, timely, and reliable completion of independent tasks by trained individuals; (2) effective communication between individuals to ensure the proper order and sequence of the individual components; and (3) effective leadership that can mold and adapt implementation to meet the needs of the local culture/environment and provide ongoing support, resources, and training.

The ABCDE bundle is indeed complex, although successful implementation holds potential for tremendous benefit to our sickest patients. Nurses play a unique role in the implementation of the ABCDE bundle as they are critical to all requirements for successful implementation. Registered nurses lead protocol-guided sedation efforts that include daily SATs and measurement of delirium and sedation/agitation by using validated instruments. The nurse is also the communication link between each of the individual specialties. Decisions to advance to subsequent steps of the ABCDE bundle with SBT, early mobility, and extubation are dependent upon the nurse's assessments of level of consciousness, pain, and other clinical parameters communicated to respiratory therapists, physical therapists, and physicians, respectively. Finally, and equally

important, nurses are well suited to the leadership roles required to individualize the ABCDE bundle to the institution. Nurses understand the local context for implementation and can provide critical insights into the resources and training required for implementation of the bundle.

In conclusion, the health of our patients depends on the successful integration of many moving parts. The development or prevention of ICU-acquired delirium and weakness exemplifies the failure or success of a coordinated approach to care. Similarly, successful implementation of the ABCDE bundle will reflect effective coordination and leadership, a role that nurses are uniquely positioned to fill (Figure 5). **CCN**

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### Acknowledgments

The authors acknowledge the support of the Robert Wood Johnson Foundation Interdisciplinary Nursing Quality Research Initiative and the Nebraska Medical Center for their assistance in implementing the ABCDE bundle into ICU practice.

### Financial Disclosures

Drs Balas and Burke are co-principal investigators of a Robert Wood Johnson Foundation Interdisciplinary Nursing Quality Research Initiative grant titled "Implementation and Dissemination of an Interdisciplinary Nurse-Led Plan to Manage Delirium in Critically Ill Adults." Funding for Drs Ely and Vasilevskis has been provided by the National Institutes of Health (K23AG040157, 1R01AG027472-01A1, 1R01AG035117-01A1), the Veterans Affairs Clinical Research Center of Excellence, and the Tennessee Valley Veterans Administration Geriatric Research Education Clinical Center.

Dr Ely consulted for or received honoraria/grants from Hospira, Eli Lilly, Cumberland, and Masimo. The content of this article is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Aging, the National Institutes of Health, or the US Department of Veterans Affairs. Ms Boehm and Ms Pun have received honoraria from Hospira.

Dr Olsen receives grant funding from Carmel-Pharma, Astellas Inc, Sanofi-Pasteur, and Otuska Inc.

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**CE Test** Test ID C1223: Critical Care Nurses' Role in Implementing the "ABCDE Bundle" Into Practice

**Learning objectives:** 1. Identify factors that place critically ill patients at high risk for developing delirium and weakness; their impact on long-term physical, functional, and cognitive outcomes; and the potential societal burdens associated with these conditions 2. Describe the essential components of the ABCDE bundle of evidence-based practice 3. Discuss the role of critical care nurses in implementation of the ABCDE bundle

1. Patients whose sedation is interrupted daily have a decreased likelihood for which of the following sequelae of mechanical ventilation?

- a. Discharge to a place other than home
- b. Long-term neurocognitive impairment
- c. Symptoms of posttraumatic stress disorder
- d. One-year mortality

2. Which class of medications is associated with an increased risk of intensive care unit (ICU) acquired delirium?

- a. Sedative-hypnotics
- b. Opioids
- c. Narcotic analgesics
- d. Benzodiazepines

3. The prevalence of delirium in adults receiving mechanical ventilation is as high as what percentage?

- a. 73%
- b. 78%
- c. 83%
- d. 88%

4. If a patient shows signs and symptoms of pain during a spontaneous awakening trial, the nurse should do which of the following?

- a. Administer bolus doses of analgesic medications as needed
- b. Administer bolus doses of sedative medications as needed
- c. Restart the patient's continuous analgesic infusion at half the previous dose
- d. Restart the patient's continuous sedative infusion at the previous dose

5. When do the authors recommend ending the use of an early mobility protocol?

- a. When the patient is extubated and is no longer receiving mechanical ventilation
- b. When the patient is discharged from the ICU
- c. When the patient is discharged from the hospital
- d. When the patient has successfully completed the protocol's highest activity level

6. How often are patients who meet criteria for early mobilization encouraged to be mobile?

- a. At least once every 8 hours
- b. At least once every 12 hours
- c. At least once a day
- d. As often as tolerated

7. The patient must be assessed by the interdisciplinary team before delivery of which component of the ABCDE bundle?

- a. Awakening and breathing coordination
- b. Delirium monitoring
- c. Delirium management
- d. Early mobility

8. Which of the following is recommended after successful completion of a spontaneous breathing trial?

- a. Restart mechanical ventilation at previous ventilator settings, and restart the patient's sedation at half the previous dose only if needed
- b. Restart mechanical ventilation with ventilator settings of 5 for both continuous positive airway pressure support and positive end-expiratory pressure, and restart the patient's sedation at half the previous dose only if needed
- c. Restart mechanical ventilation with ventilator settings of 5 for both continuous positive airway pressure support and positive end-expiratory pressure, but do not restart the patient's sedation
- d. Consider extubation of the patient

9. Implementation of the ABCDE bundle should include use of standardized and validated tools for assessment of which of the following?

- a. Delirium and sedation/agitation
- b. Sedation/Agitation and muscle weakness
- c. Functional mobility and fall risk
- d. Fall risk and delirium

10. Which of the following statements regarding ICU-acquired delirium is true?

- a. The hyperactive form of delirium is more prevalent than the mixed form of delirium, and it is frequently misdiagnosed as agitation rather than delirium.
- b. Routine use of a valid and reliable tool to screen for delirium is likely to result in identification of more cases of the hypoactive form of delirium than cases of the mixed form of delirium or the purely hyperactive form of delirium.
- c. The mixed form of delirium is characterized by a depressed level of consciousness and a lack of psychomotor agitation, and it is the most prevalent form of delirium in patients receiving mechanical ventilation.
- d. The mixed form of delirium is the form most likely to be recognized by health care providers because it is characterized by a fluctuating course of mental status and increased psychomotor agitation in the early evening hours.

11. The authors recommend that the ABCDE bundle be implemented on which group of patients?

- a. All intubated ICU patients, with or without an individual physician's order
- b. All ICU patients deemed eligible by the implementation team
- c. All patients whose prescriber has not "opted out" of implementation of the bundle
- d. All ICU patients whose prescriber has "opted in" for implementation of all or part of the bundle

12. For what purpose was the ABCDE bundle first proposed?

- a. Increased implementation of a set of evidence-based practices that are known to improve patients' outcomes when performed collectively and reliably
- b. Reduction in the societal burden associated with the adverse outcomes resulting from ICU-acquired delirium and weakness
- c. Prevention of the cycle of oversedation and prolonged mechanical ventilation in adult ICU patients
- d. Prevention of brain dysfunction in young and elderly ICU patients

13. The THINK acronym is a tool for aiding in identification of what?

- a. Nonpharmacological strategies for treatment of delirium
- b. Underlying causes contributing to delirium
- c. Patient eligibility for early mobility based on evidenced-based criteria
- d. Patient's "on-target" sedation level and the appropriate administration of sedative medication to reach that target

Test answers: Mark only one box for your answer to each question. You may photocopy this form.

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## **Critical Care Nurses' Role in Implementing the "ABCDE Bundle" Into Practice**

Michele C. Balas, Eduard E. Vasilevskis, William J. Burke, Leanne Boehm, Brenda T. Pun, Keith M. Olsen, Gregory J. Peitz and E. Wesley Ely

Crit Care Nurse 2012;32 35-47 10.4037/ccn2012229

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