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Extending the ABCDE Bundle to the Post-Intensive Care Unit Setting

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Abstract

A recently proposed interprofessional, evidence-based, multicomponent approach to mitigating the effects of intensive care unit (ICU) acquired delirium and weakness has the potential to radically transform the way care is delivered to older adults requiring sedation and/or mechanical ventilation. The Awakening and Breathing Coordination, Delirium Monitoring and Management, and Early Mobility (ABCDE) bundle empowers members of the interdisciplinary ICU team to implement the best available evidence regarding mechanical ventilation, sedation, weakness, and delirium in a safe, effective, and patient-centered manner. Considering that critically ill older adults are cared for in a number of different settings during the course of hospitalization and recovery, the purpose of this paper is to explore the rationale and possible benefits of extending the ABCDE bundle into the post-ICU setting. We provide a case study that illustrates how ABCDE bundle adoption could be the key to improving the quality of care provided to seriously ill older adults in the ICU and beyond.

Older adults requiring mechanical ventilation (MV) are at risk for numerous adverse outcomes including increased short and long-term mortality, profound neuropsychological impairment, substantial functional decline, and frequent readmission to hospitals and skilled nursing facilities (Barnato, Albert, Angus, Lave, & Degenholtz, 2011; Jackson et al., 2003; Wunsch et al., 2010). This increase in morbidity, mortality, and resource utilization contributes to the enormous human and societal costs associated with the provision of MV. It is estimated that by the year 2020 the expected annual hospital cost associated with MV for 96 hours will exceed \$64 billion (Zilerberg & Shorr, 2008). Similarly, the number of discharges to skilled nursing facilities for this same population is expected to exceed

200,000 in the year 2020, compared to 90,928 in the year 2000. There is a clear need for interprofessional, evidence-based strategies aimed at reducing the frequency and complications associated with MV in the older adult population.

The Awakening and Breathing Coordination, Delirium Monitoring and Management, and Early Mobility (ABCDE) bundle is an evidence-based, interprofessional, multicomponent approach aimed at improving the quality of care and clinical outcomes of mechanically ventilated patients (Morandi, Brummel, & Ely, 2011; Pandharipande, Banerjee, McGrane, & Ely, 2010; Vasilevskis et al., 2010). The ABCDE bundle was proposed in recognition of the complex, interconnected relationship between MV, sedation, delirium, and weakness and their effect on patient outcomes (see Figure 1). The ABCDE bundle seeks to reduce the risk for ICU-acquired delirium and weakness by reducing and or removing sedation and MV therapy in a structured, standardized process, while simultaneously promoting delirium monitoring and early mobility (Vasilevskis et al., 2010). For example, patients historically received continuous infusions of sedatives and analgesics in an attempt to prevent anxiety and pain, provide amnesia, reduce ventilator asynchrony, and decrease oxygen consumption (Kress, Pohlman, & Hall, 2002; Sessler & Pedram, 2009), yet excessive doses and duration of these medications have also been linked to the development of ICU delirium (Jones & Pisani, 2012). In addition, over-sedation and the duration of MV are associated with immobility and the development of ICU-acquired weakness (Hopkins & Spuhler, 2009) which further contribute to physical, functional, and cognitive morbidity. Timely reduction and removal of each of these factors can be safely performed in a standardized way, to maximize benefit, without reported increases in harm.

While the ABCDE bundle was originally intended to be used with critically-ill, mechanically ventilated patients, we believe an opportunity exists to extend its use beyond the borders of the ICU. We also argue that older adults, in particular, would benefit from a unified approach to preventing and managing delirium and weakness associated with surgery, serious illness, sedation and/or previous MV. Here we present a clinical case study and discussion that illustrates how the framework of the ABCDE bundle could be applied outside the ICU setting.

Case Study

Jim was a relatively healthy 83 year old man without a history of cognitive or functional impairment. Jim was at home helping his wife paint their barn when he fell off a 12 foot ladder onto a pile of firewood. The ambulance was called to his residence because of his complaints of severe left-sided chest pain and difficulty breathing. Upon arrival to the emergency department, Jim received a Chest X-ray that revealed multiple left-sided rib fractures without evidence of a pneumothorax. Chest and abdominal computed tomography (CT) scans revealed no further abnormalities. After receiving 4 mg of morphine sulfate, Jim rated his pain an 8 out of 10. The pain inhibited him from taking deep breaths and his oxygen saturation on 2 liters nasal cannula was 92%. Because of his age, injuries, and oxygen requirements, Jim was admitted to a step-down unit for close monitoring.

Jim struggled with pain control issues for the first 24 hours of his step-down unit stay. After receiving multiple boluses of PRN (when necessary) morphine, Jim was started on intravenous hydromorphone via a patient controlled analgesia pump. Although Jim's pain control improved, it was still severe enough to prevent use of the inspiratory spirometer or engagement in physical activity. He also reported being extremely tired and unable to sleep. Jim's nurse obtained an order for a medication to help him sleep and asked physical therapy (PT) to defer evaluating him until the pain was better controlled.

The next day Jim became acutely confused. He had difficulty following conversations and was not sure where he was or why he was in the hospital. He also had no recollection of the fall and appeared very restless. His respiratory rate was elevated and his oxygen requirements increased to 4 liters. To evaluate his mental status changes, the doctors ordered a CT scan of Jim's head which was read as "negative". A repeat chest X-ray showed mild bilateral atelectasis. Throughout the night, Jim became more tachypneic and kept screaming out for help stating "someone is stabbing me in the chest". Jim's nurse relayed these findings to his doctor who ordered lorazepam and haloperidol PRN until they could evaluate him more fully in the morning. Jim's agitation worsened, requiring escalating doses of lorazepam and haloperidol to remain calm. At a subsequent nurse check-in, Jim was found unarousable. A rapid response was called and Jim was intubated for airway management. He was then transferred to the hospital's ICU.

Jim's condition deteriorated over the next several days and he was eventually diagnosed as having Adult Respiratory Distress Syndrome (ARDS). He required MV support and high doses of continuously infused narcotics and sedatives to maintain adequate oxygen saturation. After a week on the ventilator, Jim began to make steady progress but received a tracheostomy to facilitate ventilator weaning. Nursing staff asked PT to defer seeing Jim as the physician had ordered him to be on bed rest and they were still having a hard time keeping him calmly sedated on continuous sedative and analgesic drips. Because of the severity of his initial lung injury, the physicians decided to wean him from the ventilator "very slowly". On day 10 of his ICU stay, all continuous sedative drips were discontinued and he was changed to PRN lorazepam, haloperidol, and morphine. Jim remained on bed rest throughout his ICU stay and was eventually transferred to a long-term acute care hospital (LTACH) for MV weaning.

During his time in the LTACH, Jim vacillated between periods of agitation and lethargy. The LTACH did not use standardized delirium and/or sedation screening instruments and staff assumed that Jim's cognitive problems were chronic in nature. He had PRN orders for lorazepam, morphine, haloperidol, diphenhydramine, and quetiapine continued from the hospital, all of which were given at the frequency they were allowed. His medication regimen included a total of 20 regularly scheduled and PRN medications. Jim consistently lay in bed all day in a darkened room, not eating and not participating in therapy or engaging with nursing staff. At times he did not even acknowledge the presence of his wife. He was unable to make progress weaning from the mechanical ventilator and twenty days after LTACH admission Jim passed away from presumed pulmonary emboli.

The ABCDE Bundle in the ICU

Stories of lost opportunities, like Jim's, are unfortunately common in our often fragmented healthcare delivery system. A primary focus of the ABCDE bundle is to recognize the importance of improving the “back-end” of critical care. That is, the period of care that directly follows aggressive diagnostic and therapeutic measures provided in the first day(s) of the hospital/ICU course. During this “front-end” period, patients are subject to many aggressive life-saving diagnostic and therapeutic measures (e.g. continuous sedation, bed rest, MV, etc.). The benefits of each of these processes are dependent entirely on patient need. When patients no longer need them, what was once a life-saving intervention can quickly transform into iatrogenic injuries that include acute and chronic cognitive and functional impairments. The ABCDE bundle in the ICU is structured in a way to reduce the potential for iatrogenic injury by means of: (1) standardizing and coordinating care processes that synergistically reverse the cycle of over-sedation, MV, and immobilization, (2) empowering nurses, respiratory therapists, and physical therapists to manage those care processes, and (3) ensuring that these processes are the default option, unless clear safety concerns preclude completion. A description of these processes in the ICU setting is provided in Table 1 and discussed more fully in a previous article describing critical care nurses' role in implementing the ABCDE bundle (Balas, 2012).

The “A” in the ABCDE bundle acronym stands for *Awakening*. Both sedative and opioid medications possess delirigenic properties (Patel & Kress, 2012) and their over-use is associated with numerous adverse outcomes including an increase: in the duration of MV, prolonged length of stay, risk of nosocomial complications, and need for additional diagnostic testing (Kollef et al., 1998; Jacobi et al., 2002). Because of these risks, the current American College of Critical Care Medicine's (AACM) guidelines for the sustained use of sedatives and analgesics in the critically ill adult recommends both pain and sedation be regularly documented and assessed using valid and reliable tools and that the ICU team should establish a sedation goal, which is regularly redefined, for each patient (Jacobi et al., 2002).

One possible strategy for accelerating recovery in patients like Jim is the regular interruption of sedative and opioid infusions. The use of spontaneous awakening trials (SATs), or holding continuous sedative infusions once a day until the patient was “awake”, was found to led to statistically significant reductions in both the duration of MV and ICU LOS (Kress, Pohlman, O'Connor, & Hall, 2000). Importantly, the use of SATs was *not* associated with post-traumatic stress disorder (PTSD), cardiac ischemia, increase rates of agitation-related complications, or self-device removal (Kress et al., 2000; Kress et al., 2003; Kress et al., 2007); suggesting SATs are safe for everyday clinical practice.

In Jim's case, it is probable that the medications he received both during his ICU stay and in the LTACH contributed to his altered mental status and need for prolonged MV. Jim's struggle with pain during his pre-ICU period also likely contributed to his lack of sleep, inability to perform incentive spirometry, reluctance to participate in PT, and eventually provoked the administration of non-opioid sedatives. All of these factors likely contributed to the development of ARDS and need for MV. If the interdisciplinary team communicated

more effectively, and explored alternative means of pain control (e.g., patient controlled epidural anesthesia), it is possible this vicious cycle may have been interrupted. While we acknowledge that Jim may have needed continuous infusions of sedatives and narcotics during fulminant ARDS, we believe an opportunity existed to reduce the amount of sedatives by using SATs once his pulmonary condition began to improve.

The “B” in the ABCDE bundle acronym stands for *Breathing*. Because the term “weaning” implies that removal from the ventilator should be a gradual process, it has been suggested this term be replaced by “discontinuation” (MacIntyre et al., 2001). This change in terminology is important because it is increasingly recognized that delays in the discontinuation process, like Jim experienced, contribute to prolonged MV, pneumonia, and airway trauma (MacIntyre et al., 2001).

One possible strategy to facilitate MV discontinuation in patients like Jim is the use of spontaneous breathing trials (SBTs). An early randomized control trial that explored the effect of a respiratory care-driven weaning protocol using SBTs compared to routine care found that patients treated with the protocolized SBT were significantly more likely to have shorter duration of MV and were less likely to require reintubation (Ely et al., 1996). In addition to significant cost savings, patients treated with the respiratory therapy driven SBT protocol were less likely to receive prolonged MV (i.e. longer than 21 days). Because of the proven effectiveness, the use of interdisciplinary protocols to guide MV discontinuation in patients like Jim is guideline recommended and increasingly common (Luetz, Goldmann, Weber-Carstens, & Spies, 2012).

The “C” in the ABCDE bundle acronym stands for *Coordination*. Given that SATs and SBTs were both found to reduce the duration of MV, Girard and colleagues (2008) studied the effect of combining SATs and SBTs vs. routine sedation and SBTs. Patients treated with the pairing experienced more ventilator free days, were discharged from the ICU and hospital earlier, spent less days in a coma, and were more likely to be alive at one year compared to controls. In Jim's case, this pairing would have occurred once he was able to pass both the SAT and SBT safety screens (see Table 1).

The “D” in the ABCDE bundle acronym stands for *Delirium* monitoring and management. Affecting up to 80% of all mechanically ventilated ICU patients (Ely et al., 2004), delirium is associated with numerous adverse outcomes including prolonged hospital stay, post-discharge institutionalization, more days requiring MV, increased risk of death, higher costs, and neurocognitive decline (Jones & Pisani, 2012). While there are numerous risk factors for ICU delirium, the evidence strongly suggests that both minimization of sedation and choice of agent may affect delirium occurrence and persistence (Patel & Kress, 2012). Medications associated with the development and/or persistence of ICU delirium include the benzodiazepines, opioids, and haloperidol, many of which Jim received during his 1 hospitalization (Jones & Pisani, 2012).

The ACCM's current guidelines recommend ICU providers perform routine delirium assessment (Jacobi et al., 2002) because without active monitoring delirium goes undiagnosed in up to 72% of cases (van Eijk et al., 2011). Two of the most frequently used,

valid and reliable delirium assessment tools in the ICU setting are the *Confusion Assessment Method-ICU* (Ely et al., 2001) and the *Intensive Care Delirium Screening Checklist* (Bergeron, Dubois, Dumont, Dial, & Skrobik, 2001). Once patients like Jim are screened, the results of the delirium assessment should be communicated on daily interdisciplinary rounds where the team can then focus on identifying potential causes and treatment strategies (Balas, 2012).

The “E” in the ABCDE bundle stands for *Early Mobility*. Bed rest is associated with numerous adverse effects including: pressure ulcers, atelectasis, pneumonia, orthostatic intolerance, and decreased insulin sensitivity (Truong, Fan, Brower, & Needham, 2009). Immobility is also associated with substantial neuromuscular weakness that is common, persistent, and severe (Truong et al., 2009). Prior research suggests that up to 60% of all critically ill patients, like Jim, will develop ICU-acquired weakness, which prolongs MV, hospital LOS, and increases the likelihood of death (Morandi et al., 2011).

Early mobilization is intended to mitigate the effects of ICU-acquired weakness. Schweickert and colleagues (2009) studied the effect of combining SATs with physical and occupational therapy assisted exercise and mobilization. Compared to patients receiving routine care, patients receiving early mobilization were found to be much more likely return to independent functional status at hospital discharge and experienced more ventilator-free days. Mobilized patients also had shorter duration of delirium (2 vs. 4 days). This finding is particularly important considering that in a critically ill older population each day spent delirious increases the risk of death within 1 year by 10% (Pisani et al., 2009).

Extending the ABCDE Bundle to the Post-ICU Setting

Older adults like Jim who are recovering from or receiving prolonged MV are cared for in a variety of post-ICU settings including the general medical/surgical ward, LTACHs, skilled nursing, rehabilitation, and home care (Unroe et al., 2010). For many of these patients, the time of ICU discharge is a particularly chaotic and potentially error prone period. Nurses can ease this transition through careful assessment of need and application of the ABCDE bundle.

It is essential that nurses in the critical care and post-ICU care settings communicate with each other about events that took place during their patient's ICU stay. In terms of “awakening”, a discussion of what kind of sedative, antipsychotic, and pain medications the patient received is particularly relevant. For “breathing”, the nurses should focus on what discontinuation strategies were used to date, the patients response to the treatment, ongoing risks to airway (e.g. secretions, dysphagia) and possible reasons for ventilator dependence (i.e. nutritional status, chest X-ray findings). The contribution of other disciplines, in terms of care “coordination” and planning, should be discussed. “Delirium” occurrence, duration, and treatment during the ICU stay are important factors to relay. Finally, the patient's mobility level and exercise tolerance should be communicated. Table 2 provides further examples of questions to facilitate the transfer of care of patients to the post-ICU setting. The following section will offer suggestions as to how Jim's care could have been improved by using the ABCDE bundle outside the ICU setting.

Awakening

Patients like Jim rarely receive continuous IV sedation outside the ICU. The use of PRN medications to treat pain, anxiety, and delirium, however, is common throughout care settings (Morandi et al, 2011). Because of the benefits associated with sedation minimization (Riker & Fraser, 2011), we believe patients in the post-ICU setting should also undergo daily “awakening” trials. Similar to SATs in the ICU, this awakening period should be guided by a process that helps the nurse determine first if it is “safe” to hold sedative medications and then objectively defines what an awakening “failure” means. This process should be guided by the use of valid and reliable sedation and pain assessment scales.

Benzodiazepines, antipsychotics, and medications with anticholinergic properties should be considered particularly high risk in the older adult population (Morandi et al., 2011; American Geriatrics Society, 2012). In addition to being potentially deliriogenic, there is evidence that their administration actually interrupts the restorative function of normal sleep (Weinhouse & Watson, 2009). Successfully implemented nonpharmacologic sleep strategies such as unit-wide noise reduction strategies, relaxation tapes, massage, and ear plugs to promote daytime awakening are therefore warranted (Inouye et al., 1999; Mudge, Maussen, Duncan, & Denaro, 2012). A pharmacy consult or use of computer based alert system (Agostini et al., 2007) to proactively identify these poorly tolerated high-risk medications may also be appropriate.

Analgesics remain the cornerstone of acute pain management of older adults. Scheduling nonopioid pain medications around-the-clock and initiating analgesia prior to surgery may be helpful strategies to decrease overall opioid requirements (Herr, Bjoro, Steffensmeier, & Rakel, 2006). The Analgesia-first (or A1) strategy is gaining popularity and may be another option in the care of ICU survivors at high risk of cognitive and functional impairment. With the A1 approach sedating medications are given only *after* aggressive analgesic strategies are employed. This strategy has been linked with faster MV discontinuation and more consistent achievement of comfort goals (Riker & Fraser, 2009). Finally, the importance of medication reconciliation at the time of ICU and hospital discharge cannot be overemphasized. One study, for example, found that 50% of inappropriate medications continued at the time of hospital discharge were originally started in the ICU (Morandi et al., 2011). This study also noted that many of the antipsychotics started for delirium in the ICU, are often continued in the post-ICU setting without a clear indication.

Awakening in the non-ICU setting could also be facilitated by involving the patients in cognitively stimulating activities during the daytime hours. The Activity and Cognitive Therapy in the Intensive Care Unit (ACT-ICU) study (Brummel et al., 2012) is currently exploring the effect of physical and twice-daily cognitive rehabilitation sessions on critically ill patient outcomes. The cognitive rehabilitation sessions, that will take place in the ICU, consists of orientation, memory, and attention exercises (e.g., forward and reverse digit spans, matrix puzzles, letter-number sequences and pattern recognition). The use of orientation and communication boards, clocks, acceptable levels of lighting, games, and

laptop computers are also strategies nurses and family members may wish to employ (Balas et al., 2012).

Breathing

Older survivors of critical care are at very high risk of developing respiratory complications throughout their recovery period. These complications frequently trigger the need for rapid response team calls and are a major factor for the high ICU readmission rates in the aged population (Rosenberg et al., 2001). Prolonged MV, over-sedation, aspiration, supine positioning, poor oral health, and age-related changes are known risk factors for the development of ventilator associated pneumonia (Casey & Balas, 2011). Preexisting respiratory disease and postoperative hypoxia also place patients at a much higher risk for developing delirium (Aldemir, Ozen, Kara, Sir, & Bac, 2001). Because of these issues, we strongly recommend respiratory therapy play an active role in the daily evaluation and treatment of older ICU survivors, especially in the immediate period following ICU discharge regardless of the primary ICU admission.

In patients requiring prolonged MV, we suggest respiratory therapists take a lead role in determining the potential etiology of ventilator dependence. The use of a daily checklist, describing the potential causes of ventilator dependence, may help standardize this process. The Evidence-Based Guidelines for Weaning and Discontinuing Ventilator Support provides six broad causes of ventilator dependency including: neurologic issues, respiratory system muscle/load interactions, metabolic factors and ventilator muscle function, and gas exchange, cardiovascular, and psychological factors, on which the checklist could be based (MacIntyre et al., 2001). Evidence suggests that implementation of a respiratory therapist driven protocol for weaning patients from prolonged MV in the post-ICU setting can be effective in reducing the duration of MV. One study using such a protocol found the time to successful weaning was reduced from 29 to <17 days (Scheinhorn, Chao, Stearn-Hassenpflug, & Wallace, 2001).

A formal respiratory therapist assessment of pulmonary status at the time of ICU discharge (similar to a safety screen) can be useful in determining which patients will benefit from more aggressive pulmonary management in the post-ICU setting. A recent study of 3,113 patients discharged from a medical/surgical oncological ICU examined the impact of a respiratory therapist assessment score (RTAS) and respiratory therapy transitional service (RTTS) on ICU readmission rates (Bolden, 2006). All patients who underwent at least 24 hours of MV, noninvasive positive pressure ventilation, or were being discharged from the ICU with a FIO₂ requirement ≥ 40 were included in the study. Of the 1,608 patients in the post-RTTS period, 240 patients met criteria for RTTS follow-up. The ICU readmission due to respiratory causes pre and post RTTS implementation were 58 (97%) and 2 (3%) respectively. These findings suggest there may be a substantial benefit from more aggressive respiratory therapy management of ICU survivors in the post-ICU setting.

Older survivors of critical care also experience complications related to intubation. Dysphagia, a common complication after intubation, carries a sevenfold increased risk of aspiration pneumonia and is an independent predictor of mortality (Singh & Hamdy, 2006). When coupled with the lethargy that often accompanies delirium, survivors are at elevated

risk for aspiration pneumonia and its sequelae. For these reasons, we suggest that “Breathing” in the post-ICU period should also entail obtaining a speech language pathologist consult for dysphagia evaluation and routine implementation of aspiration precautions.

Delirium monitoring and management

Delirium is a complex, under-recognized, serious, and commonly encountered syndrome the post-ICU setting. The incidence of delirium outside the ICU ranges from 6% to 56% (Yang et al., 2009). We recommend delirium monitoring continue throughout the post-ICU period to facilitate recognition and treatment by routine screening (i.e. every 8 hours) using the CAM-ICU or ICDSC for non-vocal patients and the Confusion Assessment Method (CAM) (Inouye et al., 1990) with speaking patients. All of these tools are quickly and easily administered and have been shown to be valid and reliable in numerous studies and patient populations (Wong, Holroyd-Leduc, Simel, & Straus, 2010).

Similarly, the patient's delirium status in the post-ICU setting should be discussed daily on interprofessional rounds where providers should identify, and if possible remove, possible causes of delirium. Risk factors for delirium in older adults outside the ICU include: preexisting cognitive impairment, vision and hearing impairment, immobilization, psychoactive medication use, dehydration, and sleep deprivation (Inouye, Bogardus, Baker, Leo-Summers, & Cooney, 2000). While there are number of nonpharmacologic interventions nurses can independently implement (Balas, 2012), the evidence strongly suggests that interprofessional, multicomponent delirium care models such as the *Hospital Elder Life Program* are most effective at reducing the frequency and duration of delirium (Inouye et al., 2000).

Early Mobility

Hospitalized adults spend 83% of their time in bed and only 4% standing or walking (Brown, Redden, Flood, & Allman, 2009). Considering the previously described hazards of immobility, we suggest that ambulation protocols should be utilized in all post-ICU settings. Implementation of the protocols should be automatic, meaning all patients should be mobilized unless there are specific reasons for not doing so. Contraindications for progressive mobility could be placed in a mobility safety screen checklist. This “opt-out” approach may be a paradigm shift for some institutions that currently require a physician order for mobility status. However, a recent integrated review of the literature found that early mobilization (especially early ambulation) of medical/surgical patients was associated with improved outcomes for patients with deep vein thrombosis, reduced length of stay in patients with community-acquired pneumonia, and maintained or improved functional status from admission to discharge of hospitalized older adults and patients recovering from major surgery (Pashikanti & Von Ah, 2012). The greatest impact of early mobilization was through standardized mobility protocols or programs. Finally, the mobility protocols should be progressive in nature and based on the patient's response to treatment.

Coordination of care

We believe extension of the ABCDE bundle in the post-ICU setting will continue a focus on interprofessional communication and patient-centered care, and therefore, improve the transition between the ICU, the hospital, and the home or institutional care. Effective implementation of the ABCDE bundle is entirely dependent on an institution's commitment to reversing the hidden epidemics of delirium, immobility, poor transitions of care that exist in our hospitals, and the ability to work across disciplines for these conditions that cut across training and specialty. A number of organizations including the *Institute for Healthcare Improvement*, the *National Quality Forum*, and the *Joint Commission* continue to emphasize the importance of communication and teamwork training in the delivery of safe, quality, patient-centered care. Models such as TeamSTEPPS (available at: <http://teamstepps.ahrq.gov/>) help provide higher quality, safer patient care by: producing highly effective medical teams that optimize the use of information, people, and resources to achieve the best clinical outcomes for patients, increasing team awareness and clarifying roles and responsibilities, resolving conflicts and improving information sharing, and eliminating barriers to quality and safety.

Conclusion

The number of older adults being cared for in ICUs is expected to increase to unprecedented numbers in the very near future. These older adults are at risk for developing numerous complications during their hospitalization, many of which are now believed to be preventable. The ABCDE bundle was originally proposed to combat preventable harm related to MV, sedation, delirium, and immobility, yet the need for continued focus on cognition, respiratory function, and mobility are equally important following ICU discharge. Successful implementation of the individual components of the ABCDE bundle in the post-ICU setting will require effective teamwork, clear communication, an environment committed to patient safety and best practices, and ways of monitoring both outcomes and processes of care. Overcoming these challenges by applying the ABCDE bundle in post-ICU settings will result in positive returns in the form of improved satisfaction and outcomes of patients, family, and staff.

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Figure 1.
The ABCDE Bundle and its Effect on Patient Outcomes Illustrated

Table 1**Application of the ABCDE bundle in the Intensive Care Unit Setting****Step 1 –Spontaneous Awakening Trial (SAT) Safety Screen-Registered Nurse (RN) Driven-**

RN determines if it is safe to interrupt sedation by responding to a set of predefined safety screen questions

If determined safe, the RN proceeds to step 2

If not safe, the RN will

Continue sedative and analgesic infusions as ordered

Discuss on interdisciplinary rounds (IDRs) possible reasons for SAT safety screen failure

Reevaluate the patient within the next 24 hours

Step 2- Perform SAT-RN Driven-

RN shuts off all continuous sedative and analgesic infusions

All PRN (when necessary) sedatives held

PRN s analgesics allowed if needed for pain

Analgesic drips continued only if patient actively experiencing pain

RN determines if patient tolerated interruption of sedation by assessing for a set of predefined SAT failure criteria

If no SAT failure criteria are displayed and the patient is able to open his/he eyes to verbal stimulation, the RN

Will contact respiratory therapy (RT) and inform them the patient passed their SAT

If after 4 hours no SAT failure criteria are displayed but the patient is unresponsive to verbal stimulation, the RN will

Contact RT and inform them the patient passed their SAT

If the patient displays any of the failure criteria, the RN will

Conclude that the SAT trial has failed

Resume sedation at % previous dose, only if needed

Titrate sedation to daily goal

Discuss on IDRs possible reasons for SAT safety screen failure

Reevaluate the patient within the next 24 hours

Step 3- Spontaneous Breathing Trial (SBT) Safety Screen- Respiratory Therapist (RT) Driven

RT determines if it is safe to perform a SBT by responding to a set of predefined safety questions

If determined safe, the RT will proceed to step 4

If not safe, the RT will

Continue mechanical ventilation as ordered

Communicate findings to RN

Ask RN to resume sedation at % previous dose, only if needed

Discuss on IDRs possible reasons for SBT safety screen failure

Reevaluate the patient within the next 24 hours

RT performs SBT

RT determines if patient tolerated SBT by assessing for a set of predefined SBT failure criteria

If no SBT failure criteria are displayed after ½ hour, the RT will

Contact the RN and MD to inform them the patient passed their SBT

Plan for patient extubation

If the patient displays any of the failure criteria, the RT will

Conclude that the SBT trial has failed

Return patient to previous mechanical ventilation settings

Inform the RN the patient has failed the SBT

Ask RN to resume sedation at % previous dose, only if needed

Discuss on interdisciplinary rounds possible reasons for SAT safety screen failure

Reevaluate the patient within the next 24 hours

Step 5-Delirium Monitoring and Management-RN, RT, MD, and Pharmacist Driven

Each day on interdisciplinary rounds the ICU team will set a target sedation level

RN assesses sedation/agitation level every 2 hours using valid and reliable tool

RN titrates continuous sedatives drips to target sedation level

RN performs delirium screening once a shift and with any change in mental status using valid and reliable tool

Each day on interdisciplinary rounds the RN will present the team with

Patient's target sedation level

Patient's actual sedation level

Patient's delirium status

Patient's exposure to sedative, analgesic, and other deliriogenic medications

For patients experiencing delirium, each day on interdisciplinary rounds the team will

Identify possible causes of delirium

Remove all possible causes of delirium

Employ all necessary nonpharmacologic means necessary to reduce the duration of delirium

In the event the above interventions fail to return patient to their baseline mental status, discuss possible pharmacologic interventions

Step 6- Early Mobility-RN, RT, Physical and Occupational Therapy Driven

RN determines if it is safe to begin mobilization by responding to a set of predefined safety screen questions

If not safe, the RN

Discuss on interdisciplinary rounds reasons for early mobility failure

Reevaluate the patient within the next 24 hours

Contact PT, OT, and RT to inform the patient passed the early mobility safety screen

Collaborate with PT, OT, and RT as to when to best mobilize patient that day

Assist PT, OT, and RT with the implementation of the early mobility plan

Patients should be mobilized at a minimum of once a day

Progressive approach of sitting on edge of bed, standing at bedside and sitting in chair, followed by ambulation may be warranted

Assess patient's tolerance of plan

Table 2**ABCDE Bundle Prompted Questions to Facilitate Care Transitions**A-Awakening

What type of sedative, antipsychotic, and pain medications did the patient receive during their ICU stay? Which are to be continued and for how long?

How frequently were the above medications given to the patient?

What behaviors did the patient display that prompted medication administration?

What effect did the medications have on the patient's behavior?

Were the medications noted to have any undesirable side effects?

B-Breathing

What discontinuation strategies were used during the patients ICU stay?

What was the patient's response to the discontinuation attempts?

What possible reasons does the patient have to explain his/her ventilator dependence (i.e. nutritional status, chest X-ray findings)

How did the patient communicate his/her needs while they were on the ventilator?

Does the patient experience dysphagia? Has a formal dysphagia screen been performed?

Has the patient's diet been modified to match any risk of aspiration?

C-Coordination

Which disciplines were involved in the patient's ICU care?

What were their specific recommendations?

Are there other specialists the nurse feels are warranted?

Delirium Monitoring and Management

What is the delirium and sedation status at the time of ICU transfer?

Was the patient ever delirious during their ICU stay?

If so, what was believed to have caused the delirium?

What interventions were used to treat the delirium?

Did the patient display the hypoactive, hyperactive, or mixed type of delirium?

Early Mobility

Did physical and/or occupational therapy see patient while they were in the ICU?

If so, what were their recommendations?

Is the patient able to ambulate?

If yes, what type of assistance do they need to ambulate?

What is the short and long-term functional status goal?