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Quality and Safety Challenges in Critical Care: Preventing and Treating Delirium in the Intensive Care Unit

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Perspective

Remarkably, in every intensive care unit (ICU) on any given day, more than half the patients (1,2) will experience acute changes in consciousness and cognition that reflect the presence of delirium. Given the profound prognostic ramifications that delirium episodes are known to carry (independent risk factor for death [3], longer length of stay [4], and worse long-term brain function [5]), it is worth thinking about delirium as an "acute brain injury" similar to other end-organ injuries (e.g., heart attack, acute kidney injury). As with these other important end-organ injuries, delirium is a clinical event for which prevention and treatment contribute to the quality and safety of care.

As we have come to appreciate the consequences of ICU delirium, research has begun to answer key questions about how it can be assessed, prevented, and managed. A valid and reliable method to measure delirium is an essential component of a delirium quality improvement program. The cardinal manifestation of delirium is inattention, such as the ability to pay attention to and follow simple commands (e.g., "squeeze my hand when I say the letter 'A' and don't squeeze when I say other letters"). Sensitive and specific delirium screening tools that incorporate tests for inattention have been developed, and they have repeatedly demonstrated high inter-rater reliability and been validated across a wide range of patients and ICUs.(6) Delirium screening takes seconds to minutes and has been successfully implemented within quality improvement programs and routine clinical care.(7,8) It is our belief that every ICU patient should be screened daily for the presence of delirium using a validated tool.

In addition to the consistent use of screening tools, we also advocate for a number of process and system changes that modify delirium risk factors and have been associated with either less delirium or better outcomes (e.g., reduced mortality and length of stay) for critically ill patients. Unfortunately, these processes have been inconsistently applied, leading to needless harm and death. The following are some of the interventions best supported by the evidence:

- *Spontaneous Awakening and Breathing Trial Coordination:* Girard and colleagues published findings of the Awakening and Breathing Controlled (ABC) Trial in 2008.(9) This multicenter, randomized control trial studied the effects of coordinating spontaneous awaking trials (SAT, defined as turning off sedation and narcotics as long as pain is controlled so that the patient responds to verbal stimulation) with spontaneous breathing trials (SBT, defined as turning the ventilator settings to continuous positive airway pressure [CPAP] to test ability to breathe without assistance). Patients receiving daily coordinated SAT and SBT protocols implemented by nurses and respiratory therapists were compared with patients receiving daily SBTs with "usual" sedation management. The standardization and coordination of SATs and SBTs decreased the average total dose of benzodiazepines delivered by almost half, shortened duration of coma (a form of acute brain dysfunction with even worse prognosis than delirium), and reduced the absolute risk of death at 1 year by 14% (a 24% relative reduction). Key features of the intervention included: (i) Nurses and respiratory therapists did not require physician orders to manage interruptions in sedation and ventilation; (ii) The default action was to perform an SAT and SBT if patients passed safety criteria; (iii) Sedatives were not restarted for patients that passed the SAT and no longer required them; and (iv) If the patient clinically required restarting sedatives or analgesics, the medications were restarted at half the previous dose and titrated to clinically desired targeted sedation levels.
- *Sedation choice:* Sedative drugs are commonly used in critically ill patients to reduce the work of breathing and alleviate agitation. Strong evidence suggests that increasing doses and duration of exposure raises the risk of delirium in a dose-dependent fashion.(10,11) Importantly, alternative sedative choices (e.g., analgesics alone, dexmedetomidine, or haloperidol) have been shown to markedly reduce the duration of delirium when compared with benzodiazepines.(12,13) Sometimes, however, the best "choice" is no sedation at all, even while receiving mechanical ventilation. A "no sedation" strategy is also referred to as an analgosedation strategy. Using this strategy it is possible to achieve adequate pain and sedation control with an opiate-based protocol that utilizes haloperidol and/or propofol only in those circumstances where patient comfort cannot be achieved with opiates alone.(14)
- *Early exercise:* In 2009, Schweickert and colleagues (15) demonstrated the benefits of early mobility of ICU patients upon cognitive as well as functional outcomes. In the study, randomly assigned intervention patients received protocolized exercise and mobilization (with physical and occupational therapy) at a median of 1.5 days following intubation, compared to 7.4 days for control patients. Patients received therapy for 87% of study days, and experienced an average of 2 fewer days of delirium, 2 more ventilator-free days, and were able to get out of bed almost 5 days earlier. Needham and colleagues demonstrated similar impacts following implementation of an early mobility program.(16)

This evidence based-approach will provide every ICU patient with a coordinated, interdisciplinary program designed to assess and prevent delirium. The practices described above have been bundled into the "ABCDE" bundle (**A**wakening and **B**reathing **C**oordination as well as **C**hoice of sedation, **D**elirium monitoring and management, and **E**arly mobility and **E**xercise).(17) The ABCDE bundle (see Table) seeks to break the cycle of over-sedation, prolonged mechanical ventilation, missed hypoactive (e.g., somnolent, psychomotor retardation) delirium, and immobilization. It does that by: (i) standardizing and coordinating care processes that synergistically reverse the cycle; (ii) empowering nurses, respiratory therapists, and

physical therapists to manage those care processes; and (iii) ensuring that these processes are the default option, unless clear safety concerns preclude completion.(17) This bundled approach, which includes delirium prevention strategies, is being rapidly adopted across the nation (18) through large-scale quality improvement programs. It is also being disseminated across key professional societies in hospital and critical care medicine.(19)

Although not yet a standard part of the bundle, it would be prudent for ICU providers to add another "E" to the ABCDE bundle: Environmental factors. Such factors have been shown to be important in non-ICU settings (20) but have only recently been examined within the ICU. Sleep disruption is such a factor, and recent trial data indicates that patients randomized to the use of earplugs at nighttime hours experience less delirium.(21) Along with sleep improvement, addressing other environment factors such as eyeglasses, hearing aids, and noise reduction may also reduce the incidence of delirium.

In addition to delirium prevention, early treatment needs further study, such as cognitive therapy while in the ICU. Current strategies being tested include multiple sessions of staged cognitive exercises that match their level of arousal and prior performance to the cognitive exercise. Exercises include modification of existing neuropsychological tests like digit span, puzzles, planning, calculations, and recall to name a few. This approach applies the concept of "use it or lose it" in the hopes of preventing and maintaining cognitive function during and following hospitalization.(22)

As more patients survive critical illnesses, their cognitive and functional abilities must be preserved with the same vigor used for life saving care. Absent this kind of focus, studies have shown a more than doubling of risk of incident dementia following an episode of critical illness, and more than half of survivors of critical illness experiencing long-term cognitive impairment.(5,23) The first step is for providers and health care systems to appreciate the frequency of delirium in ICU patients and the important short- and long-term consequences. The next is to systematically implement effective screening, prevention, and management strategies. The ABCDE model is an initial framework on which new prevention and treatment strategies can be added as evidence is developed.

Eduard E. Vasilevskis, MD Assistant Professor of Medicine, Vanderbilt University Medical CenterVA Tennessee Valley Geriatric Research, Education and Clinical Center

E. Wesley Ely, MD, MPH Professor of Medicine and Critical Care, Vanderbilt University Medical CenterAssociate Director of Aging Research, VA Tennessee Valley Geriatric Research, Education and Clinical Center

Robert S. Dittus, MD, MPH Professor of MedicineAlbert and Bernard Werthan Chair in MedicineAssociate Vice-Chancellor for Public Health and Health CareDirector of the Institute for Medicine and Public HealthSenior Associate Dean for Population Health SciencesVanderbilt University Medical CenterVA Tennessee Valley Geriatric Research, Education and Clinical Center

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Table

Table. The ABCDE Bundle.

(Go to table citation in the text)

Bundle Letter	Bundle Component	Bundle Action

AB	Awakening and Breathing Coordination	Daily spontaneous awakening trials (sedation vacation) and spontaneous breathing trials to reduce sedative and mechanical ventilator exposure.
C	Choice of Sedation	Avoid benzodiazepines. Choose less deliriogenic agents when possible (e.g., analgesics, dexmedetomidine, propofol).
D	Delirium Assessment and Management	Assess for delirium every 8–12 hours using a validated delirium screening instrument. Recognition of delirium must prompt consideration and treatment of underlying causes.
E	Early Exercise	Daily progressive mobility protocol to increase functional capacity and reduce delirium incidence.