

# Delirium and Long-Term Cognitive Impairment in Intensive Care Unit Survivors—Has Your Team Practiced Its ABCDEs Today?

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Researchers at the VA Tennessee Valley Healthcare System-Geriatric Research Education and Clinical Center in Nashville, Tennessee, share their formula for improving the care of patients with delirium in the intensive care unit, preventing its development, and decreasing its length of duration.

“**I** found myself being stared at by 2 middle-aged men in dark suits and bright ties. One was busily explaining to me that I was in the intensive care unit and that I was quite safe. ... I knew they were lying. For me, the reason I was in a bed, on a ventilator, hardly able to move, was that I had been drugged and kidnapped. It had all started in Portugal; at least I thought it was Portugal, where I'd been abducted. ... I'd tried on several occasions to pull the tube

*out of my mouth but had always been instantly plunged back into darkness. It never crossed my mind that there might have been a medical reason for my predicament, and I had no knowledge that severe aspiration pneumonia following my routine surgery had landed me in the ICU and was putting my family through hell.”<sup>1</sup>*

Unfortunately, this patient's firsthand experience in the intensive care unit (ICU) is not uncommon.

Although delirium among severely ill patients has been recognized since antiquity, advancement in critical care over several decades has focused predominantly on respiratory and cardiovascular life support. Only recently has delirium been acknowledged as an important manifestation of end-organ dysfunction. This idea is reflected in the evolution of the guidelines of the Society of Critical Care Medicine (SCCM)

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The VHA's Geriatric Research Education and Clinical Centers (GRECCs) are designed for the advancement and integration of research, education, and clinical achievements in geriatrics and gerontology throughout the VA health care system. Each GRECC focuses on particular aspects of the care of aging veterans and is at the forefront of geriatric research and clinical care. For more information on the GRECC program, visit the website (<http://www1.va.gov/grecc/>). This column, which is contributed to by GRECC staff members, is coordinated and edited by Kenneth Shay, DDS, MS, director of geriatric programs for the VA Office of Geriatrics and Extended Care, VA Central Office, Washington, DC. Please send suggestions for future columns to [Kenneth.Shay@va.gov](mailto:Kenneth.Shay@va.gov).



on sedation and analgesia—the first to include delirium as an addendum in 2002, and then to add delirium even in the title of the latest SCCM guidelines published this year.<sup>2</sup> Additionally, there is growing interest in including neuropsychiatric outcomes as a primary or secondary outcome in large randomized, controlled trials in critical care, which previously was a rarity.<sup>2-5</sup>

In the past decade, however, an explosion of scientific studies has increased clinicians' awareness of delirium in patients in the ICU as a vitally important prognostic comorbidity that predicts death, longer stays, higher costs of care, and the acquisition of lasting dementia among survivors. Delirium, a form of organ dysfunction best thought of as an acute brain injury, analogous to an acute lung injury or an acute kidney injury, is characterized by fluctuating mental status, disorganized thinking, altered level of consciousness, and particularly inattention or distractibility. Patients may also have hallucinations, delusions, or memory loss as part of their delirium, though these are not cardinal features of the diagnosis. Delirium is exceedingly common, affecting more than 50% of patients in most ICUs, and is even more prevalent among the elderly.<sup>6,7</sup>

Over more than a decade, researchers at the VA Tennessee Valley Healthcare System-Geriatric Research Education and Clinical Center (VATVHS-GRECC) in Nashville, Tennessee, have focused on this illness, developing tools to screen and monitor for delirium, demonstrating its impact on clinical and health care outcomes, uncovering its causes, and now developing prevention and treatment strategies. For example, older age and medications commonly given to older patients in

the ICU, such as benzodiazepines, have been shown to be risk factors for transition into delirium.<sup>8,9</sup> Patients with delirium in the ICU are also more likely to die than are those who do not develop delirium during the hospital course.<sup>10</sup> Finally, delirium, which in many cases may be preventable, is associated with a longer hospital stay and increased costs to the health care system.<sup>11,12</sup> Thus, preventing its development and decreasing the length of delirium could both improve patient care and reduce health care costs.

Increased efforts regarding educating patients, providers, and peer institutions about the risk factors, warning signs, screening tools, and management approaches for critical illness-associated delirium should be a priority of all who care for patients in the ICU. One such mechanism is the ICU Delirium and Cognitive Impairment Study Group website (<http://www.icudelirium.org>), which provides resources and support. The opportunity for such education and support results from evidence generated through research. Two significant arms of research are included: identifying the long-term effects predicted by the duration of delirium during critical illness, and developing an evidence-based ABCDE bundle as an enhanced quality improvement approach to capitalize on the strengths of the entire ICU team of health care professionals.

### **DELIRIUM AND LONG-TERM COGNITIVE IMPAIRMENT**

Traditional thinking had been that the impact of critical illness-associated delirium was limited to a patient's acute illness in the ICU, and that after rehabilitation and therapy, patients could return home, back to their previous level of activity and functioning prior to hospital-

ization.<sup>1,6</sup> However, patients often returned for their follow-up appointments months after their ICU course or postoperative after cardiac surgery, reporting changes in their ability to carry out their activities of daily living (ADL)—some subtle, and some not so subtle—including memory loss, inability to balance their checkbook or take care of finances, difficulty reading maps, slight personality changes, depression, or anxiety.<sup>13,14</sup> Some patients reported symptoms of posttraumatic stress disorder (PTSD) related to their ICU course. These included reexperiencing frightening events (such as those described earlier by a patient), avoidant behavior, nightmares, and physiologic symptoms, such as sleeplessness, causing distress and impairing normal daily functioning.<sup>15</sup> In many ways, these mental changes were similar to those associated with a new-onset dementia-like illness.

Over the last decade, the ICU Delirium and Cognitive Impairment Study Group, with support from the VATVHS-GRECC, has conducted numerous studies exploring this link between episodes of delirium in the ICU and the long-term psychosocial effects that persist months to years after delirium. One such investigation demonstrated a time relationship between the duration of delirium in the ICU in mechanically ventilated patients and long-term cognitive impairment—as the number of days of delirium increased, patients scored worse on neuropsychological testing at the 3-month follow-up and 12-months' posthospitalization.<sup>16</sup>

This long-term decline in the ability to carry out normal ADL was particularly significant in elderly patients who survived severe sepsis—that is, a systemic infection,

usually spread through the bloodstream, which affects multiple organs, including the brain. In a study by Iwashyna and colleagues, the development of severe sepsis marked a major trajectory change for older patients, because those who suffered from sepsis had a tripling of the likelihood of developing moderate-to-severe cognitive impairment (odds ratio, 3.34) and functional

limitations that both persisted for  $\geq 3$  years in follow-up.<sup>17</sup>

As the number of elderly patients who survive critical illness in the ICU continues to increase, the long-term personal and societal effects of delirium will continue to mount, resulting in a disproportionate strain on elderly patients, their families and caregivers, and Medicare and Medicaid. Therefore, important pri-

orities for further research include uncovering the pathophysiologic mechanisms of the development of delirium and its subsequent relationship to long-term cognitive impairment, identifying risk factors that could be amenable to preventive strategies, and developing new approaches to treatment and rehabilitation that address the physical, occupational, and psychological impact on these fragile patients.

**CURRENT APPROACH TO PREVENTION AND TREATMENT: THE ABCDE BUNDLE**

Mechanically ventilated elderly patients are among the sickest patients in the ICU and have a higher incidence of delirium than do non-ventilated patients. To improve the care for these patients and to reduce the incidence of and impact from delirium, the ICU Delirium and Cognitive Impairment Study Group proposed an evidence-based approach that can be bundled together by the interdisciplinary treatment team, similar to bundles used elsewhere in the hospital for preventing and treating sepsis or ventilator-associated pneumonia.<sup>18</sup> The study group labeled this the *ABCDEs of Critical Care*, based on 2 general concepts: *liberation* and *animation* (Figure).

*Liberation* refers to freeing the patient as soon as possible from sedation and mechanical ventilation, recognizing that harmful effects of the sedative medications used in the ICU are inextricably linked to the untoward outcomes of mechanical ventilation.<sup>20,21</sup> Liberation from these elements of critical care, which are both necessary and helpful, while also imparting risk and harm, can be achieved through the ABCDE approach. Important elements of ABCDE include daily at-

| The ABCDEs of Critical Care for Patients in the Intensive Care Unit <sup>19</sup>  |   |
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| <b>A</b>   | <b>Awakening Trials:</b> Daily interruption of sedative infusions through SATs decreases oversedation, allowing for arousal and SBT readiness and shorter time on a ventilator.   |
| <b>B</b>   | <b>Breathing Trials:</b> Daily spontaneous breathing trials (SBTs, ie, placing patient on CPAP) decreases number of days on mechanical ventilation. Together SATs and SBTs in the ABC Trial led to earlier extubation, shorter ICU and hospital stays, and 14% absolute reduction in mortality at 1 year. <sup>23</sup>   |
| <b>C</b>   | <b>Coordination:</b> Interdisciplinary care supported by all team members (nurses, physicians, pharmacists, respiratory therapists, nurse practitioners, physician assistants, and social workers). <b>Choice of Sedatives and Analgesics:</b> Decreasing use of medications, particularly benzodiazepines, when appropriate, and considering alternative approaches such as analgo-sedation. |
| <b>D</b>   | <b>Daily Delirium Monitoring and Management:</b> Using validated arousal scales (RASS or SAS) and delirium tools (CAM-ICU or ICDSC), coupled with nonpharmacologic (environment, sleep, hearing, and visual aids) and pharmacologic management.   |
| <b>E</b>   | <b>Early Mobility and Exercise:</b> Getting the patient out of bed and moving (dangling before dancing) as early as possible (enhanced by ABCDs) and initiating physical and occupational therapy.  |
| <small>ABC = Awakening and Breathing Controlled Trial; CAM-ICU = Confusion Assessment Method for the Intensive Care Unit; CPAP = continuous positive airway pressure; ICDSC = Intensive Care Delirium Screening Checklist; ICU = intensive care unit; RASS = Richmond Agitation Sedation Score; SAS = Riker Sedation-Agitation Score; SATs = spontaneous awakening trials; SBT = spontaneous breathing trials.</small> |   |

**Figure.** An evidence-based approach to improving the short- and long-term outcomes of patients in the intensive care unit.

tempts at cessation of all sedatives, careful selection of those sedative medications that are used/needed, use of target-based protocols that limit the amount of medication when provided, and daily trials to wean a patient of mechanical ventilation following the cessation of sedative medications.<sup>22</sup> These daily attempts to free the patient of strong sedative drugs and mechanical ventilation are known as spontaneous awakening trials (SATs) and spontaneous breathing trials (SBTs). The Awakening and Breathing Controlled Trial, a large multicenter, prospective trial pairing daily SATs and SBTs decreased time spent in the ICU and the hospital by 4 days, as well as decreased mortality during the year following enrollment in the study.<sup>23</sup>

With *animation*, the patient is encouraged to get out of bed and move around through early physical and occupational therapy. This approach to care has a favorable effect on ICU outcomes—in one study, when early exercise and physical therapy were combined with daily interruption of sedatives (SATs), patients experienced delirium for fewer days and spent more days breathing on their own, without mechanical ventilation.<sup>24</sup>

This liberation and animation approach has resulted in a comprehensive, evidence-based bundle of care—the ABCDE bundle.<sup>19</sup> This strategy, summarized in the Figure, combines these simple principles—daily attempts to interrupt sedative drugs and mechanical ventilation (A and B), careful use of sedatives (C), monitoring and management of delirium (D), and early mobility and exercise (E). Although each principle alone has been shown to improve outcomes of care (eg, reducing ICU and hospital length of stay, reducing mortality, and mitigat-

ing the duration of delirium), the combination of approaches, summarized in this simple mnemonic, could have a dramatic effect on the sickest patients.

## CONCLUSION

The VATVHS-GRECC and its ICU Delirium and Cognitive Impairment Study Group continue their vigorous efforts to serve the nation's elderly veterans and their families through ongoing research to identify causative factors for critical illness-associated delirium and long-term cognitive impairment and to develop new strategies for prevention, treatment, and rehabilitation. Current and planned large cohort studies and randomized controlled trials will further add to the evidence base and inform future care strategies.

But the achievement of improved health outcomes resulting from new approaches to care, such as the ABCDE approach, can only occur through the reliable implementation of these approaches to care in the everyday management of critically ill patients, especially through the active engagement of critical care nursing staff.<sup>25</sup> Every patient must receive the best possible care every time, at the right time, and in the right way. Collaborative partnerships among clinicians from multiple disciplines, systems redesign staff, quality improvement experts, and facility management will be required to assure the processes are in place in a safe, reliable fashion to achieve this goal.

The VATVHS-GRECC is a willing partner for any hospital to achieve the best outcomes for its patients. Patients who are the most sick and vulnerable need this cooperation and can greatly benefit from these enhanced quality improvement approaches to critical care. ●

## Author disclosures

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