

## COMMENTARY

# Liberation and animation for ventilated ICU patients: the ABCDE bundle for the back-end of critical care

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See related research by Jackson *et al.*, <http://ccforum.com/content/14/2/R59>

### Abstract

Critically ill patients are frequently prescribed sedatives and analgesics to ensure patient safety, to relieve pain and anxiety, to reduce stress and oxygen consumption, and to prevent patient ventilator dyssynchrony. Recent studies have revealed that these medications themselves contribute to worsening clinical outcomes. An evidence-based organizational approach referred to as the ABCDE bundle (Awakening and Breathing Coordination of daily sedation and ventilator removal trials; Choice of sedative or analgesic exposure; Delirium monitoring and management; and Early mobility and Exercise) is presented in this commentary.

In the previous issue of *Critical Care*, Jackson and colleagues performed a systematic literature review with the goal of evaluating the impact of sedation practices on the safety and economic outcomes in intensive care unit (ICU) patients [1]. Heterogeneity of the different patient populations studied and variations in methodology prevented the authors from conducting a formal quantitative data synthesis and analysis; hence their article is primarily a collation of published studies. The authors conclude that the past decade has seen much focus on sedation practices during critical illness and that a systematic approach to sedation and analgesia improves patient outcomes. Using the review as a springboard for our commentary, we would like to focus the reader towards an evidence-based paradigm for improving the quality of care and clinical outcomes of ventilated patients.

Over the past 15 years, we have learned in critical care that there are many potentially life-saving maneuvers we perform at the outset of a patient's illness (for example, source control of infections, antibiotics, aggressive resuscitation); we will refer to this as the front-end of critical care. It is now becoming imperative for us to improve our management of the back-end of critical care in order to optimize patients' recovery and outcomes. We must therefore begin to focus on strategies to liberate our patients from life support that was instituted during the front-end period of high illness severity and then animate (get them out of the bed earlier) by focusing on five evidence-based steps of care. We refer to these steps as the ABCDE bundle (Awakening and Breathing Coordination of daily sedation and ventilator removal trials; Choice of sedative or analgesic exposure; Delirium monitoring and management; and Early mobility and Exercise).

Critically ill patients are frequently prescribed sedatives and analgesics – especially if they are on mechanical ventilation (MV) – to ensure patient safety, to relieve pain and anxiety, to reduce stress and oxygen consumption, and to prevent patient ventilator dyssynchrony. Scientific advances in the past 10 to 15 years have revealed that these medications themselves contribute to increased morbidity, and perhaps even mortality [2-4]. Additionally a solid body of evidence demonstrates an independent association between commonly prescribed benzodiazepines and their attendant risk of delirium [2], and likewise the relationship between delirium and a dementia-like brain dysfunction following ICU care and mortality [5-7]. These observations have literally forced healthcare providers to study and determine best sedation practices to liberate patients faster from MV.

To fully understand ventilator liberation, one needs to review what happened to weaning during the 1990s. First, protocolization and daily spontaneous breathing trials were proven superior to the ongoing varied approaches to ventilator weaning [8]. This was vitally important because of documentation showing that about

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two-thirds of the time on MV was spent during weaning, so anything that reduced this period would have a very high likelihood of improving outcomes. By the late 1990s and early 2000s, another body of literature was growing that showed continuous sedative infusions were associated with worse clinical outcomes and that protocolized, target-based sedation, with the incorporation of daily awakening trials (daily sedation cessation), resulted in decreased sedative exposure and shorter times on the ventilator [3,9].

The next advance was bringing these two areas of weaning together for formal testing. The Awakening and Breathing Controlled trial combined spontaneous awakening trials with spontaneous breathing trials (the ABCs of liberation from MV) and yielded a 4-day reduction in ICU and hospital lengths of stay and an unprecedented 15% reduction in 1-year mortality [4]. This study pointed to the importance of removing the silos of our care paradigms by centering the care delivered by nurses and respiratory therapists in an interdigitating protocol with checks and balances to improve patient safety and quality.

Liberation from MV is often hampered by nonpulmonary organ dysfunction. In a subgroup analysis of the ARDSnet low versus high tidal volume study, it was noted that older survivors recovered from respiratory failure and achieved spontaneous breathing at the same rate as younger patients, but had greater difficulty achieving liberation from the ventilator and successful ICU discharge [10]. This study led to the hypothesis that older patients developed acute brain dysfunction (manifested as delirium and coma); but without validated tools to diagnose this dysfunction in the ICU, the hypothesis could not be tested.

Development of easy to use delirium monitoring instruments such as the Confusion Assessment Method for the ICU [11] and the Intensive Care Delirium Screening Checklist [12] (the D of the ABCDEs) led to investigations that quantified the undesirable consequences of delirium in the critically ill [5-7], and identified sedative medications (benzodiazepines in particular) as modifiable risk factors for delirium [2]. Psychoactive medications could for the first time be compared using central nervous system outcomes (delirium). The ensuing MENDS and SEDCOM studies compared benzodiazepines (GABA<sub>A</sub>-agonists) versus dexmedetomidine (an  $\alpha_2$ -agonist) and showed that patients managed with the  $\alpha_2$ -agonist approach experienced a 20% or more reduction in the daily rates of delirium while on MV [13-15].

The ability to monitor for delirium has also allowed us an opportunity to study analgosedation techniques that focus on treating pain first and on utilizing the sedating properties of the analgesics, thus avoiding GABA<sub>A</sub>-agonists. Such techniques have been associated with shorter times on MV and in the ICU [16], and may

reduce the overall burden of delirium and its consequences, given that pain itself predisposes patients to delirium. Clearly much work needs to be done in this area, as we determine best strategies to prevent and manage delirium.

The last component of the ABCDE bundle is related to the need for early mobility and exercise (the E of the ABCDEs) to prevent and rehabilitate the muscles and nerves of the body experiencing the nearly universal problem of ICU-acquired weakness. Surely immobilization and comatose states associated with heavy sedation and MV are contributors, yet some degree of this acquired disease process develops even without sedation and MV. It was only recently that Schweickert and colleagues incorporated an early physical therapy program in addition to daily sedation cessations, and demonstrated that patients who underwent early mobilization had a significant improvement in functional status at hospital discharge [17]. This study also showed that the early mobility group experienced roughly a 50% reduction in the duration of delirium in the ICU and hospital [17], supporting interconnectedness of the brain and body via the mantra that 'exercise sparks the brain'.

Healthcare providers are thus encouraged to incorporate strategies that lead to early liberation and animation; the ABCDE bundle represents just one method of approaching the organizational changes that need to occur to effect a change of culture that will breed success. Persisting with our old approach to the back-end of care for these vulnerable patients is possible, but it is irresponsible in light of the growing body of evidence that says we can do so much better for our patients. Given that there are negligible adverse consequences of implementing these recommended strategies [4,9,17], minimal costs associated with changing commonly prescribed medications [14,18], and no evidence of adverse short or long-term psychiatric or neuropsychological effects of minimizing sedation exposure [19,20], the pendulum needs to swing back to having interactive patients with well-controlled pain who can participate in physical and cognitive activities at the earliest possible safe point in their critical illness.

#### Abbreviations

ICU, intensive care unit; MV, mechanical ventilation.

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