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REVIEW ARTICLE

ICU Liberation Bundles: Practical Bedside Methods to Reduce Pain, Over-sedation, and Delirium: An Update

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ABSTRACT

Critically ill patients are exposed to multiple interrelated and potentially modifiable insults, including pain, excessive sedation, delirium, immobility, and sleep disruption. These complications may prolong mechanical ventilation and intensive care unit (ICU) stay and adversely affect neurological, functional, and cognitive recovery. The ICU Liberation Bundle, commonly represented by the ABCDEF bundle, provides an integrated framework for addressing these challenges. This update reviews practical bedside strategies for implementing ICU Liberation, focusing on pain management, sedation, delirium prevention, early mobilisation, sleep promotion, and family engagement. Systematic pain assessment using validated tools such as the Critical-Care Pain Observation Tool (CPOT) and Behavioral Pain Scale (BPS) should guide analgesia, with the principle of analgesia before sedation. We must target sedation to the lightest effective level, with explicit daily targets and appropriate spontaneous awakening and breathing trials. Delirium should be assessed systematically using validated instruments, while prevention should emphasise multicomponent non-pharmacological interventions, including orientation, sensory aids, sleep promotion, adequate pain control, early mobilisation, and family participation. Routine antipsychotic therapy lacks strong evidence for improving major clinical outcomes. Early progressive mobilisation should be considered even in mechanically ventilated patients. Sleep-promoting environmental measures remain fundamental, while melatonin may be considered as an adjunct. Family engagement should be incorporated as an active component of recovery. ICU Liberation represents a shift from routine sedation and immobility toward patient-centred care. Reliable interdisciplinary implementation of simple interventions remains central to its success.

Key words: *ABCDEF bundle, delirium, ICU Liberation, pain, sedation.*

INTRODUCTION

Critically ill patients are exposed to multiple potentially modifiable insults, including pain, anxiety, excessive sedation, delirium, immobility and sleep disruption. These problems are closely interrelated. Unrecognised pain may manifest as agitation and lead to unnecessary escalation of sedative therapy, whereas deep or prolonged sedation can delay liberation from mechanical ventilation, impair neurological assessment, promote immobility and increase delirium risk. The intensive care unit (ICU) Liberation Bundle, commonly represented by the ABCDEF bundle, provides an integrated framework for addressing these problems rather than treating them as isolated complications.[1-3]

The ABCDEF bundle comprises: A — Assess, prevent and manage pain; B — Both spontaneous awakening trials (SATs) and spontaneous breathing trials (SBTs); C — Choice of analgesia and sedation; D — Delirium: assess, prevent and manage; E — Early mobility and exercise; and F — Family engagement and empowerment.[1] The 2025 focused update of the Society of Critical Care Medicine (SCCM) guidelines for pain, anxiety, agitation/sedation, delirium, immobility and sleep disruption provides important contemporary refinements, including conditional recommendations favouring dexmedetomidine over propofol in appropriate patients, enhanced mobilisation and melatonin.[4,5]

The practical objective is not simply to keep patients "comfortable", but to help them remain awake when appropriate, pain-free, delirium-free, mobile and able to participate in their recovery.

Pain: the first vital component of liberation

Pain should be assessed systematically in every ICU patient rather than inferred from heart rate, blood pressure or ventilator synchrony alone. When patients can communicate, self-report remains the preferred method. In patients who cannot communicate, validated behavioural tools such as the Critical-Care Pain Observation Tool (CPOT) and Behavioral Pain Scale (BPS) should be used.[2,6]

Assessment should occur both at rest and during potentially painful interventions such as suctioning, repositioning, wound care, vascular procedures and mobilisation. A key bedside principle is "analgesia before sedation." Agitation should not automatically trigger a sedative infusion; clinicians should first consider pain, hypoxaemia, hypercapnia, urinary retention, withdrawal, delirium and environmental distress.

Opioids remain important for severe acute pain but should be titrated to effect and reviewed daily. Multimodal analgesia can reduce opioid exposure and may include acetaminophen, local or regional analgesic techniques and selected non-opioid agents when clinically appropriate. Non-pharmacological interventions including repositioning, reassurance, therapeutic communication, music and family involvement, should complement analgesic therapy.

A practical bedside question is therefore, "Is this patient agitated because he or she needs more sedation—or because we have failed to treat pain or another reversible cause?" This simple distinction can prevent a cycle of escalating opioid and sedative administration.

Avoiding over-sedation: targeting the lightest effective level

The era of routine deep sedation for mechanically ventilated patients has largely passed. Unless there is a specific indication, such as severe intracranial hypertension, status epilepticus, refractory hypoxaemia or selected neuromuscular blockade strategies, the default should be light, targeted sedation.

The Richmond Agitation-Sedation Scale (RASS) is commonly used to define and monitor sedation depth. A target around RASS –2 to 0 is appropriate for many mechanically ventilated patients, although targets must be individualised according to neurological status, respiratory support and disease severity. Sedation should be prescribed with an explicit target and reviewed at least daily. Continuous infusions should not simply continue because they were started during intubation or during a period of instability.

Spontaneous awakening and breathing trials

The *B component* of the ABCDEF bundle links daily SATs with SBTs. When clinically appropriate, sedative infusions are interrupted or reduced to determine whether the patient can awaken and participate in an SBT. The concept is particularly valuable because sedation and mechanical ventilation can otherwise become self-perpetuating.

The landmark Awakening and Breathing Controlled trial demonstrated the clinical value of pairing daily spontaneous awakening and breathing trials.[7] In contemporary practice, SAT/SBT assessment should be embedded into the daily multidisciplinary round rather than considered an optional nursing intervention.

SAT and SBT should be performed only after daily assessment of patient eligibility, with temporary withholding when predefined safety criteria are present. SAT should generally be withheld in patients receiving neuromuscular blockade, those with ongoing or escalating sedative requirements for active seizures, severe agitation or withdrawal, uncontrolled intracranial hypertension, or other conditions in which interruption of sedation may pose a significant risk. Similarly, an SBT should be withheld in patients with persistent hypoxemia or escalating ventilatory requirements, significant respiratory distress, hemodynamic instability or escalating vasopressor support, uncontrolled arrhythmias, severe metabolic or acid–base abnormalities, or other acute conditions that make spontaneous breathing unsafe. In patients with acute brain injury, the decision to withhold SAT or SBT should additionally consider neurological and neurophysiological stability, including uncontrolled intracranial hypertension and the need for deep sedation

for specific indications. Importantly, these criteria should be regarded as temporary safety exclusions rather than permanent contraindications; eligibility should be reassessed regularly, and SAT/SBT should be undertaken at the earliest appropriate opportunity once the underlying contraindication has resolved.

Choice of sedative

The 2025 SCCM focused update conditionally recommends dexmedetomidine over propofol when light sedation and/or reduction of delirium is a priority.[4,5] Dexmedetomidine has the practical advantage of producing an arousable form of sedation and generally causes less respiratory depression. However, hypotension and bradycardia can limit its use, and it should not be regarded as universally superior.

Benzodiazepines should generally be avoided as routine sedatives when suitable alternatives are available because of their association with delirium and prolonged sedation. Importantly, however, abrupt discontinuation of chronic benzodiazepine therapy can itself precipitate withdrawal and should be avoided.

Delirium: detect early and address causes

Delirium remains one of the most important neurological complications of critical illness. It is associated with prolonged mechanical ventilation, longer ICU and hospital stay, mortality and long-term cognitive impairment.[2,8]

Delirium assessment should be systematic rather than based on clinical impression. The Confusion Assessment Method for the ICU (CAM-ICU) and Intensive Care Delirium Screening Checklist (ICDSC) are commonly used validated tools.[9]

Sedation assessment should precede delirium assessment. A deeply unresponsive patient cannot be reliably assessed for delirium; therefore, coma or excessive sedation should itself be considered an adverse and potentially modifiable outcome.

Practical non-pharmacological prevention

Delirium prevention should focus on multiple modifiable non-pharmacological factors as shown in Table 1.

Recent evidence reinforces the importance of a multicomponent rather than single-intervention strategy. A 2025 systematic meta-review incorporating 32 systematic reviews/meta-analyses and 335 individual studies found that multicomponent interventions, including ABCDEF-type bundles and early mobilisation, were associated with reductions in delirium incidence and duration. Family participation also appeared beneficial. However, the authors emphasised that the certainty of evidence was variable.[10]

Table 1. Non-pharmacological interventions to prevent delirium.

1. Maintain day-night orientation.
2. Minimise unnecessary night-time noise, alarms and procedures.
3. Reduce unnecessary exposure to bright light at night.
4. Provide clocks and calendars.
5. Ensure access to glasses and hearing aids.
6. Correct hypoxaemia and metabolic abnormalities.
7. Treat pain adequately.
8. Avoid unnecessary psychoactive medications.
9. Promote early mobilisation.
10. Encourage family participation and familiar communication.
11. Promote normal sleep-wake patterns.

An Indian umbrella review published in 2025 similarly concluded that multicomponent non-pharmacological strategies were among the most promising approaches for delirium prevention and highlighted family participation as an important component.[11]

Should antipsychotics be used?

Routine administration of haloperidol or atypical antipsychotics to shorten delirium is no longer supported by strong evidence. A 2024 systematic review and meta-analysis of five randomised trials involving 1,750 critically ill patients found that antipsychotics did not increase delirium- or coma-free days and did not improve mortality, duration of mechanical ventilation, ICU stay or hospital stay.[12]

Accordingly, the 2025 SCCM guideline could not recommend for or against antipsychotics for delirium treatment.[4,5] They may still have a selective role in patients with severe hyperactive delirium, marked distress or behaviour that creates an immediate safety risk, but should not substitute for correction of reversible causes and implementation of non-pharmacological measures.

Early mobility: from "bed rest" to active recovery

Immobility is a major contributor to ICU-acquired weakness and functional disability. Sedation, mechanical ventilation and prolonged bed rest frequently reinforce one another. The *E component* of the bundle requires mobilisation to be considered every day. A practical progression is shown in Figure 1.

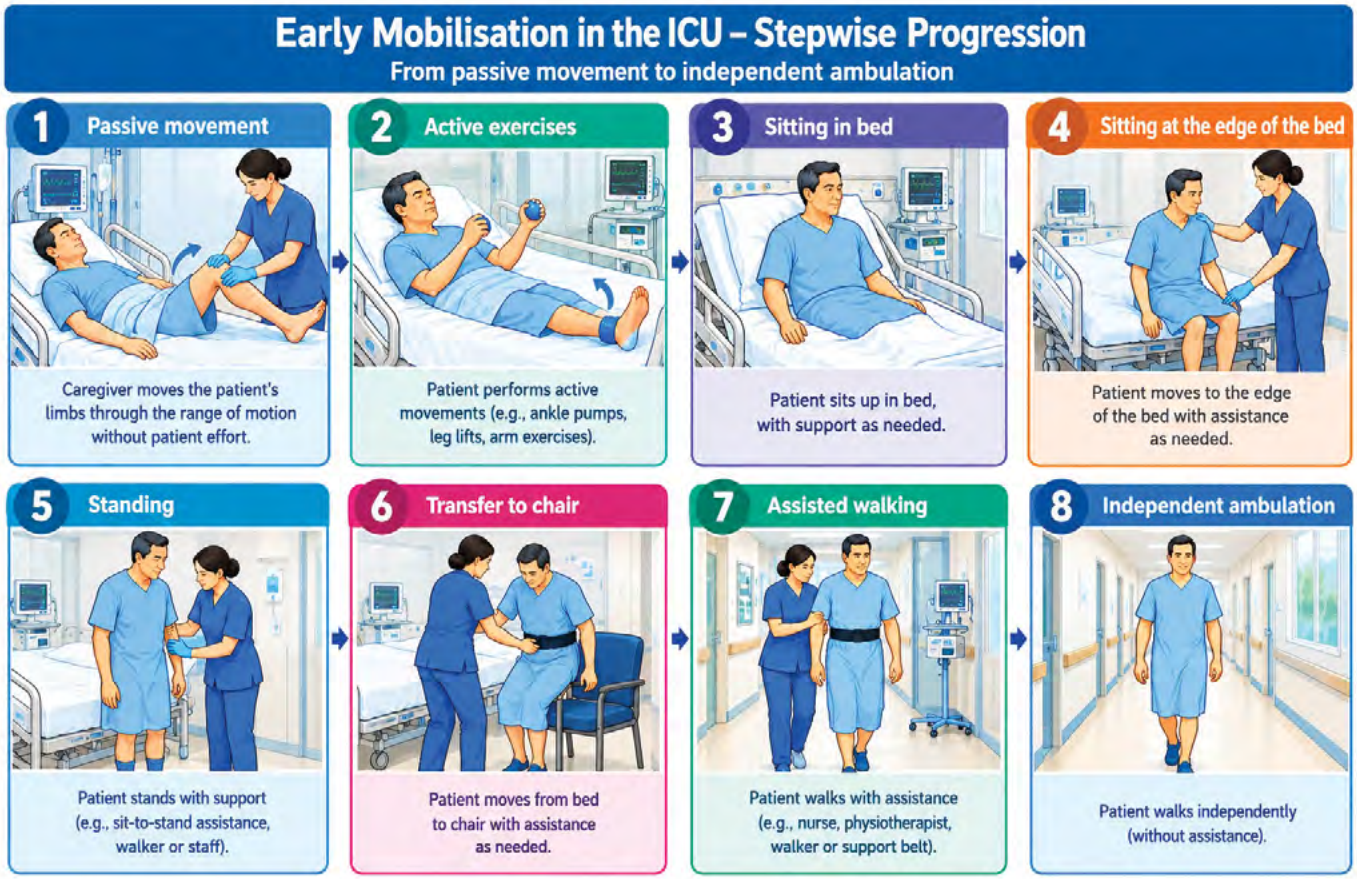


Figure 1. A practical progression for early mobility from 'passive movements' to 'independent ambulation'.

The 2025 PADIS update conditionally recommends enhanced mobilisation/rehabilitation over usual care.[4,5] A 2024 randomised trial demonstrated that a mobile patient lift could facilitate earlier standing in mechanically ventilated patients and improve functional status at ICU discharge.[13] Such technology is particularly useful for patients who are unable to stand independently but are otherwise suitable for mobilisation.

Importantly, mobilisation should not wait until extubation. With appropriate screening, mechanically ventilated patients can often participate safely in progressive mobilisation.

However, early mobilisation should be immediately paused or terminated if the patient develops signs of clinical instability or is unable to safely participate. The reasons to stop include new or worsening respiratory distress, significant oxygen desaturation, marked haemodynamic instability, new or sustained arrhythmia, acute neurological deterioration, loss of consciousness, severe agitation, uncontrolled pain, or any concern regarding airway, vascular access, or other device safety. Mobilisation should also be stopped if the patient reports intolerable symptoms such as severe dyspnoea, dizziness, or chest discomfort. The patient should be reassessed and mobilisation resumed only when clinical stability has been restored and the activity can be undertaken safely.

Sleep: an often neglected component

Sleep disruption is common in the ICU because of noise, light exposure, alarms, procedures, pain and altered circadian rhythms. Poor sleep may contribute to delirium and impaired recovery.

The 2025 SCCM guideline conditionally recommends melatonin in critically ill adults.[4,5] A 2025 systematic review and meta-analysis of 32 randomised trials involving 3,895 patients found that melatonin may reduce delirium (RR 0.72; 95% CI 0.58–0.89), slightly reduce ICU length of stay and improve perceived sleep quality, although certainty of evidence was low.[14] Thus, melatonin may be considered as an adjunct, but it should not replace basic sleep-promoting practices.

Family engagement is an active intervention

The *F component* is sometimes overlooked because it does not involve a drug or procedure. Families can assist with orientation, communication, reassurance, familiar music and emotional support. Flexible family participation may be particularly valuable in patients with delirium or communication difficulties. Family engagement should be incorporated into the care plan rather than being regarded simply as visitation.

Making ICU Liberation work at the bedside

The greatest challenge is not knowing what the ABCDEF bundle contains but reliably implementing it every day. A useful bedside checklist during multidisciplinary rounds is tabulated in Table 2.

Table 2. Bedside checklist during multidisciplinary rounds to facilitate ICU liberation

A – Pain: Is pain assessed and adequately treated?
B – Wake and breathe: Can we perform an SAT and SBT today?
C – Sedation: What is the RASS target? Is the current sedative still required?
D – Delirium: Has the patient been screened? What reversible factors are present?
E – Exercise: What is the highest safe mobility level today?
F – Family: Can the family contribute to orientation and recovery?

SAT, spontaneous awakening trials; SBT, spontaneous breathing trials; RASS, Richmond Agitation-Sedation Scale

Implementation science is increasingly recognised as an essential part of ICU Liberation. A 2024 multicentre study across 34 hospitals found that implementation of the ABCDEF bundle was associated with reductions in ICU length of stay and duration of mechanical ventilation, while sedation and delirium assessment improved and benzodiazepine use decreased. However, mobility and family engagement remained difficult to sustain.[15]

A separate systematic review and meta-analysis of implementation strategies found that use of multiple strategies to implement PAD/PADIS recommendations was associated with reductions in mechanical ventilation duration and ICU length of stay, although the evidence was heterogeneous and many studies had a high risk of bias.[16-18] These findings emphasise that bundle implementation requires leadership, education, nursing and rehabilitation involvement, electronic reminders, audit and feedback, and measurement of individual bundle components.

Bundle compliance should be considered a core metric for evaluating the implementation and fidelity of the ICU Liberation Bundle. Implementation should be quantified using objective, reproducible measures of adherence rather than reported solely as whether individual bundle elements are available or routinely practiced. Compliance with each component should be expressed as the proportion of eligible patient-days or assessment opportunities in which the recommended intervention was delivered, while overall bundle compliance should reflect the proportion of eligible patient-days during which all applicable components were achieved. Importantly, compliance denominators should account for patient-specific eligibility, clinical contraindications, and situations in which a particular intervention is not indicated. Reporting compliance as percentages enables identification of gaps in individual bundle elements, facilitates benchmarking within and across ICUs, and permits assessment of changes in implementation over time. Where complete bundle adherence is difficult to achieve, reporting the distribution of the number or proportion of bundle elements achieved may provide additional information on the degree of implementation. Routine measurement, audit, and feedback of bundle compliance can therefore provide an objective framework for quality improvement and support sustained integration of ICU Liberation principles into routine clinical practice.

ICU Liberation in resource-limited settings

The principles of ICU liberation are particularly relevant to resource-limited ICUs because many of its most effective interventions are inexpensive. Pain assessment, sedation targets, daily awakening assessments, delirium screening, orientation, sleep promotion, passive and active exercises and family participation do not require sophisticated technology.

Resource limitations may restrict availability of dedicated rehabilitation teams, sedative choices or electronic monitoring systems. Nevertheless, an adapted ABCDEF bundle can be implemented using paper-based checklists, bedside sedation targets, nurse-led delirium screening, family participation and progressive mobilisation.

The emphasis should therefore be on process reliability rather than technology. A simple bundle that is consistently implemented may be more valuable than an elaborate protocol that is inconsistently followed.

CONCLUSIONS

ICU liberation represents a fundamental change in critical care philosophy—from keeping patients sedated and immobile to helping them remain comfortable, awake, oriented, mobile and connected with their families. ICU liberation approach follows a patient-centred continuum: treat pain, minimise sedation, target light sedation, promote wakefulness and spontaneous breathing, screen for and prevent delirium, initiate early mobilisation, protect sleep, and actively involve families.

The 2025 PADIS update strengthens the evidence for dexmedetomidine when light sedation or delirium reduction is a priority, enhanced mobilisation and melatonin, while reinforcing uncertainty regarding routine antipsychotic therapy for delirium. Ultimately, ICU liberation is not a medication protocol but a daily interdisciplinary culture of care. Its greatest impact is likely to come from reliable bedside execution of simple interventions, repeated every day for every eligible patient.

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CONFLICT OF INTEREST

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