Chapter 2
Monitoring for Delirium in Critically Ill Adults

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Introduction

Delirium is the most common manifestation of acute brain dysfunction and is increasingly understood as a serious medical event during hospitalization. It is most commonly precipitated by underlying medical conditions, iatrogenic causes (e.g., administration of deliriogenic medications), sensory impairment (e.g., removal of eye glasses or hearing aids), immobilization, and alterations of sleep cycle. It is a prevalent complication in people receiving care throughout the hospital, especially in older people, those with dementia, and patients admitted to intensive care, postoperative, geriatric, and palliative care units [1, 2]. Delirium during the ICU period is a strong predictor of increased length of mechanical ventilation, longer ICU and hospital stays, increased risk of falls, increased health care cost, mortality [3–7], and is linked to negative outcomes long after hospital discharge such as increased mortality and cognitive impairment [4, 8, 9]. The first step in managing ICU delirium is systematic monitoring with a validated delirium assessment tool. Current recommendations

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focus on valid assessment of pain, sedation, and delirium in tandem [10, 11]. This highlights the fundamental interconnectedness of delirium and other patient symptoms and interventions in the ICU. Delirium assessment is so fundamental to critical care management that it is now a core feature in the evidence-based organizational approach referred to as the "ABCDEF bundle" (awakening and breathing coordination, choice of sedatives, delirium monitoring, early mobility, and family engagement and empowerment) [10–14]. Currently, there are enormous variations in practice, with most patients not routinely monitored for delirium in hospital wards and ICUs around the world and with most delirium going undiagnosed [15].

This chapter describes the most common delirium assessment tools for the ICU and outlines how to use those tools to inform delirium prevention and management strategies.

Definition of Delirium

Delirium is an acute neuropsychiatric disorder that is characterized by a loss of attention and accompanied by cognitive change, perceptual disturbance, and/or change in level of consciousness (LOC). Delirium first appeared in medical writings over 2000 years ago [16], and today the term is widely used in medicine and in everyday language and pop culture. There are bands, movies, and beers that bear the name. As a result, there is widespread variation in defining the term [17]. In this era that demands ICU clinicians to practice in multiprofessional teams, it is important that each team member uses medical terms accurately and consistently in order to maximize the care and treatment for patients and families. The primary source for defining delirium has become the *Diagnostic and Statistical Manual of Mental Disorders* (DSM). The DSM details explicit diagnostic criteria for delirium and thus serves as the reference standard (see previous chapter for further details). The most recent revision, the DSM-5, outlines the core criteria for delirium providing more detailed descriptions of each feature and differentiates it from severe neurocognitive disorders and coma [18]. According to DSM-5 criteria, delirium is defined as an acutely developing deficit in attention (reduced ability to direct, focus, sustain, and shift attention) coupled with a change in cognition (memory deficit, disorientation, or perceptual disturbance) [18]. While no major criteria were changed in the revision, it did include some minor changes that prompted some to criticize that the new criteria could be interpreted too narrowly [19]. Meagher and colleagues compared the DSM-IV and two versions of the DSM-5, a strict version (all DSM-5 criteria in their most explicit forms) and a relaxed version (delirium features in all possible forms) with more general interpretation of the criteria. The strict application of DSM-5 criteria interpretation excluded cases with substantial delirium symptoms, but the relaxed version included these patients, thus leading the authors to recommend the relaxed interpretation [19]. The European Delirium Association and the American Delirium Society both endorse a relaxed approach to the criteria interpretation [20]. This debate underscores that, while the DSM-5 provided more detailed explanations of the delirium criteria, it still requires psychiatric training to navigate

and interpret. This complexity does not lend itself to widespread application; thus, valid and reliable assessment tools are needed for general bedside practitioners.

Delirium Assessment Tools for the ICU

Despite the high prevalence of delirium, delirium goes undetected by bedside nurses and medical practitioners in up to three out of four patients when structured assessment tools are not used [21–23]. This is, in part, because symptoms of delirium are often "quiet" (hypoactive rather than hyperactive), challenging to recognize in patients who are sedated or nonverbal [24–27], and frequently fluctuate during the day. Bedside critical care clinicians need delirium assessment tools that, while validated against the DSM standards, are easy to use, are easy to communicate, and have good inter-rater reliability. While many tools have been developed over time, they do not all have strong psychometric properties. In 2013, the Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium (PAD) in Adult Patients in the ICU evaluated a myriad of ICU delirium assessment tools and identified two tools satisfying the threshold for recommendation: Confusion Assessment Method for the ICU (CAM-ICU) [28, 29] and Intensive Care Delirium Screening Checklist (ICDSC) [30]. Gelinas and colleagues reproduced the PAD guideline psychometric evaluation using updated data and again concluded only the CAM-ICU and ICDSC met the acceptable threshold for delirium monitoring [31]. Other tools evaluated for psychometric and feasibility properties that *did not* meet the acceptable threshold include the Cognitive Test for Delirium, the Delirium Detection Score, and the Nursing Delirium Screening Scale. In 2018, the updated version of the guidelines confirmed the role of validated screening tools, including CAM-ICU and ICDSC to improve delirium recognition [10].

There are a variety of other tools developed for use outside the ICU (e.g., Confusion Assessment Method [CAM], 4 A's Test [4AT] [32], Nursing Delirium Screening Scale [Nu-DESC] [33], Delirium Observation Screening Scale [34], Single Question in Delirium [SQiD] [35], Recognizing Acute Delirium As part of your Routine [RADAR] [36]). However, this chapter focuses on tools developed and validated for use in critically ill patients. The following sections provide an overview of the two guideline-recommended and validated ICU delirium monitoring tools.

CAM-ICU

The CAM-ICU scale (Fig. 2.1a) was designed as an adaptation of the original CAM [37] in order to evaluate delirium objectively in a largely nonverbal population due to mechanical ventilation [28, 29]. It is a point-in-time assessment tool. The CAM-ICU evaluates for delirium by assessing four diagnostic features: (1) sudden changes/fluctuations in mental status, (2) inattention, (3) altered levels of consciousness, and (4) disorganized thinking. The patient is considered CAM-ICU positive (i.e., delirious) if he/she manifests both features 1 and 2, plus either feature 3 or 4. The original

CAM-ICU validation study was conducted with 111 patients being evaluated by two independent observers. The observer CAM-ICU evaluations were compared with an assessment conducted by a psychiatrist employing the DSM-IV criteria for delirium diagnosis. Analysis revealed a specificity of 93% and 100% for both raters, respectively, and a sensitivity of 98% and 100% for both raters, respectively [28]. Further studies have demonstrated the usefulness of the CAM-ICU in routine clinical assessment of delirium in ICU patients in other critical care environments to include surgery,

a **CAM-ICU Worksheet**

Feature 1: Acute Onset or Fluctuating Course	Score	Check here if Present
Is the patient different than his/her baseline mental status? OR Has the patient had any fluctuation in mental status in the past 24 hours as evidenced by fluctuation on a sedation/level of consciousness scale (i.e., RASS/SAS), GCS, or previous delirium assessment?	Either question Yes →	☐
Feature 2: Inattention		
Letters Attention Test (See training manual for alternate **Pictures**) Directions: Say to the patient, *"I am going to read you a series of 10 letters. Whenever you hear the letter 'A,' indicate by squeezing my hand."* Read letters from the following letter list in a normal tone 3 seconds apart. **S A V E A H A A R T** or **C A S A B L A N C A** or **A B A D B A D A A Y** **Errors are counted when patient fails to squeeze on the letter "A" and when the patient squeezes on any letter other than "A."**	Number of Errors >2 →	☐
Feature 3: Altered Level of Consciousness		
Present if the Actual RASS score is anything other than alert and calm (zero)	RASS anything other than zero →	☐
Feature 4:Disorganized Thinking		
Yes/No Questions (See training manual for alternate set of questions) 1. Will a stone float on water? 2. Are there fish in the sea? 3. Does one pound weigh more than two pounds? 4. Can you use a hammer to pound a nail? **Errors are counted when the patient incorrectly answers a question.** **Command** Say to patient: "Hold up this many fingers" (Hold 2 fingers in front of patient) "Now do the same thing with the other hand" (Do not repeat number of fingers) *If the patientis unable to move both arms, for 2nd part of command ask patient to "Add one more finger" **An error is counted if patient is unable to complete the entire command.**	Combined number of errors >1→	☐

Overall CAM-ICU **Feature 1 plus 2 and either 3 or 4 present = CAM-ICU positive**	**Criteria Met →**	☐ **CAM-ICU Positive** (Delirium Present)
	Criteria Not Met →	☐ **CAM-ICU Negative** (No Delirium)

Fig. 2.1 Assessment of the content of consciousness: (**a**) Confusion Assessment Method for the ICU (CAM-ICU) (Ely et al. [28, 53]); (**b**) Intensive Care Delirium Screening checklist (ICDSC). (Used with permission from John Devlin. Sessler et al. [54], Ely et al. [55])

b **Intensive Care Delirium Screening Checklist Worksheet (ICDSC)**

- Score your patient over the entire shif. Components don't all need to be present at the same tme.
- Components #1 through #4 require a focused bedside patient assessrnent. This cannot be completed when the patient is deeply sedated or comatose (ie. SAS = 1 or 2; RASS = -4 or -5).
- Components #5 through #8 are based on observations throughout the entire shift. information from the prior 24 hrs (ie, from prior 1-2 nursing shifts) should be obtained for components #7 and #8.

1. **Altered Level of Consciousness** NO 0 1 Yes
   Deep sedation/coma over entire shift (SAS= 1, 2; RASS = -4,-5] = Not assessable
   Agitation [SAS = 5,6, or 7; RASS= 1-4] at any point = 1 point
   Normal wakefulness [SAS = 4: RASS = 0] over the entire shift = 0 points
   Light sedation [SAS = 3; RASS= -1, -2, -3]: = 1 point (if no recent sedatives)
   = 0 points (if recent sedatives)
2. **Inattention** NO 0 1 Yes
   Difficulty following instructions conversation, patient easily distracted by external stimuli.
   Will not reliably squeeze hands to spoken letter A: **S A V E A H A A R T**
3. **Disorientation** NO 0 1 Yes
   In addition to name, place, and date, does the patient recognize ICU caregivers?
   Does patient know what kind of place they are in?
   (list examples: dentist's office, home, work, hospital)
4. **Hallucination, delusion, or psychosis** NO 0 1 Yes
   Ask patient if they are having hallucinations or delusions.
   (e.g. trying to catch an object that isn't there
   Are they afraid of the people or things around them?
5. **Psychomotor agitation or retardation** NO 0 1 Yes
   Either: a) Hyperactivity requiring the use of sedative drugs or restraints in order to control potentially dangerous behavior (e.g. pulling IV lines cut or hitting staff)
   OR b) Hypoactive or clinically noticeable psychomotor slowing or retardation
6. **Inappropriate speech or mood** NO 0 1 Yes
   Patient displays; inappropriate emotion; disorganized or incoherent speech; sexual or inappropriate interactions; is either apathetic or overty demanding
7. **Sleep-wake cycle disturbance** NO 0 1 Yes
   Either; frequent awakening/< 4 hours sleep at night OR sleeping during much of the day
8. **Symptom Fluctuation** NO 0 1 Yes
   Fluctuation of any of the above symptoms over a 24 hr period.

TOTAL SHIFT SCORE: _____ **(0 – 8)**

Score	Classification
0	Normal
1-3	Subsyndromal Delirium
4-8	Delirium

Fig. 2.1 (continued)

trauma, burn, cardiovascular, and neurological ICU settings [38]. A meta-analysis performed by Gusmao-Flores et al. demonstrated excellent accuracy of the CAM-ICU with pooled sensitivity of 80% (95% confidence intervals (CI): 77.1–82.6%) and specificity of 95.9% (95% CI: 94.8–96.8%) for detecting delirium [39]. Evaluation of CAM-ICU features is conducted through objective evaluation. The CAM-ICU has been translated in over 30 languages which can be found at www.icudelirium.org/cibs-center along with training materials and videos.

There is one recent adaptation of the CAM-ICU to highlight [10]. The *CAM-ICU-7* is a severity rating scale based on the CAM-ICU assessment. Specific points are assigned for each feature. The CAM-ICU-7 scores are categorized as 0–2, no delirium; 3–5, mild to moderate delirium; and 6–7, severe delirium [40] (Table 2.1). A recent observational study using the CAM-ICU-7 suggests an association between delirium severity and worse outcomes (i.e., ICU and hospital length of stay and the probability of returning home) [40].

Table 2.1 The confusion assessment method for the ICU-7 delirium severity scale

Items (assessed using CAM-ICU criteria)	Grading
1. Acute onset or fluctuation of mental status	0 for absent
	1 for present
2. Inattention	0 for absent (correct: ≥8)
	1 for inattention (correct: 4–7)
	2 for severe inattention (correct: 0–3)
3. Altered LOC	0 for absent (RASS: 0)
	1 for altered level (RASS: 1, −1)
	2 for severe altered level (RASS: >1, <−1)
4. Disorganized thinking	0 for absent (correct: ≥4)
	1 for disorganized thinking (correct: 2, 3)
	2 for severe disorganized thinking (correct: 0, 1)
Score	0–2: no delirium
	3–5: mild to moderate delirium
	6–7: severe delirium

Adapted from: Khan et al. [40]

ICDSC

Intensive Care Delirium Screening Checklist (ICDSC) is an 8-item checklist (Fig. 2.1b) validated in 2001 by Bergeron et al. [30]. The ICDSC incorporates both a point-of-care focused evaluation by the bedside clinician and evaluation of other delirium features manifesting during the remainder of a specified time period (e.g., 12-h nursing shift). The eight predefined diagnostic criteria as per DSM-IV include altered LOC, inattention, disorientation, hallucination or delusion, changes in psychomotor activity (agitation and retardation), inappropriate mood or speech, sleep/wake cycle disturbances, and symptom fluctuation [30]. Patients are given one point for each delirium symptom manifesting over the course of a shift. The ICDSC is positive for delirium when at least four out of eight criteria are present. The validation study performed by Bergeron et al. compared ICDSC to a psychiatric evaluation and reported sensitivity of 99% and specificity of 64% in detecting ICU delirium. According to the meta-analysis by Gusmao-Flores et al., the ICDSC has good accuracy (area under ROC 0.89) with pooled sensitivity of 74% (95% CI: 65.3–81.5%) and pooled specificity of 81.9% (95% CI: 76.7–86.4%) [39].

Incorporating Delirium Assessment into Clinical Practice

Regular monitoring of delirium with a valid and reliable tool allows for enhanced detection of delirium and facilitates a coherent clinical plan in which specific management of the patient's delirium is planned alongside other aspects of care, thus coordinating care and optimizing therapeutic interventions [41–46]. Moreover, delirium monitoring can reveal early signs of acute and serious physiologic

problems (e.g., acute disruption to homeostasis, adverse drug effects, organ dysfunction) and stimulate rapid and responsive medical care. Routine delirium monitoring can help overcome delirium miscommunications between the multidisciplinary team [47] and improve precision of diagnostic understanding and language. This enhanced communication is achieved by counteracting the numerous misnomers for delirium (*ICU psychosis, confusion, and terminal agitation*) which downplay the significance and severity of delirium and contribute to its under-recognition, poor assessment, and inadequate follow-up care [48].

Assessment Recommendations

Delirium assessment should be performed serially in order to obtain the best picture of the patient's mental status. Delirium assessment can be performed by any healthcare professional, although nurses most commonly perform the assessment and should be included as part of standard care. The role of nurses in this process is critically important due to the nurse's consistent close patient contact and interaction. Since a key feature of delirium is fluctuation, the guidelines recommend delirium evaluation be performed at least every shift (e.g., every 8 or 12 h) and each time a change in mental status is noted [10, 49]. Delirium assessment can most often be completed in <1 min. The result of delirium assessments should be recorded in patient medical record documents to enable its use for members of the multidisciplinary team.

The assessment of delirium is an important element of general assessment of the state of consciousness and is conducted in two stages. The first step is to assess the LOC, via either the Richmond Agitation-Sedation Scale (RASS) (see previous chapter for figure) or Sedation Agitation Scale (SAS) (Fig. 2.2). The next step is to assess the content of consciousness (i.e., delirium). In cases of coma (e.g., RASS −4, RASS −5 or SAS 1, SAS 2), it is impossible to assess for delirium because the patient is unresponsive to external stimuli. Coma disqualifies the patient from delirium evaluation. However, a patient can be assessed for delirium if there is any responsiveness to verbal stimulation (e.g., RASS −3 to +4 or SAS 3–7). When it is possible to obtain at least the beginnings of meaningful reactions (e.g., any response to voice), the content of consciousness should be evaluated, and delirium can be assessed.

Implementation Recommendations

Implementation of routine delirium monitoring requires not only appropriate practical training (e.g., expert lectures, workshops, case-based scenarios, visual aids, mnemonics, bedside teaching) in the ICU environment but also institutional support and acknowledgment of the necessity for delirium screening [50]. Implementation trials have shown that great importance must be put on follow-up teaching, reinforcement, and audits of delirium screening in order to maintain high levels of compliance and reliability many years after implementation [51].

Riker Sedation-Agitation Scale (SAS)

Score	Term	Descriptor
7	Dangerous Agitation	Pulling at ET tube, trying to remove catheters, climbing over bedrail, striking at staff, thrashing side-to-side
6	Very Agitated	Requiring restraint and frequent verbal reminding of limits, biting ETT
5	Agitated	Anxious or physically agitated, calms to verbal instructions
4	Calm and Cooperative	Calm, easily arousable, follows commands
3	Sedated	Difficult to arouse but awakens to verbal stimuli or gentle shaking, follows simple commands but drifts off again
2	Very Sedated	Arouses to physical stimuli but does not communicate or follow commands, may move spontaneously
1	Unarousable	Minimal or no response to noxious stimuli, does not communicate or follow commands

Fig. 2.2 Sedation Agitation Scale (SAS). Guidelines for SAS Assessment: (1) agitated patients are scored by their most severe degree of agitation as described. (2) If patient is awake or awakens easily to voice ("awaken" means responds with voice or head shaking to a question or follows commands), that's a SAS 4 (same as calm and appropriate – might even be napping). (3) If more stimuli such as shaking are required but patient eventually does awaken, that's SAS 3. (4) If patient arouses to stronger physical stimuli (may be noxious) but never awakens to the point of responding yes/no or following commands, that's a SAS 2. (5) Little or no response to noxious physical stimuli represents a SAS 1. This helps separate sedated patients into those you can eventually wake up (SAS 3), those you can't awaken but can arouse (SAS 2), and those you can't arouse (SAS 1)

A "delirium vigilance approach" can enhance implementation success by employing altered LOC as a trigger to perform delirium assessment [52], brain roadmaps for multiprofessional communication, mnemonics for risk identification, and structured documentation systems for quality improvement performance tracking [20, 47]. Clinical dashboards can trigger delirium assessment if a patient's LOC meets criteria for delirium assessment (i.e., RASS −3 to +4, SAS 3–7) but delirium status has not been documented. The brain roadmap (Fig. 2.3) provides the script for communicating delirium assessment results in addition to relevant information to guide delirium management discussion during interdisciplinary rounds. Components of the brain roadmap communication framework are pain assessment, target and actual LOC, delirium assessment, and sedative/analgesic/antipsychotic medications received in the previous 24 h [50]. Mnemonics (Table 2.2) [e.g., Dr. DRE, THINK, DELIRIUM(S)] can then be applied to guide discussion of predisposing and precipitating factors contributing to delirium and, thus, determine a patient-centered therapeutic management approach. Finally, quality improvement feedback can be

Brain Road Map for Rounds
(Script for Interdisciplinary Communication)

Skipping any of these steps could leave the clinical team wanting more information!

Investigate (Ask these questions)	Report (only takes 10 seconds)
Where is the patient going?	Target level of consciousness (RASS, SAS)
Where is the patient now?	Actual level of consciousness (RASS, SAS) Delirium assessment (CAM-ICU, ICDSC) Pain assessment (NRS, CPOT, BPS)
How did they get there?	Drug exposures

Fig. 2.3 The brain roadmap for rounds. (Adapted from www.icudelirium.org)

Table 2.2 Mnemonics for delirium

Dr. DRE Strategies to consider when delirium is present	**Dr** Diseases (sepsis, COPD, CHF)
	DR Drug removal (especially sedatives)
	E Environment (immobilization, sleep, day/night variation, hearing aids, glasses)
THINK What to THINK about when delirium is present	**T** Toxic situations (heart failure, shock, dehydration, deliriogenic meds [especially sedatives], new organ failure)
	H Hypoxemia
	I Infection/sepsis, immobilization
	N Nonpharmacological interventions (sensory aids, reorientation, sleep, music, noise control, ambulation)
	K+ or electrolyte problems
DELIRIUM (S) Differential diagnosis for patients with delirium (Remember: delirium usually has more than one cause)	**D** Drugs
	E Eyes, ears, other sensory deficits
	L Low O2 states (heart attack, stroke, pulmonary embolism)
	I Infection
	R Retention (urine or stool)
	I Ictal state
	U Underhydration/undernutrition
	M Metabolic causes (diabetes, postoperative state, sodium abnormalities)

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created using data from the medical record. Structured delirium documentation and recording delirium components in addition to only the overall assessment result can provide data for tracking process and outcome measures for quality improvement initiatives to reduce delirium prevalence in addition to monitoring assessment reliability.

Interprofessional Approach to Delirium Management

The PAD-IS guidelines recommend using a multidisciplinary ICU team approach to facilitate pain, agitation, and delirium management [10, 49]. The ABCDEF bundle, a group of evidence-based critical care practices, provides a framework for implementation of this recommendation. This bundle emphasizes essential routine patient assessments (i.e., pain, LOC, delirium) and prioritizes key interventions (e.g., sedation cessation, spontaneous breathing trials, early mobility). Implementation of the ABCDEF bundle maximizes the likelihood of successful patient engagement in each individual bundle component. Outcomes associated with ABCDEF bundle implementation include reduced duration of delirium and mechanical ventilation and a higher likelihood of early mobilization and hospital survival [11–14].

Conclusion

Delirium monitoring should become part of routine clinical care for every ICU patient. Validated simple and quick assessment tools are available for routine use by non-psychiatric personnel. The choice of which validated delirium assessment tool and implementation process to use is dependent on patient needs, goals of care, and organizational structure. Regular monitoring of delirium allows an enhanced detection of delirium that could facilitate the clinical management of the patient leading to improved patient outcomes and increased awareness of early signs of acute and serious physiological problems, thus stimulating rapid and responsive medical care.

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