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Implementing Delirium Screening in the Intensive Care Unit: Secrets to Success

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Abstract

Objective—To review delirium screening tools available for use in the adult and pediatric ICU, review evidence-based delirium screening implementation and to discuss common pitfalls encountered during delirium screening in the ICU.

Data Sources—Review of delirium screening literature and expert opinion.

Results—Over the past decade, tools specifically designed for use in critically ill adults and children have been developed and validated. Delirium screening has been effectively implemented across many ICUs settings. Keys to effective implementation include addressing barriers to routine screening, multi-faceted training such as lectures, case-based scenarios, one-on-one teaching and real-time feedback of delirium screening and interdisciplinary communication through discussion of a patient's delirium status during bedside rounds and through documentation systems. If delirium is present clinicians should search for reversible or treatable causes since it is often multifactorial.

Conclusion—Implementation of effective delirium screening is feasible but requires attention to implementation methods, including a change in the current ICU culture that believes delirium is inevitable or a normal part of a critical illness, to a future culture that views delirium as a

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dangerous syndrome which portends poor clinical outcomes and which is potentially modifiable depending on the individual patients circumstances.

Keywords

delirium; implementation; CAM-ICU; Intensive Care Delirium Screening Checklist; monitoring; intensive care; nursing; quality improvement; process improvement

“A long habit of not thinking a thing wrong, gives it a superficial appearance of being right.” Thomas Paine, *Common Sense*

Introduction

Delirium in the intensive care unit (ICU) is common. Despite a high prevalence, delirium is commonly overlooked, and as the quote above alludes, we too often accept it as having a “rightful place” in our patients’ clinical course, when in fact it is harbinger of danger in most circumstances. Delirium is present in as many as 60–80% of mechanically ventilated patients(1–6) and 20–50% of non-mechanically ventilated patients(7–10). It is characterized by the acute to sub-acute onset of altered consciousness and cognition, frequently with a reduced awareness of the environment, impaired attention, and/or disorganized thinking. (11–13) Delirium presents as three major subtypes, hyperactive (agitated), hypoactive (quiet) and mixed (features of both hyperactive and hypoactive), with hypoactive and mixed the most common presentations in critically ill patients.(14, 15)

ICU clinicians regularly monitor the heart, lungs and kidneys through blood pressure, heart rate, oxygen saturation, and urine output measurements. Yet, the same clinicians often employ a less structured routine for monitoring the brain, an organ of equal, or arguably greater, importance to patients.(16–20) While acute brain dysfunction in the critically ill includes both delirium and coma, delirium is by far the most common manifestation and is associated with short and long-term consequences including prolonged mechanical ventilation, increased hospital and ICU length of stay, increased healthcare costs, long-term cognitive impairment and physical disability.(2, 21–29) Repeated studies have demonstrated the independent association between the duration of delirium in the ICU and an increased risk of death in the months following a critical illness.(2, 29, 30) There is a dose response relationship such that each additional day a patient experiences delirium increases the likelihood of death by 10%.(2, 30)

The need to implement screening for delirium as a form of organ dysfunction across the spectrum of ICU settings, alongside other end-organs, is increasingly recognized.(31) Strikingly, without the use of a structured diagnostic tool, delirium goes undetected in up to 3 out of 4 patients, highlighting the need for tools to rapidly and accurately detect delirium. (32, 33) Fortunately, the last decade has seen the development, validation and implementation of delirium screening in ICUs worldwide and in over 20 languages (see translations at www.icudelirium.org). Multiple delirium detection tools have now been developed for use in many different patient populations, including those in nursing homes, hospital wards, ICUs and more recently in the Emergency Department. As with most clinical instruments, these tools are not without controversy and the diagnostic criteria for delirium continue to evolve with updates to the American Psychiatric Association’s Diagnostic and Statistical Manual (with DSM V coming soon) and the International Classification of Diseases (ICD).(34, 35) Importantly, both of these updated delirium classification instruments upheld inattention (not hallucinations or delusions) as the cardinal feature of delirium across patient types.(36) This take-home message represents a key lesson for clinicians who often misunderstand what constitutes the presence of delirium. Reflecting the

positions of the DSM and ICD criteria, the most commonly used tools in critical care [i.e., the Confusion Assessment Method for the ICU (CAM-ICU)(1) and the Intensive Care Delirium Screening Checklist (ICDSC)(7)] both include the presence of inattention, and the CAM-ICU actually pivots on the presence or absence of this feature. As our understanding of delirium grows, delirium screening tools will likely evolve to keep pace with growing knowledge.(37) Nonetheless, despite current tools' imperfections, the brain dysfunction that they detect has been repeatedly and independently associated with numerous poor outcomes that dramatically alter the lives of patients being treated in ICUs across the world today.

This manuscript, written by members of the team who developed the CAM-ICU and who, importantly, are very supportive of and often teach the ICDSC as well, will serve as a guide to those interested in implementing (or improving) delirium monitoring in their ICU. We will briefly describe and compare screening tools available for detecting delirium in critically ill adults. We then will use an overview of the literature and our own experience in assisting others with delirium screening implementation in ICUs worldwide to discuss methods for effective implementation of delirium screening in an ICU. Finally, we explore common pitfalls encountered during delirium screening and provide guidance on delirium prevention and management.

Delirium Screening Tools for the ICU

ICU patients are commonly intubated, sedated, and/or physically weak. These unique characteristics led to the development of five adult delirium screening tools which are validated against the American Psychiatric Association's Diagnostic and Statistical Manual (DSM) criteria for the diagnosis of delirium: the Intensive Care Delirium Screening Checklist (ICDSC), the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU), the Nursing Delirium Screening Scale (Nu-DESC), the Delirium Detection Score (DDS) and the Cognitive Test for Delirium (CTD). (1, 7, 11, 38, 39) Each tool varies with regard to content, delirium symptom assessment method (e.g., standardized vs. observational assessment), length of assessment time, and psychometric properties. The ICDSC(7) and the CAM-ICU(1), are the most well studied and widely implemented adult ICU delirium screening tools worldwide (8, 15) and are the two delirium screening tools recommended by recently updated clinical practice guidelines.(31) These tools are described and contrasted below.

Delirium Screening Tools in the Adult ICU

The two components of consciousness are "arousal" and "content." Arousal of consciousness is synonymous to level of consciousness. Thus, a thorough assessment of consciousness should involve an evaluation of "arousal" using a sedation-agitation scale [e.g., Richmond Agitation-Sedation Scale (RASS)(40) or Riker Sedation-Agitation Scale (SAS)(41)], which allows for categorizing the patient on the spectrum of arousal. This should be part of *any* standard neurological exam, not just for patients receiving sedatives. The second step of the consciousness examination, which should occur in all patients who are arousable to voice (RASS -3, SAS 3 or more alert), involves an evaluation of "content" with a delirium screening tool. We emphasize that content of consciousness (i.e., screening for delirium) cannot be assessed when a person's level of consciousness is so impaired that they are stuporous or comatose (RASS -4/-5 or SAS 1/2).

Confusion Assessment Method for the ICU (CAM-ICU)

The CAM-ICU is modified from the Confusion Assessment Method (CAM) (2, 42, 43) and assesses four features: 1) Acute change or fluctuation in mental status from baseline, 2) inattention, 3) altered level of consciousness and 4) disorganized thinking.(1, 42) The CAM-

ICU is positive, and the patient is considered to have delirium, if Features 1 and 2 and *either* Feature 3 or 4 is present. Each feature relies on components considered to be standard neurologic assessments and provides objective evaluation of each. Figure 1 provides an outline of how each feature is assessed. As shown in this figure, the CAM-ICU is logically ordered to allow for early stoppage, therefore increasing its efficiency in the clinical setting. For example, if the patient is at his/her mental status baseline with no fluctuation and attentive (Features 1 and 2 negative), then it is not necessary to assess other CAM-ICU features since a patient must be inattentive to meet criteria for delirium. Similarly, evaluation of disorganized thinking (Feature 4) is only needed when the patient is positive for Features 1 and 2 (i.e., not at mental status baseline or fluctuating *and* inattentive), but negative for Feature 3 (i.e., alert and calm). All other times, Feature 4 assessment is not required. While a more in-depth description of performing the CAM-ICU as well the CAM-ICU training manual is available at www.icudelirium.org, some additional salient tips can be found in Table 1.

The Intensive Care Delirium Screening Checklist

The Intensive Care Delirium Screening Checklist (ICDSC) is an 8-item checklist of delirium symptoms evaluated over an 8–24 hour period.⁽⁷⁾ Patients are given one point for each symptom that manifests during the specified time frame (zero points if symptom did not manifest). The eight symptoms are: level of consciousness, inattention, disorientation, hallucinations/delusions/psychosis, psychomotor agitation or retardation, inappropriate speech or mood, sleep/wake cycle disturbances, and symptom fluctuation. A score 4 indicates a positive ICDSC and the presence of delirium. Key symptoms of delirium can be part of a focused evaluation from the bedside clinician. For example, as the nurse introduces him/herself to the patient and performs the clinical assessment s/he also assesses for signs that may indicate the patient is inattentive, has disorganized thinking, psychomotor agitation/retardation, etc. Presence of any symptoms noted during an initial focused evaluation can immediately be scored on the ICDSC. The patient can subsequently be observed and scored for additional symptoms that manifest or fluctuate during the remainder of the specified time period. Without objective criteria, there could be variation in how symptoms are identified in intubated patients. See Table 2 for suggestions on how to assess delirium symptoms in this special population using the ICDSC.

Efficacy of Delirium Screening Tools in Adults

Two recent systematic reviews and meta-analyses reviewed the psychometric properties of both the CAM-ICU and ICDSC and the reader is referred to these for a broader discussion of these properties of these tools. (44, 45) Briefly, the CAM-ICU's pooled sensitivity was 76% and 80%, respectively, and pooled specificity was 96% in both studies. The pooled sensitivity for the ICDSC was 74% and 80% and the pooled specificity was 75% and 82%. Furthermore, the CAM-ICU's reliability and validity has been evaluated against DSM reference raters in 12 studies totaling 1179 ventilated and non-ventilated adult patients (Table 3).^(1, 9, 23, 38, 42, 46–51) Three studies were performed in medical ICUs, two in surgical ICUs, six in mixed (medical & surgical) ICUs and one in a neurologic ICU. Five studies (Table 3) have evaluated the ICDSC against DSM reference raters.^(7, 46, 47, 52, 53) All studies enrolled in mixed ICUs and included 465 patients, both ventilated and non-ventilated.

Clinical differences between the CAM-ICU and ICDSC

The CAM-ICU and the ICDSC demonstrate two major clinical differences: the duration over which symptoms are assessed and methods for identifying delirium symptoms.

Most CAM-ICU assessments can be completed in <1 minute.(9) The ICDSC, gathers information over 8–24 hours (depending on how the teams decides to implement and collect data). Since delirium is characterized by a fluctuating course, the ‘spot’ nature of the CAM-ICU may miss an episode of delirium if specific delirium symptoms are not found at the time of the assessment, and this is more likely to be an issue in populations with a low severity of illness. This limitation can be addressed by increasing assessment frequency (e.g., every 4 to 12 hours) and with changes in the patient’s mental status. Conversely, the longer assessment period of the ICDSC may lead to increased false positive screens for delirium if a patient exhibited signs of delirium in the last 24 hours, but currently exhibits no signs.

The second clinical difference is how each tool identifies delirium symptoms. The CAM-ICU uses specifically defined and validated measures requiring interaction with the patient to determine the presence or absence of each delirium feature, providing a reproducible measure. A potential disadvantage is that the diagnostic performance may be dependent on patient characteristics such as age, premorbid cognition, and severity of illness. Nevertheless, Ely et al. found the CAM-ICU’s diagnostic performance was consistent across these subgroups.(1) The ICDSC relies on observational methods to detect inattention, disorientation, hallucinations, presence of sleep, and inappropriate speech or mood.(7) Detection of these symptoms may be particularly difficult in non-verbal mechanically ventilated patients, yet the ICDSC allows subjective interpretation with those more difficult circumstances. For this reason, the ICDSC relies more upon clinical experience. While researchers have sought to operationalize specific definitions of the symptom descriptions in the ICDSC, they surmised that these definitions warrant further validation.(54–56)

Delirium Screening Tools for other Critical Care Areas

Pediatric ICUs

With the revelation of harmful effects of delirium in adults, researchers and clinicians have begun to explore delirium in the pediatric ICU. Three delirium screening tools have been developed to address the specific needs of the pediatric population. The Pediatric Confusion Assessment Method for the ICU (pCAM-ICU) modified the CAM-ICU for detecting delirium in children aged 5 and greater. The pCAM-ICU includes age-appropriate content for children over the age of five such as kid-friendly, boldly colored visual attention pictures and questions such as, “Is ice cream hot?” (57, 58) The Pediatric Anesthesia Emergence Delirium (PAED) was originally developed to detect emergence delirium but subsequently applied to the pediatric ICU. It evaluates five items: 1) Eye contact with the caregiver, 2) Purposeful actions, 3) Awareness of surroundings, 4) Restlessness, and 5) Inconsolability. (59) Finally, the Cornell Assessment of Pediatric Delirium (CAP-D) can be used in children of any age, and variable developmental stages utilizing bedside nursing assessment of the five behaviors included in the PAED, with the addition of assessments for “underactivity” and “delayed and/or sparse responses” to detect hypoactive delirium.(60)

Table 4 provides a summary of key psychometric properties of these three pediatric delirium screening tools. The p-CAM was studied in 68 children treated in a mixed pediatric ICU (PICU).(57) The PAED was studied in two studies, consisting of 232 critically ill children in two mixed PICUs and the CAP-D was evaluated in 50 critically ill children in a single mixed PICU.(59, 60) All three studies enrolled ventilated and non-ventilated patients. The pCAM-ICU and the CAP-D demonstrated excellent sensitivity (>80%) and specificity (>98%) across studies.(57, 59, 60) The PAED, however, demonstrated a sensitivity of 91.3% in one study and only 50% in another.(60) The specificity of the PAED was greater than 98% in both studies.(59, 60) All three tools were reliable across raters with kappas greater than 0.79. Finally, given its initial focus on detecting emergence delirium, a

classically “hyperactive” form of delirium, the PAED may be less sensitive at detecting hypoactive delirium than either the pCAM-ICU or the CAP-D, although data conflict in this regard.(60, 61)

Emergency Departments

Another area of emerging importance is the issue of monitoring severely ill patients in environments where there is very little time and even fewer personnel trained in psychiatry and geriatrics, such as the Emergency Department. Since the available general delirium screening tools generally take 10 to 15 minutes or longer, emergency physicians miss delirium in up to 75% of cases.(62) The ED is a dynamic and high-throughput environment, where clinicians take care of multiple patients at once and have limited amount of time to spend with each patient.(63) Consequently, prolonged delirium assessments are not feasible for use the ED or other similar fast-paced patient care settings. Therefore, we have recently modified the CAM-ICU into a tool called the Brief Confusion Assessment Method (B-CAM), which asks the patient to recite the months backwards from December to July, rather than perform the attention screening tests used in the CAM-ICU, with more than 1 error indicating delirium. The B-CAM was 84% sensitive and 96% specific compared with a psychiatrist’s 30-minute delirium evaluation using the DSM-IV criteria as the reference standard.(34) The reliability was very good as the B-CAM’s kappa was 0.88. Thus, there now exist multiple ways, using the 4-featured Confusion Assessment Method framework [originally described in 1990 by Sharon Inouye(43)] to screen for delirium among patients in the Emergency Department, acute care, and ICU settings (both adult and pediatric).

Implementing Delirium Monitoring Tools

Despite the differences between the CAM-ICU and the ICDSC, the key to widespread delirium detection, prevention, and treatment is implementation and routine use of any of the validated delirium screening tools. Objective testing for delirium allows clinicians to detect more cases of delirium (particularly the hypoactive subtype) and prevents “overcalling” of delirium in patients who are agitated for other reasons.(32, 64) Clinicians commonly cite perceived difficulty screening in sedated or intubated patients, perceived complexity of delirium screening tools and time constraints as barriers to using delirium screening tools. (20, 65–69). These barriers may be overcome through education on delirium and training in the delirium screening tools.(56, 69)

Although a larger number of studies have examined implementation of the CAM-ICU, both the CAM-ICU and ICDSC have been implemented with high reliability when implemented properly into daily clinical practice.(69–72) We will now describe some of these successful implementation studies and summarize effective strategies implementing delirium screening in the ICU (Table 5).

Pun and colleagues performed multi-center implementation of level of consciousness (RASS) and delirium monitoring (CAM-ICU).(70) Nurses participated in 20-minute long, unit-wide in-services detailing the RASS and the CAM-ICU that incorporated pocket references and case studies. Nurses received additional teaching over the course of the next 6–9 months at monthly staff meetings, display of unit-wide compliance and accuracy data, and one-on-one teaching with an expert rater. This interdisciplinary, multifaceted approach resulted in over 84% compliance with performance of delirium assessments over the next 6–12 months, with nurses frequently assessing patients more often than the minimum requirement. Overall, the bedside nurses had very high agreement with the reference raters in both ICUs.

Identifying and addressing key barriers to delirium screening prior to beginning the implementation process can further enhance implementation process. In a separate study, the addition of these steps resulted in a dramatic increase in the proportion of nursing shifts where delirium screening with the CAM-ICU occurred from 38% before the implementation program to 95% afterwards.(69)

A Trauma ICU utilized an online training program, supplemented by in-person in-services and one-on-one demonstrations carried out over a two-week period, followed by 10 weeks of informal follow-up education led by expert raters and nurse “champions” to implement delirium screening with the CAM-ICU.(71) The overall agreement between bedside nurses and expert raters was high ($\kappa = 0.77$) and assessments were performed on more than 85% of nursing shifts six weeks following the end of the implementation program.

Devlin and colleagues used case-based scenarios along with didactic teaching theory to implement delirium assessment in two ICUs using the ICDSC.(72) Following the educational intervention, more bedside nurses correctly and accurately used a validated delirium screening tool compared with the pre-intervention period.

After Devlin’s study mentioned above, a second pharmacists-led, interdisciplinary delirium educational intervention and implementation study of the ICDSC utilizing in-person lectures, a web-based tutorial and a bedside demonstration increased bedside nurse knowledge, confidence, and performance as measured by the number of correct delirium assessments.(56)

These studies show that successful delirium screening implementation is possible and underscore the importance of an education program that includes background knowledge, applied training with the specific delirium screening tool that includes bedside demonstrations, individual follow-up teaching, real-time feedback on the accuracy of assessments and incorporation of the results of the delirium screen into daily rounds and documentation systems. Finally, it should be recognized that implementation of delirium screening is a continual process and while new staff members will most certainly require training, current staff members will also benefit from periodic refresher training and ongoing feedback.

Effectiveness of Delirium Monitoring in Clinical Practice

Within the last year, four studies of delirium monitoring outside of clinical trials and even outside the ICU have presented findings that are worthy of discussion. Neufeld and colleagues sought to implement delirium screening among non-ICU oncology ward patients.(73) The delirium prevalence in this population was 26% and both the CAM-ICU and the ICDSC demonstrated sensitivities of <50%. Despite lower sensitivity in this specific population, both tools were very specific (98%). Similarly, van Eijk sought to determine the test characteristics of the CAM-ICU in ICU practice.(51) Across 10 Dutch ICUs, the CAM-ICU again demonstrated 50% sensitivity, but excellent specificity (98%).(51) Conversely, Vasilevskis and collaborators compared CAM-ICU assessments performed by bedside nurses to the CAM-ICU assessments performed by well-trained reference-rater research nurses. Bedside nurses in this study had undergone routine sedation and delirium monitoring training as described above.(70) Overall there was very good agreement between raters (weighted $\kappa = 0.67$), and sensitivity and specificity of the bedside nurses’ CAM-ICU assessments were 0.81 (95% CI = 0.78–0.83) and 0.81 (95% CI = 0.78–0.85) respectively.(74) Thus, regular ICU nurses without formal research training and with minimal “in-servicing” can most certainly achieve a very high level of sensitivity and specificity and reliability with routine monitoring.(74) It cannot be assumed, however, that this is always the case (51) and due diligence must be the rule and not the exception. Finally,

the CAM-ICU was recently validated in 129 patients admitted to a neurological ICU for treatment of acute stroke. The CAM-ICU performed well against the reference raters using DSM criteria, with a sensitivity of 75% (95% confidence interval 55%–91%) and a specificity of 98% (95% confidence interval 93%–100%).⁽⁵⁰⁾ The likelihood ratio of a positive CAM-ICU in the diagnosis of delirium was 47, which is very high since likelihood ratios of >10 are noted to warrant large and meaningful sways in clinical decision making. (75, 76)

Taken together, the results of these four studies highlight five key points about delirium screening in the ICU. The first is the consistently high specificity of the CAM-ICU. In the van Eijk study, for example, across 8 out of the 10 ICUs studied, there was not a single false positive. In this study and in the study of post-stroke patients the positive likelihood ratios for the CAM-ICU were very high, indicating that a positive CAM-ICU gives the clinician near certainty that delirium is present. Second, as with most screening tests, it is clear that some delirium detected by reference raters using the DSM-IV criteria will be missed by both the CAM-ICU and ICDSC. Nevertheless, delirium detected by the CAM-ICU or the ICDSC is associated with adverse clinical outcomes including duration of mechanical ventilation, ICU and hospital length of stay, healthcare costs, cognitive impairment, physical disability and death. (2, 21–30) Which brings us to point three, whether these “difficult to detect” cases of delirium (e.g., missed by the CAM-ICU or the ICDSC, but detected with a longer, more rigorous interview done by a DSM rater) or subsyndromal delirium (e.g., the presence of delirium symptoms that do not meet the full syndromal definition of delirium) are associated with worse outcomes remains an area in need of further study. Fourth, when delirium is suspected, but the clinician is having difficulty detecting inattention, the cardinal feature of delirium (36), a more strenuous ‘stress test’ of attention may be required (i.e., the visual over the auditory attention test for the CAM-ICU as described above, see Table 1). Use of a more stringent test of attention can help to optimize the sensitivity of the delirium screen. Finally, the differences with regard to the findings of the two ‘real-world’ CAM-ICU implementation studies emphasize that methods used to train ICU personnel may have implications for the ultimate successful implementation of delirium screening tools.

Recommendations to improve effectiveness of bedside delirium screening

A key component to establishing effective and lasting bedside delirium screening is to incorporate it into the daily routine of the ICU team. We recommend three specific mechanisms to facilitate this endeavor: using the “Brain Roadmap” as a tool to rapidly communicate the vital components of a patient’s mental status and sedating medications, using targeted sedation protocols which integrate assessments of level of consciousness and delirium status into sedation management, and finally incorporating delirium assessments into existing documentation systems.

The Brain Roadmap

The Brain Roadmap is a quick (less than 10-second) presentation given by a bedside caregiver during daily, interdisciplinary bedside rounds that incorporates the three key components of a patient’s cognitive status (see table 6).⁽⁷⁷⁾ This conversation allows the team to rapidly communicate about the delirium status and sedation strategy so the team is ‘on the same page’ with regard to management of these components of the patient’s ICU care.

Targeted Sedation Management and Delirium Assessments

Targeted sedation is recommended by expert guidelines to avoid the harms of over- and under-sedation.^(78, 79) Using targeted sedation, the clinician chooses a sedation target

around which sedating medications are titrated (down in the case of over-sedation and up in the case of under-sedation). Using this strategy, the delirium assessment can be seamlessly incorporated into the daily ICU routine. At the same time the bedside clinician is checking the patient's level of consciousness (to adjust sedation) he or she can obtain information needed for the delirium assessment.

Incorporation of the Delirium Assessment into Documentation Systems

Incorporation of the delirium assessment into nursing and physician documentation systems allows formal capture of the results of the assessment, reminds the clinical personnel to perform the delirium assessment, enhances communication between providers across shifts, and makes the assessment part of the patient's medical record.(78, 79) This latter benefit is important as we learn more about the long-term effects of delirium including cognitive impairment and functional disability.(27, 28)

Utilizing information garnered from the delirium assessment

Despite using the above recommendations and effectively implementing delirium screening in an ICU, enthusiasm for delirium screening can still be diminished when team members do not respond to a positive delirium screen.(70) A full discussion regarding the management of the delirious ICU patient is beyond the scope of this review, therefore we will only offer two important points. First, the presence of delirium should serve as a 'burglar alarm' and alert the ICU personnel that the patient is in danger. Immediate steps should be taken to identify potentially reversible or modifiable causes of delirium. We posit two mnemonics "THINK" and "Dr. DRE" to remind the clinician that he or she should look closely for risk factors that may be managed or eliminated in the patient who has developed delirium (Table 7). Second, the presence of delirium should not automatically trigger the prescription of an antipsychotic medication. While commonly used(17) these medications are without proven efficacy and therefore expose patients to potential side effects without proven benefit.(79–81)

Finally, systemic changes to ICU management may reduce delirium. One such 'bundled' approach, called the ABCDEs has been advocated.(77, 82–84) The ABCDEs combines evidence-based components from ventilator weaning (Spontaneous Awakening and Spontaneous Breathing Trial Coordination), sedation management (Choosing a sedative other than benzodiazepines), and physical and occupational therapy (Early mobility). Consciousness monitoring – both arousal/level and content (i.e., Delirium) is a central thread linking all components of this bundle. The approaches contained in this multi-faceted approach to patient care are associated with improved patient outcomes including reductions in delirium prevalence, reduction in duration of acute brain dysfunction, shorter duration of mechanical ventilation, ICU and hospital length of stay and reduced mortality.

Conclusions

Delirium is associated with short and long-term adverse outcomes following critical illness, which takes us back to the introductory quote for this paper. We have so long seen it as part of the scenery in our ICU patients that we have mistakenly come to think of it as normal and acceptable. In fact, delirium represents an organ failure that must be adequately monitored in order to attempt to minimize risks and duration that are so predictive of bad outcomes for the humans suffering this malady. Effective treatment for this deadly syndrome remains an area of ongoing study, yet delirium management cannot take place unless delirium is first detected via the use of a well-validated and reliable screening tool in adult ICUs (i.e., CAM-ICU or ICDSC), pediatric ICUs (i.e., the CAP-D, PAED, or pCAM-ICU), or Emergency Departments (i.e., B-CAM). Implementation of effective delirium screening is feasible but

requires attention to implementation methods, including a change in the ICU culture that delirium is inevitable or a normal part of a critical illness. Perhaps the most important piece of implementation is to make use of the information provided by the delirium screening tool to efficiently communicate cognitive status and modify patient management such as the causative diseases, drugs, and environmental risks.

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Confusion Assessment Method for the ICU (CAM-ICU) Flowsheet

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Figure 1.

The Confusion Assessment Method for the ICU (CAM-ICU). The CAM-ICU assesses for the four features of delirium: Feature 1 is an acute change in mental status or a fluctuating mental status, Feature 2, is inattention, Feature 3, is altered level of consciousness and Feature 4, is disorganized thinking. Only patients who are arousable to voice can be assessed for delirium (Richmond Agitation Sedation Scale [RASS] –3, Sedation Agitation Scale [SAS] 3 or more alert). A patient screens positive for delirium if Features 1 and 2 and *either* Feature 3 or Feature 4 are present. See text for additional details of how to perform the CAM-ICU.

Table 1**Tips for Assessing Inattention (Feature 2) using the CAM-ICU**

Auditory attention test (sufficient to determine inattention in most patients)

- Typically a string of ten letters (e.g., “S-A-V-E-A-H-A-A-R-T” or “A-B-A-D-B-A-D-A-A-Y”)
- Can be modified for different languages (e.g., “A-N-A-N-A-S-B-A-U-M”, German for pineapple)
- Character based languages (e.g., China, Japan, Korea) can use a string of numbers (e.g. 1-2-1-3-4-2-1-2-6-1)
- If the patient incorrectly squeezes >2 times, then s/he is inattentive. This includes patients who squeeze on no letters, those who squeeze on every letter, and those who stop squeezing after a few letters.

Visual attention test

- Typically reserved for ~5% of needing a more rigorous “stress test” of attention (e.g., clinician is highly suspicious that delirium is present but the patient is borderline on the auditory attention test)
 - During the visual test the patient is shown and asked to remember 5 pictures. The patient is then shown 10 pictures, and asked to indicate whether a picture was previously seen. (instructions & picture packets available to be printed at www.icudelirium.org/assessment).
 - If the patient makes >2 mistakes, then s/he is inattentive.
-

CAM-ICU, Confusion Assessment Method for the Intensive Care Unit.

Table 2**Suggestions for Assessing Delirium with the ICDSC**

1. Altered level of consciousness Choose ONE from A–E.		
A. Exaggerated response to normal stimulation	SAS = 5, 6, 7 or RASS = +1 to +4	(1 point)
B. Normal wakefulness	SAS = 4 or RASS = 0	(0 points)
C. Response to mild or moderate stimulation (follows commands)	SAS = 3 or RASS –1 to –3	(1 point)
D. Response only to intense and repeated stimulation (e.g. loud voice and pain)	SAS = 2 or RASS –4	*Stop assessment
E. No response	SAS = 1 or RASS –5	*Stop assessment
2. Inattention		(1 point if any present)
A. Difficulty in following commands <u>OR</u>		
B. Easily distracted by external stimuli <u>OR</u>		
C. Difficulty in shifting focus		
<i>Does the patient follow you with their eyes?</i>		
3. Disorientation		(1 point for any abnormality)
A. Mistake in either time, place or person		
<i>Does the patient recognize ICU caregivers who have cared for him/her and not recognize those that have not? What kind of place are you in? (list examples)</i>		
4. Hallucinations or Delusions		(1 point for either)
A. Equivocal evidence of hallucinations or a behavior due to hallucinations (<u>Hallucination</u> = perception of something that is not there with <u>NO</u> stimulus) <u>OR</u>		
B. Delusions or gross impairment of reality testing (<u>Delusion</u> = false belief that is fixed/unchanging)		
<i>Any hallucinations now or over past 24 hrs? Are you afraid of the people or things around you? [fear that is inappropriate to the clinical situation]</i>		
5. Psychomotor Agitation or Retardation		(1 point for either)
A. Hyperactivity requiring the use of additional sedative drugs or restraints in order to control potential danger (e.g. pulling IV lines out or hitting staff) <u>OR</u>		
B. Hypoactive or clinically noticeable psychomotor slowing or retardation		
<i>Based on documentation and observation over shift by primary caregiver</i>		
6. Inappropriate Speech or Mood		(1 point for either)
A. Inappropriate, disorganized or incoherent speech <u>OR</u>		
B. Inappropriate mood related to events or situation		
<i>Is the patient apathetic to current clinical situation (ie. lack of emotion)? Any gross abnormalities in speech or mood? Is patient inappropriately demanding?</i>		
7. Sleep/Wake Cycle Disturbance		(1 point for any abnormality)
A. Sleeping less than four hours at night <u>OR</u>		
B. Waking frequently at night (do not include wakefulness initiated by medical staff or loud environment) <u>OR</u>		
C. Sleep 4 hours during day		
<i>Based on primary caregiver assessment</i>		
8. Symptom Fluctuation		(1 point for any)
Fluctuation of any of the above items (ie. 1 – 7) over 24 hours (e.g. from one shift to another)		
<i>Based on primary caregiver assessment</i>		
TOTAL ICSDC SCORE (Add 1 – 8)		

ICDSC, Intensive Care Delirium Screening Checklist; SAS, Sedation Agitation Scale; RASS, Richmond Agitation Sedation Scale. *Modified from Devlin, et al., Combined didactic and scenario-based education improves the ability of intensive care unit staff to recognize delirium at the bedside. Crit Care 2008;12(1):R19.*

Table 3

Sensitivity, specificity and reliability of the CAM-ICU and ICDSC

Study (Year) ^a	Delirium Screening Tool	N	Delirium Prevalence (%)	Sensitivity (%)	Specificity (%)	Reliability
Ely (2001)	CAM-ICU	36	87	95 & 100	93 & 89	0.79–0.95
Ely (2001)	CAM-ICU	96	83	93 & 100	98 & 100	0.96
Lin (2004)	CAM-ICU	102	22	91 & 95	98	0.91
Guenther (2009)	CAM-ICU	54	46	88 & 91	100	0.96
Tobar (2009)	CAM-ICU	29	42	80 & 83	96 & 96	0.91
vanEijk (2009)	CAM-ICU	126	42	64	88	0.75–0.85
Luetz (2010)	CAM-ICU	156	40	81	96	0.89
Toro (2010)	CAM-ICU	129	26	79	98	0.79
Heo (2011)	CAM-ICU	22	73	90 & 77	72 & 76	0.81
Gusmão-Flores (2011)	CAM-ICU	119	39	72.5	96.2	NR ^b
Mitasova (2011)	CAM-ICU	129	43	76	98	0.94
vanEijk (2011)	CAM-ICU	181	41	47	98	0.63
Bergeron (2001)	ICDSC	93	16	99	64	0.71–0.79
vanEijk (2009)	ICDSC	126	23	43	95	0.75–0.86
George (2011)	ICDSC	59	34	74	75	0.95
Radtke (2009)	ICDSC	68	69	89	57	NR
Gusmão-Flores (2011)	ICDSC	119	39	96	72.4	NR ^b

^a All studies used American Psychiatric Associations' Diagnostic and Statistical Manual Criteria for delirium.

^b Not Reported

CAM-ICU, Confusion Assessment Method for the Intensive Care Unit. ICDSC, Intensive Care Delirium Screening Checklist.

Table 4

Sensitivity, specificity and reliability of the pCAM-ICU, PAED and CAP-D

Study (Year)	Delirium Screening Tool	N	Delirium Prevalence (%)	Sensitivity (%)	Specificity (%)	Reliability
Smith (2011)	pCAM-ICU	68	12	83	99	0.96
Janssen (2011)	PAED	182	17	91	98	0.89
Silver (2012)	PAED	50	29	50	100	0.79
Silver (2012)	CAP-D	50	29	91	100	0.97

^a All studies used American Psychiatric Associations' Diagnostic and Statistical Manual Criteria for Delirium.

pCAM-ICU, Pediatric Confusion Assessment Method for the Intensive Care Unit; PAED, Pediatric Anesthesia Emergence Delirium Scale; CAP-D, Cornell Assessment of Pediatric Delirium.

Table 5**Tips for implementing delirium screening in the ICU**

-
- 1 Create an interdisciplinary team.**
 - These “delirium champions” (e.g., physicians, nurses, pharmacists, respiratory therapists, physical and occupational therapists) will become local delirium experts champion the cause of delirium screening and serve as resources throughout the implementation process.
 - Involve ICU leadership, get their buy-in and to help in “selling” change on rounds and in all forms of interdisciplinary interactions
 - 2 Choose a validated delirium screening tool**
The CAM-ICU and ICDSC are recommended by expert guidelines and are the most well-validated and widely used delirium screening tools worldwide.
 - 3 Identify and address barriers to delirium screening in your ICU**
The most commonly cited barriers include perceived difficulty using a delirium screening tool, concern about assessing delirium in sedated and intubated patients, and time constraints. These barriers are overcome with ongoing education and training of delirium screening tools.
 - 4 Use a multi-faceted approach to train clinicians to screen for delirium**
Effective strategies include:
 - Didactic instruction, training videos or online resources about delirium, its symptoms adverse outcomes associated with the syndrome, and how to use the screening tool.
 - Case-based scenarios to reinforce concepts learned during didactic sessions. Utilize additional educational materials including pocket cards, posters and flyers.
 - One-on-one teaching by the delirium champions
 - Unit-wide metrics regarding compliance and accuracy
 - 5 Provide follow-up training**
 - Involvement and engagement with front-line personnel with continual feedback (and reinforcement) will help maintain a high degree of motivation
 - Utilize monthly staff meetings to reinforce delirium screening concepts, address concerns and provide additional education
 - Train new staff members at orientation and provide refresher training to current staff
 - 6 Incorporate the delirium screen into daily interdisciplinary bedside rounds**
 - Communication amongst interdisciplinary staff is key
 - Have “the talk”: Utilize bedside nursing presentation of the Brain Roadmap or other communication frameworks to rapidly report the patient’s level of consciousness and delirium status. Discuss the patient’s brain status and strategy to manage sedatives and/or delirium.
 - 7 Incorporate results of the delirium screen into documentation systems**
Incorporation of these results reminds clinicians to complete the screen, facilitates communication across shifts, and makes the delirium status part of the medical record.
 - 8 Utilize “Small Tests of Change” and Plan-Do-Study-Act (PDSA) Cycles**
Remember that small changes can make a big difference.
Ask:
 - “What are we trying to accomplish?”
 - “How will we know that a change is an improvement?”
 - “What changes can we make that will result in improvement?”
-

CAM-ICU, Confusion Assessment Method for the ICU. ICDSC, Intensive Care Delirium Screening Checklist.

Table 6**The Brain Roadmap****Where is the patient going?**

Report the target level of consciousness (RASS or SAS).

Where is the patient now?

Report current level of consciousness (RASS or SAS) and delirium status (CAM-ICU or ICDSC). Consider also reporting a pain score (CPOT or BPS).

How did the patient get there?

Report sedatives, analgesics and antipsychotics the patient is receiving or has received over the last 24 hours.

Conversation Points

Should sedation targets be adjusted?

Does this information represent a change in the patient's clinical status?

If newly delirious or a new altered level of consciousness, why?

Can any medications be stopped?

Should any medications be started or adjusted?

Can the patient be mobilized?

The Brain Roadmap serves as a communication framework for interdisciplinary team members to rapidly (less than 10 seconds) communicate about a patient's level of consciousness and delirium status during bedside rounds. This framework allows clinicians to address the status of the patient's brain (e.g., Is the patient over-sedated and sedatives should be held? If delirious, what is the likely cause? Can we modify that cause?). RASS, Richmond Agitation-Sedation Scale. SAS, Riker Sedation-Agitation Scale. CAM-ICU, Confusion Assessment Method for the ICU. ICDSC, Intensive Care Delirium Screening Checklist. CPOT, Critical-Care Pain Observation Tool. BPS, Behavioral Pain Scale. *Adapted from Balas, et al., Crit Care Nurse 2012; 32:35.*

Table 7When Delirium is present, “*THINK*” about “*Dr. DRE*”

T.H.I.N.K.	Dr. DRE
<u>T</u>oxic Situations <i>CHF, shock, dehydration, delirigenic medications, new organ failures (e.g., renal, liver)</i>	<u>D</u>iseases <i>Sepsis, CHF</i>
<u>H</u>ypoxemia/<u>H</u>ypercarbia	<u>D</u>rug <u>R</u>emoval <i>Stop delirigenic medications (e.g benzodiazepines, antihistamines, opioids used for sedation)</i>
<u>I</u>nfection, <u>I</u>nflammation, <u>I</u>mmobility <i>Is there a new nosocomial infection? Can the patient be mobilized?</i>	<u>E</u>nvironment <i>Remove restraints, provide orientation items including clocks and calendars, reduce isolation mobilize the patient, restore day/night light patterns, reduce noise, promote sleep</i>
<u>N</u>on-pharmacologic Interventions <i>Assess & treat pain, mobilize the patient, provide hearing aids and eyeglasses, reorient the patient reduce noise, promote sleep</i>	
<u>K</u>[±] or other electrolyte abnormalities	

When the CAM-ICU or ICDSC is positive, the immediate search for potential etiologies and modifiable risk factors should be undertaken. We posit the mnemonics “THINK” and “Dr. DRE” to provide clinicians with a brief list of conditions to consider in a delirious patient. “THINK” mnemonic adapted with permission from Marta Render, MD, Department of Veterans Affairs Inpatient Evaluation Center (IPEC).