Intensive Care Med (2001) 27: 859–864
DOI 10.1007/s001340100909

ORIGINAL

N. Bergeron
M.-J. Dubois
M. Dumont
S. Dial
Y. Skrobik

Intensive Care Delirium Screening Checklist: evaluation of a new screening tool

Received: 15 February 2000
Final revision received: 1 November 2000
Accepted: 25 January 2001
Published online: 20 April 2001

N. Bergeron
Department of Psychiatry,
Université de Montréal,
Hôpital Maisonneuve-Rosemont,
Montréal, Québec, Canada

M.-J. Dubois
Division of Critical Care,
Université de Montréal,
Hôpital Maisonneuve-Rosemont,
Montréal, Québec, Canada

M. Dumont
COREV, affiliated with Université
de Montréal, Hôpital Maisonneuve-
Rosemont, Montréal, Québec, Canada

S. Dial
Critical Care and Respirology,
McGill University, Montréal,
Québec, Canada

Y. Skrobik (✉)
Critical Care, Université de Montréal,
Hôpital Maisonneuve-Rosemont,
5415 Boulevard de l'Assomption,
Montréal, Québec, Canada H1T 2M4
E-mail: skrobiky@total.net
Phone: +1-514-252-3822
Fax: +1-514-939-8891

Abstract *Objective*: Delirium in the intensive care unit is poorly defined. Clinical evaluation is difficult in the setting of unstable, often intubated patients. A screening tool may improve the detection of delirium.
Method: We created a screening checklist of eight items based on DSM criteria and features of delirium: altered level of consciousness, inattention, disorientation, hallucination or delusion, psychomotor agitation or retardation, inappropriate mood or speech, sleep/wake cycle disturbance, and symptom fluctuation. During 3 months, all patients admitted to a busy medical/surgical intensive care unit were evaluated, and the scale score was compared to a psychiatric evaluation.
Results: In 93 patients studied, 15 developed delirium. Fourteen (93%) of them had a score of 4 points or more. This score was also present in 15 (19%) of patients without delirium, 14 of whom had a known psychiatric illness, dementia, a structural neurological abnormality or encephalopathy. A ROC analysis was used to determine the sensitivity and specificity of the screening tool. The area under the ROC curve is 0.9017. Predicted sensitivity is 99% and specificity is 64%.
Conclusion: This study suggests that the Intensive Care Delirium Screening Checklist can easily be applied by a clinician or a nurse in a busy critical care setting to screen all patients even when communication is compromised. The tool can be utilized quickly and helps to identify delirious patients. Earlier diagnosis may lead to earlier intervention and better patient care.

Keywords Delirium · Intensive care unit · Screening · Detection · Checklist · Rating scale

Abbreviations *ICU* intensive care unit · *DSM* diagnostic and statistical manual of mental disorders · *ROC* receiver operator characteristic · *APACHE* acute physiologic and chronic health evaluation

Introduction

Behavioral disturbances in patients admitted to the intensive care unit (ICU) are common and have been associated with increased morbidity [1, 2] and mortality [3]. Delirium occurring in the ICU setting is a poorly described and studied entity, which encompasses a range of behavioral and neuropsychiatric disorders during critical illness. To date, no systematic disorder classification attempt exists. Much of what is described in stan-

Table 1 Delirium diagnostic criteria from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)

A. Disturbance of consciousness (i.e., reduced clarity of awareness of the environment) with reduced ability to focus, sustain or shift attention.
B. A change in cognition (such as memory deficit, disorientation, language disturbance) or the development of a perceptual disturbance that is not better accounted for by a pre-existing, established, or evolving dementia.
C. The disturbance develops over a short period of time (usually hours to days) and tends to fluctuate during the course of the day.
D. There is evidence from the history, physical examination, or laboratory findings that the disturbance is caused by the direct physiological consequences of a general medical condition.

dard textbooks is extrapolated from anecdotal experience or inferred from data collected in other patient populations. Delirium, usually described as an acute reversible state, is a psychiatric diagnosis with specific criteria [4], summarized in Table 1.

In the ICU population, the frequent inability to conduct an interview makes determination of the presence of these criteria and subsequent diagnosis difficult. Physicians are known to make incorrect psychiatric diagnoses in acutely ill patients [5]. Improvements in the ability to screen for and recognize delirium in critically ill patients would facilitate rapid intervention and potentially enhance treatment of reversible problems in a population where morbidity and mortality are already very high.

This study aimed to develop a screening tool that would facilitate detection of delirium in a general ICU population.

Delirium assessment instruments

Well-written reviews of delirium assessment instruments by Trzepacz [6] and Smith [7] describe the advantages and shortcomings of a number of methods in the hands of various professionals (physicians, psychiatrists, nurses, and trained personnel).

We conducted a 3-month pilot study which preceded our data collection period. During this time we evaluated patient characteristics that we hoped would better allow us to describe the features of delirium in the critical care setting, and identified potential risk factors relevant to the ICU population. To make the diagnostic process reproducible, we attempted to implement the tools [Clinical Assessment of Confusion-A (CAC-A), Delirium Rating Scale (DRS), Confusion Assessment Method (CAM), Memorial Delirium Assessment Scale (MDAS), and Delirium Symptom Interview (DSI)] [8, 9, 10, 11, 12] to systematically identify delirium in our ICU population. We had considerable difficulties with scales that required language-dependent answers, as approximately 80 % of our patients are intubated on arrival. Other difficulties included variable levels of consciousness impairing the ability to respond to complex questions, and the necessity for good vision and intact motor skills. Our patients are usually sedated for pain (with narcotics or combination regimens titrated by the nurses with a visual analog scale) or discomfort (with benzodiazepines or other anxiolytics titrated by the nurses for a desired Ramsay score) and thus limited in their ability to answer questionnaires. Hemodynamic or medical stability is often problematic in these patients, making longer evaluations by a physician or nurse impractical.

Hart and Levenson created an elegant graphics-based scale [13] for the evaluation of the delirium in the ICU. The tool, validated in selected patients, is claimed to be reliable, easy to use and able to discriminate delirium from dementia, schizophrenia, and depression. The same authors then introduced an abbreviated version of this cognitive test for delirium in the ICU [14], which included attention and memory assessment. We had difficulty in applying this scale as a screening tool in all our consecutively admitted, unscreened patients. The visual integrity issues mentioned above were problematic; the patients come to the intensive care unit without glasses or hearing aids, and frequently received medication (e.g., atropine in the perioperative setting), which also interfered with visual identification of drawn objects. Moreover, the described scales required time investment and training on the part of the interviewer. The information was not readily available from the data routinely recorded during the time spent at the bedside evaluating the patient.

We attempted to create a screening tool based on well-recognized psychiatric criteria. It had to be easy to use for personnel at the bedside (nurses or physicians), be applied in minimal time to all ICU patients, and utilize as many elements as possible of routinely gathered data. We wished to circumvent many of the communication difficulties inherent to the ICU population. Because of the often medically unstable status of the patient, the tool had to be quick to administer. For these reasons, we simplified such time-consuming tasks as detailed evaluation of cognitive functions.

We developed a screening checklist of eight items based on DSM criteria and features of delirium, which were easily utilized at the bedside of a critically ill patient. The Intensive Care Delirium Screening Checklist and the scoring system are shown in Table 2 and Table 3, respectively. The first four screening elements refer directly to the first two DSM-IV criteria. We combined routinely collected data (such as orientation) with short observations of obvious manifestations of described features. Obvious manifestation of a checklist item during

Table 2 The Intensive Care Delirium Screening Checklist

Patient evaluation	Day 1		Day 2		Day 3		Day 4		Day 5	
Altered level of consciousness* (A–E)										
If A or B do not complete patient evaluation for the period										
Inattention										
Disorientation										
Hallucination–delusion–psychosis										
Psychomotor agitation or retardation										
Inappropriate speech or mood										
Sleep/wake cycle disturbance										
Symptom fluctuation										
Total score (0–8)										

* Level of consciousness:
A: No response, score: None
B: Response to intense and repeated stimulation (loud voice and pain), score: None
C: Response to mild or moderate stimulation, score: 1
D: Normal wakefulness, score: 0
E: Exaggerated response to normal stimulation, score: 1

the evaluation period scored one point. Any item that could not be assessed was not eliminated but scored no point.

Materials and methods

During a 3-month period of time (November 1998–January 1999), patients hospitalized in a large medical and surgical (16 bed) intensive care unit for more than 24 h were prospectively evaluated for the development of delirium. Patients admitted with a diagnosis of delirium were excluded. Demographic data, Acute Physiology And Chronic Health Evaluation (APACHE II index of severity) scores and admitting diagnoses were collected. The medical records were reviewed carefully for diagnoses such as central nervous system (CNS) disease, schizophrenia, dementia, and depression as well as history of drug or alcohol abuse.

Each admitted patient had their chart reviewed and was evaluated for their duration of stay or up to a maximum of 5 days. The checklist was administered within 24 h of admission and daily. The primary care nurse assessed patients on every shift and three groups evaluated each patient. A member of the "checklist" team (four data-gathering critical care research nurses, one intensive care board certified physician, one critical care fellow, one psychiatry senior resident) completed the scale every morning. The information utilized included information from the last 24 h (three previous shifts of 8 h) collected from the patient, the primary nurses' evaluation, and the chart. The "study" team, either the treating ICU physician or the study ICU physician, evaluated the patient for development of delirium. The 'psychiatry' team (the consulting board certified psychiatrist) also evaluated each patient and was blind to the results of the scale. The "study" team and the "psychiatry" team were independent evaluators (as to the presence of delirium); we considered the psychiatrist the gold-standard evaluator. The psychiatric diagnosis of delirium was recorded for the day the consultant judged it to be present, even if he or she saw the patient on a subsequent day.

A random sample of the patients was evaluated with the checklist by two independent observers to assess for inter-observer reliability.

Statistical analysis

Each item of the rating scale (yes/no) was attributed one point, for a maximum total score of eight. Using the clinical diagnosis (confirmed by a psychiatrist) as a gold standard for delirium state, the total score of the scale completed on the day of diagnosis was submitted to a receiver operator characteristic (ROC) analysis to determine levels of sensitivity (Sn) and specificity (Sp) of the questionnaire as an instrument for detection of delirium [15]. The homogeneity of the questionnaire, as defined by the propensity of the evaluated psychometric variables to form a coherent image of the patient, was evaluated by calculating Cronbach's alpha homogeneity coefficients.

Results

Ninety-nine patients were admitted to the intensive care unit for 24 h or more. Four were excluded because their level of consciousness did not allow for evaluation; these patients were either comatose or stuporous for the first 5 days after admission, or during their entire stay. Two other patients were excluded because they were admitted in delirium and antipsychotic medication had already been started. Ninety-three patients, sequentially admitted to the ICU, were studied and considered eligible for the scale rating. The characteristics of the population are described in Table 4.

The number of patients diagnosed as having delirium or not, in relation to the total score of the checklist, is shown in Table 5. Fifteen (16%) patients were diagnosed as having delirium. Of these, a score of 4 points or more on the scale identified 14 (93%). This level of scoring was also present in 15 (19%) of the 78 patients who were not diagnosed with delirium.

The ROC curve, with its area under the curve of .9017, is shown in Fig. 1. Levels of sensitivity and specificity were estimated from the ROC curve (with a confi-

Table 3 The scale is completed based on information collected from each entire 8-h shift or from the previous 24 h. Obvious manifestation of an item = 1 point; no manifestation of an item or no assessment possible = 0 point. The score of each item is entered in the corresponding empty box and is 0 or 1

1. Altered level of consciousness: A) No response or B) the need for vigorous stimulation in order to obtain any response signified a severe alteration in the level of consciousness precluding evaluation. If there is coma (A) or stupor (B) most of the time period then a dash (-) is entered and there is no further evaluation during that period. C) Drowsiness or requirement of a mild to moderate stimulation for a response implies an altered level of consciousness and scores 1 point. D) Wakefulness or sleeping state that could easily be aroused is considered normal and scores no point. E) Hypervigilance is rated as an abnormal level of consciousness and scores 1 point.
2. Inattention: Difficulty in following a conversation or instructions. Easily distracted by external stimuli. Difficulty in shifting focuses. Any of these scores 1 point.
3. Disorientation: Any obvious mistake in time, place or person scores 1 point.
4. Hallucination, delusion or psychosis: The unequivocal clinical manifestation of hallucination or of behavior probably due to hallucination (e.g., trying to catch a non-existent object) or delusion. Gross impairment in reality testing. Any of these scores 1 point.
5. Psychomotor agitation or retardation: Hyperactivity requiring the use of additional sedative drugs or restraints in order to control potential danger to oneself or others (e.g., pulling out iv lines, hitting staff). Hypoactivity or clinically noticeable psychomotor slowing. Any of these scores 1 point.
6. Inappropriate speech or mood: Inappropriate, disorganized or incoherent speech. Inappropriate display of emotion related to events or situation. Any of these scores 1 point.
7. Sleep/wake cycle disturbance: Sleeping less than 4 h or waking frequently at night (do not consider wakefulness initiated by medical staff or loud environment). Sleeping during most of the day. Any of these scores 1 point.
8. Symptom fluctuation: Fluctuation of the manifestation of any item or symptom over 24 h (e.g., from one shift to another) scores 1 point.

dence interval of 95 %). With a cut-off score of 4 points, sensitivity is 99 % and specificity 64 %. In other words, a score of 4 points or more will detect 99 % of patients who will go on to have a diagnosis of delirium, but also falsely identify 36 % of patients in whom a psychiatric assessment will not result in this diagnosis.

We reviewed the charts of the 15 patients with scores of 4 or higher who did not have delirium. With the exception of one patient all others had the following:

- A psychiatric diagnosis: schizophrenia, depression with regular intake of codeine and benzodiazepines, depression, and personality disorder (four patients)
- Dementia (three patients)
- Structural neurologic abnormalities: large frontal abscess, meningioma, right parietal tumor, strokes, and anoxic encephalopathy (six patients)
- Cryptogenic cirrhosis with previous encephalopathy (one patient)

Table 4 Characteristics of the patients studied in the evaluation of the Intensive Care Delirium Screening Checklist

Mean age (years)	Mean APACHE score	Medical/ surgical	Male/ female
62 (30–90)	14 (8–21)	49/44	52/41

Table 5 Number of patients diagnosed as having delirium in relationship to the total score of the Intensive Care Delirium Screening Checklist

Diagnosed delirium	Score ≥4	Score < 4	Total
Yes	14	1	15
No	15	63	78
Total	29	64	93

It is relevant to add that the non-delirious patient with a score of four points or more, who did not have a neurologic or psychiatric diagnosis, developed delirium after ICU discharge.

We evaluated the item reliability of the checklist by calculating alpha-homogeneity coefficients. For each of the 5 days the calculated alpha value was between 0.71 and 0.79 (values from 0.65 to 0.90 are considered acceptable). However, the first item of the questionnaire (altered level of consciousness evaluation) weakened, for each evaluated day, the questionnaire's homogeneity. The coefficients, if one disregarded item 1, varied from 0.78 to 0.85. The level of consciousness increased the proportion of error between the total score and the expected diagnosis. Interobserver reliability between nurses, and between nurses and critical care physicians was verified throughout the study and overlap was found in over 94 % of the items.

Discussion

The high sensitivity (99 %) shown in our results is desirable for a screening tool, which raises awareness about transient clinical features necessary to make a diagnosis of delirium. Several reports [1, 3, 16] describe the relationship between the incidence of delirium and self-harm or higher morbidity; a rapid diagnosis and prompt treatment may lead to lowering complications in this population at very high risk. The specificity of 64 % reflects false positive "scoring" on the checklist because

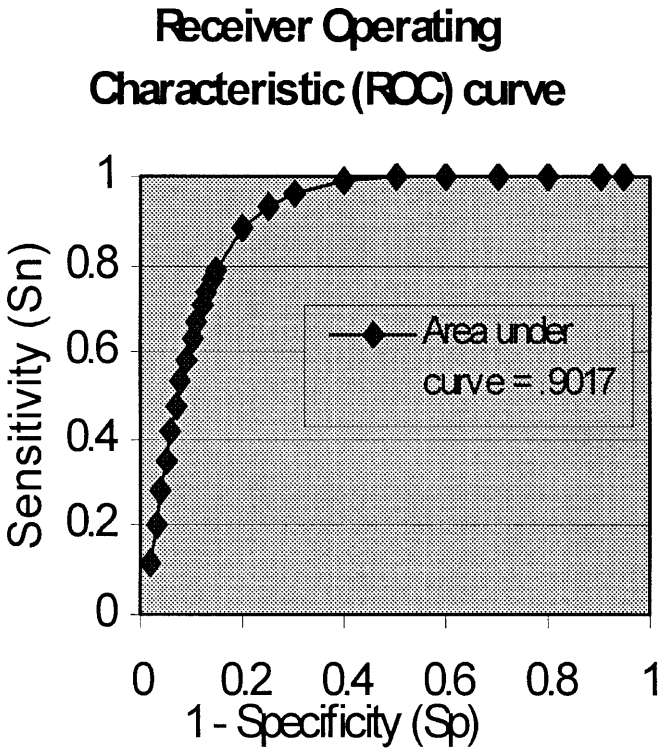

Fig. 1 Receiver operating characteristic (ROC) curve based on total score (0–8) on the day delirium is diagnosed. With a cut-off score of 4, levels of sensitivity and specificity estimated from the ROC curve yield 99 % and 64 %, respectively

of patients with clinical features that mimic delirium (such as a psychiatric diagnosis of schizophrenia). This element emphasizes the potential utility of the scale as a screening, but not a diagnostic tool. Given the 36 % false positive delirium rate, psychiatric consultation may be valuable, especially in situations where psychiatric or neurologic past record is unknown.

Agreement as to the diagnosis between the treating critical care physician and the psychiatrist occurred in all but one patient. This feature of our study may be secondary to our critical care physicians' interest in the clinical presentation of delirium, but also suggests that an initial clinical diagnosis of delirium could be made by a critical care physician without the possible delay involved in obtaining a consultation from a psychiatric liaison team. Our nurses and physicians were strikingly homogeneous in terms of patient assessment. There was probably a learning curve during the initial part of the study, which sensitized all intensive care personnel to delirium. Nurses could, thus, screen patients as well as doctors in the ICU.

Patients whose level of consciousness would not have allowed use of the checklist during their first 5 days were not evaluated. It may be that these patients were more ill or requiring greater sedation or analgesia. The average APACHE score in the study group was somewhat lower than our average ICU APACHE score (mean APACHE = 16), which supports this thought. Delirium cannot realistically be assessed in many of our very sick patients, and our scale accommodates this characteristic of our population.

We did not follow patients onto the ward to continue monitoring for delirium. The appearance of symptoms within hours of discharge, although potentially related to ICU stay, would have been missed. We speculated whether the score of 4 points in one non-delirious patient, who did not have a neurologic or psychiatric diagnosis, was a harbinger of the development of delirium, which occurred 2 days after ICU discharge.

The difference in the accuracy of the described scale when the level of consciousness feature was excluded suggests that, in this population, level of consciousness does not discriminate well for delirium in comparison with the patient population at large, e.g., in outpatients or less ill inpatients. This is hardly surprising when one considers the routine use of analgesics and sedative drugs, as well as the frequency of diagnoses, which make causal attribution of level of consciousness features difficult in an intensive care setting. Level of consciousness evaluation weakens this scale and would probably be the most likely element to vary between less experienced observers. A prospective trial with a 7-point checklist (one which does not include level of consciousness as an item), although of potential interest, may exclude level of consciousness in an individual patient in whom this cardinal feature of delirium would be of importance. This statistical variant emphasizes how different the ICU population is from the average hospitalized or clinic patient.

Conclusion

We describe a new, user-friendly checklist, which may be useful in early and systematic screening of delirium in the intensive care unit. The ease of administration of the scale, its high sensitivity, and its reliability in our experience, make it a potentially useful tool in the intensive care setting, where conventional assessment is often difficult. The speed with which the questionnaire can be completed, as well as the fact that many items can be evaluated by a nurse in the course of routine evaluation, make it practical in the current climate of cost-cutting and maximal efficiency.

References

1. Sessler CN, Rutheford L, Best A, Hart R, Levenson J (1992) Agitation in a medical intensive care unit: prospective analysis of incidence & risk factors. Chest 102: 191S
2. Rutheford LE, Sessler CN, Levenson JL, Hart RP, Black KF (1991) Prospective evaluation of delirium and agitation in a medical intensive care unit. Crit Care Med 19:S81
3. Dial S, Menzies R (1998) ICU Delirium. Am J Respir Crit Care Med 156: 35
4. American Psychiatric Association (1994) Diagnostic and statistical manual of mental disorders. 4th edn. American Psychiatric Association, Washington, D.C.
5. Armstrong SC, Cozza KL, Watanabe KS (1997) The misdiagnosis of delirium. Psychosomatics 38: 433–439
6. Trzepacz PT (1994) A review of delirium assessment instruments. Gen Hosp Psychiatry 16: 397–405
7. Smith MJ, Breitbart WS, Platt MM (1994) A critique of instruments and methods to detect, diagnose, and rate delirium. J Pain Sympt Manage 10: 35–77
8. Hardley Vermeersch PE (1990) The clinical assessment of confusion-A. Appl Nurs Res 3: 128–133
9. Trzepacz PT, Baker RW, Greenhouse J (1988) A symptom rating scale for delirium. Psychiatry Res 23: 89–97
10. Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegal AP, Horwitz RI (1990) Clarifying confusion: the confusion assessment method. Ann Intern Med 113: 941–948
11. Breitbart W, Rosenfeld B, Roth A, Smith MJ, Cohen K, Passik S (1997) The memorial delirium assessment scale. J Pain Sympt Manage 13: 3128–135
12. Albert MS, Levkoff SE, Reilly C, Liptzin B, Pilgrim D, Cleary PD, Evans D, Rowe JW (1992) The delirium symptom interview: an interview for the detection of delirium symptoms in hospitalized patients. J Geriatr Psychiatry Neurol 5: 14–21
13. Hart RP, Levenson JL, Sessler CN, Best AM, Schwartz SM, Rutherford LE (1996) Validation of a cognitive test for delirium in medical ICU patients. Psychosomatics 37: 533–546
14. Hart RP, Best AM, Sessler CN, Levenson JL (1997) Abbreviated cognitive test for delirium. J Psychosom Res 43: 417–423
15. Fletcher RH, Fletcher SW, Wagner EH (1996) Clinical epidemiology: the essentials. 3rd edn. In: Satterfield, Taylor (eds) Williams and Wilkins, pp 51–53
16. Trzepacz P, Breitbart W, Levenson J, Franklin J, Martini DR, Wang P (1999) Practice guideline for the treatment of patients with delirium. Am J Psychiatry 156 [Suppl May]:1–20
17. Chonchubhair AN, Valacio R, Kelly J, O'Keefe S (1995) Use of the abbreviated mental test to detect postoperative delirium in elderly people. Br J Anaesth 75: 481–482
18. Inouye SK, Bogardus ST, Charpentier PA, Leo-Summers L, Acampora D, Holford TR, Cooney LM Jr (1999) A multicomponent intervention to prevent delirium in hospitalized older patients. New Engl J Med 340: 669–676
19. Booth HG, Gillis PA, Fehlauer CS (1993) Nursing observations: a powerful and under-utilised tool for diagnosing delirium. Clin Res 41
20. Wise MG, Trzepacz PT (1996) Delirium (confusion states). In: The American Psychiatric Press Textbook of Consultation-Liaison Psychiatry. American Psychiatric Association, Washington, D.C., pp 259–274
21. Rudberg MA, Pompei P, Foreman MD, Ross RE, Cassel CK (1997) The natural history of delirium in older hospitalized patients: a syndrome of heterogeneity. Age Ageing 26: 169–174
22. Hayashi H, Maeda Y, Morichika H, Miyama T, Suzuki T (1996) Surgical stress and transient postoperative psychiatric disturbances in aged patients studied using the Yamaguchi University mental disorder scale. Surg Today 26: 413–418
23. Trzepacz PT (1996) Advances in diagnosis, pathophysiology, and treatment. Psychiatr Clin North Am 19: 429–449