Clarifying Confusion: The Confusion Assessment Method

A New Method for Detection of Delirium

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Objective: To develop and validate a new standardized confusion assessment method (CAM) that enables nonpsychiatric clinicians to detect delirium quickly in high-risk settings.

Design: Prospective validation study.

Setting: Conducted in general medicine wards and in an outpatient geriatric assessment center at Yale University (site 1) and in general medicine wards at the University of Chicago (site 2).

Patients: The study included 56 subjects, ranging in age from 65 to 98 years. At site 1, 10 patients with and 20 without delirium participated; at site 2, 16 patients with and 10 without delirium participated.

Measurements and Main Results: An expert panel developed the CAM through a consensus building process. The CAM instrument, which can be completed in less than 5 minutes, consists of nine operationalized criteria from the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-III-R*). An a priori hypothesis was established for the diagnostic value of four criteria: acute onset and fluctuating course, inattention, disorganized thinking, and altered level of consciousness. The CAM algorithm for diagnosis of delirium required the presence of both the first and the second criteria and of either the third or the fourth criterion. At both sites, the diagnoses made by the CAM were concurrently validated against the diagnoses made by psychiatrists. At sites 1 and 2 values for sensitivity were 100% and 94%, respectively; values for specificity were 95% and 90%; values for positive predictive accuracy were 91% and 94%; and values for negative predictive accuracy were 100% and 90%. The CAM algorithm had the highest predictive accuracy for all possible combinations of the nine features of delirium. The CAM was shown to have convergent agreement with four other mental status tests, including the Mini-Mental State Examination. The interobserver reliability of the CAM was high (kappa = 0.81 – 1.0).

Conclusions: The CAM is sensitive, specific, reliable, and easy to use for identification of delirium.

Annals of Internal Medicine. 1990;113:941-948.

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Delirium (acute confusional state), defined as an acute disorder of attention and cognition, poses a common and serious health problem for the elderly hospitalized patients. In this setting, incidence estimates have ranged from 25% to 60% (1-11) and case fatality rates, from 25% to 33% (1, 2, 12). Development of delirium in the hospital is associated with increased morbidity, closer nursing surveillance, higher hospital costs per day, longer hospitalizations, and increased rates of nursing home placement on discharge (1, 8, 10, 13-17). Levkoff and colleagues (1) have estimated that if the length-of-stay for each acutely confused, elderly hospitalized patient could be reduced by just 1 day, the savings to Medicare would amount to $1 to $2 billion per year.

Despite its clinical importance, delirium has not been regarded as a legitimate medical and resource-use problem. In addition, the clinical management and study of delirium have been hindered by the lack of uniform terminology and diagnostic criteria for delirium, as well as by the frequently nonspecific presentation of delirium in the elderly. Delirium is often overlooked, misdiagnosed as depression or psychosis, or misattributed to dementia or senescence. In one study, 32% of cases went unrecognized by physicians (18).

Although many indexes for evaluating mental status exist, they are seriously limited in identifying delirium. Most of these indexes are designed specifically for identifying dementia, and their usefulness in identifying delirium has not been addressed. Of the remaining mental status indexes (19-30), few have been validated for use in delirium. In many indexes, the essential features of delirium are not directly rated. In addition, some indexes are too complex for nonpsychiatrists to use.

The aim of this study was to develop and validate a new standardized confusion assessment method (CAM) that would enable nonpsychiatrically trained clinicians to identify delirium quickly and accurately in both clinical and research settings.

Methods

Face validity (that is, whether the contents make sense to clinicians and experts), high sensitivity, and high negative predictive accuracy were among the criteria used in developing the CAM. High specificity was also sought, to permit discrimination between patients with delirium and those with other conditions resulting in cognitive impairment (for example, dementia or depression) but was considered a secondary goal. Ratings based on directly observable behaviors, requiring minimal interviewing time and interpretation, were the final criterion. The CAM includes a new instrument and diagnostic algorithm.

Development of the Instrument

The new method was adapted from the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-III-R*) criteria (31). First, the important clinical features of delirium were identified. Second, these features were specifically defined in the CAM questionnaire. Terminology that would be unfamiliar to nonpsychiatrists was clarified.

On the basis of a review of the literature (1-10, 13, 31-47) and the consensus of an expert panel, we identified nine clinical features of delirium that were considered to be of great diagnostic importance. The expert panel included four geriatricians, two neurologists, and two psychiatrists. The clinical features identified were acute onset and fluctuating course, inattention, disorganized thinking, altered level of consciousness, disorientation, memory impairment, perceptual disturbances, increased or decreased psychomotor activity, and disturbance of the sleep-wake cycle. All of these features are included in the *DSM-III-R* diagnostic criteria for delirium. We eliminated the requirement for a specific organic etiology, another *DSM-III-R* criterion, because it is not observable at the bedside and the required information is often not available at the time of initial diagnosis.

The resulting questionnaire (*see* Appendix Table 1) was based on specific observations relevant to each of the nine features of delirium. The questionnaire includes a quick rating system but also provides open-ended questions to allow richer clinical detail to be recorded, if desired.

Development of the Diagnostic Algorithm

On the basis of the *DSM-III-R*, the previous literature, and the expert panel, we developed, a priori, the following diagnostic algorithm for delirium. The diagnosis of delirium is based on four features: acute onset and fluctuating course (feature 1), inattention (feature 2), disorganized thinking (feature 3), and altered level of consciousness (feature 4). The diagnosis of delirium requires the presence of features 1 and 2 and either 3 or 4. The algorithm was designed to be simple, acceptable to nonpsychiatrists, and useful for rapid identification of delirium. The complete algorithm appears in Appendix Table 2.

These four features are cardinal elements of *DSM-III-R* criteria (31). Features 1 (acute onset and fluctuating course) and 2 (inattention) are identified as essential features of delirium in the *DSM-III-R*. The complementary designation of feature 3 (disorganized thinking) or 4 (altered level of consciousness) is supported by expert judgment and clinical practice. In the presence of a reduced level of consciousness, disorganized thinking often cannot be assessed.

The remaining five features were not included in the algorithm, because we anticipated that they would add nothing to the diagnostic sensitivity or specificity (on the basis of a review of the literature and our clinical experience). For example, memory impairment is sometimes absent in mild delirium, whereas it is present in other conditions, such as dementia.

Face and Content Validity

Face validity involves a qualitative appraisal of the sensibility of an index (48). We asked the expert panel to rate the extent to which the CAM addresses overall concepts of delirium, as well as the specific features of delirium. Each panel member independently completed a detailed, standardized critique of the instrument and algorithm, which we then used to assess face and content validity.

Concurrent Validation

Procedure

Concurrent validity was determined by comparing the CAM ratings with those of a psychiatrist. Concurrent validation was replicated in two clinically distinct samples. At two sites (Yale University and the University of Chicago), each subject was evaluated independently by a geriatrician (S.K.I. or C.A.A.) and by a psychiatrist (C.V.D., A.P.S., or S.B.) within a maximum of 6 hours of each other. Only the geriatrician completed the CAM rating. The geriatrician and the psychiatrist were blinded to the results of each other's evaluation. The order in which patients were seen (whether by the geriatrician or the psychiatrist first) was varied. To minimize a learning effect, each investigator avoided correcting the subjects' responses.

The psychiatrist used standard psychiatric procedures to evaluate the patient and made final diagnoses in accordance with *DSM-III-R* criteria. The evaluation included a detailed patient interview (complete psychiatric interview and mental status examination), family interview, medical record review, and nurse interview (for inpatients). The final diagnoses of the psychiatrist, as confirmed by follow-up medical record review, were the reference standard against which the CAM was assessed.

In a standardized interview, the geriatrician administered the Mini-Mental State Examination (20), checked immediate recall of a story (49), and made a CAM rating and a rating on the Visual Analog Scale for Confusion (20). In addition, either a family member or another observer (a nurse or physician) was interviewed briefly to assess whether an acute change in mental status had been noted. At site 2, an additional attention task, digit span forward (50, 51), was done. The geriatrician did not use information from any source other than the standardized interviews to score the CAM.

Patient Selection

The selection criteria were designed to provide a group of patients who would adequately challenge the CAM; subjects were not intended to be a representative sample of elderly hospitalized patients. To establish sensitivity, we chose to examine patients whose delirium varied broadly in severity and presentation. Our goal was to discover false-negative results. To establish specificity, we challenged the CAM with a broad range of subjects without delirium, particularly those with alternative ailments that may lead to false-positive results (for example, dementia, depression, and other causes of altered mental status).

Before entering the study, the patient, their family (if indicated), and the attending physician gave informed consent. The Institutional Review Board at each institution approved the study protocol.

Study Sample at Site 1

Potential subjects included consecutive patients who were being newly evaluated at the Geriatric Assessment Center and a random sample of patients who had been admitted to six general medical wards at Yale-New Haven Hospital from July 1988 to March 1989. The Geriatric Assessment Center is an outpatient, community referral-based center in which multidisciplinary geriatric assessments are done on 400 new patients per year. Yale-New Haven Hospital is an 800-bed urban teaching hospital with 200 general medical beds. At both sites, eligible patients were 65 years of age or older and were not receiving care from the geriatrician or the psychiatrist. At site 1, eligible patients had diagnoses of suspected delirium, dementia, depression, or "confusion." In addition, a random sample of patients who had normal mental status and no psychiatric diagnoses was selected at site 1.

Thirty-eight eligible patients were identified at site 1. Nine of these patients were excluded because of severe psychosis (3 patients), severe delusions or paranoia (2 patients), agitation (1 patient), or lack of cooperation or refusal (3 patients). Patients who were suspected of having dementia, depression, or both were included in the study to provide particular diagnostic challenge. Thirty patients were enrolled, including 11 (37%) from the clinic and 19 (63%) from the medical wards.

Study Sample at Site 2

Potential subjects included a selected sample of patients who had been admitted from April to June of 1989 to the general medical service at Bernard Mitchell Hospital, a 600-bed urban teaching hospital at the University of Chicago, with 150 general medical beds. At site 2, eligible patients exhibited abnormal thinking or behavior identified by the nursing staff. Unlike at site 1, at site 2 suspected depression and normal mental status were not inclusion criteria. Twenty-nine eligible patients were approached; 3 were excluded because of refusal (2 pa-

Table 1. *Characteristics of Study Groups*

Patient Features and Diagnoses	Concurrent Validation		Interobserver Reliability of Patients at Site 1 (n = 10)
	Patients at Site 1 (n = 30)	Patients at Site 2 (n = 26)	
Baseline features			
Mean age ± SD (range), *y*	80.3 ± 7.9 (67-97)	77.1 ± 8.7 (65-98)	81.7 ± 5.4 (72-90)
Gender, *% women*	14	14	6
Race, *% white*	29*	4*	9
Mean number of years of education ± SD	8.9 ± 3.6	8.6 ± 3.9	8.4 ± 4.4
Active medical problems ± SD, *n*	4.6 ± 2.0	4.9 ± 1.6	4.7 ± 2.5
Chronic diseases	3.3 ± 1.4	2.7 ± 1.4	3.3 ± 2.3
Acute problems	1.3 ± 1.4*	2.2 ± 1.1*	1.4 ± 0.5
Medications, *n*†	3.8 ± 2.4	4.6 ± 2.4	6.1 ± 2.9
Study diagnoses, *n*			
Delirium	10*	16*	2
Alone	9	8	1
With dementia	1*	8*	1
Dementia	9	3	5
Alone	6	3	3
With depression	3	0	2
Depression alone	6*	0*	0
Other psychiatric diagnosis	2	0	0
No psychiatric diagnosis	3	7	3

* $P < 0.05$ for comparison of sites 1 and 2.
† Excluding bowel, eye, and topical medications.

tients) or inability to complete interviews within the specified time (1 patient). Twenty-six patients were enrolled at site 2.

Convergent Validity

We determined the agreement of the CAM ratings with the results of four other mental status indexes. The Mini-Mental State Examination assesses general cognitive functioning (for example, dementia) (20); story recall assesses memory (49); the Visual Analog Scale for Confusion assesses disorganization of thought (10); and the digit span assesses attention (50, 51).

Interobserver Reliability

At site 1 only, interobserver reliability was determined by assessing the consistency of the independent ratings given simultaneously by different observers using the CAM. A separate group of 10 patients was randomly sampled from the same sampling frame used in the concurrent validation. Two researchers observed each patient simultaneously while one of them interviewed the patient. Each researcher independently and blindly completed the confusion assessment questionnaire on the basis of observations made during the interview. Nineteen paired assessments were completed on the 10 patients. Each pair of assessments was done on a different day. The concordance between these 19 assessments was determined. Test-retest reliability was not determined because of the fluctuating nature of delirium.

Ease of Use

Some training is required for optimal use of the CAM. As indicators of ease of use, we measured time for completion of cognitive testing and CAM ratings, subject tolerance, and the CAM's acceptability to clinicians and interviewers.

Statistical Analysis

For comparisons between the groups, the Student *t*-test and standard tests for proportions were used (52). Sensitivity, specificity, positive predictive value, negative predictive value, and confidence intervals (CIs) for sensitivity and specificity were calculated using standard formulae (48, 52). The likelihood ratio for a positive test was defined as follows: sensitivity/(1-specificity). The kappa (κ) coefficient was calculated as the index of concordance exceeding chance for interobserver reliability and convergent validity (52).

Results

Face and Content Validity

The expert panel agreed that the questionnaire had high face validity; that is, they agreed that each item assessed the feature of delirium that it was intended to assess and that the overall instrument would suitably assess patients with delirium. In addition, the diagnostic algorithm was anticipated to have high diagnostic sensitivity. However, the panel was concerned about the algorithm's diagnostic specificity in distinguishing between delirium and dementia.

Concurrent Validity

Table 1 shows the characteristics of the subjects in the concurrent validation (at both sites) and interobserver reliability groups. For purposes of validation, the CAM was applied in the same way to two clinically distinct study populations that differed significantly in race, number of acute medical problems, and distribution of study diagnoses.

As shown in Tables 2 and 3, at site 1 (total, 30 patients), all 10 patients whom the psychiatrist rated as being delirious were also positive according to the CAM

Table 2. *Validation of the Confusion Assessment Method (CAM)*

Diagnosis According to the CAM	Psychiatric Diagnoses of Patients at Site 1 (n = 30)		Psychiatric Diagnoses of Patients at Site 2 (n = 26)	
	Delirium	No Delirium	Delirium	No Delirium
Positive diagnosis	10	1	15	1
Negative diagnosis	0	19	1	9

Table 3. *The Sensitivity, Specificity, and Predictive Accuracy of the Confusion Assessment Method (CAM)**

Measure	Patients at Site 1	Patients at Site 2
	n/N (%) [95% CI]	
Sensitivity	10/10 (100) [66-100]	15/16 (94) [68-100]
Specificity	19/20 (95) [73-100]	9/10 (90) [54-100]
Positive predictive accuracy	10/11 (91)	15/16 (94)
Negative predictive accuracy	19/19 (100)	9/10 (90)

* The likelihood ratios were 20.0 and 9.4 for patients at sites 1 and 2, respectively.

(sensitivity of 100%). The CAM ratings were negative for 19 of the 20 patients whom the psychiatrist rated as not being delirious (specificity of 95%). The likelihood ratio of 20.0 indicates that a subject with a rating of delirium according to the CAM is 20 times more likely to be truly delirious than not to be delirious. At site 2 (total, 26 patients), ratings were positive for 15 of the 16 patients whom the psychiatrist rated as being delirious (sensitivity of 94%). The CAM ratings were negative for 9 of the 10 patients whom the psychiatrist rated as not being delirious (specificity of 90%).

Individual Elements of the Algorithm

The presence or absence of each clinical feature was compared with the reference standard to determine the sensitivity, specificity, and likelihood ratio of that feature (Table 4). Of the nine clinical features of delirium, the four features used in the diagnostic algorithm had the highest likelihood ratios. In addition, when analyzed according to the diagnostic algorithm for this study, the presence of features 1 and 2 and either 3 or 4 gave the best performance of all of the combinations that we examined. The remaining five clinical features, when added alone or in various combinations, did not increase the sensitivity, specificity, or likelihood ratio. Feature 4, an altered level of consciousness, had the highest likelihood ratio (ratio of 63) at site 2 because of its high specificity. However, the sensitivity of this feature is only 63%, and its greatest diagnostic contribution remains in the format of the CAM algorithm.

Convergent Validity

The CAM ratings were found to agree moderately or substantially ($P < 0.001$) with the other mental status indexes: For the Mini-Mental State Examination, $\kappa = 0.64$; for story recall, $\kappa = 0.59$; for the Visual Analog Scale for Confusion, $\kappa = 0.82$; and for the digit span test, $\kappa = 0.66$.

As expected, of the diagnostic features of delirium, attention and disorganization of thought were most closely correlated with the CAM ratings. The strength of agreement between the CAM ratings and the results of all four indexes relates to the CAM's ability to detect any type of abnormal mental status. However, the lack of complete agreement reflects the CAM's ability to discriminate between different types of abnormal mental status. Perfect agreement was not expected, because the CAM measures aspects of delirium that are not included in the other indexes.

Interobserver Reliability

During the 19 paired assessments, the CAM was completed with substantial reliability, as shown in Table 5. For assessing the presence or absence of delirium, agreement was 100% ($\kappa = 1.0$); for rating all nine clinical features, agreement was 88% ($\kappa = 0.67$); and for assessing the four CAM features, agreement was 93% ($\kappa = 0.81$). The strength of agreement for the four individual CAM features was substantial, ranging from 84% ($\kappa = 0.56$) to 100% ($\kappa = 1.0$).

Ease of Use

The standardized interviews, including cognitive testing, administered by the geriatricians (S.K.I., C.A.A.) took a mean of 20 minutes and were well tolerated. Only three subjects were unable to complete the cognitive testing because of severe delirium. However, the investigators were able to complete CAM ratings on all subjects. The CAM instrument can be completed in less than 5 minutes and is well understood by physicians, nurses, and trained lay interviewers. By contrast, the psychiatrist's evaluation took a mean of 90 minutes, of which 30 to 45 minutes were spent on the patient interview.

Table 4. *Sensitivity, Specificity, and Likelihood Ratios for Individual Clinical Features of the Confusion Assessment Method (CAM)*

Clinical Feature	Site 1			Site 2		
	Sensitivity	Specificity	Likelihood Ratio	Sensitivity	Specificity	Likelihood Ratio
Acute onset and fluctuating course	100	95	20.0	100	80	5.0
Inattention	100	85	6.7	94	80	4.7
Disorganized thinking	100	90	10.0	88	80	4.4
Altered level of consciousness	50	95	10.0	63	100	63.0*
Disorientation	90	55	2.0	88	80	4.4
Memory impairment	100	20	1.3	100	60	2.5
Perceptual disturbance	30	90	3.0	19	90	1.9
Abnormal psychomotor activity	60	85	4.0	94	60	2.3
Altered sleep-wake cycle	80	50	1.6	25	70	0.8
Four CAM features	100	95	20.0	94	90	9.4

* Calculated using a specificity of 99%.

Discussion

We have developed and validated a new method that facilitates detection of delirium. The CAM, which includes a new instrument and standardized diagnostic algorithm, has been shown to have high sensitivity (94% to 100%), high specificity (90% to 95%), and high interrater reliability. With its high negative predictive accuracy (90% to 100%), the CAM may serve as a useful test for detection of delirium. It is particularly intended for use in groups of persons who are at high risk for the development of delirium (for example, hospitalized elderly medical and surgical patients). However, its usefulness will need to be confirmed in future studies of representative samples from the specific populations in which it will be used. Because its false-positive rate is as high as 10%, we recommend that in the clinical setting all patients with a diagnosis of delirium according to the CAM have further evaluation to confirm the diagnosis.

Although the CAM diagnoses usually agreed with those of the psychiatrist, discrepancies did occur. In the combined concurrent validation sample of 56 subjects, 3 were misclassified: 1 had a false-negative and 2 had false-positive results. All 3 of these subjects had severe underlying dementia, with inattention and disorganized thinking at baseline. Diagnosing delirium superimposed on dementia is a particularly complex problem. Greater specification or alternate diagnostic criteria may be required for this group. The discrepancies in diagnoses may also result from the geriatrician and the psychiatrist evaluating the patient at different times; the geriatrician and the psychiatrist using different sources of information; and the psychiatrist using a more detailed cognitive evaluation. The false-negative CAM rating most likely resulted from the geriatrician's use of a less detailed cognitive assessment. The two false-positive CAM ratings most likely resulted from temporal separation of the evaluations and the use of different sources of information on the acuity of the mental status change.

For this study, the CAM ratings were based on observations made during a brief, structured interview that included administration of the Mini-Mental State Examination. Although the CAM was designed for use in various clinical settings, such as in making observations during routine clinical care, its validity and reliability using alternative methods of assessment will need to be studied. Some training is required for optimal use of the CAM. The proficiency and thoroughness of the primary observations on which the CAM ratings are based may well influence the CAM's performance.

This study had several important limitations. First, relatively few persons were studied, and they were selected. Although the leading differential diagnoses for cognitive impairment in the elderly (for example, dementia, depression) were adequately tested, the broader spectrum of psychiatric diagnoses—such as schizophrenia, mania, anxiety disorders—were not sufficiently represented to assess the performance of the CAM in patients with these diagnoses. However, these conditions are infrequently seen on general medical and surgical services where the CAM is intended to be used. In addition, further testing of the CAM will be required in patients with multiple psychiatric diagnoses, such as combinations of dementia, depression, psychosis, and delirium. Because the CAM was specifically designed for use in the elderly, its performance in younger subjects will need to be clarified. In addition, further validation studies of the shortened, four-item CAM instrument are needed. The negative predictive accuracy of the CAM may be poorer in populations with a lower prevalence of delirium.

Table 5. *Interobserver Reliability**

Variable	Agreement	Concordance
	%	κ
Overall diagnosis	100	1.0
All nine clinical features	88.2	0.67
Four CAM features	93.4	0.81
Individual features		
Acute onset and fluctuating course	89.5	0.73
Inattention	100	1.0
Disorganized thinking	100	1.0
Altered level of consciousness	84.2	0.56

* On the basis of 19 pairs of observations. CAM = confusion assessment method.

In a preliminary study (53), subjects with a diagnosis of delirium according to the CAM had significantly higher rates of death, medical complications, and prolonged hospital stay than did those without delirium, even after controlling for underlying illness severity. The CAM's ability to predict clinical outcomes associated with delirium supports the CAM's predictive validity (48).

A major reason for the underdiagnosis of and the high complication rate associated with delirium has been the absence of a clinically useful measure. The use of the newly validated and standardized CAM may lead to improved recognition, increased diagnostic accuracy, and earlier intervention for delirium. Ultimately, its use may reduce the morbidity and mortality of this devastating condition, particularly in hospitalized high-risk elderly patients treated on general medical and surgical services. Because the CAM is highly sensitive, rapid, and simple, it may be useful for widespread, daily assessment of delirium in persons in high-risk settings. Because of the high rates of morbidity and mortality and the prolonged length of hospital stay associated with delirium, such assessment may be important for quality assurance. In addition, the CAM provides a useful tool for training physicians and nurses to recognize delirium. It also serves as a means of systematizing and recording clinical observations. Finally, the CAM provides a much needed standardized diagnostic tool for use in clinical research on delirium, an area in which further studies remain vitally important.

This study was completed while Dr. Inouye was a Robert Wood Johnson Clinical Scholar at Yale University and while Dr. Alessi was a fellow in Geriatric Medicine at the University of Chicago.

Acknowledgments: The authors thank Leslie Hurst, MS, for technical assistance; Catherine Viscoli for statistical advice; Cindy Smith and Jason Huckaby for clerical assistance; and Mary E. Tinetti, MD, and Alvan R. Feinstein, MD, for manuscript review.

Appendix Table 1. *The Confusion Assessment Method Instrument*

Acute onset

1. Is there evidence of an acute change in mental status from the patient's baseline?

Inattention*

2. A. Did the patient have difficulty focusing attention, for example, being easily distractible, or having difficulty keeping track of what was being said?

   Not present at any time during interview.
   Present at some time during interview, but in mild form.
   Present at some time during interview, in marked form.
   Uncertain.

   B. (If present or abnormal) Did this behavior fluctuate during the interview, that is, tend to come and go or increase and decrease in severity?

   Yes.
   No.
   Uncertain
   Not applicable.

   C. (If present or abnormal) Please describe this behavior:

Disorganized thinking

3. Was the patient's thinking disorganized or incoherent, such as rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject?

Altered level of consciousness

4. Overall, how would you rate this patient's level of consciousness?

   Alert (normal).
   Vigilant (hyperalert, overly sensitive to environmental stimuli, startled very easily).
   Lethargic (drowsy, easily aroused).
   Stupor (difficult to arouse).
   Coma (unarousable).
   Uncertain.

Disorientation

5. Was the patient disoriented at any time during the interview, such as thinking that he or she was somewhere other than the hospital, using the wrong bed, or misjudging the time of day?

Memory impairment

6. Did the patient demonstrate any memory problems during the interview, such as inability to remember events in the hospital or difficulty remembering instructions?

Perceptual disturbances

7. Did the patient have any evidence of perceptual disturbances, for example, hallucinations, illusions, or misinterpretations (such as thinking something was moving when it was not)?

Psychomotor agitation

8. Part 1.

   At any time during the interview, did the patient have an unusually increased level of motor activity, such as restlessness, picking at bedclothes, tapping fingers, or making frequent sudden changes of position?

Psychomotor retardation

8. Part 2.

   At any time during the interview, did the patient have an unusually decreased level of motor activity, such as sluggishness, staring into space, staying in one position for a long time, or moving very slowly?

Altered sleep-wake cycle

9. Did the patient have evidence of disturbance of the sleep-wake cycle, such as excessive daytime sleepiness with insomnia at night?

* The questions listed under this topic were repeated for each topic where applicable.

Appendix Table 2. *The Confusion Assessment Method (CAM) Diagnostic Algorithm**

Feature 1. Acute Onset and Fluctuating Course

This feature is usually obtained from a family member or nurse and is shown by positive responses to the following questions: Is there evidence of an acute change in mental status from the patient's baseline? Did the (abnormal) behavior fluctuate during the day, that is, tend to come and go, or increase and decrease in severity?

Feature 2. Inattention

This feature is shown by a positive response to the following question: Did the patient have difficulty focusing attention, for example, being easily distractible, or having difficulty keeping track of what was being said?

Feature 3. Disorganized Thinking

This feature is shown by a positive response to the following question: Was the patient's thinking disorganized or incoherent, such as rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject?

Feature 4. Altered Level of Consciousness

This feature is shown by any answer other than "alert" to the following question: Overall, how would you rate this patient's level of consciousness? (alert [normal], vigilant [hyperalert], lethargic [drowsy, easily aroused], stupor [difficult to arouse], or coma [unarousable])

* The diagnosis of delirium by CAM requires the presence of features 1 and 2 and either 3 or 4.

Grant Support: In part by the American Federation for Aging Research.

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