# Delirium

Craig R. Keenan, MD[a,*], Sharad Jain, MD[b]

**KEYWORDS**

• Delirium • Confusion • Assessment • Examination • Attention • CAM • Cognition

**KEY POINTS**

- Delirium is a common neuropsychiatric disorder that can be a harbinger of serious underlying conditions, yet it is often underrecognized.
- There are validated tools using the clinician's history and physical examination that have high sensitivity and specificity that should be used to diagnose delirium.
- Diagnosing the underlying cause of delirium is also a critical step in the patient's care. Physical examination as a tool to find these underlying causes is not well studied, but still can provide important clues to the clinician.

## INTRODUCTION/DEFINITIONS/BACKGROUND

Delirium is a very common neuropsychiatric condition affecting medical patients. The most commonly used definition of delirium is outlined in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-V), and has the following criteria[1]:

- Disturbance in attention (ie, reduced ability to direct, focus, sustain, and shift attention) and awareness.
- Change in cognition (eg, memory deficit, disorientation, language disturbance, perceptual disturbance) that is not explained by a preexisting, established, or evolving dementia.
- The disturbance develops over a short period (usually hours to days) and tends to fluctuate during the course of the day.
- There is evidence from the history, physical examination, or laboratory findings *that the disturbance is caused by a direct physiologic consequence of a general medical condition, an intoxicating substance, medication use, or more than one cause.*

The estimated prevalence of delirium is 23% of hospitalized adults, 4% to 38% of patients in the nursing home, 35% of patients in palliative care settings, and 8% to

[a] University of California, Davis School of Medicine, 4150 V Street, Suite 1100, Sacramento, California 95817, USA; [b] University of California, Davis School of Medicine, 4610 X Street, Suite 4202, Sacramento, California 95817, USA
* Corresponding author.
*E-mail address:* crkeenan@ucdavis.edu

Med Clin N Am 106 (2022) 459–469
https://doi.org/10.1016/j.mcna.2021.12.003
0025-7125/22/

medical.theclinics.com

17% of patients in emergency department settings. The prevalence is particularly high in patients in the intensive care unit (ICU) at 32%, with a 50% to 70% prevalence in mechanically ventilated patients. Last, delirium is a common complication of surgery in older adults with an incidence of 15% to 25% after major elective surgery and up to 50% after higher risk surgeries.[2–4]

Despite these high prevalence rates, delirium often goes unrecognized by clinicians, with up to 65% to 88% of cases not identified by clinicians when compared with formal assessments.[3] One reason for this observation is that only 25% of delirium is the so-called hyperactive delirium, which is characterized by agitation and is more easily identified. Up to 75% of cases in older adults are the more quiet, hypoactive delirium, which often goes unrecognized.[4]

Often delirium is a signal of underlying potentially dangerous and treatable conditions, so it is critical to recognize and address it. The presence of delirium in patients portends a worse prognosis, with increased mortality, impaired physical functioning, incident dementia, and institutionalization; it also is a risk factor for medical complications, increased length of hospital stay, and discharge to post–acute care nursing facilities.[4] Last, delirium can have a highly variable course, lasting a few days in some patients but causing identifiable cognitive dysfunction for many months after the initial diagnosis.

Using the DSM-V definition of delirium, one can outline 2 steps that must be undertaken by the clinician to make a complete diagnosis of delirium. The first step is to identify both the characteristic disturbance in attention and change in cognition. Although the history is very important, there are mental status examinations that can help to identify the cognitive and attention deficits. The second step is to identify the underlying medical cause of the disturbance, whether a medical condition or a reaction to a medication or substance. Here, again, the history is paramount, but the physical examination can provide many clues to underlying conditions at the root of a delirious state.

## DISCUSSION

### *Diagnosis of Delirium*

Our literature review did not find any studies that specifically evaluated the physical examination or specific physical examination maneuvers in the diagnosis of delirium. There are, however, many studies of diagnostic and severity assessment tools for delirium that incorporate both the history and mental status examination—the mental status examination being an essential part of the physical examination in all physical examination texts. These tools are a crucial first step in diagnosing delirium. A 2010 systematic review of these diagnostic instruments found that, for hospitalized, non-ICU patients, the Confusion Assessment Method (CAM) yielded the best test characteristics.[5] The CAM was first published in 1990 and has been validated in many different settings (**Box 1**).[6] The CAM instrument prompts the assessing clinician to answer 9 questions to assess mental status, takes about 5 minutes to complete, and uses history from the patient, care team, and family together with the clinician's assessments on mental status examination to identify the attention and cognitive deficits. In the original CAM study, the geriatricians used the Mini Mental Status Examination to assess cognition, but other tools such as the MiniCog or the Montreal Cognitive Assessment can be used. These tests are then used to complete the CAM diagnostic algorithm that assesses 4 features for diagnosis. **Box 1** outlines the CAM diagnostic algorithm. To diagnose delirium, the patient must have (1) acute change or a fluctuating course (Feature 1) *and* inattention (Feature 2) *plus one of either* disorganized thinking (Feature 3) or altered level of consciousness (Feature 4).

**Box 1**
**The confusion assessment method diagnostic tool**[6]

Feature 1: Acute onset and fluctuating course

Feature 2: Inattention

Feature 3: Disorganized thinking

Feature 4: Altered level of consciousness

The diagnosis of delirium requires the presence of both 1 and 2, and either 3 or 4.

Inouye SK, van Dyck CH, Alessi CA, et al. Clarifying confusion: the confusion assessment method. Ann Intern Med 1990;113:941.

Real world use of the CAM instrument often uses assessments during routine care by physicians and nurses, as opposed to formal interviews and cognitive assessments by geriatricians or researchers. This use of more routine care assessment reduces the CAM's sensitivity to as low as 19% in one study of nurse assessments compared with those made by formal researchers.[7] The amount of time required to administer the CAM also limits its clinical use by busy clinicians. Over the years, other CAM-based instruments that are shorter have been developed and studied that incorporate brief but standardized mental status testing for clinicians, which increases the sensitivity. The test characteristics for each of these instruments are outlined in **Table 1**.

The 3-Minute Diagnostic Interview for Delirium Using the Confusion Assessment Method (3D-CAM) is designed for use with general medical patients. The 3D-CAM consists of 20 items in total, 10 of which are administered directly to patients, including 7 items assessing orientation and attention and 3 items assessing patient symptoms. The other 10 items are observations to assess the 4 CAM diagnostic features and are completed by the assessor at the conclusion of the interview. With training, the 3D-CAM can be completed in 3 minutes or less. A "skip" pattern method of delivering the 3D-CAM allows the clinician to skip some of the 20 items once there is a "positive" answer in each CAM feature. This approach can further reduce the 3D-CAM assessment time. The 3D-CAM has excellent testing characteristics, with a high sensitivity and specificity, making it a useful clinical diagnostic tool.

**Table 1**
**Characteristics of diagnostic tools for delirium**

| Tool | Sensitivity (%) | Specificity (%) | Likelihood Ratio Positive | Likelihood Ratio Negative |
|---|---|---|---|---|
| CAM[5] | 86 | 93 | 9.6 | 0.16 |
| 3D-CAM[8] | 95 | 94 | 15.8 | 0.05 |
| CAM-ICU[10] | 85 | 95 | 15.5 | 0.16 |
| bCAM[11] | 84 | 96 | 19.9 | 0.17 |
| 4AT[13] | 88 | 88 | 7.3 | 0.14 |
| Ultrabrief 2-Item Screen (UB-2)[14] | 93 | 64 | 2.6 | 0.11 |

*Abbreviations:* 3D-CAM, 3-Minute Diagnostic Interview for Delirium Using the Confusion Assessment Method; bCAM, Brief Confusion Assessment Method; CAM-ICU, Confusion Assessment Method for the Intensive Care Unit; UB-2, UltraBrief 2-Item Screen.
Data from Refs.[5,8,10,11,13,14]

The Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) uses the commonly used Glasgow Coma Scale or Richmond Agitation Sedation Scale (RASS) to assess fluctuation in condition and altered level of consciousness. CAM-ICU also includes tests that can be done in nonverbal intubated patient, using either picture recognition or the Vigilance A Random Letter Test to assess attentiveness.[9] The CAM-ICU has been validated in multiple studies and has high sensitivity (85%) and specificity (95%).[10]

The Brief Confusion Assessment Method (bCAM) has been studied in patients in the emergency department; it uses the RASS for level of consciousness, asks the patient to recite months of the year backward to assess attention, and has the patient answer a series of simple questions and follow a simple motor commands to assess for disorganized thinking. bCAM also has excellent sensitivity and specificity when used in the emergency department.[11]

In addition, the non-CAM based 4AT test is also widely used and well studied.[12,13] This test scores patients on 4 items, is easy to administer, does not require training, and takes less than 2 minutes to complete. The assessor asks the patient to recite the months of the year backward to assess attention and asks the patient 4 questions (age, date of birth, current place, and year) to assess cognition. The clinician then assesses for alertness and any acute change and/or fluctuation in condition. A recent meta-analysis of multiple studies showed 88% sensitivity and specificity.[13]

All these newer instruments are quick to administer and have excellent test characteristics with both low negative likelihood ratio (LR) and high positive LR. These instruments are helpful in both diagnosing and ruling out delirium when used in the appropriate patients.

Even with these shorter instruments, busy clinicians are not always able to perform them in all patients in whom delirium may be occurring, leading to missed opportunities to diagnose this disorder. A reasonable approach is to focus the use of these instruments to confirm delirium in suspected cases (the patient reported to be mildly confused overnight or difficult to arouse in the morning), or to find cases in high-risk patients (the patient with underlying dementia, recent major surgery, or ICU admission). For busy clinicians, it would also be ideal to have a quick screening tool for delirium that could be used in nearly all patients. Fick and colleagues[14] assessed the individual items in the 3D-CAM to try to find 1- or 2-item screens to identify delirium quickly. The single-item screen "Recite the months of the year backward" had a sensitivity of 83% and specificity of 69%, with corresponding LR+ of 2.7 and LR− of 0.24. The 2-item combination that worked the best was (1) "Recite the months of the year backward" and (2) "What is the day of the week?" This combination of these 2 items had a sensitivity of 93% and specificity of 64%, with corresponding LR+ of 2.6 and LR− of 0.11; this is now called the UltraBrief 2-Item Screen (UB-2).[14] As a negative screen, this tool is very good to rule out delirium. However, the low LR+ requires that a positive screen be followed up by a more in-depth assessment to confirm the diagnosis of delirium.

The creators of the 3D-CAM and UB-2 have combined these results into a single, 1-page instrument called the UB-CAM (**Fig. 1**)[15]; it starts with the 2-item screen and, if either are positive, moves the clinician through the remaining portions of the 3D-CAM for more specificity. A study comparing different screening algorithms using these tools found that using the UB-CAM took only an average of 1 minute 14 seconds when the 2-item screen was positive and then followed up with a 3D-CAM using the "skip" method of questions.[16] The UB-CAM tool can easily be implemented in a busy clinical practice for general medical patients.

| Ultra-Brief CAM [UB-CAM] UB-2/3D-CAM | | |
|---|---|---|
| **Instructions:** Administer items in order specified. Direct questions of patients are *shown in italics*.<br>• A positive sign for delirium is any incorrect, don't know, non-response, or non-sensical response.<br>• CAM features 1-4 are indicated with F1, F2, F3, F4, respectively. | | |
| | **Severe lethargy or severe altered level of consciousness** | Check |
| 1 | **Severe lethargy or severe altered level of consciousness (no or minimal response to voice/touch).** If present, terminate assessment and ratings. **Patient is considered DELIRIOUS.** If not present, proceed to UB-2 Screener. | ☐ |
| | **UB-2 Screener** | Check if sign positive |
| 2 | **Ask both questions** | |
| | *Please tell me the day of the week (F3)* | ☐ |
| | *Please tell me months of the year backwards, say "December" as your first month (F2)* | ☐ |
| | **Checkpoint:**<br>**- If neither sign is positive/checked, STOP: patient is NOT DELIRIOUS**<br>**- If at least one sign is positive/checked, proceed to next section (3) and follow as directed** | |
| | **3D-CAM Algorithm: Part 1 - Patient Assessment** | |
| 3 | **Assess Disorganized Thinking (Feature 3/F3). Stop, and go to Section 4, after the first positive sign (error) of Disorganized Thinking. Carry-forward errors from the UB2 Screener:** | Check if sign positive |
| | Carry forward: Was the patient unable to correctly identify the day of the week? (F3, UB2) | ☐ |
| | *Please tell me the year we are in right now (F3)* | ☐ |
| | *Please tell me what type of place is this [hospital, rehab, home, etc.] (F3)* | ☐ |
| 4 | **Assess Attention (Feature 2/F2). Stop, and go to Section 5, after the first positive sign (error) of Inattention. Carry-forward errors from the UB2 Screener:** | Check if sign positive |
| | Carry forward: Was the patient unable to correctly name the months of the year backwards (UB2) | ☐ |
| | *Please tell me the days of the week backwards, say "Saturday" as your first day(F2)* | ☐ |
| | *Repeat these numbers in backwards order: "7-5-1" (F2)* | ☐ |
| | *Repeat these numbers in backwards order: "8-2-4-3" (F2)* | ☐ |
| 5 | **Assess Acute change or Fluctuation (Feature 1/F1). Stop, and go to Section 6, after the first positive sign of Acute Change is noted:** | Check if sign positive |
| | *Over the past day have you felt confused? (F1)* | ☐ |
| | *Over the past day did you think that you were not really in the hospital [or location of interview]? (F1)* | ☐ |
| | *Over the past day did you see things that were not really there? (F1)* | ☐ |
| | **3D-CAM Algorithm: Part 2 - Interviewer Ratings** | |
| 6 | **Ratings for Altered Level of Consciousness (Feature 4/F4). Stop, and go to Section 7, after first sign of Altered Level of Consciousness.** | Check if sign positive |
| | Was the patient sleepy during the interview? (requires that they actually fall asleep) (F4) | ☐ |
| | Did the patient show hypervigilance? (F4) | ☐ |
| 7 | **Ratings for Disorganized Thinking (Feature 3/F3). Only rate if all of the patient assessment items for Feature 3 above were responded to correctly. Stop, and go to Section 8, after the first sign of Disorganized Thinking is noted.** | Check if sign positive |
| | Was the patient's flow of ideas unclear or illogical? (F3) | ☐ |
| | Was the patient's conversation rambling, inappropriately verbose, or tangential? (F3) | ☐ |
| | Was the patient's speech unusually limited or sparse? (F3) | ☐ |
| 8 | **Ratings for Attention (Feature 2/F2). Only rate if all of the patient assessment items for Feature 2 above were responded to correctly. Stop, and go to Section 9, after first sign of Inattention is noted.** | Check if sign positive |
| | Does the patient have trouble keeping track of what was said or following directions? (F2) | ☐ |
| | Does the patient seem inappropriately distracted by external stimuli? (F2) | ☐ |
| 9 | **Ratings for Acute Change or Fluctuation (Feature 1/F1). Only rate if all patient assessment items for Feature 1 above were negative. Stop, and go to CAM Rating Summary, after 1st positive sign of Acute Change or Fluctuation is noted.** | Check if sign positive |
| | Did the patient's level of consciousness, level of attention or speech/thinking fluctuate during the interview? (F1) | ☐ |
| | If no prior assessments, is there evidence an acute change in memory or thinking according to records, or informant? (F1) | ☐ |
| | If prior assessments, are there any new signs of delirium based on above questions (new errors, positive ratings)? (F1) | ☐ |
| | **Checkpoint: CAM Delirium feature assessment and rating summary** | Check |
| | - At least one sign of Acute Change and/or Fluctuation was noted (Feature 1) | ☐ |
| | - At least one sign of Inattention was noted (Feature 2) | ☐ |
| | - At least one sign of Disorganized Thinking was noted (Feature 3) | ☐ |
| | - At least one sign of Altered Level of Consciousness was noted (Feature 4) | ☐ |
| | **CAM Criteria for Delirium: (Feature 1 AND Feature 2) AND (Feature 3 OR Feature 4) Is delirium present? Yes ☐ No ☐** | |

**Fig. 1.** Ultrabrief Confusion Assessment Method (UB-CAM).[15]

All these diagnostic tools are readily accessible by an Internet search. Several are also available on clinical decision tool applications for smartphones or as individual smartphone applications that can be downloaded.

### *Diagnosis of Underlying Causes of Delirium*

Once the diagnosis of delirium is made, the second step is to determine the underlying cause. Although sometimes a single factor causes delirium, more often it has a

multifactorial cause, especially in older patients. It is important to consider a broad differential diagnosis to determine underlying causes, especially those that can be addressed and potentially reversed.This will include a thorough history, which often requires collaboration with family members and nursing or other clinical staff to get a more complete history due to patient confusion. It is also critical to review the patient's medications, especially drugs that were recently started as well as any potential drug interactions. Sedative-hypnotic, analgesic, and anticholinergic medications are especially common culprits in causing delirium and should be discontinued or substituted whenever possible. Similarly, it is important to assess for substance use, as withdrawal and intoxication syndromes can contribute to delirium. The clinician should assess for any pain or discomfort that may result in delirium; common causes include thirst, urinary retention, and constipation. A thorough physical examination can also provide clues as to the cause, and is discussed further in the article. Last, patients will usually get targeted laboratory and other studies, based on the history and physical examination; this often includes assessing renal and liver function, electrolytes, complete blood cell count, thyroid studies, urinalysis, electrocardiogram, and targeted radiographic imaging, whether chest radiograph or computed tomography.

**Table 2** lists the common causes for delirium and the possible physical examination findings associated with them. Although many of these causes require laboratory studies to confirm, the clinician can obtain significant information from the physical examination.

In performing the physical examination, the clinician should start by reviewing the patient's vital signs. An abnormal temperature (high or low) might suggest an infection, low blood pressure may indicate volume depletion or shock, high blood pressure could indicate hypertensive encephalopathy, and tachypnea might suggest metabolic acidosis, pneumonia, or pulmonary embolus. The remaining examination should look for clues to the precipitants of delirium. The head examination should look for evidence of trauma, which could be a clue to an underlying subdural hematoma. Examining for ophthalmoplegia could uncover a stroke, tumor, or Wernicke encephalopathy. The neck examination may reveal thyromegaly, which could be a clue for thyroid disease. Chest examination will look for evidence of consolidation (bronchial breath sounds, egophony, dullness to percussion) or reactive airways disease (wheezing, prolonged expiratory phase, accessory muscle use), whereas the cardiovascular examination will assess for signs of heart failure. Abdominal examination may give clues to an intra-abdominal infection such as appendicitis, diverticulitis, or cholecystitis. Careful observation and palpation of the abdomen can sometimes reveal abdominal distension or palpable stool burden revealing evidence of fecal impaction, which can also contribute to delirium in the elderly. Suprapubic palpation may reveal tenderness with a urinary tract infection or urinary retention. Percussion for bladder enlargement may also reveal bladder distension and urinary retention, which is a common contributor to delirium in the elderly (sometimes referred to as the "cystocerebral syndrome"). Careful evaluation of the skin in search of skin and soft tissue infections such as erysipelas, cellulitis, and infected pressure ulcers should be performed, especially on the feet, hip, and sacral and buttock regions. In addition to the mental status examination, a complete neurologic examination is warranted. Focal neurologic findings of an acute stroke or those suggestive of meningitis may be discovered, but there may also be clues to other diagnoses such as vitamin $B_{12}$ deficiency (hyperreflexia due to myelopathy or sensory loss due to peripheral neuropathy).

Looking for signs of advanced chronic liver disease, such as decreased body hair, prominent abdominal wall veins, gynecomastia, spider angiomas, palmar erythema,

**Table 2**
**Common causes of delirium**

| Causes | Physical Examination Findings |
|---|---|
| Metabolic abnormalities | |
| Hyponatremia/hypernatremia | |
| Hypercalcemia | |
| Hypoglycemia/hyperglycemia | |
| Hypercarbia | Asterixis |
| Hypoxemia | |
| Hypothyroidism | Delayed relaxation of ankle reflexes, pretibial edema, bradycardia, hypertension, dry skin, coarse voice |
| Hyperthyroidism | Fine tremor, proptosis, pretibial edema, eyelid lag, eyelid retraction, goiter, tachycardia |
| Vitamin $B_{12}$ deficiency | Hyperreflexia, reduced sensation |
| Vitamin $B_1$ deficiency (Wernicke encephalopathy) | Ophthalmoplegia, confabulation |
| Adrenal insufficiency | Hyperpigmentation |
| Neurologic disorders | |
| Seizures | Tongue trauma |
| Subdural hematoma/head injury | Contusions, abrasions to scalp |
| Stroke | Focal neurologic findings |
| Hypertensive encephalopathy | |
| Systemic diseases | |
| Hepatic encephalopathy | Asterixis, ascites, spider angiomata, palmar erythema |
| Uremic encephalopathy | Asterixis, uremic frost |
| Acute pulmonary embolism | Tachycardia, parasternal heave, unilateral leg swelling |
| Acute myocardial ischemia | |
| Heart failure | Cardiomegaly, S3, S4, peripheral edema, elevated neck veins |
| Chronic obstructive pulmonary disease exacerbation | Wheezing, prolonged expiration, accessory muscle use, asterixis |
| Urinary retention | Enlarged bladder to palpation or percussion |
| Fecal impaction | Hard stool in vault, abdominal distension |
| Drugs/toxins | |
| Medications (eg, opioids, benzodiazepines, antihistamines) | |
| Drugs of abuse (eg, alcohol, methamphetamine, hallucinogens) | Miosis, mydriasis, anhidrosis |
| Withdrawals states (eg, alcohol, benzodiazepines) | Tachycardia, hypertension, labile blood pressure |
| Medication side effects (eg, serotonin syndrome, gabapentin toxicity, hyperammonemia) | Asterixis, myoclonus |

(*continued on next page*)

**Table 2**
***(continued)***

| Causes | Physical Examination Findings |
|---|---|
| Toxins (eg, ethylene glycol, methanol) | Depends on agent: salivation, lacrimation, anhidrosis, miosis |
| Infections | |
| Pneumonia | Bronchial breath sounds, crackles, egophony |
| Soft tissue (eg, cellulitis, pressure ulcer infection) | |
| Urinary tract infection | Suprapubic tenderness |
| Meningitis | Nuchal rigidity, Kernig and Brudzinski signs, positive jolt acceleration test |

ascites, or jaundice, can provide evidence of possible hepatic encephalopathy. If able to follow commands, the patient should be assessed for the presence of asterixis. Although asterixis is often associated with hepatic encephalopathy, it is a nonspecific finding. Other common causes of asterixis include uremia, hypercarbia, drug side effects (most commonly antiepileptics), stroke, and viral encephalitis.[17] If asterixis is

**Table 3**
**Causes of delirium in which examination characteristics exist**

| | | Test Characteristics | | | |
|---|---|---|---|---|---|
| Cause | Physical Examination Findings | Sens | Spec | LR+ | LR- |
| Meningitis[18] | Nuchal rigidity | 46.1 | 71.3 | 1.60 | 0.76 |
| | Kernig sign | 22.9 | 91.2 | 2.61 | 0.84 |
| | Brudzinski sign | 27.5 | 88.8 | 2.44 | 0.82 |
| | Jolt acceleration | 52.4 | 71.1 | 1.81 | 0.67 |
| Hypothyroidism[19] | Coarse skin | 60.9 | 73.8 | 2.33 | 0.53 |
| | Slow movements | 87 | 13.1 | 1 | 1 |
| | Bradycardia | 43.5 | 88.8 | 3.88 | 0.64 |
| | Pretibial edema | 78.3 | 30.8 | 1.13 | 0.7 |
| | Puffiness of face | 91.3 | 20.6 | 1.15 | 0.42 |
| | Delayed ankle reflex | 47.8 | 86 | 3.41 | 0.61 |
| | Coarse skin, bradycardia, ankle reflex | 60 | 84 | 3.75 | 0.48 |
| Hyperthyroidism[20] | Tachycardia (>90 beats/min) | 80 | 82 | 4.5 | 0.2 |
| | Skin moist and warm | 34 | 95 | 6.8 | 0.7 |
| | Enlarged thyroid | 93 | 59 | 2.3 | 0.1 |
| | Eyelid retraction | 34 | 99 | 33.2 | 0.7 |
| | Eyelid lag | 19 | 99 | 18.6 | 0.8 |
| | Fine finger tremor | 69 | 94 | 11.5 | 0.3 |
| Pneumonia[21] | Bronchial breath sounds | 14–19 | 94–96 | 3.3 | 0.9 |
| | Egophony | 4–16 | 96–99 | 4.1 | NS |
| | Crackles | 19–67 | 36–97 | 2.8 | 0.8 |
| | Diminished breath sounds | 7–60 | 73–98 | 2.4 | 0.8 |
| | Dullness to percussion | 4–26 | 82–99 | 3.6 | NS |
| | Asymmetric chest expansion | 5 | 100 | 44.1 | NS |

*Abbreviations:* LR+, likelihood ratio positive; LR-, likelihood ratio negative, NS, not significant; Sens, sensitivity; Spec, specificity.

present, effort should be made to differentiate among these possibilities and avoid anchoring on hepatic encephalopathy.

Most of the physical examination findings for conditions causing delirium do not have robust data on test characteristics. **Table 3** lists potential causes of delirium for which there is some evidence in the literature supporting physical examination maneuvers. In addition, please refer to the articles in this issue "Chronic Obstructive Pulmonary Disease and the Physical Exam", "Cirrhosis" and "Congestive Heart Failure" on chronic obstructive pulmonary disease, cirrhosis, and congestive heart failure for evidence on those specific examinations.

For meningitis, physical examination maneuvers do not have very impactful LRs. The sensitivities are particularly low, so they are not very good at ruling out disease. In a study by Akaishi and colleagues a case was made for performing jolt accentuation (head rotation 2 to 3 times per second to see if headache worsens) in patients suspected as having meningitis over checking for nuchal rigidity because jolt accentuation is easier to reproduce, although both have comparable test characteristics.[18]

For hypothyroidism, the physical examination findings when considered in isolation also have poor diagnostic accuracy and test performance. However, the combination of coarse skin, bradycardia, and delayed ankle reflex taken together have modest diagnostic accuracy and might be useful to identify which patients should receive further laboratory testing in a search for underlying thyroid disease.[19]

The examination findings in hyperthyroidism are much more helpful to the clinician. The lack of a goiter or lack of tachycardia (heart rate >90) make this diagnosis much less likely (low LR−), whereas the presence of eyelid lag, eyelid retraction, or a fine tremor all have LR+ greater than 10, making the diagnosis much more likely.[20]

Last, the pulmonary examination for pneumonia has findings with modest LR+, such as crackles, egophony, and bronchial breath sounds.[21] Their presence on examination can be an important clue but are not diagnostic in most cases. Unfortunately, they are often absent in many patients with pneumonia, so their absence is not particularly helpful at ruling out pneumonia.

## SUMMARY

Delirium is an acute and fluctuating disorder characterized by a disturbance in attention and cognition. Delirium is underdiagnosed by clinicians, but there are excellent diagnostic tools that use history and physical examination findings that can assist clinicians in making the diagnosis in multiple settings (ie, the CAM, CAM-ICU, 3d-CAM, b-CAM, 4AT, and UB-CAM). The UB-2 screen is a quick tool that can be used daily on all patients and that can reliably rule out delirium. If the screening result is positive, it can be followed with a more sensitive tool such as the 3D-CAM to confirm the diagnosis. Delirium is caused by underlying medical conditions and is often multifactorial, so a full diagnosis requires a careful assessment for a wide range of potential causes. Such an assessment includes a careful history, complete medication review, a thorough physical examination, and targeted laboratory and imaging studies. Other than the diagnostic tools discussed earlier, the physical examination for delirium has not been specifically studied. Though not specific to patients with delirium, some studients show that some physical findings in meningitis, thyroid disease and pneumonia may have some value in daignosing these conditions, which may be causes of delirium. . Even without known test characteristics, a complete physical examination can provide potentially important clues to underlying conditions.

## CLINICS CARE POINTS

- Delirium is an acute, fluctuating condition characterized by inattention and a change in cognition characterized by either disorganized thinking or a change in the level of consciousness.
- Delirium is one of the most common neuropsychiatric conditions affecting medical patients, especially those who are older and hospitalized.
- It is critical that delirium be recognized and addressed because it is often a clue to serious underlying medical conditions. However, delirium is not recognized by clinicians in 65% to 88% of cases.
- The CAM has been studied extensively and has the best test characteristics for diagnosing delirium in general medical patients. As it takes significant time to deliver, shorter, structured versions of this have been identified for the general medical (3D-CAM), ICU (ICU-CAM), and emergency department patients (bCAM) patients that have similar excellent test performance to diagnose delirium.
- For busy clinicians, the very quick, 2-item UB-2 screen in non-ICU patients is useful to rule out delirium if it is negative. Owing to its lower specificity, if the result of screening is positive it should be followed up by the 3D-CAM or 4AT diagnostic tool to confirm delirium.
- The history and physical examination provide important clues to the underlying cause for the delirium and may help determine whether laboratory tests and/or imaging are warranted.
- Common causes of delirium include medication side effects, infections, neurologic disorders, and metabolic disorders. However, clinicians should consider a broad differential in evaluating patients with delirium.
- There is limited evidence for test characteristics for physical examination findings associated with causes for delirium, but evidence does exist for diagnosing meningitis, cirrhosis, hypothyroidism, hyperthyroidism, and pneumonia.

## DISCLOSURE

The authors have nothing to disclose.

## REFERENCES

1. American Psychiatric Association. Neurocognitive disorders. In: Diagnostic and statistical manual of mental disorders. 5th edition. Arlington: American Psychiatric Publishing, Inc; 2013.
2. Wilson JE, Mart MF, Cunningham C, et al. Delirium. Nat Rev Dis Primers 2020;6:90.
3. Inouye SK, Westendorp RG, Saczynski JS. Delirium in elderly people. Lancet 2014;383:911–22.
4. Marcantonio ER. Delirium in hospitalized older adults. N Engl J Med 2017;377:1456–66.
5. Wong CL, Holroyd-Leduc J, Simel DL, et al. Does this patient have delirium?: value of bedside instruments. JAMA 2010;304:779–86.
6. Inouye SK, van Dyck CH, Alessi CA, et al. Clarifying confusion: the confusion assessment method. Ann Intern Med 1990;113:941–8.
7. Inouye SK, Foreman MD, Mion LC. Nurses' recognition of delirium and its symptoms: comparison of nurse and researcher ratings. Arch Intern Med 2001;161:2467–73.
8. Marcantonio ER, Ngo LH, O'Connor M, et al. 3D-CAM: derivation and validation of a 3- minute diagnostic interview for CAM-defined delirium. Ann Intern Med 2014;161:554–61.

9. Ely EW, Margolin R, Francis J, et al. Evaluation of delirium in critically ill patients: validation of the confusion assessment method for the intensive care unit (CAM-ICU). Crit Care Med 2001;29:1370–9.
10. Ho M, Montgomery A, Traynor V, et al. Diagnostic performance of delirium assessment tools in critically ill patients: a systematic review and meta-analysis. Worldviews Evid Based Nurs 2020;17:301–10.
11. Han JH, Wilson A, Vasilevskis EE, et al. Diagnosing delirium in older emergency department patients: validity and reliability of the delirium triage screen and the brief confusion method. Ann Emerg Med 2013;62:457–65.
12. Bellelli G, Morandi A, Davis DH, et al. Validation of the 4AT, a new instrument for rapid delirium screening: a study in 234 hospitalised older patients. Age Ageing 2014;43:496–502.
13. Tieges Z, Maclullich AM, Anand A, et al. Diagnostic accuracy of the 4AT for delirium detection in older adults: systematic review and meta-analysis. Age Ageing 2021;50:733–43.
14. Fick DM, Inouye SK, Guess J, et al. Preliminary development of an ultrabrief two-item bedside test for delirium. J Hosp Med 2015;10:645–50.
15. Marcantonio ER, Fick DM, Jones RN, et al. The Ultra-brief confusion assessment method (UB-CAM): a new approach for rapid diagnosis of CAM-defined delirium. Network for Investigation of Delirium: Unifying Scientists; 2020. Available at: https://deliriumnetwork.org/the-ultra-brief-confusion-assessment-method-ub-cam/.
16. Moytl CM, Ngo L, Zhou W, et al. Comparative accuracy and efficiency of four delirium screening protocols. J Am Geriatr Soc 2020;68:2572–8.
17. Ellul MA, Cross TJ, Larner AJ. Asterixis. Pract Neurol 2017;17:60–2.
18. Aksaishi T, Kobayashi J, Abe M, et al. Sensitivity and specificity of meningeal signs in patients with meningitis. J Gen Fam Med 2019;20:193–8.
19. Indra R, Patil SS, Joshi R, et al. Accuracy of physical exam in the diagnosis of hypothyroidism: a cross-sectional, double blind study. J Postgrad Med 2004; 50:7–10.
20. McGee S. Thyroid and its disorders. In: Evidence-based physical diagnosis. 5th edition. Philadelphia: Elsevier; 2022. p. 208–12.
21. McGee S. Pneumonia. In: Evidence-based physical diagnosis. 5th edition. Philadelphia: Elsevier; 2022. p. 271–9.