Evaluation of abnormal behavior in the emergency department

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INTRODUCTION

Psychomotor alterations in behavior range from subjective difficulty thinking clearly to abnormal thought content, states of depressed consciousness, and agitation. When altered behavior directs the diagnostic workup, this implies that confusion, acute thought disorders, or altered mental status (AMS) is the chief complaint. Adjunctive complaints such as dyspnea, hypoxia, high fever, or acute focal neurologic deficits help prioritize the differential diagnosis.

AMS and altered behavior are common. Confusion is thought to be present in up to 50 percent of hospitalized older adult patients, 10 percent of all hospitalized patients, and 2 percent of emergency department (ED) patients [1]. A presenting complaint of agitation may be present in 2 to 3 percent of adult patients in the ED [2], and up to 10 percent of older adults in the ED may display features of delirium [3], a specific subtype of AMS.

The differentiation of abnormal behavior may be straightforward or complex. Sometimes no single explanation for altered mental status can be identified. Frequently, an acute medical illness exacerbates confusion in patients with dementia, essentially creating coexistent acute and chronic confusional states.

The focus of this review is the differentiation of acute medical and neurologic disorders from psychiatric causes of abnormal behavior in the emergency setting. The evaluation of the patient

with dementia or agitation is discussed separately. (See "Evaluation of cognitive impairment and dementia" and "Assessment and emergency management of the acutely agitated or violent adult" and "Diagnosis of delirium and confusional states".)

DEFINITIONS

Altered behavior and confusion are terms without strict medical definitions. A "confused" patient frequently comes to medical attention because in the judgment of someone (family, caregiver, observers, or police) some behavior is deemed unusual for the individual or deviates from societal norms. Less commonly do patients complain of confusion, consistent with the frequent lack of insight into their altered behavior. Delirium is an acute change in the faculty of attention, often coexisting with other changes in mental status, that is fluctuating in course. Agitation due to an underlying psychiatric diagnosis or toxidrome may or may not be associated with delirium. Dementia is a chronic disorder of cognition, with insidious onset, with or without behavioral disturbances. The two conditions can and frequently do coexist. (See "Evaluation of cognitive impairment and dementia" and "Diagnosis of delirium and confusional states".)

DIFFERENTIAL DIAGNOSIS

Approach — The potential causes of confusion and altered behavior are many and may reflect systemic illness, isolated organ system dysfunction, drug adverse reactions, intoxications or withdrawal, psychiatric illness, trauma, or neurologic disease (table 1) [4]. A systematic approach to the patient with altered behavior looks first at states of diminished consciousness and then for neurologic disorders with any acute focal neurologic deficit. If either is present, such findings direct the diagnostic approach. For the patient with altered behavior who is awake, alert, and without neurologic deficit, a formal assessment of attention span and cognitive ability may help to distinguish delirium from primary psychiatric complaints (algorithm 1) [5]. (See "Stupor and coma in adults" and 'Mental status testing' below.)

Life-threatening conditions — A chief complaint of confusion or isolated abnormal mental status implies that vital signs are stable and normal or near normal, which reduces the concern for many life-threatening conditions. Patients with abnormal behavior are screened for hypoxia and hypoglycemia by bedside testing. If present, treatment is provided and the cause investigated. Sepsis most often presents with fever, but not all patients manifest fever and some may be hypothermic. The presentation of certain toxidromes may overlap with systemic illnesses; for example, serotonin syndrome can present with tachycardia, hyperthermia, and

agitation or confusion and can be difficult to distinguish from sepsis or central nervous system infection. Hypertensive encephalopathy is a diagnosis of exclusion, but if suspected should prompt reduction of blood pressure. Wernicke's encephalopathy, also uncommon, occurs in patients with alcoholism or chronic malnutrition and is treated empirically with thiamine. Patients with drug overdoses also frequently present with altered behavior. (See "Hypoglycemia in adults without diabetes mellitus: Determining the etiology" and "Moderate to severe hypertensive retinopathy and hypertensive encephalopathy in adults" and "Wernicke encephalopathy" and "General approach to drug poisoning in adults".)

Acute neurologic disorders, such as meningitis and subarachnoid hemorrhage, may present with abnormal behavior, but headache or fever is a more common presentation. Ischemic stroke is an uncommon cause of isolated confusion, but cases of basilar ischemic stroke or bilateral thalamic stroke (eg, from occlusion of anomalous single arterial branch of posterior cerebral artery [artery of Percheron]) could present as altered mental status. Sudden onset would be an important clue for ischemic stroke. Either acute or delayed presentations of central nervous system trauma, such as a subdural hematoma, can manifest as confusion. Seizures may present with confusion, usually transient in the postictal state, though some seizure types may present without convulsions as an ongoing confusional state, including nonconvulsive status epilepticus. Another uncommon cause is a frontal lobe mass lesion such as tumor or abscess. (See "Clinical features and diagnosis of acute bacterial meningitis in adults" and "Aneurysmal subarachnoid hemorrhage: Clinical manifestations and diagnosis" and "Subdural hematoma in adults: Etiology, clinical features, and diagnosis" and "Acute mild traumatic brain injury (concussion) in adults" and "Convulsive status epilepticus in adults: Classification, clinical features, and diagnosis" and "Posterior circulation cerebrovascular syndromes", section on 'Top of the basilar syndrome'.)

For severe altered mental status approaching and including coma, **reversible** causes can be grouped into five diagnostic categories [6]:

- Causes that require brain or cerebrovascular imaging (eg, intracerebral hemorrhage, mass lesion)
- Poisonings that require a specific treatment (eg, carbon monoxide, toxic alcohols)
- Infectious causes that require lumbar puncture and/or intravenous (IV) antimicrobials
- Seizures that require an electroencephalogram (EEG) for diagnosis
- Metabolic and endocrine abnormalities that require treatment with dextrose, thiamine, or hormone replacement

Evaluation of the comatose patient is discussed in greater detail separately. (See "Stupor and coma in adults".)

Common conditions — The most frequent disorders causing altered behavior are common systemic disorders, such as urinary tract infections or pneumonia, leading to delirium. Older adults, particularly those with chronic cognitive impairment, are the most vulnerable. Patients with dementia who develop a systemic illness can present with an acute change in behavior, but they can also present with behavioral disturbances of dementia without a new acute illness. Medication adverse effects and drug interactions (see drug interactions program) also commonly cause confusion in older adults (table 2). Some of the most common adverse drug events resulting in hospitalization among older adults come not from inappropriate medications but rather from anticoagulants and hypoglycemic agents, both of which can result in conditions associated with acute confusional states [7]. Alcohol and medication withdrawal syndromes are other common diagnoses. (See "Drug prescribing for older adults", section on 'Drug-drug interactions' and "Management of moderate and severe alcohol withdrawal syndromes".)

Psychiatric disorders, such as depression, bipolar disorder, and schizophrenia, represent another group of patients presenting to the emergency department (ED) with altered behavior. Factitious confusion, either feigned or from a functional neurological symptom disorder (conversion disorder), does occur, but the clinician must be cautious when considering this diagnosis. Any consideration should be based on positive findings and not speculation, while excluding true pathology. (See "Unipolar depression in adults: Assessment and diagnosis" and "Bipolar disorder in adults: Epidemiology and pathogenesis" and "Schizophrenia in adults: Clinical features, assessment, and diagnosis" and "Evaluation of cognitive impairment and dementia".)

Other conditions — Virtually every acute medical condition is capable of causing abnormal behavior or confusion, particularly in older adults. Any acute condition causing electrolyte disturbances, including endocrine diseases, can present with confusion. Thyroid disease, myocardial infarction, strokes without motor deficits, and central nervous system mass lesions may all present with altered mental status, though typical presentations of these conditions are more common. (See "Acute toxic-metabolic encephalopathy in adults" and 'Life-threatening conditions' above.)

HISTORY

The first challenge facing the emergency clinician is to define what is meant by altered behavior or confusion and to ascertain why this behavior led to the emergency department (ED) visit. Discussion with eyewitnesses is ideal. The specific behavior that led to the ED visit must be

explored. Previous medical or psychiatric history from family, caregivers, clinicians, or medical records may hold the key to diagnosis.

The second issue is to determine whether the problem concerns disorientation or memory difficulty versus abnormal thought content. Disorientation and memory problems suggest medical or neurologic illness while disorders of thought content suggest psychiatric illness [8]. Hallucinations, if present, are frequently auditory in psychiatric illnesses and visual with medical causes. (See "Psychosis in adults: Epidemiology, clinical manifestations, and diagnostic evaluation".)

Time of onset of the behavior, suspected precipitants, and a history of previous similar episodes are important facts. Schizophrenia and bipolar disorder frequently recur. A truly abrupt onset suggests a cerebrovascular event. New onset psychiatric illness typically begins in the teen and young adult years. Dementia is a disorder of older adults; a specific time of onset is often difficult to identify, though acute illness often reveals an undiagnosed cognitive disorder. (See "Unipolar depression in adults: Assessment and diagnosis" and "Bipolar disorder in adults: Epidemiology and pathogenesis" and "Schizophrenia in adults: Clinical features, assessment, and diagnosis" and "Evaluation of cognitive impairment and dementia".)

Historical factors associated with medical causes of abnormal behavior include:

- Preexisting medical problems (eg, diabetes mellitus, seizure disorder)
- Absence of a known psychiatric diagnosis
- Use of psychoactive drugs of abuse (eg, hallucinogens)
- Use of psychotropic prescription drugs, particularly of more than one type, especially among older adults
- Late age of onset (>40 years)
- Presence of symptoms that are sudden in onset and that fluctuate over hours to days [8]

Of particular interest are current medications, recent changes in medications, or any history of substance abuse. Withdrawal syndromes as well as active substance abuse may cause alterations in behavior. Particularly in older patients, medical illnesses and drug interactions (see drug interactions program) are common causes (table 1).

The rate of symptom onset may provide insight. Altered behavior from medical causes tends to be of acute onset and may occur at any age. Psychiatric illness may have an onset over weeks to months and tends to occur in younger adults. Delirium may be acute or insidious and has a hallmark feature of fluctuating attention.

PHYSICAL EXAMINATION

General physical examination helps to determine whether the cause of the altered behavior is a systemic problem, a problem of the central nervous system, or a psychiatric disorder.

First the vital signs are reviewed. Patients with behavioral disorders usually have normal vital signs unless they are acutely agitated or suffering from a coexistent medical disorder. The presence of a fever suggests that an infectious process may be responsible for the altered behavior. Among older adult patients, any abnormal temperature raises concern for infection. However, the absence of a temperature change does not rule out infection in older adults. Tachypnea or tachycardia suggest the possibility of an infectious process or other systemic disorder.

Next, a general physical examination is performed. Patients with behavioral disorders usually have an unremarkable physical examination, although signs of dehydration or neglect of chronic medical problems (eg, old wounds or skin infections) may be evident. Abnormal respiratory signs such as wheezes or crackles suggest pulmonary or cardiac disease, which can cause altered behavior from hypoxia, hypercarbia, or infection. Findings such as goiter, abdominal tenderness, jaundice, signs of trauma, or petechial rash direct further investigations.

Structural problems of the central nervous system or systemic medical problems are more likely to cause a diminished level of consciousness than psychiatric illness.

The presence of a toxidrome should prompt investigation of a toxic ingestion or medication interaction (ie, toxidromes) (table 3). Toxidromes may include confusion in addition to abnormalities of vital signs. Nystagmus may be present in patients with intoxication from ethanol, sedative-hypnotic drugs, and other medications but can be seen with posterior circulation cerebrovascular events as well. (See "General approach to drug poisoning in adults" and "Posterior circulation cerebrovascular syndromes".)

A neurologic examination is performed to look for findings that suggest structural abnormalities of the brain. Anisocoria and abnormalities of extraocular movements suggest a posterior circulation neurological event and, if associated with decreased level of consciousness, suggest basilar ischemia. Aphasia is a focal neurologic finding, and though nonfluent aphasias are not difficult to recognize, a fluent aphasia with word-substitutions may go unrecognized in the emergency department (ED). Asking the patient to name objects, read a sentence, and repeat a phrase may be useful to detect such aphasia. Neglect syndromes, especially visual neglect syndromes from parietal-occipital strokes, may be particularly difficult

to discern. Performing confrontation testing of visual fields or observing the patient walk may be helpful. (See "The detailed neurologic examination in adults".)

MENTAL STATUS TESTING

If a patient is awake, alert, with unremarkable vital signs, and without any focal neurologic deficit, an assessment of mental status including attention span is in order. We suggest such patients be screened initially in the emergency department (ED) with one of a variety of simple tests that have been recommended for assessing attention. Simple digit repetition, with or without reversal of those digits, is commonly used. Most people can easily repeat six or seven digits, and can easily reverse four digits. Spelling "WORLD" backwards, or alphabetizing the letters in "WORLD" is also used as a screen for attention [9].

A more detailed evaluation may be obtained from the Six-Item Screen (SIS) or the Quick Confusion Scale (QCS), which are described below. Patients with evidence of attention deficits, including an SIS score below 5 or a QCS score below 15, should be assessed for underlying medical (ie, nonpsychiatric) illness or medication-related problems. Patients with normal screening results should be assessed for psychiatric disorders. (See 'Approach to diagnosis' below.)

Mental status testing is an assessment of the emotional and intellectual state of the individual at the moment of the examination. Mental status testing is often done informally in the ED, which can increase the risk of missing important findings. A detailed discussion of the mental status examination is found separately. (See "The mental status examination in adults".)

A formal structure for mental status testing consists of six elements [10]:

- Appearance, affect, and attitude
- Disorders of thought
- Disorders of perception
- Mood and affect
- Insight and judgment
- Sensorium and intelligence

Disorders of thought include delusions or hallucinations. Auditory hallucinations are more common in psychiatric disorders, while visual and other hallucinations suggest the possibility of neurologic or medical disorders.

The presence of an attention deficit and short-term memory problem is a key finding in confusional states, particularly among older adults. The ability to shift attention and incorporate new information is necessary for daily functioning. The inability to perform these tasks represents the most common symptom of confusion.

Many patients with psychiatric disorders, such as depression or bipolar disorder, preserve the ability to maintain attention and perform cognitive functions, while patients with medical or neurologic disorders do not. There are exceptions to this principle, most notably in the presence of psychosis. Depression, schizophrenia, or bipolar disorder may be so severe that the normal relationship with the environment is disrupted by hallucinations or delusions. Cognitive testing may be altered or even impossible to perform in such cases.

The mini-mental status examination (MMSE) is commonly used to screen for cognitive problems by mental health personnel, and allows a rough quantification of attention [11]. However, it may be difficult to use in the ED. The MMSE is a screen for dementia and consists of tasks assessing orientation, registration, attention, calculation, following a three-step command, and design copy. (See "Evaluation of cognitive impairment and dementia", section on 'Cognitive testing'.)

The Quick Confusion Scale (QCS) represents another attempt to quantify the attention aspects of mental status (table 4) [12-14]. The QCS and MMSE were found to have significant correlation in one study of a convenience sample of 205 ED patients with abnormal behavior not attributable to trauma or acute illness. The QCS can be administered more quickly than the MMSE and does not require a constructional task.

The Six-Item Screener (SIS) is another brief test of cognition (table 5) found to be 94 percent sensitive (95% CI 73-100) and 86 percent specific (95% CI 74-94) in identifying cognitive impairment in older ED patients, when compared with the MMSE in a prospective randomized trial [15]. The SIS consists of six simple questions administered in a three-step process. The patient is: given three items to remember (eg, apple, table, and penny) and asked to repeat them back to the examiner; asked to state the current year, month and day of week; asked to repeat the original three items. One point is given for each correct answer; a score below five connotes cognitive impairment.

A number of other screening tests for cognitive dysfunction in older adult ED patients have been evaluated [16]. All screening tests may be influenced by patient literacy, native intelligence, and environmental surroundings, and assess just a small part of the mental status of the patient.

The multidisciplinary Geriatric Emergency Department Guidelines recommend the use of a two-tiered process to assess for delirium [17]. The highly sensitive Delirium Triage Screen

(figure 1) is performed first, followed by the more specific Brief Confusion Assessment Method (figure 2). If delirium is not present, the guidelines go on to recommend dementia screening using the Short Blessed Test (table 6).

ANCILLARY STUDIES

Information from the medical history and physical examination is used to guide laboratory evaluation and other diagnostic tests obtained in the emergency department (ED). The causes of altered mental status are numerous, and indiscriminate testing is neither cost-effective nor efficient. Batteries of tests in patients who are awake and alert with normal vital signs seldom aid diagnosis, unless directed by the history and physical examination [18,19].

The diagnostic algorithm (algorithm 2) demonstrates one testing strategy. We suggest that a finger stick glucose and oxygenation measurement be obtained immediately at the bedside in any patient with an altered mental status. If the patient has a diminished level of consciousness, basic electrolytes, a complete blood count (CBC), and renal function tests should also be obtained.

Appropriate laboratory investigations looking for a source of infection are performed in patients with fever or other signs of infection. An electrocardiogram (ECG), urinalysis, and chest x-ray (CXR) are routinely performed, particularly in older adult patients. If indicated, a CT scan of the head is useful to look for acute intracranial hemorrhage or other mass lesions. Focused toxicologic testing, such as aspirin and acetaminophen concentrations or urine drug screens, may be useful if indicated by history or physical examination or if the provider is unable to obtain a clear history. (See "Testing for drugs of abuse (DOAs)".)

If the altered mental status persists and the cause remains unclear, additional testing may be needed, including: arterial blood gas, thyroid studies, cerebrospinal fluid analysis, or cardiac biomarkers. As ED lengths of stay increase, the distinction between ED and inpatient workups has blurred, and more detailed investigations may be performed in the ED. Such testing may include an electroencephalogram (EEG), magnetic resonance imaging (MRI), and even brain biopsy. Obviously, such testing must be coordinated among emergency clinicians, consultants, and admitting clinicians.

APPROACH TO DIAGNOSIS

The algorithm provided outlines an approach for the patient with altered mental status (algorithm 1). This approach involves four core questions:

- Is there a diminished level of consciousness?
- Is there an acute neurologic deficit?
- Is there an acute attention deficit or short-term memory problem (ie, confusion)?
- Is there evidence of infection or other acute medical illness?

Patients with a diminished level of consciousness are quickly identified and assigned a different diagnostic strategy. Likewise, patients with focal neurologic deficits are evaluated in a different manner, looking for a stroke or mass lesion of the central nervous system. Confused patients with a fever or other signs of infection or systemic disease receive an appropriate workup.

Patients who do not fall into any of these categories may have either a psychiatric or medical reason for their altered behavior. Focused testing of attention and cognition is helpful in these patients. We suggest using either the Six-Item Screen or the Quick Confusion Scale for such screening. For many patients with psychiatric disorders, attention span and other cognitive testing is normal, but thought content is not. Abnormal attention span or cognitive testing suggests that a medical or neurologic etiology for altered behavior may be present. (See 'Mental status testing' above and 'Differential diagnosis' above.)

MANAGEMENT AND DISPOSITION

Patient and staff safety are foremost concerns. Most of the emergency department (ED) workup is directed at determining life-threatening and reversible causes of confusion (algorithm 2). If confusion or abnormal behavior persists, the emergency clinician attempts to determine the nature of the confusion with assistance from the appropriate consultation or admitting service. Patients with suspected primary psychiatric issues are evaluated by psychiatrists or other mental health personnel consistent with local practice patterns. Patients with suspected or identified medical or neurologic disorders are admitted to the appropriate ward under the care of primary care clinicians, internists, or neurologists. If the confusion resolves and appropriate care can be provided as an outpatient, the patient may be discharged. Social service consultation may be useful.

At times, control of behavioral problems is necessary in the ED. Environmental manipulation (eg, quiet room, calm conversation) is the first approach, but sedative agents such as haloperidol or lorazepam may be necessary for patient and staff protection [18-20]. (See "Assessment and emergency management of the acutely agitated or violent adult".)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Adult with altered mental status in the emergency department".)

INFORMATION FOR PATIENTS

UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or e-mail these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword(s) of interest.)

- Basics topic (see "Patient education: Delirium (confusion) (The Basics)")
- Beyond the Basics topic (see "Patient education: Delirium (Beyond the Basics)")

SUMMARY AND RECOMMENDATIONS

- **Terminology** – Altered behavior and confusion are terms without strict medical definitions. A "confused" patient frequently comes to medical attention because in the judgment of someone (family, caregiver, observers, or police) some behavior is deemed unusual for the individual or deviates from societal norms. Delirium is an acute change in attention and mental functioning; dementia is a chronic confusional state with insidious onset. The two conditions can and frequently do coexist. (See "Evaluation of cognitive impairment and dementia" and "Diagnosis of delirium and confusional states".)
- **Differential diagnosis** – The potential causes of confusion and altered behavior are many and may reflect systemic illness, isolated organ system dysfunction, drug intoxications or withdrawal, psychiatric illness, trauma, or neurologic disease. The accompanying table provides a list of life-threatening, common, and other potential causes of abnormal behavior (table 1). (See 'Differential diagnosis' above.)

- **History** – When obtaining the history, the first issue is to determine the nature of the abnormal behavior. Important elements to consider include the onset and time course of the altered behavior, associated symptoms, previous medical and psychiatric illness, medication use, and illicit drug use. The second issue is to determine whether the problem concerns disorientation or memory difficulty or rather abnormal thought content. Disorientation and memory problems suggest medical or neurologic illness while disorders of thought content suggest psychiatric illness. (See 'History' above.)

- **Examination including mental status** – The physical examination helps to determine whether the cause of the altered behavior is a systemic problem, a problem of the central nervous system, or a psychiatric disorder. Patients with behavioral disorders usually have an unremarkable physical examination. Of particular importance are abnormal vital signs, depressed level of consciousness, signs of a toxidrome (table 3), and focal neurologic deficits (eg, aphasia, abnormal extraocular movements, or anisocoria). If a patient is awake, alert, with unremarkable vital signs, and without focal neurologic deficits, an assessment of mental status including attention span is in order. Techniques for assessing mental status, such as the Six-Item Screen (table 5) and the Quick Confusion Scale (table 4), are described in the text. (See 'Physical examination' above and 'Mental status testing' above.)

- **Diagnostic testing** – Findings from the medical history and physical examination determine what diagnostic tests are obtained. Indiscriminate testing is counterproductive and wasteful. A finger stick glucose and oxygenation saturation measurement should be obtained immediately at the bedside for any patient with an altered mental status. One suggested approach to testing is described in the attached algorithm (algorithm 2). (See 'Ancillary studies' above.)

- **Diagnostic algorithm** – The algorithm provided outlines an approach to the patient with abnormal behavior (algorithm 1). This approach involves four core questions:

  - Is there a diminished level of consciousness?
  - Is there an acute neurologic deficit?
  - Is there an acute attention deficit or short-term memory problem (ie, confusion)?
  - Is there evidence of infection or other acute medical illness?

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Topic 289 Version 27.0

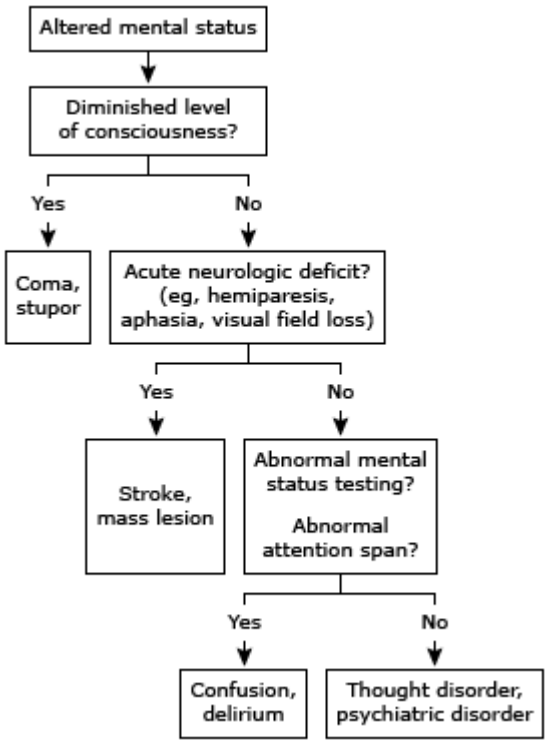
GRAPHICS

Differential diagnosis of abnormal adult behavior

Life-threatening conditions
Hypoxia
Hypoglycemia
Sepsis
Hypertensive encephalopathy
Wernicke's encephalopathy
Overdose
CNS infections (meningitis, encephalitis)
CNS trauma
Intracranial hemorrhage (eg, subarachnoid, subdural)
Epilepsy (eg, non-convulsive status epilepticus)
Common conditions
Urinary tract infections
Pneumonia
Electrolyte abnormalities
Medication adverse effects and interactions
Medication withdrawal syndromes
Psychiatric illness
Other conditions
Endocrine disease (eg, thyroid)
Stroke without focal motor deficit
CNS mass lesions
Dementia

Graphic 64699 Version 3.0

Diagnostic approach to the adult with altered mental status



Graphic 77387 Version 3.0

Drugs believed to cause or prolong delirium or confusional states*

Analgesics
NSAIDs
Opioids (especially meperidine)
Antibiotics and antivirals
Acyclovir
Aminoglycosides
Amphotericin B
Antimalarials
Cephalosporins
Cycloserine
Fluoroquinolones
Isoniazid
Interferon
Linezolid
Macrolides
Metronidazole
Nalidixic acid
Penicillins
Rifampin
Sulfonamides
Anticholinergics
Atropine
Benztropine
Diphenhydramine
Scopolamine
Trihexyphenidyl
Antiseizure medications
Carbamazepine
Levetiracetam

Corticosteroids
Dopamine agonists
Amantadine
Bromocriptine
Levodopa
Pergolide
Pramipexole
Ropinirole
Gastrointestinal agents
Antiemetics
Antispasmodics
Histamine 2 receptor blockers
Loperamide
Herbal preparations
Atropa belladonna extract
Henbane
Mandrake
Jimson weed
St. John's wort
Valerian
Hypoglycemics
Hypnotics and sedatives
Barbiturates
Benzodiazepines
Muscle relaxants
Baclofen
Cyclobenzaprine
Other CNS-active agents
Disulfiram

Phenytoin	Cholinesterase inhibitors (eg, donepezil)
Valproate	Interleukin 2
Vigabatrin	Lithium
Antidepressants	Phenothiazines
Mirtazapine	
Selective serotonin reuptake inhibitors	
Tricyclic antidepressants	
Cardiovascular and hypertension drugs	
Antiarrhythmics	
Beta blockers	
Clonidine	
Digoxin	
Diuretics	
Methyldopa	

NSAIDs: nonsteroidal antiinflammatory drugs; CNS: central nervous system.

* Not exhaustive, all medications should be considered.

Graphic 70449 Version 9.0

Common poisoning syndromes (toxidromes)

Toxidrome	Mental status	Vital signs	Skin	Pupils	Other manifestation
Excitatory					
Sympathomimetic	▪ Hypervigilance ▪ Agitation (can be violent) ▪ Hyperactive delirium ▪ Hallucinations ▪ Paranoia	**T:** Increased **HR:** Increased **RR:** Increased **BP:** Increased	Wet	Dilated	▪ Seizures ▪ Widened pulse pressure
Anticholinergic	▪ Hypervigilance ▪ Agitation (usually easily controlled) ▪ Hyperactive delirium ▪ Hallucinations (picking at objects in air) ▪ Mumbling speech (described as "mouth full of marbles")	**T:** Increased **HR:** Increased (but may be normal in early poisoning) **RR:** Increased **BP:** Increased or normal	Dry and flushed	Dilated	▪ Dry mucous membranes ▪ Decreased bowe sounds ▪ Urinary retentio ▪ Choreoathetosis ▪ Seizures (rare)
Hallucinogenic	▪ Hallucinations ▪ Perceptual distortions (typically visual) ▪ Depersonalization ▪ Synesthesia ▪ Occasional agitation (with or without delirium)	**T:** Increased or normal **HR:** Increased or normal **RR:** Increased or normal **BP:** Increased	Variable	Dilated (usually)	▪ Nystagmus (phencyclidine, ketamine) ▪ Tachycardia, hypertension, agitated deliriur (designer phenethylamine

		or normal			
Serotonin syndrome (serotonin toxicity)	▪ Agitation ▪ Hyperactive delirium ▪ Confusion ▪ Awake and unresponsive	**T:** Increased **HR:** Increased **RR:** Increased **BP:** Increased	Wet, flushed, or normal	Dilated	▪ Tremor, hyperreflexia, clonus (typically lower extremitie ▪ Roving eye movements (ocu clonus) ▪ Diarrhea
Inhibitory					
Opioid	▪ Sedation ▪ Coma	**T:** Decreased or normal **HR:** Decreased or normal **RR:** Decreased or apneic **BP:** Decreased or normal	Variable	Constricted (may be pinpoint)	▪ Noncardiogenic pulmonary eder ▪ Needle marks ▪ Can develop hypotension

Sedative-hypnotic	▪ Sedation ▪ Confusion ▪ Stupor ▪ Coma	**T:** Decreased or normal **HR:** Decreased or normal **RR:** Decreased, apneic, or normal **BP:** Decreased or normal	Variable	Variable	▪ Nystagmus ▪ Barbiturates car cause respirator depression or apnea ▪ In most cases, isolated benzodiazepine ingestions do nc cause respirator depression ▪ Cyclical coma ar myoclonic encephalopathy (carisoprodol, meprobamate, glutethimide)
Cholinergic	▪ Sedation ▪ Confusion ▪ Stupor ▪ Coma	**T:** Normal **HR:** Low (may be increased in early poisoning) **RR:** Decreased or increased **BP:** Decreased or normal	Wet	Constricted	▪ Seizures (typical occur early) ▪ Salivation ▪ Urinary and feca incontinence ▪ Vomiting, diarrh abdominal cram ▪ Bronchorrhea a bronchoconstric ▪ Muscle fasciculations ar paralysis ▪ Weakness

BP: blood pressure; HR: heart rate; MAOIs: monoamine oxidase inhibitors; MDEA: 3,4-methylenedioxy-N-ethylamphetamine; MDMA: 3,4-methylenedioxymethamphetamine; RR: respiratory rate; SNRIs: serotonin-nonspecific reuptake inhibitors; SSRIs: serotonin-specific reuptake inhibitors; T: temperature; VX: venomous agent X.

Graphic 71268 Version 25.0

Quick confusion screen for adults

Item	Scoring	Weight	Score
What year is it now?	0 or 1 (Score 1 if correct, 0 if incorrect)	x2	
What month is it?	0 or 1 (Score 1 if correct, 0 if incorrect)	x2	
Repeat phrase and remember: "John Brown, 42 Market Street, New York"			
About what time is it? (answer correct if within one hour)	0 or 1 (Score 1 if correct, 0 if incorrect)	x2	
Count backwards from 20 to 1	0, 1, or 2 (Score 2 if correct, 1 if 1 error, and 0 if 2 or more errors)	x1	
Say the months in reverse	0, 1, or 2 (Score 2 if correct, 1 if 1 error, and 0 if 2 or more errors)	x1	
Repeat memory phrase	0, 1, 2, 3, 4, 5 (Score 5 if correct; deduct 1 for each miss)	x1	
Final score is sum of the total; score less than 15 suggests the presence of altered cognition and need for further assessment.			

References:

1. *Huff JS, Farace E, Brady WJ, et al. The quick confusion scale in the ED: comparison with the mini-mental state examination. Am J Emerg Med 2001; 19:461.*
2. *Irons MJ, Farace E, Brady WJ, Huff JS. Mental status screening of emergency department patients: normative study of the quick confusion scale. Acad Emerg Med 2002; 9:989.*

Graphic 70343 Version 3.0

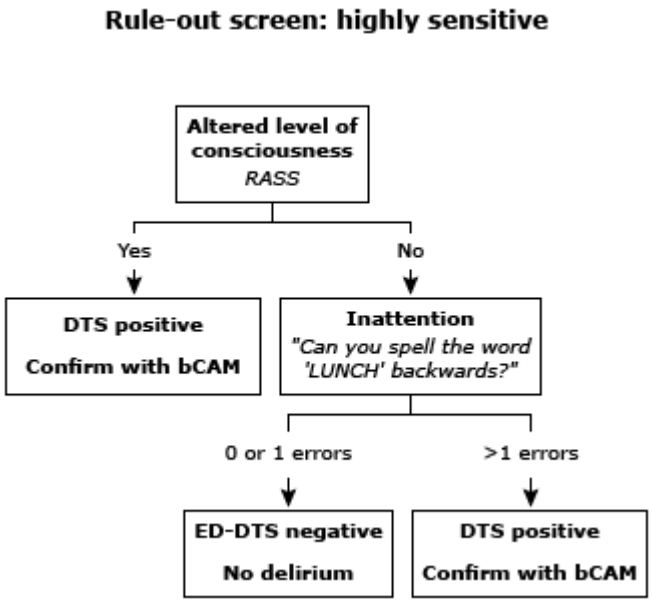
Six item screen for confusion in adults

1. Give the patient three items to remember (eg, apple, table, and penny), and ask the patient to repeat them aloud.
2. Ask the patient to state the current year, month, and day of week.
3. Ask the patient to repeat the original three items.
One point is given for each correct answer; a score below five connotes cognitive impairment.

Source: Wilbur et al. An evaluation of two screening tools for cognitive impairment in older emergency department patients. Acad Emerg Med. 2005; 12:612.

Graphic 58243 Version 3.0

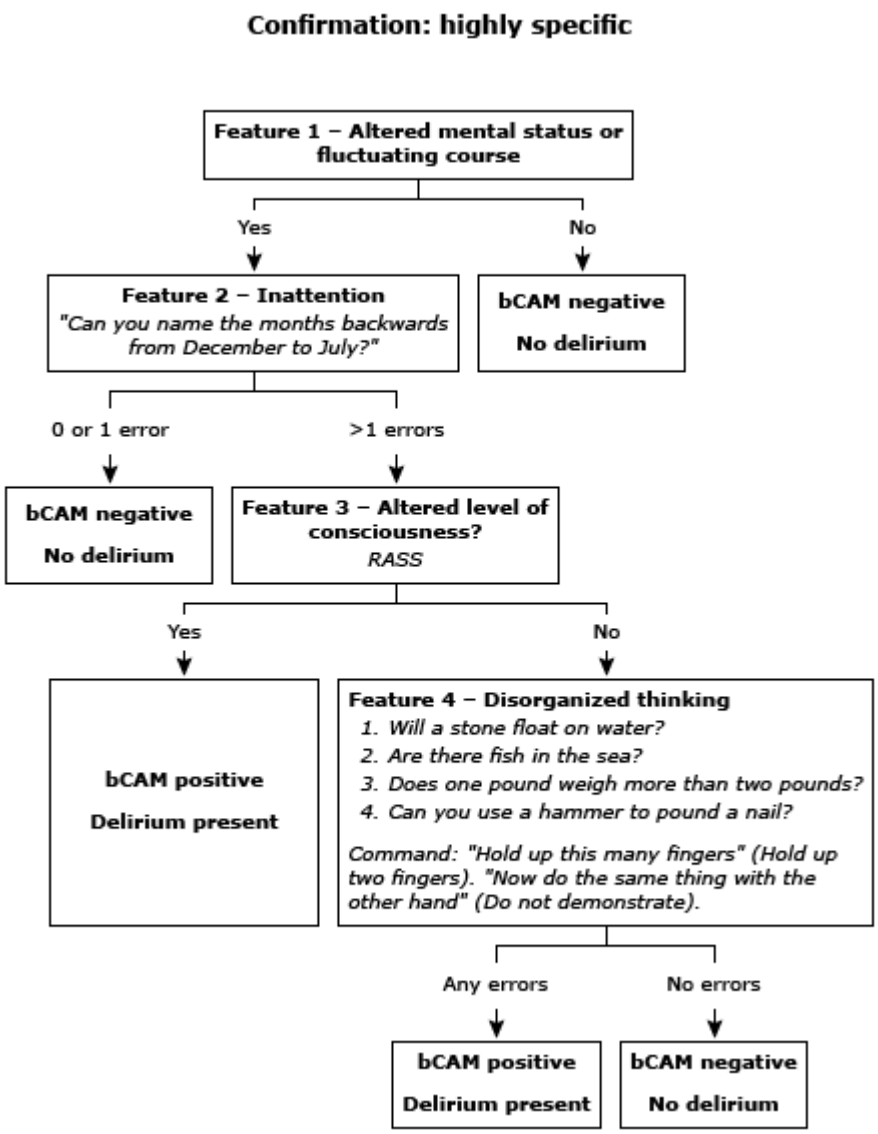
Delirium Triage Screen



RASS: Richmond Agitation Sedation Scale; DTS: Delirium Triage Screen; bCAM: Brief Confusion Assessment Method; ED: emergency department.

Graphic 121403 Version 1.0

Brief Confusion Assessment



bCAM: Brief Confusion Assessment Method; RASS: Richmond Agitation Sedation Scale.

Graphic 121404 Version 1.0

Short Blessed Test for Dementia[1]

Patient: _____	**Date:** _____
Age: _____	

Short blessed test (SBT)[1]

"Now I would like to ask you some questions to check your memory and concentration. Some of them may be easy and some of them may be hard."

1. What year is it now?_____	Correct (0)	Incorrect (1)
2. What month is it now?_____	Correct (0)	Incorrect (1)

Please repeat this name and address after me:
John Brown, 42 Market Street, Chicago
John Brown, 42 Market Street, Chicago
John Brown, 42 Market Street, Chicago

(underline words repeated correctly in each trial)
Trials to learning_____ (can't do in 3 trials = C)

Good, now remember that name and address for a few minutes.

3. Without looking at your watch or clock, tell me about what time it is. (If response is vague, prompt for specific response) (within 1 hour) _____ Actual time: _____	Correct (0)	Incorrect (1)
4. Count aloud backwards from 20 to 1 (Mark correctly sequenced numerals) If subject starts counting forward or forgets the task, repeat instructions and score one error 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1		0 1 2 Errors
5. Say the months of the year in reverse order. If the tester needs to prompt with the last name of the month of the year, one error should be scored (Mark correctly sequenced months) D N O S A JL JN MY AP MR F J		0 1 2 Errors
6. Repeat the name and address I asked you to remember. (The thoroughfare term (Street) is not required)		0 1 2 3 4 5 Errors

(John Brown, 42 Market Street, Chicago)

____, _____, __, _____, _____

Check correct items	Use attached scoring grid and norms

Short blessed test (SBT) administration and scoring guidelines*

A spontaneous self-correction is allowed for all responses without counting as an error.

1. What is the year?

   Acceptable response: The exact year must be given. An incomplete but correct numerical response is acceptable (eg, 01 for 2001).

2. What is the month?

   Acceptable response: The exact month must be given. A correct numerical answer is acceptable (eg, 12 for December).

3. The clinician should state: "I will give you a name and address to remember for a few minutes. Listen to me say the entire name and address and then repeat it after me."

   It is important for the clinician to carefully read the phrase and give emphasis to each item of the phrase. There should be a one second delay between individual items.

   The trial phrase should be re-administered until the subject is able to repeat the entire phrase without assistance or until a maximum of three attempts. If the subject is unable to learn the phrase after three attempts, a "C" should be recorded. This indicates the subject could not learn the phrase in three tries.

   Whether or not the trial phrase is learned, the clinician should instruct "Good, now remember that name and address for a few minutes."

4. Without looking at your watch or clock, tell me about what time it is?

   This is scored as correct if the time given is within plus or minus one hour. If the subject's response is vague (eg, "almost 1 o'clock"), they should be prompted to give a more specific response.

5. Counting. The instructions should be read as written. If the subject skips a number after 20, an error should be recorded. If the subject starts counting forward during the task or forgets the task, the instructions should be repeated and one error should be recorded. The maximum number of errors is two.

6. Months. The instructions should be read as written. To get the subject started, the examiner may state "Start with the last month of the year. The last month of the year is_____." If the subject cannot recall the last month of the year, the examiner may prompt this test with "December"; however one error should be recorded. If the subject skips a month, an error should be recorded. If the subject starts saying the months forward upon initiation of the task, the instructions should be repeated and no error recorded. If the subject starts saying the months forward during the task or forgets the task, the instructions should be repeated and one error recorded. The maximum number of errors is two.

7. Repeat. The subject should state each item verbatim. The address number must be exact (ie, "4200" would be considered an error for "42"). For the name of the street (ie, Market Street), the thoroughfare term is not required to be given (ie, leaving off "drive" or "street") or to be correct (ie, substituting "boulevard" or "lane") for the item to be scored correct.

8. The final score is a weighted sum of individual error scores. Use the table below to calculate each weighted score and sum for the total.

Final SBT score and interpretation

Item #	Errors (0 to 5)	Weighting factor	Final item score
1		X 4	
2		X 3	
3		X 3	
4		X 2	
5		X 2	
6		X 2	
			Sum total = _____ (Range 0 to 28)

Interpretation

A screening test in itself is insufficient to diagnose a dementing disorder. The SBT is, however, quite sensitive to early cognitive changes associated with Alzheimer's disease. Scores in the impaired range (refer to below) indicate a need for further assessment. Scores in the "normal" range suggest that a dementing disorder is unlikely, but a very early disease process cannot be ruled out. More advanced assessment may be warranted in cases where other objective evidence of impairment exists.

- In the original validation sample for the SBT (Katzman et al, 1983), 90% of normal scores 6 points or less. Scores of 7 or higher would indicate a need for further evaluation to rule out a dementing disorder, such as Alzheimer's disease.
- Based on clinical research findings from the Memory and Aging Project[2], the following cut points may also be considered:
  - 0 to 4: Normal cognition
  - 5 to 9: Questionable impairment (evaluate for early dementing disorder)
  - 10 or more: Impairment consistent with dementia (evaluate for dementing disorder)

For more cognitive screening tests, visit: www.mybraintest.org

* These guidelines and scoring rules are based on the administration experience of faculty and staff of the Memory and Aging Project, Alzheimer's Disease Research Center, Washington University School of Medicine, St. Louis. For more information about the ADRC, please visit: http://alzheimer.wustl.edu.

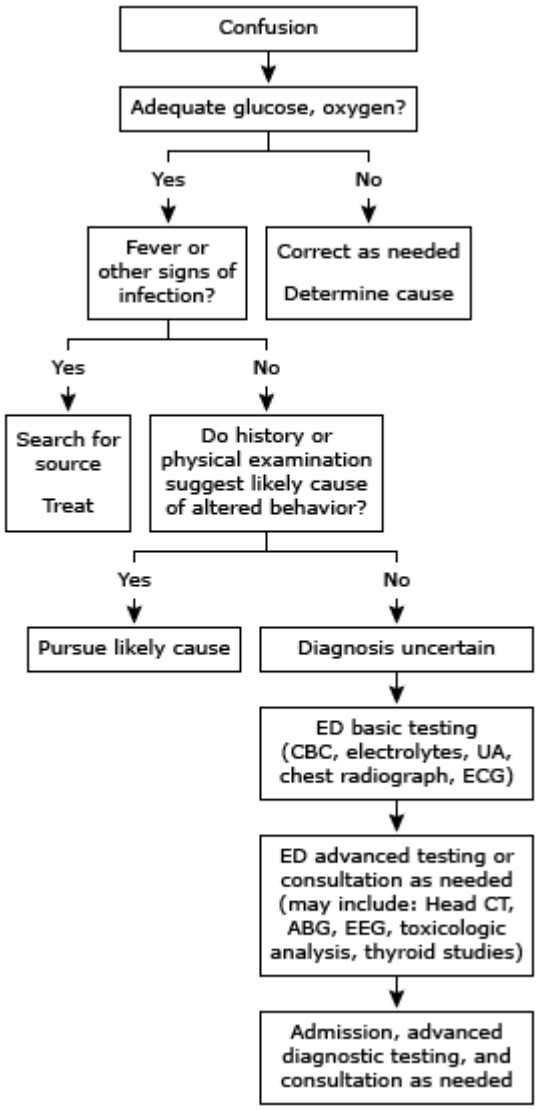
References:

1. *Katzman R, Brown T, Fuld P, et al. Validation of a short orientation-memory-concentration test of cognitive impairment. Am J Psychiatry 1983; 140:734.*

2. *Morris JC, Heyman A, Mohs RC, et al. The Consortium to Establish a Registry for Alzheimer's Disease (CERAD). Part I. Clinical and neuropsychological assessment of Alzheimer's disease. Neurology 1989; 39:1159.*

Graphic 121405 Version 4.0

Management approach to the patient with confusion



ED: emergency department; CBC: complete blood count; UA: urinalysis; ECG: electrocardiogram; CT: computed tomography; ABG: arterial blood gas; EEG: electroencephalogram.

Graphic 57512 Version 3.0