Delirium is a serious symptom and is commonly seen in emergency departments.\(^1\) One of the most challenging problems with altered mental status can be determining its etiology. Unfortunately acute altered mental status often goes unrecognized.\(^2\) While it is easy to recognize a patient who is unresponsive or responds only to painful stimuli, it can be extremely difficult to distinguish subtle mental status changes in patients a provider hasn’t met before.

Delirium is one cause of acute altered mental status that is particularly difficult to identify. Even emergency department physicians struggle to recognize delirium, and only identify it in 35% of patients with acute changes.\(^2\) While diagnostic checklists for identifying delirium are being developed, they are far from perfect. One study just demonstrated that a prehospital delirium checklist may identify 63% of patients with delirium, but is really no more accurate than recognition of a GCS less than 15.\(^3\) This month’s CE article discusses causes of delirium and acute altered mental status in geriatric patients.
Epidemiology
The elderly population is defined as those 65 and older.\textsuperscript{2} In the 2000 U.S. Census, the elderly made up 10% of the population, with 34.6 million individuals; this is expected to rise to 82 million (20\% of the population) by 2050. Altered mental status is present in 10\% of all elderly patients who present to emergency departments, yet it is only recognized 20\% of the time.\textsuperscript{4} Many of these patients will present via EMS.

In one study, the average age of patients with AMS presenting to the ED was 66.5 years. One in nine (11\%) of these ultimately died during their hospital stay, signifying the serious morbidity associated with AMS.\textsuperscript{3} Among these patients the most common etiologies of AMS were neurologic (34.4\%), infectious (18.3\%) and metabolic (12\%).

There are many causes of mental status changes. AMS caused by delirium is particularly important to recognize because it represents a serious underlying condition and is marked by an acute change in the patient’s cognition. Delirium is defined by the American Psychiatric Association as a disturbance of consciousness and change in cognition that develops over a short period of time.\textsuperscript{2} It is not natural and not associated with diseases such as dementia and Alzheimer’s. Rather, delirium is a hyper- or hypoactive alteration in brain function, and thus affects behavior, memory, actions and attitude. While patients with delirium are often described, based on the word’s Latin root, as “going crazy” or “deranged,” this description only addresses the hyperactive form of delirium. A patient with delirium can also have a hypoactive brain and present with lethargy and decreased motor function. Table 1 identifies several causes of delirium, which can be remembered using the mnemonic I watch death.\textsuperscript{5} In many cases delirium may be the only symptom of a serious underlying medical condition.\textsuperscript{2}

Delirium and dementia are not the same. Delirium is also not the same as a gradual mental status change. The prehospital screening assessment for dementia mentioned in the introduction asks paramedics to look for:

1) An acute onset of the condition;
2) Patient inattention;
3) Disoriented thinking; and
4) Altered level of consciousness.\textsuperscript{3}

These items focus on sudden changes. It is important to try to distinguish sudden changes in mental status, as they represent underlying conditions that are serious but also likely reversible. Gradual mental status changes are not associated with delirium and suggest different pathologies.

Dementia is a completely different condition and for the most part beyond the scope of this article.
is generally thought of as a single disease, it is really a constellation of syndromes caused by decreased brain size and function that manifest in permanent cognitive impairment worse than would be expected for a specific age. Dementia is not reversible and represents a progressive decline in an individual’s ability to function on a daily basis.

**Case 1**

- **72-year-old female cancer patient.**

Medic 12 responds to a suburban home for a 72-year-old female hallucinating. When the crew arrives at the well-kept house, the patient’s concerned daughter leads them to a first-floor bedroom and says her mother was brought home following an extended hospital stay for leukemia, during which she received chemotherapy. She has been recovering well for the past week but woke today with “fast breathing” and has been talking to her husband, who has been deceased for 15 years.

The crew finds the patient talking toward the wall. When they try to talk with her, she keeps talking past them, addressing her dead husband. She is warm to the touch, with pale and clammy skin. On exam her eyes are PERRL, no JVD is present and her lungs are clear; however, she is tachypneic at a rate of 32/min, with normal heart tones. The EKG shows sinus tachycardia at a rate of 112/min. Her abdomen is flat and soft, and palpation elicits

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**Table 1: Causes of Delirium: The I Watch Death Mnemonic**

<table>
<thead>
<tr>
<th>Cause</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infectious abscess</td>
<td>Sepsis, encephalitis, meningitis, syphilis, central nervous system (CNS)</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>Alcohol, barbiturates, sedative-hypnotics</td>
</tr>
<tr>
<td>Acute metabolic disturbances</td>
<td>Acidosis, electrolyte disturbance, hepatic or renal failure, other metabolic (increase/decrease in glucose, magnesium, calcium)</td>
</tr>
<tr>
<td>Trauma</td>
<td>Head trauma, burns</td>
</tr>
<tr>
<td>CNS disease</td>
<td>Hemorrhage, stroke, vasculitis, seizures, tumor</td>
</tr>
<tr>
<td>Hypoxia</td>
<td>Acute hypoxia, chronic lung disease, hypotension</td>
</tr>
<tr>
<td>Deficiencies</td>
<td>Vitamin B12, hypovitaminosis, niacin, thiamine</td>
</tr>
<tr>
<td>Environmental</td>
<td>Hypothermia, hyperthermia, endocrinopathies: diabetes, adrenal, thyroid</td>
</tr>
<tr>
<td>Acute vascular</td>
<td>Hypertensive emergency, subarachnoid hemorrhage, sagittal vein thrombosis</td>
</tr>
<tr>
<td>Toxins, drugs</td>
<td>Medications, street drugs, alcohol, pesticides, industrial poisons (e.g., carbon monoxide, cyanide, solvents)</td>
</tr>
<tr>
<td>Heavy metals</td>
<td>Lead, mercury</td>
</tr>
</tbody>
</table>

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no tenderness. She has a Foley catheter in place with dark urine in the bag and a foul smell, with particulate matter visible as well. She has 2-plus edema in the legs but moves all of her extremities well. The crew obtains a blood pressure of 86/56 mmHg and tympanic temperature of 101.4°F.

**Differential diagnoses to consider:** advancement of cancer, stroke, hypoglycemia, infection, sepsis, medication/drug dosing error.

While lifting their patient onto the cot, the crew discusses their list of possible problems. To help complete their assessment, they ask about the patient’s history and medicines. The daughter says her mother has no allergies, and provides a list of more than 20 medicines she takes. The daughter says the medicines are tracked with the assistance of a home health nurse who places them in a daily dispenser for the daughter to give morning and night. She’s diligent about giving the medicines on time, which places an overdose lower on the list of likely diagnoses.

Besides cancer, the patient’s history includes hypertension, coronary stent placement, a hysterectomy 24 years ago and hypothyroidism. A blood sugar check returns a result of 424 mg/dL. After reconfirming it, they ask about diabetes, which the daughter confirms the patient does not have.

Working through the differential diagnoses, hypoglycemia has been ruled out, but this patient is hyperglycemic, and her blood sugar could be high enough to be the primary cause of her AMS. Before settling on hyperglycemia as the primary problem here, though, consider it a symptom of a problem. We’ll come back to this in a bit.

Cancer can spread to the brain, causing hallucinations. However, the spread of cancer is slow and unlikely to cause an acute change within 24 hours. Metastasis to the liver could cause hepatic derangement and also cause delirium, but without jaundice and ascites, this is unlikely as well.

It is possible this patient has had a stroke. Hemorrhagic strokes can occur when a patient is receiving chemotherapy; however, the blood pressure is not consistent with intracranial bleeding. As intracranial pressure rises, as it would in a head bleed, it is common to see...
blood pressure rise. This patient's blood pressure is low. Also, the patient moves all of her extremities well. So while her mental status makes performing a stroke exam nearly impossible, stroke would remain low on the list of potential causes. This patient, then, likely has altered mental status from sepsis.

Altered mental status is present in 23% of patients with sepsis, and this patient has several symptoms of sepsis. Sepsis is present whenever a local infection develops and causes systemic inflammatory response syndrome (SIRS). This patient's risk factors for infection include receiving chemotherapy (which causes immunosuppression), being bedridden and having a Foley catheter. Taking a temperature can confirm an infection, and this patient's temperature is 101.4°F. A SIRS response is present whenever a patient has at least two of the following: tachycardia, tachypnea, fever, elevated white blood cells or hyperglycemia (see Table 2). This patient has four signs of a SIRS response. Hyperglycemia occurs during a SIRS response because the body's insulin shifts from its balance with other regulatory hormones. As a result, insulin releases at a higher level than the patient's baseline, and their body decreases its use of glucose. The presence of hyperglycemia with no history of diabetes suggests the potential for serious illness.

Sepsis causes mental status changes for several reasons. During a sepsis infection, the entire body has an increased oxygen demand (thus tachypnea). If the patient's respiratory system cannot keep up, hypoxia develops, and the brain is one of the first organs affected. Additionally, toxins released by the bacteria causing the infection, particularly gram-negative bacteria, can impair normal brain function. Finally, when patients are in septic shock (diagnosed by a blood pressure less than 100 systolic after 2 liters of normal saline or by an elevated lactic acid level greater than 4.0 mmol/L), acids building up within the body can lead to metabolic acidosis, which also interrupts normal brain function.

Where is this patient's infection? Sometimes infection sources are not obvious. However, this patient likely has developed sepsis from what was origi-
nally a urinary tract infection (UTI). She has a Foley catheter in place, and more than 90% of patients with long-term Foley catheter placement eventually experience bacteriuria, or bacteria in the urine.7 Once in the urine, the bacteria can easily move up the bladder and cause infection. The supporting evidence for a UTI includes the foul odor and particulate matter in the bag.

An individual need not have a Foley catheter to develop a UTI. UTIs are one of the most common causes of delirium in patients over 50, with 10% of men and 20% of women having bacteriuria.8 Any time an elderly patient appears toxic and has a history of diabetes or is immunocompromised, consider a urinary tract infection. Without a Foley catheter in place, this patient may have complained of difficult or painful urination, blood in her urine or fatigue. Keep in mind that patients who are incontinent or have dementia may not complain directly about their symptoms.

Prehospital care of altered mental status from sepsis focuses on comfort care and identifying the cause. Crews suspecting sepsis need to look for an infection source, such as evidence of pneumonia, a urinary tract infection or an infected wound. After establishing baseline vital signs and pulse oximetry, supplemental oxygen via nasal cannula may be indicated to maintain a normal SpO₂. The 2010 AHA guidelines recommend it for patients with SpO₂ readings of less than 94%.9 While this guideline was developed with cardiac emergencies in mind, the same principle can reasonably apply to other medical emergencies. IV access and normal saline are indicated, as aggressive fluid therapy is needed in sepsis. Avoid Ringer’s lactate—it contains lactate, which may exacerbate the patient’s condition if they are experiencing lactic acidosis.

When a patient’s blood pressure is less than 100 mmHg, consider early administration of vasopressors. While dopamine is the most common prehospital vasopressor, it is likely to exacerbate any tachycardias. Levophed is generally the vasopressor of choice in sepsis, as it has limited effects on heart rate and
is titrated to effect from 2–20 mcg/min. Hospitals strive to intervene with sepsis within 60 minutes of patient arrival; for each hour that passes prior to antibiotic administration, patients’ mortality increases by 7.6%. It is essential that prehospital providers communicate the suspicion of sepsis whenever it’s in the working diagnosis.

Case 2
- Confused 75-year-old female at skilled nursing facility.

EMS 22 is dispatched to Livewell Skilled Nursing Facility for a 75-year-old female patient with confusion and difficulty walking. The arriving crew is directed to the common room, where they find their patient lying on the couch and holding her head. She is irritable and argues with anyone who speaks to her, and will not answer questions appropriately. The staff report the patient is here for rehab following a right hip replacement, and has been doing well besides a fall 10 days ago. She went to the hospital for the fall, but the new hip was fine. She’s been ambulatory since then on a daily basis.

Over the past 24 hours, though, the patient has developed difficulty walking, begun complaining of a worsening headache, and this morning was found disoriented and arguing. She is normally very sweet, according to her nurse. The staff assisted her to the couch and called 9-1-1. Other than her hip replacement, the patient has been healthy, although she does have a history of hypertension. She is currently taking lisinopril, Coumadin for a month following the hip replacement, and ibuprofen as needed for her pain.

Differential diagnoses to consider: stroke, embolism, subdural hematoma, tumor, meningitis.

As the crew start to evaluate their patient, she yells at them and largely ignores their questions. “To hell with you all,” she shouts repeatedly, then rolls over and holds her head. Nonetheless crew members are able to determine her vitals: pulse 82/min, respirations 16/min, blood pressure 172/94/min, SpO₂ 96%, tympanic temperature 97.8°F. The woman will not follow commands to perform any stroke assessment but appears to move all of her extremities freely without noticeable motor deficit, and she has no facial droop or slurred speech. The crew
does notice that her right pupil appears quite dilated compared to the left, and there is bruising between the right eye and ear that extends superiorly into the hair. It appears several days old, and a staff member says the bruising has been present since two days after her fall.

This patient is experiencing a subacute subdural hematoma (SDH). Subacute SDHs begin showing symptoms between 24 hours and 14 days following the original injury and are particularly common in elderly patients. There is an increased frequency for intracranial hemorrhage of 12% for patients taking Plavix and 5% for those taking Coumadin.11

A subdural hematoma is a slow venous bleed between the dura and arachnoid layers of the brain’s meninges. The hemorrhage is not actually within the brain itself. Table 3 identifies the three classifications for subdural hematomas. Subacute SDHs often bleed and develop in elderly patients because the brains of older patients experience atrophy and shrink in size, allowing more space for blood to collect. With this additional space the SDH can grow in size before symptoms begin to develop. Symptoms from an SDH appear when the hematoma begins to press against the brain and inhibits normal brain function.

Subacute and acute SDHs have the same symptoms; the difference is when the symptoms first appear. Symptoms include headache, nausea, irritability and confusion, level of consciousness changes, personality changes, weakness, pupil changes, blurred or double vision, raccoon eyes, Battle’s sign and hemiparesis. In this case patient history and presentation strongly support SDH as a differential diagnosis, but crew suspicions cannot be confirmed until a CT scan is performed at the emergency department.

Prehospital management of a subacute subdural hematoma is supportive in nature and focuses on protecting the critical systems. Be a good investigator and obtain a thorough history. It may be necessary to dig several weeks into the patient’s activities to identify a traumatic event that could have triggered a SDH. Immobilizing these patients is debatable. If the spine was never cleared.
and the brain is bleeding, there is certainly a mechanism for spine injury. Further, the absence of current deficits and a patient’s being able to ambulate do not rule out fracture. If allowed, it may be prudent to perform a spine assessment on these patients. Always follow local medical direction; however, it is our opinion that complete immobilization on a longboard is unlikely to be beneficial in the subacute setting and is more likely to cause the patient pain or discomfort and put them at risk for vomiting.

Applying supplemental oxygen may improve patient comfort. Advanced providers should establish IV access and maintenance fluids of normal saline or Ringer’s lactate. EKG monitoring is not necessary for an SDH but is prudent whenever treating a patient with an altered mental status. Keep in mind, it’s not possible to definitively diagnose an SDH until a CT scan is performed. If the patient has a headache or other pain, consider use of an analgesic such as fentanyl.

Conclusion

Delirium, or an acute change in a patient’s consciousness, cognition or personality, is a serious symptom that may signal a life-threatening underlying medical condition. When presented with a patient with acute memory or personality changes or who suddenly develops hallucinations, seek out potential underlying causes. Remember that delirium is not associated with dementia and is not a normal part of the aging process. Provide these patients a thorough assessment and careful transport. Delirium is often subtle and easy to miss, so use family members and close friends for help in understanding patient behavior. Identifying subtle changes from baseline can help early recognition of the underlying cause and as a result reduce the patient’s risk for serious morbidity.

REFERENCES

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