

Deadly Behavioral Emergencies

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Abstract “Altered mental status” is a common presentation to emergency departments. The differential diagnosis for this symptom is quite long and includes acute medical issues, worsening of chronic medical conditions, and various psychiatric conditions. Of the medical reasons for the change, some evolve rapidly and have high mortality, especially if improperly diagnosed. Physicians need to quickly differentiate between the medical and behavioral causes for altered mental status. This article delves into five medical emergencies, based on cases, that may initially present with a behavioral chief complaint. Delirium, neuroleptic malignant syndrome, serotonin syndrome, anticholinergic toxicity, and thyrotoxicosis are detailed and basic treatments are noted.

Keywords Mental health · Altered mental status · Emergency conditions · Behavioral emergencies · Neuroleptic malignant syndrome · Thyroid storm · Serotonin syndrome · Anticholinergic toxicity · Delirium

Introduction

Commonly, individuals with odd or agitated behavior are brought to the emergency department for evaluation. Emergency clinicians must decide between the myriad causes of these presentations, and diagnose medical conditions that may be causing the symptoms. This process termed “medical clearance,” is perhaps best termed “investigation into other non-psychiatric causes of psychiatric symptoms,” and many experts have urged that the term be dropped. It is critical that emergency clinicians be able to distinguish between various causes of psychiatric symptoms, since even though all psychotic patients may initially appear to have similar presentations, the causes and treatments are vastly different. Indeed, the terms confused, disoriented, and psychotic are often called “altered” in casual description.

The initial step in treating a mental health patient is to treat any agitation, both pharmacologically and non-pharmacologically (see Wilson and Nordstrom this issue). The next step is to get a complete set of vital signs, and possibly a fingerstick to determine blood glucose. Although agitated patients may have abnormal vital signs such as tachycardia, fever and hypoxia are uncommon, and may indicate a more medical presentation. The article below is a case-based review of five medical emergencies with psychiatric symptoms. Cases are based on real presentations to the emergency department, either in the experience of the authors or published literature. However, identifying details and protected health information have been changed.

Case 1 An 82-year-old female is brought in from home late at night by EMS after calling EMS for a “bug-bite.” She apparently attempted to trap the bug by placing frozen fish on the dresser but was bitten. Neither EMS nor treating

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clinicians could identify a bug bite. There were concerns from EMS about the condition of the home.

Delirium In older adults delirium is common and often multifactorial [1]. Although some cases are quite obvious, delirium can be notoriously difficult to diagnose, and may often be blamed on depression or cognitive decline. In one ED study, the diagnosis was missed in 76 % of cases [2]. Delirium has been shown to contribute to longer hospital length of stays [3] and higher death rates [4].

The diagnostic criteria of delirium can be found in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) and are as follows [5]:

1. Disturbance in attention (i.e., reduced ability to direct, focus, sustain, and shift attention) and awareness.
2. Change in cognition (e.g., memory deficit, disorientation, language disturbance, and perceptual disturbance) that is not better accounted for by a pre-existing, established, or evolving dementia.
3. The disturbance develops over a short period (usually hours to days) and tends to fluctuate during the course of the day.
4. 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.

Signs and symptoms include those that are associated with the definition (disturbance in attention and cognition) but also can include disorientation, hallucinations, delusions, depression, anxiety, and neurological abnormalities such as dysphasia, dysarthria, tremor, and motor abnormalities. Other symptoms and signs may occur depending on etiology of the delirium, such as asterixis in patients suffering from encephalopathy and uremia.

The manifestation of delirium is multifactorial, usually occurring with an acute underlying illness in someone with vulnerability. The typical factors associated with vulnerability are older age, history of dementia, and multiple medical comorbidities [1]. The acute underlying illness may come in many forms: medication toxicity, infection, hypoxia, electrolyte abnormalities, cardiac or neurologic insults, and others; the list is exhaustive. See Table 1.

Because delirium is often misdiagnosed, screening tools have been developed. In fact, the Society for Academic Emergency Medicine Geriatrics Task Force has recommended screening as a key quality indicator for emergency geriatric care [6]. The confusion assessment method (CAM) [7•] is the most widely used screening and has several related screens for particular settings, ICU, hospital based. The CAM looks at four clinical features: (1) acute onset of mental status changes and fluctuating course, (2) inattention, (3) disorganized thinking, and (4) altered level

Table 1 Systemic causes of Delirium: mnemonic “I WATCH DEATH”

Infectious
Withdrawal of alcohol/benzodiazepines
Acute metabolic disorder
Trauma—head injury, postoperative
CNS pathology
Hypoxia
Deficiencies of vitamins
Endocrinopathies
Acute vascular
Toxins, substance use, medication
Heavy metals

of consciousness. To be screened as positive, the patient must exhibit those features of 1 and 2 and with either of those listed in 3 and 4. The CAM appears simple enough but #1 is often difficult to determine if there is no one to provide collateral information.

The workup for delirium begins with most likely causes—often focused on infection and electrolyte imbalances with simple labs. Further workup is directed by findings and the narrowing of the differential. Treatment of delirium focuses on treating the underlying disease process. While working up the patient, the physician is usually faced with needing to treat agitation. Guidelines from the American Association for Emergency Psychiatry suggest the use of second-generation antipsychotics or low-dose haloperidol, if the delirium does not appear to be associated with alcohol or benzodiazepine withdrawal [8•].

In this case, the patient also had a more general longer term cognitive decline known as dementia. She was admitted for workup of her urinary tract infection, but eventually required assisted living.

Case 2 A 25-year-old male newly diagnosed with schizophrenia presents to the ED after a recent discharge from the inpatient psychiatric unit. His family, who accompany him to the ED, state that he was initially “better” after discharge. However, approximately 2 days ago he started “not making sense.” His mother feels that this is different from how he was acting before. He is “feverish” and moves like a “robot.”

Neuroleptic malignant syndrome Neuroleptic malignant syndrome (NMS) is rare with a reported occurrence of 0.01–0.02 % [9]. Even though it is rare, physicians need to recognize and treat it aggressively to improve outcomes [10], as expected mortality rates are approximately 10 % [11].

Multiple risk factors have been found to be associated with the chance of developing NMS. Unsurprisingly, higher potency antipsychotics have been frequently associated [10] but other factors such as agitation, dehydration,

catatonia, and history of past NMS have also been found to be related [12]. Of note, even though higher potency antipsychotics have a more frequent association, cases of NMS have been seen with risperidone, olanzapine, clozapine, quetiapine, ziprasidone, and aripiprazole, and other types of antidopaminergic agents (such as metoclopramide) [10].

The classic tetrad of symptoms associated with NMS is fever, muscle rigidity, and altered mental status.

In 2011, an international consensus study was published that promoted diagnostic criteria for determining NMS. The criteria include recent dopamine antagonist exposure, or dopamine agonist withdrawal; hyperthermia; rigidity; mental status alteration; creatine kinase elevation; sympathetic nervous system lability; tachycardia plus tachypnea; and a negative workup for other causes [13]. A key feature of NMS is that symptoms develop over days to weeks, rather than the more abrupt onset of serotonin syndrome.

Treatment often occurs in the ICU setting, as NMS is considered a medical emergency. Treatment begins with stopping the causative agent (or restarting a dopamine agonist if NMS related to withdrawal) and supportive care around the clinical sequela; examples include rehydration, restoration of electrolytes, and cardiac and respiratory care. A toxicology consultation should also be considered [14••].

Case wrap-up Keys to diagnosis in this case are that the patient was just discharged from an inpatient psychiatric unit, which prompted the question of whether he was started on any antipsychotics. The patient was treated symptomatically, admitted to the ICU, and the offending agent withdrawn.

Case 3 A 75-year-old female presents from her skilled nursing facility with agitation, disorientation, and restlessness. The ED calls staff at the SNF, who additionally report fever, vomiting, and diarrhea. The symptoms have been present for approximately 7 h. On exam, she is noted to have tremor, hyperreflexia, and ocular clonus.

Serotonin syndrome Similar to NMS, serotonin syndrome (SS) can be a deadly disorder that is related to medications received in the normal course of treatment. See Table 2 for list of common medications associated with SS. The incidence of SS is unknown because it is often unrecognized. Even though the widely prescribed selective serotonin reuptake inhibitors (SSRIs) are considered less dangerous generally, the incidence of SS may actually be increasing [15]. In 2013, SSRIs were the 8th most common cause of toxicological fatalities according to the nationwide poison control center [16].

The diagnosis is based on clinical findings and exclusion. One set of criteria for diagnosis has been found to be 84 % sensitive and 97 % specific when compared to the gold standard of diagnosis by a medical toxicologist [17]. The Hunter Serotonin Toxicity Criteria include the use of a

Table 2 Medications that have associated with serotonin syndrome

Psychiatric medications

- Selective serotonin reuptake inhibitors (SSRIs)
- Serotonin and norepinephrine reuptake inhibitors (SNRIs)
- Monoamine oxidase inhibitors
- Tricyclic antidepressants
- Bupropion
- Lithium
- Valproic acid
- Carbamazepine

Non-psychiatric medications

- Analgesic medications: cyclobenzaprine, fentanyl, meperidine, tramadol
- Dextromethorphan (Delsym Mucinex DM)
- Linezolid

Migraine medications

- Triptans

Nausea medications

- Droperidol
- Granisetron
- Metoclopramide
- Ondansetron
- Ritonavir

Herbal supplements

- Ginseng
- Nutmeg
- St. John's wort

Illicit drugs

- Amphetamines
- Cocaine
- Ecstasy
- LSD

serotonergic agent and 1 of the 5 following criteria: spontaneous clonus, inducible clonus plus agitation or diaphoresis, ocular clonus plus agitation or diaphoresis, tremor plus hyperreflexia, and hypertonia plus a temperature above 38 °C plus ocular or inducible clonus. Other symptoms may include autonomic instability, gastrointestinal symptoms, mental status changes, and hallucinations but are not required for diagnosis.

There is not a particular workup as there is no one lab value that is key to diagnosing SS. Often, a workup is started for the broad differential which would include delirium and NMS. Laboratory findings are helpful in determining the extent of physical crisis—such as dehydration and rhabdomyolysis.

Management is mostly supportive with the goal of rehydration, stabilizing vital signs, and increase or maintain appropriate oxygen saturation [18]. Cardiac monitoring is required for severe SS. Pharmacotherapy centers around the use of benzodiazepines to relax musculature and

aid in calming the patient. In moderate to severe SS, treatment with a serotonin antagonist (cyproheptadine) should be considered [19••].

Case wrap-up The patient had polypharmacy, with multiple medications having serotonergic effects. She had a recent increase in tramadol which appeared to be most causally related. Her serotonergic medications were discontinued and only those deemed necessary by her care team were reinitiated, after full recovery. This highlights the need to review the medication list every time a medication is initiated or increased.

Case 4 A 32-year-old man presents to the emergency department (ED) with unknown psychiatric and medical history. He is very agitated, disorganized, and picks at the air. He occasionally screams “I am God” to the nurses.

Anticholinergic toxicity Anticholinergic toxicity can be caused by many over the counter and prescribed medications, as well as use of hallucinogenic plants and mushrooms. The toxicity may be due to intentional overdose but commonly is caused by unintentional (over) ingestions, which can occur easily with polypharmacy. In 2013, there were 8729 single exposures to anticholinergic drugs, 8208 were unintentional ingestions reported to the national poison data system. 219 cases required specific treatment and 16 were considered life threatening [16]. A number of psychiatric medications, or medications used to offset psychiatric symptoms, have anticholinergic (or muscarinic) properties. Where clinicians become culpable is in not knowing which medications and medication combinations have the ability to lead to toxicity. When a patient is on multiple medications, simply increasing a dose of a side-effect medication, such as Cogentin or Benadryl, without careful thought as to the entire medication regimen can lead to an untoward event.

Patients with anticholinergic toxicity are easier to identify than some of the other dangerous emergencies outlined in this chapter. From the old mnemonic, one can remember “blind as a bat, dry as a bone, hot as a hades...” to help in identification. Manifestations are caused by both central and peripheral nervous system effects and can include altered mental status, dry skin and mucous membranes, fever, vision problems (mydriasis with loss of accommodation), urinary retention, autonomic changes (tachycardia, hypertension), functional ileus (with decreased bowel sounds), and tremor.

The workup is focused on determining what supportive care is required and is directed by history (reported symptoms) and physical exam, such as a basic metabolic panel to determine extent of dehydration when dry mucous membranes are visualized.

Acute anticholinergic toxicity is completely reversible once all of the causative agents are excreted from the body.

Primary treatment is to stop the offending agents and to administer supportive care. Reversible cholinergic agents such as physostigmine can be used to treat severe cases. This treatment is contraindicated for patients with cardiac conduction disturbances on ECG. In the case of prescribed polypharmacy, medications need to be re-evaluated to determine necessity of restarting limited agents.

Case wrap-up Family which arrived later to the ED note that the patient has been boiling “strange leaves” in his tea. They bring some of the leaves which are later identified as *Datura Stramonium* or Jimsonweed. His confusion clears temporarily but fully with physostigmine.

Case 5 A 30-year-old female with a past medical history notable for possible depression presents with 1-week history of irritability, minimal sleep, increasing disorganization, and the thought that someone wishes to hurt her. Review of systems notes weight loss. Vital signs indicate tachycardia. Physical exam indicates irritability, tremor, and exophthalmos.

Thyrotoxicosis An abnormally high level of thyroid hormone in the bloodstream is considered thyrotoxicosis which in the extreme case is known as a thyroid storm. Thyrotoxicosis is common in the US with a prevalence of 1.2 % [20]. This condition, while uncomfortable, usually responds to various forms of treatment [21]. Thyroid storm is a more severe condition, which usually involves altered mental status, confusion, vomiting, diarrhea, and hemodynamic instability. This is rare and can be life threatening. The symptoms are in the same spectrum as seen with thyrotoxicosis, but are just much more severe. Widened pulse pressure with elevated systolic pressure is characteristic of hyperthyroidism [22]. Very high temperature (40.5–41.1 °C) is hallmark feature of thyroid storm.

Thyroid storm occurs when the thyroid gland suddenly releases large amounts of hormone in a short period of time. This is more likely to happen when a person suffers a serious health problem, such as a major infection or heart attack, in addition to thyrotoxicosis (untreated or under-treated). Other causes for thyroid storm include abrupt discontinuation of antithyroid medication (for treatment of hyperthyroid), over-replacement of thyroid hormone, and recent treatment with radioactive iodine.

Treatment is twofold: primary treatment to reduce circulating hormone levels, such as with methimazole or propylthiouracil (PTU), and supportive treatment. Supportive treatment is directed at dehydration and cooling of the body, as well as beta-blockers to help control heart rate. Once the patient is stabilized, the underlying cause should be determined and treatment initiated.

Case wrap-up The patient was given propranolol and PTU. She was admitted to the hospital for close observation.

Conclusions

Medical screening of the patient with psychiatric symptoms involves, at a minimum, the workup of potential medical causes of behavioral symptoms. Each of these five disorders may present with agitation or altered mental status, but have quite different causes. In addition, each has different treatments. All of them, in the extreme, can be deadly but if the symptoms and signs are learned, these disorders may be caught early. Early recognition is key, as mortality rates may be significant.

Compliance with Ethics Guidelines

Conflicts of interest The authors declared that they have no conflicts of interests.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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