Neurological Emergency or Delirium? How to Tell the Difference

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Disclosures

none

Objectives

1. Participants can define delirium
2. Participants recognize common neurological causes of delirium
3. Participants can identify clear signs that a patient is experiencing a neuro change versus delirium

Delirium

Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) defines delirium as:

"acute and fluctuating brain organ dysfunction, presenting with a disturbance of consciousness with reduced ability to focus, sustain, or shift attention"


History of Delirium

"Phrenitis" by Hippocrates circa 500 bce.
- a syndrome of acute onset of behavioral change, sleep disturbance, and cognitive deficit most commonly associated with the onset of fever.
- 1st Century- Celsus
- described non fever associated mental ailments related to illness
- 16th century- name origin
- Latin, owing its etymology to the phrase de lire, meaning "off-track"
- 18th century
- Prominent minds determined delirium owed its pathophysiology to inflammation of animal spirits, a disturbance in the sleep-wake cycle, and separated delirium without fever as mania or madness

Field. R & Ball. M.R. Delirium: Past, Present, and Future
Overview of Delirium

Delirium affects an
• estimated 14–56% of all hospitalized elderly patients.
• At least 20% of the 12.5 million patients over 65 years of age hospitalized each year in the US experience complications during hospitalization because of delirium
• 30–40% of cases of delirium are preventable
• Delirium affects up to 80% of ICU patients, and it is estimated that ICU costs associated with delirium equal between $4 and $16 billion annually in the United States

What is the Big Deal?

Numerous studies have found ICU delirium to be associated with many negative outcomes such as:
• Increased time on the ventilator
• Longer ICU and Hospital lengths of stay
• Increased costs
• Higher mortality – both in-hospital and after discharge
• Greater long-term cognitive dysfunction

Patient Story

I don't remember most of the 40+ days I spent fighting ARDS in the ICU. I do remember bits, like snapshots – my Dad's warm wave and greeting when he arrived; I remember my Mom and sister lovingly giving me a bed-bath; I remember Dr. Wheeler and others talking. I also remember being asked questions over and over and answering by squeezing the questioner's hand. And I remember having my chest tube removed.

Part of the time, I thought I was being restrained by elastic bands that held me down so that I couldn't move. The walls around me looked like I was being held in a multi-level pagoda. In my mind, I was plotting my escape to home, thinking I could pick at the threads of the imagined sewn elastic restraints and set myself free. Randomly I saw small Asian people who wouldn't look at me and I saw a black cat and a black pot-bellied pig. All the while, I was so, SO consumed by anxiety. Just remembering brings back shadows of anxiety.

Types of Delirium

<table>
<thead>
<tr>
<th>Type of Delirium</th>
<th>Incidence in ICU</th>
<th>Incidence in Med–surgical Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall incidence of Delirium</td>
<td>50-80%</td>
<td>15-50%</td>
</tr>
<tr>
<td>Hypoactive</td>
<td>43.5%</td>
<td></td>
</tr>
<tr>
<td>Hyperactive</td>
<td>1.6%</td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td>54.9%</td>
<td></td>
</tr>
</tbody>
</table>
**Common Delirium Scales**

**BEST TOOL:** The Confusion Assessment Method (CAM) is a standardized evidence-based tool that enables non-psychiatrically trained clinicians to identify and recognize delirium quickly and accurately in both clinical and research settings.

Both the CAM and the CAM–ICU have demonstrated sensitivity of 94-100%, specificity of 89-95% and high inter-rater reliability.


**Richmond Agitation and Sedation Assessment Scale (RASS)**

- Score: -5, -4, -3, -2, -1, 0, 1, 2, 3, 4
- Descriptors: Comatose, coma, minimally conscious, defined as no or minimal cognitive or communicative responses, or drowsy, sedated, restless, alert, combative, aggressive
- Characteristics:
  - Alert and calm: Not drowsy, alert, oriented to time, place, person
  - Disturbed: Not drowsy, alert, oriented to time, place, person
  - Comatose: Comatose, vegetative, drowsy, sedated
  - Agitated: Agitated, combative, restless, combative, combative, alterable, combative
  - Restless: Restless, combative, agitated, combative, combative, combative
  - Calm: Calm, alert, combative, combative, combative

Sessler CN et al. Image retrieved from ccn.aacnjournals.org/content/23/2/25/T3.large.jpg

**Know your Baseline**

**CAM positive = Now what?**

Delirious
Common causes

**Non-modifiable**
- Dementia or cognitive impairment
- Advancing age (>65 years)
- History of delirium, stroke, neurological disease, falls or gait disorder
- Multiple comorbidities
- Male sex
- Chronic renal or hepatic disease

**Modifiable**
- Sensory impairment (hearing or vision)
- Immobilization (catheters or restraints)
- Medications
- withdrawal of alcohol
- Acute neurological diseases
- Anemia, dehydration, poor nutritional status, 
  - Fracture or trauma,
  - Metabolic derangement
  - Surgery/Anesthesia
  - Environment
  - Pain
  - Emotional distress
  - Sustained sleep deprivation


Pneumonic for Delirium Causes

**DELIRIUM(S)**
- D – Drugs, Drugs, Drugs
- E – Eyes/Ears (Sensory deprivation/overload)
- L – Low Oxygen
- I – Infection
- R – Retention (urine/stool); Restraints
- I – Immobility
- U – Underhydration, Undernutrition
- M – Metabolic Abnormalities (labs)
  - (S) –Sleep Deprivation

Red Flags that Delirium caused by acute Neuro

- Difficulty Talking
- Twitching
- Staring Spells
- Motor Weakness
- Drift
- Facial Drop
- Visual Changes
- Delirium Behavior Changes
- Periods of temporary Loss of Consciousness
Seizures

Definitions:
- Seizure: a sudden, explosive, disorderly discharge of cerebral neurons
  - Motor, sensory, autonomic, or psychic

Types
- Partial (focal), simple, complex, generalized

Generalized Seizures
- Symptoms
  1. "Grand Mal" or Generalized tonic-clonic
  2. Absence
  3. Myoclonic
  4. Clonic
  5. Tonic
  6. Atonic

Partial Seizures
- Symptoms
  1. Simple (awareness is retained)
    a. Simple Motor
    b. Simple Sensory
    c. Simple Psychological
  2. Complex (Impairment of awareness)
  3. Partial seizure with secondary generalization

Generalized Seizures

Partial Seizures

Seizure Classification

Post Ictal

Thought:
- Memory loss
- Writing difficulty
- Somnolence/Lethargy

Emotional:
- Confusion
- Depression and sadness
- Fear
- Frustration
- Shame/Embarrassment

At risk for:
- Aspiration
- Falls
- Bruising/self injury
- Airway
- Status Epilepticus

When should I think about Seizure?

History of seizure
Seizure meds taken at home
Missed seizure meds due to NPO
Brain tumors
Strokes/head injury
Anoxic brain injury
Alcohol Withdrawal
Cocaine/heroin/ Methamphetamine
Meningitis/encephalopathy
Drugs that lower the seizure threshold
Infections in patients with seizure history

Drugs that Lower the seizure threshold

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Antidepressants</th>
<th>Analgesics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pencillins</td>
<td>Clozapine</td>
<td>Meprobamate</td>
</tr>
<tr>
<td>Fluoroquinolones</td>
<td>Chlorpromazine</td>
<td>Moephine</td>
</tr>
<tr>
<td>Meiconazole</td>
<td>Haloperidol</td>
<td>Thiamide</td>
</tr>
<tr>
<td>Cephalosporins</td>
<td>Anesthetics</td>
<td>Hydromorphone</td>
</tr>
<tr>
<td>Carbapenems</td>
<td>Propofol</td>
<td>Antidepressants</td>
</tr>
<tr>
<td>Isoniazid</td>
<td>Sevoflurane</td>
<td>Bupropion</td>
</tr>
<tr>
<td>Theophylline</td>
<td>Clonapirine</td>
<td>Tricyclic antidepressants</td>
</tr>
</tbody>
</table>

Table 1. Potential Causes of Seizures in Seniors

- Alzheimer’s disease
- Cerebrovascular disease
- Drugs and toxins (e.g., antidepressants, including bupropion and venlafaxine, and particularly tricylics; trazodone; benzoic acid; and other CNS stimulants; e.g., amphetamines; cyclizine; lev, pentylentetrazole, picrotoxin, strychnine, tacrolimus)
- Head trauma (e.g., blunt or penetrating injuries)
- Hypertension (e.g., fever, heatstroke, drug toxicity [including that from amphetamines or cocaine])
- Infections of the CNS (e.g., AIDS, neurosyphilis, tetanus, viral encephalitis)
- Renal failure
- Substance withdrawal syndromes (e.g., from alcohol, anesthetics, barbiturates, benzodiazepines)

CNS: central nervous system.
Source: References 1, 6, 8, 10.

F.A.S.T

Stroke
Left MCA/Right MCA - Most Common Site of Stroke

Right MCA
- Altered depth perception.
- Neglect/weakness of left side of the body
- Left facial droop
- Left field cut
- Poor decision making
- Lack of insight
- Impulsive
- Denial of deficit

Left MCA
- Aphasia
- Slow, careful movements
- Right Weakness
- Right Field cut
- Right facial droop
- Swallowing problems
- Awareness of Injury

What about the Rest of the Brain?
### Identifying patients at High risk for stroke

- Postoperative patients
- Diabetes
- Myocardial infarction (MI)
- Coronary artery bypass graft
- Acute stroke
- Unstable angina
- Pulmonary edema
- Atrial fibrillation (AF)
- Urinary tract infection
- Prior transient ischemic attack (TIA)
- Cardiovascular disease
- Hyperlipidemia
- Hypertension
- Dehydration

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### Aphasia

**Wernicke aphasia (receptive or fluent):** Patients speak normal words fluently, often including meaningless phonemes, but do not know their meaning or relationships. The result is a jumble of words or “word salad.” Patients are typically unaware that their speech is incomprehensible to others. A right visual field cut commonly accompanies Wernicke aphasia because the visual pathway is near the affected area.

**Broca aphasia (expressive or non fluent):** Patients can comprehend and conceptualize relatively well, but their ability to form words is impaired. Usually, the impairment affects speech production and writing (agraphia, dysgraphia); greatly frustrating patients’ attempts to communicate. Broca aphasia may include anomia (inability to name objects).

Cortical Blindness

Damage to the Occipital Lobe

Symptoms
- A complete loss of visual sensation and of vision
- Preservation/sparing of the abilities to perceive light and/or moving, but not static objects (Riddoch syndrome)
- A lack of visual fixation and tracking
- Denial of visual loss (Anton–Babinski syndrome)
- Visual hallucinations
- Macular sparing, in which vision in the fovea is spared from the blindness

How do we rule out Cortical Blindness

1. Identify previous eye injuries or blindness
2. Ensure the patient can see
3. "How many fingers am I holding up?"
4. "What is in this picture?"

Decision Tree for Managing Delirium

1. The patient is CAM positive?
2. Do they have any RED FLAG symptoms?
   - If yes- call MD or consider a rapid response
3. If No Progress through the I WATCH DEATH causes of delirium to find the potential cause
4. Keep patient safe
5. Consider low dose Haldol as ordered by MD if patient behavior unsafe and no history of delirium
When working with Neuro Patients there is an added layer of FUN!!!!

**ACUTE NEURO CHANGE VS. Worsening**

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In Acute Neuro patients Always…. Assume that delirium OR worsening delirium is an acute neuro change that we need to react to

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### Delirium in patients with Acute Stroke

<table>
<thead>
<tr>
<th>Basal region</th>
<th>Cerebral</th>
<th>Patients, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basal steam</td>
<td>VA, BA</td>
<td>6 (54.5)</td>
</tr>
<tr>
<td>Cortical</td>
<td>MCA, PCA, ICA</td>
<td>4 (36.8)</td>
</tr>
<tr>
<td>Medial part of frontal and parietal lobe</td>
<td>ACA ante/post medial temporal; fronto-temporal</td>
<td>4 (36.8)</td>
</tr>
<tr>
<td>Hypothalamus</td>
<td>ACA</td>
<td>2 (18.2)</td>
</tr>
<tr>
<td>Ventral part of temporal lobe, occipital pole</td>
<td>PCA (posterior thalamic branches)</td>
<td>2 (18.2)</td>
</tr>
<tr>
<td>Thalamus</td>
<td>PCA (middle thalamic branches)</td>
<td>2 (18.2)</td>
</tr>
<tr>
<td>Hippocampus</td>
<td>PCA (posterior thalamic branches; CA1)</td>
<td>2 (18.2)</td>
</tr>
<tr>
<td>Caudate nucleus, internal capsule</td>
<td>Putamen, globus pallidus</td>
<td>2 (18.2)</td>
</tr>
<tr>
<td>Lateral frontal, temporal, parietal and occipital lobe</td>
<td>MCA (smetal sparing)</td>
<td>10 (86.4)</td>
</tr>
</tbody>
</table>

*© 2002 E. Wesley Ely MD, MPH and Vanderbilt University. All rights reserved. Retrieved from www.icudelirium.org*

### Case Study 1

70 year old patient with prosthetic AVR 2 days ago related to staph endocarditis.

During charge report the staff nurse indicates that the patient is delirious/Cam +.  “He is really sweet.  He said he liked me because I made his family appear.  He was climbing out of bed most of the night and was having trouble following my directions of where he had to go.  He doesn’t track you in the room and is hyper vigilant”
Is this patient delirious?

1. Fluctuating Course- Yes
2. Inattention- Yes (Failed SAVE AHA ART)
3. RASS- 1- Yes

DELIRIOUS

Are there any Neuro Red flags?

What Do I need to assess more and what tools will I need to do it?

Further Quick assessment

Vision Assessment
- Pt states he can see fine
- + blink to threat
- Patient unable to identify any objects on cards
- Patient can not point to TV in the room

Ability to follow commands
- Thumbs up/Wiggles his toes

Orientation
- Does not know date
- Unsure if night or day
- Hyper alert and responding to noises in the hallway
- Startles with touch

Rapid Response TEAM
Case 2

The patient undergoes the hernia repair with no intraoperative problems and with typical (minimal) blood loss. He is back on the surgical ward by that evening and has a quiet night.

POD # 1 AM rounds. Temp 100.8, BP/P/R stable, complains of pain and gets Percocet 5/325 mg with relief. Low grade bowel sounds are noted to be present. Later that day nurses note that the patient is agitated. He pulls out his IV twice, tries to get out of bed without assistance, is calling out frequently, and is not eating. He has angry outbursts and claims the staff is trying to harm him. On one occasion he is found in another patient’s room. At other times he is drowsy.

PMH

DM2
Etch(3-4 beers/day)
Seizures
History of head injury

Current Meds

Tylenol
Thiamine
Benadryl
Oxycodone
Regular Insulin QAC
Lantus 50 units HS

On exam he is lethargic. It takes several attempts to gain his attention to answer questions and to wake him up. Once focused on a question he rambles in a disorganized way, his speech is incoherent. There are no focal neurological deficits and his exam is otherwise unchanged.

Is this patient delirious?

1. Fluctuating Course- Yes
2. Inattention-Yes(Failed SAVEHAART)
3. RASS- 1- Yes

DELIROSUS
Are there any Neuro Red flags?

What Do I need to assess more and what tools will I need to do it?

PMH
- DM2
- Etoh (3-4 beers/day)
- Seizures
- History of head injury

Current Meds
- Tylenol
- Thiamine
- Benadryl
- Oxycodone
- Regular Insulin QAC
- Lantus 50 units HS

Any Signs of increased Seizure Risk?

UMM, what does this signal mean to us? What does this mean to you?
After ½ amp of D50- patient interacting much better. Speech is clear and less confused. Medical team arrived and canceled the head CT.
Restarted the patient on home dosing of Depakote.

Is this patient delirious?
1. Fluctuating Course - Yes
2. Inattention - Yes (Failed SAVEAHAART pushing at staff)
3. RASS - 2 - Yes
DELIRIOUS

F.A.S.T

Case 3
76 year old patient status post R total joint replacement.
Patient received general anesthesia. Had some pain (fentanyl)medication in PACU and transferred at 1800 to med-surg bed. On arrival, pt is drowsy but interacting with staff and family. She falls asleep quickly but awakes when someone enters the room, family decided to go home as it is a long day. 2030 nurse in to check on the patient. She is keeping her eyes squeezed tight and refusing to answer questions or follow commands. Nursing returns at 2100. Patient pushing at staff with her left hand and crying, but still will not answer when asked what is wrong.

Are there any Neuro Red flags?

CMO Confusion Assessment Method
The diagnosis of delirium requires the presence of features 1 and 2, plus either 3 or 4.
Feature 1: Acute onset and fluctuating course
This feature is usually confirmed by statements of a family member or health care professional and is shown by positive response to the following question:
• Is there evidence of an acute change or mental status from the patient’s baseline?
- Changes are typically seen as progressive deterioration during the day, leading to coma or death, or increase and decrease in severity?
Feature 2: Inattention
This feature is shown by a positive response to the following question:
• Does the patient have difficulty focusing attention? For example, in the patient easily distracted or having difficulty keeping track of what is being said?
Feature 3: Disorganized thinking
This feature is demonstrated by a positive response to the following question:
• Is the patient’s thinking disorganized or incoherent, as evidenced by word finding or irrelevant conversation, echoic or Blunted flow of ideas, or unpredictable switching from subject to subject?
Feature 4: altered level of consciousness
This feature is shown by a positive response to the following question:
• Are you aware of what is going on around you that you are the patient’s level of consciousness?
- Alert (normal)
- Stupor (sleepy)
- Unresponsive (blurred or wakened)
- Comatose (unconscious)

What Do I need to assess more and what tools will I need to do it?

Pt fighting with left arm and leg
Not talking/answering questions
Right arm drops when it is held up

ACUTE STROKE CALL INITIATED

CT Negative

Patient to Interventional Radiology
The patient on the IR table was instantly able to start talking and move her right side. Went to rehab and back to baseline with her brand new hip 😊

Saver, J.L., Time Is Brain—QuantifiedStroke. 2006; 37: 263-266. Published online before print December 8, 2005, doi:10.1161/01.STR.0000196657.55928.ab

Delirium and Military Specific Applications
Risk Factors for Emergence Delirium in U.S. Military Members

Military perianesthesia nurses often prepare during the surgical procedure for what they "know" will soon occur: the violently combative emergence of the soldier, sailor, airman, or marine. Colloquial phrases like "anesthesia nods," "wild wakers," and "post-anesthetic windup" have all been used to describe ED as it occurs in some military members. Recently injured combat veterans returning for their third, fourth, or even fifth surgery sometimes prepare for pre-anesthesia team stating, "Watch out, I've been told I wake up swinging." Percutaneous endoscopies of the arms and minimum exercise,/POR in an effort to decrease sensory stimuli.

### Table 3. Psychological Factors Believed to Be Related to Emergence Delirium (n = 66)

<table>
<thead>
<tr>
<th>Implication</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTSD</td>
<td>58 (80.0)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>56 (84.8)</td>
</tr>
<tr>
<td>Depression</td>
<td>33 (50.0)</td>
</tr>
<tr>
<td>Pain</td>
<td>30 (45.0)</td>
</tr>
<tr>
<td>Medication other than anesthetics</td>
<td>25 (37.5)</td>
</tr>
<tr>
<td>Other*</td>
<td>2 (3.0)</td>
</tr>
</tbody>
</table>

Questions?

neuroglia1@hotmail.com

### Table 4. Interventions Perceived to Have Helped Alleviate Emergence Delirium Symptoms During Anesthesia (n = 83)

<table>
<thead>
<tr>
<th>Intervention</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administer a benzodiazepine</td>
<td>46 (55.3)</td>
</tr>
<tr>
<td>Talk to patient during episode</td>
<td>31 (51.0)</td>
</tr>
<tr>
<td>Analgesic</td>
<td>25 (41.0)</td>
</tr>
<tr>
<td>Nothing allows for time to awaken</td>
<td>21 (34.8)</td>
</tr>
<tr>
<td>Induction agent to deepen PT</td>
<td>17 (27.9)</td>
</tr>
<tr>
<td>Haloperidol</td>
<td>4 (6.5)</td>
</tr>
<tr>
<td>Dexamethasone</td>
<td>6 (9.6)</td>
</tr>
<tr>
<td>Deepen anesthetic utilizing PAs</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Other</td>
<td>19 (31.1)</td>
</tr>
<tr>
<td>Phenylephrine</td>
<td>4 (6.5)</td>
</tr>
<tr>
<td>Have family or &quot;buddies&quot; present in PACU</td>
<td>4 (6.5)</td>
</tr>
<tr>
<td>Induction dose of non-narcotic</td>
<td>3 (3.3)</td>
</tr>
<tr>
<td>Propofol on emergence</td>
<td>2 (3.3)</td>
</tr>
<tr>
<td>Disopyridol</td>
<td>2 (3.3)</td>
</tr>
<tr>
<td>Use longer acting PACU</td>
<td>1 (1.6)</td>
</tr>
</tbody>
</table>

### Table 5. Anesthetic Agents Believed To Be Related to Emergence Delirium (n = 47)

<table>
<thead>
<tr>
<th>Anesthetic agent</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCEA</td>
<td>26 (55.3)</td>
</tr>
<tr>
<td>Patient-controlled analgesia</td>
<td>25 (53.2)</td>
</tr>
<tr>
<td>Ketamine</td>
<td>19 (40.4)</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>18 (38.3)</td>
</tr>
<tr>
<td>Desflurane</td>
<td>17 (36.2)</td>
</tr>
<tr>
<td>Midazolam</td>
<td>12 (25.5)</td>
</tr>
<tr>
<td>Propofol</td>
<td>10 (21.3)</td>
</tr>
<tr>
<td>Others</td>
<td>5 (10.6)</td>
</tr>
</tbody>
</table>

### Table 2. Physical Factors Believed to Be Related to Emergence Delirium (n = 149)

<table>
<thead>
<tr>
<th>Factor</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>12 (7.9)</td>
</tr>
<tr>
<td>Male</td>
<td>12 (8.1)</td>
</tr>
<tr>
<td>Female</td>
<td>12 (8.1)</td>
</tr>
</tbody>
</table>

*Other response includes: "Other medical condition". The majority of documentation is "inadequate eugene surgery; inactivity; no pain; no suctioning; unnecessary pain; no "ECG; no history of pain; no ability to communicate. These factors could lead to more than one response.

### Table 1. Pharmacologic, Physiologic, and Psychological Characteristics Associated with Emergence Delirium in Combat Veterans

**Anesthetic agent** | **No. (%)**
--- | ---
PCEA | 26 (55.3)
PACU | 25 (53.2)
Ketamine | 19 (40.4)
Fentanyl | 18 (38.3)
Desflurane | 17 (36.2)
Midazolam | 12 (25.5)
Propofol | 10 (21.3)
Others | 5 (10.6)

**Factor** | **No. (%)**
--- | ---
Age | 12 (7.9)
Male | 12 (8.1)
Female | 12 (8.1)

Questions?

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