Delirium care in ICU

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The patient story of Nancy Andrews delirium
Overview

• What is delirium?
• How is it categorised?
• Why does it matter?
• Why does it happen?
• How do we diagnose/monitor it?
• How do we prevent and treat it?
• What does it mean for our patients?
“Delirium” is rarely called by name!

- Altered mental status
- Dementia
- Confusion
- ICU Psychosis
- Sundowners
- Acute Confusional State
What is Delirium?

DSM IV definition: “a disturbance of consciousness with inattention accompanied by a change in cognition or perceptual disturbance that develops over a short period (hours to days) and fluctuates with time”

• An **acute** confusional state with
  – **Fluctuating** mental status
  – Disordered **attention**
  – Disorganised **thinking**
How is Delirium Categorised?

Hyperactive 1.4%
Mixed 31.1%
Hypoactive 67.6%

Why does delirium matter?

- Affects up to 80% of mechanically ventilated adult ICU patients.
- Increased risk of reintubation (OR=3)
- Increased ICU & hospital stay* (up to 10 days extra)
- Each day in delirium increases risk of longer stay by 20%
- Increased ICU & hospital costs***

Increased mortality in ICU & out to 6 months**
  - Each day spent in delirium increases risk of death by 10%

- 10-24% risk of long-term cognitive impairment
- Increased dementia risk
- Reduced functional status at 3 & 6 months
ICU Delirium and Mortality

Despite similar baseline characteristics in a cohort of 275 mechanically ventilated patients, delirium was an independent predictor of higher 6-month mortality and longer stay even after adjusting for relevant covariates including coma and sedative/analgesic medications. See the Figures below and the comment from the multivariable analysis.

Reference:
U.S. Delirium Costs:

• $16,303 to $64,421 additional per delirious patient.

• U.S. cost-of-care directly attributed to delirium ranges from $143 to $152 billion

IMPACT OF DELIRIUM: Extends Beyond the Hospital

Post-hospital costs ($>100 B/yr):

- Institutionalization
- Rehabilitation
- Home care
- Caregiver burden

Why does delirium happen?

Serotonin
Acetylcholine
Dopamine

- Opioids & benzo’s
- Hypoxia
- Metabolic derangement
- Systemic disease
- Withdrawal syndromes
- 1° intracranial disease
- 2° brain infection
- Decreased cerebral metabolism
- Toxins
- 1° intracranial disease
- Metabolic derangement
- Hypoxia
- Opioids & benzo’s
Why does delirium happen?

- **Higher cortical dysfunction** (on functional neuroimaging)
  - Pre-frontal cortex, non-dominant posterior parietal regions, anterior thalamus, basal ganglia, temporal-occipital cortex

- **Neurotransmitter dysfunction**
  - Reduced acetylcholine levels – blockade or deficiency
    - Endogenous anticholinergic substances
    - Opiates/hypoxia/inflammation
  - Serotonin fluctuation
  - Dopamine excess
  - Glutamate excess (2° to IFN-γ, LPS, hypoxia, hypoglycaemia)
Patient Vulnerability + Precipitating Risk Factor

is **WHY** One Patient Develops Delirium, while a Similar Patient Does Not.
## Predisposing or Vulnerability Factors

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Decreased Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Older age</td>
<td>Dehydration</td>
</tr>
<tr>
<td>Male gender</td>
<td>Malnutrition</td>
</tr>
<tr>
<td>Cognitive status</td>
<td>Drugs</td>
</tr>
<tr>
<td>Dementia</td>
<td>Multiple psychoactive drugs</td>
</tr>
<tr>
<td>Cognitive impairment</td>
<td>High number of drugs</td>
</tr>
<tr>
<td>History of delirium</td>
<td>Alcohol abuse</td>
</tr>
<tr>
<td>Depression</td>
<td></td>
</tr>
<tr>
<td>Functional status</td>
<td>Medical Comorbidity</td>
</tr>
<tr>
<td>Functional dependence</td>
<td>High severity of illness</td>
</tr>
<tr>
<td>Immobility</td>
<td>High level of comorbidity</td>
</tr>
<tr>
<td>Poor activity level</td>
<td>Chronic renal or hepatic disease</td>
</tr>
<tr>
<td>History of falls</td>
<td>Previous stroke</td>
</tr>
<tr>
<td>Sensory impairment</td>
<td>Neurologic disease</td>
</tr>
<tr>
<td>Vision impairment</td>
<td>Metabolic derangements</td>
</tr>
<tr>
<td>Hearing impairment</td>
<td>Fracture or trauma</td>
</tr>
<tr>
<td></td>
<td>Terminal illness</td>
</tr>
<tr>
<td></td>
<td>HIV infection</td>
</tr>
</tbody>
</table>

Inouye SK. NEJM 2006;354:1157-65
PRECIPITATING FACTORS OR INSULTS

Drugs
- Sedative hypnotics
- Narcotics
- Anticholinergic drugs
- Polypharmacy
- Alcohol or drug withdrawal

Primary neurological diseases
- Stroke, particularly nondominant hemispheric
- Intracranial bleed
- Meningitis/encephalitis

Environmental
- Intensive care unit admission
- Physical restraint use
- Bladder catheter use
- High number of procedures
- Pain
- Emotional stress
- Prolonged sleep deprivation

Inter-current illnesses
- Infections
- Iatrogenic complications
- Severe acute illness
- Hypoxia
- Shock
- Fever/hypothermia
- Anemia
- Dehydration
- Poor nutritional status
- Low serum albumin
- Metabolic derangements (e.g., electrolytes, glucose, acid-base)

Surgery
- Orthopedic surgery
- Cardiac surgery
- Duration of cardiopulmonary bypass
- Non-cardiac surgery

Inouye SK. NEJM 2006;354:1157-65
Patient Factors
Older age
Alcohol/drug use
Functional dependence
Male gender
Living alone
Depression
Dehydration
Vision/Hearing impaired

Environment
Admission via ED or through transfer
Isolation/No visitors
No clock
No daylight
Noise
Use of physical restraints
Tethers
Sleep deprivation

Predisposing Disease
Cardiac disease
Cognitive impairment
Hx Delirium or dementia
Pulmonary disease
Pain poorly controlled
Liver/Renal disease
HIV

Acute Illness
Length of stay
Fever/Infection/Sepsis
Cardiac/Hip surgery
Medicine service
Malnutrition
Hypotension
Metabolic disorders
Tubes/catheters/tethers
Medications:
- Anticholinergics
- Corticosteroids
- Benzodiazepines

What to **THINK** if + for delirium

**Toxic Situations**
- CHF, shock, dehydration
- Deliriogenic meds (tight titration, sedative choice)
- New organ failure, e.g., liver, kidney

**Hypoxemia**; also, consider giving **Haloperidol** or other antipsychotics

**Infection/sepsis** (nosocomial), **Immobilization**

**Nonpharmacological interventions**
- Hearing aids, glasses, reorient, sleep protocols, music, noise control, ambulation

**K+** or Electrolyte problems
DELIRIUM(S) - causes

- **D** Drugs, dementia
- **E** Eyes & ears (poor vision and hearing)
- **L** Low O$_2$ states (CHF, COPD, ARDS, MI, PE)
- **I** Infection
- **R** Retention (urine and stool)
- **I** Ictal states
- **U** Underhydration/undernutrition
- **M** Metabolic upset
- **(S)** Subdural, sleep deprivation
I've seen a dying eye
Run round and round a room
In search of something, as it seemed,
Then cloudier become;
And then, obscure with fog,
And then be soldered down,
Without disclosing what it be,
'Twere blessed to have seen.

Emily Dickinson

DELIRIUM IS OFTEN UNRECOGNIZED
NURSES’ RECOGNIZE DELIRIUM
ONLY 31% of the time

Inouye SK, Arch Intern Med.
2001;161:2467-2473
Delirium is often confused with Dementia
Up to 40% of Hospital-Acquired DELIRIUM is PREVENTABLE

- Common problem
- Often unrecognized
- Typically of multifactorial etiology
- Serious complications
- Often preventable (40-50% cases)

Prevention is the key to management
The Duration of delirium is an independent predictor of long-term cognitive impairment. (Girard et al., CCM 2010)
Diagnosis & monitoring

- **Level** of consciousness
- **Content** of consciousness
Treatment & management of delirium
Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the Intensive Care Unit

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Agitation
Statements and recommendations – Agitation and sedation

• Depth of sedation

• Maintaining light levels of sedation in adult ICU patients is associated with improved clinical outcomes (e.g., shorter duration of mechanical ventilation and a shorter ICU length of stay)

• Unless clinically contraindicated.
Statements and recommendations – Agitation and sedation

• Monitoring depth of sedation

• The **Richmond Agitation-Sedation Scale (RASS)** and **Sedation-Agitation Scale (SAS)** are the most valid and reliable sedation assessment tools for measuring quality and depth of sedation in adult ICU patients.
  ✓ Both scales demonstrated a high degree of inter-rater reliability, and were able to discriminate different sedation levels in various clinical situations.

• The use of **objective measures of brain function** (eg auditory evoked potentials [AEPs], Bispectral Index [BIS], Narcotrend Index [NI], Patient State Index [PSI], or state entropy [SE]) as the primary method to monitor depth of sedation in non-comatose, non-paralyzed critically ill adult patients is not recommended.

• However, they may be used as an **adjunct to subjective sedation assessments** in adult ICU patients who are receiving neuromuscular blocking agents, as subjective sedation assessments may be unobtainable in these patients.
### Richmond Agitation Sedation Scale (RASS) *

<table>
<thead>
<tr>
<th>Score</th>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+4</td>
<td>Combative</td>
<td>Overtly combative, violent, immediate danger to staff</td>
</tr>
<tr>
<td>+3</td>
<td>Very agitated</td>
<td>Pulls or removes tube(s) or catheter(s); aggressive</td>
</tr>
<tr>
<td>+2</td>
<td>Agitated</td>
<td>Frequent non-purposeful movement, fights ventilator</td>
</tr>
<tr>
<td>+1</td>
<td>Restless</td>
<td>Anxious but movements not aggressive, vigorous</td>
</tr>
<tr>
<td>0</td>
<td>Alert and calm</td>
<td>Not fully alert, but has sustained awakening</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(eye-opening/eye contact) to voice (\geq 10) seconds)</td>
</tr>
<tr>
<td>-1</td>
<td>Drowsy</td>
<td>Briefly awakens with eye contact to voice (&lt;10) seconds</td>
</tr>
<tr>
<td>-2</td>
<td>Light sedation</td>
<td>Movement or eye opening to voice (\text{but no eye contact})</td>
</tr>
<tr>
<td>-3</td>
<td>Moderate sedation</td>
<td>No response to voice, but movement or eye opening to physical stimulation</td>
</tr>
<tr>
<td>-4</td>
<td>Deep sedation</td>
<td>No response to voice or physical stimulation</td>
</tr>
<tr>
<td>-5</td>
<td>Unarousable</td>
<td></td>
</tr>
</tbody>
</table>

#### Procedure for RASS Assessment

1. Observe patient
   
   a. Patient is alert, restless, or agitated. \((\text{score}\ 0\ \text{to}\ +4)\)

2. If not alert, state patient’s name and say to open eyes and look at speaker.
   
   b. Patient awakens with sustained eye opening and eye contact. \((\text{score} \ -1)\)
   
   c. Patient awakens with eye opening and eye contact, but not sustained. \((\text{score} \ -2)\)
   
   d. Patient has any movement in response to voice but no eye contact. \((\text{score} \ -3)\)

3. When no response to verbal stimulation, physically stimulate patient by shaking shoulder and/or rubbing sternum.
   
   e. Patient has any movement to physical stimulation. \((\text{score} \ -4)\)
   
   f. Patient has no response to any stimulation. \((\text{score} \ -5)\)

---


## Riker Sedation-Agitation Scale (SAS)

<table>
<thead>
<tr>
<th>Score</th>
<th>Term</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Dangerous Agitation</td>
<td>Pulling at ET tube, trying to remove catheters, climbing over bedrail, striking at staff, thrashing side-to-side</td>
</tr>
<tr>
<td>6</td>
<td>Very Agitated</td>
<td>Requiring restraint and frequent verbal reminding of limits, biting ETT</td>
</tr>
<tr>
<td>5</td>
<td>Agitated</td>
<td>Anxious or physically agitated, calms to verbal instructions</td>
</tr>
<tr>
<td>4</td>
<td>Calm and Cooperative</td>
<td>Calm, easily arousable, follows commands</td>
</tr>
<tr>
<td>3</td>
<td>Sedated</td>
<td>Difficult to arouse but awakens to verbal stimuli or gentle shaking, follows simple commands but drifts off again</td>
</tr>
<tr>
<td>2</td>
<td>Very Sedated</td>
<td>Aroused to physical stimuli but does not communicate or follow commands, may move spontaneously</td>
</tr>
<tr>
<td>1</td>
<td>Unarousable</td>
<td>Minimal or no response to noxious stimuli, does not communicate or follow commands</td>
</tr>
</tbody>
</table>

### Guidelines for SAS Assessment
1. Agitated patients are scored by their most severe degree of agitation as described

2. If patient is awake or awakens easily to voice ("awaken" means responds with voice or head shaking to a question or follows commands), that’s a SAS 4 (same as calm and appropriate – might even be napping).

3. If more stimuli such as shaking is required but patient eventually does awaken, that’s SAS 3.

4. If patient awakes to stronger physical stimuli (may be noxious) but never awakens to the point of responding yes/no or following commands, that’s a SAS 2.

5. Little or no response to noxious physical stimuli represents a SAS 1.

This helps separate sedated patients into those you can eventually wake up (SAS 3), those you can’t awaken but can arouse (SAS 2), and those you can’t arouse (SAS 1).

4. Validating the Sedation-Agitation Scale with the bispectral index and visual analog scale in adult ICU patients after cardiac surgery. Intensive Care Med 2001; 27:853-858.
• **Choice of sedatives**

• Sedation strategies using **non-benzodiazepine sedatives** (either propofol or dexmedetomidine) may be preferred over sedation with benzodiazepines (either midazolam or lorazepam) to improve clinical outcomes in mechanically ventilated adult ICU patients.

• The choice of sedative agent used in ICU patients should be driven by:
  ✓ Specific indications and sedation goals for each patient
  ✓ The clinical pharmacology of the drug in a particular patient, including its onset and offset of effect and its side effect profile
  ✓ The overall costs associated with using a particular sedative
Statements and recommendations – Agitation and sedation

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Benzodiazepine</th>
<th>non-benzodiazepine</th>
<th>Mean Difference IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hall 2001-72+, M/P, SD</td>
<td>9.14</td>
<td>8.46</td>
<td>0.68 (-4.66, 6.02)</td>
</tr>
<tr>
<td>Hall 2001-24-72, M/P, SD</td>
<td>6.31</td>
<td>6.59</td>
<td>-0.28 (-4.83, 4.27)</td>
</tr>
<tr>
<td>Pandharipande 2007, L/D, IQR</td>
<td>9.66</td>
<td>7.5</td>
<td>1.50 (-1.86, 4.86)</td>
</tr>
<tr>
<td>Carson 2006, L/P, IQR</td>
<td>10.4</td>
<td>8.3</td>
<td>2.10 (-0.44, 4.64)</td>
</tr>
<tr>
<td>Hall 2001-24, M/P, SD</td>
<td>2.48</td>
<td>2.95</td>
<td>-0.47 (-2.31, 1.37)</td>
</tr>
<tr>
<td>Riker 2009, M/V, SD, median</td>
<td>7.6</td>
<td>5.9</td>
<td>1.70 (0.55, 2.85)</td>
</tr>
<tr>
<td>Searle 1997, M/P, SD</td>
<td>3.9</td>
<td>3.7</td>
<td>0.20 (-0.84, 1.24)</td>
</tr>
<tr>
<td>Huey-Ling 2008, M/P, SD</td>
<td>3.1</td>
<td>2.8</td>
<td>0.30 (-0.27, 0.87)</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>338</td>
<td>463</td>
<td>0.57 (0.03, 1.10)</td>
</tr>
</tbody>
</table>

Heterogeneity: Tau² = 0.08; Chi² = 8.03, df = 7 (p = 0.33), I² = 13%
Test for overall effect Z = 2.08 (p = 0.04)

Figure 1. ICU length of stay meta-analysis of high and moderate-quality studies comparing benzodiazepine to non-benzodiazepine sedation. CI = confidence interval; IQR = interquartile range. L/D = lorazepam vs. dexmedetomidine; L/P = lorazepam vs. propofol; M/P = midazolam vs. propofol; M/D = midazolam vs. dexmedetomidine; SD = standard deviation.
• **Choice of sedatives**

- Multiple studies have been conducted to compare benzodiazepine-based and non-benzodiazepine-based sedation.
- A meta-analysis of 6 trials suggested that sedation with benzodiazepines may increase ICU length of stay by approximately **0.5** days compared with non-benzodiazepine sedation. (Figure 1)
- Moderate to high-quality data favor using propofol over lorazepam and dexmedetomidine over midazolam to limit the duration of mechanical ventilation.
- Benzodiazepines remain important for managing agitation in ICU patients, especially for treating anxiety, seizures, and alcohol or benzodiazepine withdrawal.
Delirium
Statements and recommendations – Delirium

• Detecting and monitoring delirium
  • Routine monitoring of delirium in adult ICU patients is recommended.

• The **Confusion Assessment Method for the ICU (CAM-ICU)** and the **Intensive Care Delirium Screening Checklist (ICDSC)** are the most valid, reliable and feasible delirium monitoring tools in adult ICU patients.
  • They are used in ICU patients both on and off mechanical ventilation.
  • Studies have found a high degree of sensitivity and specificity for both tools.
Diagnosis & monitoring

- **Intensive Care Delirium Screening Checklist (ICDSC)**
  - 8 items based on data from preceding 24 hours
  - Score $\geq 4$ items = positive for delirium
  - Sensitivity 99%, specificity 64%, inter-observer reliability 94%
  - Simple

- **Confusion Assessment Method for ICU (CAM-ICU)**
  - 4 features
    1. Altered or fluctuating mental status compared to baseline
    2. Inattention (Attention Screening Examination – ASE, visual or auditory recollection of letter or images)
    3. Disorganised thinking – 4 Y/N questions + hold up 2 fingers on each hand
    4. Altered consciousness – sedation scale e.g. RASS
  - Delirium = 1 AND 2 plus 3 OR 4
Table 1—*ICU Delirium Screening Checklist*

<table>
<thead>
<tr>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Altered level of consciousness (if A or B, do not complete patient evaluation for the period)</strong></td>
</tr>
<tr>
<td>A: No response, score: none</td>
</tr>
<tr>
<td>B: Response to intense and repeated stimulation (loud voice and pain), score: none</td>
</tr>
<tr>
<td>C: Response to mild or moderate stimulation, score: 1</td>
</tr>
<tr>
<td>D: Normal wakefulness, score: 0</td>
</tr>
<tr>
<td>E: Exaggerated response to normal stimulation, score: 1</td>
</tr>
<tr>
<td><strong>Inattention (score: 0 to 1)</strong></td>
</tr>
<tr>
<td><strong>Disorientation (score: 0 to 1)</strong></td>
</tr>
<tr>
<td><strong>Hallucination-delusion-psychosis (score: 0 to 1)</strong></td>
</tr>
<tr>
<td><strong>Psychomotor agitation or retardation (score: 0 to 1)</strong></td>
</tr>
<tr>
<td><strong>Inappropriate speech or mood (score: 0 to 1)</strong></td>
</tr>
<tr>
<td><strong>Sleep/wake cycle disturbance (score: 0 to 1)</strong></td>
</tr>
<tr>
<td><strong>Symptom fluctuation (score: 0 to 1)</strong></td>
</tr>
<tr>
<td><strong>Total (score: 0 to 8)</strong></td>
</tr>
</tbody>
</table>

*The scale is completed based on information collected from each entire 8-h shift or from the previous 24 h. Adapted from Bergeron et al., with the kind permission of Springer Science and Business Media. Obvious manifestation of an item = 1 point; no manifestation of an item or no assessments possible = 0 point.*
### CAM-ICU Worksheet

<table>
<thead>
<tr>
<th>Feature 1: Acute Onset or Fluctuating Course</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive if you answer 'yes' to either 1A or 1B.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1A: Is the pt different than his/her baseline mental status?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1B: Has the patient had any fluctuation in mental status in the past 24 hours as evidenced by fluctuation on a sedation scale (e.g. RASS), GCS, or previous delirium assessment?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feature 2: Inattention</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive if either score for 2A or 2B is less than 8.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attempt the ASE letters first. If pt is able to perform this test and the score is clear, record this score and move to Feature 3. If pt is unable to perform this test or the score is unclear, then perform the ASE Pictures. If you perform both tests, use the ASE Pictures’ results to score the Feature.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2A: ASE Letters: record score (enter NT for not tested)</td>
<td>Score (out of 10):</td>
<td></td>
</tr>
<tr>
<td>Directions: Say to the patient, “I am going to read you a series of 10 letters. Whenever you hear the letter ‘A,’ indicate by squeezing my hand.” Read letters from the following letter list in a normal tone.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S A V E A H A A R T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scoring: Errors are counted when patient fails to squeeze on the letter “A” and when the patient squeezes on any letter other than “A.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2B: ASE Pictures: record score (enter NT for not tested)</td>
<td>Score (out of 10):</td>
<td></td>
</tr>
<tr>
<td>Directions are included on the picture packets.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feature 3: Disorganized Thinking</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive if the combined score is less than 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3A: Yes/No Questions</td>
<td>Combined Score (3A+3B):</td>
<td>(out of 5)</td>
</tr>
<tr>
<td>(Use either Set A or Set B, alternate on consecutive days if necessary):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Will a stone float on water?</td>
<td>1. Will a leaf float on water?</td>
<td></td>
</tr>
<tr>
<td>2. Are there fish in the sea?</td>
<td>2. Are there elephants in the sea?</td>
<td></td>
</tr>
<tr>
<td>3. Does one pound weigh more than two pounds?</td>
<td>3. Do two pounds weigh more than one pound?</td>
<td></td>
</tr>
<tr>
<td>4. Can you use a hammer to pound a nail? 4. Can you use a hammer to cut wood?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score ____ (Patient earns 1 point for each correct answer out of 4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3B: Command</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Say to patient: “Hold up this many fingers” (Examiner holds two fingers in front of patient) “Now do the same thing with the other hand” (Not repeating the number of fingers). *If pt is unable to move both arms, for the second part of the command ask patient “Add one more finger”)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score ____ (Patient earns 1 point if able to successfully complete the entire command)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feature 4: Altered Level of Consciousness</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive if the Actual RASS score is anything other than “0” (zero)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Overall CAM-ICU** (Features 1 and 2 and either Feature 3 or 4):

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Confusion Assessment Method for the ICU (CAM-ICU) Flowsheet

1. Acute Change or Fluctuating Course of Mental Status:
   - Is there an acute change from mental status baseline?  OR
   - Has the patient’s mental status fluctuated during the past 24 hours?
   - NO → CAM-ICU negative NO DELIRIUM
   - YES →

2. Inattention:
   - “Squeeze my hand when I say the letter ‘A’.”
   - Read the following sequence of letters:
     - SAVE AHAART or CASABLANCA or ABADBADAAY
     - ERRORS: No squeeze with ‘A’ & Squeeze on letter other than ‘A’
   - If unable to complete Letters → Pictures
   - > 2 Errors → 0 - 2 Errors
   - NO → CAM-ICU negative NO DELIRIUM
   - > 2 Errors → CAM-ICU positive DELIRIUM Present

3. Altered Level of Consciousness
   - Current RASS level
   - RASS = zero
   - RASS other than zero → CAM-ICU positive DELIRIUM Present

4. Disorganized Thinking:
   - 1. Will a stone float on water?
   - 2. Are there fish in the sea?
   - 3. Does one pound weigh more than two?
   - 4. Can you use a hammer to pound a nail?
   - Command: “Hold up this many fingers” (Hold up 2 fingers)
     “Now do the same thing with the other hand” (Do not demonstrate)
     OR “Add one more finger” (If patient unable to move both arms)
   - > 1 Error → 0 - 1 Error
   - 0 - 1 Error → CAM-ICU negative NO DELIRIUM
• Delirium prevention

• **Early mobilization** of adult ICU patients to reduce the incidence and duration of delirium.
Treating delirium

• **Non-pharmacological:**
  
  – Up to 40% risk reduction achieved
  – Repeated reorientation of patients
  – Early mobilisation
  – Visual and hearing aids
  – Early CBD, line etc. removal
  – Minimise restraints and sedatives
Pharmacological treatment

- **Atypical antipsychotics** (eg quetiapine) may reduce the duration of delirium in adult ICU patients.

- IV infusions of **dexmedetomidine** rather than benzodiazepine infusions be administered for sedation to reduce the duration of delirium in these patients.

- There is no published evidence that treatment with haloperidol reduces the duration of delirium in adult ICU patients.
Treating delirium - **Haloperidol**

- **Typical antipsychotic**
- Dopamine blockade + disinhibition of ACh
- Anti-inflammatory effects
- 2.5-5 mg iv/po q6H (reduce in elderly)

**Adverse effects** – extrapyramidal, prolonged QTc, torsades (3.8%), neuroleptic malignant syndrome
Treating delirium – atypical antipsychotics

- Olanzepine, quetiapine, risperidone
- Alter multiple neurotransmitters: including DA, NA, serotonin, ACh, histamine
- Suggestion of decreased extrapyramidal & arrhythmia side-effects compared to haloperidol

Caution....

- Delirium assessment should be routinely performed in all ICU patients (1B).
- The CAM-ICU and ICDSC delirium monitoring tools are the most valid and reliable scales to assess delirium in ICU patients (A).
- Mobilize ICU patients early when feasible to reduce the incidence and duration of delirium, and to improve functional outcomes (1B).
- Promote sleep in ICU patients by controlling light and noise, clustering patient care activities, and decreasing stimuli at night (1C).

- Avoid using rivastigmine to reduce the duration of delirium in ICU patients (1B).
- Suggest avoiding the use of antipsychotics in patients who are at risk for torsades de pointes (2B).
- Suggest not using benzodiazepines in ICU patients with delirium unrelated to ETOH/benzodiazepine withdrawal (2B).
• A: Pocket card operationalizing the PAD guideline recommendations
• B: Pocket card summarizing specific pain, agitation, and delirium (PAD) guideline statements and recommendations
A

- Agitation in critically ill patients may result from inadequately treated pain, anxiety, delirium, and/or ventilator dysynchrony.
- Detection and treatment of pain, agitation, and delirium should be reassessed often in these patients.
- Patients should be awake and able to purposely follow commands in order to participate in their care unless a clinical indication for deeper sedation exists.
- For a comprehensive list of Guideline Statements, Recommendations and GRADES, see back of card.

Assess and Treat

<table>
<thead>
<tr>
<th>Statements and Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pain assessment should be routinely performed in all ICU patients (B).</td>
</tr>
<tr>
<td>• Self report is preferred over the use of behavioral pain scales to assess pain in ICU patients who are able to communicate (B).</td>
</tr>
<tr>
<td>• The BPS and CPOT are the most valid and reliable behavioral pain scales for use in ICU patients who cannot communicate (B).</td>
</tr>
<tr>
<td>• Vital signs should not be used alone to assess pain, but they may be used adjunctively for pain assessments (C).</td>
</tr>
<tr>
<td>• Preemptively treat chest tube removal with either analgesics and/or non-pharmacologic therapy (1C).</td>
</tr>
<tr>
<td>• Suggest preemptively treating other types of procedural pain with analgesic and/or non-pharmacologic therapy (1C).</td>
</tr>
<tr>
<td>• Use opioids as first line therapy for treatment of non-neuropathic pain (1C).</td>
</tr>
<tr>
<td>• Suggest using non-opioid analgesics in conjunction with opioids to reduce opioid requirements and opioid-related side effects (2C).</td>
</tr>
<tr>
<td>• Use gabapentin or carbamazepine, in addition to intravenous opioids, for treatment of neuropathic pain (1A).</td>
</tr>
<tr>
<td>• Use thoracic epidural for postoperative analgesia in abdominal aortic surgery patients (1B).</td>
</tr>
<tr>
<td>• Suggest thoracic epidural analgesia be used for patients with traumatic rib fractures (2B).</td>
</tr>
</tbody>
</table>

| Depth and quality of sedation should be routinely assessed in all ICU patients (B). |
| The RASS and SAS are the most valid and reliable scales for assessing quality and depth of sedation in ICU patients (B). |
| Suggest using objective measures of brain function to adjunctively monitor sedation in patients receiving neuromuscular blocking agents (2B). |
| Use EEG monitoring either to monitor non-convulsive seizure activity in ICU patients at risk for seizures, or to titrate electroencephalographic medication to achieve burst suppression in ICU patients with elevated intracranial pressure (1A). |
| Target the lightest possible level of sedation and/or use daily sedative interruptions (1B). |
| Use sedation protocols and checklists to facilitate ICU sedation management (1B). |
| Suggest using analgesia-first sedation for intubated and mechanically ventilated ICU patients (2B). |
| Suggest using non-benzodiazepines for sedation (either propofol or dexmedetomidine) rather than benzodiazepines (either midazolam or lorazepam) in mechanically ventilated adult ICU patients (2B). |

| Delirium assessment should be routinely performed in all ICU patients (B). |
| The CAM-ICU and ICDS-C delirium monitoring tools are the most valid and reliable scales to assess delirium in ICU patients (A). |
| Mobilize ICU patients early when feasible to reduce the incidence and duration of delirium, and to improve functional outcomes (1B). |
| Promote sleep in ICU patients by controlling light and noise, clustering patient care activities, and decreasing stimuli at night (1C). |
| Avoid using rivastigmine to reduce the duration of delirium in ICU patients (1B). |
| Suggest avoiding the use of antipsychotics in patients who are at risk for torsades de pointes (2B). |
| Suggest not using benzodiazepines in ICU patients with delirium unrelated to ETOH/benzodiazepine withdrawal (2B). |

B

Summary of PAD Guidelines

1. Maintaining lighter levels of sedation in ICU patients is associated with improved clinical outcomes (B); light levels of sedation should be maintained in these patients (1B).
2. The RASS and SAS scales are most valid and reliable instruments for assessing adequacy and depth of sedation (B).
3. Use Brain Function monitors only as adjuncts to subjective sedation scales in unparalyzed patients (1B), but suggest using brain function monitors to primarily monitor depth of sedation in patients receiving neuromuscular blocking agents (2B).
4. Use EEG to monitor non-convulsive seizure activity in ICU patients at risk for seizures, and to titrate burst suppression in ICU patients with elevated intracranial pressure (1A).
5. Use either daily sedative interruption or titrate sedative medications to maintain light levels of sedation (1B). Suggest using Analgesia-first sedation (2B). Suggest using non-benzodiazepines rather than benzodiazepine infusions for sedation in these patients. Use sedation protocols and daily checklists to integrate and facilitate management of pain, sedation, and delirium in ICU patients (1B).

1. Delirium is associated with increased mortality (A), prolonged ICU and hospital LOS (A), and post-ICU cognitive impairment (B).
2. Delirium risk factors include: pre-existing dementia, HTN, history of alcoholism, and a high severity of illness at baseline (A); coma (B); and benzodiazepine use (B). Mechanically ventilated ICU patients at risk for delirium have a lower delirium prevalence when treated with dexmedetomidine rather than with benzodiazepines (B).
3. Routinely monitor ICU patients for delirium (1B). The CAM-ICU and ICDS-C are the most valid and reliable instruments for this purpose (A).
4. Pursue early mobilization to reduce the incidence and duration of delirium (1B).
5. Suggest not using either haloperidol or atypical antipsychotics prophylactically to prevent delirium (2C).
6. Promote sleep in adult ICU patients by optimizing patients’ environments, using strategies to control light and noise, to cluster patient care activities, and to decrease stimuli at night in order to protect patients’ sleep cycles (1C).
7. Do not use rivastigmine to reduce the duration of delirium in ICU patients (1C).
8. Suggest withholding antipsychotics in patients with baseline QT prolongation, a history of Torsades de Pointes, or in those receiving concomitant medications known to prolong the QT interval (2C).
9. When sedation is required in delirious ICU patients, suggest using dexmedetomidine rather than benzodiazepine infusions for sedation in these patients, unless delirium is related to either alcohol or benzodiazepine withdrawal (2B).
### Pain
- Assess pain every 4 hours & prn
  - Preferred pain assessment tools:
    - Patient able to self report → NRS (0-10)
    - Unable to self-report or CPOT (0-8)
  - Patient is in significant pain if NRS ≥ 4 or CPOT ≥ 3
- Treat pain within 60 minutes then reassess:
  - Non-pharmacologic treatment - relaxation therapy
  - Pharmacologic treatment:
    - Non-neuropathic pain → IV opioids +/- non-opioid analgesics
    - Neuropathic pain → gabapentin or carbamazepine, + IV opioids
- Targeted sedation or Daily Sedation Interruption (Goal: patient purposely follows commands without agitation):
  - RASS = -2 - 0
  - If under sedated (RAS >0) assess/treat pain → treat w/sedatives prn (non-benzodiazepines preferred, unless alcohol or benzodiazepine withdrawal is suspected)
  - If over sedated (RASS < -2) hold sedatives until at target, then restart at 50% of previous dose

### Agitation
- Assess agitation, sedation every 4 hours & prn
  - Preferred sedation assessment tools:
    - RASS (-5 to +4)
    - NMB → suggest using brain function monitoring (Bispectral Index, BIS)
  - Depth of agitation, sedation defined as:
    - agitated if RASS = +1 to +4
    - awake and calm if RASS = 0
    - lightly sedated if RASS = -1 to -2
    - deeply sedated if RASS = -3 to -5
- Consider daily Spontaneous Breathing Trial, early mobility and exercise when patients are at goal sedation level, unless contraindicated.
  - EEG monitoring if:
    - at risk for seizures
    - burst suppression therapy is indicated for ↑ ICP

### Delirium
- Assess delirium every 4 hours & prn
  - Preferred delirium assessment tools:
    - CAM-ICU (+ or -)
  - Delirium present if:
    - CAM-ICU is positive
- Treat pain as needed
- Reorient patients, familiarize surroundings; use patient’s eyeglasses, hearing aids if needed
- Pharmacologic treatment of delirium:
  - Avoid benzodiazepines unless alcohol or benzodiazepine withdrawal is suspected
  - Avoid antipsychotics if ↑ risk of Torsades de pointes
- Identify delirium risk factors: dementia, HTN, alcohol abuse, high severity of illness, coma, benzodiazepine administration
- Avoid benzodiazepine use in those at ↑ risk for delirium
- Mobilize and exercise patients early
- Promote sleep (control light, noise: cluster patient care activities; decrease nocturnal stimuli)
- Restart baseline psychiatric medication, if indicated

Reference: Clinical Practice Guidelines of the management of Pain, Agitation and Delirium in adult patients in the intensive care unit, Barr et al 2013
Delirium in the ICU
Conclusions

- Delirium is a significant problem for hospitalized patients and a predictor of many negative clinical outcomes.
- Reliable and easy tools are available for identification of delirium in patients in the ICU.
- Processes of care are available to minimize incidence of modifiable risk factors.
- ABCDE Bundle can be incorporated into current practices with minimal additional resources.
- Culture change.
THANK YOU