Sedation & Delirium in ICU - Application of ABCDE Bundle

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Disclosure

• No Commercial affiliations to disclose
Objectives

- State incidence, complications and consequences of Delirium
- Recognize Chronic Critical Illness Syndrome in the CCU
- Illustrate ABCDE Bundle application to sedation, delirium, and mobility
Delirium

- What is it?
- Why is it important?
- How can it be prevented/treated?
As per DSM IV, Delirium is a disturbance of consciousness with:
- inattention
- accompanied by a change in cognition or perceptual disturbance
- develops over a short time
- fluctuates over time
Symptoms of Delirium and Coma

AROUSABLE TO VOICE
- Acute mental status change
- Fluctuating mental status
- Inattention
- Disorganized thinking
- Hallucinations, Delusions, Illusions
- Altered level of consciousness

UNAROUSABLE TO VOICE

COMA

Delirium - Pathophysiology

- Dopamine excess
- Acetylcholine depletion
Delirium Subtypes

2% - Best Prognosis

Hyperactive Delirium

- Combative
- Agitated
- Restless

Alert & Calm

Lethargic
Sedated
Stupor

44% - Worse Prognosis

Mixed Delirium
54% Intermediate Prognosis
Delirium: Epidemiology

• General hospital admissions ~20%

• Prevalence depends on population
  – Greater in med/surg population

• On admission 10 – 15% elders
  – During hospitalization up to 40%

• At end of life up to 83%
Prevalence in the ICU

• Occurs in up to 80% MICU/TICU/SICU ventilated patients

• 20-50% of lower severity ICU patients

• 65-70% goes undiagnosed if routine monitoring is not done

• 10% remain delirious at hospital discharge
# Delirium – Risk Factors

<table>
<thead>
<tr>
<th>Host factors</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline comorbidities</td>
</tr>
<tr>
<td></td>
<td>Baseline cognitive impairment</td>
</tr>
<tr>
<td></td>
<td>Genetic predisposition (?)</td>
</tr>
<tr>
<td>Acute illness</td>
<td>Sepsis</td>
</tr>
<tr>
<td></td>
<td>Hypoxemia*</td>
</tr>
<tr>
<td></td>
<td>Global severity of illness score</td>
</tr>
<tr>
<td></td>
<td>Metabolic disturbances</td>
</tr>
<tr>
<td>Iatrogenic or environmental factors</td>
<td>Metabolic disturbances*</td>
</tr>
<tr>
<td></td>
<td>Anticholinergic medications*</td>
</tr>
<tr>
<td></td>
<td>Sedative and analgesic medications*</td>
</tr>
<tr>
<td></td>
<td>Sleep disturbances*</td>
</tr>
</tbody>
</table>

*Potentially modifiable factor.
Generates $4-16 billion annually in associated costs in the U.S.
Delirium and LOS

Ely et al JAMA 2004;291:1753-1764
Delirium and Mortality

[Graph showing the probability of survival over months after enrollment for individuals with and without delirium.]
ICU Delirium - Impact

- Increased ICU length of stay (8 vs 5 days)
- Increased Hospital length of stay (21 vs 11 days)
- Increased time on vent (9 vs 4 days)
- Higher ICU costs
- Higher ICU mortality (19.7% vs 10.3%)
- Higher hospital mortality (26.7% vs 21.4%)

By et al ICM 2001;27, 1892-1900
By et al JAMA 2004
Lin SM CCM 2004
Milbrandt E et al Crit Care Med 2004
Ouimet et al ICM 2007
# Delirium Duration & Outcomes

<table>
<thead>
<tr>
<th>NUMBER OF DELIRIUM DAYS</th>
<th>HAZARD RATIO - MORTALITY</th>
<th>95% CI</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 vs. 1 days</td>
<td>1.70</td>
<td>1.27–2.29</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>0 vs. 2 days</td>
<td>2.69</td>
<td>1.58–4.57</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>0 vs. 3 days</td>
<td>3.73</td>
<td>1.92–7.23</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
ICU Delirium and Weakness
Prolonged critical care illness

- Characterized by permanent depletion of physiologic reserve = accelerated aging

- Neuroendocrine and metabolic dysfunction may underlie chronic illness and may be directly responsible for slow recovery
Prolonged critical care illness

- Adrenal abnormalities in PCI include
  - Persistent hypercortisolism
  - Relative adrenal insufficiency

- Hypothalamic under secretion leads to GH, T3, PRL and gonadal hormone deficiency

- Direct hormone replacement has not been successful
Chronic critical illness syndrome

- Severe malnutrition, muscle wasting
- Bone loss
- Endocrine problems
- Infection and sepsis
- Wounds and poor healing
- Critical illness Neuro-Myopathy
- Delirium
- Depression
- Suffering
How To Put it All Together

Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the Intensive Care Unit

An Evidence-Based Approach for Managing the Complex Care of the Critically and Acutely Ill Patient

Critical Care Med 2013;41:263-306
The ABCDE Approach

• AB – Awakening & Breathing coordination
• C – Choice of sedatives
• D – Delirium monitoring/management
• E – Early mobility
- **Awake & Breathing Coordination**
  - ↓Duration of vent
  - ↓Duration of coma
  - ↓Mortality

- **Choose Light sedation & Avoid Benzos**
  - ↓Duration of vent
  - ↓Mortality
  - ↓Delirium

- **Delirium Monitoring & Treatment**
  - ↑Delirium Detection
  - ↑Delirium predictor of M&M

- **Early Mobility & Environment**
  - ↓Duration of Delirium
  - ↓Disability
  - ↓ICU LOS
  - ↓Rehospitalization and Mortality

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Awake & Breathing Coordination

• Negative outcomes of prolonged ventilation
  – VAP
  – Immobility – Chronic Critical illness
  – Delirium

• Sedation used to relieve anxiety and agitation
  – Over sedation
  – Under sedation
  – Harmful outcomes
ABC Protocol

• Synergy of Spontaneous Awakening Trial (SAT) & Spontaneous Breathing Trail (SBT)
  – Decreased medication accumulation
  – Decreased over sedation
  – Increased opportunity for effective independent breathing

• “Wake Up and Breathe” Protocol
  – Combines SAT and SBT
  – Two step process
    • Safety screen
    • Trial period
Liberating from Ventilator

SBT reduced weaning time by = 2 days

$\text{Control (n = 151)}$

$\text{Protocol (n = 149)}$

$\text{p < .001}$

SAT reduced ventilator time by = 2 days

$\text{Control (n = 60)}$

$\text{Adjusted}

$\text{Protocol (n = 68)}$

$\text{p < .001}$
Efficacy and safety of a paired sedation and ventilator weaning protocol for mechanically ventilated patients in intensive care (Awakening and Breathing Controlled trial): a randomised controlled trial

SAT plus SBT
32 % less likely to die than control group

SAT Plus SBT
Usual care plus SBT

Patients alive (%)

Days after randomisation

Patients Even

167 74
168 97

- Reduced vent days by 3
- Reduced ICU and LOS by 4 days
- Reduced Mortality 14%
- Reduced duration of coma 1 day

<table>
<thead>
<tr>
<th></th>
<th>Intervention group (n=167)</th>
<th>Control group (n=168)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventilator-free days*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>14.7 (0.9)</td>
<td>11.6 (0.9)</td>
<td>0.02</td>
</tr>
<tr>
<td>Median</td>
<td>20.0 (0 to 26.0)</td>
<td>8.1 (0 to 24.3)</td>
<td></td>
</tr>
<tr>
<td>Time to discharge (days)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From intensive care</td>
<td>9.1 (5.1 to 17.8)</td>
<td>12.9 (6.0 to 24.2)</td>
<td>0.01</td>
</tr>
<tr>
<td>From hospital</td>
<td>14.9 (8.9 to 26.8)</td>
<td>19.2 (10.3 to NA)†</td>
<td>0.04</td>
</tr>
<tr>
<td>28-day mortality</td>
<td>47 (28%)</td>
<td>58 (35%)</td>
<td>0.21</td>
</tr>
<tr>
<td>1-year mortality</td>
<td>74 (44%)</td>
<td>97 (58%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Duration of brain dysfunction (days)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coma</td>
<td>2 (0 to 4)</td>
<td>3 (1 to 7)</td>
<td>0.002</td>
</tr>
<tr>
<td>Delirium</td>
<td>2 (0 to 5)</td>
<td>2 (0 to 6)</td>
<td>0.50</td>
</tr>
<tr>
<td>RASS at first successful SBT</td>
<td></td>
<td></td>
<td>0.0001</td>
</tr>
<tr>
<td></td>
<td>-1 (-3 to 0)</td>
<td>-2.5 (-4 to 0)</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any self-extubation</td>
<td>16 (10%)</td>
<td>6 (4%)</td>
<td>0.03</td>
</tr>
<tr>
<td>Self-extubation requiring reintubation ‡</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reintubation ‡</td>
<td>23 (14%)</td>
<td>21 (13%)</td>
<td>0.73</td>
</tr>
<tr>
<td>Tracheostomy</td>
<td>21 (13%)</td>
<td>34 (20%)</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Data are mean (SD), n (%), or median (IQR). RASS = Richmond agitation-sedation scale. SAT = spontaneous awakening trial. SBT = spontaneous breathing trial. *Ventilator-free days from study day 1 to 28. †Greater than 25% of patients in the SBT group remained in the hospital at study day 28. ‡Reintubation within 48 hours of extubation.

Table 3: Main outcomes

"Wake Up and Breathe" Protocol
Spontaneous Awakening Trials (SATs) + Spontaneous Breathing Trials (SBTs)

**SAT Safety Screen**
- No active seizures
- No alcohol withdrawal
- No agitation
- No paralytics
- No myocardial ischemia
- Normal intracranial pressure

**SAT Failure**
- Anxiety, agitation, or pain
- Respiratory rate > 35/min
- Oxygen saturation < 88%
- Respiratory distress
- Acute cardiac arrhythmia

**SBT Safety Screen**
- No agitation
- Oxygen saturation ≥ 88%
- FiO2 ≤ 50%
- PEEP ≤ 7.5 cm H2O
- No myocardial ischemia
- No vasopressor use
- Inspiratory efforts

**SBT Failure**
- Respiratory rate > 35/min
- Respiratory rate < 8/min
- Oxygen saturation < 88%
- Respiratory distress
- Mental status change
- Acute cardiac arrhythmia

Process:
- **SAT Safety Screen**
  - Every 24 hrs
  - Fail → Restart sedatives at 1/2 dose
  - Pass

- **Perform SAT**
  - Fail
  - Pass → Full ventilatory support

- **Perform SBT**
  - Fail
  - Pass → Consider extubation
Awake & Breathing Coordination

- ↓Duration of vent
- ↓Duration of coma
- ↓Mortality

Choose Light sedation & Avoid Benzos

- ↓Duration of vent
- ↓Mortality
- ↓Delirium

Delirium Monitoring & Treatment

- ↑Delirium Detection
- ↑Delirium predictor of M&M

Early Mobility & Environment

- ↓Duration of Delirium
- ↓Disability
- ↓ICU LOS
- ↓Rehospitalization and Mortality
Choice of Sedation

- Light levels of sedation associated with improved clinical outcome (B)

- Light level of sedation is associated with improved outcomes (DOMV, LOS) (B)

- Light sedations causes increased physiologic stress but not increased myocardial ischemia (B)

- RASS (Richmond Agitation-Sedation Scale) or SAS (Sedation Agitation Scale) most reliable (B)
## Riker Sedation Agitation Scale (SAS)

<table>
<thead>
<tr>
<th>Scale and Scoring Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dangerous agitation (score of 7)</td>
<td>Pulling at endotracheal tube, trying to remove catheters, climbing over bed rail, striking at staff, thrashing from side to side</td>
</tr>
<tr>
<td>Very agitated (score of 6)</td>
<td>Requiring restraint and frequent verbal reminding of limits, biting endotracheal tube</td>
</tr>
<tr>
<td>Agitated (score of 5)</td>
<td>Anxious or physically agitated, calming at verbal instruction</td>
</tr>
<tr>
<td>Calm and cooperative (score of 4)</td>
<td>Calm, easily rousable, follows commands</td>
</tr>
<tr>
<td>Sedated (score of 3)</td>
<td>Difficult to arouse but awakens to verbal stimuli or gentle shaking; follows simple commands but drifts off again</td>
</tr>
<tr>
<td>Very sedated (score of 2)</td>
<td>Arouses to physical stimuli but does not communicate or follow commands, may move spontaneously</td>
</tr>
<tr>
<td>Cannot be aroused (score of 1)</td>
<td>Minimal or no response to noxious stimuli, does not communicate or follow commands</td>
</tr>
</tbody>
</table>
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></td>
</tr>
<tr>
<td>-1</td>
<td>Drowsy</td>
<td>Not fully alert, but has sustained awakening (eye-opening/eye contact) to voice (&gt;10 seconds)</td>
</tr>
<tr>
<td>-2</td>
<td>Light sedation</td>
<td>Briefly awakens with eye contact to voice (&lt;10 seconds)</td>
</tr>
<tr>
<td>-3</td>
<td>Moderate sedation</td>
<td>Movement or eye opening to voice (but no eye contact)</td>
</tr>
<tr>
<td>-4</td>
<td>Deep sedation</td>
<td>No response to voice, but movement or eye opening to physical stimulation</td>
</tr>
<tr>
<td>-5</td>
<td>Unarousable</td>
<td>No response to voice or physical stimulation</td>
</tr>
</tbody>
</table>
Light Sedation

- Endpoint: patient who purposefully responds to commands
- Open eyes
- Maintain eye contact
- Squeeze hands
- Stick out tongue
- Wiggle feet

- Useful for self report of pain; weaning trial; delirium assessment; early physical therapy
Sedation Strategy

• Analgesia first

• Non Benzodiazepine sedatives (Propofol or dexmedetomidine) may be preferred over Benzodiazepines to improve clinical outcomes in ventilated ICU patients (+2B)

• Benzodiazepines are important
  – Benzodiazepine withdrawal
  – Seizures
  – Deep sedation
  – ETOH withdrawal
Benzodiazepines and Delirium Risk

OR 1.2
P=0.003

Delirium Risk vs. Lorazepam Dose (mg)
<table>
<thead>
<tr>
<th>Trial</th>
<th>Drug (comparator)</th>
<th>Delirium</th>
<th>Ventilator duration</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MENDS 2007</td>
<td>Lorazepam</td>
<td>Decrease (sepsis)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SEDCOM 2009</td>
<td>Midazolam</td>
<td>Decrease</td>
<td>Decrease</td>
<td>-</td>
</tr>
<tr>
<td>PRODEX 2012</td>
<td>Propofol</td>
<td>n/a</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MIDEX 2012</td>
<td>Midazolam</td>
<td>n/a</td>
<td>Decrease</td>
<td>-</td>
</tr>
</tbody>
</table>
Acute Pain

• Unrelieved pain has significant and long term consequences

• Majority (82%) of non ICU hospitalized patients remember ETT discomfort and ICU pain

• Increased Catecholamine
  – Vasoconstriction, impaired tissue perfusion, decreased tissue PaO2

• Hyper metabolism (lipolysis, Slow healing, Catabolism)

• Risk factor for developing chronic, often neuropathic pain

SCCM Guidelines, Crit Care Med 2013;41:261-306
Pain Assessment

- Recommend that pain be routinely monitored in all ICU patients (1B)

- BPS (Behavioral Pain Scale) and Critical Care Pain Observation Tool (CPOT) are most valid and reliable pain scales (B)

- Do not suggest to use vital signs alone for pain assessment (2C), but as clue to assess further
## Behavioral Pain Scale

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facial expression</strong></td>
<td>Relaxed</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Partially tightened (brow lowering)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Fully tightened (eyelid closing)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Grimacing</td>
<td>4</td>
</tr>
<tr>
<td><strong>Upper limbs</strong></td>
<td>No movement</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Partially bent</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Fully bent with finger flexion</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Permanently retracted</td>
<td>4</td>
</tr>
<tr>
<td><strong>Compliance with ventilator</strong></td>
<td>Tolerating</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Coughing but tolerating most of the time</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Fighting it</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Unable to control</td>
<td>4</td>
</tr>
</tbody>
</table>
Treatment of Pain

- IV opioid as 1\textsuperscript{st} line drug for non-neuropathic pain (1C)
- All IV opioids (titrated) are equally effective (C)
- Suggest non-opioid (NSAID, acetaminophen) to reduce opioid amount, reduce side effect (2C)
- Recommend gabapentin or carbamazepine for neuropathic pain (in addition to opioid) (1A)

SCCM Guidelines, Crit Care Med 2013;41:261-306
Non-Opioids

- Non-opioid analgesics available in IV form
  - IV acetaminophen: OFIRMEV
  - IV Ketamine
  - IV NSAIDs: ketorolac, ibuprofen
Specific indication for sedation

- Status epilepticus
- Intracranial hypertension
- Severe respiratory failure with or without neuromuscular blockade

Assess pain and treat with opioid or other drug or technique

- Pain controlled
  - Yes
    - Mainly hyperactive delirium
      - Treat with antidelirium medication or nonpharmacologic measures
      - Delirium controlled
        - Yes
          - Assess need for sedative medication to achieve target RASS score of −2 to 0 (lightly sedated but responsive at least to voice)
          - Target sedation to RASS score of −2 to 0
          - Reassess analgesic, antidelirium, and sedative requirement regularly (e.g., every 4 hr or with observed change)
        - No
          - Do not use sedative medication
    - No delirium
  - No
    - Mainly hypoactive delirium
      - Treat with nonpharmacologic measures (e.g., physical therapy, earplugs or quiet room, cognitive stimulation, repeated reorientation)
      - Delirium controlled
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        - No
          - Do not use sedative medication

Target sedation to indication:
- Seizure control
- Acceptable intracranial pressure
- Tolerance of hypercarbia or necessary ventilator settings
- No awareness when being treated with neuromuscular blocking agent

Regularly assess the need for this level of sedation

The target sedation level is likely to be best communicated using the RASS scale
- **Awake & Breathing Coordination**
  - ↓Duration of vent
  - ↓Duration of coma
  - ↓Mortality

- **Choose Light sedation & Avoid Benzos**
  - ↓Duration of vent
  - ↓Mortality
  - ↓Delirium

- **Delirium Monitoring & Treatment**
  - ↑Delirium Detection
  - ↑Delirium predictor of M&M

- **Early Mobility & Environment**
  - ↓Duration of Delirium
  - ↓Disability
  - ↓ICU LOS
  - ↓Rehospitalization and Mortality
Delirium Monitoring

- Screening recommended (B)
  - 75% of delirium missed if screening not done

- The Confusion Assessment Method for the ICU (CAM-ICU) and Intensive Care Delirium Screening Checklist (ISDSC) are most reliable

- Routine monitoring is feasible in clinical practice
CAM-ICU

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?

   **YES**

2. Inattention:
   - “Squeeze my hand when I say the letter ‘A’.”
   - Read the following sequence of letters: S A V E A H A R T
   - ERRORS: No squeeze with ‘A’ & Squeeze on letter other than ‘A’
   - If unable to complete Letters → Pictures

   **> 2 Errors**

3. Altered Level of Consciousness
   - Current RASS level
   - RASS = zero

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)

   **0 - 1 Error**
   **> 1 Error**

   **CAM-ICU negative**
   **CAM-ICU positive**
   **NO DELIRIUM**
   **DELIRIUM Present**
ICDSC – Intensive Care Delirium Screening Checklist – 8 Items

1. Altered LOC
2. Inattention
3. Disorientation
4. Hallucination – delusion – psychosis
5. Psychomotor agitation or retardation
6. Inappropriate speech or mood
7. Sleep/wake cycle disturbance
8. Symptom fluctuation

• Total score 0-8

• 0: Normal
• 1-3: Sub syndromal Delirium
• >=4: Delirium
Prevention

- Early mobilization (+1B)

- No recommendation for pharmacologic, non pharmacologic or combined prevention protocol

- No recommendation for use of halol

- No recommendation for use of Dexmedetomidine
Diagnosis and Management

• Screening

• Identify risk factor/etiology

• Consider Non pharmacologic and pharmacologic treatment
Stop and Think

- **Stop**
  - Do any medications (especially benzo-diazepines) need to be stopped or lowered?
  - Is the patient on the minimal amount of sedation necessary? Do any titration strategies need to be used, such as a targeted sedation plan or daily sedation cessation?
  - Do the sedative drugs need to be changed?

<table>
<thead>
<tr>
<th>Toxic situations and medications: congestive heart failure, shock, dehydration, new organ failure (eg, liver, kidney), deliriogenic medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples of deliriogenic medications include benzodiazepines, anticholinergic medications, and steroids</td>
</tr>
<tr>
<td>Hypoxemia</td>
</tr>
<tr>
<td>Infection/sepsis (nosocomial), inflammation, immobilization</td>
</tr>
<tr>
<td>Nonpharmacological interventions</td>
</tr>
<tr>
<td>K+ [potassium] or other electrolyte interventions</td>
</tr>
</tbody>
</table>
Non Pharmacological

- Repeated reorientation of patients
- Provisions of cognitively stimulating activities for the patients multiple times a day
- A non pharmacological sleep protocol
- Early mobilization activities
- Timely removal of catheters and physical restraints
- Use of eye glasses and magnifying lenses, hearing aids and earwax disimpaction
- Early correction of dehydration
- Use of a scheduled pain management protocol
- Minimization of unnecessary noise/stimuli
Pharmacological Treatment

• There is no published evidence that treatment with haloperidol reduces the duration of delirium

• Atypical antipsychotics may reduce the duration of delirium (C)

• Antipsychotics should not be used in patients at risk of torsades de pointes – Long QT interval.
## Pharmacologic Management

<table>
<thead>
<tr>
<th></th>
<th>Oral bioavailability</th>
<th>Peak</th>
<th>Half Life</th>
<th>Metabolism</th>
<th>Dosing</th>
</tr>
</thead>
</table>
| **Risperidone** | 70% | 1 hr | 20-30 hrs | • Hepatic  
• Active metabolite | • 1 mg PO q12 hr  
• Increased in increments of 0.5-1 mg/day  
• Max daily dose 6mg  
• Renal and Hepatic Adjustment (0.5mg Q12hr) |
| **Olanzapine**  | 57% | 6 hr | 21-54 hrs | • Hepatic  
• Active metabolite | • 2.5 mg PO QHS  
• Increase in increments of 5 mg/day  
• Max Daily dose 20 mg  
• No renal adjustment |
| **Quetapine**   | 9%  | 1.5 hr | 6 hrs | • Hepatic  
• Active metabolite | • 25 mg PO Q 12hr  
• Titrate in increments of 25 mg/day  
• Max daily dose 800 mg  
• No renal adjustment |
- **Awake & Breathing Coordination**
  - ↓Duration of vent
  - ↓Duration of coma
  - ↓Mortality
- **Choose Light sedation & Avoid Benzos**
  - ↓Duration of vent
  - ↓Mortality
  - ↓Delirium
- **Delirium Monitoring & Treatment**
  - ↑Delirium Detection
  - ↑Delirium predictor of M&M
- **Early Mobility & Environment**
  - ↓Duration of Delirium
  - ↓Disability
  - ↓ICU LOS
  - ↓Re-hospitalization and Mortality
Early Mobility & Exercise

• ICU-acquired weakness – neuromuscular/functional impairment without plausible etiology

• Impairs ventilator weaning and functional mobility

• Patients with ICU-acquired weakness require approximately 20 additional ventilator days

• Increased mortality

• Effects persist well after discharge
Early Mobilization

- Safe
- Decreases ICU LOS
- Improves Skin integrity
- Saves money
Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial

William D Scheweickert, Mark C Pohlmam, Anne S Pohlman, Celerina Nigos, Amy J Pawlik, Cheryl L Esbrook, Linda Spears, Megan Miller, Mietka Franczyk, Deanna Deprizio, Gregory A Schmidt, Amy Bowman, Rhonda Barr, Kathryn E McCallister, Jesse B Hall, John P Kress

<table>
<thead>
<tr>
<th></th>
<th>Intervention (n=49)</th>
<th>Control (n=55)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return to independent functional status at hospital discharge</td>
<td>29 (59%)</td>
<td>19 (35%)</td>
<td>0.02</td>
</tr>
<tr>
<td>ICU delirium (days)</td>
<td>2.0 (0.0-6.0)</td>
<td>4.0 (2.0-7.0)</td>
<td>0.03</td>
</tr>
<tr>
<td>Time in ICU with delirium (%)</td>
<td>33% (0-58)</td>
<td>57% (33-69)</td>
<td>0.02</td>
</tr>
<tr>
<td>Hospital delirium (days)</td>
<td>2.0 (0.0-6.0)</td>
<td>4.0 (2.0-8.0)</td>
<td>0.02</td>
</tr>
<tr>
<td>Hospital days with delirium (%)</td>
<td>28% (26)</td>
<td>41% (27)</td>
<td>0.01</td>
</tr>
<tr>
<td>Barthel Index score at hospital discharge</td>
<td>75 (75-95)</td>
<td>55 (0-85)</td>
<td>0.05</td>
</tr>
<tr>
<td>ICU-acquired paresis at hospital discharge</td>
<td>15 (31%)</td>
<td>27 (49%)</td>
<td>0.09</td>
</tr>
<tr>
<td>Ventilator-free days*</td>
<td>23.5 (7.4-25.6)</td>
<td>21.1 (0-23.8)</td>
<td>0.05</td>
</tr>
<tr>
<td>Duration of mechanical ventilation (days)</td>
<td>3.4 (2.3-7.3)</td>
<td>6.1 (4.0-9.6)</td>
<td>0.02</td>
</tr>
<tr>
<td>Duration of mechanical ventilation, survivors (days)</td>
<td>3.7 (2.3-7.7)</td>
<td>5.6 (3.4-8.4)</td>
<td>0.19</td>
</tr>
<tr>
<td>Duration of mechanical ventilation, non-survivors (days)</td>
<td>2.5 (2.4-5.5)</td>
<td>9.5 (5.9-14.1)</td>
<td>0.04</td>
</tr>
<tr>
<td>Length of stay in ICU (days)</td>
<td>5.9 (4.5-13.2)</td>
<td>7.9 (6.1-12.9)</td>
<td>0.08</td>
</tr>
<tr>
<td>Length of stay in hospital (days)</td>
<td>13.5 (8.0-23.1)</td>
<td>12.9 (8.9-19.8)</td>
<td>0.93</td>
</tr>
<tr>
<td>Hospital mortality</td>
<td>9 (18%)</td>
<td>14 (25%)</td>
<td>0.53</td>
</tr>
</tbody>
</table>

Data are n (%), median (IQR), or mean (SD). ICU=intensive care unit. *Ventilator-free days from study day 1 to day 28. Barthel Index scale 0-100, APACHE II scale 0-71.

Table 3: Main outcomes according to study group

24 % returned to full Independent function Reduced # of delirium days By 2
Early Mobility Implementation

- Two-step process
  - Safety screen
  - Mobility protocol
Safety Screen for Early Mobility

<table>
<thead>
<tr>
<th>N – Neurological</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Patient responds to verbal stimulation (ie, RASS score &gt; -3)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>(1) Activity not started in comatose patients (RASS score -4 or -5)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R – Respiratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. F&lt;sub&gt;IO2&lt;/sub&gt; &lt; 0.6&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>b. PEEP &lt; 10 cm H&lt;sub&gt;2&lt;/sub&gt;O&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C – Circulatory/central catheters/contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. No increase dose of any vasopressor infusion for at least 2 hours&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>b. No evidence of active myocardial ischemia&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>c. No arrhythmia requiring the administration of a new antiarrhythmic agent&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>d. Not receiving therapies that restrict mobility (extracorporeal membrane oxygenation, open-abdomen, intracranial monitoring/drainage, femoral arterial catheter)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>e. No injuries in which mobility is contraindicated (eg, unstable fractures)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Early Mobility Implementation
Early Mobility – When to Stop

Symptomatic decrease in mean arterial pressure
Heart rate <50 or >130 beats per minute for 5 minutes
Respiratory rate <5 or >40 breaths per minute for 5 minutes
Systolic blood pressure >180 mm Hg for 5 minutes
Pulse oximetry reading <88% for 5 minutes
Marked ventilator dyssynchrony
Patient distress
New arrhythmia
Concern for myocardial ischemia
Concern for airway device integrity
Fall to knees
Endotracheal tube removal
Benefits of ABCDE Protocol

Morandi A et al, Curr Opin Crit Care 2011
Bedside Treatments for ABCDE Protocol

**ABC**
Awakening & Breathing Coordination

- **SAT Safety Screen**
  - If passed the SAT safety screen, Perform SAT

- **If failed SAT, Restart sedatives if needed at 1/3 dose & titrate**

- **If passed the SBT safety screen, Perform SBT**

- **If passed the SBT, team should consider extubation**
  - If fail → Return ventilator support to previous settings

**D**
Delirium Nonpharm Interventions

- **Pain**: Monitor and/or manage pain using an objective scale
- **Orientation**: Talk about day, date, place; discuss current events; provide caregiver names; use clock and calendar in room
- **Sensory**: Determine need for hearing aids and/or eye glasses
- **Sleep**: noise reduction, day-night variation, “time-out” to minimize interruptions of sleep, promoting comfort & relaxation (e.g., massage, daytime bath, back care, wash face/hands, oral care)

**E**
Early Exercise & Mobility

 Perform Exercise Safety Screen. If passed, perform therapy at patient’s highest level of ability.

1. Active range of motion exercises in bed and sitting position in bed
2. Dangling
3. Transfer to chair (active), includes standing without marching in place
4. Ambulation (marching in place, walking in room/hall)

[www.ICUdelirium.org](http://www.ICUdelirium.org)
### Bedside Checklist for ABCDE Protocol

**DATE:** __________/__________/__________

**Awakening and Breathing Coordination**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Check if yes or Indicate reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAT screen passed? If not, why?</td>
<td></td>
</tr>
<tr>
<td>SAT done? If not, why not?</td>
<td></td>
</tr>
<tr>
<td>SBT screen passed? If not, why?</td>
<td></td>
</tr>
<tr>
<td>SBT done? If not, why not?</td>
<td></td>
</tr>
<tr>
<td>SAT &amp; SBT Coordinated/Paired?</td>
<td></td>
</tr>
</tbody>
</table>

**Delirium Nonpharmacologic Interventions**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Check if done</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain assessment/management</td>
<td></td>
</tr>
<tr>
<td>Orientation</td>
<td></td>
</tr>
<tr>
<td>Sensory (eyes/ears)</td>
<td></td>
</tr>
<tr>
<td>Sleep (nonpharm)</td>
<td></td>
</tr>
</tbody>
</table>

Check any intervention that was performed during your shift (including night shift).

**Early Exercise and Mobility**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Check if done</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active ROM</td>
<td></td>
</tr>
<tr>
<td>Sitting up on side of bed</td>
<td></td>
</tr>
<tr>
<td>Standing</td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td></td>
</tr>
</tbody>
</table>

Check any level of activity the patient performed during your shift (including night shift).

[www.ICUdelirium.org](http://www.ICUdelirium.org)
• Reduce Sedation by ½ the Current Dose and Titrate as Needed
• Continue Sedation and Delirium Monitoring

Daily Exercise

Unsuccessful SAT, SBT, or Extubation

ICU Patient

Assess for Sedation and Delirium

Daily Spontaneous Awakening Trial (SAT) PASS

Daily Spontaneous Breathing Trial (SBT) PASS

Consider Extubation

PASS

• Extubate
• Exercise
• Continue Sedation and Delirium Monitoring

Morning ——— Time
Strategies to Improve Outcomes

• Recommend interdisciplinary approach – education, protocols (preprinted and/or computerized) and order forms, checklists, to facilitate use of PAD guidelines (1B)

• Reduces mechanical ventilation

• Little harm

• No significant costs
Interdisciplinary Care in ICU

- Respiratory
- Nursing
- PT/OT
- Pharmacists
- Physicians
Developing & Implementing ICU Sedation Protocol

Phase I: Development
1. Creating the physical champions
2. Multidisciplinary committee
3. Data synthesis
4. Protocol drafting

Phase II: Implementation
1. Pilot analysis
   • Efficacy, safety, adherence
2. Endorsement from institutional credible bodies
3. Education of all ICU staff
4. Integration with EMR

Phase III: Continuous Quality Improvement (CQI)
1. Periodic metric assessment
2. Guideline update with current literature
3. Publication of data
4. Benchmarking against other institutions
5. Assistance in guideline development
It is a Balance

- Analgesia, amnesia, sedation vs delirium
Figure 1: The ICU PAD Care Bundle

<table>
<thead>
<tr>
<th>PAIN</th>
<th>AGITATION</th>
<th>DELIRIUM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSESS</strong></td>
<td><strong>TREAT</strong></td>
<td><strong>PREVENT</strong></td>
</tr>
<tr>
<td>Assess pain ≥4x/shift &amp; prn</td>
<td>Treat pain within 30&quot; then reassess:</td>
<td>Administer pre-procedural analgesia and/or non-pharmacologic interventions (e.g., relaxation therapy)</td>
</tr>
<tr>
<td>Preferred pain assessment tools:</td>
<td>- Non-pharmacologic treatment—relaxation therapy</td>
<td>Treat pain first, then sedate</td>
</tr>
<tr>
<td>- Patient able to self-report → NRS (0-10)</td>
<td>Pharmacologic treatment:</td>
<td>- Consider daily SBT, early mobility and exercise when patients are at goal sedation level, unless contraindicated</td>
</tr>
<tr>
<td>- Unable to self-report → BPS (3-12)</td>
<td>- Non-neuropathic pain → IV opioids +/- non-opioid analgesics</td>
<td>EEG monitoring if:</td>
</tr>
<tr>
<td>or CPOT (0-8)</td>
<td>- Neuropathic pain → gabapentin or carbamazepine, + IV opioids</td>
<td>- at risk for seizures</td>
</tr>
<tr>
<td>Patient is in significant pain if NRS ≥ 4, BPS ≥ 6, or CPOT ≥ 2</td>
<td>- S/p AAA repair, rib fractures → thoracic epidural</td>
<td>- burst suppression therapy is indicated for ↑ ICP</td>
</tr>
<tr>
<td><strong>TREAT</strong></td>
<td>Targeted sedation or DSI (Goal: patient purposely follows commands without agitation):</td>
<td></td>
</tr>
<tr>
<td>RASS = -2 - 0, SAS = 3 - 4</td>
<td>If under sedated (RASS &gt; 0, SAS &gt; 4) assess/treat pain → treat w/sedatives prn (non-benzodiazepines preferred, unless ETOH or benzodiazepine withdrawal is suspected)</td>
<td>Avoid benzodiazepines in those at ↑ risk for delirium</td>
</tr>
<tr>
<td>If over sedated (RASS &lt; -2, SAS &lt; -3) hold sedatives until at target, then restart at 50% of previous dose</td>
<td></td>
<td>Mobilize and exercise patients early</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Promote sleep (control light, noise; cluster patient care activities; decrease nocturnal stimuli)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restart baseline psychiatric meds, if indicated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- CAM-ICU is positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Delirium present if:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- CAM-ICU is positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ICDSC ≥ 4</td>
</tr>
</tbody>
</table>

Benefits of ABCDE

SAT/TS + SBT = ABC

MV ↓ 3d
LOS ↓ 4d
Mort ↓ 32%
(Girard 2008)

ABC + EM = ABC+ E

ICU LOS ↓ 1.4d
Hosp LOS ↓ 3.3d
(Morris 2008)

EM + SAT/TS = ABC DE

↓ delirium
↑ FS @ d/c
(Schweickert 2009)
Resources and References

- www.icudelirium.org
- www.sccm.org
- www.surgicalcriticalcare.net
- Icusteps.org
- Journals.lww.com/ccmjournall
Delirium = Dangerous

Patient = Vulnerable

"You should sit in meditation for 20 minutes a day, unless you’re too busy; then you should sit for an hour"

-Old Zen saying