Post Sepsis Syndrome (PSS) and Post ICU Syndrome (PICS): What You Need to Know to Impact Outcomes Starts with Your ABC’s...

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Disclosures for Pat Posa

- Consultant-Michigan Hospital Association
  Keystone Center
- Consultant/Faculty for CUSP for MVP—AHRQ
  funded national study
- Subject matter expert for Sepsis, CAUTI and
  CLABSI for CMS/HEN 1.0 & 2.0 and HIIN
- Speaker bureau for ICU Medical

Learning Objectives

At the completion of this activity, the participant will be able to:
- Define Post Sepsis Syndrome (PSS) and Post ICU Syndrome (PICS) in
  the patients.
- Identify current practice and begin to build the will to reduce
  cognitive and physical dysfunction harm that occurs as a result
  of sepsis or in patients with an ICU stay.
- Discussion current evidence based practice that can help reduce PICS
What is it

Post-sepsis syndrome describes physical and/or long-term effects that affects up to 50% of people who survive sepsis.

Longer term effects of sepsis include:

- Sleep disturbance including insomnia
- Experiencing nightmares, hallucinations, flashbacks and panic attacks
- Muscle and joint pains which can be severe and disabling
- Extreme tiredness and fatigue
- Inability to concentrate
- Impaired mental (cognitive) functioning
- Loss of confidence and self-belief
Post Sepsis Syndrome

- People who have suffered from severe sepsis and especially those treated in an intensive care unit are at greatest risk of suffering post-sepsis syndrome.

- “60 percent of hospitalizations for severe sepsis were associated with worsened cognitive and physical function among surviving older adults. The odds of acquiring moderate to severe cognitive impairment were 3.3 times higher following an episode of sepsis than for other hospitalizations.”

- Sepsis survivors may be more at risk for developing other infections both viral and bacterial

Iwashyna, T. JAMA 2010;
Mukherjee, S SHOCK 2012

Cognitive Impairment: Sepsis

![Cognitive Impairment Chart](chart.png)

Iwashyna T, JAMA 2010;304:1787-1794
Functional Trajectories by Baseline Functioning

Figure 8. Functional Trajectories by Baseline Functioning

1.57 new limitations among patients who had no limitations before

ADL: walking, dressing, bathing, eating, getting into and out of bed and toileting
IADL: preparing a hot meal, shopping for groceries, making telephone calls, taking medicines, and managing money

Cause of Post Sepsis Syndrome

- Response to systemic inflammation
- Brain, muscle and nerve injury from inflammation, ischemia and ischemia-reperfusion
- Poor perfusion, blood clots
- End organ damage
- Hypoxia

Iwashyna T, JAMA 2010;304:1787-1794
Quote from husband of 32 year old sepsis survivor

“Doctor, she’s not all there. The wit, the comprehension, the concentration. It’s all haphazard at best. To most, it is unrecognizable. The best way to describe it is mental disorganization, like there is a connection missing or a synapse not firing. It has been 10 months, and I just keep waiting for it to straighten itself out. Is this it?”

Post Sepsis Syndrome---Close to home

• 86 year old mother in law:
  – Pnuemonia twice in the past 3 years; first time led to septic shock, second time severe sepsis
  – In ICU first episode, not in the second episode
  – Impacted short term memory
  – Not requiring high dose antihypertensives like before sepsis

• 59 year old husband
  – Bacterial endocarditis—severe sepsis with hypotension that resolved after 5L of fluid
  – Never in the ICU
  – Long term impact:
    • Lower dose of antihypertensives for first 6 weeks
    • Extreme fatigue
http://www.icudelirium.org/testimonials.html

Post Intensive Care Syndrome

**Definition**

**PICS** is defined as new or worsening impairment in physical, cognitive, or mental health status arising and persisting after hospitalization for critical illness


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**PICS-Physical Dysfunction**

- Less than 10% of patients on mechanical ventilation for > 4 d are alive and fully independent 1 yr. later
- Caregiver assistance ranging from assistance with activities of daily living to full care is required by patients 1 yr. later
- Half of patients with adult respiratory distress syndrome have not returned to work 1 yr. later
- ICU-acquired weakness that can persist for years can develop in 25–80% of those with sepsis or on mechanical ventilation for > 4 d

PICS: Cognition & Mental Illness

- Cognitive impairment that can persist for years develops in 30–80% of patients
- Symptoms of depression occur 1/3 of patient and persist for a year
- Symptoms of anxiety occur in 23–48% have symptoms of anxiety
- Symptoms of posttraumatic distress syndrome occur in 10–50% of patients and may persist for years


Epidemiology of ICU Delirium

- 20 - 80% of ICU patients have delirium during ICU
- Frequently unrecognized or misdiagnosed by clinicians
- Subtypes:
  - Hyperactive (agitated, increased motor activity) 1%
  - Hypoactive (sleepy, inattentive, decreased motor activity) 44%
  - Mixed 55%
- Onset: ICU Day 2 (+/- 2)
- Duration: 4 (+/- 2) days
- 50% & 10% of ARDS pts delirious at ICU & hospital d/c

Brain-ICU Study

- Multicenter RCT- medical-surgical ICU’s
- 821 patients with ARF or Shock
- Evaluated in-hospital delirium and cognitive impact 3-12 months post d/c

Results

- 74% of patients developed delirium during hospital stay
- 1/3 & 1/4 had cognitive scores at 1 year follow-up c/w moderate TBI & mild Alzheimer’s, respectively
- Affected both older and younger


Delirium and Patient Outcomes

- Independently associated with increased risk of death:
  - Each day of delirium increase 1 yr. mortality by 10%
- Duration assoc. with short & long term cognitive impairment
- 1 out of 4 patients had cognitive impairment at 12 months
- Mech Vent duration
- ICU & Hospital Length of Stay
- Estimated national costs $4 to $16 Billion
- Post-d/c anxiety/ PTSD symptom from delirious memory

Patient Risk Factors

- Immobility
- Number of days on mechanical ventilation
- Length of stay in the ICU
- Heavy sedation
- Delirium
- Hypoglycemia
- Hypoxia
- Sepsis
- ARDS


The Cost of Surviving ICU Care

- 50% ICU survivors require long term care
- 31% depleted savings
- 20% reported family had to leave gainful employment
- Caregiver support - 17.4 hours per week
- Higher 5 year mortality (32.2% vs 22.7%)
- Greater hospital resource use defined as mean hospital readmission rate (4.8 vs. 3.3/person/five years)
- Comorbidities/pre-ICU hospitalizations stronger predictor of hospital resource use than acute illness
- 51% higher mean 5 year hospital cost ($23,608 vs 16,913/patient)
- After adjustment for co-founders-resource use persisted

Prevention is Key

Minimizing Risk Factors

Reduction of Risk Factors for PICS

- ABCDEF bundle
- Early psychologic intervention
- ICU diaries
- Healing environments of care
- Post-discharge follow-up programs

“Four Cornerstones for Success”

- Evidence Based Practice
- Inter-Professional Teams
- System Collaboration
- Reduction of Practice Variation

A. ASSESS, PREVENT & MANAGE PAIN
B. BOTH SAT & SBT
C. CHOICE OF SEDATION
D. DELIRIUM
E. EARLY MOBILITY
F. FAMILY ENGAGEMENT

www.iculiberation.org
Pain Agitation and Delirium (PAD) Recommendations

- 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

Website to help organizations implement the PAD guidelines and reverse immobility: www.iculiberation.org; www.icudelirium.org


ASSESS, PREVENT & MANAGE PAIN

Society of Critical Care Medicine PAD Guidelines 2013

CPOT and BPS most valid and reliable

The American Society of Pain Management Nursing July 2011

CPOT is acceptable for the critically ill/unconscious

### Critical Care Pain Observation Tool (CPOT)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facial expression</td>
<td>No muscular tension observed, Presence of frowning, brow lowering, orbital tightening, and frontalis contraction, All of the above facial movements plus eyelid tightly closed</td>
<td>Relaxed, neutral 0, Tense 1, Grimacing 2</td>
</tr>
<tr>
<td>Body movements</td>
<td>Does not move at all (does not necessarily mean absence of pain), Slow, cautious movements, touching or rubbing the pain site, seeking attention through movements, Pulling tube, attempting to sit up, moving limbs without following commands, striking at staff, trying to climb out of bed</td>
<td>Absence of movements 0, Protection 1, Restlessness 2</td>
</tr>
<tr>
<td>Muscle tension</td>
<td>No resistance to passive movements, Resistance to passive movements, Strong resistance to passive movements, inability to complete them</td>
<td>Relaxed 0, Tense, rigid 1, Very tense or rigid 2</td>
</tr>
<tr>
<td>Compliance with the ventilator (intubated patients)</td>
<td>Alarms not activated, easy ventilation, Alarms stop spontaneously, Asynchrony: blocking ventilation, alarms frequently activated</td>
<td>Tolerating ventilator or movement 0, Coughing but tolerating 1, Fighting ventilator 2</td>
</tr>
<tr>
<td>Vocalization (extubated patients)</td>
<td>Talking in normal tone or no sound, Sighing, moaning, Crying out, sobbing</td>
<td>Talking in normal tone or no sound 0, Sighing, moaning 1, Crying out, sobbing 2</td>
</tr>
</tbody>
</table>

Total range: 0-8

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### ICU Liberation Program based on PAD Guidelines

- **Assess**
  - Assess pain > 4x/shift & PRN
  - Significant pain with NRS >3, BPS >5, or CPOT>2

- **Treat**
  - Treat pain within 30 minutes of detecting significant pain & REASSESS:
    - Non-pharmacological treatment (e.g. relaxation)
    - Pharmacological treatment

- **Prevent**
  - Administer pre-procedural analgesia and/or non-pharmacological interventions
  - Treat pain first, then sedate

www.iculiberation.org
**ASSESS, PREVENT & MANAGE PAIN**

**BOTH SAT & SBT**

**CHOICE OF SEDATION**

**DELIRIUM**

**EARLY MOBILITY**

**FAMILY ENGAGEMENT**

www.iculiberation.org

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**ABC Trial (RCT Paired Sedation & Vent Weaning Protocols)**

<table>
<thead>
<tr>
<th>Outcome*</th>
<th>SBT</th>
<th>SAT+SBT</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventilator-free days</td>
<td>12</td>
<td>15</td>
<td>0.02</td>
</tr>
<tr>
<td>Time-to-event, days</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Successful extubation, days</td>
<td>7.0</td>
<td>5</td>
<td>0.05</td>
</tr>
<tr>
<td>ICU discharge, days</td>
<td>13</td>
<td>9</td>
<td>0.02</td>
</tr>
<tr>
<td>Hospital discharge, days</td>
<td>19</td>
<td>15</td>
<td>0.04</td>
</tr>
<tr>
<td>Death at 1 year, n (%)</td>
<td>97 (58%)</td>
<td>74 (44%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Days of brain dysfunction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coma</td>
<td>3.0</td>
<td>2.0</td>
<td>0.002</td>
</tr>
<tr>
<td>Delirium</td>
<td>2.0</td>
<td>2.0</td>
<td>0.50</td>
</tr>
</tbody>
</table>

*Median, except as noted

ABC Trail: Mortality at 1 Year

![Graph showing mortality data](Image)


Daily Sedation Interruption Decreases Duration of Mechanical Ventilation

- Hold sedation infusion until patient awake, then restart at 50% of prior dose
- “Awake” defined as any 3 of the following:
  - Open eyes in response to voice
  - Use eyes to follow investigator on request
  - Squeeze hand on request
  - Stick out tongue on request

www.ICUliberation.org.

- Length of MV 4.9 vs. 7.3 days (P=0.004)
- ICU LOS 6.4 vs. 9.9 days (P=0.02)
- Fewer diagnostic tests to assess changes in mental status
- No increase in rate of agitated-related complications or episodes of patient-initiated device removal
- No increase in PTSD or cardiac ischemia
Perform the Safety Screen:

- No active seizures
- No alcohol withdrawal
- No agitation
- No paralytics
- No myocardial ischemia
- Normal intracranial pressure

Pass safety screen? **Turn off all sedatives**

- Observe for 5 min, cont. for up to 4 hrs.
- If patient awakens: follow 3 out of 4 commands (open eyes, look at you, squeeze hand, push out tongue)
- Leave sedation off! Tell RT so SBT can be completed.

The patient fails based on:

<table>
<thead>
<tr>
<th>SAT Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety, agitation, or pain</td>
</tr>
<tr>
<td>Respiratory rate &gt; 35/min</td>
</tr>
<tr>
<td>SpO2 &lt; 88%</td>
</tr>
<tr>
<td>Respiratory distress</td>
</tr>
<tr>
<td>Acute cardiac arrhythmia</td>
</tr>
</tbody>
</table>

Try intermittent dosing or restart at ½ rate

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**DAILY SBT Process**

- Coordinate timing with RT
- Conduct safety screen
  - **Is the patient on vasopressors? This is not automatic exclusion. Must be a discussion with the medical team.**
- Pass the safety screen? RT will perform and document SBT and results of SBT.
- RT will notify team if patient passes.
- Failure of SBT is based on:

<table>
<thead>
<tr>
<th>SBT Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO2 &lt; 88%</td>
</tr>
<tr>
<td>Respiratory distress</td>
</tr>
<tr>
<td>Mental status change</td>
</tr>
<tr>
<td>Acute cardiac arrhythmia</td>
</tr>
</tbody>
</table>
CDC Prevention Epicenters  
Wake Up and Breathe Collaborative

- Prospective quality improvement collaborative
- Goal: prevent VAEs through less sedation and earlier liberation from mechanical ventilation
- Mechanism: increase performance of paired daily spontaneous awakening trials and breathing trials (SATs and SBTs)
- 12 ICUs affiliated with 7 hospitals


CDC Prevention Epicenters’  
Wake Up and Breathe Collaborative

<table>
<thead>
<tr>
<th>SATs / SBTs</th>
<th>VAEs</th>
</tr>
</thead>
<tbody>
<tr>
<td>63% ↑ in SATs</td>
<td>37% ↓ in VACs</td>
</tr>
<tr>
<td>16% ↑ in SBTs</td>
<td>65% ↓ in IVACs</td>
</tr>
<tr>
<td>81% ↑ in SBTs done with sedatives off</td>
<td></td>
</tr>
</tbody>
</table>

**Outcome of SAT/SBT**

- Decreased days of mechanical ventilation
- Reduced weaning time
- Reduced reintubation rates
- Fewer days with delirium
- Decreased length of ICU stay
- Decreased length of hospital stay

Esteban A. *Am J Respir Crit Care Med*. 1999;159:512-8
www.ICUliberation.org

**Making it Happen: Wake Up & Breathe**

- Process Measure: Daily audit of SAT/SBT compliance or documentation of contraindication
  - Determine if they meet SAT criteria
  - Decrease or stop sedation per protocol
  - Determine if patient meets Readiness to Wean
  - Determine if meet SBT protocol criteria
  - Consider same time daily (sometimes x2)
  - Discuss results in multidisciplinary rounds
  - Include in nurse to nurse handoff/other handoffs
  - Ventilator LOS posted/Extubation rates posted
Additional Strategies for Success

- Implement non-physician staff driven protocols for daily SBT/SAT
- Protocols on order sets
- Include in both nursing & respiratory flow sheets
- Self extubation is slightly higher but re-intubation is not.

Ely W et al. Chest, 2001;120(6):454s-463s
Westwall S. Nursing in Critical Care, 2008;13(4):203-207
Abbott CA, et al. Worldviews on Evidence Based Practice, 2006:139-152

Interdisciplinary Rounds: Nursing Objective Card

<table>
<thead>
<tr>
<th>Pain, Agitation and Delirium</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assess Pain: What is the current score? What is the pain goal and current scale?</td>
</tr>
<tr>
<td>2. Breathing: Both SAT and SBT</td>
</tr>
<tr>
<td>3. Choice of Sedation: Name of medication, route and dosage</td>
</tr>
<tr>
<td>4. Delirium: What is the CAM-ICU result?</td>
</tr>
<tr>
<td>5. Exercise: Mobility Level?</td>
</tr>
<tr>
<td>6. Family: Family questions? Patient goals for the day? Who will update pt/family? When? (Continued on back)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAP</td>
</tr>
<tr>
<td>SEPSIS</td>
</tr>
<tr>
<td>CAUTI/CLABSI</td>
</tr>
<tr>
<td>7. Severe Sepsis screen result? + or –</td>
</tr>
<tr>
<td>8. Vasoactive Infusions</td>
</tr>
<tr>
<td>10. Foley: Can it be D/Cd?</td>
</tr>
<tr>
<td>11. Lines / Tubes:</td>
</tr>
<tr>
<td>12. Patient Diet / Tube Feeding / Bowel Regimen</td>
</tr>
<tr>
<td>14. Time of scheduled procedures today? Expected labs / tests</td>
</tr>
<tr>
<td>15. Other: Nursing / Patient Concerns</td>
</tr>
</tbody>
</table>
Agitation

- **Avoid deep sedation/coma:**
  - Sedative medications should be titrated to maintain 
    lighter levels of sedation, unless clinically 
    contraindicated. (+1B)
  - Use daily awakening or a titrated sedation strategy to 
    maintain patient wakefulness. (1B)

- **Choice of sedative:**
  - Non-benzodiazepines may be preferred over 
    benzodiazepines to improve clinical outcomes in 
    mechanically ventilated ICU patients. (+2B)

- **Reduction in sedation requirements:**
  - Use of an analgesia-first (i.e., analog-sedation) strategy is 
    recommended in mechanically ventilated patients. (+ 2B)
### Propofol vs. Benzodiazepines

<table>
<thead>
<tr>
<th>Randomized Trial</th>
<th>ICU</th>
<th>Comparator</th>
<th>Superior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ronan et al. 1995</td>
<td>Surgical</td>
<td>Midazolam</td>
<td>Propofol</td>
</tr>
<tr>
<td>Chamorro et al. 1996</td>
<td>General</td>
<td>Midazolam</td>
<td>Propofol</td>
</tr>
<tr>
<td>Hsiao et al. 1996</td>
<td>Surgical</td>
<td>Midazolam</td>
<td>Equivalent</td>
</tr>
<tr>
<td>Kress et al. 1996</td>
<td>Medical</td>
<td>Midazolam</td>
<td>Propofol</td>
</tr>
<tr>
<td>Barrientos-Vega et al. 1997</td>
<td>General</td>
<td>Midazolam</td>
<td>Propofol</td>
</tr>
<tr>
<td>Searle et al. 1997</td>
<td>Cardiac</td>
<td>Midazolam</td>
<td>Equivalent</td>
</tr>
<tr>
<td>Weinbroum et al. 1997</td>
<td>General</td>
<td>Midazolam</td>
<td>Both</td>
</tr>
<tr>
<td>Sanchez-Izquierdo-Riera JA, et al. 1998</td>
<td>Trauma</td>
<td>Midazolam</td>
<td>Propofol</td>
</tr>
<tr>
<td>Hall et al. 2001</td>
<td>Mixed</td>
<td>Midazolam</td>
<td>Propofol</td>
</tr>
<tr>
<td>Carson et al. 2006</td>
<td>Medical</td>
<td>Lorazepam</td>
<td>Propofol</td>
</tr>
</tbody>
</table>

Outcomes improved by **propofol**: sedation quality, ventilator synchrony, time to awakening, variability of awakening, time to extubation from discontinuation of sedation, overall time to extubation, ventilator days, ICU LOS among survivors, costs of sedation.

### Dexmedetomidine vs. Benzodiazepines

<table>
<thead>
<tr>
<th>Trials with better outcomes with Dex</th>
<th>Population</th>
<th>Outcome Improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pandharipande et al/2007</td>
<td>Mixed ICU</td>
<td>More accurate sedation, more delirium/coma-free days</td>
</tr>
<tr>
<td>Riker et al/2009</td>
<td>Mixed ICU</td>
<td>Lower prevalence of delirium, earlier extubation</td>
</tr>
<tr>
<td>Ruokonen et al/2009</td>
<td>Mixed ICU</td>
<td>Shorter duration of mechanical ventilation</td>
</tr>
<tr>
<td>Maldonado et al/2009</td>
<td>Cardiac surgery</td>
<td>Lower incidence and duration of delirium</td>
</tr>
<tr>
<td>Esmaoglu et al/2009</td>
<td>Eclampsia</td>
<td>Shorter ICU length of stay</td>
</tr>
<tr>
<td>Dasta et al/2010</td>
<td>Mixed ICU</td>
<td>Lower ICU costs</td>
</tr>
<tr>
<td>Jakob et al/2012</td>
<td>General ICU</td>
<td>Lighter sedation, fewer ventilation days</td>
</tr>
</tbody>
</table>

- Trials with better outcomes with Benzo’s = None

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Non-Benzodiazepine Sedative Medications are Associated with Better ICU Outcomes

- Systematic review and meta-analysis of 6 RCTs comparing benzodiazepine vs. non-benzodiazepine ICU sedation regimens:
  - ↓ ICU LOS (6 studies)
    - Difference of 1.6 days, \( P = 0.0007 \)
  - ↓ Duration of mechanical ventilation (4 studies)
    - Difference of 1.9 days, \( P < 0.00001 \)
  - Similar delirium prevalence and short-term mortality.

Fraser G. Crit Care Med. 2013; 41:S30-8
www.ICUliberation.org

Agitation

- Assess q 2-4hrs or prn with change in dose or patients condition
- Use validated tool (RASS or SAS)
- RASS target -1 to +1
- SAS target 3 to 4

TABLE 1. BOURJAN AGITATION-SEDATION SCALE

<table>
<thead>
<tr>
<th>Score</th>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+4</td>
<td>Comatose</td>
<td>Overly comatose or investor sudden change to staff</td>
</tr>
<tr>
<td>+3</td>
<td>Very agitated</td>
<td>Rolls on or removes tube(s) or catheter(s) or has aggressive behavior toward staff</td>
</tr>
<tr>
<td>+2</td>
<td>Agitated</td>
<td>Frequent nonpurposeful movement or patient-ventilator dysynchrony</td>
</tr>
<tr>
<td>+1</td>
<td>Restless</td>
<td>Anxious or apprehensive but movements not aggressive or vigorous</td>
</tr>
<tr>
<td>0</td>
<td>Alert and calm</td>
<td>Not fully alert, but has sustained (more than 10 seconds) awakening, with eye contact to voice</td>
</tr>
<tr>
<td>-1</td>
<td>Drowsy</td>
<td>Briefly (less than 10 seconds) awakens with eye contact to voice</td>
</tr>
<tr>
<td>-2</td>
<td>Light sedation</td>
<td>Any movement (but no eye contact) to voice</td>
</tr>
<tr>
<td>-3</td>
<td>Moderate sedation</td>
<td>No response to voice, but any movement 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>Unresponsive</td>
<td>No response to voice or physical stimulation</td>
</tr>
</tbody>
</table>

www.iculiberation.org
DAYS WITHOUT SEDATION!!!!
Delirium: First Focus on Prevention

- Pain and sedation scores
- Analgesia and Sedative Algorithm
  - Control pain first, then anxiety
  - Use intermittent meds first before continuous
- Target RASS + 1 to -1
- Daily SAT (spontaneous awakening trial)
- Daily SBT (spontaneous breathing trial)
- Screen for Delirium---minimum q12hrs; can do it more frequently
- Implement non-pharmacological strategies

www.iculiberation.org
Is anyone home?

Check if the lights are on.

**STEP 1**

**RICHMOND AGITATION-SEDATION SCALE (RASS)**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>COMBATIVE</td>
<td>Comitative, violent, immediate danger to staff</td>
</tr>
<tr>
<td>-3</td>
<td>VERY AGITATED</td>
<td>Pulls to remove tubes or catheters; 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>Headnodding, movements not aggressive</td>
</tr>
<tr>
<td>0</td>
<td>ALERT &amp; CALL</td>
<td>Sleepy, needs attention to caregiver</td>
</tr>
<tr>
<td>1</td>
<td>DROWSY</td>
<td>Not fully alert, but has sustained awakening to voice</td>
</tr>
<tr>
<td>2</td>
<td>LIGHT SEDATED</td>
<td>Voice response, minimal eye opening (10 &lt; eyes open &lt; 10 sec)</td>
</tr>
<tr>
<td>3</td>
<td>MODERATE SEDATION</td>
<td>Movement or eye opening to voice (no eye contact)</td>
</tr>
</tbody>
</table>

If RASS is 2 - 3 proceed to CAM-ICU (is patient CAM-ICU positive or negative?)

-4 DEEP SEDATION
- No response to voice, but movement or eye opening to physical stimulation

-6 UNAROUSABLE
- No response to voice or physical stimulation

If RASS is -4 or -3 STOP (patient unconscious, RECHECK later)

**STEP 2**

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

1. Acute Change or Fluctuating Course of Mental Status:
   - Is there an acute change from mental status baseline? **YES**
   - Has the patient’s mental status fluctuated during the past 24 hours? **YES**

2. Inattention:
   - “Squeeze my hand when I say the letter ‘A’”
   - If unable to complete letters \( \Rightarrow \) Pictures
   - 0 - 2 Errors **CAM-ICU negative NO DELIRIUM**
   - > 2 Errors **CAM-ICU positive DELIRIUM Present**

3. Altered Level of Consciousness:
   - Current RASS level (think back to sedation assessment in Step 1)
   - RASS = zero **CAM-ICU negative NO DELIRIUM**
   - > 1 Error **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)
   - “Add one more finger” (If patient unable to move both arms)

   **CAM-ICU negative NO DELIRIUM**
In Rounds When ICU-CAM is +

- When reporting the CAM ICU in rounds, if it is positive the following evaluation should occur.
- Dr. Dre
  - Dr.: diseases; diseases that contributes to delirium (sepsis, hypoxia, COPD)
  - Dr.: drug removal; benzodiazepines or any drug interactions that may contribute to delirium
  - E: environment; nonpharmacological interventions to reduce delirium. This may include reorientation sleep protocol, unrestrained, eyeglasses, hearing aids etc.

Courtesy of Dr. Wes Ely

Non-Pharmacological Strategies

Sleep Promotion
- Appropriate Medications
- Bath during day
- Chair position
- Lighting
- Television
- Hearing/Vision Aids/Dentures
- Control Noise
- Ear plugs/eye mask
- Minimizing care related disruptions

Mobility Promotion
- Evaluate for Physical Therapy
- Range of Motion
- Sleep
- Work with PT
- Spontaneous Awakening Trial

Sedation Awakening
- Sleep Promotion
- Mobility

Other
- Cognitive Stimulation/Music
- Reorientation
- Familiar objects in room/pictures

PAD Treatment of Delirium Recommendations

- There is no published evidence that treatment with haloperidol reduces the duration of delirium in adult ICU patients (No Evidence).

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

- We do not recommend administering rivastigmine to reduce the duration of delirium in ICU patients (~1B).


Perceptions and Practices Regarding Sleep in the ICU*1

- 1,223 surveys of providers
  - 59% nurses
  - 39% physicians
- 24 countries
- 75% indicate ICU patients sleep poor or very poor
- 83% to 97% felt poor sleep was associated with negative ICU outcomes
- 32% had sleep promoting protocols

ICU noise at 45dBA & ½ the time at 54 dBA²

2. The Sleep in the ICU Task Force
Perceptions and Practices Regarding Sleep in the ICU

Table 4. Perceptions and practices surrounding sleep promotion in the ICU

<table>
<thead>
<tr>
<th>Question</th>
<th>All Respondents (n=366)</th>
<th>Sleep Protocol in ICU (n=80)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the biggest thing that you believe may improve your patients sleep in the ICU (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowing patients blocks of uninterrupted sleep time</td>
<td>590 (49%)</td>
<td>404 (50%)</td>
<td>0.63</td>
</tr>
<tr>
<td>Noise control</td>
<td>225 (19%)</td>
<td>157 (20%)</td>
<td></td>
</tr>
<tr>
<td>Keeping patients physically active during the day so they are more tired for sleep at night</td>
<td>123 (11%)</td>
<td>82 (10%)</td>
<td></td>
</tr>
<tr>
<td>Keeping the ICU dark at night and bright during the day</td>
<td>119 (10%)</td>
<td>75 (10%)</td>
<td></td>
</tr>
<tr>
<td>Keeping patients awake during the day so they are more tired for sleep at night</td>
<td>66 (5%)</td>
<td>40 (5%)</td>
<td></td>
</tr>
<tr>
<td>Medication prescribed for sleep</td>
<td>38 (3%)</td>
<td>23 (3%)</td>
<td></td>
</tr>
<tr>
<td>Other / Do not know</td>
<td>45 (4%)</td>
<td>30 (4%)</td>
<td></td>
</tr>
</tbody>
</table>

What percent of your patients receive medications for sleep?

<table>
<thead>
<tr>
<th>Dose (%)</th>
<th>Yes (n=366)</th>
<th>No or Unknown (n=80)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-25%</td>
<td>571 (48%)</td>
<td>182 (46%)</td>
<td>0.98</td>
</tr>
<tr>
<td>26-50%</td>
<td>377 (32%)</td>
<td>124 (39%)</td>
<td></td>
</tr>
<tr>
<td>51-75%</td>
<td>137 (11%)</td>
<td>41 (11%)</td>
<td></td>
</tr>
<tr>
<td>76-100%</td>
<td>87 (7%)</td>
<td>28 (7%)</td>
<td></td>
</tr>
<tr>
<td>Do not know</td>
<td>19 (2%)</td>
<td>13 (2%)</td>
<td></td>
</tr>
</tbody>
</table>

Ratio whether you can do the following, 1 = Never, 10 = Always, mean (SD)

<table>
<thead>
<tr>
<th>Goal</th>
<th>Yes (n=366)</th>
<th>No or Unknown (n=80)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess whether patients are sleeping enough</td>
<td>6.1 (2.4)</td>
<td>5.5 (2.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Control lighting conditions to allow patients to sleep</td>
<td>6.3 (2.4)</td>
<td>6.5 (2.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Control environmental noise levels to allow patients to sleep</td>
<td>6.2 (2.5)</td>
<td>6.2 (2.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Adjust the ventilator or bi-level PAP to allow patients to sleep</td>
<td>6.0 (2.4)</td>
<td>6.1 (2.4)</td>
<td>0.75</td>
</tr>
<tr>
<td>Delay non-emergency disturbances to allow patients to sleep</td>
<td>6.5 (2.5)</td>
<td>6.5 (2.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Adhere to a clustered sleep protocol for the ICU</td>
<td>6.1 (2.5)</td>
<td>6.2 (2.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Temporarily suspend ventilation to allow for sleep</td>
<td>6.2 (2.9)</td>
<td>6.2 (2.7)</td>
<td>0.25</td>
</tr>
<tr>
<td>Continue conditions for a dedicated sleeping time for stable patients</td>
<td>6.2 (2.5)</td>
<td>6.2 (2.7)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*Total responses do not total 1223 since all respondents did not answer the question. Percentages represent proportion of responses among completed.

Healing Environments

- Lighting
- Color
- Art
- Noise reduction
- Room temperature
- Use of sensory aids
  - Glasses & hearing aids
- Promote family presence
- Sleep Protocols

↓ Delirium & anxiety which contribute to ↓ in risk of cognitive impairment & PTSD post discharge


The Sleep in the ICU Task Force
Outcomes of Early Mobility Programs

- ↓ incidence of VAP
- ↓ time on the ventilator
- ↓ days of sedation
- ↓ incidence of skin injury
- ↓ delirium
- ↑ ambulatory distance
- Improved function
- ↓ in hospital readmissions
- ↓ ICU & Hospital LOS

www.iculiberation.org

Thomsen GE, et al. CCM 2008;36;1119-1124
Winkelma C et al, CCN,2010;30;36-60
Azuh O, et al. The American Journal of Medicine, 2016,
doi:10.106/j/mjmed.2016.03.032
Corcoran JR, et al. PMR J, 2016 in press
Early Physical and Occupational Therapy in Mechanically Ventilated Patients

• Prospective randomized controlled trial from 2005-2007

• 1,161 screen, 104 patients mechanically ventilated < 72hrs, functionally independent at baseline met criteria

• Randomized to:
  – early exercise of mobilization during periods of daily interruption of sedation (49 pts)
  – daily interruption of sedation with therapy as ordered by the primary care team (55 pts)

• Primary endpoint: number of patients returning to independent functional status at hospital discharge able to perform activities of daily living and walk (independently)


<table>
<thead>
<tr>
<th></th>
<th>Intervention (n=49)</th>
<th>Control (n=55)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time from intubation to first PCTT session (days)</td>
<td>1.5 (1.3-2.1)</td>
<td>2.4 (1.5-3.6)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Independent ADLs total at ICU discharge</td>
<td>3 (0-5)</td>
<td>0 (0-3)</td>
<td>0.05</td>
</tr>
<tr>
<td>Independent ADLs total at hospital discharge</td>
<td>6 (0-6)</td>
<td>2 (0-6)</td>
<td>0.06</td>
</tr>
<tr>
<td>NKIC examination score at hospital discharge</td>
<td>32 (15-51)</td>
<td>48 (40-58)</td>
<td>0.18</td>
</tr>
<tr>
<td>Hand-grip strength at hospital discharge (kg-force)</td>
<td>30 (10-51)</td>
<td>35 (5-57)</td>
<td>0.57</td>
</tr>
<tr>
<td>Greatest walking distance at hospital discharge (m)</td>
<td>33.4 (9-51.4)</td>
<td>0.0 (30-48)</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Time from intubation to independent functional status (days):

- Out of bed: 1.7 (1-3) vs. 6.5 (4.2-8.3) < 0.0001
- Standing: 3.2 (15-5.5) vs. 6.0 (4.5-8.2) < 0.0001
- Standing in place: 3.3 (1.5-6.8) vs. 6.1 (4.6-9.6) < 0.0001
- Transferring to a chair: 3.4 (1.8-4.5) vs. 6.4 (4.5-8.4) < 0.0001
- Walking: 3.8 (3.5-3.5) vs. 7.4 (9-9.9) < 0.0001

Data are median (IQR). ADLs activities of daily living, ICU intensive care unit, NKIC Medical Research Council, PCTT Physical therapy and occupational therapy, MRC examination scale 0-66

Table 4: Functional muscle strength outcomes according to study group.

International Survey of Early Mobilization Practices: Where Do We Stand

- Surveyed directors of medical and mixed medical surgical ICUs in 4 countries
- Institutions selected a random
- Results
  - 951 ICUs (US 500; France 151, UK 150, Germany 150)/response rate 64%
  - Staffing models of RN/patient and Physiotherapist differ by country

<table>
<thead>
<tr>
<th></th>
<th>France</th>
<th>Germany</th>
<th>UK</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>% EM practice</td>
<td>40%</td>
<td>59%</td>
<td>52%</td>
<td>45%</td>
</tr>
<tr>
<td>% EM protocol</td>
<td>24%</td>
<td>30%</td>
<td>20%</td>
<td>30%</td>
</tr>
</tbody>
</table>

- Factors associated with EM practice
  - presence of multidisciplinary rounds
  - setting daily goals
  - Presence of a dedicated physiotherapist
  - Nurse patient ratio
  - Sedation protocol

Consensus on Safe Criteria for Active Mobilization

- Systematic review performed than 23 international experts gather to reach consensus

<table>
<thead>
<tr>
<th>Categories</th>
<th>Consensus reach on all criteria. If no other contraindications; vasoactives, endotracheal tube, FIO2 &lt; 60% with SaO2 90% &amp; RR &lt; 30/min were considered safe criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory</td>
<td>Hodgson CL, et. al Critical Care, 2014;18:658</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td></td>
</tr>
<tr>
<td>Neurological</td>
<td></td>
</tr>
<tr>
<td>Other Considerations</td>
<td></td>
</tr>
</tbody>
</table>
Mobility Protocol Safety Screen

**Early Progressive Mobility Protocol**

**STEP 1: Screen for safety**

Evaluate daily

- **M** Myocardial Stability (except CTS)
  - No active cardiac ischemia within past 24 hours

- **O** Oxygenation Stability
  - FiO2 < 0.70 on mechanical ventilation
  - PEEP < 10 cm H2O
  - No unsecured airway
  - No need of Rotopron bed

- **V** Vasopressor Use
  - Vasopressor use should be discussed with medical team

- **E** Engages to Voice
  - RASS -2 to +2

- **N** Neuro Stability
  - No acute or uncontrolled intracranial event

Does not meet criteria = Start at Level 1 and evaluate in 12 hours
Meets all criteria = Start at Level 2 and Progress

*Discuss safety screen failure with medical team, document reason if decision made to not mobilize

Adapted from AACN mobility tool

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**Mobility Protocol**

**STEP 2: Implement Progressive Mobility**

1. **Level Bed**
   - Passive/Active ROM TID
   - Turn Q8 hours
   - Active-resistance exercises
   - Sitting position 20 min TID
   - Consult PT/OT if can’t progress to Level 2

   **Goal:** Clinical stability and able to move arm against gravity

2. **Level Dangle**
   - Level 1 Interventions
   - Dangle edge of bed w/feet on floor
   - Mechanical lift to chair
   - Consult PT/OT if can’t progress to Level 3

   **Goal:** Sitting upright and able to move leg against gravity

3. **Level Chair**
   - Level 2 Interventions
   - Active transfer to chair ≥20 min 2 x/day
   - Consult PT/OT if require assist device to get to chair
   - Level 2 & 3: Use ROHO cushion for pressure relief in chair

   **Goal:** Increased strength, stands w/min to mod assist

4. **Level Ambulation**
   - Level 3 Interventions
   - Active transfer to chair ≥20 min 3 x/day
   - Ambulation (marching in place, walking in halls)
   - Consult PT/OT for first time walking in the room on ventilator

   **Goal:** Strength and distance walk

Adapted from AACN mobility tool

---

5/26/2017
Early Mobility: Can We Do It? Is it Safe?

Safety

- > 1% adverse events during 1449 sitting, standing and walking sessions with patients on ventilators.
- Impact of safety of therapy intervention in a single center (routine care) between 2009-2011
  - 1,787 admission of at least 24hrs
  - 1,110 participated in 5,267 PT sessions (1-3 days from admission)
  - 10 different therapist on 4,580 days

- **Results:**
  - Physiological abnormalities: 34 session (0.6%)
    - Arrhythmias: 10 occurrences (0.2%)
    - MAP > 140: 8 occurrences (0.2%)
    - MAP < 55: 5 occurrences (0.1%)
    - Oxygen desaturation: 4 occurrences (0.8%)
    - Falls: 3 occurrences (0.6%)
    - 1 chest tube, feeding tube and arterial line

It Takes a Village For Sustainability

1. Necessary Components for Early Rehab
   • Buy-in
   • Multiple disciplines
   • Team communication
   • Opinion leader
   • Individual discipline champion
   • Dedicated rehab personnel
   • Equipment
   • Sedation practice
   • Administrative funding

2. Implementation Strategies
   • Team center approach
   • Staff education
   • Strength & quality of evidence

3. Perceived Barriers
   • Increase workload
   • Safety concerns

4. Positive Outcomes
   • Improved patient outcomes
   • Staff satisfaction
   • Changed culture
   • Financial savings


ASSESS, PREVENT & MANAGE PAIN
BOTH SAT & SBT
CHOICE OF SEDATION
DELIRIUM
EARLY MOBILITY
FAMILY ENGAGEMENT

May;42(5):1024-36.
www.iculiberation.org
Family Engagement and Empowerment

Good communication with the family is critical at every step of a patient’s clinical course, and empowering the family to be part of the team to ensure best care is adhered to diligently will improve many aspects of the patient’s experience. The F was recently added to help to keep patients and families as the center and focus of care.

www.icudelirium.org

Families are the heart of patient-centered
“I have learned that people will forget what you said, people will forget what you did, but people will never forget how you made them feel.”

Maya Angelou

ICU Diaries

- Used routinely in Europe
- Diaries are kept by families and staff to describe the patients experience during the ICU stay
- Pictures are sometimes included
- When read post discharge diaries can fill in memory gaps, replace false memories and delusions

Outcomes of ICU Diaries:

- Decrease anxiety, depression and PTSD symptoms
- Decrease PTSD symptoms in families

Early Psychologic Intervention

- Psychologists as members of the critical care team
- Early patient & family support, counseling and education on stress management and coping skills
- Psychologist involvement has shown to cut the prevalence of anxiety, depression and PTSD in half


Handout materials on PICS

Self help rehabilitation manual showed ↓ In PTSD symptoms

First US Post ICU Clinics - Indiana University & Vanderbilt

- Critical Care Recovery Center at Indiana University (2011)
- ICU recovery Center at Vanderbilt (2012)
  - Team consists of medical ICU nurse practitioner, a pharmacist, pulmonary intensivists, a case manager and neurocognitive psychologist
  - Any member of the ICU teams can make a referral for patients to the clinic
  - Screening for inclusion and exclusion criteria are performed
  - Exclusion criteria
    - Pre-existing dementia or cognitive defect, life limiting illness, manage primarily by different subspecialty service/eg. liver/renal transplant, already have specialty resources (eg. Stroke or cardiac rehab, long-term resident of a skilled nursing facility
  - Initial visit: completes spirometry & a 6 minute walk test
  - Nurse practitioner completes a detailed history and physical exam
  - Neuropsychologist meets with the patient to evaluate and screen for cognitive impairment and PTSD, anxiety and depression
  - Only anecdotal data to date

Huggins EL, AACN Advances in Critical Care. 2016;27(2):204-211

SCCM Program

Every year, millions of Americans survive critical illness; but despite the efforts of their ICU, many are left with ongoing problems. The current health care system often does not meet the needs of these survivors, or their families, during their weeks to years of recovery. SCCM seeks to improve patient and family support after critical illness through the THRIVE Initiative.
THE OUTCOME

ABCDE Bundle Reduces Ventilation, Delirium & ↑OOB

- Eighteen-month, prospective, cohort, before-after study
- 5 adult ICU’s, 1 step down, 1 oncology unit
- Compared 296 patients (146 pre-bundle) & 150 post bundle
- Intervention: ABCDE
- Measured:
  - For mechanical ventilation patients (187) examined ventilator free days
  - All patients examined incidence of delirium, mortality, time to discharge and compliance with the bundle

### Keystones ABCDE Bundle Implementation

- 51 hospitals in Michigan’s Keystone ICU initiative
- Those implementing SATs and delirium screening were **3.5 times more likely** to exercise ventilated patients
- Incomplete or non-sequential bundle implementation yielded lower success rates
- Authors wrote, “Another layer of evidence that for the ABCDEs, the whole is greater than sum of the parts.”

---

ABCDE QI Contextual Study

Quality Improvement Project

- 4 ICUs
- Implemented nearly all elements of the ABCDE bundle within the 12-month time frame.

Results:

- SATs compliance increased (25% → 81%)
- SBTs compliance increased (30% → 67%)
- Delirium Assessment increased (0% → 65%)
- ¾ ICUs have implemented an early mobility program
- 82% received some form of mobility
- 49% getting out of bed at least once per day

Carrothers, K. Crit Care Med 2013; 41:S128–S135

ABCDEF Bundle: Improving Survival & Reducing Brain Dysfunction

- Ventilated and non-ventilated medical and surgical ICU patients enrolled between January 1, 2014, and December 31, 2014
- Determine association between ABCDEF bundle compliance/total & partial & outcomes of hospital survival and delirium-free and coma-free days/adjusting for age, severity of illness, and presence of mechanical ventilation
- Patients experienced more days alive and free of delirium and coma with both total bundle compliance (incident rate ratio, 1.02; 95% CI, 1.01–1.04; \( p = 0.004 \)) and partial bundle compliance (incident rate ratio, 1.15; 95% CI, 1.09–1.22; \( p < 0.001 \)).
In Summary

- Critical illness and sepsis is catabolic and depleting, rapidly and potentially lasting for years
- A prolonged ICU stay can cause delirium and cognitive changes for most patients
- Mobility combined with minimal or no sedation started at the beginning of an ICU stay is protective and preventative
- Approach the task with structured QI project, collaboration, barrier identification
- Implement the ABCDEF Bundle in your ICU today

Questions?
“QUALITY IS NEVER AN ACCIDENT. IT REPRESENTS THE WISE CHOICE OF MANY ALTERNATIVES.”

Willa Foster