PICU Up: Teaming up and Transforming to a Culture of Mobility for the Critically Ill Child

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#PedsICU
#ICURehab
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- Sleep Services of America
- PICU Up!™ Trademark
Objectives

• Describe characteristics of sleep across the age spectrum in healthy & critically ill children
• Discuss the effects of sedatives and analgesics on sleep in the developing brain
• Define early mobilization and discuss the adult and pediatric literature
• Describe the interplay of sleep, sedation and delirium in team-based implementation of early mobilization initiatives
The Patient Experience
Post-intensive care syndrome = PICS

“THRIVE takes the proverbial baton, leverages the principles espoused in the ABCDEF bundle championed within the ICU Liberation Initiative to mitigate long-term impairment, and focuses on life after critical illness.

http://www.sccm.org/Communications/Critical-Connections/Archives/Pages/Why-ICU-Clinicians-Need-to-Care-about-Post-Intensive-Care-Syndrome.aspx
“The synthesis revealed that, similar to adult ICU patients, a wide range of physical, neurocognitive and psychological morbidities occur in PICU patients after discharge.”
ICU Liberation Model: ABCDEF Bundle

Assess, prevent & manage pain
- CPOT or BPS to assess pain, insure adequate pain control
- Use of regional anesthesia and nonopioid adjuncts
- Analgesia-based sedation techniques with fentanyl

Both SAT & SBT
- Daily linked SAT and SBT
- Multidisciplinary coordination of care
- Faster liberation from MV

Choice of sedation
- Targeted light sedation when sedation necessary
- Avoidance of benzodiazepines
- Dexmedetomidine if high delirium risk, cardiac surgery, MV weaning

Delirium monitoring & management
- Routine CAM-ICU or ICDSC assessments
- Nonpharmacologic intervention, including sleep hygiene
- Dexmedetomidine or antipsychotic if hyperactive symptoms

Early mobility & exercise
- Physical and occupational therapy assessment
- Coordinate activity with SAT or periods of no sedation
- Progress through range of motion, sitting, standing, walking, ADLs

Family engagement & empowerment
- Reorientation, provision of emotional and verbal support
- Cognitive stimulation, participation in mobilization
- Participation in multidisciplinary rounds
Adult Evidence for the ABCDEF

- Payen J. Crit Care Med 2001;29:2258-2263
- Payen J. Anesthesiology 2009; 111:1308-16
- Chanques G. Crit Care Med 2010;151:711-721
- Puntillo K. Am J Respir Crit Care Med 2014; 89:39-47

  - Pandharipande P. Anesthesiology. 2006;104:21-6.
  - Pandharipande P. Crit Care. 2010;14:R38.


- Ely E. JAMA. 2001;286:2703-2710 (CAM-ICU)
- Dubois M. Intensive Care Med. 2001;27:1297-1304 (Risk Factors)
- Ely E. Intensive Care Med. 2001;27:1892-1900 (LOS and Risk Factors)
- Ely E. JAMA. 2004;291:1753-1762 (Delirium Mortality)
- Pisani M. Am J Respir Crit Care Med. 2009;180:1092-1097 (Delirium Mortality)
- Shehabi Y. Crit Care Med. 2010;38:2311–2318 (Delirium Mortality)
- Schweickert W. Lancet. 2009;373:1874-1882 (Delirium Reduction)
- Needham D. Arch Phys Med Rehabil. 2010;91:536-542 (Delirium Reduction)
- Colombo R. Minerva Anestesiol. 2012;78:1026-1033 (Delirium Reduction)
- Balas M. Crit Care Med. 2013;42:1024-1036 (Delirium Reduction)
- Kamdar B. Crit Care Med. 2013;41:800-809 (Delirium Reduction)

- Ehlenbach W. JAMA. 2010;303:763-70.
“Critically ill patients managed with the Awakening and Breathing Coordination, Delirium monitoring/management, and Early exercise/mobility bundle spent three more days breathing without assistance, experienced less delirium, and were more likely to be mobilized during their ICU stay than patients treated with usual care” – Crit Care Med 2014
What about the kids?

Choice of Sedation

Spontaneous breathing trials

Delirium

Family involvement

Early mobilization
Challenges in caring for critically ill children

• Heterogeneity in ages and development
• Children unable to understand or communicate basis and need for interventions
  – Danger of inadvertently removing life-saving modalities (endotracheal tube, vascular access)
  – Fear and anxiety contribute to physiologic changes and stress
Creating a healing environment for children in the hospital: It just makes sense!

- Optimizing pain and sedation mgmt.
- Optimizing sleep
- Optimizing a child’s ability to communicate
- Minimizing risk factors for delirium
- Early mobilization
Expectation
Reality: A complex interplay we can tackle
The Cost: Multiprofessional Collaboration to Promote Culture Change--It just makes sense!

- Patient & Family
- Nurses
- Child Life
- PT/OT
- Dietician
- Respiratory Care
- Pharmacists
- Physicians

[Diagram showing the interconnection of various healthcare professionals with the patient and family at the center]
Fall 2013: Our PICU Culture

- Mechanically ventilated children oversedated
- High prevalence of benzodiazepine use and escalation
- PT/OT consultation often ordered by medical team >4 days into PICU admission
- Restraints
- Not screening for, diagnosing or treating delirium
- Benzos, diphenhydramine and narcotic being used to improve sleep
Goals

- Challenge the PICU paradigm that children must receive large doses of sedatives to tolerate PICU interventions
- Change the standard of care and confront an unmet and unrecognized need for sleep promotion
- Encourage hospital teams/staff to “buy in” to the risk factors for delirium and interventions to prevent it
- TRANSITION FROM A CULTURE OF IMMOBILITY TO MOBILITY
Why should we care about sleep in the hospital?

- Natural sleep is integral to physiologic homeostasis
  - Thermoregulation
  - Respiratory
  - Cardiovascular
  - Gastrointestinal
  - Immune defenses
  - Endocrine
“Broadly speaking, it might be argued that the most fundamental requirements for healthy growth and development in young children include:

a) Loving support and protection by parents/caretakers
b) Adequate nutrition, and
c) Adequate sleep”

-Ronald Dahl, SLEEP 2007
Are they sleeping?
Sleep Stages

- **Stage 1**: In stage 1 we experience a light transitional sleep. This is where drowsiness and sleep begin.

- **REM**: REM sleep revitalizes the memory. In this stage brain activity is very high and intense dreaming is likely to occur.

- **Stage 2**: In stage 2 more stable sleep occurs. Chemicals produced in the brain block the senses making it difficult to be woken.

- **Stage 3**: Stage 3 is deep sleep. Growth hormone is released during this stage. Most stage 3 sleep occurs in the first third of the night.

- **90-120 Minutes**: Average adult: 25% REM

- **Infants**: Up to 80% REM
Principle Concepts

Sleep is necessary for:

- Neurosensory development
- Preservation of brain plasticity
- Learning and long term memory

- Evolution of sleep reflects the complex brain maturational process during infancy, childhood and adolescence
Sleep and the Developing Brain:
Neurosensorily, plasticity, long-term memory

Human Brain Development
Neural Connections for Different Functions Develop Sequentially

- Sensory Pathways (Vision, Hearing)
- Language
- Higher Cognitive Function

FIRST YEAR

Hospital Sleep Disturbances

PICU Sleep Disturbance
- Circadian rhythm disturbance
- Sleep Loss
- Sleep Fragmentation

Factors:
- Medications
- Immobility
- Noise
- Light
- Pain
- Stress
- Cares/Interventions
A vicious circle?

Physiologic dependence, prolonged hospital stay for withdrawal

- Not "sleeping" given more sedation
- Sedation needs escalate over duration of intubation
- Sleep quality worsens
- Child is delirious, more agitated
Hospital sleep is not a priority

Sleep of critically ill children in the pediatric intensive care unit: A systematic review

Sapna R. Kudchadkar^a,*, Othman A. Aljohani^a, Naresh M. Punjabi^b

– Multitude of studies of sleep in the NICU
– Nine publications about sleep in the PICU
  • Four publications from same RCT
  • Two studies using subjective assessment (PSBOT)

Kudchadkar et al., Sleep Med Rev 2014
Sedation, Sleep Promotion, and Delirium Screening Practices in the Care of Mechanically Ventilated Children: A Wake-Up Call for the Pediatric Critical Care Community

Sapna R. Kudchadkar, MD\textsuperscript{1,2}; Myron Yaster, MD\textsuperscript{1,2}; Naresh M. Punjabi, MD, PhD\textsuperscript{3,4}

- 341 pediatric intensivists
- <15% aware of efforts to optimize sleep of critically ill children in their unit including any of following:
  - Noise reduction
  - Lighting
  - Earplugs/eyemasks

\textit{Crit Care Med 2014.}
Pediatric Intensive Care and Sleep: Is it a priority?

- >85% use a combination of benzodiazepine and opioid for sedation in mechanically ventilated children
- <10% use dexmedetomidine

What’s wrong with opioids and benzodiazepines?

Table 5. Common ICU Medications and Their Effect on Sleep

<table>
<thead>
<tr>
<th>Medication</th>
<th>Effect on Sleep</th>
<th>Possible Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sedative/hypnotics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>↑TST, ↓SWS, ↓REM, ↓W</td>
<td>GABA (type A) receptor stimulation</td>
</tr>
<tr>
<td>Propofol</td>
<td>↑TST, ↓W, ↓SL</td>
<td>GABA (type A) receptor stimulation</td>
</tr>
<tr>
<td>Dexmedetomidine</td>
<td>↑SWS, ↓SL, ↓REM</td>
<td>Alpha₂-agonist</td>
</tr>
<tr>
<td><strong>Analgesics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opioids</td>
<td>↑W, ↓TST, ↓SWS, ↓REM</td>
<td>Mu-receptor stimulation</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>↓TST, ↓SE</td>
<td>Prostaglandin synthesis inhibition</td>
</tr>
</tbody>
</table>

Benzodiazepines are the only independent risk factor for the development of delirium

Kudchadkar et al. Contemporary Critical Care 2009
Dexmedetomidine

• <10% of all respondents use dexmedetomidine as a primary agent

• Dexmedetomidine most closely induces an EEG pattern consistent with natural sleep
Synaptic density, CMRO$_2$ and delta wave amplitude: parallels

Gamma distribution model of growth in childhood and decline in adolescence

..... synaptic density

---- delta wave amplitude

___ cerebral metabolic rate

Changes in delta power are a reflection of synaptic pruning, brain maturation and reorganization

• 8 subjects from Pediatric ICU at Johns Hopkins

• All healthy, developmentally appropriate children prior to admission to hospital

• All receiving opioid and benzodiazepine for sedation during mechanical ventilation due to primary respiratory failure
Delta Activity

Nocturnal δ Activity
Healthy children vs. PICU patients

Graphs by age and gender-matched pair
Critical illness and the Circadian Rhythm: Melatonin

- Produced by the pineal gland
- Under control of circadian pacemaker of suprachiasmatic nuclei
- Peaks at 2 a.m., decreases to daylight levels by 8 a.m.
- Nocturnal melatonin suppression noted in ICU and post-operative patients
Ongoing work

• What is the longitudinal evolution of sleep-wake patterns in children in the PICU and during recovery from critical illness?
• Prospective, observational study
  – All children 0-18 s/p major surgery admitted to the PICU
• Actigraphy initiated POD #1 and discontinued at hospital discharge
Actigraphy plot demonstrates normal sleep-wake cycles.
What we’ve learned

• Evolution of sleep is a marker of brain development in childhood
• Sleep is severely fragmented in children admitted to the hospital
• Sleep disturbances during infancy and childhood may have negative effects on neurocognitive outcomes
Sleep: On the causal pathway for delirium?
What is Delirium? - Key Features

- Disturbance in attention and awareness
- Disturbance in cognition, e.g. memory, disorientation, language, perception
- Develops over a short period of time and fluctuates throughout the day
- Disturbances are not better explained by a preexisting, established or evolving neurocognitive disorder and don’t occur in the context of severely reduced level of arousal (coma)

Incidence in the Adult ICU

- 60%-80% of mechanically ventilated patients
- 50%-70% of non-ventilated patients
- Hypoactive delirium = 44%
- Hyperactive delirium = 2%
- Mixed delirium = 54%

(Girard, 2008)
Outcomes

• 3 fold increase in 6-month mortality
  – 1 in 3 delirium survivors develop permanent cognitive impairment

Associated with…..

• New nursing home placement
  – Increased length of stay > 8.0 days
  – Increased mortality
  – Increased number of days on the ventilator
'The problem of delirium is far from an academic one. Not only does the presence of delirium often complicate and render more difficult the treatment of a serious illness, but also it carries the serious possibility of permanent irreversible brain damage.'

- Engel & Romano, 1959
Why should we focus on sleep promotion and sedation optimization to prevent delirium?

- Low cost, non-invasive, and low risk: CULTURE CHANGE and INTERDISCIPLINARY COLLABORATION
- Lack of proven prophylactic agents to reduce delirium
- It just makes sense—especially for the developing brain!
What do we know about the interaction between sleep and delirium?

• Definitive relationship has not been established…but…
• Sleep disturbance can independently cause all features of delirium
• Metabolic waste is primarily removed from CNS during sleep (“glymphatic system”)
• Loss of rapid-eye movement sleep is associated with delirium
• Sleep-deprived patients are more likely to develop delirium than those who are not sleep-deprived
What do we know about the interaction between sleep and delirium?

The Impact of Interventions to Improve Sleep on Delirium in the ICU: A Systematic Review and Research Framework

Alexander H. Flannery, PharmD, BCCCP, BCPS\textsuperscript{1,2}; Douglas R. Oyler, PharmD, BCCCP\textsuperscript{1,2}; Gerald L. Weinhouse, MD\textsuperscript{3}

Conclusions: Although sleep interventions seem to be a promising approach for improving delirium-related outcomes, studies are limited by bias issues, varying methodologies, and multiple confounders, making the evidence base for this conclusion limited at best. Future studies would benefit from a systematic approach to studying the link between sleep intervention and delirium-related outcomes, which is outlined in the context of reviewing the existing literature. (Crit Care Med 2016; 44:2231–2240)
Sleep promotion interventions (bundled)

1. Minimize nighttime interventions
2. Noise reduction
3. Earplugs
4. Soothing music
5. Dim lights
6. Eye masks
7. Increased light exposure during daytime
8. Artificial light during daytime
9. Avoidance of deliriogenic meds
10. Minimize napping
11. Pharmacologic therapy (zolpidem, melatonin, antipsychotic)

The Impact of Interventions to Improve Sleep on Delirium in the ICU: A Systematic Review and Research Framework*

Alexander H. Flannery, PharmD, BCCCP, BCPS®; Douglas R. Oyler, PharmD, BCCCP®; Gerald L. Weinhouse, MD®
What about the kids?

- Choice of Sedation
- Spontaneous breathing trials
- Delirium
- Early mobilization
- Family involvement
State of delirium screening in PICUs internationally: 2013

- Only 2% of respondents reported delirium screening is performed for all mechanically ventilated patients once per shift

- When asked which tools were being used for delirium, several listed withdrawal scales
  - Sophia Observation Scale
  - Withdrawal Assessment Tool-1 (WAT-1)
But why? We have our own tools! icudelirium.org

Cornell Assessment of Pediatric Delirium: A Valid, Rapid, Observational Tool for Screening Delirium in the PICU

Chani Traube, MD; Gabrielle Silver, MD; Julia Kearney, MD; Anita Patel, MD; Thomas M. Atkinson, PhD; Margaret J. Yoon, MD; Sari Halpert, MD; Julie Augenstein, MD; Laura E. Sickles, BA; Chunshan Li, MA; Bruce Greenwald, MD

Crit Care Med 2014

Diagnosing delirium in critically ill children: Validity and reliability of the Pediatric Confusion Assessment Method for the Intensive Care Unit

Heidi A. B. Smith, MD, MSci; Jenny Boyd, MD; D. Catherine Fuchs, MD; Kelly Melvin, MD; Pamela Berry, RN; Ayumi Shintani, PhD; Svetlana K. Eden, MS; Michelle K. Terrell, NP; Tonya Boswell, RN; Karen Wolfram, RN; Jenna Sopfe, MS; Frederick E. Barr, MD, MSci; Pratik P. Pandharipande, MD, MSci; E. Wesley Ely, MD, MPH

Crit Care Med 2011

The Preschool Confusion Assessment Method for the ICU: Valid and Reliable Delirium Monitoring for Critically Ill Infants and Children

Crit Care Med 2016
### Table 1 Survey answers

<table>
<thead>
<tr>
<th>Survey item</th>
<th>Correct (%)</th>
<th>Incorrect (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fluctuation between orientation and disorientation is not typical of delirium (FALSE)</td>
<td>96 (91.4%)</td>
<td>9 (8.5%)</td>
</tr>
<tr>
<td>2. Poor nutrition increases the risk of delirium (TRUE)</td>
<td>102 (97.1%)</td>
<td>3 (2.9%)</td>
</tr>
<tr>
<td>3. The GCS score is the best way to diagnose delirium in critically ill children (FALSE)</td>
<td>93 (88.6%)</td>
<td>12 (11.4%)</td>
</tr>
<tr>
<td>4. Hearing or vision impairment increases the risk of delirium (TRUE)</td>
<td>86 (81.9%)</td>
<td>19 (18.1%)</td>
</tr>
<tr>
<td>5. Delirium in children always manifests as a hyperactive, confused state (FALSE)</td>
<td>103 (98.1%)</td>
<td>2 (1.9%)</td>
</tr>
<tr>
<td>6. Benzodiazepines can be helpful in the treatment of delirium (FALSE)</td>
<td>65 (61.9%)</td>
<td>40 (38.1%)</td>
</tr>
<tr>
<td>7. Behavioral changes in the course of the day are typical of delirium (TRUE)</td>
<td>96 (91.4%)</td>
<td>8 (7.6%)</td>
</tr>
<tr>
<td>8. Patients with delirium will often experience perceptual disturbances (TRUE)</td>
<td>98 (93.3%)</td>
<td>6 (5.7%)</td>
</tr>
<tr>
<td>9. Altered sleep/wake cycle may be a symptom of delirium (TRUE)</td>
<td>104 (99%)</td>
<td>0</td>
</tr>
<tr>
<td>10. Symptoms of depression may mimic delirium (TRUE)</td>
<td>87 (82.9%)</td>
<td>17 (16.1%)</td>
</tr>
<tr>
<td>11. The greater the number of medications a patient is taking, the greater their risk of delirium (TRUE)</td>
<td>86 (81.9%)</td>
<td>18 (17.1%)</td>
</tr>
<tr>
<td>12. Delirium usually lasts several hours (FALSE)</td>
<td>59 (56.2%)</td>
<td>45 (42.8%)</td>
</tr>
<tr>
<td>13. A urinary catheter in situ reduces the risk of delirium (FALSE)</td>
<td>90 (85.7%)</td>
<td>14 (13.3%)</td>
</tr>
<tr>
<td>14. Gender has no effect on the development of delirium (FALSE)</td>
<td>37 (35.2%)</td>
<td>67 (63.8%)</td>
</tr>
<tr>
<td>15. Dehydration can be a risk factor for delirium (TRUE)</td>
<td>104 (99%)</td>
<td>0</td>
</tr>
<tr>
<td>16. Children generally do not remember being delirious (FALSE)</td>
<td>39 (37.1%)</td>
<td>65 (61.9%)</td>
</tr>
<tr>
<td>17. A family history of dementia predisposes a patient to delirium (FALSE)</td>
<td>72 (68.6%)</td>
<td>32 (30.4%)</td>
</tr>
</tbody>
</table>
Barriers to diagnosis

- Pathophysiology
  - Confusion with agitation, withdrawal, pain
- Absence of screening
- Tolerance of hypoactive state
- Sedation and pain management
  - Protocols? Consistent language?
- Focus on other organ systems
- Busy work flow
- If screening is positive—what’s the next step?
Why should we consistently screen for delirium?

• Not just to diagnose delirium and treat it!

• “A positive delirium screen after several negative screens is a warning sign for impending badness” – Wes Ely, MD
Delirium in Critically Ill Children: An International Point Prevalence Study

25% Delirium Prevalence
N=835, Traube et al, Crit Care Med 2017

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &gt; 2 years</td>
<td>0.7 (0.5, 1.0)</td>
</tr>
<tr>
<td>Physical restraints</td>
<td>4.0 (2.0, 7.7)</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>1.7 (1.1, 2.7)</td>
</tr>
<tr>
<td>Narcotics</td>
<td>2.3 (1.5, 3.5)</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>2.2 (1.5, 3.3)</td>
</tr>
<tr>
<td>Antiepileptics</td>
<td>2.9 (1.8, 4.8)</td>
</tr>
<tr>
<td>General anesthesia</td>
<td>0.4 (0.3, 0.8)</td>
</tr>
<tr>
<td>Vasopressors</td>
<td>2.4 (1.5, 3.8)</td>
</tr>
</tbody>
</table>
### TABLE 3. Risk Factors for Delirium Duration

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Comparison</th>
<th>Incidence Rate Ratio (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at enrollment (mo)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>37 vs 11</td>
<td>0.51 (0.35–0.76)</td>
<td>0.005</td>
</tr>
<tr>
<td>Cyanotic heart disease</td>
<td>Yes vs no</td>
<td>1.29 (0.72–2.10)</td>
<td>0.477</td>
</tr>
<tr>
<td>Pediatric Risk of Mortality score at enrollment&lt;sup&gt;b&lt;/sup&gt;</td>
<td>10 vs 0</td>
<td>2.25 (1.28–3.94)</td>
<td>0.007</td>
</tr>
<tr>
<td>Sepsis or related condition at ICU admission</td>
<td>Yes vs no</td>
<td>1.05 (0.69–1.59)</td>
<td>0.823</td>
</tr>
<tr>
<td>Benzodiazepines (mg/kg/d)&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>0.73 vs 0</td>
<td>2.47 (1.36–4.49)</td>
<td>0.005</td>
</tr>
<tr>
<td>Opioids (μg/kg/d)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>3.3 vs 0</td>
<td>0.70 (0.33–1.48)</td>
<td>0.410</td>
</tr>
<tr>
<td>Cardiovascular Sequential Organ Failure Assessment score</td>
<td>1 vs 0</td>
<td>0.96 (0.79–1.17)</td>
<td>0.691</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>Yes vs no</td>
<td>0.66 (0.37–1.16)</td>
<td>0.135</td>
</tr>
<tr>
<td>Lowest O₂ saturations</td>
<td>95 vs 87</td>
<td>1.03 (0.67–1.59)</td>
<td>0.516</td>
</tr>
</tbody>
</table>

**Conclusions:** Delirium is associated with a lower likelihood of ICU discharge in preschool-aged children. Benzodiazepine exposure is associated with the development and longer duration of delirium, and lower likelihood of ICU discharge. These findings...
Quality Improvement Initiative to Reduce Pediatric Intensive Care Unit Noise Pollution With the Use of a Pediatric Delirium Bundle

Yu Kawai, MD, Jeffrey R. Weatherhead, MD, Chani Traube, MD, Tonie A. Owens, MSN, RN, Brenda E. Shaw, RN, BSN, Erin J. Fraser, BSN, Annette M. Scott, MSN, RN, Melody R. Wojczynski, BSN, Kristen L. Slaman, BSN, Patty M. Cassidy, RN, Laura A. Baker, RN, Renee A. Shellhaas, MD, Mary K. Dahmer, PhD, Leah L. Shever, PhD, RN, Nasuh M. Malas, MD, MPH, and Matthew F. Niedner, MD

Table 4. Effect of the Evening Bundle to Eliminate Delirium on Pediatric Intensive Unit Noise Levels.

<table>
<thead>
<tr>
<th>Occupied Rooms at Nighttime</th>
<th>Pilot Room (A), n = 210</th>
<th>Pilot Compliant Rooms (B), n = 162</th>
<th>Pilot Noncompliant Rooms (C), n = 48</th>
<th>Nonpilot Rooms (D), n = 1841</th>
<th>P Values (A vs D)</th>
<th>(B vs C)</th>
<th>(C vs D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hourly minimum</td>
<td>39.5 (37.5-55.0)</td>
<td>39.0 (37.0-55.0)</td>
<td>54.8 (46.8-58.0)</td>
<td>48.0 (39.0-51.7)</td>
<td>.03</td>
<td>&lt;.01</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Hourly average</td>
<td>45.3 (39.7-55.9)</td>
<td>44.1 (38.5-55.5)</td>
<td>56.9 (50.4-58.0)</td>
<td>51.2 (46.9-54.8)</td>
<td>&lt;.01</td>
<td>&lt;.01</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Hourly maximum</td>
<td>64.0 (59.5-67.5)</td>
<td>63.0 (59.0-66.5)</td>
<td>67.0 (61.5-76.5)</td>
<td>63.0 (59.0-67.0)</td>
<td>.24</td>
<td>&lt;.01</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

*Median decibels (interquartile range).
Where do we go from here?
Goals

• Challenge the PICU paradigm that children must receive large doses of sedatives to tolerate PICU interventions
• Change the standard of care and confront an unmet and unrecognized need for sleep promotion
• Encourage hospital teams/staff to “buy in” to the risk factors for delirium and interventions to prevent it
Creating a healing environment for children in the hospital

- Optimizing pain and sedation management.
- Optimizing sleep.
- Optimizing a child’s ability to communicate.
- Minimizing risk factors for delirium.
- Early mobilization.
Benefits of mobility

- Blood sugar homeostasis
- Cardiovascular function
- Pulmonary function
- Decreases chronic inflammation
- Hormonal regulation
- Musculoskeletal & neuromuscular integrity
- Sleep/wake pattern
- Cognition
- Decreases depression
Consequences of IMMOBILITY
What is Early Mobilization?

### Activities of Progressive Mobilization

- **Age-appropriate activities**
- **Normalization of sleep-wake cycle**
- **Increased HOB**
- **Ambulation**
- **OOB to Chair**
- **Sit at Edge of Bed**
- **Sitting Position**
- **Range of Motion**
- **Splinting**

Progressive mobilization includes the graded application of these activities.
ICU Liberation Model: ABCDEF Bundle

**A**
Assess, prevent & manage pain
- CPOT or BPS to assess pain, insure adequate pain control
- Use of regional anesthesia and nonopioid adjuncts
- Analgesia-based sedation techniques with fentanyl

**B**
Both SAT & SBT
- Daily linked SAT and SBT
- Multidisciplinary coordination of care
- Faster liberation from MV

**C**
Choice of sedation
- Targeted light sedation when sedation necessary
- Avoidance of benzodiazepines
- Dexmedetomidine if high delirium risk, cardiac surgery, MV weaning

**D**
Delirium monitoring & management
- Routine CAM-ICU or ICDSC assessments
- Nonpharmacologic intervention, including sleep hygiene
- Dexmedetomidine or antipsychotic if hyperactive symptoms

**E**
Early mobility & exercise
- Physical and occupational therapy assessment
- Coordinate activity with SAT or periods of no sedation
- Progress through range of motion, sitting, standing, walking, ADLs

**F**
Family engagement & empowerment
- Reorientation, provision of emotional and verbal support
- Cognitive stimulation, participation in mobilization
- Participation in multidisciplinary rounds
“Critically ill patients managed with the Awakening and Breathing Coordination, Delirium monitoring/management, and Early exercise/mobility bundle spent three more days breathing without assistance, experienced less delirium, and were more likely to be mobilized during their ICU stay than patients treated with usual care” – Crit Care Med 2014
Early Mobilization in Adults

ICU-acquired weakness and cognitive deficits: occur quickly and resolve slowly


Early progressive mobility interventions work


Safety of early progressive mobility

- Hopkins R. Crit Care Clinics. 2007;23:81-96

KEY REFERENCES: Laying the foundation for mobility for femoral catheters

- Perme C. Am J Respir Crit Care Med. 2009;179:A1586.

KEY REFERENCES: Laying the foundation for Nursing Progressive Mobility Program in ICU

Weak patients have worse outcomes

- Increased duration of mechanical ventilation
  - Time of ventilation increases by 1-3 weeks
  - Most significant predictor of prolonged MV
- Longer ICU and hospital stay
- More likely to need re-intubation
- Less likely to go home at hospital discharge
- More likely to die in the hospital
- Experience delays in rehabilitation
  - Take longer to regain strength, walk, work
- Prolonged impairment in HRQOL and physical function

Muscle wasting occurs quickly in the ICU

Percentage Change in Rectus Femoris Cross-Sectional Area

Time From Admission, d

No. of patients
Single organ failure 15
Multiorgan failure 47

Puthucheary Z. JAMA 2013
Standardized rehabilitation therapy did not decrease hospital length of stay among patients with acute respiratory failure.

Limitation: No sedation protocol—patients were unarousable on 15% of ventilator days.
Point Prevalence Study of Mobilization Practices for Acute Respiratory Failure Patients in the United States

Sarah Elizabeth Jolley, MD, MSc; Marc Moss, MD; Dale M. Needham, MD, PhD; Ellen Caldwell, MS; Peter E. Morris, MD; Russell R. Miller, MD, MPH; Nancy Ringwood, RN, BSN; Megan Anders, MD; Karen K. Koo, MD; Stephanie E. Gundel, RD, CD; Selina M. Parry, PhD; Catherine L. Hough, MD, MSc; on behalf of the Acute Respiratory Distress Syndrome Network Investigators

ARDS Network point prevalence study

• Population
  – Patients with acute or resolving respiratory failure
  – In ICU on January 15th or February 4th, 2014
  – 17 academic and community ARDS Network hospitals

• Data Collection:
  – In-person of all mobility events during the day
    • by PT/OT or RN, including passive and active mobility
  – Chart abstraction
    • Mobility events over 24 hours
    • Severity of illness
    • Level of sedation
• 32% of patient-days with any therapist-provided mobility intervention
• 16% of patient days with out-of-bed mobility
• 4% of patient days with ambulation
• Predictor of mobility progression: PT/OT involvement
• Negative predictors: ETT, delirium
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Sarah Elizabeth Jolley, MD, MSc; Marc Moss, MD; Dale M. Needham, MD, PhD; Ellen Caldwell, MS; Peter E. Morris, MD; Russell R. Miller, MD, MPH; Nancy Ringwood, RN, BSN; Megan Anders, MD; Karen K. Koo, MD; Stephanie E. Gundel, RD, CD; Selina M. Parry, PhD; Catherine L. Hough, MD, MSc; on behalf of the Acute Respiratory Distress Syndrome Network Investigators

Most activity events performed by a solo RN

- RN alone: 57%
- PT alone: 17%
- OT alone: 5%
- HA or Tech: 2%
- RN/RN: 1%
- RN/PT: 9%
- RN/OT: 2%
- RN/HA or Tech: 2%
- PT/OT: 5%
**Conclusions:** In a cohort of hospitals caring for acute respiratory failure patients, physical therapy/occupational therapy—provided mobility was infrequent. Physical therapy/occupational therapy involvement in mobility was strongly predictive of achieving greater mobility levels in patients with respiratory failure. Mechanical ventilation via an endotracheal tube and delirium are important predictors of mobility progression. *(Crit Care Med 2016; XX:00–00)*
Sedation, Sleep Promotion, and Delirium Screening Practices in the Care of Mechanically Ventilated Children: A Wake-Up Call for the Pediatric Critical Care Community*

Sapna R. Kudchadkar, MD\textsuperscript{1,2}; Myron Yaster, MD\textsuperscript{1,2}; Naresh M. Punjabi, MD, PhD\textsuperscript{3,4}

**Conclusions:** The results highlight the heterogeneity in sedation practices among intensivists who care for critically ill children as well as a paucity of sleep promotion and delirium screening in PICUs worldwide. (*Crit Care Med* 2014; 42:1592–1600)
Early Mobilization in Adults

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- Hopkins R. Crit Care Clinics. 2007;23:81-96

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- Perme C. Am J Respir Crit Care Med. 2009;179:A1586.

KEY REFERENCES: Laying the foundation for Nursing Progressive Mobility Program in ICU
Pediatric Literature review

Early Mobilization in the Pediatric Intensive Care Unit: A Systematic Review

Beth Wieczorek¹  Christopher Burke¹  Ahmad Al-Harbi¹  Sapna R. Kudchadkar²

• Methods
  – All prospective and retrospective studies investigating early mobilization in the PICU
  – PubMed, CINAHL, Embase, no limiters
  – 1928 abstracts reviewed by 2 independent reviewers
  – 168 articles identified for full-text review
  – 59 included for data extraction with double data entry
  – 6 included in review

» JPIC 2015
Included Studies

- Melchers et al 1999: 30 severe TBI
- Jacobs et al 2001: 133 LTRs
- Andelic et al 2012: 61 severe TBI
- Abdulsatar et al 2013: 8 Wii boxing
- Hollander et al 2014: 14 VADS
- Schweitz & Van Aswegan 2013: Pectus
State of Practice

- Choong et al. (PCCM 2014 & CCM 2013)
  - Reported the therapy practices in Canadian PICUs
    - Retrospective
    - Rehab practices largely included chest physiotherapy
    - Barriers
      - MD and PTs reporting - 66.7% reported having adequate knowledge
      - MDs and PTs – 76.1% reported therapy/mobility important
    - Institutional barriers
      - No practice guidelines
      - Lack of champions/advocates
      - Lack of MD order for therapy
    - Provider barriers
      - Safety concerns
        - Medical stability, risk of device dislodgement, presence of ETT
      - Conflicting views regarding stability
      - Slow to recognize when child was ready
      - Limited staffing
      - Poor communication re: readiness and goals
Functional Recovery following Critical Illness in Children: the “Wee-cover” Pilot Study

Karen Choong, MB BCh, Samah Al-Harbi, MD, Katie Siu, MD, Katie Wong, BSc, Ji Cheng, MSc, Burke Baird, MD, David Pogorzelski, BSc, Brian Timmons, PhD, Jan-Willem Gorter, MD PhD, Lehana Thabane, PhD, and Mary Khetani, ScD OTR Conducted on behalf of the Canadian Critical Care Trials Group

Figure 3. Proportion of patients recovering to baseline functional status at 3 and 6 months post PICU discharge
Baseline functional limitation was defined as patients with a Pediatric Overall Performance Category (POPC) score > 1.
Recommendations from Literature Review

• Safe, feasible, positive outcomes when...
  – Unit culture
  – Barriers and facilitators
  – Protocols
  – Knowledge
  – Resources
  – Interdisciplinary collaboration

• 2 or more individuals, different disciplines, working together, shared goals, patient outcomes
Fall 2013: Our PICU Culture

- Mechanically ventilated children oversedated
- High prevalence of benzodiazepine use and escalation
- PT/OT consultation often ordered by medical team >4 days into PICU admission
- Restraints
- Not screening for, diagnosing or treating delirium
- Benzos, diphenhydramine and narcotic being used to improve sleep
PICU Up!™: Early Rehabilitation and Progressive Mobility

• Structured and interdisciplinary program
• Integrated into the routine care of the critically ill child
• Outcomes
  – Provide a standardized mechanism to increase activity level
  – Improve patient outcomes
    • Lower rates of mobility associated complications
    • Decrease length of mechanical ventilation
    • Decrease length of stay
      – PICU
      – Hospital
PICU Up! Task Force: Champions met weekly for one year

- Physicians
- Nurses
- Nurse practitioners
- Child Life Specialists
- Kennedy Krieger
- Respiratory Therapists
- Physical therapists
- Occupational therapists
- Speech and Language
One year process..

• Identify barriers
• Discuss solutions
• Create draft guidelines
• Pilot the process
• Create the learning module
• Implement!
Program Development: PICU Up! Activity Levels

- Stratified: 3 levels
  - Objective clinical data
    - Severity of illness
    - Behavioral state
    - Premorbid history
  - Criteria to pause activity and reassess
    - Changes in vital signs
    - Changes in LOC
    - Concern for device integrity
    - Behavioral issues

Each level associated with activities

Level 1
- ROM
- Positioning

Level 2
- OOB to chair
- Play in bed
- Consider ambulation

Level 3
- Mat play
- Ambulate
Development of Unit-wide myLearning Module

Patient scenario compatible with delirium module
Shift 1: 7am to 7pm

SBS Chart

Assess Patient

Patient Status

**Shift 1.** Jade is sitting up in bed, interacting with her parents. She is on 3L nasal cannula with oxygen saturation >95%. Parents say that she is at her neurologic baseline. She is on Morphine pca bolus only, and comfortable with this regimen. She does occasionally use Valium prn q 8 hours or so for anxiety.

SBS is 0 Awake (Able to Calm).
## PICU Up! Levels

### Step 1-Screening Process: Early Activity and Mobility Levels

These are the criteria for inclusion at each level of the screening process.

<table>
<thead>
<tr>
<th>LEVEL 1: Parameters for Inclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Intubated with FiO2 &gt;60% or</td>
</tr>
<tr>
<td>• Intubated with PEEP &gt; 8 or</td>
</tr>
<tr>
<td>• Intubated difficult airway or</td>
</tr>
<tr>
<td>• New tracheostomy or</td>
</tr>
<tr>
<td>• Acute neurological event or</td>
</tr>
<tr>
<td>• Sedated and SBS -3 to –2 or</td>
</tr>
<tr>
<td>• Vasopressor other than Milrinone</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LEVEL 2: Parameters for Inclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Intubated or tracheostomy with FiO2 ≤ 60% +/or PEEP ≤8 and SBS -1 to +3 or</td>
</tr>
<tr>
<td>• Noninvasive respiratory support with FiO2 &gt; 60% or</td>
</tr>
<tr>
<td>• Dialysis/Renal Replacement Therapy or</td>
</tr>
<tr>
<td>• Femoral access</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LEVEL 3: Parameters for Inclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Non-invasive respiratory support with FiO2 ≤ 60% or</td>
</tr>
<tr>
<td>• Baseline pulmonary support or</td>
</tr>
<tr>
<td>• EVD cleared by NUS and SBS -1 to +3</td>
</tr>
</tbody>
</table>
Screening is followed by a progression of activities appropriate for the patient’s level.

**Activity Progression: Level 1**
- Lights on/shades up by 0900
- Bed/bath/weight by 2300
- Lights dimmed/out by 2300
- Increase lighting as needed for cares/interventions
- TV limited to 30 min at a time. Goal of < 2 hours per day for children >2 yo
- HOB elevated $\geq 30^\circ$
- Turn q2h daytime and q4h at night
- Positioned in developmentally supportive position or as recommended by OT/PT
- OT consult by PICU day 3
- PT consult as needed

**Activity Progression: Level 2**
- Level 1 activities *plus*
- Positive touch for infants/toddlers
- Sitting up in bed TID
- Team to consider OOB to chair +/- ambulation
- OT/PT consult by PICU day 3
- Assess for difficulty with communication or phonation and consult SLP
- Assess for swallowing readiness in high risk children and consult SLP
- Assess need for daily schedule
- pCAM-ICU BID

**Activity Progression: Level 3**
- Level 1 and 2 activities *plus*
- OOB to chair TID or sitting up in bed TID if appropriate chair is not available
- Ambulate BID if trunk control present
Rest and Reassess

PICU065 Appendix B: Criteria to Pause PICU UP! Activity, Rest and Reassess

- Change in baseline HR by 20%
- Change in baseline BP by 20%
- Change in baseline RR by 20%
- Decrease in baseline SaO2 by 15%
- Increase in baseline FiO2 by 20%
- Increase in baseline ETCO2 by 20%
- Ventilator asynchrony
- CPAP/BiPAP asynchrony
- Respiratory distress
- New arrhythmia
- Hemodynamic concerns
- Change in mental status
- Concern for airway device, vascular access or EVD integrity
- Behavior interfering with safe activity
Exclusions...but no longer

| Excluded from PICU UP! Levels and Activities | • ECMO  
|                                            | • Open chest  
|                                            | • Open abdomen  
|                                            | • Unstable fracture  
|                                            | • Medical orders specifying alternate activity |
Program Evaluation

• Sample
  – Non-probability, convenience
  – Before/After implementation
    • July/August 2014 and July/August 2015
  – Inclusion criteria
    – Ages 1 day to 17 years
    – PICU LOS ≥ 3 days
## Patient Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Pre-implementation (N=100)</th>
<th>Post-implementation (N=100)</th>
<th>P Value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in months, mean (SD)</td>
<td>92.94 (68)</td>
<td>92.92 (66)</td>
<td>0.99</td>
</tr>
<tr>
<td>Weight in kg, mean (SD)</td>
<td>26.8 (19)</td>
<td>27.3 (22)</td>
<td>0.86</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>0.02*</td>
</tr>
<tr>
<td>Male, n</td>
<td>67</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>Female, n</td>
<td>33</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Admission categories</td>
<td></td>
<td></td>
<td>0.26</td>
</tr>
<tr>
<td>Medical, n</td>
<td>58</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Surgical, n</td>
<td>42</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Intubated on admission</td>
<td>39</td>
<td>46</td>
<td>0.32</td>
</tr>
<tr>
<td>Pre-existing conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor impairment, n</td>
<td>29</td>
<td>26</td>
<td>0.63</td>
</tr>
<tr>
<td>Intellectual disability, n</td>
<td>32</td>
<td>27</td>
<td>0.44</td>
</tr>
<tr>
<td>PRISM score, mean (SD)</td>
<td>4.9 (4.4)</td>
<td>5.4 (4.5)</td>
<td>0.36</td>
</tr>
<tr>
<td>PICU LOS, mean (SD)</td>
<td>6.8 (5.4)</td>
<td>7.6 (6.9)</td>
<td>0.34</td>
</tr>
<tr>
<td>PICU Up! level – day 3</td>
<td></td>
<td></td>
<td>0.79</td>
</tr>
<tr>
<td>1, n</td>
<td>7</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>2, n</td>
<td>18</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>3, n</td>
<td>64</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Excluded, n</td>
<td>11</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>
Outcomes

- **Patient Characteristics:** Pre/post implementation sample similar in age, weight, reason for admission, premorbid processes, physiologic status as measured by PRISM scores and PICU LOS.

- **No adverse events including tube dislodgments and vascular device compromise**

- **Barriers**
  - Procedures
  - Change in patient condition
  - Equipment

PCCM 2016
Results

- 59% of children with OT consultation and session by PICU Day 3 after PICU Up! (44% pre; p=0.04)
- 66% with PT consultation vs. 54% (p=0.08)
- 82% of PICU patients had a PT session prior to discharge from PICU vs. 53% (p=0.02)
- Median number of mobilization activities per patient by day 3 doubled from 3 to 6
- No adverse events
# PICU Up! Outcomes

## TABLE 4. Early Mobilization Activities: First 3 Days of PICU Admission

<table>
<thead>
<tr>
<th>Activity (No. of Children Participating in That Activity)</th>
<th>Preimplementation</th>
<th>Postimplementation</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-bed activities (n)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passive range of motion</td>
<td>13</td>
<td>17</td>
<td>0.43</td>
</tr>
<tr>
<td>Passive bed positioning</td>
<td>41</td>
<td>47</td>
<td>0.39</td>
</tr>
<tr>
<td>Splinting</td>
<td>3</td>
<td>9</td>
<td>0.08</td>
</tr>
<tr>
<td>Active range of motion</td>
<td>2 (2)</td>
<td>2 (1)</td>
<td>0.99</td>
</tr>
<tr>
<td>Active bed positioning</td>
<td>26</td>
<td>57</td>
<td>&lt;0.001b</td>
</tr>
<tr>
<td>At least one bed activity</td>
<td>70</td>
<td>98</td>
<td>&lt;0.001b</td>
</tr>
<tr>
<td>Mobility activities (n)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sit edge of bed</td>
<td>6</td>
<td>11</td>
<td>0.20</td>
</tr>
<tr>
<td>Sit to stand</td>
<td>24</td>
<td>30</td>
<td>0.34</td>
</tr>
<tr>
<td>Transfer</td>
<td>48</td>
<td>46</td>
<td>0.77</td>
</tr>
<tr>
<td>Ambulate</td>
<td>15</td>
<td>27</td>
<td>0.04b</td>
</tr>
<tr>
<td>Play</td>
<td>6</td>
<td>3</td>
<td>0.78</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>3</td>
<td>0.31</td>
</tr>
<tr>
<td>At least one mobility activity</td>
<td>63</td>
<td>76</td>
<td>0.05b</td>
</tr>
</tbody>
</table>
# Barriers to Mobilization

<table>
<thead>
<tr>
<th>Barriers to Activities: First 3 Days of PICU Admission</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No. of Times Barrier Reported</strong></td>
</tr>
<tr>
<td>----------------------------------</td>
</tr>
<tr>
<td>Barrier</td>
</tr>
<tr>
<td>Child refused</td>
</tr>
<tr>
<td>Parent refused</td>
</tr>
<tr>
<td>Test/study/procedure/surgery</td>
</tr>
<tr>
<td>Patient condition</td>
</tr>
<tr>
<td>Equipment availability</td>
</tr>
<tr>
<td>Bed rest order</td>
</tr>
</tbody>
</table>

<sup>a</sup>Fisher exact test used for analysis.
### Daily Safety Timeout: Accountability!

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are PT and/or OT consults ordered by Day 3 of admission?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Delirium Screen: (patients ≥ 5 years)</td>
<td>+ / -</td>
<td>n/a</td>
</tr>
<tr>
<td>Daily SBS Goal</td>
<td>SBS</td>
<td></td>
</tr>
<tr>
<td>Daily WAT Goal</td>
<td>WAT</td>
<td></td>
</tr>
<tr>
<td>PICU Up Level</td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Is a communication device needed?</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Breaking down the silos

Early Mobilization
Take home points

• Consistency creates culture change!
• Cluster non-emergent interventions and optimize rehab and communication to promote wakefulness during the day!
• Minimize benzodiazepines and deliriogenic drugs—analgesia first, and…**start low, go slow**!
• Critically ill children CAN tolerate an endotracheal tube and communicate with us!
• Focus on non-pharmacologic therapy
• Push the envelope…safely!
Celebrate all successes, big and small!
Additional free resources:

- www.johnshopkinssolutions.com/solution/amp/
- www.icudelirium.org
Thank you!
sapna@jhmi.edu
@SapnaKmd
@PICU_Up