ICU Delirium in Infants & Children: Cause for Concern or False Alarm

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Objectives

1. Identify 2 validated tools to assess pediatric delirium
2. Recognize treatment options for delirium in pediatric patients
Question 1:
What is the prevalence of ICU delirium in pediatric patients?

A. <15%
B. 20-35%
C. 60-80%
D. 85-100%

Background

• Delirium = fluctuation in awareness & cognition occurring acutely

• Etiologies:
  - Neuroinflammatory hypothesis
  - Neurotransmitter hypothesis
  - Oxidative stress

• 3 types:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyperactive</td>
<td>Agitation, restlessness, combativeness</td>
</tr>
<tr>
<td>Hypoactive</td>
<td>Lethargy, inattention,</td>
</tr>
<tr>
<td>Mixed</td>
<td>Combination of hyperactive &amp; hypoactive</td>
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</tbody>
</table>
Epidemiology & Overview

• Delirium in adults:
  - Prevalence of 60-80% in MV adults
  - ↑ risk of mortality
  - ↑ hospital LOS, time to extubation, & costs
  - ↑ cognitive impairment in survivors

• Delirium in children:
  - Prevalence less understood
  - Lack of validated tool for assessment


MV = Mechanically ventilated
LOS = Length of stay

Pediatric Confusion Assessment Method (pCAM-ICU) Tool

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

2. Inattention
   A. “Squeeze my hand when I say ‘A.’”
   B. Read the following sequence of letters: ABBBBAAAAY
   C. Errors: 5) No squeeze with ‘A’ and 2) Squeeze with letter other than ‘A’.
   D. If unable to complete ASE Letters → ASE Pictures
   - Score ≥ 6
   - STOP
   - NO DELIRIUM

3. Altered Level of Consciousness
   Refer to current RASS (sedation assessment) score
   - RASS score other than 0
   - STOP
   - DELIRIUM PRESENT

4. Disorganized Thinking
   A. Is sugar sweet? (Alternately: Is a rock hard?)
   B. Is ice cream hot? (Do rabbits fly?)
   C. Do birds fly? (Is ice cream cold?)
   D. On an elephant bigger than an elephant? (Is a giraffe smaller than a mouse?)
   E. Comment: “Hold up these many fingers.” (Hold up 2 fingers.)
   F. Or: “Add one more finger.” (If patient unable to move both arms.)
   - Score ≤ 4
   - STOP
   - DELIRIUM PRESENT

   - Score ≥ 4
   - NO DELIRIUM

Preschool Confusion Assessment Method (psCAM-ICU) Tool

Cornell Assessment of Pediatric Delirium (CAPD)

RASS Score ______ (if -4 or -5 do not proceed)

Please answer the following questions based on your interactions with the patient over the course of your shift.

<table>
<thead>
<tr>
<th>Question</th>
<th>Never (4)</th>
<th>Rarely (3)</th>
<th>Sometimes (2)</th>
<th>Often (1)</th>
<th>Always (0)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does the child make eye contact with the caregiver?</td>
<td></td>
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<tr>
<td>2. Are the child’s actions purposeful?</td>
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<tr>
<td>3. Is the child aware of his/her surroundings?</td>
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<tr>
<td>4. Does the child communicate needs &amp; wants?</td>
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<td>5. Is the child restless?</td>
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<tr>
<td>6. Is the child inconsolable?</td>
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<td></td>
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<tr>
<td>7. Is the child underactive—very little movement while awake?</td>
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<tr>
<td>8. Does it take the child a long time to respond to interactions?</td>
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</tbody>
</table>

TOTAL

Scored at *end* of nursing shift; Delirium ≥9
Delirium Point Prevalence (n=835)

- Delirium free: 62%
- Comatose: 25%
- Delirious: 13%

Median Prevalence rate 23.3% (IQR 20.0-35.4%, p=0.038)


Single Center Evaluation*

- 78% developed delirium within 3 days
- Delirium lasted median 2 days (IQR 1-5)
- Delirium types:
  - Hypoactive: 45%
  - Mixed: 9%
  - Hyperactive: 46%

  • ↑ PICU LOS, OR 2.3, CI: 2.1-2.5%
  • ↑ Mortality: OR 4.39, CI: 1.96-9.99%

*1547 patients (17% delirium prevalence)

IQR = Interquartile range

**Question 1:**
What is the prevalence of ICU delirium in pediatric patients?

A. <15%
B. 20-35%
C. 60-80%
D. 85-100%

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**Question 2:**
Which of the following are recommended treatment and/or prevention of pediatric delirium?

A. Haloperidol
B. Lorazepam
C. Melatonin
D. Quetiapine
Risk Factors

<table>
<thead>
<tr>
<th>Age &lt; 2 years</th>
<th>Cardiac bypass surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental delay</td>
<td>Immobilization</td>
</tr>
<tr>
<td>High severity of illness</td>
<td>↑ LOS</td>
</tr>
<tr>
<td>↓ albumin</td>
<td>Restraints</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>Medications:</td>
</tr>
<tr>
<td>Pre-existing medical conditions</td>
<td>• Anticholinergic agents</td>
</tr>
<tr>
<td></td>
<td>• Benzodiazepines</td>
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<tr>
<td></td>
<td>• Opioids</td>
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<tr>
<td></td>
<td>• Vasopressors</td>
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</tbody>
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LOS = Length of stay

Suggested Treatment Algorithm

**Step 1: Underlying disease:**
- Assess infection
- Address hypoxemia
- Optimize pain control
- Correct metabolic abnormalities

**Step 3: Environmental Modification:**
- Early mobilization
- Cognitive stimulation
- Clustered care
- Sleep hygiene

**Step 2: Iatrogenic factors:**
- ↓ sedation
- Recognize & treat drug withdrawal
- Avoid restraints
- Review medications

**Step 4: Pharmacologic:**
- Dexmedetomidine
- Atypical antipsychotics
Quetiapine Retrospective Study*

<table>
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<th>Variable</th>
<th>Number (%) or Median (Range)</th>
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<tr>
<td>Dosage (mg/kg/day)</td>
<td>1.3 (0.4-2.3)</td>
</tr>
<tr>
<td>Duration (days)</td>
<td>12 (4.5-22)</td>
</tr>
<tr>
<td>Number of doses:</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2428</td>
</tr>
<tr>
<td>Children &lt; 2 years</td>
<td>953 (39.3%)</td>
</tr>
</tbody>
</table>

- No cases of EMS or EPS
- 3 (6.7%) with QTc prolongation
- No torsade de pointes

*n = 45

NMS = Neuroleptic malignant syndrome
EPS = Extrapyramidal symptoms


Question 2:
Which of the following are recommended treatment and/or prevention of pediatric delirium?

A. Haloperidol
B. Lorazepam
C. Melatonin
D. Quetiapine
Conclusions

- Delirium responsible for ↑’ed complications
- Prevalence of 20-35% of children
- Assessment:
  - pCAM-ICU
  - psCAM-ICU
  - CAPD
- Prevention/Treatment:
  - Prevention
  - Dexmedetomidine & quetiapine*

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