PICU Sedation Holidays

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PICU Sedation Holidays

Objectives

1. Define sedation holiday.
2. Review differences between adult and pediatric sedation in ICU
2.- Review sedation strategies for pediatric critically ill mechanically ventilated patients.
Analgesia and Sedation in pediatric critically ill patients is complex, risky, and difficult to achieve.

Necessary in order to achieve certain goals:
- Mechanically ventilation support/asynchrony
- Decrease metabolic rate/WOB and energy expenditure
- Protect patients from dislodging vital monitor devices and life sustaining devices (ETT, EVD, arterial lines, abdominal drains, chest tubes, epicardial wires and others.)
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Sedation Holiday: involves stopping the sedative infusions and allowing the patient to wake up. The infusion should only be resumed once the patient is fully awake and able to follow commands or until the become uncomfortable or agitated. Ideally should be performed in a daily basis; this strategy has been proven to reduce MV days and LOS in adult ICU without increasing adverse events.
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Is it practical, feasible, safe, and realistic to do sedation Holidays in critically ill-mechanically ventilated pediatric patients???????????

Maybe
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Children are not small adults....
Major differences in the sedation arena are neuro-developmental (agitation perception of pain, perception of body image vs objects). 2 speeds: Off and On.

Sedation neuroapoptosis effects in developmental brain

Physiologic differences. (pharmacokinetics, volume of distributions, drug drug interactions)

Difficult IV access.

Nursing staffing ratios

Cohort of care/bundled care.
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• The perfect sedation strategy for mechanically ventilated children would be:

  No side effects. No cardiac toxicity, no adrenergic toxicity, no risk for tachy and anaphylaxis.

  Genomic tailored therapy, predictable, and reliable – easy to titrate.

  Immediate recovery, and minimal or no risk for delirium or withdrawal.

  No negative neurodevelopmental effects

  Cost effective
153 PICU patients observation group, 166 intervention group.
Inclusion: nb to 21 years, sedation for more than 2 days
Exclusion: ECMO, seizures, NMB paralytics, death, solid organ tx.
Results: less morphine and lorazepam and less total sedation in intervention group
MV, LOS trended to be less in intervention group but not stat significant.
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Seattle comfort score

Figure 2. Seattle Pediatric Intensive Unit (PICU) Comfort Score.
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- Developed a nursing driven protocol
- Increase awareness and define goals for sedation
- Increase and reinforce education
- Identify limitations and deal with them systematically
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Randomized controlled trial of interrupted versus continuous sedative infusions in ventilated children

Kunal Gupta, MD; Vipul K. Gupta, MD, DNB; Jayashree Muralindharan, MD; Sunit Singhi, MD

Pediatr Crit Care Med 2012 Vol. 13, No. 2

- 56 versus 46 picu patients. Randomized to intermittent or continuous sedation group.
- Intermittent group stop sedation at 8:00 am and cut dose by half
- Continuous group stopped when ever physician wanted
## Table 2. Continuous versus intermittent sedation: Primary and secondary outcomes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Continuous (n = 56)</th>
<th>Intermittent (n = 46)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of mechanical ventilation (days), mean ± sd (95% CI)</td>
<td>10.3 ± 8.4 (8.04–12.58)</td>
<td>7.1 ± 4.8 (5.63–8.46)</td>
<td>.021&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Number of days awake, mean ± sd (95% CI)</td>
<td>2.3 ± 4.7 (1.01–3.53)</td>
<td>3.7 ± 3.9 (2.54–4.58)</td>
<td>.103</td>
</tr>
<tr>
<td>Percentage of awake days, mean ± sd (95% CI)</td>
<td>61.1 ± 38 (50.80–71.32)</td>
<td>78.8 ± 19.3 (73.02–84.47)</td>
<td>.005&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Duration of pediatric intensive care unit stay (days), mean ± sd (95% CI)</td>
<td>14.1 ± 9.8 (11.38–16.69)</td>
<td>10.7 ± 6.1 (8.89–12.51)</td>
<td>.048&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Total dose of midazolam (mg/kg/day), mean ± sd (95% CI)</td>
<td>11.0 ± 6.9 (9.08–12.82)</td>
<td>7.1 ± 4.7 (5.68–8.47)</td>
<td>.002&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Total cost of midazolam (rupees), mean ± sd (95% CI)</td>
<td>13865 ± 25338 (7015–20715)</td>
<td>4827 ± 5445 (3210–6444)</td>
<td>.020&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Adverse events, n (%)</td>
<td>8 (14.3)</td>
<td>6 (13.0)</td>
<td>.86&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Pneumothorax, n (%)</td>
<td>7 (12.5)</td>
<td>5 (10.9)</td>
<td>.79&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Spontaneous extubation, n (%)</td>
<td>1 (1.8)</td>
<td>1 (2.2)</td>
<td>.88&lt;sup&gt;b&lt;/sup&gt;</td>
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CI, confidence interval.
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Figure 1. Duration of mechanical ventilation.

Figure 2. Duration of pediatric intensive care unit (PICU) stay. LOS, length of stay.
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What to do? .... ...and more important ... What not to do?
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- PICU pathway for sedation of mechanically ventilation CHOP...a step forward.....June 2014
- Based on studies mentioned before
- Has pathway for < 48hr and > 48hr
Sedation/Analgesia, PICU, Mechanically Ventilated Patient - Clinical Pathway: Inpatient

Intubated Patient in PICU

**Inclusion Criteria**
- This pathway can guide the use of sedation / analgesia for all intubated patients in the PICU.

**Exclusion Criteria**
- Patients receiving continuous paralytics
- Status Epilepticus
- Increased ICP
- Traumatic Brain Injury with a target goal of burst suppression
- Brain Death
- End of Life/Comfort Care
- Patients > 100kg (Please page 11548 Clinical Pharmacy for infusion recommendations)
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PICU Pathway for Sedation/Analgesia in the Mechanically Ventilated Patient

Goals and Metrics

PICU Sedation/Analgesia in the Mechanically Ventilated Patient

Intubated Patient in PICU — Delirium

Start SRS and Age Appropriate Pain Scale Assessment

Review Pain Scales

Expected Length of Intubation < 48 hours

Expected Length of Intubation ≥ 48 hours

Short Term — All Ages

Patients < 50 kg

Patients ≥ 50 kg

FLACC

Term NB – 7 yrs

FACESE

≥ 3 yrs, able to self-report

Numeric Rating Scale

> 5 years

SRS

Ready for Extubation

Sedation Pathway Quick Links

Sedation:

- Weight Based Dosage Guidelines for Patients ≥ 50 kg
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**Initiation**

- **Patient with Expected Length of Intubation < 48 Hours**
  - **Set SBS Goal**
    - Initiate Opioid (Fentanyl) Infusion

**PRN SBS Management (Hour 0-4)**
- **0-4 Hour**
  - PRN opioid (fentanyl) available q 30m
  - Additional Benzodiazepine (Lorazepam) x 1 per FLOC

- **Enter Sedation Maintenance Phase After 4 hours**

**Maintenance**

- **SBS > Goal Under-Sedated**
  - Consider reversible causes
  - Vent dysrhythmia
  - Reassessment and trialing
  - Non-pharmacologic interventions

- **Assess SBS, Pain Score every 4 hours and PRN**
  - Assess appropriateness of SBS goal daily & PRN

- **SBS < Goal Over-Sedated**

- **SBS = Goal**

- **SBS < Goal for 8 hours**
  - 1. Contact FLOC
  - 2. Consider decreasing infusion rate by 20%

- **Pain Present**
  - PRN Opioid

- **Anxiety Present**
  - PRN Benzodiazepine

- **If >3 non-procedural PRNs of either agent are administered within 8 hours, contact FLOC for indication specific intervention**

  - **Pain**
    - Consider increasing fentanyl infusion by 0.5 mcg/kg/hr

  - **Anxiety**
    - Consider lorazepam 0.1 mg/kg/dose or dexmedetomidine
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**Main Pathway:**
PICU Pathway for Sedation/Analgesia
in the Mechanically Ventilated Patient

Patients with an Expected Length of Intubation < 48 Hours

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<th>Medication Infusion — Initial Doses</th>
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<td>PRN Doses</td>
<td>PRN Fentanyl 1mcg/kg 1q30min IV PRN PRN Lorazepam 0.05-0.1mg/kg IV q4h PRN</td>
<td>MAX starting dose: 50mcg MAX starting dose: 4mg</td>
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<td>Selection of PRN agent is based on pain</td>
<td>Pain Present Opioid (Fentanyl) No Pain Benzodiazepine (Lorazepam)</td>
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IV Wean Plans for Patients Unable to Tolerate Enteral Sedation

5-9 days (consider for High risk <5 days)

- Assign Day 0 to threshold dose (≤) for each agent
- Calculate 10% of Day 0 continuous infusion opioid and/or benzodiazepine dose(s)
- Wean opioid infusion by 10% of Day 0 dose every 12 hours
- Wean benzodiazepine infusion by 10% of Day 0 dose every 12 hours
- For patients on opioid and benzodiazepine infusions, wean every 6 hours in an alternating fashion
- *Total wean should take about 5 days
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### Enteral Weaning Plans

5-9 days (consider for High risk <5 days)

- Initiate opioid and benzodiazepine wean on the same day to allow for concurrent daily weans
- Calculate 20% of initial opioid and benzodiazepine doses (Day 0) = increment for stepwise dose weaning
- Wean BOTH opioid and benzodiazepine every 24h by 20% of day 0 doses
- Once ≤ the lowest starting dose is reached, space opioid and benzodiazepine frequencies in a daily stepwise fashion until off

(I.e. q4h → q6h → q8h → q12h → OFF)

### Lowest Starting Doses for PO Agents

<table>
<thead>
<tr>
<th>Medication</th>
<th>Lowest starting dose (&lt;50kg) mg/kg PO</th>
<th>Lowest starting dose (&gt;50kg) mg PO</th>
</tr>
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<tbody>
<tr>
<td><strong>Opioids</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphine</td>
<td>0.15 mg/kg/dose PO</td>
<td>7.5 mg PO</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>0.03 mg/kg/dose PO</td>
<td>2 mg PO</td>
</tr>
<tr>
<td>Meperidine</td>
<td>0.05 mg/kg/dose PO</td>
<td>2.5 mg PO</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>0.1 mg/kg/dose PO</td>
<td>5 mg PO</td>
</tr>
<tr>
<td><strong>Benzodiazepines</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diazepam</td>
<td>0.05 mg/kg/dose PO</td>
<td>2.5 mg PO</td>
</tr>
<tr>
<td>Lorcazepam</td>
<td>0.05 mg/kg/dose PO</td>
<td>2.5 mg PO</td>
</tr>
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*Total wean should take about 5-9 days
*Methadone is not recommended for short term weans over 5-9 days
Transitioning from Continuous IV Sedation to Intermittent PO regimen

**IV to PO Opioid**

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<td>Step 1</td>
<td>Start PO opioid agent at dose calculated <a href="#">Conversion from IV to PO Opioid</a></td>
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<tr>
<td>Step 2</td>
<td>Wean opioid infusion by 50% 30 minutes after the 2nd PO opioid dose</td>
</tr>
<tr>
<td>Step 3</td>
<td>Turn opioid infusion off 30 minutes after the 3rd PO opioid dose</td>
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**IV to PO Benzodiazepine**

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<tr>
<td>Step 1</td>
<td>Start PO benzodiazepine agent at dose calculated <a href="#">Conversion from IV to PO Benzodiazepines</a></td>
</tr>
<tr>
<td>Step 2</td>
<td>Wean benzodiazepine infusion by 50% 30 minutes after the 1st PO benzodiazepine dose</td>
</tr>
<tr>
<td>Step 3</td>
<td>Turn benzodiazepine infusion off 30 minutes after the 2nd PO benzodiazepine dose</td>
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Conclusion

There is evidence that comprehensive sedation strategies in children, can potentially replicate sedation holiday strategies in adults in a safe and beneficial way for peds patients.

Nursing driven protocols are necessary to achieve sedation goals in Pediatrics.

Choosing patient populations is a must for successful sedation strategies in pediatrics. Monitor metrics are absolutely necessary to assure success.
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“Success demands singleness of purpose”

Vince Lombardi
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Questions?????
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