Evaluation of 10 Day Low Dose Dexamethasone Course for Ventilator Wean/Bronchopulmonary Dysplasia (BPD) in Neonatal ICU

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• In 2010 new AAP policy statement released on use of postnatal corticosteroids for ventilator weaning/BPD
  • Recommended against use of high dose dexamethasone
  • Short-term adverse effects (hyperglycemia, hypertension)
  • Worse neurodevelopmental outcomes (cerebral palsy)

Watterberg, Kristi; Committee on Fetus and Newborn. Postnatal corticosteroids to prevent or treat bronchopulmonary dysplasia.” *Pediatrics* 2010;126:800-808.
At that time, NICU used a 3-7 day course of high dose dexamethasone for ventilator weaning/BPD:

- **0.3 - 0.5 mg/kg/day**
- **1.2 - 2.7 mg/kg/course**

* LUMC data from Jan 2010 – Dec 2010
AIM Statement

- Introduce new steroid ventilator weaning/BPD dosing regimen
  - To decrease steroid exposure
    - Limit dexamethasone dose to < 0.2mg/kg/day
    - Lessen overall dexamethasone exposure (dose/kg/course)
  - Maintain similar safety and efficacy
    - Uphold current levels of successful vent weaning
    - Maintain present extubation rates
    - Minimize side effects associated with corticosteroids: elevated mean arterial pressure (MAP), hyperglycemia, and adverse neurodevelopmental effects
NICU Therapeutics Committee (multidisciplinary) met to review literature on low dose steroid regimens for vent wean/BPD

10-day low dose dexamethasone course discussed and accepted at NICU Division Meeting among attendings and staff

Educated staff including neonatal nurses, residents, NNPs, respiratory, and pharmacy on new dosing protocol

Utilized EPIC medication ordering screens to assist with implementation, guide dosing, and avoid errors
July 2011: Implemented 10-day low dose dexamethasone course for ventilator weaning/BPD
Results

- Patient Demographics

<table>
<thead>
<tr>
<th></th>
<th>Patients (n)</th>
<th>Courses (n)</th>
<th>GA at birth (wks)</th>
<th>Birth Weight (g)</th>
<th>Maternal Steroid</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Dose-Baseline</strong>&lt;br&gt;1/10 -12/10</td>
<td>17</td>
<td>27</td>
<td>23-29 (25.1)</td>
<td>440-1060 (745)</td>
<td>16 (94%)</td>
</tr>
<tr>
<td><strong>Low Dose Cycle 1</strong>&lt;br&gt;7/11 – 4/12</td>
<td>16</td>
<td>19</td>
<td>23-28 (24.4)</td>
<td>480-960 (697)</td>
<td>9 (56%)</td>
</tr>
<tr>
<td><strong>Low Dose Cycle 2</strong>&lt;br&gt;5/12 – 5/13</td>
<td>10</td>
<td>10</td>
<td>23-26 (24.4)</td>
<td>380-870 (589)</td>
<td>9 (90%)</td>
</tr>
</tbody>
</table>

- Adherence to Vent Wean/BPD Steroid Protocol
  - Cycle 1: 95% adherence
  - Cycle 2: 80% adherence
  - No patients received ≥ 0.2 mg/kg/day dexamethasone
Results

Efficacy of Ventilator Weaning

- Wean FiO₂:
  - High Dose Baseline: 81%
  - Low Dose Cycle 1: 74%
  - Low Dose Cycle 2: 81%

- Extubated:
  - High Dose Baseline: 90%
  - Low Dose Cycle 1: 78%
  - Low Dose Cycle 2: 80%

- ReIntubated:
  - High Dose Baseline: 100%
  - Low Dose Cycle 1: 24%
  - Low Dose Cycle 2: 0%

- Multiple Courses:
  - High Dose Baseline: 47%
  - Low Dose Cycle 1: 19%
  - Low Dose Cycle 2: 0%
Results (combined data)

Efficacy of Ventilator Weaning

- Wean FiO₂: 81% (High Dose), 79% (Low Dose)
- Extubated: 78% (High Dose), 88% (Low Dose)
- Reintubated: 24% (High Dose), 8% (Low Dose)
- Multiple Courses: 47% (High Dose), 12% (Low Dose)
Results

Occurrence of Side Effects

*MAP remained within normal limits for age except for patients requiring treatment.
Analysis of Results

- **Overall adherence to new protocol**
  - 90% followed exact protocol
  - 10% minor deviations

- **Low dose vs. high dose dexamethasone**
  - Similar efficacy with ventilator weaning/BPD
  - No increase in reintubation rates
  - Fewer patients required multiple courses of steroids
  - Similar occurrence rates of hyperglycemia and increased MAP requiring treatment

- **Dexamethasone exposure decreased by 30-60%**
  - 1.2-2.5mg/kg per course to 0.89mg/kg per course
Lessons Learned

• System-based
  • Obtaining agreement from all attending physicians to utilize new protocol and reinforcement of dosing by the EPIC ordering screens enhances the ability for protocols to be followed successfully

• Efficacy
  • Low dose dexamethasone course led to similar extubation rates and potentially lower reintubation rates as compared to our baseline high dose dexamethasone course
Lessons Learned

• Safety
  • Patients receiving low dose dexamethasone had a higher incidence of increased MAP but all blood pressures were still within normal limits for age

• Fewer patients receiving the low dose dexamethasone course required multiple treatment courses, further limiting excessive exposure to corticosteroids
Next Steps

- Plan to continue use of AAP recommended low dose dexamethasone courses for ventilator weaning/BPD
- In the future we may transition neonatal ventilator weaning/BPD treatment to hydrocortisone
  - Limited studies demonstrate decreased adverse neurodevelopmental outcomes and successful ventilator weaning/BPD treatment with low dose hydrocortisone
Questions?