Evaluation of a standardized order set for the treatment of Neonatal Abstinence Syndrome (NAS)

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Financial Disclosure

• The speaker of this presentation declares no conflicts of interest and no financial relationships to disclose.

Educational Objectives

• Describe Neonatal Abstinence Syndrome (NAS) and current methods of management
• Compare the results of data collection before and after an NAS order set implementation

BACKGROUND

What is NAS?

• Postnatal drug withdrawal
  – Most often caused by opiates
• Signs and Symptoms:
  – Preterm birth
  – Low birth weight
  – Feeding difficulties
  – Increased incidence of seizures
• Long-term Outcomes:
  – Hypertonicity
  – Generalized motor delay
  – Impaired neurodevelopment

Scoring

• Finnegan Neonatal Abstinence Scoring
  – Modified Finnegan endorsed by American Academy of Pediatrics (AAP)
  – Based on 21 items in 3 categories
    • Central nervous system disturbances
    • Metabolic/Vasomotor/Respiratory disturbances
    • Gastrointestinal disturbances
  – Maximum score: 45


Treatment

• Non-pharmacologic measures
• Pharmacologic Therapy
  – Oral morphine
  – Oral methadone
• Adjunct pharmacologic therapy
  – Phenobarbital
  – Clonidine

STUDY


Study Setting

• The Children’s Hospital at Saint Francis
• Tulsa, Oklahoma
• 162 bed pediatric facility
• 58 bed Level IV Neonatal Intensive Care Unit (NICU)
• 6 neonatologists
• Approximately 850 neonates admitted annually

Purpose

• Ascertain the effectiveness of a standard algorithm to aid neonatologists in dose adjustment and weaning
• Implementation of this order set was hypothesized to decrease:
  – duration of morphine therapy
  – length of stay

Study Design

• Retrospective
• Descriptive
• Inclusion Criteria
  – ICD-9 diagnosis code of NAS
  – Patient was treated with morphine
  – Treatment initiated and completed in the NICU at The Children’s Hospital at Saint Francis
  – Treated within the range of July 1, 2011 – June 30, 2014
• Exclusion Criteria
  – Diagnosis of iatrogenic narcotic dependency
  – Initiated on treatment outside of the NICU at The Children’s Hospital at Saint Francis
  – Not treated with morphine
  – Discharged on morphine

Pre-Implementation Chart Review
• 50 patients admitted from 07/01/2011-06/30/2013
• Prior to NAS order set implementation

Order Set Implementation 07/01/2013
• NAS scoring based on hospital policy
• Morphine initiation, dosing, and weaning per order set
• Addition of phenobarbital and/or clonidine as per order set

Post-Implementation Chart Review
• 50 patients admitted from 07/01/2013-06/30/2014
• Using standardized NAS order set
RESULTS

INCIDENCE AT SAINT FRANCIS HOSPITAL

<table>
<thead>
<tr>
<th>Year</th>
<th>NAS diagnosis nationally</th>
<th>NAS at Saint Francis Hospital</th>
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</thead>
<tbody>
<tr>
<td>2000</td>
<td>1.20 / 1000</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>3.39 / 1000</td>
<td></td>
</tr>
<tr>
<td>FY 2012</td>
<td>1.91 / 1000</td>
<td></td>
</tr>
<tr>
<td>FY 2013</td>
<td>4.29 / 1000</td>
<td></td>
</tr>
<tr>
<td>FY 2014</td>
<td>2.94 / 1000</td>
<td></td>
</tr>
</tbody>
</table>
Pre-Implementation Data

- Patients admitted to the NICU from July 1st, 2011 – June 30th, 2013
- Neonatal patients diagnosed with NAS
- 52 patients screened
  - 30 patients excluded
  - 22 patients enrolled

<table>
<thead>
<tr>
<th>N</th>
<th>Exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Never treated with morphine</td>
</tr>
<tr>
<td>4</td>
<td>Discharged home on morphine</td>
</tr>
<tr>
<td>3</td>
<td>Diagnosis of iatrogenic narcotic dependency</td>
</tr>
<tr>
<td>2</td>
<td>Patient born outside of the inclusion time-frame</td>
</tr>
<tr>
<td>1</td>
<td>Missing chart information</td>
</tr>
</tbody>
</table>

Post-Implementation Data

- Patients admitted to the NICU from July 1st, 2013 – June 30th, 2014
- Neonatal patients diagnosed with NAS
- 37 patients screened
  - 20 patients excluded
  - 17 patients enrolled

<table>
<thead>
<tr>
<th>N</th>
<th>Exclusion</th>
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</thead>
<tbody>
<tr>
<td>37</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Never treated with morphine</td>
</tr>
<tr>
<td>3</td>
<td>Diagnosis of iatrogenic narcotic dependency</td>
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<tr>
<td>3</td>
<td>Patient was started on morphine outside the NICU</td>
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<tr>
<td>2</td>
<td>Patient born outside of the inclusion time-frame</td>
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<tr>
<td>1</td>
<td>Patient expired in the NICU</td>
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<tr>
<td>1</td>
<td>Patient was treated outside the NICU</td>
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</table>

Results

INTRAUTERINE EXPOSURE

<table>
<thead>
<tr>
<th></th>
<th>Pre-Implementation (N=22)</th>
<th>Post-Implementation (N=17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opiates</td>
<td>% N</td>
<td>% N</td>
</tr>
<tr>
<td>Methadone</td>
<td>86.3 19</td>
<td>82.3 16</td>
</tr>
<tr>
<td>Methadone Derivatives</td>
<td>31.8 7</td>
<td>47.1 8</td>
</tr>
<tr>
<td>Amphetamines Derivatives</td>
<td>13.6 3</td>
<td>5.9 1</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>9.1 2</td>
<td>17.6 3</td>
</tr>
<tr>
<td>Barbiturates</td>
<td>4.5 1</td>
<td></td>
</tr>
<tr>
<td>Antipsychotics</td>
<td>9.1 2</td>
<td>17.6 3</td>
</tr>
<tr>
<td>Heroin</td>
<td>4.5 1</td>
<td></td>
</tr>
<tr>
<td>Cocaine</td>
<td>4.5 1</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>18.2 4</td>
<td>47.1 8</td>
</tr>
<tr>
<td>Unknown</td>
<td>4.5 1</td>
<td>5.9 1</td>
</tr>
</tbody>
</table>

DAYS OF MORPHINE THERAPY

<table>
<thead>
<tr>
<th></th>
<th>Pre-Implementation</th>
<th>Post-Implementation</th>
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<tbody>
<tr>
<td>Mean</td>
<td>14.3</td>
<td>14.9</td>
</tr>
<tr>
<td>Median</td>
<td>13.5</td>
<td>11.8</td>
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</table>

LENGTH OF STAY

<table>
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<tr>
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<th>Pre-Implementation</th>
<th>Post-Implementation</th>
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</thead>
<tbody>
<tr>
<td>Mean</td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td>Median</td>
<td>21</td>
<td>21</td>
</tr>
</tbody>
</table>

TOTAL CUMULATIVE MORPHINE DOSE

<table>
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<tr>
<th></th>
<th>Pre-Implementation</th>
<th>Post-Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.36</td>
<td>2.21</td>
</tr>
<tr>
<td>Median</td>
<td>1.17</td>
<td>1.17</td>
</tr>
</tbody>
</table>

mg/kg
Results
FINNEGAN SCORES

<table>
<thead>
<tr>
<th></th>
<th>Pre-Implementation</th>
<th>Post-Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>6.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Median</td>
<td>5.7</td>
<td>5.8</td>
</tr>
<tr>
<td>Range</td>
<td>0-25</td>
<td>0-22</td>
</tr>
</tbody>
</table>

Conclusions

- No clinically significant impact on number of morphine days or length of stay
- Decreased median total cumulative morphine dose
- Increased mean total cumulative morphine dose
  - Increased utilization of maximum dose
  - More frequent dosing

Conclusions

- Average Finnegan NAS Score was lower in post-implementation group
  - Wider range of scores in pre-implementation group
- Average Finnegan NAS Scores during treatment period for post-implementation group were slightly higher than overall scores

Limitations

- Small sample size
- Subjectivity of Finnegan NAS scoring tool
- Order set compliance
- Change in neonatologists
Future Applications

• Results were compared to pre-implementation data and will be presented to the neonatologists and nursing staff

• Re-educate neonatologists and nursing staff
  – Variations in treatment since Epic implementation

• Reevaluate parameters
  – Initiation
  – Stabilization
  – Weaning

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References


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