Disclosure

• I have no financial or other conflicts of interest.

• The OPQC NAS Project is funded by the Ohio Department of Medicaid and administered by the Ohio Colleges of Medicine Government Resource Center.

• The views expressed are solely those of the authors and do not represent the views of the state of Ohio or Federal Medicaid programs.
Governor’s Challenge Grant
STEP One

• 2012: Gov Kasich challenged 6 Ohio Childrens Hospitals to work together on research to improve care.

• Projects chosen-
  - Neonates: Narcotic Abstinence Syndrome
  - Pediatrics: Asthma

* Deaths per 100,000 population; age-adjusted to the 2000 U.S. standard population using the bridge-race estimates.
First Step:

- Compare treatments and outcomes of full term infants with NAS treated at the 6 Childrens hospitals and their affiliated nurseries.
- Hypothesized: A potentially better protocol would emerge that could then be tested.
Infant Treatments

Drug 1

Drug 2

Drug 3

May 24 2013
## Infant Treatment

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms Started (hours; Mean)</td>
<td>46</td>
</tr>
<tr>
<td>Treatment Length (days; Mean)</td>
<td>18.5</td>
</tr>
<tr>
<td>Hospital Stay (days; Mean)</td>
<td>22.2</td>
</tr>
<tr>
<td>Number of Drugs Used (Mean)</td>
<td>1.5</td>
</tr>
<tr>
<td>Drugs used</td>
<td></td>
</tr>
<tr>
<td>Morphine</td>
<td>50%</td>
</tr>
<tr>
<td>Methadone</td>
<td>49%</td>
</tr>
</tbody>
</table>
Differences by Site

Days

CENTERS

A  B  C  D  E  F

Treatment
Stay
Poly Exposures

(272 with illegal co-exposure)
Multiple Simultaneous Withdrawals

82% Exposed to tobacco
- Average cotinine level by cord analysis 135 ng
- Maximum = 270
- Average US Adult Smoker= 100 ng

10% Exposed to SSRI or Benzodiazepine
- Known withdrawal syndromes
Differences by Drug

![Bar chart showing days and differences by drug for different centers.](chart.png)
# OCHA Protocol

## Initiate (modified Finnegan Scoring)

<table>
<thead>
<tr>
<th>NAS score</th>
<th>Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 8 q3h two times</td>
<td>NAS score &gt; 8 q3h two times</td>
</tr>
<tr>
<td>&gt; 12 one time</td>
<td>&gt; 12 one time</td>
</tr>
</tbody>
</table>

## Pharmacologic Bundle

<table>
<thead>
<tr>
<th>Drug</th>
<th>Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine/Methadone</td>
<td>Drug: Morphine/Methadone</td>
</tr>
<tr>
<td>0.05 mg/kg PO</td>
<td>0.05 mg/kg PO</td>
</tr>
</tbody>
</table>

## Escalate

If ≥ 12, increase dose

## Stabilize

No increase for 48 hrs.

## Wean

10% of max dose daily; see protocol weaning schedule examples

## Discharge

48 hours off Morphine
72 hours off Methadone

---

Moving Towards a Standardized Approach
Impact of Protocol

Pilot Hospital #1

Consecutive Patients

Treatment Days
Modified Finnegan Score

- Circa 1976
- ID symptoms for tool from literature and clinical experience
- Symptoms ranked by pathological significance
- Initial tool composed of 32 weighted items
Modified Finnegan Tool

- 21 original items
- Reorganized into 3 categories:
  - CNS, GI and metabolic
- Same scoring process and cut-off points for RX treatment

Validation Studies

- None found.
- Used by significant majority of NICUs
- Also referenced as the Finnegan Neonatal Abstinence Scoring Tool (FNAST), the modified Finnegan scoring system (MFSS), etc.

**How many other “modified” tools are out there?**
Impact of Tool

- Decreased need for pharmacological management (30% versus 46%) compared to no scoring system.
- Decreased duration of treatment (6 versus 8 days)
- Reduced hospital stay by 25%
Current Neonatal Strategies

- First line: opiate - generally morphine
- Methadone: ? Concern for pharmacokinetics, and arrhythmia?

Osborn, et al Cochrane Database, 2010
When “max” opiate dose reached

<table>
<thead>
<tr>
<th></th>
<th>Opiate + Pheno</th>
<th>Opiate alone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Score&gt; 8(%)</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td>Duration Hosp (d)</td>
<td>35 ± 21</td>
<td>76 ± 22</td>
</tr>
<tr>
<td>Max Dose</td>
<td>4.7</td>
<td>16.8</td>
</tr>
<tr>
<td>Costs ($US1000)</td>
<td>33.3 ± 17.9</td>
<td>69.2 ± 19.7</td>
</tr>
</tbody>
</table>

Osborn, Cochrane Review, 2010
Knowledge Gaps:

- Size of epidemic.
- Optimal treatment strategies, including drug, dose, safety, side effects due to differences in neonatal metabolism.
- Impact of poly substance use on severity of NAS
- Differences in outcome for different maternal treatment strategies
- Safety of treatment as outpatient
- Long term outcomes of children exposed to narcotics in utero
OPQC: Spread Potentially better protocol across state

- 52 of 54 (96%) Ohio NICUs participated.
- 3266 opioid exposed infants identified and 48% received pharmacologic treatment.
- Compliance with non-pharmacologic bundle improved from 37% to 58% and the pharmacologic bundle improved from 59% to 68%.
- Regardless of opioid used the length of treatment and length of stay decreased.
Statewide Spread: Participating Sites

2014

1/2014 start Level 3 and Level 2 teams
4/2014 start Level 2 teams
**GLOBAL AIM**

To reduce the number of moms and babies with narcotic exposure, and reduce the need for treatment of NAS.

**SMART AIM**

By increasing identification of and compassionate withdrawal treatment for full-term infants born with Neonatal Abstinence Syndrome (NAS), we will reduce length of stay by 20% across participating sites by June 30, 2015.

**KEY DRIVERS**

- Prenatal Identification of Mom
- Implement Optimal Med Rx Program
- Improve recognition and non-judgmental support for Narcotic addicted women and infants
- Attain high reliability in NAS scoring by nursing staff
- Optimize Non-Pharmacologic Rx Bundle
- Standardize NAS Treatment Protocol
- Connect with outpatient support and treatment program prior to discharge
- Partner with Families to Establish Safety Plan for Infant
- Partner with other stakeholders to influence policy and primary prevention.

**INTERVENTIONS**

- All MD and RN staff to view “Nurture the Mother- Nurture the Child”
- Monthly education on addiction care
- Fulltime RN staff at Level 2 and 3 to complete D’Apolito NAS scoring training video and achieve 90% reliability.
- Swaddling, low stimulation.
- Encourage kangaroo care
- Feed on demand- MBM if appropriate or lactose free, 22 cal formula
- Initiate Rx if NAS score > 8 twice.
- Stabilization/ Escalation Phase
- Wean when stable for 48 hrs by 10% daily.
- Establish agreement with outpatient program and/or Mental Health
- Utilize Early Intervention Services
- Collaborate with DHS/ CPS to ensure infant safety.
- Engage families in Safety Planning.
- Provide primary prevention materials to sites.
Non-Pharmacologic Bundle Compliance
Percent of Infants Compliant with Individual Elements of Non-Pharmacologic Bundle

![Graph showing percent compliant with individual elements of non-pharmacologic bundle between Jan 2014 and Jun 2015.]

(1) Breast Milk/Low Lactose Feeds, (2) Swaddling, and (3) Low Stimulation/Rooming In are ALL required to be in compliance with the bundle. 22 kcal/oz feeds, Clothed Cuddling, and Other are all optional treatment.
Pharmacologic Bundle Compliance

* In Hospitals Using Morphine
Proportion with compliance with individual elements of bundle

(1) Treatment Initiated Appropriately at Score >= 8 Times 2, or > 12 Times 1; (2) Unit Designated Primary Opiate Given, and (3) Weaning Started After Stable Without Dose Escalation for 48 Hours are ALL required to be in compliance with the bundle.
Intermediate Process Measure
Failure of Wean (%)
Outcome Measure: Length of treatment

* Geometric Mean

**OCHA Work**  
2012 - 2013  
33.8 to 18.5 days

**OPQC Spread:**  
2014-2015  
13.5 to 12.1 days
Outcome Measure: Length of Hospital Stay

OCHA Work 2012 - 2013
34 to 22 days

OPQC Spread:
18 to 16 days

* Geometric Mean
Step 3: Large Variation in Formulas Used

- Utilized Orchestrated Testing: a factorial design
- Hospitals selected:
  - Either 19 or 22 Calorie Formula
  - Either regular or low lactose
- Found that 22 Calorie decreased length of opioid treatment.
Conclusions:

- Standardized approaches to the identification, non-pharmacologic and pharmacologic care
  - reduced length of opioid exposure (from original 34 to 12 days)
  - and hospital stay (from original 30 to 17 days)
- Other states and institutions treating opioid exposed infants may benefit from the adoption of these practices
Next Step -→ Moving Upstream
MOMS + NAS

• Just funded… in design.
• Working with pregnant women with substance use disorder
• Multidisciplinary teams: OB, PCP, Behavioral Medicine, Med Assisted Treatments, Medicaid Managed Care Plans
• Wrap around services
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