Through collaborative use of improvement science methods, reduce preterm births & improve perinatal and preterm newborn outcomes in Ohio as quickly as possible.
The **NAS Project** is funded by the Medicaid Technical Assistance and Policy Program (MEDTAPP) and administered by the Ohio Colleges of Medicine Government Resource Center.

The views expressed in these presentation are solely those of the authors and do not represent the views of state or federal Medicaid programs. This study includes data provided by the Ohio Department of Health which should not be considered an endorsement of this study or its conclusions.
Objectives

• Identify potentially better practices, including pharmacological and non-pharmacological treatment for infants with NAS

• Describe the statewide Ohio Perinatal Quality Collaborative methodology to improve treatment of infants with NAS

• Discuss the practice of standardized care and the impact on decreasing duration of opioid treatment and length of stay for NAS

• Describe 1-2 Quality Improvement tools utilized in the OPQC NAS Project to support consistent practice
NEONATAL ABSTINENCE SYNDROME: SCOPE OF THE PROBLEM
Geographic Variation of NAS in the US

Maternal Opiate/Opioid Use and NAS

Neonatal Abstinence Syndrome per 1000 Hospital Births by US Census Division 2012

<table>
<thead>
<tr>
<th>Division</th>
<th>SE Central</th>
<th>New England</th>
<th>NE Central</th>
<th>Mountain</th>
<th>NW Central</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAS Rate (per 1000)</td>
<td>16.2</td>
<td>13.7</td>
<td>6.8 - 6.9</td>
<td>5.1</td>
<td>2.6 - 3.4</td>
</tr>
</tbody>
</table>

• From 2004 to 2014, the rate of U.S. infants diagnosed with opioid withdrawal symptoms, known as neonatal abstinence syndrome (NAS), increased 433%, from 1.5 to 8.0 per 1,000 hospital births.

• However, the increase was even more stark in state Medicaid programs -- rising from 2.8 to 14.4 per 1,000 hospital births. Medicaid, a public health insurance program, covered more than 80% of NAS births nationwide in 2014.
Age-adjusted drug overdose death rates, by state: United States, 2016

NOTES: Deaths are classified using the International Classification of Diseases, Tenth Revision. Drug-poisoning (overdose) deaths are identified using underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14.

SOURCE: NCHS, National Vital Statistics System, Mortality
Total Opioid Overdose Deaths

- Ohio’s opioid overdose death rate increased 325 percent in five years (2009 to 2014).
- Unintentional opioid overdoses caused 2,590 Ohio deaths in 2015 and accounted for 85% of all drug overdose deaths in the state.
- This is equivalent to six Ohioans dying every day or one Ohioan dying every four hours from an opiate overdose.

Source: statistics are from the Kaiser Family Foundation State Health Facts Website, including Opioid Overdose Death Rates and Opioid Overdose Deaths by Type of Opioid, and from the 2015 Ohio Department of Health Unintentional Overdose Death Report.
Drug Abuse or Dependence Diagnosis at Time of Delivery

Source: Ohio Hospital Association

Number of cases, Ohio, 2004-2015

- Women with a marijuana-related dx increased 107% -- from 994 in 2004 to 2,061 in 2015.
- **Dx of opioid abuse or dependence grew 1,039%**.
- Dx of cocaine abuse or dependence fell 41% among delivering mothers.
NAS Statewide Rate per 1,000 Live Births

Source: Ohio Hospital Association
NAS Treatment and Cost

• Cost of Inpatient Hospitalizations
  – In 2015, Medicaid was the payer for approximately 89.7% of NAS inpatient hospitalizations.

• Cost of Treating NAS
  – In 2015, treating newborns with NAS was associated with over $133 million in charges and over 30,000 days in Ohio’s hospitals.
This map examines the discharge rates for neonatal abstinence syndrome (NAS; ICD-9 779.5) per 1,000 live births in Ohio by county of patient residence. On average, there were 2.2 discharges for NAS per 1,000 live births statewide between 2004 and 2008. Counties with the highest rates of NAS discharges were Athens (6.2), Scioto (6.0) and Madison (5.8). NAS discharge rates for 10 counties were at or close to zero during this time.

Note: Alcohol, Drug Addiction and Mental Health Services (ADAMHS) Boards have black borders, and counties have white borders. Borders are black in cases where ADAMHS boards and counties have the same borders.

Data Source:
Data adapted by OhioMHAS from the Ohio Hospital Association & the Ohio Department of Health
Map produced March 2014
Discharge Rates for Neonatal Abstinence Syndrome per 1,000 Live Births
Five-year Weighted Average from 2005 to 2009

Legend
ADAMHS Board
Rate per 1,000
- 0.0 - 2.5
- 2.6 - 5.8
- 5.9 - 9.0

Map Information:
This map examines the discharge rates for neonatal abstinence syndrome (NAS; ICD-9 779.5) per 1,000 live births in Ohio by county of patient residence. On average, there were 3.0 discharges for NAS per 1,000 live births statewide between 2005 and 2009. Counties with the highest rates of NAS discharges were Athens (9.0), Lawrence (8.6), Pickaway and Ross (both 7.7). NAS discharge rates for five counties were at or close to zero during this time.

Note: Alcohol, Drug Addiction and Mental Health Services (ADAMHS) Boards have black borders, and counties have white borders. Borders are black in cases where ADAMHS boards and counties have the same borders.

Data Source:
Data adapted by OhioMHAS from the Ohio Hospital Association & the Ohio Department of Health
Map produced March 2014
Discharge Rates for Neonatal Abstinence Syndrome per 1,000 Live Births

Five-year Weighted Average from 2006 to 2010

Legend
- ADAMHS Board
- Rate per 1,000
  - 0.0 - 2.5
  - 2.6 - 5.8
  - 5.9 - 11.0
  - 11.1 - 14.1

Map Information:
This map examines the discharge rates for neonatal abstinence syndrome (NAS; ICD-9 779.5) per 1,000 live births in Ohio by county of patient residence. On average, there were 3.9 discharges for NAS per 1,000 live births statewide between 2006 and 2010. Counties with the highest rates of NAS discharges were Pickaway (14.1), Athens (10.9) and Ross (9.5). NAS discharge rates for five counties were at or close to zero during this time.

Note: Alcohol, Drug Addiction and Mental Health Services (ADAMHS) Boards have black borders, and counties have white borders. Borders are black in cases where ADAMHS boards and counties have the same borders.

Data Source:
Data adapted by OhioMHAS from the Ohio Hospital Association & the Ohio Department of Health
Map produced March 2014
Discharge Rates for Neonatal Abstinence Syndrome per 1,000 Live Births

Five-year Weighted Average from 2007 to 2011

Legend
- ADAMHS Board
- Rate per 1,000
  - 0.0 - 2.5
  - 2.6 - 5.8
  - 5.9 - 11.0
  - 11.1 - 24.5

Map Information:
This map examines the discharge rates for neonatal abstinence syndrome (NAS; ICD-9 779.5) per 1,000 live births in Ohio by county of patient residence. On average, there were 5.3 discharges for NAS per 1,000 live births statewide between 2007 and 2011. Counties with the highest rates of NAS discharges were Scioto (24.5), Pickaway (18.4) and Pike (18.3). NAS discharge rates for four counties were at or close to zero during this time.

Note: Alcohol, Drug Addiction and Mental Health Services (ADAMHS) Boards have black borders, and counties have white borders. Borders are black in cases where ADAMHS boards and counties have the same borders.

Data Source:
Data adapted by OhioMHAS from the Ohio Hospital Association & the Ohio Department of Health
Map produced March 2014
Discharge Rates for Neonatal Abstinence Syndrome per 1,000 Live Births
Five-year Weighted Average from 2008 to 2012

Legend
- ADAMHS Board
- Rate per 1,000
  - 0.0 - 2.5
  - 2.6 - 5.8
  - 5.9 - 11.0
  - 11.1 - 52.6

Map Information:
This map examines the discharge rates for neonatal abstinence syndrome (NAS, ICD-9 779.5) per 1,000 live births in Ohio by county of patient residence. On average, there were 6.9 discharges for NAS per 1,000 live births statewide between 2008 and 2012. Counties with the highest rates of NAS discharges were Scioto (52.6), Lawrence (40.8) and Pike (36.9); Carroll (0.7), Holmes (0.5) and Auglaize (0.0) counties had the lowest rates of NAS discharges.

Note: Alcohol, Drug Addiction and Mental Health Services (ADAMHS) Boards have black borders, and counties have white borders. Borders are black in cases where ADAMHS boards and counties have the same borders.

Data Source:
Data adapted by OhioMHAS from the Ohio Hospital Association & the Ohio Department of Health
Map produced March 2014
Discharge Rates for Neonatal Abstinence Syndrome per 1,000 Live Births

Five-year Weighted Average from 2009 to 2013

Legend

- ADAMHS Board
- Rate per 1,000
  - 0.5 - 2.5
  - 2.6 - 5.8
  - 5.9 - 11.0
  - 11.1 (76.0)

Map Information:

This map examines the discharge rates for neonatal abstinence syndrome (NAS; ICD-9 779.5) per 1,000 live births in Ohio by county of patient residence. On average, there were 8.8 discharges for NAS per 1,000 live births statewide between 2009 and 2013. Counties with the highest rates of NAS discharges were Scioto (76.0), Lawrence (66.7) and Pike (57.7). NAS discharge rates were lowest in Holmes (0.5), Carroll (0.7) and Auglaize (1.0) counties.

Note: Alcohol, Drug Addiction and Mental Health Services (ADAMHS) Boards have black borders, and counties have white borders. Borders are black in cases where ADAMHS boards and counties have the same borders.

Data Source:
Data adapted by OhioMHAS from the Ohio Hospital Association & the Ohio Department of Health
Map produced June 2015
What a difference 5 years makes…

2004-2008

Discharge Rates for Neonatal Abstinence Syndrome per 1,000 Live Births
Five-year Weighted Average from 2004 to 2008

2009-2013

Discharge Rates for Neonatal Abstinence Syndrome per 1,000 Live Births
Five-year Weighted Average from 2009 to 2013
NEONATAL ABSTINENCE SYNDROME: ADDRESSING THE PROBLEM IN OHIO
Ohio Children's Hospital Association
NAS Consortium

- September 2012 – September 2014
- Six children’s hospitals and their affiliates (20 total hospitals)
- Funded by Office of Governor John Kasich
- Goals:
  - Understand epidemiology of mothers and infants with NAS by following longitudinal cohort
  - Determine the “potentially better practice” for NAS treatment
  - Identify variation and areas for future research
Descriptors: 553 neonates (2012 - 2013)

- Young, white and single
- 80% mothers public insurance
- 85% had pregnancy complications
- 26% Hepatitis C positive
- 82% used tobacco products

## Infant Treatment Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms Started</td>
<td>46.1 hours</td>
</tr>
<tr>
<td>Opioid Treatment Days</td>
<td>20.5 days</td>
</tr>
<tr>
<td>DOL at discharge</td>
<td>22.4 days</td>
</tr>
<tr>
<td>Number of Drugs Used</td>
<td>1.5</td>
</tr>
<tr>
<td>Drugs used</td>
<td></td>
</tr>
<tr>
<td>Morphine only</td>
<td>50.8%</td>
</tr>
<tr>
<td>Methadone only</td>
<td>41%</td>
</tr>
</tbody>
</table>

Hall et. al. *Pediatrics.* 2014;134(2):e527
Impact of Ohio OCHA Weaning Protocol

- In July 2013 a standard “Potentially Better” weaning protocol was adopted by all six groups.
- We documented management of 462 infants prior to statewide adoption of the weaning protocol, and 392 infants after adoption.
  - We removed infants who completed therapy as an outpatient, as this center did not adopt the protocol.
Impact of Standardization at a participating OCHA Site

Neonatal Abstinence Syndrome Length of Stay 2012-2014

- Standardized inter-rater reliability begins Oct 2012
- Decreased average length of treatment to 38 days
- New standardized treatment protocol initiated
- Decreased to average length of treatment 17 days

Number of Days

Infants Treated for NAS through 2014

- Length of treatment
- Avg length of stay
- Average length of treatment
Spreading OCHA learnings through Ohio

- 54 sites:
  - 26 Level III NICU’s
  - 26 Level II Special Care Nurseries
  - 2 Normal Newborn Nurseries

- Funded by Ohio Dept. of Medicaid to start January 2014
**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**

- 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.
Key Strategies to Accomplish our AIM?

- Develop and implement *standardized processes* for the identification, evaluation, treatment and discharge management of an infant with neonatal abstinence syndrome.
  - Standardization of Finnegan Scoring—improve consistency in use of Modified Finnegan Tool with D’Apolito video
  - Standardization of pharmacologic and non-pharmacologic care

- Create a culture of compassion, understanding, and healing for the mother infant dyad affected by the problem of neonatal abstinence syndrome.
  - Addiction as a chronic illness
  - Nurture the Mother-Nurture the Child video
  - Attitudes Survey
Attain high reliability in NAS scoring

- All sites use same tool

- Train RN staff to 90% reliability in scoring using D’Apolito Training System

- In Pilot work, we were able to see drop in max score when training completed

- OPQC has sent out DVD/workbook’s to each site
Standardize Pharmacological Treatment Bundle

**Initiate**
Treatment should be initiated if infant has:
- 2 consecutive scores > 8 or
- 1 score > 12

**Drug:** Morphine/ Methadone
0.05 mg/kg PO

**Escalate**
If ≥ 12, increase dose

**Stabilize**
No increase for 48 hrs

**Wean**
10% of max dose daily

**Discharge**
- 48 hours off Morphine
- 72 hours off Methadone

Ohio Potentially Better Protocol

![Graph showing percentage of pharmacologic bundle compliance over time]
Standardize Non-Pharmacological Treatment Bundle
“Steal Shamelessly/Share Seamlessly”

Parent/Caregiver Education
Developmentally Supportive Care

- Awaken gently AND only when necessary
  - Protect sleep
- Apply the 5-Second Rule
  - Before touching the infant, speak to them
  - Containment hold for at least 5 seconds
  - Safe human touch 1st and ALWAYS
- Provide 2-person care whenever possible
  - 1 to support the infant, 1 to complete the task at hand
  - Ideally this is a nurse/therapist AND a parent/caregiver

Are We Making a Difference?

- Data is currently being analyzed on time and interventions that NAS Volunteer Specialists have documented.
  - LOS has decreased
  - Pre/Post-tests results
    - Pretest Score - Range 60-90; Mean 75
    - Posttest Score - 100
  - Positive feedback from nursing staff on program
  - Volunteers are asking to be part of program.
Improve recognition and non-judgmental support for Narcotic addicted women and infants

**Addiction = Chronic Illness**
- Addiction is a chronic and treatable disease
- Opioid maintenance therapy with methadone or buprenorphine may play an important role in treatment of pregnant women struggling with addiction
- Opioid maintenance therapy improves outcomes for both pregnant women and their infants
- Providing non-judgmental, compassionate care can be rewarding and beneficial for the patients and the providers

**Relapse Rates: Similar for Drug Addiction And Other Chronic Illnesses**

<table>
<thead>
<tr>
<th>Illness</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug addiction</td>
<td>60%</td>
</tr>
<tr>
<td>Type 1 diabetes</td>
<td>30 to 50%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>50 to 70%</td>
</tr>
<tr>
<td>Asthma</td>
<td>50 to 70%</td>
</tr>
</tbody>
</table>


**Attitude Measures Survey**

This resource is focused on people’s attitudes towards alcohol and other drug use and is designed to encourage health professionals to explore and evaluate their attitudes towards drug users—particularly perceptions about a client’s or patient’s deservingness of medical care.
OPQC Interventions Focused on Attitude Change

• Unit wide training for all NICU staff about living with OUD—”Nurture the Mother-Nurture the Child” video

• Sharing stories of pregnant women with SUD—session with panel of mother of infants with NAS

• Education about addiction as a chronic disease—lectures by addiction specialist

• Community resources outreach—NICU teams identified community resources available to support mother-infant dyad and examined barriers to accessing resources
<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Desired Direction of Change</th>
<th>Adjusted Mean Time point 1</th>
<th>Adjusted Mean Time point 2</th>
<th>Adjusted Mean Time point 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>To what extent do you feel angry towards people using drugs?</td>
<td>Down</td>
<td>2.41</td>
<td>2.27*</td>
<td>2.29*</td>
</tr>
<tr>
<td>To what extent is an individual personally responsible for their problematic drug use?</td>
<td>Down</td>
<td>4.21</td>
<td>4.02*</td>
<td>3.98*</td>
</tr>
<tr>
<td>To what extent do you feel disappointed towards people using drugs?</td>
<td>Down</td>
<td>3.11</td>
<td>2.92*</td>
<td>2.95*</td>
</tr>
<tr>
<td>To what extent are adverse life circumstances likely to be responsible for a person's problematic drug use?</td>
<td>Up</td>
<td>3.65</td>
<td>3.71</td>
<td>3.72</td>
</tr>
<tr>
<td>To what extent do you feel sympathetic towards people using drugs?</td>
<td>Up</td>
<td>2.95</td>
<td>3.13*</td>
<td>3.14*</td>
</tr>
<tr>
<td>To what extent do people who use drugs deserve the same level of medical care as people who don't use drugs?</td>
<td>Up</td>
<td>4.49</td>
<td>4.56</td>
<td>4.57*</td>
</tr>
<tr>
<td>To what extent do you feel concerned towards people using drugs?</td>
<td>Up</td>
<td>4.15</td>
<td>4.13</td>
<td>4.19</td>
</tr>
</tbody>
</table>

*Denotes a significant difference from the mean of timepoint 1 after adjusting for site and multiple comparisons
Partner with other stakeholders to influence policy and primary prevention

All available for download on our website at https://opqc.net
Phase I Results

After 9 months of improvement work, length of treatment decreased by 9% from 13.4 to 12 days

...and LOS decreased by 9% from 18.3 to 17 days in September 2014
Ohio Perinatal Quality Collaborative Improves Care of Neonatal Narcotic Abstinence Syndrome

Michele C. Walsh, Moira Crowley, Scott Wexelblatt, Susan Ford, Pierce Kuhnell, Heather C. Kaplan, Richard McClead, Maurizio Macaluso, Carole Lannon and for the Ohio Perinatal Quality Collaborative

Pediatrics  originally published online March 7, 2018;

The online version of this article, along with updated information and services, is located on the World Wide Web at: http://pediatrics.aappublications.org/content/early/2018/03/05/peds.2017-0900

Objective: Neonatal abstinence syndrome (NAS) after an infant’s in-utero exposure to opioids has increased dramatically in incidence. No treatment standards exist, leading to substantial variations in practice, degree of opioid exposure, and hospital length of stay.

Methods: The Ohio Perinatal Quality Collaborative conducted an extensive multi-modal quality improvement initiative with the goal to (1) standardize identification, nonpharmacologic and pharmacologic treatment in levels 2 and 3 NICUs in Ohio, (2) reduce the use of and length of treatment with opioids, and (3) reduce hospital length of stay in pharmacologically treated newborns with NAS.

Results: Fifty-two of 64 (84%) Ohio NICUs participated in the collaborative. Compliance with the nonpharmacologic bundle improved from 33% to 89%, and the pharmacologic bundle improved from 59% to 66%. Forty-eight percent of the 3366 opioid-exposed infants received pharmacologic treatment of symptoms of NAS, and this rate did not change significantly across the time period. Regardless of the opioid used, pharmacologically treated infants with NAS the length of treatment decreased from 13.4 to 12.0 days, and length of stay decreased from 16.8 to 17 days.

Conclusions: Standardized approaches to the identification and nonpharmacologic and pharmacologic care were associated with a reduced length of opioid exposure and hospital stay in a large statewide collaborative. Other states and institutions treating opioid-exposed infants may benefit from the adoption of these practices.

* Accepted December 4, 2017.
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View Full Text
Variation and Uncertainty in Non-Pharmacologic Care

Distribution of Compliance with Non-Pharmacologic Bundle Components

Survey Responses Regarding Certainty in Non-Pharmacologic Bundle Components (7 = Least Sure)

Breast Milk Feeds if mother in active treatment program

Legend:
- Green: Breast Milk Feeds OR Low Lactose Feeds
- Yellow: Swaddling
- Green: Low Stimulation OR Rooming in
- Purple: 22 kcal/oz Feeds
- Magenta: Clothed Cuddling
- Light Purple: Other
Orchestrated Testing (OT)

• OT involves planned testing across multiple sites (within or across institutions)

• Can use factorial design to...
  – Be more systematic about simultaneous testing of different change ideas
  – Look at the independent and combined effects of different changes

• Standardization of practices and reliable implementation is necessary

• Can result in faster and more efficient learning
OPQC OT Phase II  
October 2015-June 2016

- Wide scale test of change examining the role of formula in non-pharmacologic care across 54 NICU/SCN sites
- Two change ideas (factors):
  - Type of formula
  - Calorie content of formula
- Two “levels” of each factor
  - Standard Lactose vs. Low-Lactose
  - Standard Calorie vs. Higher Calorie
### OPQC Factorial Design (2^2)

<table>
<thead>
<tr>
<th>Group</th>
<th>Low Lactose Standard</th>
<th>22 kcal/oz Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Sites self-selected into 1 of 4 formula groups based on their practice culture.
Measures

- LOS (pharmacologically treated infants)
- Treatment failure—percent infants requiring dose escalation, failed wean, and/or secondary medication
- Weight Loss >10%
Formula Choice based on Orchestrated Testing Results

Overall, the Orchestrated Testing data suggest that use of 22 kcal/oz could be a beneficial practice for NAS non-pharmacologic support

• Consistent benefit of 22 kcal/oz feeds on weight loss, treatment failure, and length of stay
  – 22 kcal/oz formula is associated with less treatment failure and shorter length of stay, though only explains a very small amount of the variation

• Benefit of LLF is not consistent across outcome measures--possible synergistic effect with 22 kcal/oz on weight loss and length of stay, but not on treatment failure
OPQC NAS Recommendations

Non-Pharmacologic Treatment

- All infants are treated with decreased stimulation, swaddling, continuous holding, and frequent feedings.
- Encourage breastfeeding if mother is in treatment program.
- If breast milk not used, give 22 kcal/oz formula. Low-lactose formula may be used at the discretion of the unit.
Updates to Recommended NAS Protocol

- “Potentially Better Practices Protocol” came from the pilot work of the OCHA NAS Project based on cohort of 553 infants in 20 participating sites.

- Updating recommendations based on OPQC NAS Project cohort of 6819 infants in 54 participating sites.
  - Including feeding recommendations based on Orchestrated Testing results.
  - Updates to the Methadone protocol are based upon testing of the pharmacokinetic-driven protocol that resulted in both a shorter length of treatment and hospitalization.
  - Changes to initiation of treatment:
    - >8 x3 or >12 x2
    - Morphine escalation doses to be score dependent.
Overview of Stages of treatment:

<table>
<thead>
<tr>
<th>Non-pharmacologic bundle:</th>
<th>Swaddle, skin to skin, decreased stimulation breast feed or 22kcal formula</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pharmacologic bundle:</strong></td>
<td></td>
</tr>
<tr>
<td>• Initiate</td>
<td>• Select Methadone or Morphine PO</td>
</tr>
<tr>
<td></td>
<td>• Finnegan scores &gt;8 q3hrs THREE times or scores ≥ 12 TWO times in a row</td>
</tr>
<tr>
<td>• Escalate</td>
<td>• If Finnegan scores remain elevated, increase dosage based on infant’s score</td>
</tr>
<tr>
<td>• Stabilize</td>
<td>• Maintain dose for 24 hrs (Methadone)</td>
</tr>
<tr>
<td></td>
<td>• Maintain dose for 48 hrs (Morphine)</td>
</tr>
<tr>
<td>• Wean</td>
<td>• Wean every 24 hrs based on Finnegan scores</td>
</tr>
<tr>
<td></td>
<td>• Wean by step daily (Methadone)</td>
</tr>
<tr>
<td></td>
<td>• Wean by 10% stabilizing dose daily (Morphine)</td>
</tr>
<tr>
<td>• Discharge</td>
<td>• Discharge 48 hrs off of Methadone or Morphine</td>
</tr>
</tbody>
</table>
Phase II Improvement

We saw increases in the use of 22 kcal/oz and low lactose feeding
Phase II Improvement (cont’d)

Further reductions in LOS were seen with implementation of findings from OT.

Reductions in LOS
18.3 → 17 days (Phase I)
17 → 16.3 days (Phase II)

Total reduction of 2 days!
Ohio Perinatal Quality Collaborative

*Through collaborative use of improvement science methods, reduce preterm births & improve perinatal and preterm newborn outcomes in Ohio as quickly as possible*
Senior Leadership Buy-In and having the right people on your team

University of Cincinnati Medical Center
234 Goodman Street, Cincinnati, Ohio 45219

Our NAS Team:
- James Van Horn MD – OB Physician
- Christine Wilder MD – Addiction Physician
- Jennifer McAllister MD – Physician Lead
- Marie Wies RN, MSN, IBCLC – NICU Manager
- Sharon Harvey RN, BSN – Nurse Lead
- Elizabeth Adu-Gyamfi – L&D Team Lead
- Beverly Stephenson RN, BSN – Perinatal Quality and Safety Coordinator
- Stacie Chapman MS, RD, CDE – Dietitian
- Kristina Cagle MSW, LSW – Social Worker
- Barbara Isenmann RPH – Pharmacist
- Charlotte Pearson RN, MSN – Postpartum Educator

OPQC
Ohio Perinatal Quality Collaborative

Improvement team
- M. David Yohannan
  Neonatologist
- Lisa Jasin
  Neonatal Nurse Practitioner
- Marja Holocaust
  Lactation Consultant
- Karan Beekman
  Resource Nurse
- Jennifer Morris
  Shift Coordinator
- Michelle Begley
  Social Services
- Kerri Scott, RN, Kara Pierce, RN,
- Erin Kichine, RN, Brittany Scott, RN

Dear Hospital Administrator,

Subject: Invitation to participate in a project to improve outcomes for babies born with Neonatal Abstinence Syndrome

In recognition of the work your hospital does to improve the health of all Ohioans, the Ohio Department of Medicaid, the Ohio Department of Health and the Ohio Perinatal Quality Collaborative (OPQC) encourage you to join an initiative to improve the health of Ohio’s pregnant women and their newborns.

OPQC (www.opqc.net) is a statewide, multi-stakeholder network founded in 2007 with a goal of making sure every Ohio mother and baby gets the best available care. Your NICU may have participated in improvement initiatives with OPQC before, and this project is an opportunity for you to participate in new and exciting efforts that will improve care and outcomes for infants across the state of Ohio.

This quality improvement initiative is designed to increase identification of and compassionate withdrawal treatment for full-term infants born with Neonatal Abstinence Syndrome (NAS). Work with a pilot group of 6 Ohio Children’s hospitals has resulted in improved health outcomes and a 20% reduction in length of hospital stay for these babies. These infants experience withdrawal hours after being born, and if unidentified and untreated, can experience excessive weight loss, grand mal seizures, and even death. The epidemic is steadily increasing, overwhelming social service systems and public payers, and our preliminary data suggests that up to 50% of neonates with NAS are not receiving optimal care. Increasing identification of and improving care for these infants will greatly impact safety and costs associated with treatment.

OPQC will begin by working with all Level 3 NICUs in Ohio, with a plan to reach all nurseries in Ohio. You are invited to identify a team from your hospital to participate in activities that will begin in January 2014. We recognize the key role your hospital plays in your community and your commitment to provide the highest quality perinatal care. We believe that participation in this initiative will allow your hospital to build a more effective perinatal team and improve your service to the patients and communities you serve.

During a time of increasing focus on quality and performance metrics, we are pleased to include your hospital in this initiative. If you have questions, please contact the OPQC Project Manager, Lakshmi Prasad via email at info@opqc.net and or by phone at 513-803-7264. We look forward to working with you to improve care and outcomes for infants in Ohio!

Sincerely,

Mary Applegath
Medical Director
Ohio Dept. of Medicaid

Theodore Wymsio
Director
Ohio Dept. of Health

Michele Walsh
Neonatal Lead
OPQC

Carole Lannon
QI Lead
OPQC
AIM Statement and Systems Inventory

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.
Perinatal Institute Neonatal Abstinence Syndrome Management Process Map

This is a suggested guideline, each hospital may have unique circumstances which requires a different process than suggested.

- Admission to Labor and Delivery
- Consent for universal maternal testing?
  - Send newborn 1st urine and/or send umbilical cord
  - Send maternal to toxicology test
    - Is maternal toxicology test positive?
      - Is there a history of illicit drug/opiate use during pregnancy?
        - Routine care
        - Send newborn 1st urine (initiate process in delivery room)
        - Send cord or meconium
        - Social Work consult
        - Is drug test + for other opioids?
          - Observe for 72 hrs, initiate Finnegan’s 6-24 hrs after birth and begin non-pharmacological interventions
        - Is drug test + for buprenorphine/methadone?
          - Observe for 96 hrs, initiate Finnegan’s 6-24 hrs after birth and begin non-pharmacological interventions
          - Y
        - Is drug test + for other drugs?
          - No Finnegan’s, apply code: Cocaine– 760.75
          - THC–760.73
          - Y
        - Are Finnegan scores ≥ 8x3 or ≥12x2?
          - Begin pharmacologic treatment protocol, apply NAS code (779.6)
          - Apply code 760.72, call PCP prior to discharge
          - Keep on 22 cal/oz low lactose formula for discharge
          - Change to 19 cal/oz low lactose formula 24-48 hours prior to discharge
          - Schedule clinic appt, call PCP prior to discharge
          - Option to start 19 cal/oz low lactose formula on floor if GI scores elevated
          - Option to start 19 cal/oz low lactose formula in NICU if GI scores elevated

UCMC Process Flow Chart: 22 Calorie Per Ounce Low-Lactose Formula for NAS infants

- Infant identified as at risk for NAS/Finnegan scoring initiated
  - Elevated Finnegan scores above threshold for treatment
    - Transfer to NICU and medication for treatment of NAS initiated
    - Medication discontinued and weight gain appropriate
      - No
        - Keep on 22 cal/oz low lactose formula for discharge
      - Yes
        - Change to 19 cal/oz low lactose formula 24-48 hours prior to discharge
        - Schedule clinic appt, call PCP prior to discharge
  - No
    - Option to start 19 cal/oz low lactose formula on floor if GI scores elevated
    - Option to start 19 cal/oz low lactose formula in NICU if GI scores elevated

*22 cal/oz low lactose formula is available to be ordered and made by 12 pm every day of the week. Monday through Friday formula can also be made between 12-3 pm if NICU RD notified. If formula is ordered outside of these times 19 cal/oz low lactose formula will be substituted until the following day.
FMEA

(Failure Mode Effects Analysis)

The Failure Mode Effects Analysis is a systematic, proactive method for evaluating a process to identify **where and how it might fail** and to **assess the relative impact of different failures**, in order to **identify the parts of the process that are most in need of change**.
Measurement

Reports Introduction

- Data Updates Nightly
- Up to date view of all of your hospital’s data AND aggregate data in an easy to use application
- Table format of data included on all charts
- Notations found in chart, legend, and explained in footnote
PDSA: Plan-Do-Study-Act

Your Site Name

PDSA Ramp

Changes That Result in Improvement

Implementation of Change

Wide-Scale Tests of Change

Follow-up Tests

Very Small Scale Test

Hunches Theories Ideas

DATA
DO:
Test the change: Was the cycle carried out as planned?
☐ Yes  ☐ No
What did you observe that was not part of the plan?

STUDY:
Did the results match your prediction?
☐ Yes ☐ No
Compare the results of your test to your previous performance:

ACT:
Decide to Abandon, Adapt, or Adopt

- **Abandon**: Discard change idea and try a new one.
- **Adapt**: Improve the change and continue testing. Describe what you will change in your next PDSA cycle.
- **Adopt**: Select changes to implement on a large scale and develop an implementation plan for sustainability.

If you plan to adapt or adopt, what plans do you have for your next 2-3 PDSA cycles for follow-up tests and implementation:
1. 
2. 
3. 

Model for Improvement
PDSA Cycle Worksheet

<table>
<thead>
<tr>
<th>Date of Test:</th>
<th>Date of Completion:</th>
<th>Site:</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/28/2015: meet with Geauga staff</td>
<td></td>
<td>Geauga Hospital</td>
</tr>
</tbody>
</table>

**Overall Project Aim:**
Decrease the LOS for NAS babies thru identification of and non-judgmental care for this population in addition to standardization of non-pharmacological and pharmacological bundle adherence.

**What is the objective of the test?**
Objective is to increase accuracy and communication of patient information for NAS babies transferred from Geauga Hospital to Rainbow Babies and Children’s for NAS treatment.

**PLAN:**

**Brief description of the test:**
OPQC/RBC staff will meet with Geauga Maternity Nursing Leadership to discuss OPQC NAS Project. A draft “handoff tool” that captures needed information regarding care of NAS infant will be reviewed. Plan for 1 RN at Geauga to test the form on 1 baby and provide feedback.

**How will you know that the change is an improvement?**
Increase in amount and accuracy of information regarding NAS patient’s care prior to transfer to RB&C.

**What driver does the change impact?**
Optimize Non-Pharmacologic Rx Bundle

**What do you predict will happen?**
The staff will find the handoff tool easy to use. Inclusion of this information will result in increased accuracy of data submissions for RB&C infants transferred from Geauga Hospital.

<table>
<thead>
<tr>
<th>List of Tasks Needed to Complete</th>
<th>Person Responsible</th>
<th>When</th>
<th>Where</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Leslie &amp; Susan meet with Nora &amp; Robyn at Geauga and review draft handoff tool.</td>
<td>Leslie</td>
<td>8/28/15</td>
<td>Geauga Hospital</td>
</tr>
<tr>
<td>1. Nora or Robyn will select a RN to test the form</td>
<td>Nora or Robyn</td>
<td></td>
<td>Geauga Hospital</td>
</tr>
<tr>
<td>1. RN will test the form on 1 baby</td>
<td>Designated RN</td>
<td></td>
<td>Newborn Nursery</td>
</tr>
<tr>
<td>1. Nora will report feedback to Leslie &amp; Susan</td>
<td>Nora</td>
<td></td>
<td>Via phone or email</td>
</tr>
</tbody>
</table>

**Plan for collecting data:**
- Leslie will review draft handoff tool with Nora and Robyn. They will select a RN to test 1 baby, explaining tool and needed feedback.
- Selected RN will test handoff tool with 1 baby and document feedback regarding the tool.
- Nora will contact Leslie regarding RN feedback.
Storyboard Walk

All NAS Teams

Describe 1-2 interventions implemented by regional teams in the NAS Project regarding OB collaboration

Storyboard Notes

Ideas to investigate

Follow up contacts (name, email, and site)

Specific to our region

Additional notes
Can your team sustain your gains?

What if your entire project team decided to retire by July 31, 2018?

- Would the changes you’ve made continue to be used?
- What could make your organization revert to the old system?

Questions to address....

- Was your collaborative team successful?
- Is it your team’s intention to hold the gains?
- Is it an organizational priority?
- Is the leadership responsibility clear?
- Is the appropriate infrastructure in place?
- Do you plan to attend to measures?
  - Will there be ongoing measurement?
  - Will you ensure reliability by identifying and understanding ‘failures’?
### Participating Centers

<table>
<thead>
<tr>
<th>Participating Centers</th>
<th>Medical Centers</th>
<th>Medical Centers</th>
<th>Medical Centers</th>
<th>Medical Centers</th>
<th>Medical Centers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adena Regional Medical Center</td>
<td>Cleveland Clinic</td>
<td>Kettering Medical Center</td>
<td>Mercy Regional Lorain</td>
<td>NCH Grant Medical Center</td>
<td>Springfield Regional</td>
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<tr>
<td>Akron Children’s Hospital</td>
<td>Dayton Children’s Hospital</td>
<td>Licking Memorial Hospital</td>
<td>MetroHealth Medical Center</td>
<td>NCH Ohio State University NICU</td>
<td>St Rita’s Medical Center</td>
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<tr>
<td>Akron Children’s Summa Health</td>
<td>Elyria Medical Center</td>
<td>Lima Memorial</td>
<td>Miami Valley Hospital</td>
<td>NCH Riverside Methodist</td>
<td>St Joseph’s Hospital</td>
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<tr>
<td>St Elizabeth/ Mahoning Valley</td>
<td>Fairview Hospital</td>
<td>Marion General</td>
<td>Mt Carmel East</td>
<td>ProMedica Bay Park Hospital</td>
<td>The Christ Hospital</td>
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<tr>
<td>Akron Children’s General</td>
<td>Fort Hamilton Hospital</td>
<td>Mercy Anderson Hospital</td>
<td>Mt Carmel West</td>
<td>ProMedica Toledo Normal Newborn</td>
<td>OSU Wexner Well Baby Unit</td>
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<tr>
<td>Atrium Medical Center</td>
<td>Genesis Healthcare</td>
<td>Mercy Children’s Hospital</td>
<td>Nationwide (NCH) Children’s Hospital</td>
<td>ProMedica Toledo Children’s</td>
<td>Trumbull Memorial Hospital</td>
</tr>
<tr>
<td>Aultman Hospital</td>
<td>Good Samaritan Tri-Health</td>
<td>Mercy Health West</td>
<td>NCH Mt Carmel St Ann’s</td>
<td>Soin Medical Center</td>
<td>UH Rainbow Babies &amp; Children’s</td>
</tr>
<tr>
<td>Bethesda North Hospital</td>
<td>Good Samaritan Premier/Dayton</td>
<td>Mercy Fairfield</td>
<td>NCH Doctor’s Hospital</td>
<td>Southern Ohio Medical Center</td>
<td>UC University Hospital Cincinnati</td>
</tr>
<tr>
<td>Cincinnati Children’s Hospital</td>
<td>Hillcrest Hospital</td>
<td>Mercy Medical Canton</td>
<td>NCH Dublin Methodist</td>
<td>Southview Medical Center</td>
<td>Upper Valley Medical Center</td>
</tr>
</tbody>
</table>
It takes a village...