Length of Stay Reduction: A Quality Improvement Project for Neonatal Abstinence Syndrome

Richard E McClead Jr. MD
Medical Director, Quality Improvement Services
Nationwide Children's Hospital
Columbus, Ohio
Disclosures

• I received a grant from the Cardinal Health Foundation for an ADE reduction QI project, a portion of which was used to provide consultation services to the NICU LOS reduction project.

• Few pharmaceuticals routinely used in the NICU are FDA approved for use in neonates. The reference to medications used in this work will be identified by generic names. Their use are based on accepted pharmacology and neuropharmacology concepts.

• I have no other conflicts to disclose.
Objectives

1. To describe a clinical convention for determining when LOS is prolonged in a regional neonatal referral center
2. To describe how local data from the Vermont Oxford Network can be used with the Model of Improvement to reduce LOS in a regional neonatal referral center
3. To list 3 interventions (PDSA) associated with decrease LOS for NAS patients
Background

- Nationwide Children’s Hospital is a large, free-standing academic pediatric facility in Columbus, Ohio

  353 beds
  > 19,000 admissions/year
  > 19,000 surgeries/year
  > 950,000 outpatient visits/year

New 12 story tower opening in 2012
Background

- Neonatal Services at NCH is one of the largest neonatal programs in US
  - 191 NICU/SCN beds
  - 6 Level III NICUs, 2 level II SCNs
  - > 2100 admissions per year
    - 22% < 1500 g birth weight
    - 7.2% ≤ 26 weeks gestation
    - 14.6% major birth defects
    - 16.9% surgical cases
  - Diverse group of private and academic neonatologists and pediatric surgeons
Why is a prolonged NICU LOS so bad?

- Increased risk of medication errors, other adverse events (e.g. CLABSI, VAP, pressure ulcers, & SSE)
- Increased stress on families already stressed
- Impaired parent-infant attachment
- Increased financial burden on families & society.
  - Hospitalization for a healthy premature infant is $1500-2000/ day.
  - The daily cost for infants dependent on life support exceeds $5,000.
  - IOM estimated total cost of prematurity at more than $26.2 billion (2005).

- At NCH, nearly half of the our neonates are capitated Medicaid manage care patients.
Main Campus NICU LOS Exceeds 75th Percentile for VON Expanded Database

- 2008 VON LOS Data - Main Campus
- 2009 LOS

VON NICU Type C IQR

NCH Main Campus NICUs

Days

0 50 100 150

Home Transfer Died All

Center Mean

Main RMH GMC DHW

Campus NICUs
Global Aim: To Reduce LOS among NCH Neonatal Services Eight Nurseries

- **Methodology:**
  - Began in summer of 2009 at the request of the CEO
  - Initially focus on 3 Main Campus Level III NICUs
  - Conduct univariate analysis of our 2008 VON expanded database to determine factors associated with prolonged LOS
  - Use IHI Model for Improvement to establish specific aims and key drivers for improvement in LOS
  - Establish neonatal QI teams with specific interest in selected key drivers
Vermont Oxford Network Expanded Database

“The Vermont Oxford Network is a non-profit, voluntary collaboration of health care professionals dedicated to improving the quality and safety of medical care for newborn infants and their families.”

“The Network maintains a VLBW Database for infants 401 to 1500 grams or gestational age between 22 weeks 0 days and 29 weeks 6 days who are born at participating hospitals or admitted to them within 28 days of birth.

Member institutions also have the option of submitting data for infants weighing over 1500 grams at birth, who are admitted to a participating hospital neonatal intensive care unit or who die within 28 days of birth.”
When is NICU LOS prolonged?

Scatterplot of InitLOS vs GWks

2008 Main Campus NICU
VON Expanded Database
When is NICU LOS prolonged?

When the postmenstrual age exceeds 37 weeks!

2008 Main Campus NICU
VON Expanded Database
Key Drivers of Prolonged LOS

**Significant Variables**

- **Lower EGA**
  - Inborn
  - No Antenatal Steroids
  - Male Gender
  - PDA
  - PDA Ligation
  - Severe ROP/ROP Surgery

- **NAS**
  - Other Surgery
  - Pneumothorax
  - GI Perforation

- **Gastroschisis**
  - CONS Sepsis
  - Oxygen at 36 weeks CGA

Reduce LOS of main campus NAS Patients By December 31, 2010
Background

• Neonatal Abstinence Syndrome (NAS) refers to a constellation of typical signs and symptoms of withdrawal that occurs in infants that have been exposed to, and have developed dependence to certain illicit drugs or prescription medications during fetal life. These symptoms are characterized by CNS irritability, gastrointestinal dysfunction, and autonomic abnormalities. Symptoms require drug-specific pharmacologic intervention.
NAS Facts at NCH

- 6-fold increase in the number of patients at NCH with NAS from 2004-2008
  - Opiates, especially methadone, heroin, oxycodone
  - Lack of consensus on recommended management, variable management
  - NAS LOS exceed 58 days prior to 2009
  - Methadone protocol established in early 2009
    - LOS decreased to 31 days
    - Literature suggested decreased LOS with oral morphine
PDSA Cycles
Also known as:
• Shewhart Cycle
• Deming Cycle
• Learning and Improvement Cycle
PROCESS Allows QI Projects to EVOLVE!

It is all about creating a belief that your changes will result in improvement!!

Start with Small-Scale/Rapid-Cycle Focused & Achievable “TESTS of CHANGE”

Changes That Result in Improvement

Hunches Theories Ideas

DATA
Research v Quality Improvement

Adapted from Lloyd Provost, Associates in Performance Improvement

Well Controlled RCT

Less Controlled QI Project
Developing Key Driver Diagrams

• Simply a project summary

  Goal -- Specific (SMART*) Aim
  Influencing Factors -- Key Drivers
  Specific Changes -- Interventions (PDSAs)

* Specific, Measurable, Actionable, Realistic and Timely

“A framework to effectively focus change efforts”
Specific Aim

Reduce LOS of main campus NAS patients from 31 to 24 days by December 31, 2010
Aim & Key Drivers for NAS

**Specific Aim**

Reduce LOS of main campus NAS patients from 31 to 24 days by December 31, 2010

**Balancing Measure:**

30-day readmission

**Key Drivers**

- Nursing Assessment
- Nursing Documentation
- Weaning Protocol
- Maternal Management

**Design Changes / Interventions**

- RN education re patient assessment & Finnegan scoring
- Compliance Monitoring
- Develop oral morphine Weaning protocol
- Collaborate with OBGYNs

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All improvement involves change, but not all change is an improvement.

Michael Fullan, 1992
PDSA / Interventions / Actions

1. Develop Awareness and Achieve Buy In:
   • Intervention:
   • Designed & implemented monthly, interdisciplinary NAS Taskforce: 12/2009

2. Education and Training:
   • Intervention:
   • Two half day NAS Workshops provided 3/24-25/2010 with nationally recognized nursing expert
   • Train the trainer-completed in 4/2010
   • Implement standardized training of new staff
   • Conduct reliability testing using video assessments
   • Conduct nursing documentation audits
Nursing Assessment & Documentation of NAS Symptoms

• Finnegan Scoring system (1975)
  – Inconsistency in symptom definitions
  – Interpretation of definitions left to staff
  – Wide variability in scores from nurse to nurse and shift to shift
  – Difficult for practitioners to make decisions regarding medication weaning
  – Infants may be under-treated or over-treated
  – Weaning may be prolonged

K. D’Apolito, 2011
## Modified Finnegan Neonatal Abstinence Score Sheet

<table>
<thead>
<tr>
<th>System</th>
<th>Signs and Symptoms</th>
<th>Score</th>
<th>AM</th>
<th>PM</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNS</td>
<td>Excessive high-pitched (or other) cry &lt; 5 mins</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Continuous high-pitched (or other) cry &gt; 5 mins</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleeps &lt; 1 hour after feeding</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleeps &lt; 2 hours after feeding</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleeps &lt; 3 hours after feeding</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hyperactive Moro reflex</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Markedly hyperactive Moro reflex</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mild tremors when disturbed</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderate-severe tremors when disturbed</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mild tremors when undisturbed</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderate-severe tremors when undisturbed</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased muscle tone</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Excoriation (chin, knees, elbow, toes, nose)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Myoclonic jerks (twisting/jerking of limbs)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Generalised convulsions</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolic/Vasomotor/Respiratory Disturbances</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Sweating</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hyperthermia 37.2-38.3 C</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hyperthermia &gt; 38.4 C</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frequent yawning (&gt; 3-4 times/scoring interval)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mottling</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nasal stuffiness</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Sneezing (&gt; 3-4 times/scoring interval)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nasal flaring</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Respiratory rate &gt; 60/min</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Respiratory rate &gt; 60/min with retractions</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Excessive suckling</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor feeding (infrequent/uncoordinated suck)</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Regurgitation (≥ 2 times during/post feeding)</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Projectile vomiting</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loose stools (curds/seedy appearance)</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Watery stools (water ring on nappy around stool)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Score**

**Date/Time**

**Initials of Scorer**

---

Effectiveness of the NAS Training Workshops

Paired T-Test and CI: Post-Workshop, Pre-Workshop

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>StDev</th>
<th>SE Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-Workshop</td>
<td>82</td>
<td>13.805</td>
<td>1.614</td>
<td>0.178</td>
</tr>
<tr>
<td>Pre-Workshop</td>
<td>82</td>
<td>12.110</td>
<td>2.667</td>
<td>0.294</td>
</tr>
<tr>
<td>Difference</td>
<td>82</td>
<td>1.695</td>
<td>2.959</td>
<td>0.327</td>
</tr>
</tbody>
</table>

95% CI for mean difference: (1.045, 2.345)

T-Test of mean difference = 0 (vs not = 0): T-Value = 5.19  P < 0.001

Erin Keels, RN NNP, ATP Project 2010
Other PDSA / Interventions / Actions

3. Develop Oral Morphine Protocol
4. Train Mother-Infant Staff in Finnegan scoring system
5. Established relationships with Maternal Providers
6. Develop additional tools at offsite nurseries
7. Obtained March of Dimes grant to educate pregnant women attending a local methadone clinic re NAS
8. Establish an NAS Developmental Follow up clinic
9. Developed NAS Clinical Guideline
Enteral Morphine Protocol for
Neonatal Abstinence Syndrome (NAS)

Protocol should be initiated if an infant has 2 consecutive scores ≥ 8 or 1 score ≥ 12 within a 24 hour period (just as was done previously with the methadone taper).
Concentration of Enteral Morphine to be used for ALL doses: 0.2 mg/ml

Starting Dose:
Enteral: 0.05 mg/kg/dose po q3hr
IV: 0.02 mg/kg/dose (IV morphine and enteral morphine doses are not equivalent)

Titration:
Enteral: Increase by 0.025-0.04 mg/kg every 3 hrs until controlled (NAS < 8)
IV: increase by 0.01 mg/kg every 3 hrs until controlled (NAS < 8)
*Rescue Dose*: If infant has 1 score of ≥ 12, double the previous dose given (enteral or IV) x 1 and then adjust accordingly:
  • If NAS score now < 12: make the scheduled maintenance dose (MD) the same as the rescue dose that was just administered. The first higher MD should be given at the next scheduled care/feed.
  • If NAS score still ≥ 12: increase next dose by 50%. Continue to do so until score is < 12. Once < 12, then follow guideline listed above.
Enteral Morphine Protocol for
Neonatal Abstinence Syndrome (NAS)

Wean: Once stabilized on a dose for 72-96 hours, use this dose as the starting point of the wean (please note this dose on infant’s card). Begin weaning the dose by 10% (of the original dose when the first wean was started) every 24-48 hours. Drug may be discontinued when a single dose is < 0.02 mg/kg/dose. Please see below for example.

*Ad lib infants*: Given the shorter duration of action of enteral morphine, it is best suited to be dosed on a q3hr schedule. Infants should be allowed to ad lib feed volumes but kept on a q3hr schedule.

*Backslide*: If infant’s NAS scores become consistently elevated (ex: 2 consecutive ≥ 8) during the weaning process, assure that nonpharmacological measures are optimized (ie: swaddling, holding, decreased stimuli, etc) before going back to previous dose at which patient was stable. If infant’s scores continue to be elevated (even after physical exam to ensure nothing else is wrong/bothering the infant), either weight adjust medication and/or continue to back up in a stepwise fashion until patient’s scores are <8. Once stabilized on new dose for minimum 48 hrs, resume 10% wean but consider weaning at longer intervals.

Discharge: Observe in-house x 48-72 hours off of medication before discharge.
“10) The limited available evidence from controlled trials of neonatal opioid withdrawal supports the use of oral morphine solution and methadone when pharmacologic treatment is indicated...”
Control Charts

Data Over Time

Upper Control Limit (+3σ)

Average

Lower Control Limit (-3σ)
Content of NAS Guidelines

- Maternal History Taking and Drug Testing Recommendations
- Neonatal Testing and Assessment
- General Supportive and Environmental Care of the Infant with NAS
- Creating Collaborative Relationships with Families
- Nutrition
- Pharmacologic Treatment
- Discharge Planning
- Follow Up
- Prevention and Outreach

• Appendices

• References
Welcome to the second issue of Going Home!, a monthly newsletter for the NICU Length of Stay (LOS) Reduction Collaborative. His project has avoided 4029 patient-days and $6M of hospital costs since June 2010. This month, I focus on Neonatal Abstinence Syndrome (NAS).

Neonatal Abstinence Syndrome

When we analyzed the factors that contributed to prolonged LOS in the NICU, I was surprised to find that withdrawal from in utero exposure to opiates, NAS, was an issue. Although many maternal medications can precipitate NAS, opiate withdrawal (e.g., methadone, heroin, Vicodin, etc) is the major problem in Central and Southeastern Ohio. Infants experiencing opiate withdrawal exhibit a variety of symptoms including irritability, excessive crying, vomiting and diarrhea. Symptoms usually begin within 1-3 days after birth, but can be delayed for several days to weeks. Treatment, both pharmacologic and non-pharmacologic, is directed at relieving symptoms. The pharmacologic therapy involves treating the infant with a medication similar to that which the mother consumed during pregnancy. The neonatal opiate dose is slowly decreased over time while the infant remains hospitalized. This process can take many days to weeks.

In the past 5 years, NCH has experienced an 8-fold increase in the numbers of infants with NAS. Prior to May 2009, the infants were treated at the discretion of the attending physician. At that time, the average LOS of NAS infants was >50 days.

In May 2009, a standard oral methadone weaning protocol was implemented. Protocol compliance was fairly good. Average LOS decreased to ~31 days.

However, the literature indicated that even lower LOS could be achieved with an oral morphine protocol. Jackie Schneider Pharm D, BCPS and Jon Wispe MD developed an oral morphine weaning protocol. A specific aim to reduce the LOS of NAS infants admitted to the main campus NICU from 31 to 24 days by December 31, 2010 was established.

Key drivers identified included a) process for regular communication, b) implementation of an oral morphine weaning protocol, c) a nursing educational and training program regarding proper use of the Finnegan scoring system, and d) improved collaboration with obstetric colleagues managing maternal opiate addiction.

In the Fall of 2009, Erin Keels RN, NNCP established an NAS Taskforce to facilitate communication and learning. In November, 2009, a nationally recognized expert on Finnegan scoring, Karen D'Apollito PhD from Vanderbilt University, conducted ‘train-the-trainer’ seminars. The newly trained NCH Finnegan scoring ‘experts’ then

As soon as the oral morphine weaning protocol was implemented, LOS decreased. The target of an average LOS of 24 days was easily met by the target date of December 31, 2010.

Successful QI projects must be spread to other units. The GMC nursery staff had used a methadone weaning protocol. However, the average LOS for NAS patients at GMC in the first quarter of 2009 had increased to over 75 days from a historic average of around 31 days. The GMC staff led by Barry Haiphen MD and Stephanie Stafford RN independent of the main campus effort, adopted a similar protocol with great success. LOS for those patients plummeted to <18 days, and more recently to <12 days.

The Pediatric group that covers the GHC nursery at Fireside Methodist Hospital, Dublin Methodist Hospital, and St. Aria’s Hospital successfully implemented the oral morphine weaning protocol for NAS patients as well. Although those nurses have many fewer NAS patients, when their data are combined, they have achieved LOS reductions comparable to that on main campus.

There are other approaches to management of the patient with NAS. The NICU at Doctor’s Hospital West has utilized an oral methadone weaning program with early discharge, and doso physician monitoring of the methadone weaning process as an outpatient. This approach led by Carl Baekes DO and Terry Ehrlif RN has achieved a LOS reduction that is similar to that of the oral morphine program at GMC.

In 2011, our goal is to reduce LOS for NAS patient admitted to all NCH nurseries to <20 days. We also plan to spread this improvement to nurseries within our large region Y that have large populations of NAS patients.

Next time in Going Home! In next month’s issue of Going Home! We will focus on the management of gastroschisis.

Check out the NAS podcast at www.childrensonquality.com or use your smart phone to access the podcast via the QR Code below.

“Children’s on Quality” podcast QR Code
Spreading the news!
LOS Data for GMC NAS Patients

NAS Patients Discharged from GMC, October 2009 - Current

Morphine Protocol

- Baby Methadone wean
- Baby Morphine wean
- Mother methadone wean
- Mother buprenorphine wean
- Mother no wean

LOS (Days)

- 71.5 days
- 21.1 days
- 18.7 days
What drugs can cause withdrawal in my baby?
- Opiates (Heroin, morphine, Percocet, oxycotin, methadone, subutex, suboxone etc)
- Narcotics
- Alcohol
- Cocaine
- Nicotine
- Caffeine

If I am in a methadone program or am taking subutex or suboxone should I continue?
- Yes, it is healthier for mom and baby to be on a consistent dosing than fluctuations of illicit drugs.
- It decrease exposure to other toxins and HIV risk of exposure.
- Allows access to services and support
- Allows breast feeding

Withdrawal symptoms
- High pitch crying
- Sleeplessness /Cranky
- Feeding problems
- Diarrhea/vomiting
- Shakes/tremors
- Overactive suck

*It is important to tell your health care provider about any drugs, medications or herbal supplements you may be taking (prescription on non-prescription

Will my baby have to stay in the hospital?
Some babies have mild signs of withdrawal and need only normal newborn care. Others can have severe withdrawal and need medical treatment. This may include being admitted to a special care nursery where they can receive medicine to help ease their discomfort. If your baby is admitted to the special care nursery, they will be watched for these signs and scored to help the health care team decide what kind of care your baby needs.

What can I do for my baby?
As a parent, in the hospital or at home, spend as much time with your infant as possible. Your baby will be comforted by your close contact.
Talk with your nurse about comfort techniques for your baby.
Keep in close contact with your doctor.

Resources:
SAMHSA (Substance Abuse and Mental Health Services)
- 1-800-662-HELP (4357) 24 hour Hotline
- www.samhsa.gov

Will your Newborn Have Withdrawal?

A Parents Guide
Neonatal Abstinence Syndrome (NAS)
Is a condition that starts at birth when an infant's mother has used drugs (legal or illegal) or alcohol during her pregnancy. When the infant is born their drug supply stops and he or she goes through a time of withdrawal. The signs and symptoms of this withdrawal is called Neonatal abstinence syndrome (NAS).

Draft developed by Michelle Doughty RN
Clinical Nurse Manager, Doctor’s Hospital West
LOS of NAS Infants at RMH, MCSA, and DMH

Red = MCSA
Blue = DMH
Black = RMH

LOS (Days)

15.4 days

28 days

Date of Birth

Oral Morphine Protocol

Methadone Protocol

People do that which gets measured!
NAS Management Algorithm

(Phase I: To Treat or not to treat)

Developed by Gary Snyder, MD, and the Pediatrix Medical Group of Central Ohio
NAS Management Algorithm

(Phase II: Stabilization on Morphine)

Developed by Gary Snyder, MD, and the Pediatrix Medical Group of Central Ohio
NAS Management Algorithm

(Phase III: Weaning)

Developed by Gary Snyder, MD, and the Pediatrix Medical Group of Central Ohio
NAS Management Algorithm

(Phase III: Backsliding)

Developed by Gary Snyder, MD, and the Pediatrix Medical Group of Central Ohio
30 Day Readmission of NAS Patients Balancing Measure

15 Readmissions in 2 years

- 2 patients for NAS symptoms (last 6/09)
- 5 cases of bronchiolitis/RSV
- 3 CNS symptoms unrelated to NAS Hx
- 3 feeding issues unrelated to NAS Hx
- 1 r/o sepsis
- 1 BPD exacerbation
Summary

• Formal training of staff in the use of the Finnegan tool led to better assessment and documentation of withdrawal symptoms, and a more reliable weaning program.
• Standardize pharmacotherapy can impact LOS of NAS patients
• Oral morphine weaning protocol associated with a significant decrease in LOS for NAS patients.
• Maternity centers with NAS babies can achieve LOS of < 20 days.
Next Steps

• Decrease LOS for all units to < 18 days
• Spread project to Level I referring hospitals in Southern Ohio
• Engage with Ohio Children’s Hospitals to address the statewide NAS problem \( (N > 1000) \)
• Explore impact of buprenorphine v morphine for mothers (and babies?)
• Assess developmental impact of \textit{in utero} drug exposure and weaning therapy
Special Thanks to the NAS Taskforce

Erin Keels
Joanna Sutton
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Nancy Wagner
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Mary Griffith
Rise Gordon
Melissa Hamms
Kimberly Conkol
Richard McClead
Kim Samson
Krissana Deppen
Barry Halpern
Marcella Roark
Janet Polentz
Nicole Stout
Katherine Ludwig
Jessica Barton
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Gary Snyder, Rebecca Young
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Carl Backes
Denise Graham
Stephanie Stafford
Tishia Richardson
Andala Sliter

QI Facilitator: Jim Dail
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