Neonatal Abstinence Syndrome (NAS)

Jennifer Achilles, MD
Jennifer Castaneda-Lovato, RN
Clinician Directed Performance Improvement (CDPI)

- Intermountain Healthcare in Utah inspired the development of CHRISTUS St. Vincent’s Clinician Directed Performance Improvement (CDPI) program,
- CSV allocates paid time for physicians (.2 FTE) and nurses (.5 FTE)
- MD and RN dyads from each service line initiate and direct high-impact, highly focused quality improvement projects.
Project Team

CDPI
Lara Goitein, MD, Medical Director CDPI

Project Team

Core members:
Team leader: Jennifer Achilles, MD, Pediatric Hospitalist
Facilitator: Jennifer Castaneda-Lovato, RN CDPI

Consulting members:
Anne Kessler, MD Director Pediatric Hospitalist
Misha Harris, PNP Pediatric Nurse Practitioner
Jasmin Sanders, Peds Nurse
Marcia Panagkos and Kathy Lewellin, Social Work
Melinda Montoya And Jasmina Demirovic, Pharmacist
Cassie Marquez, Cerner IT support
Catalina Roybal, Data Specialist
Mission Statement

To improve the screening for and treatment of Neonatal Abstinence Syndrome in order to reduce use of medication for withdrawal symptoms, length of stay, and cost of admission, as well as to improve family and staff experience.
DRAMATIC INCREASES IN MATERNAL OPIOID USE AND NEONATAL ABSTINENCE SYNDROME

The use of opioids during pregnancy can result in a drug withdrawal syndrome in newborns called **Neonatal Abstinence Syndrome** (NAS), which causes lengthy and costly hospital stays. According to a new study, an estimated 21,732 babies were born with this syndrome in the United States in 2012, a **5-fold increase** since 2000.

**Every 25 minutes, a baby is born suffering from opioid withdrawal.**

**Average Length or Cost of Hospital Stay**

<table>
<thead>
<tr>
<th></th>
<th>With NAS</th>
<th>W/O NAS</th>
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<tbody>
<tr>
<td>Newborns</td>
<td>16.9</td>
<td>2.1</td>
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<td>$66,700</td>
<td>$3,500</td>
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**NAS and Maternal Opioid Use on the Rise**


National Institute on Drug Abuse
Background: A look at our baseline data

What was known about NAS at CSVRMC

Frequency:
- 2222 newborns between January 2015 and September 2016
- 150 babies with coding suggestive of NAS identified through Midas
- 90 of the 150 were exposed to opioids in utero (documented with positive maternal and/or baby drug screen, history, or in treatment program)
  - 4 NICU transfers excluded
- 86 of 150 included in baseline sample
- 24 of 86 exposed newborns required symptom relief with methadone

- **Rate of newborns exposed in utero:** 4%
- **Rate of newborns treated with methadone for NAS:** 1.08% (28% of exposed babies)

Resources: For opioid-exposed newborns requiring opioid medication for treatment:
- Average LOS 18 days
- Average cost $16,000
Fishbone Diagram

- **Prenatal**
  - Lack of education
  - Parental expectations
  - Lack of resources or family support
  - Embarrassment

- **L&D Hospitalization**
  - NAS scoring variability
  - Infant drug screening
  - Begin 96 hour stay
  - Maintaining confidentiality

- **Social Services**
  - Social services consults
  - CYFD involvement
  - Security

- **Admission**
  - Maternal drug screening
  - Obtaining consent
  - Awkward conversation
  - Prenatal records not available

- **Peds Hospitalization**
  - NAS scoring
  - MD interpretation of scores
  - MD resistance
  - May stay up to 6 weeks
  - 96 hour stay minimum
  - Difficult family behavior

- **Overuse of opioid treatment**
  - Family expectations
  - Family support involvement
  - Lack of use of non pharmacological treatments
Leverage Points

**Prenatal**
- Lack of education
- Parental expectation
- No resources or family support
- Embarrassment

**L&D Hospitalization**
- NAS scoring
- Infant drug screening
- RN education about NAS
- Maintaining confidentiality
- Awkward conversations
- Begin 96 hour stay
- MD resistance
- Obtaining consent
- Prenatal records not available
- Difficult family behavior
- Lack of infant centered scoring
- May stay up to 6 weeks

**Social Services**
- Social services consults
- CYFD involvement
- Security
- Simplified Eat/Sleep/Console approach
- Family expectations/ involvement
- Family support
- Lack of non pharmacological treatments

**Admission**
- Maternal drug screening questions
- Awkward conversation

**Peds Hospitalization**
- Maintaining confidentiality

Decrease use of opioid treatment
Aim

Statements

During the period from October 2016-September 2017, for newborns exposed to opioids in utero we will:

1. Reduce the proportion who receive any opioid medications by 20%.
2. Reduce the total dose of opioid medications by 20%.

... when compared to January 2015-September 2016.
Metrics

- **Primary metric**
  - Proportion of opioid exposed newborns requiring treatment with opiates
  - Cumulative dose of opiates per exposed newborn requiring treatment

- **Secondary metrics**
  - Length of stay for exposed newborns
  - Length of stay for exposed newborns requiring opiates
  - Direct variable cost per exposed newborn
  - Direct variable cost per exposed newborn requiring opiates
  - Total number of doses of opiates for those requiring treatment

- **Balance metrics**
  - Rate of 30 day all cause readmission
  - Rate of 30 day readmission related to NAS
  - Death or NICU transfer within 30 days
Interventions

What changes can we make that will result in improvement?

Interventions planned in our first “rapid cycle PDSA test”
## Interventions PDSA cycle 1

<table>
<thead>
<tr>
<th>Leverage points</th>
<th>Change hypotheses/interventions</th>
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<tbody>
<tr>
<td>I. Lack of maternal education re drug exposure in babies</td>
<td>I. Prenatal pamphlet OB and subutex clinics</td>
</tr>
<tr>
<td></td>
<td>II. RN visit subutex clinics</td>
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<tr>
<td>II. Maternal and newborn drug screening</td>
<td>II. New admit orders on maternal admission, newborn umbilical cord drug testing</td>
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<td>III. Improving infant assessments</td>
<td>III. Training sessions for all L&amp;D and Peds nurses on standardized Finnegan scoring, on newborns schedule.</td>
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<td>IV. Improving family engagement, understanding, education, involvement in infant's care</td>
<td>IV. Admission packet for families with clear expectations, agreement letter</td>
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<td>V. Non pharmacologic treatments for infants</td>
<td>V. Low stim environment, donor breast milk, cuddlers</td>
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<td>VI. Provider education for pediatric hospitalists, FP resident/attending Improved NAS score interpretation Multidisciplinary rounds Peds consult for NAS Breast feeding guidelines</td>
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Newborns exposed to drugs during pregnancy – a guide for families pamphlet

**WHAT IS NEONATAL ABSTINENCE SYNDROME?**

Neonatal Abstinence Syndrome (NAS) refers to withdrawal symptoms that babies may develop after birth. This can occur when babies are suddenly cut off from the medications or drugs used by the mother during pregnancy. This is often called “withdrawal.” It is hard to know which infants will have NAS. Some infants will experience withdrawal symptoms and others will not, regardless of the amount of medications/street drugs that the infant was exposed to during pregnancy. Whatever the reason, this guide will help you learn about NAS.

**WHAT CAN CAUSE NAS?**

Prescription Medications
- Morphine
- Oxycontin
- Methadone
- Tylenol #3
- Subutex
- Hydromorphone
- Fentanyl
- Hydrocodone/Lortab/Norco
- Oxycodeone/Percocet

Street Drugs
- Heroin
- Oxys

Other Harmful Drugs That Can Cause Similar Symptoms
- Cocaine
- Crack
- Ecstasy
- Speed
- Methamphetamines
- Alcohol
- Marijuana/Tobacco
- Benzodiazepines
- SSRIs

**WHAT ARE THE SYMPTOMS OF NAS?**

- High Pitched Cry
- Irritability
- Tremor/Jitteriness
- Stuffy Nose/Sneezing
- Poor Weight Gain
- Increased Breathing Rate
- Skin Irritation
- Vomiting
- Loose/Watery Stools
- Tense Arms, Legs, Back
- Feeding Difficulties
- Seizures
- Sleeping Difficulties

**HOW IS YOUR INFANT TREATED?**

Usually within 1–2 days after birth your baby will be transferred to the pediatric unit for further monitoring. The nursing staff will use a scoring system to assess your baby for signs and symptoms of withdrawal. They will ask you to be involved in this process as well. Bonding with your infant is extremely important. The nurses will encourage you to hold, feed and provide other types of simple interventions to soothe your baby. If your infant’s score is repeatedly elevated it may be necessary to begin your baby on a medication to help ease your infant through the withdrawal symptoms. Your infant will then begin a gradual process of decreasing doses of medication that may take 1–4 weeks.

**WHAT IS EXPECTED OF YOU, THE PARENT/CAREGIVER, AND WHAT CAN YOU EXPECT FROM THE NURSING STAFF?**

The nursing staff will teach you about the scoring system. They will give you a checklist and ask you to assist them recording any withdrawal symptoms that you notice. Your participation in the care of your infant is essential. The staff will also teach you helpful ways to comfort your infant. They will suggest how you can keep the environment quiet, limit visitors, and give your infant attention during this time. The staff knows that there are times you may need to leave, but it is important for you to arrange for another caregiver to be with your infant while you are gone. It is very important for you to communicate with the nursing staff as well as for them to communicate with you.
Neonatal Abstinence Syndrome: Rethinking our Approach

Matthew R. Grossman, MD
Assistant Professor of Pediatrics
Yale-New Haven Children's Hospital

Wednesday, May 31, 2017 at 12:30 PM and
Thursday, June 1, 2017 at 7:00 AM
Medical Dental Auditorium
CHRISTUS St. Vincent Regional Medical Center
1.0 AAMA PRA Category 1 Credit™

BIOGRAPHY:
Matthew R. Grossman, MD graduated from SUNY Stony Brook School of Medicine in 2003 and completed his pediatric residency at Yale-New Haven Children’s Hospital (YNHCH) in 2006. He then became an Assistant Professor of Pediatrics at Yale School of Medicine and a pediatric hospitalist. He has been the quality and safety officer for YNHCH since 2013 and his team was awarded the 2015 National Pediatric Quality Award from the Children’s Hospital Association.

NEEDS ASSESSMENT:
Neonatal abstinence syndrome (NAS) is a postnatal drug withdrawal syndrome in newborns caused primarily by in utero exposure to opioids. In the United States, the incidence of NAS increased 383% during 2000-2012, and an estimated 80% of hospital charges for NAS are covered by state Medicaid programs. An article in the New England Journal of Medicine stated that from 2000 through 2009, the incidence of the neonatal abstinence syndrome in the United States nearly tripled, with several states reporting even larger recent increases. This rise occurred in association with an increase in the use of opioids by pregnant women. Despite the increased incidence of the neonatal abstinence syndrome, data on changes in the utilization of neonatal intensive care unit (NICU) resources or the treatment of affected infants are lacking.

Understanding the changes in health care utilization and clinical treatment of these infants is critical in aiding in the design of public health programs to improve health care delivery for the infants and their mothers.

The current practice follows prolonged length of stay for infants with neonatal abstinence syndrome. There is a need to address this issue with a patient-centered approach.

LEARNING OBJECTIVES:
- Understand the lack of evidence for the current approach for management of infants with NAS
- Describe the new, patient-centered approach to NAS management

ACCREDITATION:
This activity has been planned and implemented in accordance with the accreditation requirements and policies of the New Mexico Medical Society (NMMS). CSVRMC is accredited by the NMMS to provide continuing medical education for physicians. CSVRMC designates this live activity for a maximum of 1.0 AAMA PRA Category 1 Credit™.

Physicians should claim only the credit commensurate with the extent of their participation in the activity.

This program is not receiving any financial support from any commercial interests.

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CHRISTUS ST. VINCENT
Regional Medical Center
Scheduled Methadone vs Morphine PRN PDSA cycle 2
Introduced March 2017

- Scheduled **Methadone** weaning protocol takes a minimum of 7 days + 2 to observe after last dose (avg 18 days)
- Requires a minimum of 24 doses (avg 39 doses)
- Based on time consuming, complex Finnegan scoring

- **Morphine** given on prn basis based on E/S/C
- Dose 0.05mg/kg PO x 1 (Q3 prn)
- Typically not increased or weaned
- Shorter acting
Eat Sleep Console PDSA cycle 3
Introduced August 2017

- Interventions focused on non pharmacologic therapies
- Simplified approach to assessment for infants
  - Eat - goal feeds OR 1 oz/feed OR BF well
  - Sleep - 1 hour undisturbed
  - Consoled - within 10 minutes
- Led to decreased ALOS and proportion of infants treated with morphine
- Decreased hospital costs
- No adverse events

Feeding Difficulties PDSA cycle 4

- Many withdrawing infants struggle with feeding and excess weight loss
  - (>10% BW)
- We’ve tried to maximize feeding/calories with NG feeds but have not been following our own guidelines...
- We have been more focused on consolability
- Infant based feeding readiness and quality score (75% of goal feeds over 30 minutes) considered good feed.
  - If not trial morphine prn
Our data
Consistent with national trends, rate of in utero opiate exposure increasing (large increase in 2017 partly explained by enhanced screening techniques involved in project)
Primary Metric 1: Proportion of opiate-exposed newborns receiving opiate treatment dropped by 29%
Primary Metric 2: For NAS newborns requiring opiate treatment, cumulative dose decreased from mean of 6.1 mg to 1.0 mg (p<0.0001)
For those NAS newborns who did receive opiate treatment, average number of doses decreased from 39 to 8 (p<0.0001)
Greater than half of opiate treatment regimens were morphine post-intervention.

No methadone used in last two quarters.
For all newborns exposed to opiates in utero, interventions were associated with a decrease in average LOS of 2.3 days ($p=0.02$)
Effect on LOS particularly pronounced for those infants who did require opiate treatment, with a decrease in average LOS of 8.2 days \((p=0.02)\)
Savings of about $2000 per exposed infant ($8800 per exposed infant requiring opiate treatment)
Financial savings

- With a rate of 66 opiate-exposed newborns per year:
  - Decrease in LOS corresponds to 152 fewer hospital days per year
  - Decrease in total direct costs corresponds to $134,000 lower costs per year
Balance metric: One NAS baby admitted post-intervention, leading to non-significant increase in 30-day readmission rate
Conclusions and Next Steps

- Non pharmacological treatment of withdrawing babies is the number one most important intervention
- Medication therapy is secondary and should be rare
- This new philosophy of treatment is associated with earlier discharges, decreased length of stay and costs, and (anecdotally) happier families and staff . . . without apparent negative outcomes

Next Steps:
- Donor breast milk
- Universal maternal toxicology testing?
References


2. Kocherlakota P. Neonatal abstinence syndrome. *Pediatrics*. 2014;134(2). Available at: www.pediatrics.org/cgi/content/full/134/2/e547


5. Incidence of Neonatal Abstinence Syndrome — 28 States, 1999–2013 *MMWR* / August 12, 2016 / 65(31);799–802 Jean Y. Ko, PhD1; Stephen W. Patrick, MD2; Van T. Tong, MPH1; Roshni Patel, MPH1; Jennifer N. Lind, PharmD3; Wanda D. Barfield, MD1

Our most recent data (through Feb 2018)
Percentage of exposed newborns treated with opiates before and after intervention

- Pre-intervention (Jan 2015-Sept 2016): 30%
- Post-intervention (Oct 2016-Feb 2018): 25%
(Jan 2015-Sept 2016) and post-intervention (Oct 2016-Feb 2018)
Large decrease in opiate treatment of newborns with NAS

Opiate doses for newborns with NAS requiring opiate treatment pre-intervention (Jan 2015-Sept 2016) and post-intervention (Oct 2016-Mar 2018)

p<0.0001 for difference in means for both number of doses and dose mg
For all newborns exposed to opiates in utero, mean LOS decreased by 2.3 days.

*Hospital length of stay for newborns exposed to narcotics in utero, pre-intervention (Jan 2015-Sept 2016) and post-intervention (Oct 2016-Mar 2018)*

*p=0.03 for difference in means*
For those exposed newborns with NAS requiring treatment, mean LOS decreased by 8 days.