Neonatal Abstinence Syndrome (NAS)

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ECHO
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Objectives

- Examine the rate of opioid Neonatal Abstinence Syndrome.
- Review the indications for neonatal toxicology screening.
- Describe the clinical characteristics of Neonatal Abstinence Syndrome and review the Finnigan Neonatal Abstinence Scoring System (FNASS).
- Discuss the clinical management of patients with NAS.
- Recognize the importance of parental education, support and involvement.
Neonatal Abstinence Syndrome (NAS)

A constellation of signs and symptoms of withdrawal in newborns resulting from the passive placental transfer of opioids used during pregnancy.

- Central nervous system irritability
- Gastrointestinal dysfunction
- Autonomic abnormalities
Congenital Morphinism: 1st reported in 1875
Synonymous with Neonatal Opioid Withdrawal Syndrome (NOWS)
Most common cause of neonatal withdrawal
50-90% of opioid exposed newborns will require medical management for symptoms
Variables: exposure, polysubstances, metabolism, placenta, genetics, epigenetics
Presents in first 24h-7 days of life
Can last 4-6 months
Long term: difficult to measure and differ with substance. Hearing, vision, motor, developmental, behavioral and cognitive
Lack of opioids in chronically stimulated receptors

- Super activation of adenyl cyclase
  - Increased cyclic adenosine monophosphate
  - Increased protein kinase
  - Increased transcription factors
  - Increased release of neurotransmitters

- Corticotrophin increase
  - Increased stress
  - Hyperphagia

- Serotonin decrease
  - Sleep deprivation
  - Sleep fragmentation

- Dopamine decrease
  - Hyperirritability
  - Anxiety

- Noradrenaline increase
  - Hyperthermia
  - Hypertension
  - Tremors
  - Tachycardia

- Acetylcholine increase
  - Diarrhea
  - Vomiting
  - Yawning
  - Sneezing
  - Sweating

- Other receptor activity increase
  - Hyperalgesia
  - Allodynia
Every hour, 1 BABY is born suffering from opiate withdrawal.

Average length or cost of hospital stay

<table>
<thead>
<tr>
<th>Newborns</th>
<th>Days</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>with NAS</td>
<td>16.4</td>
<td>$53,400</td>
</tr>
<tr>
<td>w/o NAS</td>
<td>3.3</td>
<td>$9,500</td>
</tr>
</tbody>
</table>

NAS and maternal opiate use on the rise

- Newborns suffering from opiate withdrawal
- Maternal opiate use

Rate per 1000 hospital births

Source: Patrick et. al., JAMA 2012
Dramatic Increases in Maternal Opioid Use Disorder and Neonatal Abstinence Syndrome

Opioid use during pregnancy can result in a drug withdrawal syndrome in newborns called neonatal abstinence syndrome, or neonatal opioid withdrawal syndrome (NAS/NOWS), which causes costly hospital stays. A recent analysis showed that an estimated 32,000 babies were born with this syndrome in the United States in 2014, a more than 5-fold increase since 2004.

Every ~ 15 minutes, a baby is born suffering from opioid withdrawal.

Policies that Punish Pregnant Women for Substance Use **linked to More Newborns Experiencing Drug Withdrawal**

State policies can punish pregnant women for substance use by:
- Criminalizing substance use in pregnancy
- Considering it grounds for civil commitment
- Considering it child abuse or neglect

Examining 4.6 million births in 8 states from 2003-2014, our research found that:
**More infants are born experiencing drug withdrawal in states w/ policies that punish pregnant women for substance use.**

### Annual Rates of NAS* per 10,000 Births

- **No Policy**: 45.7 (±2.2)
- **≤1 year**: 52.4 (±2.8)
- **>1 year**: 59.6 (±3.1)

- **46** in states with NO punitive policies
- **57** in states with policies in effect for ≤1 year
- **60** in states with policies in effect for >1 year

Punitive policies aren’t beneficial for women or infants:
- Punishing pregnant women for substance use discourages them from seeking prenatal care and substance use treatment

Policymakers should focus on public health approaches that bolster prevention & expand access to substance use treatment among pregnant women.

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*Neonatal Abstinence Syndrome (NAS) is a withdrawal syndrome experienced by some opioid-exposed infants after birth.

Faherty, LJ; Kranz, AM; Russell-Fritch, J; Patrick, SW; Cantor, J; Stein, BD. Association of Punitive Reporting State Policies Related to Substance Use in Pregnancy with Rates of Neonatal Abstinence Syndrome. JAMA Network Open, 2019; 2(10): e1914078.
Benzodiazepine Exposure Increases Severity of Neonatal Abstinence Syndrome

Pregnant women who use opioids are more likely to also use other prescribed, illicit, or illegal substances, i.e. alcohol.

Research shows exposure to a mix of these substances may alter the severity and onset of infant withdrawal symptoms.

Benzodiazepine use was associated with more severe NAS, even after accounting for other substances.**

Infants exposed to benzodiazepines were 50% more likely to require medications to treat NAS than infants not exposed.**

A recent significant rise in the concurrent use of opioids and benzodiazepines, such as Xanax, highlights the risks for moms & babies that may arise from mixing substances during pregnancy.

*Neonatal Abstinence Syndrome (NAS) is a withdrawal syndrome experienced by some opioid-exposed infants after birth.

**Sanlrenzo, LA, Cooper, WO, Dudley, JA, Stratton, S, Maalouf, FI, Patrick, SW. (2019). Increased Severity of Neonatal Abstinence Syndrome Associated With Concomitant Antenatal Opioid and Benzodiazepine Exposure. Hospital Pediatrics, 9(8).

www.childpolicy.org  •  @VUMCchildpolicy
Associated Neonatal Complications

- Prematurity
- Intrauterine growth restriction
- Microcephaly
- Respiratory difficulties
- Jaundice
- Neurobehavioral abnormalities
- Increased neonatal mortality
- Significant increase in sudden infant death syndrome (SIDS)
- Neonatal Abstinence Syndrome (NAS)
Associated Neonatal Complications


- Atrial and ventricular septal defects
- Hypoplastic left heart syndrome
- Spina bifida
- Gastroschisis
Indicators for Neonatal Drug Screening

- Unexplained abruption
- Inconsistent prenatal care
- Social work recommendation
- Emergency department care plan
- Independent physician care plan
- Obviously intoxicated
- Hx of drug abuse in the last 2 years
- CPS and legal involvement
- Unexplained infant neurological complication (IVH, seizures)
Differential Diagnosis

- Serum glucose level
- Serum calcium level
- Sepsis (CBC, BC)
- Confirm maternal hepatitis status and treat accordingly
- Confirm HIV status
Neonatal Drug Screening

- Urine Drug Toxicology
  - Past 2-3 days
- Meconium Sampling
  - 2nd & 3rd trimester
- Umbilical Cord Analysis
  - Last 20 weeks
- Hair Analysis
Non-pharmacologic Treatment

- Swaddling, holding upright, Bouncy/rocker
- Pacifier
- Decreasing Stimulation: Lighting and Voices
- Feeding:
  - Breast feeding
  - Frequent smaller feeds
  - Higher caloric feeds
  - IV fluids
Finnegan Neonatal Abstinence Scoring System (FNASS)

- A score sheet lists symptoms
- Each symptom is assigned a score
- Scoring is dynamic
- Designed for term babies on q4h feeds
- Modification for preterm infants
Finnegan Neonatal Abstinence Scoring System (FNASS)

- 1st score ~2 hours after birth.
- Score AFTER feeding
- If pharmacotherapy is NOT needed, score at least first 3-5 days of life.
- Pharmacotherapy is considered for consistent scores >8.
- Rule of 24. Three consecutive scores 8 or > or two scores 12 or >
<table>
<thead>
<tr>
<th>System</th>
<th>Signs and Symptoms</th>
<th>Score</th>
<th>AM</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Nervous System</td>
<td>Excessive high-pitched (or other) cry &lt; 5 mins</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disturbances</td>
<td>Continuous high-pitched (or other) cry &gt;5 mins</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleeps &lt;1 hour after feeding</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleeps &lt;2 hours after feeding</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleeps &lt;3 hours after feeding</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hyperactive Moro reflex</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Markedly hyperactive Moro reflex</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mild tremors when disturbed</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderate-severe tremors when disturbed</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mild tremors when undisturbed</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderate-severe tremors when undisturbed</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased muscle tone</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Excoriation (chin, knees, elbow, toes, nose)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Myoclonic jerks (twitching/jerking of limbs)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Generalized convulsions</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metabolic/Vasomotor/</td>
<td>Sweating</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory Disturbances</td>
<td>Hyperthermia 37.2-38.3C</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hyperthermia &gt;38.4C</td>
<td>2</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>
</tr>
<tr>
<td></td>
<td>Mottling</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nasal stuffiness</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sneezing (&gt; 3-4 times / scoring interval)</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td>Nasal flaring</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Respiratory rate &gt;60/min</td>
<td>1</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>
</tr>
<tr>
<td></td>
<td>Excessive sucking</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor feeding (infrequent/uncoordinated suck)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Regurgitation (≥ 2 times during/post feeding)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Projectile vomiting</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loose stools (curds/seedy appearance)</td>
<td>2</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>
</tr>
<tr>
<td>Total Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date/Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initials of Scorer</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Eat, Sleep, Console (ESC)

- Primarily withdrawal from Methadone
- Consistent Maternal rooming-in
- Subjective
- Difficult to know when/how to advance/wean medication
- Questionable long-term neurological development
Pharmacologic Treatment

• Morphine:
  – First line treatment
  – Monitored in the Neonatal ICU
• Methadone: not recommended
• Adjunct treatment
  – Clonidine: only opioids
  – Phenobarbital: polysubstance
  – Wean morphine then adjunct
• Monitor for 3-5 days after last dose of medication with NAS scores consistently <8 with appropriate wt changes
Parental Education, Support and Involvement

- Open, honest and supportive communication
- Promote involvement in clinical decisions
- Promote involvement in infant cares
Parental Education, Support and Involvement

• Mother/baby Dyad
  • Promote zero separation
• Improved outcomes:
  • Shorter LOS
  • Less maternal relapse
  • Less CPS/law enforcement involvement
• Multidisciplinary Care Team
Parental Education, Support and Involvement

- Symptoms of withdrawal
- When to seek medical help
- How to reduce stimulation at home
- Calming techniques
- Feeding instructions
- Close medical follow-up
Trifold pamphlet
Preparation for Discharge

The biggest question most parents have is “when does my baby get to go home?” We want to assure you our goal is a safe and successful discharge for you and your baby.

Your baby will be ready to go home when he or she:

- Can take all feedings orally (breast or bottle) and gain weight.
- Can maintain low NAS scores off medication.
- Is free of other medical complications.
- Has a follow-up health care provider identified.
- And you have identified a support system.

It is very important to keep all follow-up appointments.

Breastfeeding

Breastfeeding can be a safe option with most medicines given to you by your Provider. Breastfeeding may even help with baby’s withdrawal symptoms. You should talk to your baby’s Provider about a feeding plan for your baby.

Breastfeeding will require some effort from you, but the benefits to your baby will be well worth it. Breastfeeding provides a special time for close contact with your baby. St Luke’s lactation nurses are available to help with pumping. They have tips to make breastfeeding easier.

Babies that go home breastfeeding should breastfeed at home. Talk to your baby’s Provider before you stop breastfeeding or before making any medication changes.
What is NAS?
Neonatal Abstinence Syndrome (NAS) is when babies have symptoms due to certain medicines their mothers used (like opioids or methadone) during pregnancy. When the baby is born he or she is not to receive the medicine but may still depend on it. This can lead to symptoms of withdrawal.

How will I know if my baby is having withdrawal symptoms?
Neonatal Abstinence Syndrome is a group of signs, symptoms and behaviors. Each baby is different; some have worse symptoms than others. There is no way to tell which babies will have withdrawal or how long it will last. Your baby may need to stay in the hospital for a few days to several weeks for treatment of withdrawal. Symptoms may include:

- tremors (trembling)
- irritability (excessive crying)
- sleep problems
- high-pitched crying
- tight muscle tone
- hyperactive reflexes
- seizures
- yawning, stuffy nose, and sneezing
- poor feeding and suck
- vomiting
- diarrhea
- dehydration
- sweating
- fever or unstable temperature

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Initial Care
After birth your baby will go with you to the mother/baby care unit. You and your baby will stay there as long as there are no other health concerns. Most babies begin to show signs of withdrawal between 24 and 72 hours after birth. Your baby will be watched for signs and symptoms of withdrawal. The symptoms will be measured using a scoring tool. You can help your nurse by watching your baby for signs of withdrawal. This way we will be able to help your baby as soon as possible.

Caring for Babies at risk for NAS
There are several things that you can do to provide comfort & decrease the discomfort of the withdrawal symptoms.

Sensory
- Maintain a quiet, dimly lit room
- Handle baby with slow, gentle movements
- Hold infant with arms & hands close to chest
- Offer pacifier; rhythmic sucking can be calming
- Swaddle with hands and arms close to chest during diaper changes
- Gentle & slow up and down rocking

Motor and Tone Control
- Assist baby to bring hands to chest
- Side-lying, bring head and hips forward to fetal position for comfort. Remember that baby should sleep on back.
- Frequent holding, including skin to skin holding

Gastrointestinal
- Breastfeeding or small frequent feedings
- Only wake your baby if it has been 4 hours since last feeding
- Frequent burping during feeding (rubbing back instead of patting)
- Pauses during feedings for baby to readjust.
- Pacifier during feeding breaks

Being a mother is learning about strengths you didn’t know you had, and dealing with fears you didn’t know existed. ~Linda Wooten

Will my baby need medication for withdrawal?
Most babies require medication to help stop withdrawal symptoms. If your baby is having worse symptoms (higher scores), medicine will be started to help your baby feel comfortable. If your baby needs medicine for withdrawal, your baby will be moved to the Newborn Intensive Care Unit (NICU). Morphine is usually given to help babies through withdrawal. We need you to feed, hold and provide comfort for your baby while in the NICU. We want you to be there every step of the way.
Neonatal Abstinence Syndrome (NAS)
Pharmacologic Treatment Advancement Algorithm
# Neonatal Abstinence Syndrome (NAS) Due to Maternal Opioid Use

## Pharmacologic Treatment Advancement Algorithm

### Indicators of substance use include:
- Known drug use/abuse
- Poor prenatal care (<2 visits)
- Obvious intoxication
- Placenta abruption
- Signs of neonatal abstinence syndrome

### Other possible indicators of substance use include:

**Maternal:**
- Previous unexplained fetal demise
- Repeated spontaneous abortions
- Precipitous labor
- Severe mood swings
- MI
- Cerebrovascular accidents
- History of psychiatric illness
- Positive sexually transmitted infections and suspected or known high-risk sexual behavior
- Inappropriate behavior arousing suspicion
- Reported physical or sexual abuse
- Positive HIV
- Hepatitis, pancreatitis, cirrhosis, cellulitis, endocarditis

**Neonatal:**
- Preterm birth
- Jitteriness with normal glucose levels
- Marked irritability
- Atypical vascular incidents or MI
- Unexplained IUGR, seizures, apnea
- Neurobehavioral or congenital abnormalities
- Necrotizing enterocolitis in otherwise healthy term infant

### If perinatal history suggests in-utero exposure or infant shows signs of withdrawal:
- Obtain urine toxicology, Cord STAT and meconium
- Notify OB provider to send Urine for OB Hold for urine drug testing.
- Start Modified Finnegan Neonatal Abstinence Score Sheet. 2 hours after birth and continue every 3 hours for a minimum of 48 hours and Start non-pharmacologic interventions

### Infants at risk for/with symptoms of NAS should receive these non-pharmacologic interventions:

**Reduce stimuli:**
- Quiet room with dim lighting
- Avoid talking at the bedside
- Prepare everything prior to disturbing infant
- Minimize handling

**Supportive therapy:**
- Swaddle
- Slow body movements
- Rock gently, talk, sing or hum softly

**Hold firmly and close to the body**
- Promote skin to skin contact
- Use a pacifier for excessive sucking
- Feed on demand, frequent small feedings or per orders
- Allow rests between sucking
- Assess coordination of suck/swallow reflex, support cheeks & jaw if necessary
- Change diaper frequently start barrier cream prophylactically on admit to prevent skin damage

### Consider other potential causes of jitteriness, irritability, poor feeding:
- Hypoglycemia
- Hypocalcemia
- Hypomagnesemia
- Sepsis
- Meningitis
- CNS injury/bleed/stroke

### Immediately contact the medical practitioner for the following changes:
- Seizures
- Diarrhea (6 or more stools/day or watery ringing)
- Repetitive vomiting >10% of intake
- Tachycardia (HR >20 beats/minute over baseline)
- Systolic BP >90mm Hg
- Cyanosis or mottling
- Continuous inconsolable crying despite nursing intervention
- Increased respiratory support
Neonatal Abstinence Syndrome (NAS) Due to Maternal Opioid Use
Pharmacologic Treatment Advancement Algorithm

**Step 1**
If after maximizing non-pharmacologic interventions the average score is ≥8 (rule of 24)*

**Give 1x PO Morphine dose based on most recent score:**

<table>
<thead>
<tr>
<th>Score</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-10</td>
<td>0.05mg/kg</td>
</tr>
<tr>
<td>11-13</td>
<td>0.06mg/kg</td>
</tr>
<tr>
<td>14-16</td>
<td>0.08mg/kg</td>
</tr>
<tr>
<td>&gt;16</td>
<td>0.1mg/kg</td>
</tr>
</tbody>
</table>

Assess & score in 2 hours

- Continue current dose Q3h & score every 3 hours
- 2 hr Score ≥8?
  - Yes: Continue current dose Q3h & score every 3 hours
  - No: 2 hr Score ≥8?
    - Yes: Score 8-13: Repeat last dose x1 and score in 2 hours
    - No: Score >13: Increase last dose by 0.02 mg/kg x1 and score in 2 hours
    - Continue last dose Q3h & score every 3 hours

**Step 2**
Repeat step 2 until NAS score: <8
If scores continue to be ≥8 when dose is up to 0.2mg/kg Q2h x3 doses, advance to adjunct treatment algorithm

*3 consecutive scores averaging > 8 or 2 consecutive scores averaging > 12
Neonatal Abstinence Syndrome (NAS) Due to Maternal Opioid Use Adjunct Pharmacologic Treatment Advancement Algorithm

If the infant is being treated with maximal dose of morphine (0.2 mg/kg Q3H) and NAS scores continue to meet/exceed the rule of 24, consider adjunctive treatment using the following algorithm:

- **Known exclusive opioid use only?**
  - No
    - NAS scores consistently >8 with unknown poly substance use
      - Start oral Phenobarbital: Loading dose of 10mg/kg x1 and start 5mg/kg Q 24 hours.
      - Continue new treatment at least 48h before considering starting to wean morphine.
      - Wean Morphine off prior to weaning Phenobarbital.
  - Yes
    - NAS scores consistently >8 with known opioid use
      - Start oral Clonidine**: 1mcg/kg Q6h x24h
      - Avg. 24 hour NAS Score >8?
        - No
          - Avg. NAS score 8 or <=: Continue current treatment another 24h then consider starting to wean morphine as tolerated.
        - Yes
          - Avg. NAS score >8: Increase oral Clonidine: to 2mcg/kg Q6h. Continue new treatment x48h then consider starting to wean morphine as tolerated.

**Special Considerations:**
- If dose maxed for morphine AND Clonidine, start phenobarbital.
- Wean morphine off prior to weaning Clonidine.
- Follow closely for side effects: hypotension, hyperglycemia, constipation.
- Follow for rebound hypertension when weaning clonidine.
- Monitor infant for at least 48h off of Clonidine prior to discharge.
Neonatal Abstinence Syndrome (NAS)
Weaning Pharmacologic Treatment Algorithm
Neonatal Abstinence Syndrome (NAS) Due to Maternal Opioid Use
Weaning Pharmacologic Treatment Algorithm

**Immediately contact the medical practitioner for any of the following changes:**
- Seizures
- Diarrhea (6 or more stools/day or watery ring)
- Repetitive vomiting >10% of intake
- Tachycardia (HR >20 beats/minute over baseline)
- Systolic BP >90mm Hg
- Continuous inconsolable crying despite nursing intervention
- Increased respiratory support or events

**Consider other potential causes of jitteriness, irritability, poor feeding:**
- Hypoglycemia
- Hypocalcemia
- Hypomagnesemia
- Sepsis
- Meningitis
- CNS injury/bleed/stroke

**Infants at risk for/with symptoms of NAS should receive these non-pharmacologic interventions:**

*Reduce stimuli:*
- Quiet room with dim lighting
- Avoid talking at the bedside
- Prepare everything prior to disturbing infant
- Minimize handling

*Supportive therapy:*
- Swaddle
- Slow body movements
- Hold firmly and close to the body
- Promote skin to skin contact
- Rock gently, talk, sing or hum softly

*Using a pacifier for excessive sucking
- Feed on demand, frequent small feedings or per orders
- Allow rests between sucking
- Assess coordination of suck/swallow reflex, support cheeks & jaw if necessary
- Change diaper frequently, use barrier cream to prevent skin damage

**Monitor:** sleeping habits, temperature stability, weight gain or loss and any other changes in clinical status that might suggest another disease process.
Neonatal Abstinence Syndrome (NAS) Weaning Morphine Treatment Algorithm

STEP 1
Wean Morphine dose by 0.02mg/kg and continue Q3h interval

NAS scores the past 24h are ALL <10 and no two consecutive scores >8

Yes

Repeat STEP 1 and continue Q3h interval until dose is decreased to 0.02mg/kg Q3h x48h then go to Step 2

No

• Ensure non-pharmacologic interventions are maximized
• Go back to previous dose/interval STEP and score in 2 hours**

STEP 2
When Q3h dose is down to 0.02mg/kg increase dose interval to Q4h

NAS scores the past 24h are ALL <10 and no two consecutive scores >8

Yes

Increase dose interval by 2 hours every 24 hours until interval is Q8h then go to STEP 3

No

STEP 3
When dose is down to 0.02mg/kg Q8h, give dose x2 then discontinue and monitor NAS score a minimum of 48 hours or move to weaning adjunct treatment algorithm if indicated

Rule of 24:
Notify provider if at any time 2 or 3 consecutive scores = > 24

**NAS score continues to be elevated:
STEP 1: increase dose by 0.02mg/kg
STEP 2: decrease interval by 2h until back to Q3h
Neonatal Abstinence Syndrome (NAS)
Weaning Adjunct Pharmacologic Treatment Algorithm

Start when infant has not received a Morphine dose for at least 24h and NAS scores are ALL <10 and no two consecutive scores >8

**Phenobarbital**

- Decrease dose by 20%*

  - **Yes**
    - NAS scores <10 and no two consecutive scores >8 x24h
      - Go back to previous dose
      - Follow scores for 24h and repeat last step
  
  - **No**

**Clonidine**

- Decrease dose by 50%
- Follow BP every 6 h to monitor for rebound hypertension

  - **Yes**
    - NAS scores <10 and no two consecutive scores >8 x48h
      - Dose < or =0.05mcg/kg
      - **No**
      
      - **Yes**
        - Decrease dose by 50%
        - Follow BP every 6 h to monitor for rebound hypertension
      
      - **No**
        - NAS scores <10 and no two consecutive scores >8 x48h

**Monitor infant for at least 48h after the last dose of phenobarbital prior to discharge**

- Discontinue Clonidine
- Follow BP every 6 h to monitor for rebound hypertension
- Monitor infant at least 48h prior to discharge
Substances and Timing of Neonatal Withdrawal Symptoms
## Common Signs of Neonatal Withdrawal, Intoxication or Neonatal Exposure

<table>
<thead>
<tr>
<th>Signs</th>
<th>Alcohol</th>
<th>Amphetamines (Methamphetamine)</th>
<th>Barbiturates</th>
<th>Benzodiazepines</th>
<th>Caffeine</th>
<th>Cannabinoids</th>
<th>Cocaine</th>
<th>Crack/Cocaine</th>
<th>Heroin</th>
<th>Lsd</th>
<th>MDMA, GSB (Ecstasy)</th>
<th>Meperidine</th>
<th>Methadone</th>
<th>Nicotine</th>
<th>Oxycodeine</th>
<th>Phencyclidine (PCP)</th>
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<tbody>
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<td><strong>Onset</strong></td>
<td>2-48 hrs</td>
<td>Limited data 1-12 hrs to 1 wk</td>
<td>1.14 days</td>
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<td>0-5 days</td>
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<td>0-48 hrs-2 wks</td>
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<td>Limited data 2-7 days-9 months</td>
<td>4-6 months</td>
<td>5 months-10-6 days with Rx</td>
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<td>0-30 days</td>
<td>May last 3-6 months</td>
<td>4-20 wks</td>
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<td>3-12 days</td>
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### Neurobehavioral Signs

#### Appetite

- Excessive hunger: X

#### Comfort

- Fist sucking: X
- Poor Consolability: X
- Uncoordinated/constant suck: X

#### Crying

- Excessive crying: X
- High pitched cry: X
- Increased crying: X

### Observations

- Observe as needed.
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<th>Alcohol</th>
<th>Amphetamines (Methamphetamine)</th>
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<tr>
<td></td>
<td>Generalized convulsions</td>
<td>5</td>
<td></td>
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</tr>
<tr>
<td>Metabolic/Vasomotor/</td>
<td>Sweating</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory Disturbances</td>
<td>Hyperthermia 37.2-38.3°C</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Hyperthermia &gt; 38.4°C</td>
<td>2</td>
<td></td>
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<tr>
<td></td>
<td>Frequent yawning (&gt; 3-4 times / scoring interval)</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td>Mottling</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td>Nasal stuffiness</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td>Sneezing (&gt; 3-4 times / scoring interval)</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td>Nasal flaring</td>
<td>2</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>
</tr>
<tr>
<td></td>
<td>Respiratory rate &gt; 60/min with retractions</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>Gastrointestinal Disturbances</td>
<td>Excessive sucking</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Poor feeding (infrequent/uncoordinated suck)</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Regurgitation (≥ 2 times during/post feeding)</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Projectile vomiting</td>
<td>3</td>
<td></td>
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<tr>
<td></td>
<td>Loose stools (curds/seedy appearance)</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Watery stools (water ring on nappy around stool)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Score</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Date/Time</strong></td>
<td></td>
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<tr>
<td><strong>Initials of Scorer</strong></td>
<td></td>
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</tbody>
</table>

Finnegan Assessment - CNS

- **High pitched cry**
  - < 5min, high pitched at peak - 2
  - > 5min, high pitched throughout - 3
- **Sleep** - longest uninterrupted interval of sleep
  - < 2 hours - 1
  - < 1 hour - 2
  - does not sleep - 3
- **Moro reflex**
  - Hyperactive -
    - pronounced jitteriness of hands - 2
  - Markedly hyperactivity - jitteriness/clonus of hands/feet - 3
Finnegan Assessment- CNS

• Tremors
  – Undisturbed
    • 1- Mild – tremors of hands/feet when not being handled
    • 2- Moderate/severe – tremors of arms/legs when not being handled
  – Disturbed
    • 3- Mild – tremors of hands/feet during handling
    • 4- Moderate/severe – tremors of arms/legs during handling

• Increased muscle tone
  – 1- Scored if no head lag or unable to extend arm/leg

• Excoriation
  – 1- Score when first appears or increases

• Myoclonic Jerks- 3
  – Involuntary spasms of the muscle in face, arms and legs
  – Irregular, quick and localized

• Seizures (generalized convulsions)- 5
  – Generalized jerky involuntary movements
  – Subtle seizure activity
  – Movement is not affected by interventions
Finnegan Assessment
Metabolic, Vasomotor and Respiratory

- **Sweating**
  - 1- Score if sweating is spontaneous

- **Hyperthermia**
  - 1- 37.2-38.3- Axillary temperature
  - 2- >38.4- pyrexia from increased muscle tone/tremors

- **Yawning**- sign of over stimulation
  - 1- Score if >3 yawns within scoring interval
**Finnegan Assessment**
Metabolic, Vasomotor and Respiratory

- **Mottling**- 1
  - Marbling discoloration of the skin
  - Also occurs when infant is hypothermic, septic or premature

- **Nasal Stuffiness**- 1
  - Score if infant sounds congested

- **Sneezing**- (multiple) sign of over stimulation
  - 1- Score if >3 sneezes within scoring interval
**Finnegan Assessment**  
Metabolic, Vasomotor and Respiratory

- **Nasal flaring**- 2  
  - Score if present without other signs of respiratory disease

- **Respiratory rate**-  
  - 1- if >60 without other signs of respiratory disease  
  - 2- if >60 with retractions
Finnegan Assessment
GI Disturbances

• **Excessive sucking-** 1
  – Hyperactive/disorganized sucking

• **Poor feeding-** 2 - adjust for gestational age
  – Score if uncoordinated suck or does not take adequate volume in 30 minutes

• **Regurgitation-**
  – 2 Score if >2 episodes observed
  – 3- projectile vomiting

• **Stools-**
  – 2- Loose
  – 3- Watery