



*Neonatal Abstinence Syndrome  
Clinical Management Document*

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# *Consensus Panel*

***This protocol for the management of Neonatal Abstinence Syndrome was developed by a consensus panel made up of experts in the related fields of health care. It is recommended for use as a treatment guideline and as a teaching tool.***

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## **NEONATAL ABSTINENCE SYNDROME**

- **Definition:**  
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.
  
- **Special Considerations:**  
Mothers should be educated about the neonatal effects of the specific drugs of abuse, informed about the potential adverse neonatal outcomes, and receive accurate information regarding their infant's treatment of NAS.
  
- **Purpose:**
  - A. To assist in the proper management of NAS
  - B. To assist in the evaluation of signs and symptoms of withdrawal and ruling out other potential diagnosis, including hypoglycemia, hypocalcaemia, sepsis, meningitis, hyperthyroidism, perinatal asphyxia, CNS hemorrhage, and polycythemia.
  - C. To assist in determining the need for pharmacologic intervention in infants with significant symptoms of withdrawal.
  
- **Indications/Patient Population:**
  - Suspected or known infants of substance abuse mothers
  - Infants with typical signs and symptoms of withdrawal
  - Infants born to mothers with high risk factors:
    - a. No prenatal care
    - b. Preterm Labor
    - c. Previous unexplained fetal demise
    - d. Intermittent hypertensive episodes
    - e. Cerebrovascular accidents
    - f. Severe mood swings or bizarre behavior
    - g. Placental abruption or repeated spontaneous abortions
    - h. History of STD's
    - i. History of physical and/or sexual abuse
    - j. History of substance abuse
    - k. Incarceration
    - l. Clinical evidence of substance abuse in family member.
  
  - Neonates with high risk factors
    - a. Unexplained IUGR or prematurity
    - b. Unexplained microcephaly
    - c. Abnormal CNS exam (jitteriness, hypertonicity, irritability, poor state control)
    - d. Unexplained cerebral infarct
    - e. Vomiting and diarrhea associated with typical symptoms of withdrawal

- **Drugs of abuse**

- **A - Substances of abuse that may cause abstinence in the newborn include:**

- Opiates/Opioids -- (Heroin, Morphine, Codeine, Opium, Methadone, Fentanyl, Demerol, Percodan, Darvon, Oxycodone, and others)
- Alcohol
- Benzodiazepine -- (Valium & other derivatives and related drugs including Librium, Placidyl, Xanax, Atarax)
- Barbiturates

- **B – Drugs not associated with NAS**

Infants exposed to cocaine, antidepressants, and/or amphetamines may experience symptoms that may resemble those of NAS, however these symptoms appear to be the result of the toxic effects of these drugs on the CNS rather than symptoms of withdrawal. Abnormal neurobehavioral findings have also been reported in infants born to mothers abusing caffeine, marijuana, tobacco, and volatile substances. Management should be symptomatic and individualized. Supportive, non-pharmacologic treatment is the rule as symptoms usually subside within a few days.

**Treatment with opiates is contraindicated in infants who have not developed dependence or tolerance to opiates.**

- **Initial Screening**

The Committee on Substance Abuse of the American Academy of Pediatrics recommends a comprehensive medical and psychological history that includes specific information about maternal drug use as part of every newborn evaluation. Most states do not require written consent from parents to obtain a urine toxicology screen in infants. Each hospital, however, may have specific guidelines, and parents should always be informed of any tests being performed on their infants.

1. Maternal Medical History
  2. Detailed Maternal Interview
  3. Prenatal records from the narcotic treatment program
  4. Maternal urine toxicology screen (when available)
  5. Testing of newborn (urine and/or meconium screen)
- A detailed maternal drug history should be obtained including prescription and non-prescription drugs, quantity, frequency, and pattern of drug use.
  - Self-reporting will identify only 40-60% of pregnant women using substances of abuse; therefore, screening is an important tool in identifying infants at risk.
  - The social habits of the parents, previous referral to Children, Youth, and Family Division of the Department of Human Services (CYF), and history of abuse or domestic violence should be tactfully obtained.

- Detailed knowledge of the drug history helps the health care team select specific pharmacotherapy, avoid unnecessary drugs, rapidly and effectively get symptoms under control, and decrease hospital days.
- Parental discussion of the care of the infant at risk of developing signs and symptoms of withdrawal should start before delivery, when possible.
- The first urine and/or meconium specimen should be collected to screen for exposure to illicit drugs in all infants at risk of developing NAS, infants with high risk factors, and infants with signs and symptoms of withdrawal.
- Meconium toxicology-screen has the potential to detect substances the fetus was exposed to after 20 weeks gestation. Stool may test positive for up to three days postnatally.
- Urine toxicology assays are useful in detecting recent exposure only, are less sensitive and therefore have a lower rate of detection.
- Mothers enrolled in a Methadone program should be requested to sign a release form in order to obtain her records from the methadone clinic.

- **Onset of symptoms of withdrawal:**

The clinical presentation of drug withdrawal is variable and depends on the drug(s), timing and amount of last maternal use, as well as the maternal and infant metabolism, and rate of excretion.

<b><u>DRUG</u></b>	<b><u>ONSET OF SYMPTOMS</u></b>
1. Opiates	48 – 72 hours (90% by five days)
2. Alcohol	3 – 12 hours (as long as 1-2 days)
3. Barbiturates	4 – 7 days
4. Benzodiazepine	1 – 2 weeks

- Sixty to 90% of term infants prenatally exposed to “narcotics” develop NAS.
- Infants born to mothers receiving <35mg of Methadone/day are less likely to develop significant symptoms of withdrawal.
- Infants less than 34 weeks gestation rarely develop the typical symptoms of withdrawal seen in term and close to term infants.
- The early symptoms are mostly autonomic and central nervous system irritability, followed by gastrointestinal dysfunction.
- Seizures may occur in 2-10% of infants withdrawing from Opioids and other drugs.
- Over 30% of infants will have abnormal EEG’s without overt seizure activity.
- Multi-drug exposure may manifest clinically with a biphasic pattern of withdrawal characterized by an exacerbation of symptoms occurring 1-2 weeks after successful treatment of the initial symptoms.

- **Initial Neonatal work-up**

1. Collect the first urine and/or meconium for toxicology screen. Urine collected after 24-36 hours is likely to be negative. Meconium toxicology screen in a term infant has the potential to detect substances the fetus was exposed to after 20 weeks gestation.
2. Neonatal Abstinence Scoring starting at 2-4 hrs after birth.
3. CBC and differential if indicated.

4. When suspected or clinically indicated: sepsis work-up, metabolic screen, and neurological evaluation.
5. Hepatitis B Vaccine to be given as per AAP guidelines
6. Screening for HIV and others STD's will be performed according to the mother's history.
7. No clinical signs or symptoms should be attributed solely to drug withdrawal without appropriate clinical assessment and/or diagnostic test to rule out other causes.
8. Infants with persistent loose stools should be evaluated further for other etiologies of diarrhea.

- **Neonatal Abstinence Score (Finnegan Scores)**

- A tool that gives us a quantitative measure of the severity of symptoms of withdrawal (see page 6).
- It allows us to evaluate the onset and progression of these symptoms, and assess the response to detoxification management strategies.
- Permits standardization and consistency of management.
- The accuracy of the scoring is essential since the Finnegan scores will dictate clinical management.
- Nursing staff must be proficient in the use and application of this tool.

## Neonatal Abstinence Scoring System

Date: \_\_\_\_\_ Weight: \_\_\_\_\_

System	Signs and Symptoms	Score	Time												Comments				
			A	M									P	M					
<b>Central Nervous System Disturbances</b>	Excessive high-pitched or other cry	2																	
	Continuous high-pitched or other cry	3																	
	Sleeps < 1 hour after feeding	3																	
	Sleeps < 2 hours after feeding	2																	
	Sleeps < 3 hours after feeding	1																	
	Hyperactive Moro reflex	2																	
	Markedly Hyperactive Moro reflex	3																	
	Mild tremors disturbed	1																	
	Moderate/severe tremors disturbed	2																	
	Mild tremors undisturbed	3																	
	Moderate/severe tremors undisturbed	4																	
	Increased muscle tone	2																	
	Excoriation	1																	
Myoclonic jerk	3																		
Generalized convulsions	5																		
<b>Metabolic/Vasomotor Respiratory Disturbances</b>	Sweating	1																	
	Fever < 38.4° (37.2° to 38.2° C)	1																	
	Fever > 38.4° C	2																	
	Frequent yawning (> 3 in ½ hour)	1																	
	Mottling	1																	
	Nasal stuffiness	1																	
	Sneezing (> 3 in ½ hour)	1																	
	Nasal Flaring	2																	
Respiratory rate > 60/minute	1																		
Respiratory rate > 60/min & retractions	2																		
<b>Gastro-intestinal Disturbances</b>	Excessive sucking	1																	
	Poor feeding	2																	
	Regurgitation	2																	
	Projectile vomiting	3																	
	Loose stools	2																	
	Watery stools	3																	
	<b>TOTAL SCORE</b>																		
	<b>INITIALS OF SCORER</b>																		

**Neonatal Abstinence Syndrome Score used for the assessment of infants undergoing neonatal abstinence. Evaluator should check signs or symptoms observed at various time intervals. Add scores for total at each evaluation.**

Adapted from Finnegan, L.P., Kaltenbach, K., *"The Assessment and Management of Neonatal Abstinence Syndrome: Primary Pediatric Care"*, 3<sup>rd</sup> edition, Hoekelman & Nelson (eds.), C.V. Mosby Company, St. Louise, MO, pp. 1367-1378, 1992.

PHARMACOLOGY	R	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T	S	D	T
S-Status; D-Dose; T-Time																			
<b>Coding:</b>																			
(+) Initiation																			
(=) Maintenance																			
(↑) Increase																			
(↓) Decrease																			
(—) Discontinuation																			

- **Instructions for scoring**

- A. Begin scores within 2-4 hours of birth in known Methadone exposure or for Infants of Substance Abuse Mothers (ISAM).
- B. Scoring should be done every two hours until stable.
- C. Scores must include all signs and symptoms exhibited during the entire scoring period, not just at a single time.
- D. Scores may be done every 4 hours once the baby is stable on weaning doses of medication (scores >9, or increasing scores, mandates more frequent scoring).
- E. Choose the most appropriate time intervals for scoring depending on nursing care.
- F. You may score zero where applicable or when symptoms are not present.
- G. Do not wake up infants for scoring.
- H. When asleep, it is reasonable to score for those symptoms that have been persistent such as increased muscle tone, hyperactive Moro reflex, and excoriated areas if applicable.
- I. Symptoms such as nasal stuffiness, sneezing, nasal flaring, and respiratory rate can be assessed while infant is asleep and should be scored only if unrelated to other lung or airway disease.
- J. A crying infant must be quieted before assessing muscle tone, respiratory rate, and Moro reflex.
- K. **Baseline:** Normal behavior of the healthy newborn infant.
- L. **Cry:** Prolonged crying or excessive crying must be scored even if it is not high pitch.
- N. **Sleeping:** Allowances should be made for infants who are beyond the newborn period. Baseline should always be the normal infant of comparable age. Do not wake up infants for scoring.
- M. **Tremors:** This is one item in the scoring system with four levels of severity. It should be scored only once. If a variety of tremors are present, score the most severe type for the period.
- N. **Sweating:** When due to environmental reasons or supportive nursing measures (swaddling) it should not be scored.
- O. **Excoriation:** Excoriation of prominent areas (chin, elbows, knees, occipital area, heels) should be scored when they first appear and when they are extending. Do not score during the healing process (unless new areas appear). Diaper rash should not be scored as excoriation.
- P. **Poor Feeding:** Score if slow to eat or if not taking adequate amounts.
- Q. **Regurgitation:** Score only if this occurs more frequently than usual in a newborn.
- R. **Yawning/Sneezing:** Score if >3 times in 30 minutes.
- S. The scores for the period are added. The total score and the initials of the scorer are placed at the bottom of each column.
- T. Under “Pharmacology”, the Status (S), Dose (D), and Time (T) are to be completed if indicated.
  - i. Status (S)
    - (+) Initiation of therapy
    - (=) Maintenance - no change in dose given
    - (↑) Increase in dose
    - (↓) Decrease in dose
    - (-) Discontinuation of medication/dose
  - ii. Dose (D) - Write the dose that is being given at that time
  - iii. Time (T) - Write the time the dose was given.

- U. Initials, full name and status are to be completed at the bottom of the Neonatal Abstinence Scoring Assessment and Treatment Record.
- V. Scores should be discussed with parents (mother and/or father).
- W. Parents should be informed on the estimated length of stay and weaning process.
- X. Meeting(s) to discuss the infant's progress, nursing, social and other medical issues should be scheduled with parents during the infant's hospitalization.

**A. Supportive Non-Pharmacological Interventions:**

- This is the cornerstone in the management of NAS.
- Supportive care should be started at birth and continued throughout the infant's hospitalization. This is best done in a unit that can provide a quiet, private environment and the option for nesting with close supervision by experienced personnel who can perform constant evaluations of mother and infant, recognize problems, and institute the necessary interventions.
- Up to 30% of infants may be managed without medication.
- Supportive care includes:
  1. Dimly lit, quiet environment to decrease sensory stimulation
  2. Frequent feedings of regular or hypercaloric formula
  3. Swaddling, rocking, swinging
  4. Soft music
  5. Pacifier for excessive sucking
  6. Early introduction to cereal (for extra calories and to firm-up stools)
  7. Positioning to reduce spitting or vomiting
  8. Soft sheets or sheepskin to prevent or minimize excoriation
  9. Frequent diaper changes for loose and frequent stools

- **Pharmacologic Therapy:**

- Drug therapy should be individualized based on the severity of the withdrawal and most importantly, on the infant's specific drug exposure.
- An abstinence scoring method should be initiated within 2-4 hours of birth in all infants exposed to methadone or other known substances of abuse and in any infant suspected of having significant exposure to drugs of abuse.
- Infants without significant sign/symptoms of withdrawal (Finnegan scores less than or equal to 7) do not require therapy, despite the mother's history.
- Pharmacologic treatment of withdrawal is indicated when, despite maximal supportive care, the average of three consecutive score is 8 or greater or three consecutive scores are greater than 8.
- ***Treatment of non-opiate withdrawal with opiates is contraindicated.***
- ***Medications should be started within 2-4 hours after infant has met criteria for pharmacologic intervention. The more severe the abstinence, the greater the need to start medications as soon as possible. Delay in treatment is associated with increased infant morbidity.***
- ***Vomiting and diarrhea associated with dehydration due to narcotic withdrawal are indications for treatment even in the absence of high abstinence scores.***

- **Drugs available for the treatment of withdrawal:**

- 1. Tincture of Opium \***

- a. Has no additives or high alcohol content
- b. Must be diluted by pharmacy to 0.4mg/ml (available as 10mg/ml)
- c. Has a short half life making it ideal for the treatment of NAS
- d. Improves sucking quickly
- e. Superior treatment for diarrhea and GI symptoms
- f. Associated with a lower incidence of seizures than with any other drugs
- g. Contraindicated in non-opiate withdrawal

- 2. Morphine oral solution \***

- a. Must be diluted to 0.4mg/ml (available as 4mg/ml or 2mg/ml)
- b. Equivalent to tincture of opium and paregoric
- c. No additives or high alcohol content
- d. Dilution errors less significant
- e. May be used and titrated as tincture of opium
- f. Contraindicated in non-opiate withdrawal
- g. Has a short half life; ideal for treatment of NAS
- h. Least effect on sucking

- 3. Phenobarbital \***

- a. Drug of choice for non-opiate withdrawal
- b. Suppresses agitation well
- c. Phenobarbital level should be followed as clinically indicated
- d. Has no effect on diarrhea or other GI symptoms
- e. High doses may cause significant sedation and interfere with bonding and sucking
- f. Has a long half life
- g. Has not prevented seizures due to opiate withdrawal

- 4. Methadone \***

- a. IV and PO preparations available
- b. Very little experience in newborns
- c. No long term studies
- d. Has a prolonged half-life making it less ideal for treatment of NAS
- e. Longer duration of therapy
- f. Difficult to wean despite good early response
- g. More significant and prolonged sub-clinical symptoms

- 5. Morphine (IV)**

- a. Helpful when infant is NPO and IV treatment is indicated
- b. May have marked respiratory depressive affect
- c. Equivalent to tincture of opium
- d. Initial Dose: 0.05mg – 0.2mg/dose every 4 hours

- 6. Paregoric**

- a. Contains 0.4mg/ml of anhydrous morphine

- b. Contains many ingredients with potential toxic effects, including camphor, alcohol, anise oil, benzoic acid and glycerin
- c. May require longer duration of therapy

**7. Clonidine**

- a. Non-narcotic that effectively reduces withdrawal signs
- b. Should be used in conjunction with a short acting opiate
- c. Initial Dose 0.5mg-1.0mg/kg followed by maintenance dose of 3mg-5mg/kg/day divided every 4-6 hours
- d. Limited studies in newborn infants

**\* = Preferred agents based on current available literature.**

- *Drugs of choice for Alcohol withdrawal are Ativan or Phenobarbital*
- *Drug of choice for non-opiate withdrawal is Phenobarbital*
- *The use of Valium and Chlorpromazine is strongly discouraged because of the significant side effects including lower seizure threshold*

**• Initial Dose and Administration:**

Infants meet criteria for pharmacologic intervention when the average of three consecutive scores is equal or greater than 8 despite maximal non-pharmacologic measures. It is recommended that infants withdrawing from “narcotics” be started on one of the opiates listed above. Some studies have suggested that the use of a combination regimen (Phenobarbital and opium\*) in infants experiencing withdrawal from methadone may be more effective than single drug treatment. The starting dose will depend on the severity of symptoms (see titration chart below). Finnegan scores should be done every two hours until infant is stable.

**Tincture of Opium/Oral Morphine**

<u>Score</u>	<u>Dose: q4 hours</u>
8-10	0.8ml (0.32mg)/kg/day
11-13	1.2ml (0.48mg)/kg/day
14-16	1.6ml (0.64mg)/kg/day
> 16	2.0ml (0.80mg)/kg/day

If scores continue to increase, or an adequate response is not achieved within 12 hours, Morphine or Opium may be increased by 0.4 ml/Kg/day (0.16 mg/Kg/day) increments. Consider adding Phenobarbital if CNS symptoms cannot be controlled with opiates alone.

**Phenobarbital**

Loading dose – 10-15 mg/kg, as a single loading dose, followed by:  
 Maintenance dose – 3-5 mg/kg/day, given 1x/day or divided into two daily doses  
 Follow levels as clinically indicated.

## **Methadone**

Start at 0.1 mg/kg/dose every 6-8 hours

Increase dose by 0.05 mg/kg/dose or consider decreasing the interval, until Finnegan scores are between 8-10

After stabilization, continue dose for 2-3 days

Goal is scores < 8

### • **Detoxification**

- Finnegan scoring and clinical evaluation should always be the basis of weaning a child from pharmacologic therapy.
- Use birth weight for all calculations.
- Maintain control dose for 24-48 hours before beginning to wean.
- Scores should be averaged over a 12 to 24 hour period.
- Wean medications at the same time every day.

## **Morphine/Opium**

- For Daily Average Scores 6 – 8 ► wean by 10% once daily.
- For Daily Average Scores 3 – 5 ► wean 15% once daily.
- If scores acutely fall to <2 within 12-24 hours, suspect the possibility of a medication error.
  - ◆ Monitor closely, and if infant is lethargic or obtunded, withhold dose.
  - ◆ Score every 2 hours until symptoms resolve.
  - ◆ Asymptomatic infants may be weaned by 20% daily or 10% every 12 hours
- When the infant has received 24 hours of 0.1ml (0.04mg) q 4 hours of opium/morphine, and his clinical condition is stable, the medication can be discontinued. However, if there are concerns about the infant's overall condition and the average Finnegan scores are greater than 4, the dose interval may be increased instead of stopping the medication.
- Infant should be observed for at least 24 hours after the medications have been discontinued.

## **Phenobarbital**

- May be weaned by 10%-20% following the same scoring principles.
- Phenobarbital and opiates, when used together, may be weaned simultaneously or on alternate days depending on the infant's clinical response and Finnegan scores.
- Another acceptable approach, when 2 medications are being used, is to completely wean the child off one medication before weaning the second.
- Phenobarbital may be discontinued when the dose has been decreased to 0.5-1.0 mg/kg/day.

## **Methadone**

- Wean by 10% every other day until the dose is 0.1 mg/kg.
- Then change interval to Q8 hours for 3-4 days.
- Q12 hours for 3-4 days.
- Q24 hours for 3-4 days.

- **Breastfeeding the ISAM**
  1. Should be encouraged in compliant women on methadone.
  2. Breastfeeding mothers on high doses of Methadone (>150mg.) should be informed of the infant's potential adverse effects, including sedation, poor feeding, and apnea.
  3. Breastfeeding is contraindicated in cocaine, heroin and heavy alcohol use.
  4. Is contraindicated in HIV positive mothers.
  5. Mothers should be educated about the risks of breastfeeding their infants if they continue to use illicit drugs.
  6. Mothers with hepatitis should be informed that viral transmission and infection via breast milk is theoretically possible, but it has never been reported. Maternal hepatitis is not a contraindication for breastfeeding.
  
- **Treatment withdrawal from multiple drugs**
  1. Exacerbation of symptoms may occur in a biphasic pattern at 1-2 weeks of age after the initial symptoms were under control
  2. Consider adding a second drug to the regimen
  3. After control is achieved, both drugs may be weaned simultaneously or on alternative days as clinically indicated
  
- **Discharge Planning**
  1. The length of hospitalization varies, depending on the drug, severity of withdrawal symptoms, and social factors.
  2. All other criteria for discharge of the newborn infant must be met.
  3. Close follow-up with the primary care physician.
  4. Parental Education to be done throughout the infant's hospitalization:
    - Team Meetings should be held at least once or as frequently as needed.
    - Educational information on NAS should be reviewed with the parents and management goals explained.
    - Address feeding problems and gastrointestinal symptoms.
    - The importance of the mother's own treatment and well-being.
    - Infant's sleeping problems and how to manage them.
    - Proper method of swaddling.
  5. Parents should understand that sub-clinical symptoms of withdrawal might persist for 4-6 months after discharge.
  6. Early Intervention or Developmental follow up should be arranged before discharge.
  7. Hearing screen and immunizations as per AAP recommendations.
  8. Social Service and/or CYF referral when indicated.
  9. Nursing Home Health Visits.
  10. Notify mother's treatment program of infant's discharge.
  
- **Monitoring**

No data exists to support or refute the use of cardio-respiratory monitoring during hospitalization for detoxification. The use of a monitor should be based on physician discretion and hospital policy.

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