

383 Neonatal Abstinence Syndrome

Definition/Cut-off Value

Neonatal abstinence syndrome (NAS) is a drug withdrawal syndrome that occurs among drug-exposed (primarily opioid-exposed) infants as a result of the mother's use of drugs during pregnancy (1). NAS is a combination of physiologic and neurologic symptoms that can be identified immediately after birth and can last up to 6 months after birth (2,3).

This condition must be present within the first 6 months of birth and diagnosed, documented, or reported by a physician or someone working under a physician's orders, or as self-reported by the infant's caregiver. See the clarification section for more information about self-reporting a diagnosis.

Participant Category and Priority Level

Category	Priority
Infants	I

Justification

Neonatal abstinence syndrome occurs when an infant is born dependent on prescription or illicit drugs the mother was taking during pregnancy. NAS is a combination of withdrawal symptoms that involve multiple bodily systems. It is most commonly associated with chronic opioid exposure during fetal development; however, can also result from chronic intrauterine exposure to other substances including: benzodiazepines, barbiturates, selective serotonin reuptake inhibitors and ethanol (3). Although these non-opioid substances can lead to NAS, these infants typically respond well to non-pharmacological methods of intervention (4).

Withdrawal in the newborn varies based on the type of substance, dose, and timing of exposure (4). Opioid is a general term for a variety of illicit and prescription drugs that decrease pain. Prescription opioid pain relievers include oxycodone, hydrocodone, codeine, morphine, and fentanyl. Opioids are water soluble and are, therefore, able to move easily across the placenta to the infant. This transfer of opioids increases as gestational age increases (3).

Heroin is an illegal opioid that is synthesized from morphine and can be injected, inhaled, or smoked. About 23% of individuals who use heroin become dependent (5). Furthermore, those who take any form of opioid, including prescription opioids as directed for chronic pain, can become addicted. Due to the risk of the transmission of infectious diseases such as Human Immunodeficiency Virus (HIV) and Hepatitis C, women who become pregnant while using illicit opioids, such as heroin, are often put on opioid maintenance therapy. Opioid maintenance therapy involves the prescribed use of either methadone or buprenorphine. These prescribed opioids can still lead to NAS; however, since they are not injected, they decrease the risk of the mother contracting blood borne infectious diseases. Opioid maintenance therapy can also help protect the fetus from repeated opioid withdrawal in utero (6).

The incidence of NAS has increased from 1.2 to 3.39 per 1,000 live births from 2000 to 2009 in the United States. This increased incidence is due to an increase in antepartum opioid use from 1.19 to 5.63 per 1,000 live births in the same period (7). In another study, it was reported that 5.9% of all women who were pregnant in 2012 reported some illicit drug use during pregnancy (4). Infants born with NAS are often

premature, have low birth weights, and are growth-restricted (see risks #142 *Preterm or Early Term Delivery*, #141 *Low Birth Weight*, and #151 *Small for Gestational Age* for more information about these conditions). (3) In addition to the concerns of exposure to substances in utero, additional factors, including social, nutritional, physical, and mental health problems can also contribute to the health status of the infant. An increased risk of certain birth defects has also been associated with early pregnancy opioid use (8). These birth defects include: spina bifida, hydrocephaly, glaucoma, gastroschisis, and heart defects (9).

Neonatal Abstinence Syndrome Symptoms

Symptoms of NAS generally involve the central nervous system, autonomic nervous system, and the gastrointestinal tract (3). The severity of the infant's symptoms is commonly assessed using the Modified Finnegan Score Sheet. The Modified Finnegan Score Sheet consists of 21 symptoms that are associated with NAS. Following the determination of a baseline score, infants are assessed every 4 hours unless the severity of the symptoms requires more frequent monitoring (10). The following list includes symptoms associated with NAS (1, 6):

- Loud, high-pitched crying
- Sweating
- Yawning
- Sleep disturbances
- Feeding difficulties
- Poor weight gain
- Excessive sucking
- Regurgitation
- Diarrhea

Neonatal Abstinence Syndrome Treatment

Infants with NAS typically have longer hospital stays, can experience serious complications, and have costly treatment (2). The first treatment option for infants with NAS is to manage symptoms without medication by rooming in with the mother, encouraging skin-to-skin contact, swaddling, having a calm environment, avoiding overstimulation, and supporting breastfeeding (11). Infants who are at risk for NAS and who room-in with their mothers are not only at a lower risk of needing pharmacological treatment for NAS, but they also have a shortened hospital stay (12). If withdrawal is severe or if the initial treatment is not successful in managing symptoms of NAS, medications such as morphine, methadone, phenobarbital or clonidine may be used. An infant given these medications may have side effects that could include: slow or shallow breathing, slow heart rate, difficulty waking-up, excessive sleepiness, constipation, and fewer wet diapers (11).

Nutritional Considerations for Neonatal Abstinence Syndrome

The timing and type of feedings play an important role in the management of NAS symptoms. Infants with NAS may have impaired feeding behaviors such as excessive sucking, regurgitation, diarrhea and poor feeding that is characterized by fussiness, crying, and sleepiness (13, 14). Infants with NAS have higher caloric requirements due to their energy expenditure. This combined with the impaired feeding behaviors may result in difficulty with weight gain (14). The American Academy of Pediatrics (AAP) recommends

breastfeeding if not contraindicated (15). The AAP also recommends that infants with NAS be fed frequent small volumes of human milk or high calorie formula, as needed, in a quiet and calm environment, to aid the infant in tolerating feedings and improving digestion and to allow for adequate growth (11, 15).

The Academy of Breastfeeding Medicine recommends breastfeeding for women who are on a prescribed stable dose of methadone maintenance because the concentrations of methadone in human milk are low (16). Studies have indicated that, although the amount of methadone in human milk is dependent on the mother's dose, the methadone transferred in human milk averages less than 2.8% of the maternal dose (17). Breastfeeding has been found to provide protection against the development of NAS symptoms and lessen the severity of symptoms, which would decrease the need for pharmacological intervention for the infant (18, 19, 20). The amount of methadone that is in human milk is small and therefore, it is thought that breastfeeding, and not the methadone in human milk, is responsible for its protective impact against NAS (18). Gradual weaning, when mutually desired by the mother and infant, is recommended for breastfeeding women who are being treated for opioid addiction. Gradual weaning (rather than an abrupt stop to breastfeeding) decreases the risk of the infant developing NAS (11, 17).

Implications for WIC Nutrition Services

NAS can be a difficult subject to talk about with WIC participants due to the stigma of addiction. In the WIC clinic, caregivers may not be forthcoming with the infant's diagnosis of NAS and an addiction history of the mother may not be available at the initial assessment. WIC staff can assist caregivers by:

- Educating to recognize infant hunger cues.
- Reviewing feeding frequency and/or formula type and amount to help manage gastrointestinal symptoms of NAS.
- Providing growth monitoring to assess adequate weight gain.
- Encouraging supportive interventions to include:
 - Skin-to-skin contact
 - Swaddling
 - Quiet environment with little stimulation
- Encouraging breastfeeding unless medically contraindicated.
- Providing referrals for support services such as drug and alcohol counseling, parenting support, and medical evaluations.
- Encouraging mothers who are on medication-assisted therapy (e.g., methadone or buprenorphine) and who are breastfeeding, to speak with their health care provider if they have questions about the timing and dose of their medication.
- Educating mothers who are on medication-assisted therapy and who are breastfeeding on the importance of gradual weaning when mutually desired by the mother and infant.

References

1. Centers for Disease Control and Prevention [Internet]. Georgia: [cited 2017 May 19]. The Problem of Neonatal Abstinence Syndrome; [about 3 screens]. Available from: <http://www.ncbi.nlm.nih.gov/pubmedhealth/PMHT0024264/>.

2. Centers for Disease Control and Prevention. Infant and maternal characteristics in neonatal abstinence syndrome-selected hospitals in Florida, 2010-2011. *MMWR*. 2015 Mar 6.
3. Kocherlakota, P. Neonatal Abstinence Syndrome. *Pediatrics*. 2014; 134(2):e547-e561.
4. Wiles JR, Isemann B, Ward LP, Vinks AA, Akinbi H. Current management of neonatal abstinence syndrome secondary to intrauterine opioid exposure. *J Pediatr*. 2014;165(3):440-446.
5. National Institute on Drug Abuse [Internet]. Maryland: [updated 2014 Oct; cited 2016 Feb 3]. DrugFacts: Heroin; [about 4 screens]. Available from: <https://www.drugabuse.gov/publications/drugfacts/heroin>.
6. Kaltenbach K, Holbrook A, Coyle MG, Heil SH, Salisbury A, Stine S, Martin P, Jones H. *Addiction*. 2012; 107: 45-52.
7. Bagley SM, Wachman EM, Holland E, Brogly SB. *Addiction Science and Clinical Practice*. 2014; 9:19.
8. Broussard CS, Rasmussen SA, Reefhuis J, Friedman JM, Jann MW, Riehle-Colarusso T, Honein MA. Maternal treatment with opioid analgesics and risk for birth defects. *Am J of Obstetrics and Gynecology*. 2011;204(4):314.e1-314.e11.
9. Centers for Disease Control and Prevention [Internet]. Georgia: [updated 2014 Oct 22; cited 2016 Feb 3]. Key findings: maternal treatment with opioid analgesics and risk for birth defects. [about 4 screens]. Available from: <http://www.cdc.gov/ncbddd/birthdefects/features/birthdefects-opioid-analgesics-keyfindings.html>.
10. University of Iowa Children's Hospital [Internet]. Iowa: [updated 2013 Feb 2; cited 2016 Mar 31]. Identifying neonatal abstinence syndrome (NAS) and treatment guidelines. Available from: http://www.uichildrens.org/uploadedFiles/UIChildrens/Health_Professionals/Iowa_Neonatology_Handbook/Pharmacology/Neonatal%20Abstinence%20Syndrome%20Treatment%20Guidelines%20Feb2013%20revision.pdf.
11. Wisconsin Association for Perinatal Care [Internet]. Wisconsin: [updated June 2014; cited 2016 Feb 12]. Assessment and Intervention in the Home: Women and Infants Affected by Opioids. [about 2 screens]. Available from: http://www.perinatalweb.org/assets/cms/uploads/files/Opioid%20Tip%20Sheet_v4.pdf.
12. McKnight S, Coo H, Davies G, Holmes B, Newman A, Newton L, Dow K. Rooming-in for infants at risk of neonatal abstinence syndrome. *Am J Perinatol*. 2015 Nov 20.
13. Maguire DJ, Rowe MA, Spring H, Elliott AF. Patterns of disruptive feeding behaviors in infants with neonatal abstinence syndrome. *Adv Neonatal Care*. 2015; 15(6): 429-439.
14. MacMullen NJ, Dulski LA, Blobaum P. Evidence-based intervention for neonatal abstinence syndrome. *J Ped Nurs*. 2014; 40(4): 165-203.
15. American Academy of Pediatrics, Committee on Drugs and the Committee on Fetus and Newborn. Clinical report: neonatal drug withdrawal. *Pediatrics*. 2012; 129:e540–e56.
16. Reece-Stremtan S, Marinelli KA. ABM Clinical Protocol #21: Guidelines for breastfeeding and substance use or substance use disorder. *Breastfeeding Medicine*. 2015; 10(3): 135-141.
17. Hale TW, Rowe HE. Medications & mothers' milk. Hale Publishing. 2014.

18. Liu A, Juarez J, Nair A, Nanan R. Feeding modalities and the onset of the neonatal abstinence syndrome. *Frontiers in Pediatrics*. 2015; 3(14).
19. Pritham UA. Breastfeeding promotion for management of neonatal abstinence syndrome. *J Obstet Gynecol Neonatal Nurs*. 2013; 42(5): 517-526.
20. Welle-Strand GK, Skurtveit S, Jansson LM, Bakstad B, Bjarko L, Ravndal E. Breastfeeding reduces the need for withdrawal treatment in opioid-exposed infants. *Acta Paediatr*. 2013; 102(11): 1060-1066.

Additional Reference:

Food and Nutrition Service, U.S. Department of Agriculture. Substance use prevention: screening, education, and referral resource guide for local WIC agencies. 2013; FNS-276 revised. [cited 2016 Jul 12]. Available from: <https://wicworks.fns.usda.gov/wicworks/Topics/ResourceManual.pdf>.

Clarification

Self-reporting of a diagnosis by a medical professional should not be confused with self-diagnosis, where a person simply claims to have or have had a medical condition without any reference to professional diagnosis. A self-reported medical diagnosis (“My doctor says that I have/my son or daughter has...”) should prompt the CPA to validate the presence of the condition by asking more pointed questions related to that diagnosis.