

# Evidence-Based Interventions For Neonatal Abstinence Syndrome

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**N**eonatal abstinence syndrome (NAS) is a group of similar behavioral and physiological signs and symptoms in the neonate caused by withdrawal from various pharmacologic agents (Hamdan, 2010). The presentation of the syndrome is unpredictable, with individual neonates displaying different symptoms and symptom severity over time (Jansson, 2008). Depending upon the etiology, type of drug, the severity of the withdrawal, and the age of the neonate, care may be provided in the NICU, the obstetrical floor, or the pediatric unit. Other hospital units may be used depending upon the institution's preference. Neonates with NAS require specialized neonatal/pediatric nursing care based on the best evidence obtained from the literature and global benchmarking of best practices. To assist with translating research into practice, the objective of this article is to identify best nursing practice by systematically and critically reviewing the literature and expert guidelines on the topic.

## Epidemiology

### Maternal Incidence

Abuse of illicit and prescription drugs is a worldwide problem. In 2013, the United Nations Office on

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This review aimed to determine best nursing practice by systematically and critically reviewing the appropriate literature and expert guidelines. Using keywords and literature databases, over 480 journal titles were reviewed. Twenty-four articles and three expert guidelines were chosen. The majority of articles selected as evidence were Level IV – opinions of respected authorities based on clinical experiences, descriptive studies, case reports, or reports of experts. Two articles were Level I-II – experimental studies. Results of the review showed that traditional supportive interventions also have a body of evidence for their use. Although there is much research regarding neonatal abstinence syndrome (NAS), the majority of future research needs to be at a higher level of evidence. Nursing applications include obtaining evidence for best practice through diligent searches of the literature and expert guidelines.

Drugs and Crime (UNODC) reported that approximately 3.6% to 6.9% of the world's population 15 to 64 years of age abused illicit drugs at least once in the previous year (UNODC, 2013). In the United States, 5.9% of pregnant women 15 to 44 years of age used illicit drugs during the past month (Substance Abuse and Mental Health Administration [SAMHSA], 2012).

### Infant/Neonatal Incidence

In the United States, approximately 225,000 infants yearly are exposed to illicit substances (Keegan, Parva, Finnegan, Gerson, & Belden, 2014). The prevalence of prenatally exposed newborns to one or more illicit drugs averages approximately 5.5%, with a range of 1.3% to 50% (Wang, 2014). Greater than 75% of infants exposed to drugs have major medical problems, compared with 27% of unexposed infants. Seventeen percent of drug-exposed versus 6% of unexposed babies are delivered prematurely (Huestis & Choo, 2002).

### Cost

In addition to the personal costs in relationships, health, and the future development of neonates with NAS, there is a financial cost as well. It is common for neonates with NAS to

experience longer stays in the hospital than NAS-free neonates (Oei & Liu, 2007). Data from the AHRQ Healthcare Cost and Utilization Project (HCUP) Nationwide Inpatient Sample (2009) show that aggregate charges for substance-related disorders in the age category of less than one year were over 96 million dollars (\$96,440,575). The cost of keeping a drug-exposed child in a neonatal unit is estimated at \$2,700 per child per day (Cooper, 2004).

### Etiology

There are two major types of NAS (Hamdan, 2010). The more recognized type is prenatal NAS, which is due to prenatal maternal use of substances. The abuse may result in withdrawal symptoms in the neonate once the placental access to the substance is no longer available. Drugs commonly implicated in prenatal NAS are opiates, barbiturates, cocaine, sedatives, ethanol, marijuana, and nicotine (Davison, Worsley, & Husband, 2007; Wang, 2010). Postnatal NAS results when an abrupt discontinuation of analgesia, such as Fentanyl or morphine, occurs usually after prolonged drug exposure for post-procedure pain management and/or sedation (Hamdan, 2010). The focus of this article is on prenatal NAS.

**Pathophysiology**

Drugs are transferred from the mother to the fetus via the placenta. Huestis and Choo (2002) describe the mechanisms responsible for the transfer: active transport (requires energy to move fluids into the cell), passive diffusion (requires no energy for movement), and pinocytosis (moves fluids by invagination of cell membrane). The authors also report that the ease of transport depends upon the size of the drug molecule, its lipophilicity, the pKa (acid ionization constant) of the compound and the pH of the blood. At delivery, the transplacental passage of the drug is interrupted, resulting in the development of a withdrawal syndrome in the neonate (Oei & Liu, 2007). The pathophysiology and mechanisms of withdrawal are poorly understood (Jansson, 2008). It is theorized that withdrawal can cause molecular and cellular alterations that produce systemic, behavioral, and cognitive symptoms (Wang, 2010).

**Effects of Drugs On the Neonate**

Symptoms and length of withdrawal vary according to the amount and type of drug used. For example, cocaine withdrawal occurs over a short period of time, whereas opiates can produce a longer and more threatening withdrawal (Greene & Goodman, 2003).

The effect of drugs on body systems is also influenced by the type of drug, the combination of drugs, the amount and frequency of use, the trimester in which the drug is used, the timing of withdrawal, and the genetic susceptibility of the fetus/neonate (Oei & Lui, 2007; Sun, 2004). Withdrawal symptoms relate to the type of drug ingested (see Table 1) (Davison et al., 2007; Hamdan, 2010; Huestis & Choo, 2002; Oei & Lui, 2007; Wang, 2010).

**Medical Management**

Medical management is aimed at treating the symptoms of withdrawal. Standardization of treatment is difficult because symptoms of withdrawal vary with each infant (Beauman, 2005). There is also a lack of double-blind controlled studies (Winklbaur et al., 2008). Most studies recommend matching the drug used to treat withdrawal to the type of drug abused (Beuman, 2005). For example, opiates

**Table 1.**  
**Effects of Drug Withdrawal on the Neonate**

Drug(s)	Symptoms of Withdrawal
Opioids	Hyperirritability GI dysfunctions: Excessive sucking, poor feeding, regurgitation, diarrhea Tremors High-pitched cry Increased muscle tone Seizures Nasal congestion Hyperthermia Tachypnea
Cocaine	No significant withdrawal symptoms
Benzodiazapines	Few infants have withdrawal syndrome
Cannabis/marijuana	Jitteriness Tremors Impaired sleeping
Alcohol	Hyperactivity Central nervous system (CNS) dysfunction Fetal alcohol syndrome (FAS) Jitteriness Irritability Hyperreflexia Hypertonia Poor suck Tremors Seizures Poor sleep patterns Hyperphagia Diaphoresis
Selective Serotonin Reuptake Inhibitors (SSRIs)	Jitteriness Respiratory distress Sleep disturbance

should be given to the neonate if withdrawing from opiates (Kuschel, 2007; Osborn, Jeffrey, & Cole, 2005; Winklbaur et al., 2008). Expert guidelines formulated by the American Academy of Pediatrics Committee on Drugs (2012), Substance Abuse and Mental Health Services (2005) guidelines for medication-assisted treatment for opioid addiction, and the Western Australian Centre for Evidence-Based Nursing and Midwifery (2007) concur with these recommendations.

**The Nursing Challenge**

A number of nursing interventions are used for providing care to the neonate/infant with NAS. Many interventions are not based on a systematic review of the evidence presented in the literature, but rather, on tradition. The interventions seemed to work, so they were incorporated into practice. As research into NAS increased, tangible evidence as to best practice emerged. A thorough review

of nursing and medical literature is essential to determine if current nursing practice matches the recommendations found in the literature. Consultation with practice experts will also identify best practices.

**Process of Literature Review**

In consultation with a medical librarian, a systematic review of the literature was conducted using CINAHL and Medline/PubMed. Key words used in the search were "neonatal abstinence syndrome," "drug withdrawal," "nursing care," "nursing interventions," "newborns," and "neonates." MESH and CINAHL subject headings included "neonatal abstinence syndrome," "nursing," "newborns," and "substance withdrawal syndrome." Journal articles chosen for inclusion in the literature search had to meet the following criteria: topics had to focus on nursing

interventions for NAS; literature reviewed had to be international; and except for classic articles, the literature could be no older than 10 years. In addition, professional nursing and medical websites were used for the latest nursing, medical, and patient education information. National guidelines and systematic reviews were also consulted by searching the Health Services/Technology Assessment Texts (HSTAT), Cochrane Systematic Re-

views, and Joanna Briggs Institute databases. Topics reviewed included supportive interventions, breastfeeding, and NAS scoring systems. Over 480 publications were reviewed. Synthesis of the articles was accomplished through the use of a table that contained the title, author(s), journal particulars, and a content abstract. Specific levels of evidence were used for categorizing the quality of articles for the review (see Table 2).

**Level of Evidence**

The level of evidence for a systematic review ranges from Level I-II to Level IV (Wright, Brand, Dunn, & Spindler, 2007). Most nursing articles selected for this review were case reports/observational studies (Level IV). Seven studies were retrospective cohort studies (Level III). Two research articles reviewed were clinical trials with or without randomiza-

**Table 2.**  
**Systematic Review**

Author	Title	Document: Journal, Guideline, Chapter	Type of Study/Design	Level of Evidence	Intervention(s)
American Academy of Pediatrics Committee on Drugs (2012)	Neonatal Drug Withdrawal	<i>Pediatrics</i> , 101(6), e540-e560	Expert opinion	IV	Initial treatment: Supportive-swaddling, nutritional support, observation of sleeping habits. NAS scoring system. Pharmacotherapy with drug of same class as that of drug abused.
Abdel-Latif et al. (2006)	Effects of Breast Milk on the Severity and Outcome of Neonatal Abstinence Syndrome among Infants of Drug-Dependent Mothers	<i>Pediatrics</i> , 117(6), e1163-e1169	Retrospective chart review	III	Breastfeeding.
Abrahams et al. (2007)	Rooming-In Compared with Standard Care for Newborns of Mothers Using Methadone or Heroin	<i>Canadian Family Physician</i> , 53(10), 1722-1730	Retrospective cohort study	III	Rooming-in.
Agency for Healthcare Research and Quality (AHRQ) (2010)	Guidelines for Breastfeeding and the Drug-Dependent Woman	U.S. Department of Health and Human Services	Guideline summary by consensus of committee of experts	IV	Breastfeeding with careful evaluation of maternal and infant substance abuse and substance treatment histories before initiation.
Ballard (2002)	Treatment of Neonatal Abstinence Syndrome with Breast Milk Containing Methadone	<i>Journal of Perinatal Neonatal Nursing</i> , 15(4), 76-85	Case series	IV	NAS scoring system. Breastfeeding, if no contraindications. Swaddling, low-light, low noise, gentle holding. Pharmacotherapy as needed.
Beauman (2005)	Identification and Management of Neonatal Abstinence Syndrome	<i>Journal of Infusion Nursing</i> , 28(3), 159-167	Case series	IV	Nutritional support. Sucrose pacifier for pain relief, dark, quiet environment, Clear dressings. Positioning in a supine position. Pharmacotherapy.
Curet & His (2002)	Drug Abuse During Pregnancy	<i>Clinical Obstetrics and Gynecology</i> , 45(1), 73-88	Case series	IV	Swaddling, quiet, dark room, nutritional support, pharmacotherapy.
D'Apolito & Hepworth (2001)	Prominence of Withdrawal Symptoms in Polydrug-Exposed Infants	<i>Journal of Perinatal Neonatal Nursing</i> , 14(4), 46-60	Secondary analysis	III	Swaddling, quiet, environment, gentle awakening, non-nutritive sucking.

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Table 2. (continued)  
Systematic Review

Author	Title	Document: Journal, Guideline, Chapter	Type of Study/Design	Level of Evidence	Intervention(s)
Dodge, Brady, & Maguire (2006)	Initiation of a Nurse-Developed Interdisciplinary Plan of Care for Opiate Addiction in Pregnant Women and Their Infants	<i>International Journal of Childbirth Education</i> , 21(2), 21-24	Case series	IV	Low lighting, decreased noise level, limited stimulation, rooming-in, decreased noise level, music therapy, cuddlers.
Fraser, Barnes, Biggs, & Kain (2007)	Caring, Chaos and the Vulnerable Family: Experiences in Caring for Newborns of Drug-Dependent Parents	<i>International Journal of Nursing Studies</i> , 44, 1363-1370	Interpretive methods (descriptive study)	III	Cuddlers.
Greene & Goodman (2003)	Neonatal Abstinence Syndrome: Strategies for Care of the Drug-Exposed Infant	<i>Neonatal Network</i> , 22(4), 15-25	Case series	IV	Quiet environment, non-nutritive sucking, vestibular stimulation, swaddling, minimal handling.
Jambert-Gray, Lucas, & Hall (2009)	Methadone-Treated Mothers: Pregnancy and Breast Feeding	<i>British Journal of Midwifery</i> , 17(10), 654-657	Case series	IV	Breastfeeding, rooming-in.
Jansson et al. (2008)	Methadone Maintenance and Breastfeeding in the Neonatal Period	<i>Pediatrics</i> , 121(1), 106-114	Non-randomized clinical trial	I-II	Breastfeeding for methadone-maintained women.
Kuschel (2007)	Managing Drug Withdrawal in the Newborn Infant	<i>Seminars in Fetal &amp; Neonatal Medicine</i> , 12(2), 127-133	Case series	IV	Breastfeeding, swaddling, dim lights, minimal noise, avoiding unnecessary handling.
Legatte (2008)	Improving Pregnancy Outcomes: Mothers and Substance Abuse	<i>British Journal of Midwifery</i> , 16(3), 160-165	Retrospective chart review	III	Breastfeeding.
Marcellus (2007)	Neonatal Abstinence Syndrome: Reconstructing the Evidence	<i>Neonatal Network</i> , 26(1), 33-40	Case series	IV	Holding, swaddling, minimal stimulation, pharmacologic treatment.
Oei & Lui (2007)	Management of the Newborn Infant Affected by Maternal Opiates and Other Drugs of Dependency	<i>Journal of Paediatrics and Child Health</i> , 43, 9-18	Case series	IV	Breastfeeding.
Pitts (2010)	Perinatal Substance Abuse, Chapter 3	<i>Core Curriculum for Neonatal Intensive Care Nursing</i> (4th ed.)	Case series	IV	Music, swaddling, decreased noise, dim lights, rocking, pacifier, supine position.
Saiki, Lee, Hannam, & Greenough (2010)	Neonatal Abstinence Syndrome – Postnatal Ward versus Neonatal Unit Management	<i>European Journal of Pediatrics</i> , 169, 169-195	Retrospective cohort study	III	Rooming-in.
Velez & Jansson (2008)	The Opioid Dependent Mother and Newborn Dyad: Non-Pharmacologic Care	<i>Journal of Addiction Medicine</i> , 2(3), 113-120	Case series	IV	Pacifier, quiet environment, positioning in the supine position, slow vertical rocking, gentle pressure to posterior head.

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Table 2. (continued)  
Systematic Review

Author	Title	Document: Journal, Guideline, Chapter	Type of Study/Design	Level of Evidence	Intervention(s)
Wachman, Byun, & Philipp (2010)	Breastfeeding Rates Among Mothers of Infants With Neonatal Aspiration Syndrome	<i>Breastfeeding Medicine</i> , 5(4), 159-164	Retrospective chart review	III	Breastfeeding.
Wang (2014)	Perinatal Drug Abuse and Neonatal Drug Withdrawal	Medscape	Case series	IV	Swaddling, dim lighting, quiet environment, pacifier.
Western Australian Center for Evidence-Based Nursing & Midwifery (2007)	Management of the Infant with Neonatal Abstinence Syndrome (NAS) – Literature Review	Guidelines	Case series	IV	Quiet environment, swaddling, cuddling, massage, rocking, heart beat audiotapes, decreased stimulation, pacifier.
White-Traut et al. (2002)	Pulse Rate and Behavioral State Correlates after Auditory, Tactile, Visual, and Vestibular Intervention in Drug-Exposed Neonates	<i>Journal of Perinatology</i> , 22, 291-299	Randomized control trial	I-II	Auditory, tactile (massage) eye-to eye contact, vertical rocking.

Table 3.  
Levels of Evidence

Levels	Types of Evidence
I-II	High-level evidence: randomized control trials
III	Retrospective cohort studies
IV	Case series

tion (Levels I and II) (Jansson et al., 2008; White-Traut et al., 2002). Interventions were gleaned from the evidence provided in the systematic review (see Table 3).

## Systematic Review Results

### Supportive Interventions

Infant comfort measures may be used to minimize the physiologic effects of withdrawal caused by the effects of central and autonomic system dysfunction (Greene & Goodman, 2003). Twenty journal articles, three Internet sites for guidelines, and one book chapter recommend supportive interventions for those neonates who do not require drug therapy or as an adjuvant to drug therapy. Supportive interventions include swaddling, gentle awakening, quiet environment with little stimulation, increased opportunities for non-nutritive sucking, and positioning. Eleven articles advocate

swaddling (American Academy of Pediatrics Committee on Drugs, 2012; Ballard, 2002; Beuman, 2005; Curet & Hsi, 2002; D'Apolito & Hepworth, 2001; Dodge, Brady, & Maguire, 2006; Greene & Goodman, 2003; Kuschel, 2007; Marcellus, 2007; Pitts, 2010; Velez & Jansson, 2008). Nine articles recommend a quiet environment with decreased stimulation and handling (Ballard, 2002; Beuman, 2005; D'Appolito & Hepworth, 2001; Dodge et al., 2006; Greene & Goodman, 2005; Kuschel, 2007; Pitts, 2010; Velez & Jansson, 2008; Wang, 2014). Non-nutritive sucking is supported by Beuman (2005), D'Apolito and Hepworth (2001), Greene and Goodman (2003), Wang (2014), and Velez and Jansson (2008). White-Traut et al. (2002), Greene and Goodman (2003), and Pitts (2010) choose vestibular stimulation (rocking) as a means of promoting physiological and behavioral functioning in drug-exposed infants. Positioning in supine position is recom-

mended in accordance with guidelines for avoiding sudden infant death syndrome (SIDS), unless the infant experiences stiffness (Beauman, 2005; Pitts, 2010; Velez & Jansson, 2008). Other recommended nursing practices are novel but not widely used. These innovative, supportive interventions include music therapy, massage, water beds, and the use of volunteers as cuddlers (Dodge et al., 2006; Fraser, Barnes, Biggs, & Kain, 2007; Greene & Goodman, 2003; Pitts, 2010). Rooming-in for neonates with NAS is a recent intervention. Several authors (Abrahams et al., 2007; Saiki, Lee, Hannam, & Greenough, 2010) compared rooming-in with traditional NICU care for infants with NAS. The authors found that newborns who roomed-in were less likely to require treatment for withdrawal and more likely to be discharged home with their mothers. They also found that rooming-in may promote more effective mothering and may reduce the prevalence and severity of neonatal withdrawal. Dodge and colleagues (2006), and Jambert-Gray, Lucas, and Hall (2009) also advocate rooming-in.

### Nutrition

Neonates suffering from NAS may have impaired feeding behaviors, such as excessive sucking, poor feeding, regurgitation, and diarrhea,

which may result in difficulty with weight gain. For weight gain, supplementation with a high-calorie formula is recommended (Greene & Goodman, 2003; Wang, 2014). Small frequent feeds (gavage, if necessary) are recommended to aid in tolerating feedings and improving digestion (Ballard, 2002; Beaman, 2005; Pitts, 2010; Velez & Jansson, 2008). Should diarrhea or other gastro-intestinal disturbances occur, they are treated with the administration of an opioid compound (D'Apolito & Hepworth, 2001; Greene & Goodman, 2003).

### Skin Care

Neonates with NAS have a potential for skin breakdown as a consequence of diarrhea and diaper rash (Wang, 2014). Barrier ointments are recommended for avoidance of skin breakdown and diaper rash. If breakdown becomes severe, clear transparent dressings over reddened or excoriated areas may help avoid further problems (Beuman, 2005).

### Breastfeeding

Several authors encourage breastfeeding for mothers who are chemically dependent on drugs, if not contraindicated (Ballard, 2002; Jansson et al., 2008; Jambert-Gray et al., 2009; Kuschel, 2007; Oei & Liu, 2007). Breastfeeding provides optimal nutrition, promotes bonding, and empowers babies' mothers to be effective parents (Jambert-Gray et al., 2009; Jansson et al., 2008; Leggate, 2008). Unfortunately, only 24% of opioid-dependent mothers breastfeed, and 60% stop on the average after 5.9 days (Wachman, Byun, & Phillip, 2010). Breastfeeding also may decrease the severity of NAS, delay its onset, and decrease the need for pharmacologic treatment (Abdel-Latif et al., 2006)

### National Guidelines

American Academy of Pediatrics. The American Academy of Pediatrics Committee on Drugs (2012) provides guidelines for the care of NAS. The committee advocates utilizing NAS scoring systems; drug therapy, if indicated; and supportive care interventions that include swaddling; high calorie formula, as needed; breastfeeding, if not contraindicated; frequent small feedings; and replacement fluids and electrolytes, if necessary. Observation of sleeping habits, temperature stability, weight gain or loss, or change in clinical status should

also be done to determine if there is a change in the neonate's condition or the potential for another disease process. Additionally, HIV, hepatitis B and C, and sexually transmitted infection (STI) screening is recommended.

Agency for Healthcare Research and Quality (AHRQ). The AHRQ has published guidelines for the drug-dependent woman on methadone who desires to breastfeed (AHRQ, 2010). Specific criteria are given to help the health care provider determine if breastfeeding the NAS patient is safe. To protect their privacy and provide confidentiality, women must give their consent to disclose their postpartum plans for addictions counseling and their progress in treatment with health care personnel. These women should also have a negative toxicology test at delivery. They must have received consistent prenatal care, have no contraindication to breastfeeding, and have counselor-endorsed achievement and maintenance of sobriety prior to and post-delivery. There are also criteria for those who should be discouraged from breastfeeding. For example, women who did not have prenatal care, who relapsed into substance abuse, or who refused substance abuse treatment should be discouraged from breastfeeding (Jansson et al., 2008). Jansson and colleagues (2008) conclude that research suggests that breastfeeding is not safe for neonates of chemically dependent mothers.

Western Australian Centre for Evidence-Based Nursing and Midwifery. The Western Australian Centre for Evidence-Based Nursing and Midwifery guidelines recommend that drug selection should match the type of agent causing withdrawal. The Centre also advocates NAS scoring systems; quiet environment; swaddling; gentle, firm handling; cuddling; massage; water therapy; and rocking. Playing heart beat audiotapes; small, frequent feedings on demand of hyper-caloric formula; and non-nutritive sucking are encouraged. Prevention of skin breakdown is accomplished with infants via mittens, sheepskin coverings for the crib or isolette, and frequent diaper changes.

### Research and Current Practice

An informal survey of the procedures of a neonatal intensive care unit

and two published articles revealed results similar to the systematic review: Level IV interventions (supportive) are commonly used in the nursing care of NAS-affected neonates (Crossetti, Amin, & Jansson, 2007; O'Grady, Hopewell, & White, 2009). Swaddling, dim lights, quiet environment, and nutritional support are the majority of the interventions implemented. NAS scoring systems are becoming routine, with the Finnegan being the most used (O'Grady et al., 2009). The unit whose practices were reviewed has a protocol for obtaining meconium and urine samples from the neonate for drug testing upon admission to the NICU (S. Evankoe, personal communication, December 8, 2011). APN or MD orders are written for medication but not for supportive interventions. The timing of the interventions depends upon the NAS score and the onset of withdrawal symptoms. Breastfeeding, if not contraindicated, is encouraged by a majority of neonatal units (O'Grady et al., 2009).

Interventions recommended by the literature reviewed but not necessarily used by nurses are cuddlers, music therapy, massage, water beds, and rooming-in. Reasons for not providing these services could be cost, lack of personnel, hospital unit design, and reluctance to initiate new evidence-based protocols. Improvisation by nursing personnel could be an opportunity for improvement. Audiotaped soft music, and specific times with the mother and neonate in her hospital room (in addition to the times spent in the NICU visiting) are cost-efficient solutions. Nursing students could volunteer as cuddlers. Evidence is continually reviewed to obtain new information and confirmation of nursing practices already in place.

### Nursing Interventions

The function of nursing interventions is to accomplish the objectives of nursing care. Therefore, the following interventions will allow best nursing practice according to the evidence from the literature:

- Do a thorough, accurate maternal history to determine if the neonate will be at risk. A drug history is included for all pregnant women, not just those who are suspected or confirmed substance abusers.

Table 4.  
Scoring Systems for Neonatal Abstinence Syndrome

Scoring Tool	Range of Scores	Frequency of Scoring	Cutoff Score for Intervention
Finnegan Neonatal Abstinence Scoring System (NASS)	0 to 62	Hourly for the first 24 hours Every two hours for the second 24 hours Every four hours after 48 hours	Greater than 8
Lipsitz Neonatal Drug Withdrawal Scoring System (NDWSS)	0 to 20	Not specified	Greater than 4
Neonatal Withdrawal Inventory (NWI)	0 to 19	Not specified	Greater than 8
Neonatal Narcotic Withdrawal Index (NNWI)	0 to 14	Not specified	Greater than 5

Sources: Finnegan, Connaughton, Kron, & Emich, 1975; Green & Suffet, 1981; Lipsitz, 1975; Zahorodny et al., 1998. Zimmerman-Baer, Notzil, Renisch, & Ulrich Bucher, 2010.

- Screen all infants at risk with a reliable and valid NAS scoring instrument, which typically assesses symptoms of withdrawal and assigns a score in accordance with the severity of the symptoms (see Table 4).
- Provide supportive measures, such as swaddling, decreased stimulation, supine (or others as appropriate) positioning, massage, cuddling.
- Correct nutritional deficiencies with appropriate therapy (e.g., high-calorie formula, gavage feeds, IV therapy).
- Encourage the maternal-neonatal relationship through support for breastfeeding and rooming-in if there are no contraindications.
- Administer topical ointments or barrier shields for skin breakdown.
- Administer and monitor pharmacologic treatment if withdrawal is not contained by supportive measures. Gradually wean when appropriate.
- Collect samples for laboratory testing, if ordered.
- Assess and reassess NAS symptoms; if severe, act to prevent complications.
- Communicate and provide referral to social worker or other personnel for follow up post-discharge.
- Provide parenting education to caretakers of the neonate.
- Promote sleep by clustering interventions to avoid sleep disruption.

### Objectives of Care

Nursing interventions are employed to meet the outcome objectives for the care of the neonate who has NAS. Objectives involve prevention or alleviation of withdrawal symptoms. The following are specific objectives for the nurse to achieve in providing comprehensive and quality care to the neonate with NAS:

- Provide safe, effective care.
- Avoid complications of body systems potentially affected by NAS.
- Maintain adequate nutrition.
- Promote maternal/parent infant bonding.

### Evaluation of Interventions

Evaluation involves determining if the interventions based on the evidence obtained were successful. Data derived from the evaluation are used for determining if the goals of nursing care were met. There are several areas for evaluation. Symptomatology, nutritional status, and behavior are among data reviewed. Symptom relief is determined by assessment and reassessment of infant behavior and symptomatology. Results of laboratory tests also provide information on physiologic status. The use of a neonatal scoring system upon admission provides baseline data, which are then used to evaluate the progression of symptoms, the response to pharmacotherapy, and the resolution of symptoms (Fike, 2007). As the neonate recovers, the scores become lower. Meticulous observation and recording of intake and output, weight, and length are necessary, as

are appraisal of nutritional and fluid status (Hamden, 2010). Results of neurobehavioral tests should be part of the follow up (Wang, 2014).

Nurses who care for babies with NAS are motivated by the goal to provide excellent patient care. They also want to understand the rationale for the chosen nursing interventions. Toward that end, they seek evidence, not tradition, as the basis for best practices. Reading classic and translational literature, whether personally or by participating in committees to evaluate literature, determining interventions, and creating policy and procedure and/or nursing protocols for more efficient care of the neonate with NAS can help achieve that goal.

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