

The Neonatal Opioid Withdrawal Syndrome (NOWS)

A review of best practices for nursing professionals and nurse leaders

Aim

The aim of this position statement is to support healthcare professionals caring for infants with neonatal opioid withdrawal syndrome (NOWS) by highlighting the challenges related to assessment and treatment of these infants and to review best practices for management, both non-pharmacologic and pharmacologic, for postpartum, newborn and neonatal intensive care unit professionals.



Stephen DeMeo, DO, MEd

Abstract

NOWS is a withdrawal syndrome in infants who are exposed to opioids in-utero. This syndrome was formerly called neonatal abstinence syndrome (NAS), a syndrome that may include non-opioid withdrawal. The reclassification to NOWS reflects the recent history of opioids being the main driver of the explosion of neonatal drug withdrawal seen in the United States¹. NOWS is a complex disorder of drug dependence, with effects seen on the central nervous system, autonomic nervous system and gastrointestinal system. Pharmacologic treatment for withdrawal in the neonatal period is reported to be required in 50-70% of at-risk infants, usually necessitating admission to a neonatal intensive care unit (NICU). Pharmacologic treatment for NOWS extends the average length of stay

(LOS) of a well newborn (2-5 days) to over 17 days, placing a great burden on hospital staff and resources and leading to increased healthcare expenditure, especially for the Medicaid population. Exposure to additional drugs or medications, such as benzodiazepines, nicotine, or selective serotonin reuptake inhibitors (SSRIs), is known to increase the severity of NOWS. Management of infants with NOWS poses several challenges to healthcare providers, including the relative subjectivity of NOWS scoring systems, the depth of skills and resources needed to optimize non-pharmacologic management, barriers to optimal family-centered care, disordered feeding, diaper dermatitis and managing the psychosocial needs of parents with substance abuse disorders.

Introduction

NOWS describes the withdrawal syndrome experienced by infants who are born dependent on opioids after *in utero* exposure. The prenatal exposure can be due either to maternal abuse of opioids or through mothers undergoing treatment for substance abuse disorders with synthetic opioids such as methadone or buprenorphine². The severity of withdrawal symptoms is thought to be dependent on several factors, including the timing of exposure, individual maternal metabolism and the variable placental transfer of the drug. The common presenting symptoms in NOWS reflect the role opioids play in both the central nervous system (CNS) and gastrointestinal (GI) system, where opioid receptors are expressed^{1,3}. Common CNS symptoms include tremors, irritability, sleep disruption and increased muscle tone. Autonomic CNS signs include skin mottling, temperature instability and fever. Common GI symptoms include poor feeding, uncoordinated sucking, vomiting, diarrhea, poor weight gain and diaper dermatitis²⁻⁴. The severity of symptoms is worse when exposure to opioids occurs in combination with other drugs such as benzodiazepines and selective serotonin reuptake inhibitors (SSRIs). Onset of symptoms usually begin after 24 hours of life. For infants born to moms using methadone for treatment of opioid use disorder, symptoms usually begins later, around 24 to 72 hours of life. Because several studies have shown that signs of withdrawal may be delayed as long as 5 to 7 days of life (typically after discharge from newborn nursery), it is recommended that infants exposed to opioids be observed for five days prior to hospital discharge³.

Epidemiology

The incidence of NOWS has increased dramatically in the United States^{1,5}. This rise in cases mirrors the rise of adults in the U.S. who use or abuse prescription opioids⁶. In 2013, a total of 4% of all NICU hospital days were attributed to NOWS cases, an increase of 6 to 7 times from 2004⁷. Families covered by Medicaid face a higher burden of NOWS, owing to the socioeconomic factors that have been a hallmark of the opioid epidemic in the U.S. Among infants covered by Medicaid, NOWS incidence increased more than fivefold from 2004–2014, from 2.8/1000 to 14.4/1000 births. In addition, infants who were covered by Medicaid were significantly more likely to be transferred to another hospital and have a longer LOS compared to infants who were covered by private insurance. Adjusting for inflation, total hospital costs for NOWS births that were covered by Medicaid increased from \$65.4 million in 2004 to \$462 million in 2014⁸. In some areas of the U.S., the sheer number of infants born dependent on opioids has overwhelmed local nurseries and NICUs. One multicenter study showed that compared to a decade prior, a much larger proportion of NICUs (nearly 50% versus less than 5%) reported over 10% of their NICU days being attributable to NOWS treatment. The financial burden of NOWS extends after hospital discharge, with 85% of infants being referred to state early intervention services⁹. In one state-level study, more than 10,000 hours a month were being spent by social workers and other employees of their department of family and child services, at a cost exceeding the growth of state budgets¹⁰.

Since 1995, methadone has been the gold standard for the treatment of opioid abuse disorders in pregnant women. More recently, the proportion of mothers treated with buprenorphine has begun to increase. Buprenorphine, a combination opioid/opioid antagonist, is being used more frequently due to its pharmacologic characteristics that make abuse by mothers undergoing treatment less likely. In addition, studies have suggested that in-term infants with NOWS, antenatal buprenorphine exposure was associated with a decreased LOS relative to antenatal methadone exposure¹¹. However, there remain substantial barriers in obtaining medications for opioid use disorder among pregnant women¹².

Assessment

Infants with possible exposure to drugs *in utero* should be screened by either urine, meconium or newer umbilical cord tissue drug screening assays. However, it should be noted that these screening methods can be unreliable, and good clinical judgment based on history of *in utero* exposure should be used. Once identified as exposed, the most widely used tool for the assessment of infants at risk for NOWS is the Finnegan scoring system, first described in 1975 and modified several times to its current form¹³. The modified Finnegan scoring system is a 31-item scale is designed to quantify the severity of NOWS and to guide treatment. The individual symptoms are weighted depending on symptoms and severity. Because of its complexity, many nurseries have observed issues with its use, including inconsistent ratings between observers an unclear understanding of the assessments themselves, which can be subjective. Postpartum nursing unit leaders are often tasked with quality improvement initiatives aimed at standardizing Finnegan scoring reliability among a large number of staff nurses.

A contemporary approach to NOWS, known as “Eat, Sleep, Console (ESC)”, ESC aims to target more physiologic goals for determination of need for pharmacologic treatment, as opposed to using the subjective modified Finnegan scoring system. In a single center, using the ESC approach, only 12% of infants were treated with morphine compared with 62% predicted to be treated had Finnegan scoring been used¹⁴. One drawback to ESC is an observed increased risk for re-admission due to worsening withdrawal symptoms at home, poor weight gain, lack of established follow-up through primary care providers, or special infant care clinics after hospital discharge.

Treatment

Non-Pharmacologic Management

Initial treatment of infants showing signs of withdrawal should be focused on non-pharmacologic supportive care²⁻⁴. The goals of non-pharmacologic interventions are to facilitate positive parenting behaviors/bonding and to decrease those stimuli that can worsen withdrawal symptoms¹⁵. Non-pharmacologic measures should always be maximized in any unit treating infants at risk for NOWS. A major issue related to the disparity of care between units is the non-standardization of non-pharmacologic management between nurses and other providers¹⁶. This is often reflected in a hospital having a higher than expected proportion of infants requiring treatment with medication compared to similar hospitals. When implemented correctly, non-pharmacologic management can keep infants out of the NICU, or from costly transports to tertiary referral centers—causing separation of parent and infant. There are several non-pharmacologic interventions that have been shown to reduce the need for pharmacological treatment in infants with NOWS. These include:

- creating a low-stimulation environment that is dark and quiet.
- encouraging skin-to-skin contact for comfort and promotion of the infant’s attachment to mother or other caregivers.
- hospital policies that encourage “rooming in” or infant non-separation from mother¹⁷.
- exclusive breastfeeding¹⁸, but only in mothers in an established treatment program^{3,15}.
- swaddling¹⁹ to inhibit self-stimulation.

Nutritional/GI Considerations

Breastfeeding can effectively decrease NOWS symptoms because methadone and buprenorphine are transferred through breast milk¹⁸. Therefore, infants who are frequently breastfed can benefit from a fairly consistent low dose exposure to opioids. Frequent feedings, often supplemented by formula feeds for increased caloric density, can be utilized to manage the higher than normal energy expenditures associated with withdrawal. Increased energy expenditure can be a result of disordered sleep, disorganized or inefficient oral feeding skills, tremulousness and general increased metabolic rate. Pediatric dieticians often recommend caloric fortification to either 22 calories/oz or even 24 calories/oz depending on caloric expenditure related to withdrawal symptoms. When formula feedings are necessary, observational studies have suggested that the use of a lactose-free formula may prevent GI upset seen in infants with NAS²⁰.

Frequent loose stools or diarrhea is a hallmark of the GI complications of NOWS, and therefore, diaper dermatitis can be a significant problem for these infants. In one observational study, 86% of infants with NOWS experienced significant diaper dermatitis, compared with only 28% of infants without NOWS²¹. Causes of severe diaper dermatitis in the NAS population have not been well defined, however, the physiology of the skin points to a possible pathway. Infants during withdrawal experience increased stool frequency, leading to skin overhydration, increased exposure time to irritants in feces and the relative higher pH of urine soaking the diaper, followed by increased stool protease and lipase activity, which can, in turn, break down skin. Complicating this situation is that generally, nurses avoid waking infants with NOWS for routine diaper changes. Therefore, a diapering regimen consisting of Pampers® Swaddlers™ diapers along with Pampers® Sensitive™ wipes can be effective in preventing dermatitis in infants. The use of topical emollients and/or appropriately formulated wipes is recommended in interventions for the treatment of diaper dermatitis^{22,23}. Pampers diapers are uniquely designed with a barrier ointment to help protect newborn skin and a proprietary Absorb Away Liner™, proven to better absorb stool away from the skin. They can counter the increased skin exposure time to stool and urine when infants are left undisturbed between care times. The pH-buffered wipes are specially formulated to maintain a physiologically balanced skin pH and barrier against stool enzymes.

Pharmacologic Management

Morphine was previously the most common medication used to treat infants who met the threshold for pharmacologic intervention based on Finnegan scores. However, morphine is being replaced with methadone in many NICUs due to data that show a decreased total treatment time and therefore decreased hospital LOS²⁴. Treatment with buprenorphine has also emerged as an option (especially in mothers using buprenorphine themselves), with studies showing a trend towards shorter LOS compared to methadone²⁵. Decisions on which medication to use should be informed by local unit data, patterns of medication use in mothers (which medication is used locally by obstetricians or addiction specialists), and knowledge about current hospital LOS before to any new intervention. For all of the above-mentioned medication options, weaning must be done on the basis of a protocolized weaning program²⁶. In addition, using multicenter quality collaboratives (such as state perinatal quality collaboratives) has been shown to better standardize assessment and pharmacologic treatment and to reduce hospital LOS^{20,27}.

Impact on NICUs and Nurses

The NOWS population can be challenging for NICUs of all sizes and levels of care. In an ideal scenario, infants at risk for NOWS can be cared for in private NICU rooms with the ability to accommodate moms rooming in²⁸. Some centers have moved care of NOWS infants to the pediatrics floor, either under the management of neonatology or general pediatric services. However, increased general pediatric hospital service volumes during winter respiratory virus season, coupled with concerns about co-locating newborns with children with acute viral and bacterial illness, remains a significant barrier to the integration of NOWS into general pediatrics settings. This approach has been proposed to lower the cost of care, and in some hospitals, the ability to offer private rooms to families when a hospital's NICU cannot accommodate. Management of NOWS in NICUs without private rooms does offer additional challenges, especially in large open pods where it may be difficult to control lighting levels and manage ambient noise. Options to manage overstimulation can include active signage about noise levels and/or noise-sensing devices, curtaining or shading of exterior windows, and the use of drapes and screens to partition off large rooms into separate bed spaces. In some units, infants with NOWS are cohorted together in one particular room or pod to allow a subset of nurses with additional expertise to manage their care. Many successful units have developed extensive clinical practice guidelines²⁹ to minimize variation in care amongst their nursing staff.

Managing the psychosocial needs of parents experiencing substance abuse disorders can be extremely challenging to nurses, who have been shown to experience burnout and moral distress while treating this population³⁰. In a fascinating study, nurses who demonstrated caring behaviors towards mothers whose infants were being treated for NOWS found that those mothers were better able to interpret infant cues and enhanced their observed mother-infant interactions³¹. Despite the emotional toll that caring for infants with NOWS can take on nurses, there can be no tolerance for judgmental attitudes toward mothers with substance abuse disorders. Perhaps the most important nursing intervention that can be undertaken is creating an atmosphere of family-centered caring and sensitivity, brought to bear with the same sharp focus with which a nurse would manage a ventilator, drips or medications¹⁵.

Conclusions and Call to Action

Pampers supports education, advocacy efforts and research aimed at improving the transition from womb to world in infants with NOWS and the healthcare professionals who care for them. As a community of caregivers, we must strive to enhance prenatal care for mothers with substance abuse and strengthen the systems of care that support them. We envision a culture of continuous quality improvement, spearheaded through our state and national collaborative networks, that aims to standardize assessment of infants with NOWS, optimize non-pharmacologic management in the hospital and educate nursing leaders in the strategies to best manage NOWS in their postpartum units. We will continue to research best practices in pharmacologic management, nutrition support, skin care and family-centered care models for NOWS. We will partner with policymakers to find innovative cost solutions and to ensure the ongoing financial support of state early intervention programs and social services for these high-risk infants and families.



References

1. Patrick SW, Barfield WD, Poindexter BB, FETUS CO, NEWBORN COSU, PREVENTION. Neonatal Opioid Withdrawal Syndrome. *Pediatrics*. 2020;146(5):e2020029074.
2. McQueen K, Murphy-Oikonen J. Neonatal Abstinence Syndrome. *N Engl J Med*. 2016;375(25):2468–2479.
3. Hudak ML, Tan RC, Committee On D, Committee On F, Newborn, American Academy of P. Neonatal drug withdrawal. *Pediatrics*. 2012;129(2):e540–560.
4. Raffaelli G, Cavallaro G, Allegaert K, et al. Neonatal Abstinence Syndrome: Update on Diagnostic and Therapeutic Strategies. *Pharmacotherapy*. 2017;37(7):814–823.
5. Patrick SW, Schumacher RE, Benneyworth BD, Krans EE, McAllister JM, Davis MM. Neonatal abstinence syndrome and associated health care expenditures: United States, 2000–2009. *JAMA*. 2012;307(18):1934–1940.
6. Pryor JR, Maalouf F, Krans EE, Schumacher RE, Cooper WO, Patrick SW. The opioid epidemic and neonatal abstinence syndrome in the USA: a review of the continuum of care. *Archives of disease in childhood Fetal and neonatal edition*. 2017;102(2):F183–F187.
7. Tolia VN, Patrick SW, Bennett MM, et al. Increasing incidence of the neonatal abstinence syndrome in U.S. neonatal ICUs. *N Engl J Med*. 2015;372(22):2118–2126.
8. Winkelman TNA, Villapiano N, Kozhimannil KB, Davis MM, Patrick SW. Incidence and Costs of Neonatal Abstinence Syndrome Among Infants With Medicaid: 2004–2014. *Pediatrics*. 2018;141(4).
9. Peacock-Chambers E, Leyenaar JK, Foss S, et al. Early Intervention Referral and Enrollment Among Infants with Neonatal Abstinence Syndrome. *Journal of Developmental & Behavioral Pediatrics*. 2019;40(6):441–450.
10. França UL, Mustafa S, McManus ML. The Growing Burden of Neonatal Opiate Exposure on Children and Family Services in Massachusetts. *Child Maltreatment*. 2016;21(1):80–84.
11. Tolia VN, Murthy K, Bennett MM, et al. Antenatal methadone vs buprenorphine exposure and length of hospital stay in infants admitted to the intensive care unit with neonatal abstinence syndrome. *Journal of Perinatology*. 2018;38(1):75–79.
12. Patrick SW, Buntin MB, Martin PR, et al. Barriers to accessing treatment for pregnant women with opioid use disorder in Appalachian states. *Substance Abuse*. 2019;40(3):356–362.
13. Finnegan LP, Connaughton JJ, Kron RE, Emich JP. Neonatal abstinence syndrome: assessment and management. *Addictive diseases*. 1975;2(1–2):141–158.
14. Grossman MR, Lipshaw MJ, Osborn RR, Berkwitz AK. A Novel Approach to Assessing Infants With Neonatal Abstinence Syndrome. *Hospital Pediatrics*. 2018;8(1):1–6.
15. Maguire D. Care of the infant with neonatal abstinence syndrome: strength of the evidence. *J Perinat Neonatal Nurs*. 2014;28(3):204–211; quiz E203–204.
16. Wachman EM, Schiff DM, Silverstein M. Neonatal Abstinence Syndrome: Advances in Diagnosis and Treatment. *JAMA*. 2018;319(13):1362–1374.
17. Holmes AV, Atwood EC, Whalen B, et al. Rooming-In to Treat Neonatal Abstinence Syndrome: Improved Family-Centered Care at Lower Cost. *Pediatrics*. 2016;137(6):e20152929.
18. Pritham UA. Breastfeeding Promotion for Management of Neonatal Abstinence Syndrome. *Journal of Obstetric, Gynecologic & Neonatal Nursing*. 2013;42(5):517–526.
19. van Sleuwen BE, Engelberts AC, Boere-Boonekamp MM, Kuis W, Schulpens TWJ, L'Hoir MP. Swaddling: A Systematic Review. *Pediatrics*. 2007;120(4):e1097–e1106.
20. Walsh MC, Crowley M, Wexelblatt S, et al. Ohio Perinatal Quality Collaborative Improves Care of Neonatal Narcotic Abstinence Syndrome. *Pediatrics*. 2018;141(4):e20170900.
21. Malik A, Witsberger E, Cottrell L, Kiefer A, Yossuck P. Perianal Dermatitis, Its Incidence, and Patterns of Topical Therapies in a Level IV Neonatal Intensive Care Unit. *Am J Perinatol*. 2018;35(5):486–493.
22. Adam R, Schnetz B, Mathey P, Pericoi M, de Prost Y. Clinical demonstration of skin mildness and suitability for sensitive infant skin of a new baby wipe. *Pediatr Dermatol*. 2009;26(5):506–513.
23. Blume-Peytavi U, Kanti V. Prevention and treatment of diaper dermatitis. *Pediatr Dermatol*. 2018;35 Suppl 1:s19–s23.
24. Brown MS, Hayes MJ, Thornton LM. Methadone versus morphine for treatment of neonatal abstinence syndrome: a prospective randomized clinical trial. *J Perinatol*. 2015;35(4):278–283.
25. Kraft WK, Adeniyi-Jones SC, Chervoneva I, et al. Buprenorphine for the Treatment of the Neonatal Abstinence Syndrome. *New England Journal of Medicine*. 2017;376(24):2341–2348.
26. Hall ES, Wexelblatt SL, Crowley M, et al. Implementation of a Neonatal Abstinence Syndrome Weaning Protocol: A Multicenter Cohort Study. *Pediatrics*. 2015;136(4):e803–e810.
27. Patrick SW, Schumacher RE, Horbar JD, et al. Improving Care for Neonatal Abstinence Syndrome. *Pediatrics*. 2016;137(5):e20153835.
28. Howard MB, Schiff DM, Penwill N, et al. Impact of Parental Presence at Infants' Bedside on Neonatal Abstinence Syndrome. *Hosp Pediatr*. 2017;7(2):63–69.
29. Casper T, Arbour M. Evidence-based nurse-driven interventions for the care of newborns with neonatal abstinence syndrome. *Advances in neonatal care : official journal of the National Association of Neonatal Nurses*. 2014;14(6):376–380.
30. Tobin KB. Changing Neonatal Nurses' Perceptions of Caring for Infants Experiencing Neonatal Abstinence Syndrome and Their Mothers: An Evidenced-Based Practice Opportunity. *Advances in neonatal care : official journal of the National Association of Neonatal Nurses*. 2018;18(2):128–135.
31. French ED, Pituch M, Brandt J, Pohorecki S. Improving Interactions Between Substance-Abusing Mothers and Their Substance-Exposed Newborns. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*. 1998;27(3):262–269.