

# Improving Skin Integrity in Babies Diagnosed with Neonatal Abstinence Syndrome

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The purpose of this article is to examine the challenges of skin care in neonates with neonatal abstinence syndrome and provide suggestions for the clinical management of skin breakdown in these infants.

## ABSTRACT

Neonatal abstinence syndrome (NAS) is becoming a national epidemic. Neonates with NAS display myriad signs during withdrawal from the drugs they were exposed to in utero. One sign is skin excoriation, as well as other skin injuries. While care of the neonate experiencing NAS has been well documented in the literature, the care of the skin of that neonate has not. The purpose of this monograph is to discuss the current literature on neonatal abstinence syndrome, to describe the anatomy and physiology of neonatal skin, and to make recommendations for the prevention and care of the most common neonatal skin injuries seen in infants exhibiting NAS.

**Keywords:** neonates, neonatal abstinence syndrome, skin, abrasions, diaper dermatitis, excoriations, scratches, skin injuries, sucking blisters

**N**eonatal abstinence syndrome (NAS) is reaching epidemic proportions in the United States. In 2015, Patrick and colleagues reported that one baby who will suffer the effects of NAS is born every 25 minutes.<sup>1</sup> NAS, therefore, has become a hot topic not only in the health care arena but also in the popular media. This increased attention to the problem has led to a plethora of information being published on the topic. For many, this appears to be a new problem, but in reality there have been references in the health care literature describing infants withdrawing from exposure to maternal opioid use for over 100 years. In 1900, in the United States, the first published report was by Happel, describing morphinism and the effect on the baby.<sup>2</sup>

In the past, neonatal withdrawal occurred most commonly as a result of maternal morphine and heroin use. The current epidemic of NAS is a result of prescription opioid use,

which has led to the resurgence of heroin use in the United States.<sup>3</sup> The current epidemic is actually the third distinct heroin epidemic the United States has seen in the past 60 years. The first took place in the late 1940s to early 1950s, the second in the late 1960s to the late 1970s.<sup>4</sup> During each of these epidemics, the knowledge needed to care for neonates born to mothers addicted to opioids and other drugs has increased. Better care leads to better outcomes for infants and decreased morbidity and mortality.

The purpose of this monograph is to describe the causes and clinical signs of NAS and the depth of the current opioid addiction problem as it relates to neonates, to review the anatomy and physiology of neonatal skin, and to specifically discuss the skin injuries of neonates diagnosed with NAS, how to prevent skin excoriations and other skin problems, as well as how to treat the signs of NAS addressed here.

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## HISTORY

Neonatal abstinence syndrome is not a new phenomenon. In 1974, Finnegan and MacNew were the first to describe the characteristics of the infant born to the narcotic-dependent mother, using the term *neonatal abstinence syndrome*. The term was used to express the cluster of signs affecting the central nervous, autonomic nervous, gastrointestinal, and respiratory systems.<sup>5,6</sup> Prior to use of the term NAS, terms such as *congenital morphinism*, *infant addiction*, *congenital infant addictions*, and *infant withdrawal syndrome* were commonly used to describe the neonate withdrawing from maternal opioid use.<sup>4</sup>

Withdrawal signs most commonly seen in neonates are listed in Table 1.<sup>5</sup> The signs of withdrawal are a result of the infant's body attempting to remove the prenatally acquired substances from the circulation.<sup>7</sup> In this monograph, the most important sign of withdrawal to note is skin excoriation. According to D'Apolito<sup>7</sup> the excoriation is a result of the continuous movement of the extremity against another surface, most commonly bed linens, though it can occur with any surface. The excoriation is the physiologic response to the behavioral dysregulation that leads to hyperirritability and the constant movements seen with NAS.<sup>8</sup>

The onset of signs for NAS varies, depending on the drug the mother used during pregnancy, the timing of her last dose, maternal metabolism, placental transport of the medication, and neonatal metabolism and excretion.<sup>6</sup> Hudak and Tan<sup>6</sup> note that the timing of withdrawal can vary from 24 hours for heroin to up to 72 hours for methadone. The length of time of acute withdrawal depends on the drug or drugs that the mother used while pregnant and the infant's excretion of the drug(s); however, signs of withdrawal can continue for weeks to months after discontinuation of pharmacologic treatment for NAS.<sup>6</sup>

**TABLE 1 ■ Common Withdrawal Signs Seen in NAS<sup>5</sup>**

High-pitched crying
Dehydration
Diarrhea
Poor feeding
Fever
Irritability
Mottling
Increased muscle tone
Hyperactive reflexes
Skin excoriation
Decreased sleep intervals
Abnormal/constant sucking
Temperature instability
Tremors
Poor weight gain

## INCIDENCE

Until 2012, there were no published reports on the incidence of NAS in the United States. At that time, Patrick and associates published a retrospective, cross-sectional analysis of neonates diagnosed with NAS from 2000 to 2009 in the United States to determine the prevalence of NAS. The authors found that the number of pregnant women using opioids increased from approximately 1.2/1,000 live births in 2000 to approximately 3.39/1,000 live births in 2009. The number of neonates diagnosed with NAS in the United States tripled between 2000 and 2009 from approximately 4,000 in 2000 to approximately 13,539 in 2009, or approximately one baby born every hour with NAS.<sup>9</sup> In a follow-up study that documented the year 2012, the number of babies with NAS had continued to increase to 5.8/1,000 live births or one baby born every 25 minutes in the United States.<sup>1</sup>

There are significant geographic variations in the incidence of NAS in the United States. Patrick and associates found that states in the East South Central area of the country have the highest rate of NAS at 16.8/1,000 live births; followed by New England (13.7/1,000 live births); East North Central, and South Atlantic (6.9/1,000 live births); Mid-Atlantic (6.8/1,000 live births); Mountain (5.8/1,000 live births); West North Central (3.4/1,000 live births); Pacific (3.0/1,000 live births); and the lowest rate being in the West South Central states (2.6/1,000 live births).<sup>1</sup>

Infants diagnosed with NAS, especially those requiring pharmacotherapy, are often admitted to NICUs. Using data from 299 NICUs across the United States, Tolia and colleagues found that NICU admissions for NAS increased from 7/1,000 admissions in 2004 to 27/1,000 admissions in 2011. The authors also noted that during this time period the median length of stay increased from 13 days to 19 days. Furthermore, the total percentage of NICU days attributed to infants with NAS increased from 0.6 percent to 4 percent, with some centers reporting as high as 20 percent of their NICU days belonging to NAS infants.<sup>10</sup>

## MANAGEMENT OF NAS

The management of infants with NAS varies depending on the hospital and health care providers. The care of the infant can occur in the mother-infant unit, well-baby nursery, special care nursery, NICU, or even on an outpatient basis. Management also varies with regard to the nonpharmacologic and pharmacologic treatment received. In 2014, Patrick and associates studied pharmacologic management of infants with NAS in 14 children's hospitals. They found that, in 12 of 14 hospitals, primary treatment was evenly divided between morphine and methadone. The remaining two hospitals used phenobarbital as the primary initial treatment.<sup>11</sup> The variation in pharmacologic treatment led to a change in the length of treatment, length of stay, and amount of

hospital charges for infants treated with methadone as these infants had a shorter length of treatment and length of stay.<sup>11</sup> Subsequently, two separate studies published by a consortium of children's hospitals in Ohio and the Vermont Oxford Network found that it was not the type of medication used that affected length of treatment and stay but the strict adherence to a protocol.<sup>12,13</sup>

### Nonpharmacologic Interventions

Nonpharmacologic interventions for the neonate with NAS often help prevent neonatal skin injuries. Interventions such as swaddling a baby in a flexed position, gentle slow rocking in a vertical manner, providing pacifiers, hand containment, and skin-to-skin care have all been found to help with the neurologic irritability seen in this population.<sup>8</sup> By decreasing the neurologic irritability of the infant, the chance of skin injury decreases.

To prevent diaper dermatitis, it is important to maintain optimal skin care of the perianal area through frequent diaper changes and the use of a barrier cream to protect the skin. Breast milk has been shown to lower the pH of both feces and urine in neonates, which could improve the overall pH of the skin and assist in preventing diaper dermatitis.<sup>14</sup>

### Pharmacologic Interventions

For many infants, nonpharmacologic interventions are not sufficient to counter the signs of NAS. When this is the case, then pharmacologic treatment is needed to decrease neurologic irritability. According to the American Academy of Pediatrics, neonates should be treated with the same class of medication that they were exposed to in utero,<sup>6</sup> with morphine and methadone being the two most common pharmacologic treatments, according to Patrick and associates.<sup>11</sup> The use of a similar class of medication helps lessen the withdrawal signs, which may help prevent skin injuries.

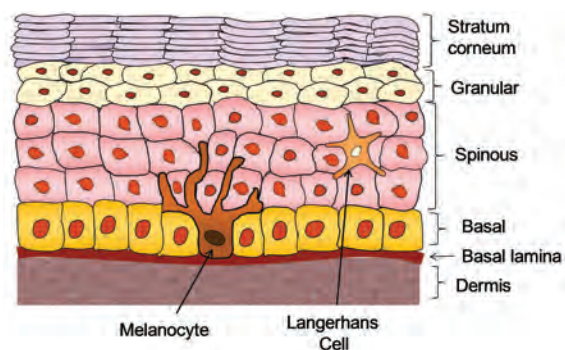
## NAS AND SKIN CARE

When an infant is withdrawing from in utero exposure to opioids and other drugs, myriad signs can be evident, most notably central nervous system (CNS) irritability. CNS irritability is demonstrated by high-pitched inconsolable crying, tremors, restlessness, exaggerated Moro reflex, and increased muscle tone; skin excoriation to the back of the head, chin, cheeks, elbows and other exposed areas; as well as myoclonic jerking and seizures.<sup>7</sup> While skin excoriation would not appear to be a central nervous sign, it is listed under this category since excoriation is the result of a physiologic response to neurobehavioral signs of drug withdrawal.

## NEONATAL SKIN

Before discussing the skin problems that infants with NAS can develop and strategies that can be used to prevent and treat skin problems, it is important to understand the physiology

**FIGURE 1 ■ Anatomy of the layers of the skin.**



Drawing courtesy of Dr. Marty Vischer.

of full-term neonatal skin. Neonatal skin, like adult skin, is comprised of three layers: the epidermis, the dermis, and the subcutaneous layer (hypodermis; Figure 1). Table 2 describes the layers of the skin. The difference between neonatal and adult skin varies depending on the gestational age of the neonate at birth. Because the majority of neonates with NAS are born at term, the discussion will focus on term versus adult skin.

An important difference between adult and neonatal skin concerns the stratum corneum. The stratum corneum is the outermost layer of the epidermis and the most important barrier layer. While the stratum corneum in both adults and full-term neonates is composed of 10–20 layers, it is approximately 30 percent thinner in neonates than in adults and does not function as well.<sup>15</sup> In addition, the epidermal layer

**TABLE 2 ■ Description of the Layers of the Skin**

Layer of Skin	Description
Epidermis	Two distinct layers
Stratum corneum	Outermost layer of skin which continuously sloughs dead skin cells
Basal layer	Adjacent to the epidermal/dermal junction and replaces the sloughed stratum corneum
	The deepest layer of the epidermis; a layer of cells that continually divide, and new cells constantly push older cells up toward the surface of the skin
Dermis	Comprised of collagen (a fibrous protein) and elastin fibers woven together
	Contains nerves and blood vessels
Subcutaneous layer (hypodermis)	Fatty layer of the skin with fat deposits occurring in the 3rd trimester
	Comprised of fatty connective tissue
	Provides insulation and caloric storage
	Functions as a shock absorber

Adapted from Nist M. *Neonatal Skin: Development and Risk Factors for Injury*. Columbus, OH: Nationwide Children's Hospital; 2015.

directly under the stratum corneum, the basal layer, is approximately 20 percent thinner in full-term infants than in adults. Furthermore, infants have an underdeveloped and thinner dermis when compared to the adult dermis. The dermal layer in neonates has less density and shorter collagen fibers.<sup>15</sup> The functionally immature epidermal barrier increases the risk of skin injuries caused by chemical, microbial, or friction injuries in neonates when compared to adults.

The pH of neonatal skin also differs from adult skin. Neonatal skin is alkaline at birth, possibly because of exposure to alkaline amniotic fluid. Neonatal skin has a higher pH, ranging from 6.6–7.5, compared to adult skin, which has a pH range of 4.5–6.7.<sup>15</sup> The pH drops steadily within the first month of life; the most dramatic drop occurs in the first 2 days of life.<sup>15</sup> Despite this drop in pH, the diaper area of the neonate continues to have a higher pH as a result of moisture from the urine and feces. The higher pH, moisture, and fecal contact increases skin permeability and susceptibility to friction injury. This can then alter the skin's microflora and increase friction injuries or diaper dermatitis.<sup>16</sup>

### Common Skin Injuries in NAS

The infant experiencing NAS may be more prone to skin injuries. The most commonly seen injury is skin excoriation, which is a source of physical stress not well addressed in this population. Other skin injuries can vary from scratches, to diaper dermatitis, to sucking blisters (Table 3).

While not well documented in the literature, scratches are another frequently assessed injury in the NAS population found at the author's institution. The scratches are more than likely caused by the neurologic irritability which prevents the infant from self-soothing. The scratches could be a direct result of the infant having excessive suck patterns. The Finnegan scoring tool refers to excessive sucking as the rapid swiping motion of the hands across the face with increased rooting.<sup>7</sup>

### Identifying Skin Injuries in NAS Infants

To improve and optimize outcomes in hospitalized neonates, avoiding skin injuries is crucially important.<sup>17</sup> One method to assure that neonates maintain skin integrity is to do weekly skin rounds. Weekly skin surveillance rounds give the health care team an additional opportunity to recognize, address, and manage skin injuries. In July 2011, at the author's institution, weekly skin rounds were initiated as a quality-improvement project to decrease the number of preventable events in all neonates in the NICU. Skin surveillance is performed by a core group of nurses who have had specialized training to identify pressure injuries and their staging, as well as specialized restraint education. After the self-study portion of the skin education is completed, the RN or LPN assessors are required to complete rounds with an established member of the team. One RN or LPN is off-unit for an eight-hour shift to perform skin rounds. Any identified pressure ulcers must be documented during skin rounds. Other skin injuries are documented based on their relevance to the skin team lead for that shift, resulting in variability in the reporting of other skin injuries. Excoriation of the face and chin along with self-inflicted scratches are frequently documented by the skin team members.

When reviewing the skin rounds data, it became apparent that additional data from the electronic medical record (EMR) were needed. Weekly skin surveillance is highly important in this population; however, not all skin injuries will be captured in this manner. Additional data were extracted from the nursing documentation in the EMR of the modified Finnegan score done every 3–4 hours, Neonatal Skin Condition Score (NSCS; Table 4) done minimally every 12 hours, diaper dermatitis presence or absence done minimally every 12 hours, and also whether a barrier cream was applied every time a diaper was changed. Assessments included inspecting the skin for dryness, erythema, and breakdown using the NSCS. This practice of

**TABLE 3 ■ Description of Common Skin Injuries in NAS Infants**

Skin Injury	Description	Possible Cause
Abrasion	A circumscribed removal of the superficial layers of the skin or mucus membrane. A scraping away of the skin.	Rubbing or scrapping of skin or mucous membrane on a surface. May be caused by neurologic irritability resulting in hyperactivity, which causes infants to constantly rub their extremities or face against a surface such as linens.
Scratches	An excoriation of the skin.	Neurologic irritability causing hyperactivity. Fingernails of the infant or a name band can cause scratches. Excessive sucking on a pacifier and the swiping of hands across the face can also cause scratches.
Sucking Blisters	Superficial bullous skin lesion on an infant's arm, hand, or lips.	The result of vigorous prenatal or postnatal sucking.
Diaper Dermatitis	Also referred to as diaper, ammonia, or napkin rash; dermatitis of thighs and buttocks resulting from exposure to urine and feces in an infant's diaper.	Formerly attributed to ammonia formation; moisture, bacterial growth, and alkalinity may all induce lesions. Result of loose or watery stools associated with withdrawal.
Erythema	Redness of the skin caused by injury, irritation, or infection.	Many times the first sign of a skin injury.

**TABLE 4 ■ Neonatal Skin Condition Score**

Dryness

- 1 = Normal, no sign of dry skin
- 2 = Dry skin, visible scaling
- 3 = Very dry skin, cracking/fissures

Erythema

- 1 = No evidence of erythema
- 2 = Visible erythema, <50% body surface
- 3 = Visible erythema, ≥50% body surface

Breakdown/excoriation

- 1 = None evident
- 2 = Small, localized areas
- 3 = Extensive

Note:

Perfect score = 3

Worst score = 9

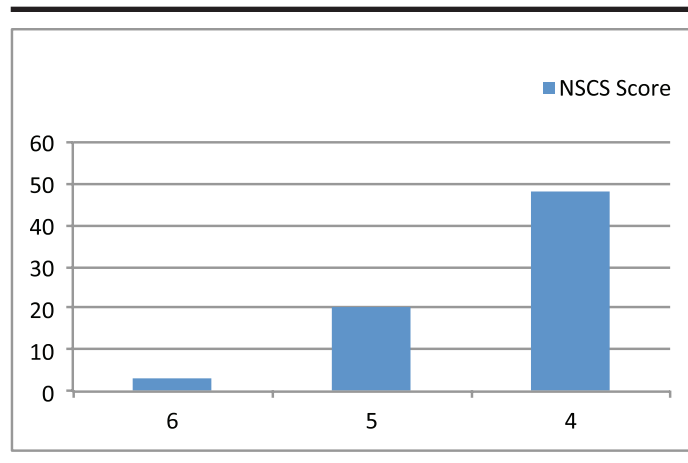
From Lund CH, Osborne JW, Kuller J, Lane AT, Lott JW, Raines DA. Neonatal skin care: clinical outcomes of the AWHONN/NANN evidence-based clinical practice guideline. *J Obstet Gynecol Neonatal Nurs.* 2001;30(1):41-51. Reprinted by permission.

using the NSCS was derived from the Association of Women's Health, Obstetric and Neonatal Nurses' (AWHONN) *Neonatal Skin Care* guidelines.<sup>14</sup>

In reviewing data from the weekly neonatal skin rounds and the EMR during a period from 2014 and 2015, it was found that 151 NAS patients were assessed. Of these patients, 85.4 percent had either loose/watery stool or skin excoriation noted on their modified Finnegan score or had diaper dermatitis during their hospitalization. The data using the NSCS tool showed that, of the NAS patients, 22.6 percent scored for dry skin, 56.3 percent scored for erythema, and 18.5 percent scored for skin breakdown. The highest score a patient can obtain is a 9 using the NSCS. The highest score noted in this cohort of patients was a 6. Figure 2 shows a breakdown of the overall NSCS scores.

When evaluating for the types of skin injuries seen in NAS patients during neonatal skin rounds, diaper dermatitis,

**FIGURE 2 ■ Neonatal Skin Condition Score percentages from skin rounds.**



scratches, and excoriations were found (Figure 3). Diaper dermatitis (Figure 3A) was the number one skin injury in 44.4 percent of the infants, followed by self-inflicted scratches (Figure 3B) at 18.5 percent, and excoriations (Figure 3C) at 13.9 percent. The data from the EMR review differed slightly, with 84.8 percent of infants with NAS having diaper dermatitis and 4.6 percent of infants with an excoriation. Scratches were not pulled from EMR data because of the multiple places that the nurses chart skin injuries such as scratches. Figure 4 shows the difference between skin rounds data and EMR data.

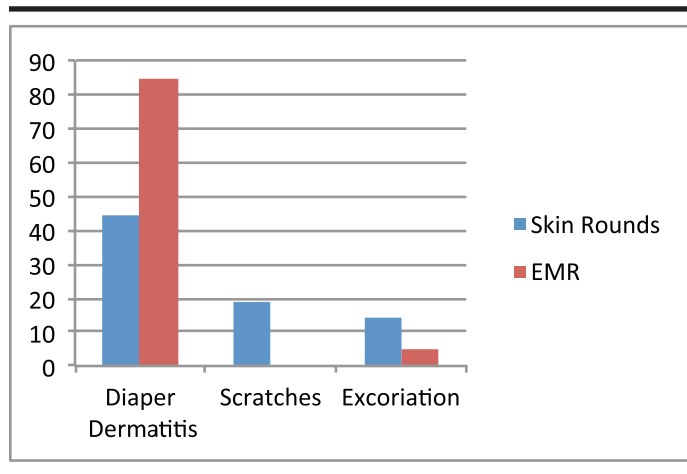
Diaper dermatitis was the highest skin injury noted by both skin rounds and EMR data. When analyzing the diaper dermatitis data, 84.8 percent scored for diaper dermatitis at some point during their hospitalization, while only eight (5.3 percent) of the NAS infants scored for loose or watery stools on the modified Finnegan scoring tool. When comparing the diaper dermatitis to a positive score on the modified Finnegan scoring tool, it was found that 75 percent of the eight infants scored simultaneously for diaper dermatitis.<sup>18</sup>

**FIGURE 3 ■ Types of skin injuries seen in NAS patients during neonatal skin rounds.**



**(a)** Diaper dermatitis. **(b)** Self-inflicted scratch. **(c)** Excoriation with scab.

**FIGURE 4 ■ Comparison of skin rounds and electronic medical record data.**



### Managing Skin Injuries in NAS Infants

While there is plethora of information on the care of the neonate with NAS, there is very little written about how to prevent the skin injuries seen with NAS or how to care for the skin of neonates with NAS once the skin injuries have developed. In one of the earlier published articles on NAS, Finnegan and MacNew describe nursing care of the infant with NAS. In the article's chart on nursing care, the only recommendation regarding skin care was to place the baby in a long-sleeve t-shirt with sewn-in mitts to prevent skin trauma and to keep the injured skin clean. While these two items are still applicable today, there has been an advance of our understanding of neonatal skin in the 40 years since this article was written.<sup>5</sup>

### Treatment of Neonatal Skin Injuries

In 2013, AWHONN published the 3rd edition of its *Neonatal Skin Care Clinical Practice Guideline*.

**TABLE 5. ■ Interventions for Skin Injury of NAS Infants**

Skin Injury	Interventions/Prevention Strategies	Commercial Products
Abrasion/excoriation	<ul style="list-style-type: none"> <li>Skin-to-skin care</li> <li>Clothed cuddling</li> <li>Offer nonnutritive sucking at breast or with pacifier</li> <li>Swaddle infant in flexed position</li> <li>Rocking in a horizontal manner</li> <li>Gentle rocking</li> <li>Soft linens</li> </ul>	Aquaphor
Scratches	<ul style="list-style-type: none"> <li>Swaddle with hands in midline position tucked inside blanket and baby in flexed position</li> <li>Skin-to-skin care</li> <li>Clothed cuddling</li> <li>Offer nonnutritive sucking at breast or with pacifier</li> <li>Clothing with built-in mittens</li> <li>Least recommended intervention would be hand mitts</li> </ul>	Aquaphor
Sucking Blisters	Intervention same as for scratches	
Diaper Dermatitis	<ul style="list-style-type: none"> <li>Breast milk feeds whenever possible</li> <li>Frequent diaper changes, every 1–3 hours</li> <li>Perineal area assessment with diaper changes</li> <li>Use “superabsorbent diapers”</li> <li>Use dry wipes moistened with sterile water to cleanse the skin instead of commercial diaper wipes</li> <li>Use barrier creams to protect the skin (petroleum-based or zinc oxide-containing)</li> <li>Do not remove cream that is left from previous diaper changes</li> <li>Apply “thick application” of barrier cream for injured skin</li> <li>Use alcohol-free pectin-based barrier cream if zinc oxide is not adequate</li> <li>Cleanse gently and pat dry with a mild soap and water</li> <li>Ensure that feces and urine are adequately removed</li> <li>Follow wound and ostomy nurse/skin care expert consultants’ recommendations when the above methods are inadequate</li> </ul>	<p>For mild to moderate diaper dermatitis, any of the following commercial products have been used:</p> <ul style="list-style-type: none"> <li>Z-Guard</li> <li>Nystatin</li> <li>Hydraguard</li> <li>Desitin</li> <li>Aquaphor</li> <li>Critic-Aid</li> <li>Ilex</li> <li>No Sting Barrier</li> </ul> <p>For moderate to severe diaper dermatitis, the following commercial product is used:</p> <ul style="list-style-type: none"> <li>Marathon Liquid Skin Protectant—a wound and ostomy nurse consultation for application</li> </ul>

This document provides an in-depth guide to treatment of general neonatal skin injuries.<sup>14</sup> Table 5 outlines treatments for NAS skin injuries that are based on the AWHONN guideline and the experiences of the authors' institution.

## SUMMARY

Neonatal abstinence syndrome is reaching epidemic portions in the United States. Skin injuries are one of the many signs that a neonate experiencing NAS may exhibit, but there is very little published on this topic in the current NAS literature. Proper care of neonatal skin is important for all neonates, but especially for neonates with NAS, as skin injuries can lead to pain and infection if not treated properly. Information from this monograph will help health care providers to provide better skin care to neonates with NAS.

## REFERENCES

1. Patrick SW, Davis MM, Lehmann CU, Cooper WO. Increasing evidence and geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012. *J Perinatol*. 2015;35(8):650-655. <http://dx.doi.org/10.1038/jp.2015.36>
2. Happel TJ. Morphine from the standpoint of the general practitioner. *JAMA*. 1900;35:407-409.
3. Kolondy A, Courtwright DT, Hwang CS, et al. The prescription opioid and heroin crisis: a public health approach to an epidemic of addiction. *Annu Rev Public Health*. 2015;36:559-574.
4. Jones HE, Fielder A. Neonatal abstinence syndrome: historical perspective, current focus, future directions. *Prev Med*. 2015;80:12-17.
5. Finnegan LP, MacNew BA. Care of the addicted infant. *Am J Nurs*. 1974;74(4):685-693.
6. Hudak ML, Tan RC; for the Committee on Drugs, Committee on Fetus and Newborn. Neonatal drug withdrawal. *Pediatrics*. 2012;129(2):e540-e560.
7. D'Apolito K, Finnegan L. *Assessing Signs and Symptoms of Neonatal Abstinence Using the Finnegan Scoring Tool: An Inter-observer Reliability Program Instructional Manual*. 2nd ed. Nashville, TN: Neo Advances; 2011.
8. Velez M, Jansson LM. The opioid dependent mother and newborn dyad: Non-pharmacologic care. *J Addict Med*. 2008;2(3):113-120. <http://dx.doi.org/10.1097/ADM.0b013e31817e6105>
9. 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.
10. 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):2118-2116. <http://dx.doi.org/10.1056/NEJMsa1500439>
11. Patrick SW, Kaplan HC, Passarella M, Davis MM, Lorch SA. Variation in treatment of neonatal abstinence syndrome in US children's hospitals, 2004-2011. *J Perinatol*. 2014;34:867-872. <http://dx.doi.org/10.1038/jp.2014.114>
12. 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.
13. Patrick SW, Schumacher RE, Horbar JD, et al. Improving care for neonatal abstinence syndrome. *Pediatrics*. 2016;137(5):1-10. <http://dx.doi.org/10.1542/peds.2015-3835>
14. Association of Women's Health, Obstetric and Neonatal Nurses. *Neonatal Skin Care*. 3rd ed. Washington, DC: Association of Women's Health, Obstetric and Neonatal Nurses; 2013.
15. Stamatias GN, Nikolovski J, Mack MC, Kollias N. Infant skin physiology and development during the first years of life: a review of recent findings based on *in vivo* studies. *Int J Cosmet Sci*. 2011;33(1):17-24. <http://dx.doi.org/10.1111/j.1468-2494.2010.00611.x>
16. Heimall LM, Storey B, Stellar JJ, Davis KF. Beginning at the bottom: evidence-based care of diaper dermatitis. *MCN Am J Matern Child Nurs*. 2012;37(1):10-16. <http://dx.doi.org/10.1097/NMC.0b013e31823850ea>
17. Rodgers E, Nist MD, Gardikes-Gingery R, Shepherd E, Ruth B, Keller L. Skin rounds: a standardized approach to pressure injury detection and reporting in the neonatal intensive care unit. *J Obstet Gynecol Neonatal Nurs*. 2014;43(1):S29-S30.
18. Nationwide Children's Hospital. *Unpublished Raw Neonatal Abstinence Syndrome Skin Data*. Columbus, OH: Nationwide Children's Hospital; 2016.

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### IMPROVING SKIN INTEGRITY IN BABIES DIAGNOSED WITH NEONATAL ABSTINENCE SYNDROME

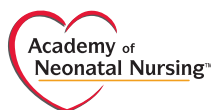
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**Purpose:** The purpose of this monograph is to examine the challenges of skin care in neonates with neonatal abstinence syndrome and provide suggestions for the clinical management of skin breakdown in these infants.

**Course Objectives:** After reading the monograph, studying the content, and taking the test, the learner will be able to:

1. Identify the incidence of neonatal abstinence syndrome (NAS).
  2. Describe general management strategies for neonates with NAS.
  3. Discuss the impact of NAS on skin integrity.
  4. Outline strategies to manage skin alterations in neonates with NAS.
1. Symptoms of neonatal abstinence syndrome (NAS) in the newborn include:
    - a. excessive sleepiness
    - b. oral aversion
    - c. temperature instability
  2. The typical age of onset with withdrawal from methadone is \_\_\_\_ hours.
    - a. 24
    - b. 48
    - c. 72
  3. Patrick and colleagues noted that, by 2012, one neonate affected by NAS is born every \_\_\_\_ minutes.
    - a. 25
    - b. 50
    - c. 75
  4. Which area of the U.S. has the highest incidence of NAS?
    - a. East North Central
    - b. East South Central
    - c. Mid-Atlantic
  5. In 2011, the median length of NICU stay for NAS infants was \_\_\_\_ days.
    - a. 13
    - b. 16
    - c. 19
  6. In the study done by Patrick and colleagues, the shortest length of stay was found in infants treated with:
    - a. methadone
    - b. morphine
    - c. phenobarbital
  7. Which of the following has been shown to be protective against diaper dermatitis in infants with NAS?
    - a. breast milk
    - b. chlorhexidine wipes
    - c. nystatin ointment
  8. Collagen is the primary component in which layer of skin?
    - a. epidermis
    - b. dermis
    - c. hypodermis
  9. The stratum corneum is \_\_\_\_ percent thinner in neonates than in adults.
    - a. 10
    - b. 20
    - c. 30
  10. Compared to adults, the pH of skin at birth is:
    - a. higher
    - b. lower
    - c. the same
  11. The most common skin alteration in infants with NAS is:
    - a. blistering
    - b. excoriation
    - c. scratches
  12. Abrasions in infants with NAS are attributed to:
    - a. excessive sucking
    - b. neurologic irritability
    - c. skin that is more acidic
  13. The highest score in the Neonatal Skin Condition Scoring tool is:
    - a. 5
    - b. 7
    - c. 9

To complete the test and evaluation and find information on NCC core competencies, please go online to [academyofneonatalnursing.org](http://academyofneonatalnursing.org).



NEONATAL NETWORK