



Neonatal Abstinence Syndrome (NAS): A Call on Mental Health Professionals and Allied Disciplines to Become Informed

Jerrod Brown, Ph.D., Cheryl Arndt, Ph.D., and Matthew Krasowski, Ph.D., MD

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A Growing Concern

Concerns of Neonatal Abstinence Syndrome (NAS) have increased dramatically in recent years with the opioid addiction crisis in the United States. It has been referred to as a national epidemic. In fact, research suggests somewhere between 25% and 30% of American pregnant women are prescribed opioids like oxycodone (OxyContin, Percocet) and hydrocodone (Norco, Vicodin). This does not even account for instances where illegal drugs are consumed by pregnant women. Fueled by the consumption of these drugs, NAS has become a significant public health problem in the United States. Cases of NAS skyrocketed by approximately 400% from 2000 to 2012 (Brown

University, 2015). This leaves 3.9 out of every 1,000 delivery admissions in the United States with NAS. Reasons pregnant women use and, in some cases, misuse opioids during pregnancy are many and varied. Some of these reasons may include:

- Addiction
- A family history of substance abuse
- Background on opioids
- Chronic stress
- Complex interpersonal trauma (e.g., physical, mental, or emotional abuse)
- Neglect felt during childhood
- Pain management
- Peer pressure
- Post-traumatic stress disorder (PTSD)
- Shame
- Unaddressed trauma
- Untreated mental illness

Opioids represent the class of drugs most commonly implicated in causing NAS (Johnson & Jones, 2018). A variety of opioids are commonly found in the United States (summarized in Table 1). Most have legitimate clinical uses but may also be misused. Hydrocodone and oxycodone are two widely prescribed opioids that are frequently used non-medically. Non-medical use of prescription opioids may lead to abuse of heroin, an opioid that is currently illegal in the United States. Methadone and buprenorphine are long-acting opioids used to treat opioid addiction by reducing withdrawal symptoms. In the United States, methadone and buprenorphine are administered through monitored programs. It is important to note that NAS can result from use of any of the opioids in Table 1, including methadone and buprenorphine in mothers receiving treatment for opioid addiction. Hydrocodone, codeine, and oxycodone are the opioids most frequently prescribed in the outpatient setting during pregnancy (Ailes et al., 2015).

Table 1. Opioid Drug Names and Main Clinical Uses

DRUG	CLINICAL USES	COMMON TRADE AND STREET NAMES
Buprenorphine	Treatment of opioid addiction	Buprenex®, Suboxone®, Subutex® Bupe, Stop Signs, Subbies, Subs
Codeine	Short-term pain relief, often in formulations with acetaminophen	Tylenol 3® Captain Cody, Cody, Empi, T-3s
Fentanyl	Short-term pain relief Chronic pain	Actiq®, Duragesic®, Fentora®, Sublimaze® Apache, China Girl, China White, Goodfella, Tango, TNT

DRUG	CLINICAL USES	COMMON TRADE AND STREET NAMES
Heroin (diacetylmorphine)	None	Big H, Black Tar, Horse, Smack, Thunder
Hydrocodone	Analgesic	Hycodan®, Lortab®, Maxidone®, Vicodin®, Zohydro® Hydro, Norco, Vikes
Hydromorphone	Analgesic, especially in hospital setting	Dilaudid® D, Dillies, Footballs, Juice, Smack
Methadone	Treatment of opioid addiction Chronic pain	Dolophine®, Methadose® Amidone, Fizzies, Maria, Salvia, Wafer
Morphine	Analgesic, including in hospital setting	Astromorph®, Avinza®, DepoDur®, Duramorph®, Kadian®, MS Contin; also found in poppy seeds Dreamer, Emsel, M.S., Morpho, Unkie
Oxycodone	Analgesic	Endocet®, Oxycontin®, Percocet®, Roxicet® Hillbilly heroin, Kicker, Oxy, Perc, Roxy

Source: Data summarized from Drug Enforcement Administration Drug Fact Sheets (<https://www.dea.gov/factsheets>)

A Complex Diagnosis

NAS is a clinically complex and multifaceted diagnosis that predominantly occurs in newborns who were exposed to opioids prenatally. Risk of NAS increases with longer and heavier exposures to opioids during pregnancy, which carry more risk than brief perinatal exposure. These substances could be prescription (e.g., methadone and oxycodone) or illegal (e.g., heroin) in nature. NAS has also been known to occur in instances involving prenatal exposure to other classes of drugs including alcohol, barbiturates, benzodiazepines (e.g., alprazolam, diazepam, lorazepam), and sedatives. It is also important to consider that all ethnicities and communities have been impacted by the NAS crisis in the United States.

The consequences associated with NAS are many and varied and can result in a host of central nervous system issues, gastrointestinal problems, autonomic dysfunction, and congenital abnormalities (Kivistö, Tupola, Kivitie-Kallio,

& Kivistö, 2015; Maguire, et al, 2016). These issues are often exacerbated for the newborn when the mother used other substances during pregnancy, including alcohol, illegal drugs, and tobacco. Professionals should be aware that the deficits and symptoms associated with NAS can range from minor (e.g., feeding, sleeping, and temperature regulation) to severe (e.g., failure to thrive, respiratory distress, and seizures) concerns. Possible symptoms associated with NAS in newborns include:

CENTRAL NERVOUS SYSTEM ISSUES

- Apnea (lapses in breathing)
- Excessive sucking
- High muscle tone
- High-pitched crying
- Inconsolability
- Irritability
- Poor ability to bond with the caregiver
- Seizures or seizure-like activity
- Sneezing
- Stuffiness
- Tremors

GASTROINTESTINAL PROBLEMS

- Dehydration
- Diarrhea
- Formula sensitivities
- Gastrointestinal upset
- Infrequent stools
- Loose stools
- Poor feeding
- Poor weight gain
- Reflux
- Uncoordinated and constant sucking
- Vomiting

AUTONOMIC DYSFUNCTION

- Decreased fetal heart rate variability
- Fever
- Increased sweating
- Skin mottling
- Nasal stuffiness
- Temperature instability

CONGENITAL ABNORMALITIES

- Congenital heart defects
- “Crossed eyes” (strabismus)
- Gastroschisis (where the intestines extend out through the belly button at birth)
- Ophthalmic problems
- Oral clefts
- Reduced visual acuity
- Spina bifida (birth defect affecting the spinal cord)
- Sudden Infant Death Syndrome, possibly

Long-Term Consequences

Long-term developmental consequences can also result from NAS. Central nervous system disorders can manifest themselves as developmental delay and impaired social development. This can show up as interpersonal problems and increased aggression both at home and in school as children grow (Nygaard, Slinning, Moe, & Walhovd, 2016). As children grow, neurobehavioral impacts can also emerge. These are still being studied but may include poor hand-eye coordination, hyperactivity, impulsivity, attentional problems, and deficits in language, cognition, memory, spatial learning, and perception (Maguire, et al, 2016; Nygaard, Moe, Slinning, Walhovd, 2015). Emotional development has also been found to be impacted, with children who were exposed to opioids in utero experiencing increased rates of anxiety and depression (Ross, Graham, Money, & Stanwood, 2015). There is also concern that individuals who had NAS as infants may have an increased risk of addiction later in life (Carroll, 2015).

These above-mentioned issues may be exacerbated when the impacted individual has been exposed to various adverse postnatal and other problematic experiences throughout his or her life. Some of these negative experiences and exposures to trauma may include:

- Child protection involvement
- Criminal justice system involvement
- Guardianship instability
- Neglect
- Parental divorce and separation
- Parental substance abuse and mental health problems
- Poverty and homelessness
- School failure
- Social isolation
- Traumatic-brain injury
- Unstable home environments
- Victimization
- Violence

Training and Education Considerations

With the increasing rates of NAS in the United States, it is imperative for mental health professionals and allied specialists to seek out training related to this complex and important topic. Training should be designed to increase awareness of NAS and prepare professionals to address this public health crisis in the field. Medical, mental health, child welfare, legal, and criminal justice professionals would benefit from training related to the topic of NAS. Specifically, training should define NAS, explore the developmental and behavioral health consequences of NAS, discuss screening and assessment options, and identify evidence-based treatments and interventions for the baby and mother.

In particular, specific topics addressed in a comprehensive training program should include:

- A brief review of opioids
- Consequences of opioid use
- Opioid dependence and co-occurring disorders
- Reasons for opioid dependence among women
- Clinical and other consequences of maternal opioid use
- Factors that may lead to opioid-exposed pregnancies
- Consequences of abrupt discontinuation of opioid use during pregnancy
- Associated terms and descriptions of NAS
- Historical overview of NAS
- Related statistics on opioid use, opioid dependence, and NAS
- Associated costs of NAS
- Factors influencing NAS outcomes
- Consequences and symptoms of NAS
- Withdrawal symptoms in NAS
- Increased risk for rehospitalization for infants with NAS
- Possible long-term effects of prenatal opioid exposure
- NAS screening and assessment
- NAS intervention and treatment
- Challenges of providing care for infants with prenatal opioid exposure
- Maternal factors to consider
- Barriers to treatment
- Protective factors
- Post-discharge supportive services
- Advocacy for those impacted by NAS and current policy issues

Conclusion

It is critical that mental health and allied professionals gain a greater awareness and knowledge of NAS and understand the impact this syndrome can have on the diagnosed individuals throughout their lifespan and on family members and caregivers. In order to effectively serve their communities, all helping professionals must be educated about NAS. This education can be achieved through consultation with recognized NAS experts.

In addition, professionals are encouraged to review key journal articles on a quarterly basis to stay abreast of the latest peer-reviewed research on NAS. Free and well-researched materials can be accessed from federal government organizations such as the Substance Abuse and Mental Health Services Administration and the National Center on Substance Abuse and Child Welfare. The completion of online or in-person continuing education training related to the topic of NAS should also be considered. Many professional associations are addressing the topic of NAS from their own discipline's perspective, both at conferences and in publications. And finally, mental health and

allied professionals should consider learning about screening, intervention, and treatment options appropriate for individuals and their families who are impacted by NAS. By following the above-mentioned recommendations, improved outcomes can be achieved for individuals, families, and communities impacted by the NAS crisis in the United States.

Author Biographies:

Jerrod Brown, Ph.D., is an assistant professor, program director, and lead developer for the Master of Arts degree in Human Services with an emphasis in Forensic Behavioral Health for Concordia University, St. Paul, Minnesota. Brown has also been employed with Pathways Counseling Center in St. Paul, Minnesota for the past 16 years and is the founder and CEO of the American Institute for the Advancement of Forensic Studies (AIAFS).

Cheryl Arndt, Ph.D., is an educational consultant with extensive experience in mental health. Her program development and management background includes work with children and youth in treatment foster care, residential, and in-patient psychiatric settings and with adults with schizophrenia. She started the first program in her county for adults with co-occurring serious mental illness and substance abuse dependence. She has further experience in program evaluation, quality assurance, performance improvement, and higher education.

Matthew D. Krasowski, M.D., Ph.D., is a pathologist and director of clinical laboratories in the Department of Pathology at the University of Iowa Hospitals and Clinics. He has interest in the pharmacology and analytical toxicology of drugs of abuse. He has published multiple articles and book chapters on pharmacology and drugs of abuse.

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