

Neonatal Abstinence Syndrome: How States Can Help Advance the Knowledge Base for Primary Prevention and Best Practices of Care





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I. Executive Summary

Over the last decade, there has been increasing public health, medical, and political attention paid to the parallel rise in two trends: an increase in the prevalence of prescription opioid abuse and an increase in the incidence of neonatal abstinence syndrome (NAS). There has been a significant increase in the prevalence of NAS, from 1.20 per 1,000 U.S. hospital births in 2000 to 3.39 per 1,000 U.S. hospital births in 2009.³

Prevention and intervention opportunities to avert or ameliorate the outcome of NAS can be considered along a continuum of care spanning timeframes in the mother and infant's life: the preconception period, during pregnancy, at birth, the postpartum or neonatal/infancy period, childhood, and beyond. There are several points when a woman or her family can be lost to follow-up, such as during the handoff between agencies or providers. State health agencies play a key role in linking various resources and providers by tracking substance-exposed infants through screening, assessment, and service delivery.⁴

Taking a public health approach to routine screening for unhealthy substance use in women at every healthcare visit can help increase the opportunities for primary prevention. States can support the American Congress of Obstetricians and Gynecologists' (ACOG) recommendation for universal substance use screening in early pregnancy in a variety of ways. State agencies, quality improvement efforts, and perinatal collaboratives can advance prenatal screenings as the expected standard of care for obstetric providers. State health agencies can ensure that Medicaid reimburses for substance abuse screening, support provider education and training, and streamline entry points for substance abuse treatment.

Although medication-assisted treatment is a centerpiece of managing opioid dependency in pregnancy, it is best applied as part of a comprehensive treatment program that includes obstetric care, counseling, and wrap-around services.² Methadone maintenance programs and office-based buprenorphine treatment offer two different models of service delivery. Family-centered care that is community-based is the ideal course to increase access and provide follow-up for the mother, infant, and family's evolving needs.

There are numerous perinatal approaches to screening for NAS in neonates and their subsequent management in birthing hospitals nationwide. Nearly all opioid-exposed infants will display some NAS symptoms, but only a subset of infants will need pharmacotherapy.⁵ Outlined in a 2012 American Academy of Pediatrics (AAP) policy statement, "Neonatal Drug Withdrawal," the AAP Committee on Drugs recommends scoring NAS symptoms using an appropriate tool to assist with therapeutic treatment decisions.⁸ Several tools are available for quantifying the severity of neonatal withdrawal signs, including the Lipsitz tool, Finnegan scoring system, Neonatal Withdrawal Inventory, and the Neonatal Narcotic Withdrawal Index. The Modified Finnegan's Neonatal Abstinence Scoring Tool is the most frequently used NAS assessment tool in the United States, validated in term infants with opioid exposure, but assessment of preterm infants and those babies exposed to multiple drugs in utero adds to the variability in clinical presentation.

There are many unanswered questions regarding the best practices surrounding evaluation, treatment, and dosing for NAS pharmacological interventions. Many research and operational questions remain on how to consistently provide high-quality care in an unbiased and compassionate manner. States are taking steps to address the gaps in knowledge regarding NAS through interdepartmental efforts, perinatal learning collaboratives, and quality improvement initiatives.

A state-level approach to NAS can address several levels of intervention, including:

- Surveillance for NAS-affected infants and the sources of maternal opiate use.
- Reimbursement for utilizing screening protocols to detect substance abuse early in pregnancy and withdrawal signs in newborns.
- Development of better measures to ensure follow-up with opioid-dependent women and receipt of comprehensive services.
- Collaborative efforts to strengthen clinical standards for identification, management, and follow-up with NAS-affected infants and their families.

II. Introduction

Over the last decade, there has been increasing public health, medical, and political attention paid to the parallel rise in two trends: an increase in the prevalence of prescription opioid abuse and an increase in the incidence of NAS. The two trends are likely intertwined, but many questions remain about the nature of the NAS “epidemic” and how best to screen for affected infants and manage their symptoms.⁶ In utero exposure to certain drugs can cause neonatal withdrawal after birth when the drug is abruptly stopped because the infant—like the mother—has developed physical dependence on the drug.⁷ Clinically relevant neonatal withdrawal most commonly results from in utero opioid exposure but has also been described in infants exposed to benzodiazepines, barbiturates, and alcohol. NAS refers to the constellation of clinical findings associated with opioid withdrawal that usually manifests as neurological excitability, gastrointestinal dysfunction, and autonomic overreactivity.⁸ Infants diagnosed with NAS are a subset of the larger group of all opioid-exposed infants, about 55 percent to more than 90 percent of whom develop withdrawal signs and require pharmacotherapy. There may be maternal or infant factors affecting the expression of NAS, but these factors are not understood well enough to serve as conclusive predictors of NAS symptoms’ severity.⁸ State health agencies play a key role in collecting accurate data to track trends and supporting evidence-informed practices to screen, manage, and prevent opioid dependency in mothers and infants.



Prevention and intervention opportunities to avert or ameliorate the outcome of NAS can be considered along a continuum of care spanning time frames in the mother’s life and that of her child. The 2009 Substance Abuse and Mental Health Services Administration’s (SAMHSA) report, “Substance-Exposed Infants: State Responses to the Problem,” provides a five-point intervention framework to organize the prevention and intervention opportunities that can impact outcomes for opioid-dependent women and their children.⁴ The five time frames for intervention include:

1. Preconception period.
2. During pregnancy.
3. At birth.
4. Postpartum or neonatal/infancy period.
5. Childhood and beyond.

Primary prevention of NAS encompasses efforts to raise awareness about the risks associated with the use of prescribed opioid narcotics with the goal of preventing addiction in all women of reproductive age, as well as assessing and treating any unhealthy use prior to conception. During pregnancy, universal screening efforts and enhanced substance abuse services—including accessible medication-assisted therapy (MAT) for all women who need it—are important goals. At birth, the systematic approach to screening infants, monitoring for withdrawal signs using a scoring tool, and managing care for the mother and infant offer numerous opportunities for improving outcomes. Enhanced services for the family (i.e., family-centered services) should also be considered for the infant’s optimal care and development over the long term. **Figure 1** provides some key strategies to consider during each of the five time periods. Because the points of potential intervention span multiple phases in women and children’s lives, many state agencies, healthcare providers, and community-based services are involved. There are several points when a woman or her family can be lost to follow-up, such as during the handoff between agencies or providers. State health agencies play a key role in linking various resources and providers by tracking substance-exposed infants through screening, assessment, and service delivery.⁴

FIGURE 1: INTERVENTION POINTS TO PREVENT PRENATAL SUBSTANCE EXPOSURE AND AMELIORATE THE IMPACTS OF SUBSTANCE-EXPOSURE IN INFANCY

1 - PRECONCEPTION	Promote awareness of effects of prenatal substance use by educating adolescent and adult women about the risks of unhealthy use. Encourage no use (including of tobacco and alcohol) when planning pregnancy and during pregnancy.
	Universal screening, brief intervention and referral to treatment during routine medical visits for all women of childbearing age.
2 - DURING PREGNANCY	Universally screen pregnant women for substance abuse and make referrals to treatment when appropriate.
	Provide enhanced prenatal services, including referrals to services in which coordination can occur with all relevant entities (hospitals, DCF, substance-abuse treatment providers, etc.) prior to birth.
3 - AT BIRTH	Use consistent and effective protocols for identification of substance-exposed newborns.
	Make referrals for developmental or child welfare services.
4 - THROUGH INFANCY	Provide developmental services.
	Ensure an environment safe from abuse and neglect.
	Respond to immediate needs of other family members, including treatment of the parent-child relationship.
5 - THROUGH THE LIFE SPAN	Identify and respond to needs of exposed child.
	Respond to needs of mother and other family members.
	Provide an appropriate education, screening, and support as exposed children approach adolescence and adulthood to prevent adoption of high-risk behaviors such as substance abuse.

III. Background

There has been a significant increase in the national prevalence of NAS. As reported in the 2012 article “Neonatal abstinence syndrome and associated health care expenditures,” the diagnosis of NAS increased from 1.20 per 1,000 hospital births in 2000 to 3.39 per 1,000 hospital births in 2009.³ This means that in 2009, there were more than 13,000 infants diagnosed with NAS, or approximately one infant born every hour in the United States had signs of drug withdrawal.³ The rise in NAS births goes hand-in-hand with a significant increase in prevalence of mothers dependent on or using opiates at the time of delivery from 2000-2009, with 5.63 cases of maternal opiate use per 1,000 hospital births in 2009.³ However, the population of pregnant women with opioid dependence is varied, and their circumstances span the spectrum from heroin addiction, polydrug abuse, prescription opioid abuse, MAT (methadone maintenance or buprenorphine maintenance), and chronic opioid use prescribed for medical indications. State health agencies and clinical providers need to keep in mind these differing contexts to effectively screen for opioid dependency among women and identify risk factors in women and infants with potential opioid exposure.

The potential link between the trend in NAS prevalence and the increasing trend of prescription opioid abuse and chronic opiate use is a public health concern. From 1999-2009, there have been steady increases in prescription opiate sales, substance abuse treatment admissions, and overdose deaths due to prescription opiates. Nonmedical use of prescription drugs is the third most common drug category of abuse after marijuana and tobacco.⁹

There has been a 33 percent increase in nonmedical use of prescription opioid pain relievers among pregnant women in the last decade.² One percent of pregnant women in 2005-2006 and 0.7 percent of pregnant women in 2007-2008 reported nonmedical use of opioid pain relievers (a rate of 7-10 per 1,000 pregnancies). This translates to 17,000 (2007-2008) to 25,000 (2005-2006) affected pregnancies as an annual average, ranking only behind marijuana use in absolute numbers.¹⁰

Nonmedical use or misuse of opioid pain relievers is a broad category, defined as the use of a narcotic pain reliever without a prescription, in a way other than as prescribed, or for the experience or feeling the drug causes.¹¹ It can precede, but does not necessarily lead to, prescription opioid abuse and addiction. Also of concern are some indicators of increasing prescription narcotics use by pregnant women for medically-indicated reasons. In one study, chronic use of narcotic prescriptions for at least one month during pregnancy increased five-fold between 1998 and 2008, from about 2.5 cases per 1,000 deliveries to more than 10 cases per 1,000 deliveries.¹²

NAS is associated with an increased risk of complications in the neonatal period and higher costs to the healthcare system, particularly Medicaid. NAS increases the risk of respiratory complications at birth, low birthweight, prematurity, feeding difficulties, and seizures.^{3,13} Medicaid covers the majority of mothers with opiate exposure during pregnancy (60%) and infants diagnosed with NAS (78%). Hence, states are well positioned to deal with the increasing numbers of opioid-dependent pregnant women



and NAS-affected infants.³ States are seeing the impact of this diagnosis on Medicaid expenditures and budgets. In Vermont, more than 90 percent of deliveries to women with opioid dependency were Medicaid deliveries.¹⁴ Tennessee's Medicaid program, TennCare, covered 75-87 percent of infants diagnosed with NAS from 2008-2011. TennCare estimates suggest that care of infants born with NAS exceeds \$40,000 in the first year of life, which is nine times the cost of care for otherwise healthy infants.¹⁵

State health agencies can examine ways in which they may support better outcomes for mothers and infants affected by opioid dependency. For example, state health agencies may:

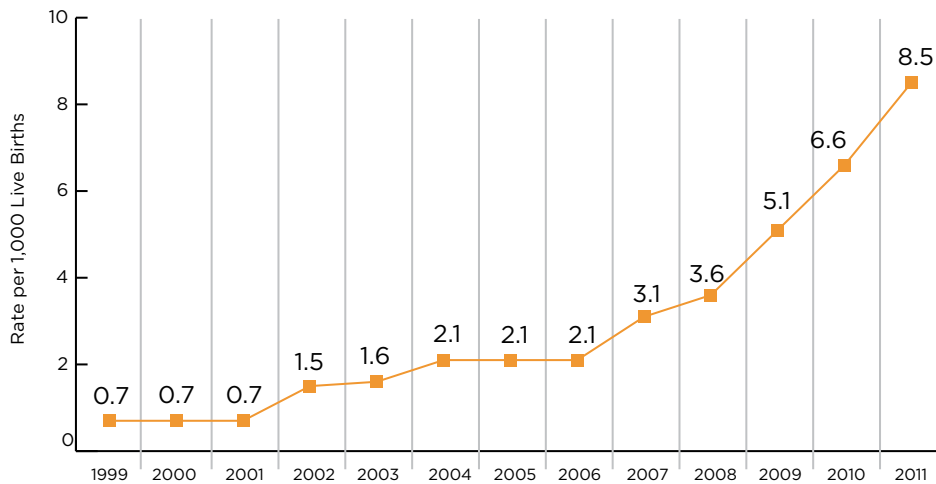
- Collect data on the number of cases of substance-exposed infants and NAS, respectively. Also, they may track the source of the maternal substance use, which will help better describe the causes of infant NAS cases and inform prevention and treatment efforts in the preconception and prenatal periods. This may be done through mandatory reporting.
- Support provider education and public awareness efforts to increase provider-patient discussion on the risks and benefits of chronic opioid therapy and the importance of concurrent contraception to reduce unintended fetal exposure to the drugs.
- Extend Medicaid coverage for substance abuse screening at preventive care visits, preconception visits, and prenatal visits.
- Educate providers on the use of validated substance abuse screening tools as the standard of care for all obstetric patients.
- Review policies on substance use/abuse in pregnancy in a public health framework, rather than with a criminal or punitive framework, to increase opportunities to engage mothers in screening, counseling, and treatment for their addiction.
- Streamline entry points for substance abuse treatment.
- Support innovation to bring more family-centered, comprehensive and wrap-around services to encompass mental healthcare and substance abuse treatment as a way of increasing access to these services in the prenatal and postpartum/interconception period.
- Identify and help address the different service delivery issues for the provision of methadone maintenance and buprenorphine maintenance.
- Build a model of a continuum of substance abuse services and treatment capacity that better links women with the appropriate level of community-based services whenever possible.
- Encourage information sharing among birthing hospitals and perinatal providers to advance the knowledge base on how to optimize screening, diagnosis, and management (both pharmacotherapy and non-pharmacological care) of opioid-exposed newborns and those diagnosed with NAS.
- Strengthen collaborations between clinical providers, community agencies, home visiting programs, and state agencies to track drug-exposed women and their infants through the first year of life. Infants with NAS may have subacute symptoms—such as poor feeding, difficulty sleeping, and loose stools—for months after birth. These prolonged NAS symptoms, along with other variables such as family characteristics and functioning and environmental deprivation, may put the infant with NAS at risk for failure to thrive, child abuse or neglect, and developmental delay.

IV. State Surveillance and Key Data to Inform NAS Trends

States are seeing a significant rise in affected infants. In Tennessee, there has been a 10-fold increase in NAS cases since 1999 [Figure 2]. The rate of NAS cases was 0.7 per 1,000 live births in 1999 and 8.5 per 1,000 live births in 2011. The Kentucky Division of Public Health reports an 11-fold increase in NAS cases, from 1.2 cases per 1,000 live births in 2001 to 13.2 cases per 1,000 live births in 2011.^{16,17} In Florida, the rate of infants diagnosed with NAS increased more than three-fold in a six-year period, from 2.31 infants diagnosed per 1,000 live births in 2007 to 7.52 per 1,000 live births in 2011.¹⁸ In Vermont, 26 per 1,000 deliveries involved an infant diagnosed with NAS in 2010 (n=162), up from three per 1,000 deliveries in 2002.¹⁴ Washington state has also reported a significant increase in NAS rates, from 1.2 per 1,000 live births in 2000 to 3.3 per 1,000 live births in 2008. Data from Washington reveals that prenatal exposure to opioids increased from 11.5 percent of all drug-exposed neonates in 2000 to 24.4 percent in 2008, and 41.7 percent of infants diagnosed with NAS were exclusively exposed to opioids.¹³

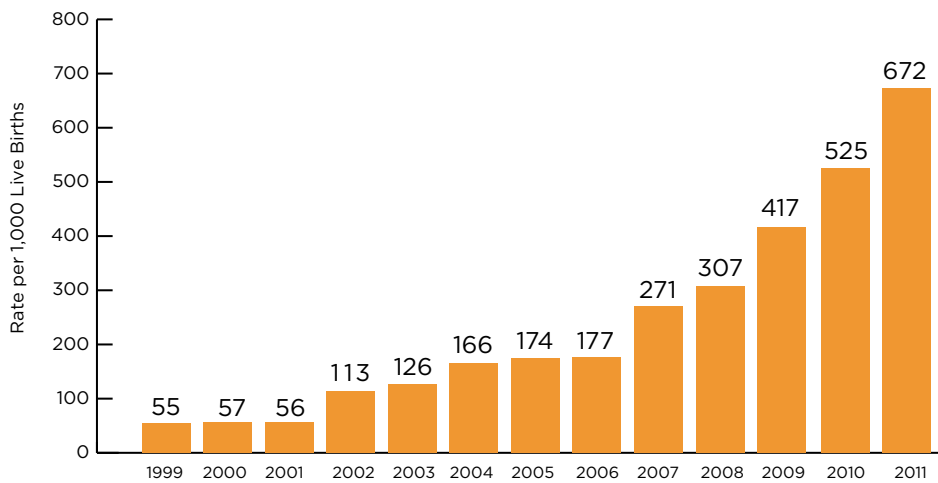
FIGURE 2

Inpatient Hospitalization Rate for Any Diagnosis of Neonatal Abstinence Syndrome
Tennessee, 1999–2011



Data Sources: Tennessee Department of Health; Policy, Planning and Assessment; Birth Statistical and Hospital Discharge Data Systems

Number of Inpatient Hospitalizations with Any Diagnosis of Neonatal Abstinence Syndrome
Tennessee, 1999–2011



Data Sources: Tennessee Department of Health; Policy, Planning and Assessment; Birth Statistical and Hospital Discharge Data Systems



TENNESSEE: State Data Is Providing Key Insights into the Causes of NAS Trends

Tennessee health officials recognized the importance of accurate and real-time data on NAS trends to help measure the impact of interventions to prevent NAS and better manage NAS-affected infants and mothers. The state commissioner of health made NAS a reportable condition as of Jan. 1, 2013, and a web-based reporting portal is available on the Tennessee Department of Health website. One piece of information captured in the portal is the source of maternal opiate use, a key factor that can be obtained through provider case reports. This data from Tennessee reveals the causes of the state's NAS increase. As of Dec. 7, 2013, 805 NAS cases have been reported to the Tennessee Department of Health. Of these cases, nearly 46 percent resulted from the mother being on supervised MAT, 39 percent were due to prescription opioid abuse, and 19 percent were due to supervised pain therapy. Illicit opiate use accounted for 28 percent of the NAS cases reported.¹

Tennessee has also examined its Medicaid claims data to gain insights into opportunities for intervention to prevent and treat opioid dependence in pregnancy. The number of women in TennCare prescribed narcotics for more than 30 days and concurrently prescribed contraceptives was particularly revealing: 82 percent of these women were on narcotics, but *not* on contraceptives. This is a missed opportunity for primary prevention and suggests an area for targeted education to raise awareness among providers and women. TennCare used the ICD-9 code 779.5, corresponding to drug withdrawal syndrome in the newborn period, to determine the incidence rate of NAS among its enrollees. The mother's length of Medicaid eligibility in the year prior to birth was also examined to get a picture of when mothers were entering the TennCare system and the potential duration for prenatal management. On average, TennCare spent almost \$41,000 per NAS case in 2010, compared to about \$4,000 for an otherwise healthy birth. Other data also indicate that infants born with NAS are 14.8 times more likely to be in child protective custody at some point in their first year of life compared to other TennCare infants. Thus, the overall costs of NAS are far greater than medical care and extend beyond the newborn period.

¹Multiple maternal substances may be reported, therefore the number of cases may not add up to 100 percent.

Source: Tennessee Department of Health. "Neonatal Abstinence Syndrome Surveillance Summary, For the Week of December 1-December 7, 2013. Week 49." Available at http://health.tn.gov/MCH/PDFs/NAS/NASsummary_Week_49.pdf. Accessed 12-10-2013; TennCare Office of Healthcare Informatics. "Neonatal abstinence syndrome among TennCare enrollees." Presentation. 9-18-2012.

Like Tennessee, other states are finding ways to make NAS a reportable condition. Kentucky recently passed a bill mandating reporting of all NAS cases to its state health department. The causes of NAS likely vary between states, so it is important for each state to track its own data on the maternal source of opiates. The data can then be used to inform preventive efforts that will decrease opioid dependency among pregnant women and the occurrence of clinically significant NAS.

V. Primary Prevention: The Preconception Period

PRESCRIBING CONTROLLED SUBSTANCES

The preconception period is the ideal point to intervene and prevent an opioid-exposed pregnancy. In 2009, the American Pain Society and the American Academy of Pain Medicine wrote, “Clinicians should counsel women of childbearing potential about the risks and benefits of chronic opioid therapy during pregnancy and after delivery” and try to minimize use of opioids during pregnancy based on a risk-benefit assessment.¹⁹ With more women of childbearing age using prescription narcotics, state health agencies can support education and awareness efforts to increase provider-patient discussions about the risks of misuse, addiction, and the potential risks to infants exposed in utero to these drugs, as well as conversations about the importance of concurrent contraception to reduce unintended fetal exposure to the drugs. Prescribing clinicians should also obtain a patient’s records from the state prescription drug monitoring program to help assess the patient’s history of exposure and any other sources of prescription opioids.¹⁹

To advance its NAS work, Tennessee formed a NAS Subcabinet Working Group, which aims to reduce the number of women on prescribed narcotics having unintended pregnancies. The subcabinet, along with many other states, signed a letter to FDA petitioning for a “black box” warning on certain narcotics to increase NAS awareness and communication between providers and patients. TennCare plans to require that narcotic prescribers counsel women of childbearing age about the risks of becoming pregnant while taking narcotics and discuss birth control options before prescribing the drugs. Such counseling will be part of the prior authorization process for certain narcotics. In Florida, the Statewide Task Force on Prescription Drug Abuse and Newborns recommended provider training on drug screening protocols and pain management education in medical schools, as well as a public awareness initiative to educate the public on the dangers of prescription drug abuse during pregnancy.¹⁸

SUBSTANCE ABUSE SCREENING

Taking a public health approach to routine screening for unhealthy substance use in women at every healthcare visit can help increase the opportunities for primary prevention. There are validated screening tools, such as the “4 P’s” or the Screening Brief Intervention and Referral to Treatment (SBIRT) model, which can be administered when a woman interacts with the health system, particularly at annual preventive care visits and preconception visits. Applying universal screening practices reduces the “stigma that occurs when only a portion of the population is screened and normalizes dialogue and education about substance use in the healthcare setting.”²⁰ However, barriers to regular screening for substance use exist and need to be addressed, including providers’ inability to obtain reimbursement for screening, lack of provider time, lack of familiarity with screening procedures and referral options, lack of information or misinformation about substance use among pregnant women, doubts about the benefits of treatment, discomfort with the subject, and cultural and language barriers.²⁰ Some of these barriers can be addressed at the state level through Medicaid coverage of substance abuse screening, provider education and training, and streamlining entry points for substance abuse treatment.

VI. Prenatal Care: Identifying and Managing Opioid Dependency

PRENATAL SCREENING

The ACOG Committee on Health Care for Underserved Women has stated that all women should be routinely asked about alcohol and drug use, including the use of prescription opioids and other medications for nonmedical reasons.²¹ ACOG endorses using a validated tool, such as the 4 P's, to screen all patients early in their pregnancy. Urine drug tests should supplement the medical history and physical exam and be performed with the patient's consent and in compliance with state laws. Women should be informed of the potential consequences of a positive test result, including any mandatory reporting requirements.²¹

States can support the ACOG recommendation for universal substance use screening in early pregnancy in a variety of ways. State agencies, quality improvement efforts, and perinatal collaboratives can help advance prenatal screenings as the expected standard of care for obstetric providers. Some states, such as West Virginia, have mandated prenatal risk screening. In May 2008, West Virginia passed the Uniform Maternal Screening Act requiring that all healthcare providers offering maternity services use the West Virginia Prenatal Risk Screening Instrument. The screening tool collects information on conditions, demographics, and behaviors, such as substance use, that may put a woman at greater risk for a poor pregnancy outcome. States can also ensure that their Medicaid program reimburses

for prenatal substance use screening. There is no federal mandate for covering screening, but more than 20 states have added SBIRT coverage to their Medicaid programs, and private insurers should be encouraged to do the same.²⁰

It is also important to consider the implications of identifying prenatal substance abuse in efforts to increase access to care and improve clinical outcomes. Framing the problem as a public health issue rather than a criminal issue may be helpful as one examines state policies to ultimately prevent and reduce NAS cases. For example, 16 states consider substance abuse during pregnancy to be child abuse under civil child welfare statutes.²² However, a punitive

atmosphere has been linked to women with substance abuse problems avoiding prenatal care or treatment for fear of losing custody of their children.²³ The American Medical Association has rejected the idea of criminalizing pregnant women for using drugs.²⁴ Some states have proposed or taken steps to provide immunity to pregnant women seeking prenatal care.¹⁸ For example, HB 12-1100 was signed into Colorado law on March 9, 2012, and prohibits information obtained during a drug screen or test performed as part of prenatal care from being admissible in criminal proceedings. There are already many other barriers to accessing substance abuse treatment services, and punitive laws that do not differentiate those women who comply with referrals and treatment can be a deterrent to accessing those very services that have shown to improve maternal and neonatal outcomes.



MEDICATION-ASSISTED TREATMENT DURING PREGNANCY

Methadone maintenance treatment is the standard of care for opioid-dependent pregnant women. State health agencies can help optimize service delivery and treatment capacity to ensure women have access to needed services in a timely manner, staying in their community or medical home whenever possible. Compared to medication-assisted withdrawal, methadone maintenance is associated with better relapse prevention, decreased exposure to illicit drugs and other high-risk behaviors, improved adherence to prenatal care, and improved neonatal outcomes.^{21,25-27} The goal of maintenance therapy is to prevent withdrawal during pregnancy and minimize fetal exposure to illicit substances.²

Methadone exposure in utero may also result in NAS incidences, but maternal methadone doses have not been consistently found to correlate with the severity of NAS.²⁸⁻³⁴ Data from a meta-analysis did not show a statistically significant difference in the incidence of NAS among women on lower versus higher methadone doses.³⁵ Methadone should be dosed to avoid withdrawal symptoms in the pregnant patient and block the euphoric effect of misused opioids.²¹ However, the woman's system will metabolize and distribute methadone differently during pregnancy, so dosages will likely need to be adjusted; having women on too low a dose has been associated with an increased risk of relapse.³⁶



Although MAT is a centerpiece of managing opioid dependency in pregnancy, it is best applied as part of a comprehensive treatment program that includes obstetric care, counseling, and wrap-around services.² There is a treatment gap in pregnant women's receipt of substance abuse services overall: In 2005, only 6 percent of the pregnant women classified as needing alcohol or illicit drug use treatment actually received it.⁴ Substance abuse treatment admissions of pregnant women comprised 3.9 percent of all female admissions in 2005.⁴ Pregnancy is an important period for offering services because of the potential far-reaching impact they can have on infant outcomes, but pregnancy also presents challenges to accessing services. Barriers to care may include lack of transportation, lack of child care services, intensive time requirements, additional costs and copays, and stigma.³⁷ The federal Substance Abuse Prevention and Treatment Block Grants require that states set aside a certain proportion of their block grant funds for services designed for pregnant women and women with dependent children. Such women should receive priority access to treatment and provision of services within 48 hours of request.⁴ Among all types of substance abuse treatment facilities, 7 percent offer prenatal care services, 8 percent offer child care services, and 14 percent offer special programs for pregnant or postpartum women.²³ Methadone treatment centers serve the greatest proportion of female substance abuse clients and often have special programs for pregnant women, but only a limited number provide child care services. Such programs should research innovative ways to provide child care services and evaluate the impact, if any, on treatment outcomes and retention.²³

Buprenorphine is another option for medication-assisted therapy of opioid dependency. Increasing evidence on maternal and neonatal effects is informing buprenorphine's role in the continuum of care and its safety profile as part of a treatment program. Buprenorphine has some key differences from

methadone in its pharmacological action: It is a partial—not complete—opioid agonist, so it acts as an opioid receptor agonist at low doses and as either an agonist or antagonist at high doses.² There is lower risk of overdose with buprenorphine because there is a ceiling effect on respiratory suppression. The single-agent formulation without naloxone (Subutex) is preferable in pregnancy but does have the higher potential risk of abuse or diversion.²¹ The properties of buprenorphine are not as well-suited for patients who have high opiate needs as methadone, and there is some evidence that there is higher attrition of patients when initiating treatment with buprenorphine compared to methadone.^{38,39}

Because buprenorphine can be prescribed by physicians in office settings, providing buprenorphine offers a different model of delivery compared to the highly regulated methadone treatment programs. Physicians can obtain a special SAMHSA waiver to prescribe buprenorphine in a medical office setting. Office-based treatment potentially reduces the stigma of opioid maintenance therapy and increases its availability, especially in rural areas.^{21,40} In 2008, more than 2 million buprenorphine prescriptions were issued to 300,000 patients nationally, and almost 14,000 providers have been authorized to prescribe the drug.² However, the patient’s clinical and psychosocial needs must be considered when selecting the appropriate drug for opioid maintenance therapy. Some women may benefit from the more structured, regulated methadone treatment programs. Access to wrap-around support services, such as mental health counseling, nutrition, and social service referrals, may also vary more in the office-based delivery model because access would then depend on individual providers’ referral practices.⁴¹



VERMONT: Designing a Regionalized, Integrated System for Opioid Dependence Treatment

Each year, more Vermont residents seek treatment for opiate addiction. Methadone treatment programs’ limited availability and capacity has led to broader use of buprenorphine services than originally anticipated. Although this has increased access to MAT, there have been challenges: Patients require more physician time, counseling services are not always readily available, and reports of drug diversion have increased.

Vermont’s approach to healthcare reform supports making opioid screening and MAT an expected component of care provision within health homes. Vermont’s 2012 Medicaid Health Home Program proposal suggests having buprenorphine prescribers, working in conjunction with nurses and substance abuse and mental health counselors, serving about two-thirds of opioid-dependent patients in their communities. Only more complicated patients would need to be cared for in methadone treatment programs. This “hub-and-spoke” model works to integrate addiction treatment services along a continuum of care, allowing more women to stay within their communities and access addiction and mental health services with primary care services.

Source: Vermont Agency of Human Services. “Integrated treatment continuum for substance use dependence ‘Hub/Spoke’ Initiative—Phase 1: Opiate dependence.” January 2012.



Data on the neonatal effects of buprenorphine, although not as complete as the evidence base for methadone, suggest that buprenorphine exposure results in a less severe NAS manifestation. During pregnancy, placental transfer of buprenorphine may be less than for methadone, thereby reducing fetal exposure.^{42,43} Fetal monitoring also suggests that buprenorphine causes less fetal cardiac and movement suppression than methadone.⁴¹ Based on a double-blind, double-dummy, randomized, controlled study, buprenorphine has been shown to result in less severe NAS with infants requiring less total morphine for treating withdrawal symptoms, a shorter duration of treatment, and shorter hospital stay.^{39,43,44} The long-term data on infant and child outcomes following in utero exposure to buprenorphine are not yet available, however, so women should be cautioned when consenting to MAT.²¹

COORDINATION OF CARE FOR OPIOID-DEPENDENT WOMEN

Finally, innovation and quality improvement should play a role in standardizing opioid-dependent women's prenatal care to deliver comprehensive, coordinated services. Half to three-quarters of opioid-dependent women also have a mood or major psychiatric disorder, necessitating ongoing coordination of mental health services and possibly medication.^{25,45,46} Women's psychiatric comorbidities can affect their outcomes in substance abuse treatment: Those with anxiety disorders are more likely to be compliant with treatment, while women with mood disorders are more likely to be positive for drugs while in treatment.⁴⁵ Opioid-dependent women are also at risk for polydrug use, which can potentiate the expression and severity of NAS in their infants.^{47,48} In some studies, around 90 percent of opioid-dependent pregnant women have been reported to smoke heavily, and smoking is known to affect birthweight and could affect NAS as well.^{27,39,49} Pregnant women with complex issues would benefit from wrap-around services linked to a medical home and a specific provider to coordinate care.

State health agencies can support innovation and quality improvement initiatives to improve the model of care coordination for opioid-dependent women. Structural changes to the delivery of prenatal care may be needed to accommodate the increased role for care coordination of complex patients to include longer appointment times, more frequent visits, multidisciplinary case reviews, and cross-discipline strategies to increase medication adherence, such as linking a medication dose with a prenatal visit or counseling requirement.¹² To inform service delivery models and innovation, states should support data collection systems to better track the number of pregnant women referred for treatment services and treatment outcomes for women identified through prenatal screening.⁴

VII. Care of the Neonate: Diagnosing Withdrawal Signs

State health agencies can support a standardized approach to NAS diagnosis by:

- Encouraging all birthing hospitals to have a written policy on the criteria for screening and testing women and infants for substance exposure.
- Encouraging the use of an NAS screening tool as the standard of care for monitoring infants.
- Working with child protection service (CPS) agencies to review and train staff on policies for reporting substance-exposed newborns.
- Tracking outcomes for CPS referrals made for NAS.

Nearly all opioid-exposed infants will display some NAS symptoms, but only a subset of infants will need pharmacotherapy.⁵ Opioid receptors are concentrated in the central nervous system and the gastrointestinal tract, so the predominant signs and symptoms of opioid withdrawal manifest as central nervous system irritability, autonomic overreactivity, and gastrointestinal dysfunction.⁸ NAS affects infants' self-organization and self-regulation, interfering with basic functions such as feeding, sleeping, and the ability to be alert and communicate clear cues to caregivers.⁵ The onset of symptoms depends on the type of drug(s) used, as well as other maternal and infant factors such as metabolism, birthweight, and gestational age at birth. Heroin exposure usually results in NAS symptoms within 24 hours of birth, whereas methadone withdrawal usually manifests within 72 hours of birth and may last several days to weeks.^{21,50} Withdrawal symptoms following buprenorphine exposure appear to emerge later, so infants may need to be observed longer in the hospital.⁴³



Infants at risk for NAS also have an increased risk of certain complications in the neonatal period. NAS is associated with an increased risk of respiratory complications at birth, low birthweight, prematurity, feeding difficulties, and seizures.^{3,13} In Tennessee, Medicaid claims data found that infants diagnosed with NAS were three times more likely to be low birthweight, with more than 33 percent of these infants weighing less than 2,500 grams at birth.⁵¹ One study found a higher risk of some congenital heart defects and other birth defects following maternal use of prescribed opioid narcotics early in pregnancy, but there are no other reports of such an association in the recent literature.⁵²

MATERNAL AND INFANT SCREENING

There are numerous approaches to screening for NAS in neonates and their subsequent management. The American Academy of Pediatrics recommends that every nursery caring for infants with NAS develop a protocol that defines the indications and procedures for screening for maternal substance abuse, as well as a standardized plan for the evaluation and comprehensive treatment of infants at risk or showing signs of withdrawal.⁸ However, a national survey of neonatology divisions revealed that

only 55 percent of respondents had a written policy addressing NAS management. Seventy percent of neonatal intensive care units (NICU) always use an abstinence scoring tool to determine when to start, titrate, or stop pharmacological therapy, and 83 percent routinely perform toxicological screening on infants' urine or meconium before starting treatment.⁵³ Maryland and Iowa have also published results from surveys of birthing hospitals revealing similarly high variability in practice around detecting and managing NAS. In Maryland, half of the hospitals responding had a standardized evaluation and treatment protocol for NAS, but only 30 percent of hospitals observed drug-exposed infants longer than 48 hours postpartum.⁵⁴ In Iowa, 25 percent of birthing hospitals had a structured protocol that guided neonatal drug screening, 60 percent of hospitals screened on an arbitrary basis, and 15 percent did not perform any screening.⁵⁵ Having a screening protocol that guides decisionmaking can help reduce testing bias, which has been reported to result in more drug testing of poor and racial or ethnic minority women.⁴



Screening for NAS should begin with a careful maternal history and physical examination and supplemented with toxicological testing as needed. Maternal report of substance use, late entry into care or no prenatal care, previous unexplained late fetal demise, precipitous labor, and placental abruption are among the risk factors that could prompt the observation and, in some cases, testing of infants for drug exposure.⁸ Urine toxicological screening can be done on either the mother or infant. For the infant, the urine specimen should be collected as soon as possible after birth and will only reflect recent drug exposure because opioid metabolites are cleared within one to three days after birth.⁸ Meconium analysis reflects drug exposure during the previous several months in utero, but results are usually not available for several days and thus, cannot guide real-time management of the newborn.² Newer laboratory testing is available on specimens such as umbilical cord blood, and research is being done to examine their utility in the screening for NAS.

Infants who are exposed to opioids should be observed in the hospital for four to seven days and their symptoms assessed with the aid of an abstinence scoring tool. Regularly and accurately using a screening tool can improve decisionmaking about whether to initiate pharmacological therapy and provide quantitative feedback to guide dosing and weaning.

There are a few different scoring tools used in hospitals today. The most frequently used tool is the Modified Finnegan's Neonatal Abstinence Scoring Tool, which assigns a cumulative score based on interval observations of 21 items relating to NAS symptomatology.^{8,53} The modified Finnegan score is comprehensive, but it may also be too complex for routine use in many nurseries. The Lipsitz Neonatal Drug-Withdrawal Scoring System is an 11-item scale that is simpler to use.⁸ All scoring tools have limitations. Their accuracy is highly dependent on observer skill and training. Regardless of the method chosen, use of an abstinence scoring system results in more objective criteria for determining when pharmacological treatment is necessary. The AAP policy statement recommends adopting a protocol for the evaluation and management of neonatal withdrawal and providing training for staff in correct use and scoring procedures.⁸ The tools are validated for term infants, not preterm infants, who appear to have a different course of NAS.⁸ The screening tools were designed for opioid withdrawal, but infants with polydrug exposure in utero will have varied symptomatology. For example, benzodiazepine

exposure prolongs the course of withdrawal, and selective serotonin reuptake inhibitors increase the risk of seizures.^{6,27,31} Finally, there is no known optimal threshold score for starting pharmacological therapy for any of the published screening tools.⁸

LEGAL CONSIDERATIONS

Diagnosing opioid-exposure and withdrawal accurately in infants has implications for the family beyond the medical arena because of child protection laws that require reporting. The Child Abuse and Prevention Treatment Act requires that states have policies and procedures in place to notify CPS agencies when an infant is affected by illicit substance abuse or withdrawal symptoms resulting from prenatal drug exposure.⁵⁶ CPS agencies are then responsible for assessing the level of risk for the exposed newborn and other children in the family.⁵⁷ A 2002 survey of 166 hospitals nationwide revealed that, of the one-third with substance exposure protocols for newborn care, only about half of the protocols included instructions for reporting to external agencies. Different states have different criteria for reporting. In Florida, a mother's report of having used illicit substances or alcohol during pregnancy is sufficient to file a report with CPS. In Iowa, the presence of an illicit substance in the infant's system must be documented by laboratory testing, independent of parental disclosure. In Colorado, it is necessary to medically document a negative fetal or neonatal outcome related to perinatal illicit drug exposure to file a CPS report.⁵⁵ As noted previously, Colorado also enacted legislation (HB 12-1100) that protects from use in criminal proceedings any information or test results related to substance use that was obtained as part of a woman's prenatal care. In addition, a lack of communication between obstetric providers, pediatricians, and nursing staff add to the complexities around reporting.⁴

VIII. Management of NAS

NON-PHARMACOLOGICAL CARE

Non-pharmacological management should be the standard of care for all opioid-exposed infants to help them sleep, eat, gain weight, and interact with caregivers.⁵⁸ Non-pharmacological interventions include minimizing stimuli such as light and sound, avoiding infant autostimulation by careful swaddling, responding early to an infant's signals, adopting infant positioning and comforting techniques such as swaying, rocking, and pacifier use, and providing frequent small volumes of feeds to allow for adequate growth.^{5,8} If there is no contraindication, such as HIV infection, mothers should be encouraged to breastfeed because it has been associated with ameliorating and delaying withdrawal symptoms, even after adjusting for prematurity and polydrug exposure.^{8,44,59} For mothers on methadone maintenance, the drug's concentrations in breast milk are low and unrelated to the maternal dose.⁶⁰

Infants who are being observed for withdrawal need to be continuously monitored, such as with pulse oximetry or a cardiorespiratory monitor, but if this can be conducted using a mother-baby unit, then there is more opportunity to support mother-infant bonding. Some evidence indicates that the site of care may influence short-term outcomes. For example, infants who room-in with mothers instead of being transferred to a NICU had an increased likelihood of being discharged home with their mother and a decreased need for NAS drug therapy.^{61,62} Parental support and teaching can be crucial for mothers who may be dealing with feelings of guilt and anxiety upon witnessing their infants' symptoms of withdrawal. Substance abuse, mood disorders, and adverse childhood experiences may also affect

mothers' abilities to respond to infant cues. Partners or relatives seeing the newborn with NAS may blame the mother for her drug dependency, which can add to maternal distress or precipitate abusive or violent confrontations.⁵ Positive role modeling by healthcare providers on how to recognize and respond to infants' cues can help set the tone for mother-infant attachment and healthy interactions.

PHARMACOLOGICAL MANAGEMENT

Pharmacological management is indicated to relieve moderate to severe signs of NAS and prevent complications such as fever, weight loss, and seizures if an infant is not responding to non-pharmacological support. Pharmacological therapy, however, should be undertaken with caution because it can lengthen the hospital stay and may interfere with mother-infant bonding.⁸ The first-line therapy for opioid withdrawal is treatment with an opiate.^{50,63} Morphine is an option and used only in the inpatient setting. Methadone is another option and may be weaned after hospital discharge, but outpatient dosing



requires good follow-up and teaching for families.² Methadone has a variable half-life in infants, so the drug can accumulate in the infant and cause lethargy.⁵⁸ In Vermont's Fletcher Allen Health Care hospital, methadone is the standard of care for pharmacological NAS management, and infants have an average stay of 6.3 days compared to the national average of 16 days for treatment with morphine. The safety, feasibility, and efficacy of outpatient methadone treatment continues to be studied to identify pharmacological agents that would safely decrease the length of inpatient hospitalization in community hospitals and other settings. Buprenorphine is another potential new option for infant treatment, but this drug needs further study as a primary choice for NAS.⁵⁸ Clonidine and phenobarbital are drugs that may be used as adjunct therapy to the primary opiate treatment for NAS.⁶³ Adjunct therapy or specially tailored regimens may be particularly important for infants with withdrawal following polydrug exposure.⁵⁸

IX. Gaps in Knowledge: Improving Standards of Care for NAS

There are many unanswered questions regarding best practices on evaluation, treatment, and dosing of pharmacological interventions for NAS. Different or modified screening tools need to be tested for their ability to recognize withdrawal in preterm infants or infants exposed to multiple drugs.⁶⁴ Many researchers point to the need for randomized, controlled trials to examine different protocols for pharmacotherapy.⁶⁴ Length of stay in hospital is an often-cited measure for NAS treatment, but it may not have enough specificity to compare efficacy or quality of care. Other measures may also need to be adopted to gain a richer picture of NAS care, such as the number of opioid-dependent mothers who have an antenatal consult with a pediatrician, the time between initiation of pharmacological therapy and weaning, the number of infants rooming-in with their mothers, the breastfeeding rate upon hospital discharge, the number of infants discharged home with their parents, and the number who follow up for outpatient services.

Many states are taking the initiative to address knowledge gaps regarding NAS. For example, the Tennessee Initiative for Perinatal Quality Care is undertaking an NAS quality improvement project. Fifteen hospitals attended the February 2013 kickoff meeting. More than 40 hospitals have expressed interest in the Neonatal Quality Improvement Collaborative of Massachusetts' NAS project. In Ohio, six children's hospitals are collaborating on research to better diagnose and manage NAS. In Delaware, the Delaware Healthy Mother and Infant Consortium's Standards of Care Subcommittee will be examining the medical management of infants with NAS, while the Delaware Home Visiting Advisory Council is looking at the social support aspect of NAS to improve monitoring and follow-up for affected families. In addition, the Vermont Oxford Network, a voluntary network of more than 950 NICUs worldwide, launched an Internet-based quality improvement collaborative on NAS in January 2013. In support of its mission, the network maintains a database including information about the care and outcomes of high-risk newborn infants. The Vermont Oxford Network's objectives include: (1) developing and implementing a standardized process for the identification, evaluation, treatment, and discharge management of infants with NAS; (2) developing and implementing a standardized process for measuring and reporting rates of NAS and prenatal drug exposure; and (3) creating a culture of compassion, understanding, and healing for the NAS-affected mother and infant.³⁶ Applying quality improvement principles and sharing data in state and professional collaboratives will add to the knowledge base and help move systems toward better standards of care and better measures to evaluate NAS-related outcomes.



Ohio's Nationwide Children's Hospital: Quality Improvement Efforts Geared to Address Staff Concerns

Nationwide Children's Hospital (NCH) in Columbus, Ohio, saw a six-fold increase in the number of infants with NAS from 2004-2008. With an average length of stay of 31 days for infants diagnosed with NAS in 2009, NCH established a quality improvement team to reduce the length of stay to 24 days by the end of 2010. Based on a staff survey, the greatest challenges in caring for infants with NAS included poor or inconsistent communication between providers, subjectivity and lack of competency with the modified Finnegan scoring tool, stressful family dynamics, and discharge planning.

To shorten the stay, NCH developed a pharmacological protocol for initiating and weaning morphine, with phenobarbital or clonidine used as adjunct therapy for specific symptomatology. To enhance consistency and overall proficiency related to screening, training courses were implemented for nursing staff, with intensive training of "super users" to serve as in-house resources. As a result of staff training, inter-rater reliability of scoring using the Finnegan tool improved, and there was better assessment and documentation of withdrawal symptoms in the charts.

NCH formed an NAS taskforce, which holds monthly interdisciplinary collaborative meetings and is working to enhance antenatal communication between providers and continues to evaluate and respond to staff needs for education. Staff resources under development include a bedside resource packet, electronic medical record best practice alerts, and unit-based NAS committees.

Source: McClead R, Prasad M, Magers J, Bagwell GA. "Neonatal Abstinence Syndrome (NAS): Treating pregnant women and their newborns." National Prescription Drug Abuse Summit. Orlando, Florida. April 2-4, 2013. Presented at National Prescription Drug Abuse Summit, Orlando, Florida, April 2-4, 2013. Available at: <http://www.slideshare.net/OPUNITE/nas-treating-pregnantwomenfinal>. Accessed 7-31-2013.

X. Follow-Up and Provision of Ongoing Services for the Mother-Infant Dyad

The postpartum period is a time for planning and careful follow-up with mothers and infants affected by opioid dependency and NAS. Persistent, subacute symptoms of NAS, such as poor feeding, difficulty sleeping, and loose stools, can occur for months.⁵⁸ These symptoms may make the infant more difficult to care for and console. Mothers and caregivers may need additional supports to parent and gain positive reinforcement. Early bonding experiences can enhance attachment and reduce the risk of failure to thrive, child abuse, or neglect.⁴¹

Comprehensive discharge planning and postpartum care must also address the mother's substance abuse management and ongoing needs assessments for the infant and the family as a whole. For mothers on methadone maintenance, there is a risk of oversedation and overdose because the physiological drug requirement decreases after pregnancy.^{9,21} The few months after delivery are also a vulnerable time for relapse.² The interconception period is an important opportunity to try to maintain or engage mothers in substance abuse treatment, because mothers with an infant exposed to drugs are at higher risk for a subsequent drug-exposed pregnancy.^{4,57} A comprehensive approach that provides family-focused services over a continuum of care could link families to needed services such as substance abuse treatment, mental health services, early intervention, parenting support, and social services.⁴ Some models for service provision and case management include the community-based peer recovery worker, home-based services, and family treatment drug courts.²⁰

Because the data are difficult to interpret or otherwise sparse, there are still many unanswered questions about long-term outcomes for infants with NAS. Long-term outcomes result from the interplay of many variables, such as environmental deprivation, inadequate nutrition, family characteristics and functioning, and prenatal and postnatal stress. The multiplicity and co-occurrence of factors makes it difficult to separate out the effect of opioid exposure alone. Few studies have looked at children beyond the first few years of life.⁸ In early childhood, there is some evidence for detectable cognitive and psychomotor deficits among infants who were opiate-exposed.⁶⁵ Other longitudinal studies from the 1970s-1980s, however, suggest that infants under two years of age function within the normal range of development.⁶⁶ The severity of NAS symptoms, including the occurrence of seizures, has not been shown to be associated with differences in long-term outcomes.⁸ It is important to follow infants diagnosed with NAS and their families because they are a group that may experience negative sequelae, including toxic stressors, and may need access to a variety of services to support caregivers in their parenting role. State agencies should strengthen collaborations to track drug-exposed women, their infants, and families so they are not lost at points of transfer between providers or services.



XI. Conclusion

A state-level approach to NAS can address several levels of intervention, including:

- Surveillance for NAS-affected infants and the sources of maternal opiate use.
- Reimbursement for utilizing screening protocols to detect substance abuse early in pregnancy and withdrawal signs in newborns.
- Developing better measures to ensure follow-up of opioid-dependent women and receipt of comprehensive services.
- Collaborative efforts to strengthen clinical standards for identification, management, and follow-up of NAS-affected infants and their families.

Although much is known about how to manage opioid dependency in pregnancy and NAS, many research and operational questions remain regarding how to consistently provide good quality of care in an unbiased and compassionate manner. State health agencies, along with other agencies, professional networks, and community partners, have a unique contribution to make to the knowledge base and support of best practices in caring for women and their children affected by NAS.

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Bibliography

- ¹ Corse SJ, McHugh MK, Gordon SM. "Enhancing provider effectiveness in treating pregnant women with addictions." *J Subst Abuse Treat*. 1995. 12(1):3-12.
- ² Johnston A, Mandell T, Meyer M. "Treatment of opioid dependence during pregnancy: Vermont guidelines." Available at <http://www.uvm.edu/medicine/vchip/documents/ICONFULLTREATMENTGUIDELINESFINAL.pdf>. Accessed 7-31-2013.
- ³ Patrick S, Schumacher R, Benneyworth B, et al. "Neonatal abstinence syndrome and associated health care expenditures: United States, 2000-2009." *JAMA*. 2012. 307(18):1934-40.
- ⁴ Young N, Gardner S, Otero C, et al. "Substance-exposed infants: State responses to the problem." Rockville, MD: Substance Abuse and Mental Health Services Administration. Available at <http://www.ncsacw.samhsa.gov/files/Substance-Exposed-Infants.pdf>. Accessed 7-31-2013.
- ⁵ Velez M, Jansson L. "The opioid dependent mother and newborn dyad: Non-pharmacologic care." *J Addict Med*. 2008. 2(3):113-20.
- ⁶ Hayes M, Brown M. "Epidemic of prescription opiate abuse and neonatal abstinence." *JAMA*. 2012. 307(18):1974-5.
- ⁷ National Institute on Drug Addiction. "Prescription drugs: abuse and addiction." Available at <http://www.drugabuse.gov/publications/research-reports/prescription-drugs>. Accessed 7-31-2013.
- ⁸ Hudak M, Tan R. The Committee on Drugs and the Committee on Fetus and Newborn. "Neonatal drug withdrawal." *Pediatrics*. 2012. 129(2):e540-e60.
- ⁹ American College of Obstetricians and Gynecologists. "Committee opinion number 538: Nonmedical use of prescription drugs." *Obstet Gynecol*. 2012. 120(4):977-82. Available at https://www.acog.org/Resources_And_Publications/Committee_Opinions/Committee_on_Health_Care_for_Underserved_Women/Nonmedical_Use_of_Prescription_Drugs. Accessed 7-31-2013.
- ¹⁰ Substance Abuse and Mental Health Services Administration. "Results from the 2008 National Survey on Drug Use and Health: National Findings." Available at <http://www.samhsa.gov/data/nsduh/2k8nsduh/2k8results.pdf>. Accessed 7-31-2013.
- ¹¹ CDC. "Vital signs: Overdoses of prescription opioid pain relievers--United States, 1999-2008." *Morbidity and Mortality Weekly Report*. 2011. 60(43):1487-92. Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6043a4.htm>. Accessed 7-31-2013.
- ¹² Kellogg A, Rose C, Harms R, Watson W. "Current trends in narcotic use in pregnancy and neonatal outcomes." *Am J Ob Gyn*. 2011. 209:e1-4.
- ¹³ Creanga A, Sabel J, Yo J, et al. "Maternal drug use and its effect on neonates: A population-based study in Washington State." *Obstet Gynecol*. 2012. 119(5):924-33.
- ¹⁴ Vermont Department of Health. "Data Brief: Opioid Dependency and Pregnancy in Vermont--Medicaid Claims Data and the Vermont Uniform Hospital Discharge Data Set." Available at http://healthvermont.gov/research/documents/subab_opi-odpreg_0113_000.pdf. Accessed 7-31-2013.
- ¹⁵ Dreyzehner J (personal communication, 2012).
- ¹⁶ Kentucky Department for Public Health, Division of Maternal & Child Health. "MCH data brief: Neonatal abstinence syndrome." 2013. Available at http://chfs.ky.gov/NR/rdonlyres/A4B5C476-F13C-4897-8E24-DFC1B5F6F34A/0/22513NAS-databrief_revised6.pdf. Accessed 7-31-2013.
- ¹⁷ Hamilton B, Martin J, Ventura S. "Births: Preliminary data for 2011." CDC. *National Vital Stats Reports*. 2012. 61(5). Available at http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_05.pdf. Accessed 7-31-2013.
- ¹⁸ Florida Statewide Task Force on Prescription Drug Abuse & Newborns. "February 2013 Final Report." Available at [http://myfloridalegal.com/webfiles.nsf/WF/RMAS-94LJPF/\\$file/Statewide_Task_Force_on_Prescription_Drug_Abuse_and_Newborns_Final_Report.pdf](http://myfloridalegal.com/webfiles.nsf/WF/RMAS-94LJPF/$file/Statewide_Task_Force_on_Prescription_Drug_Abuse_and_Newborns_Final_Report.pdf). Accessed 7-31-2013.
- ¹⁹ Chou R, Fanciullo G, Fine P, et al. "Clinical guidelines for the use of chronic opioid therapy in chronic noncancer pain." *J of Pain*. 2009. 10(2):113-30. Available at [http://www.jpain.org/article/S1526-5900\(08\)00831-6/abstract](http://www.jpain.org/article/S1526-5900(08)00831-6/abstract). Accessed 7-31-2013.
- ²⁰ O'Brien M, Phillips S. "Substance exposed newborns: Addressing social costs across the lifespan." Issue Brief (Mass Health Policy Forum). 2011. 27(40):1-49.
- ²¹ ACOG Committee on Health Care for Underserved Women and American Society of Addiction Medicine. "Committee opinion number 524: Opioid abuse, dependence, and addiction in pregnancy." *Obstet Gynecol*. 2012. 119(5):1070-6.
- ²² Guttmacher Institute. "State policies in brief: Substance abuse during pregnancy." Available at http://www.guttmacher.org/statecenter/spibs/spib_SADP.pdf. Accessed 7-31-2013.

- ²³ Brady T, Ashley O, eds. "Women in substance abuse treatment: Results from the Alcohol and Drug Services Study (ADSS)." Rockville, MD: SAMHSA, Office of Applied Studies. 2005. Available at <http://www.samhsa.gov/data/womentx/womentx.pdf>. Accessed 7-31-2013.
- ²⁴ Jain R, Thomasma D, Ragas R. "Ethical challenges in the treatment of infants of drug-abusing mothers." *Cambridge Quarterly of Healthcare Ethics*. 1999. 8:179-88.
- ²⁵ Jones H, Martin P, Heil S, et al. "Treatment of opioid-dependent pregnant women: Clinical and research issues." *J Subst Abuse Treat*. 2008. 35(3):245-59.
- ²⁶ SAMHSA. "Quick guide for clinicians based on TIP 2: Pregnant, substance-using women." (DHHS Publication No. SMA 01-3551). Rockville, MD: U.S. Department of Health and Human Services. 2007.
- ²⁷ Winklbaur B, Kopf N, Ebner N, et al. "Treating pregnant women dependent on opioids is not the same as treating pregnancy and opioid dependence: A knowledge synthesis for better treatment for women and neonates." *Addiction*. 2008. 103:1429-40.
- ²⁸ Dysart K, Hsieh H, Kaltenbach K, Greenspan J. "Sequela of preterm versus term infants born to mothers on a methadone maintenance program: Differential course of neonatal abstinence syndrome." *J Perinat Med*. 2007. 35:344-6.
- ²⁹ McCarthy J, Leamon M, Parr M, Anania B. "High-dose methadone maintenance in pregnancy: Maternal and neonatal outcomes." *Am J Ob Gyn*. 2005. 193:606-10.
- ³⁰ Jansson L, Velez M. "Neonatal abstinence syndrome." *Curr Opin Pediatr*. 2012. 24(2):252-8.
- ³¹ Seligman N, Salva N, Hayes E, et al. "Predicting length of treatment for neonatal abstinence syndrome in methadone-exposed neonates." *Am J Ob Gyn*. 2008. 199:396.e1-e7.
- ³² Berghella V, Lim P, Hill M, et al. "Maternal methadone dose and neonatal withdrawal." *Am J Ob Gyn*. 2003. 189(2):312-7.
- ³³ Cleary B, Donnelly J, Strawbridge J, et al. "Methadone and perinatal outcomes: A retrospective cohort study." *Am J Ob Gyn*. 2011. 204:139.e1-e9.
- ³⁴ Lim S, Prasad M, Samuels P, et al. "High-dose methadone in pregnant women and its effect on duration of neonatal abstinence syndrome." *Am J Ob Gyn*. 2009. 200:70.e1-e5.
- ³⁵ Cleary B, Donnelly J, Strawbridge J, et al. "Methadone dose and neonatal abstinence syndrome—a systematic review and meta-analysis." *Addiction*. 2010. 105:2071-84.
- ³⁶ Patrick S. NAS Workshop. TIPQC annual meeting. Available at <http://tipqc.org/wp-content/uploads/TIPQC-2-27-2013-Neonatal-Abstinence.mp3>. Accessed 2-6-2014.
- ³⁷ Taillac C, Goler N, Armstrong MA, et al. "Early Start: An integrated model of substance abuse intervention for pregnant women." *The Permanente Journal*. 2007. 11(3):5-11. Available at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3057720/>. Accessed 7-31-2013.
- ³⁸ Mattick R, Kimber J, Breen C, Davoli M. "Buprenorphine maintenance versus placebo or methadone maintenance for opioid dependence." *Cochrane Database of Syst Rev*. 2008(2).
- ³⁹ Jones H, Kaltenbach K, Heil S, et al. "Neonatal abstinence syndrome after methadone or buprenorphine exposure." *N Engl J Med*. 2010. 363(24):2320-31. Available at <http://www.nejm.org/doi/full/10.1056/NEJMoa1005359>. Accessed 7-31-2013.
- ⁴⁰ CDC. "Grand rounds: Prescription drug overdoses—a U.S. epidemic." *Morbidity and Mortality Weekly Report*. 2012. 61(1):10-3. Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6101a3.htm>. Accessed 7-31-2013.
- ⁴¹ Jones H, Finnegan L, Kaltenbach K. "Methadone and buprenorphine for the management of opioid dependence in pregnancy." *Drugs*. 2012. 72(6):747-57.
- ⁴² Minozzi S, Amato L, Vecchi S, Davoli M. "Maintenance agonist treatments for opiate dependent pregnant women." *Cochrane Database of Syst Rev*. 2008. (2):CD006318.
- ⁴³ Gaalema D, Scott T, Heil S, et al. "Differences in the profile of neonatal abstinence syndrome signs in methadone- versus buprenorphine-exposed neonates." *Addiction*. 2012. 107:53-62.
- ⁴⁴ Pritham U, Paul J, Hayes M. "Opioid dependency in pregnancy and length of stay for neonatal abstinence syndrome." *J Obstet Gynecol and Neonatal Nursing*. 2012. 41:180-90.
- ⁴⁵ Fitzsimmons H, Tuten M, Vaidya V, Jones H. "Mood disorders affect drug treatment success of drug-dependent pregnant women." *J Subst Abuse Treat*. 2007. 32:19-25.
- ⁴⁶ Jansson L, Velez M. "Infants of drug-dependent mothers." *Pediatrics in Rev*. 2011. 32:5-12. Available at <http://pedsinreview.aappublications.org/content/32/1/5.extract>. Accessed 7-31-2013.
- ⁴⁷ Kaltenbach K, Holbrook A, Coyle M, et al. "Predicting treatment for neonatal abstinence syndrome in infants born to women maintained on opioid agonist medication." *Addiction*. 2012. 107 Suppl 1:45-52.
- ⁴⁸ Jansson L, Velez M. "Neonatal abstinence syndrome." *Curr Opin Pediatr*. 2012. 24(2):252-8.

- ⁴⁹ Lainwala S, Brown E, Weinschenk N, *et al.* "A retrospective study of length of hospital stay in infants treated for neonatal abstinence syndrome with methadone versus oral morphine preparations." *Adv Neonatal Care*. 2005. 5(5):265-72.
- ⁵⁰ Osborn D, Jeffery H, Cole M. "Opiate treatment for opiate withdrawal in newborn infants." *Cochrane Database of Syst Rev*. 2010. (10):CD002059.
- ⁵¹ Office of Healthcare Informatics Bureau of TennCare. "Neonatal abstinence syndrome among TennCare enrollees." 2012.
- ⁵² Broussard C, Rasmussen S, Reefhuis J, *et al.* "Maternal treatment with opioid analgesics and risk for birth defects." *Am J Ob Gyn*. 2011. 204:314-7.
- ⁵³ Sarkar S, Donn S. "Management of neonatal abstinence syndrome in neonatal intensive care units: A national survey." *J Perinatology*. 2006. 23:15-7.
- ⁵⁴ Crocetti M, Amin D, Jansson L. "Variability in the evaluation and management of opiate-exposed newborns in Maryland." *Clinical Pediatrics*. 2007. 46(7):632-5.
- ⁵⁵ Oral R, Strang T. "Neonatal illicit drug screening practices in Iowa: The impact of utilization of a structured screening protocol." *J Perinatology*. 2006. 26:660-6.
- ⁵⁶ Child Welfare Information Gateway. "Parental drug use as child abuse." 2012. Available at https://www.childwelfare.gov/systemwide/laws_policies/statutes/drugexposed.cfm. Accessed 7-31-2013.
- ⁵⁷ Ryan J, Choi S, Hong J, *et al.* "Recovery coaches and substance exposed births: An experiment in child welfare." *Child Abuse & Neglect*. 2008. 32:1072-9.
- ⁵⁸ Jansson L, Velez M, Harrow C. "The opioid exposed newborn: Assessment and pharmacological management." *J Opioid Manag*. 2009. 5(1):47-55.
- ⁵⁹ Abdel-Latif M, Pinner J, Clews S, *et al.* "Effects of breast milk on the severity and outcome of neonatal abstinence syndrome among infants of drug-dependent mothers." *Pediatrics*. 2006. 117(6):e1163-e9. Available at <http://pediatrics.aappublications.org/content/117/6/e1163.short>. Accessed 7-31-2013.
- ⁶⁰ Jansson L, Choo R, Velez M, *et al.* "Methadone maintenance and breastfeeding in the neonatal period." *Pediatrics*. 2008. 121(1):106-14. Available at <http://pediatrics.aappublications.org/content/121/1/106.abstract>. Accessed 7-31-2013.
- ⁶¹ Abrahams R, Kelly S, Payne S, *et al.* "Rooming-in compared with standard care for newborns of mothers using methadone or heroin." *Can Fam Physician*. 2007. 53:1722-30.
- ⁶² Abrahams R, MacKay-Dunn M, Nevmerjitskaia V, *et al.* "An evaluation of rooming-in among substance-exposed newborns in British Columbia." *J Obstet Gynaecol Can*. 2010. 32(9):866-71.
- ⁶³ Osborn D, Jeffery H, Cole M. "Sedatives for opiate withdrawal in newborn infants." *Cochrane Database of Syst Rev*. 2010. (10):CD002053.
- ⁶⁴ Jones H, Kaltenbach K. "Neonatal abstinence syndrome." *JAMA*. 2012. 308(8):762-4. Available at <http://jama.jamanetwork.com/article.aspx?articleid=1352105>. Accessed 7-31-2013.
- ⁶⁵ Hunt R, Tzioumi D, Collins E, Jeffery H. "Adverse neurodevelopmental outcome of infants exposed to opiate in-utero." *Early Hum Dev*. 2008. 84:29-35.
- ⁶⁶ Kaltenbach K. "Exposure to opiates: Behavioral outcomes in preschool and school-age children." *NIDA Res Monogr*. 1996. 164:230-41.

Appendix: State Index of Resources

FLORIDA

Statewide Task Force on Prescription Drug Abuse & Newborns. “February 2013 Final Report.” Available at: [http://myfloridalegal.com/webfiles.nsf/WF/RMAS-94LJPF/\\$file/Statewide_Task_Force_on_Prescription_Drug_Abuse_and_Newborns_Final_Report.pdf](http://myfloridalegal.com/webfiles.nsf/WF/RMAS-94LJPF/$file/Statewide_Task_Force_on_Prescription_Drug_Abuse_and_Newborns_Final_Report.pdf). Accessed 7-31-2013.

OHIO

“Neonatal abstinence syndrome (NAS): Treating pregnant women and their newborns.” Presented at National Prescription Drug Abuse Summit, Orlando, Florida, April 2-4, 2013. Available at: <http://www.slideshare.net/OPUNITE/nas-treating-pregnantwomenfinal>. Accessed 7-31-2013. This presentation contains the quality improvement efforts undertaken by Nationwide Children’s Hospital to improve care of infants exposed to opioids and diagnosed with NAS.

Contacts: **Richard McClead**, Medical Director of Quality Improvement, Nationwide Children’s Hospital.

Michele Walsh, Chief, Division of Neonatology, Rainbow Babies and Children’s Hospital.

TENNESSEE

Tennessee Department of Health. “Neonatal Abstinence Syndrome (NAS).” Available at: <http://health.state.tn.us/MCH/NAS/>. Accessed 7-31-2013. Website includes weekly surveillance reports on NAS, background materials, and the portal for reporting NAS cases.

Contact: **John Dreyzehner**, Commissioner, Tennessee Department of Health.

VERMONT

Vermont Child Health Improvement Program. “Improving Care for Opioid-exposed Newborns (ICON).” Available at: <http://www.uvm.edu/medicine/vchip/?Page=ICON.html>. Accessed 7-31-2013. Website contains links to Vermont clinical guidelines for the treatment of opioid dependence in pregnancy, “The Care Notebook” for mothers, and educational brochures.

Contacts: **Jerilyn Metayer**, Neonatal Medical & Development Follow-up Nurse Clinician, ICON.

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Barbara Cimaglio, Deputy Commissioner of Alcohol & Drug Abuse Programs, Vermont Department of Health.

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