



Department of
**Mental Health &
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**Substance Use Best Practice Tool
Guide**
FETUSES AND NEONATES

Division of Clinical Leadership in Collaboration with the
Division of Substance Abuse Services

Fetuses and Neonates

Being pregnant is a very big deal not only for the mom but also for the developing fetus and neonate. Substance use is harmful to fetal development and can have lasting effects on the unborn child. The neonate can have a host of developmental problems as a result of the mother's substance use during pregnancy (WebMD, n.d.).

Harmful substance use is not restricted to use of illegal drugs during pregnancy. Legal medications can also have a direct impact on the fetus. Tobacco, alcohol, and even caffeine can have a negative impact on the fetus. Commonly used over-the-counter medicines can have a harmful effect of the unborn child. Detrimental effects can show up as birth defects, prematurity, low birth weight, and stillborn births (WebMD, n.d.). The table below shows the risks of stillborn births associated with substance use during pregnancy.

Table 1. Risks of Stillbirth from Substance Use during Pregnancy

- Evidence of any marijuana, prescription pain reliever, or stimulant use—**2.02** times greater risk of stillbirth

- Marijuana use—**2.3** times greater risk of stillbirth

- Passive exposure to tobacco—**2.1** times greater risk of stillbirth

- Tobacco use—**1.8 to 2.8** times greater risk of stillbirth, with the highest risk found among the heaviest smokers

Source: NIH, 2013.

Sometimes deficits caused by substance use are not manifested until later in the neonate's life, showing up in areas such as cognitive performance, information-processing, and attention to tasks. These are areas that are vital for success in school and in life (WebMD, n.d.).

This module focuses on two of the most preventable effects on fetuses/neonates caused by maternal substance use, fetal alcohol syndrome disorder (FASD) and neonatal abstinence syndrome (NAS). These effects are described, substance culprits are identified, research findings are presented, and prevention/intervention strategies are provided.

References

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Fetal Alcohol Spectrum Disorder

***NOTE:** The Substance Abuse and Mental Health Services Administration (SAMHSA) Fetal Alcohol Spectrum Disorders (FASD) Center for Excellence announced that it will cease operations on April 21, 2016, due to funding cuts. Resources are supposed to be available but there are no guarantees. As a result, some links may not be accessible.

Fetal alcohol spectrum disorder (FASD) is an inclusive term that encompasses several more specific diagnoses, including FAS (Nuñez, Roussotte, & Sowell, 2011). The concept of FAS was introduced in 1973 (Golden & Finkel, 2005). FASD also includes partial FAS (pFAS), Static Encephalopathy/Alcohol-Exposed (SE/AE), Alcohol-Related Neurodevelopmental Disorders (ARND), and Neurobehavioral Disorder/Alcohol Exposed (ND/AE) (SAMHSA, 2014). ARND and pFAS are the most common diagnoses (Chasnoff, Wells, & King, 2015). FAS represents the severe end of the FASD spectrum (CDC, 2014). Partial FAS (pFAS) contains most of the growth deficiency and/or facial features associated with FAS. In addition, CNS abnormalities are severe and prenatal alcohol exposure is confirmed. SE/AE includes all features of pFAS except the growth deficiencies. Facial dysmorphism is also possible (University of Washington, n.d.).

It (FASD) is a consequence of what can happen when a woman drinks during pregnancy (NIAAA, 2013).

Individuals with ARND may have problems with behavior and learning, along with intellectual disabilities. They would not be expected to do well in school and likely manifest difficulties with memory, attention, judgment, math, and impulse control.

However, the use of the term ARND is being phased out (CDC, 2014). Persons with ND/AE have confirmed prenatal alcohol exposure but only moderate CNS dysfunction. Further, there is no evidence of growth deficiency (University of Washington, n.d.). In short, FASD incorporates alcohol-related birth defects (O’Leary et al., 2010).

It is a consequence of what can happen when a woman drinks during pregnancy. Alcohol can disrupt fetal development at any stage of pregnancy, even at the earliest stages prior to the woman knowing that she is pregnant (NIAAA, 2013). Many children exposed to alcohol during pregnancy do not meet the full criteria for a diagnosis of fetal alcohol syndrome (FAS) because they do not have the facial dysmorphology required for such a diagnosis (NIH/NIAAA, 2000; Nuñez, Roussotte, & Sowell, 2011). The United States Surgeon General estimated, however, that three more children are born without the actual physical dysmorphology for every one child born with the dysmorphia (Nuñez et al., 2011). Hence, FASD includes individuals with and without the physical signs (Golden & Finkel, 2005; Warren, Hewitt, & Thomas, 2011).

According to the FASD Center of Excellence, FASD affects an estimated 40,000 newborns in the United States every year (SAMHSA, 2009). Prevalence of FAS has been estimated between one to three per 1,000 live births in the general population, with estimates of 10-15 per 1,000 live births in some higher risk populations, such as children in foster care (SAMHSA, 2014). For the full spectrum (i.e., FASD), general population estimates are around nine per 1,000 live births. Much higher estimates (as many as 50 per 1,000 live births) have been indicated when considering reviews of in-school screening and diagnosis studies.

According to the FASD Center of Excellence, FASD affects an estimated 40,000 newborns in the United States each year (SAMHSA, 2009).

Retrospective analyses based on hospital admissions data suggest substantial underreporting of alcohol abuse and misuse by women, thus further disguising true prevalence (SAMHSA, 2014).

Unfortunately we do not know exactly the number of people that have fetal alcohol spectrum disorders (FASDs). Estimates from several different approaches give us our best count. Medical and other records, in-person assessments involving school-aged children, and community studies using physical examinations are among the methods used to estimate the number of people in the population living with FASDs (CDC/NCBDDD, 2015). FAS prevalence is based on birth-certificate data, the usual source of vital statistics, but supporting data may not have been recorded. Physical features are often subtle and extremely difficult to recognize in the newborn, thereby resulting in underestimations. It should also be noted that very few general pediatricians have the clinical expertise to diagnose affected children and/or to make appropriate referrals. There is further the tendency of mothers to underreport their alcohol use and/or for clinicians to resist posing questions about alcohol consumption during pregnancy (Jones & Streissguth, 2010). In many cases, primary care and other clinicians who care for children fail to consistently or routinely identify individuals with fetal alcohol syndrome (FAS), additionally hindering efforts to account for these children in developmental disabilities and birth defects monitoring programs (CDC/NCBDDD, 2004).

Babies that have been exposed to alcohol and diagnosed with fetal alcohol spectrum disorder (FASD) typically develop central nervous system (CNS) abnormalities, facial irregularities, and growth retardation (Centers for Disease Control and Prevention [CDC], 2005; Ismail, Buckley,

Budacki, Jabbar, & Gallicano, 2010). Of these, the CNS is the most critical system affected adversely by alcohol exposure during pregnancy (Warren et al., 2011). FASD is a leading cause of developmental disabilities and birth defects (Cannon, Dominique, O'Leary, Sniezek, Floyd, & FASSNet Team, 2012; Fabbri, Farrell, Penberthy, Ceperich, & Ingersoll, 2009; Warren et al., 2011). Further, newborns with exposure to heavy alcohol use in utero were more than three times as likely to be exposed to amphetamines (includes methamphetamine) and nearly twice as likely to be exposed to narcotic opiates (Shor, Nulman, Kulaga, & Koren, 2010).

Most commonly, FASD features include varying aspects of brain dysfunction. Some children have intelligence quotients (IQs) in the intellectually disabled range but many IQs fall within normal limits. Regardless, these children appear to exhibit difficult and persistent behavioral problems. It has also been shown that typical interventions may not work in curbing behavioral issues in these children. For example, sometimes children with FASD who present with symptoms of attention deficit hyperactivity disorder (ADHD) do not respond well to the typical stimulant medications. Children with FASD are likely to present with problems in processing and cognitive areas as well (Clarren & Salmon, 2010). Moreover, behavioral problems and cognitive deficits associated with FASD tend to manifest as lifelong issues (CDC, 2005). Additionally the diagnosis is a critical risk marker for premature death in the mothers of children that have been diagnosed (Li, Fisher, Peng, Williams, & Burd, 2012). Children with FASD may exhibit the following signs and symptoms:

- Weigh in as small at birth;
- Exhibit problems sleeping and eating;
- Demonstrate problems in hearing and seeing;
- Display difficulty following directions and learning how to do simple tasks;
- Exhibit difficulty paying attention and learning in school;
- Require special teachers and/or schools;
- Show a great deal of difficulty getting along with people and controlling their behavior; and/or
- Require medical care all their lives (NIH/NIAAA/NOFAS, 2006).

Based on a study of mother characteristics and behaviors, mothers of children with FASD were significantly likely to have a lower educational level; have more live born children; be older, unmarried, unemployed, and of Native American, Alaska Native or African American descent (excluding Hispanic origin). (It should be noted that the limited number and location of states involved in this study may have affected ethnicity findings.) When compared to all mothers in the United States, these moms were also significantly likely to be receiving public assistance; on Medicaid at the time of the child's birth; have a confirmed alcohol use disorder (AUD); have participated in binge drinking during pregnancy; have used cocaine or marijuana during pregnancy; have a history of mental issues; have consumed alcohol heavily (i.e., at least seven days a week) during pregnancy; had an induced abortion; and the baby tested positive for substances at birth.

These women were also significantly likely to have received treatment for their alcohol use (Cannon et al., 2012).

FASD represents a major public health issue. Cost associated with raising a child with FASD varies, depending on the source and factors included in the analysis. Moreover, cost estimates are typically only available in relation to FAS. The lifetime cost for a person with FAS has been estimated to be around two million dollars, with the majority of the costs attributed to medical, special education, and mental health treatment services (Paley & O'Connor, 2011). Overall annual cost to the U.S. healthcare system has been estimated at five billion dollars, using two cases per 1,000 live births (SAMHSA, 2014).

However, FASD is a preventable condition. (See BSAS, 2011; Fabbri, et al., 2009; Floyd, Weber, Denny, & O'Connor, 2009; Ismail, Buckley, Budacki, Jabbar, & Gallicano, 2010; Li et al., 2012; Osterman, 2011; and Warren et al., 2011, e.g.) Science has not determined a safe level of alcohol consumption during pregnancy, so the message to women of childbearing potential, which includes

Science has not determined a safe level of alcohol consumption during pregnancy (SAMHSA, 2014).

pregnant women, should be to refrain from alcohol use. FASD cannot be cured; it can only be treated (SAMHSA, 2014).

One of the national health objectives focuses on reducing drinking by women of childbearing potential. Any reduction in this number will, in turn, result in a reduction in prenatal exposure to alcohol. (A discussion of standard drink sizes can be found in the module on Medication-Assisted Treatment in this document. Women of childbearing potential who drink at risky levels place themselves at high risk of having an unplanned pregnancy. In fact, research suggests that half of all pregnancies are unplanned. Moreover, greater than half of these unplanned pregnancies happen to seven percent of the women who do not use any method of contraception, despite not wanting to become pregnant. The remaining unplanned pregnancies occur to women who use contraception intermittently or ineffectively (Fabbri, 2009). Even more devastating is the reality that many women do not recognize they are pregnant until four- to six weeks gestation (Floyd et al., 2009)

Screening

Screening identifies the likelihood that individuals are to have a disorder, as determined by their responses to certain key questions. If they obtain a positive screen, people may be advised to undergo more detailed diagnostic testing to definitively rule out or confirm a disorder. Hence, screening results may lead clinicians to initiate further assessment, provide brief interventions, and/or arrange clinical follow-up (NIH/NIAAA, 2005).

Objective screening tools are preferred to subjective measures. It is further preferable that the screening instruments be validated for the target population, setting, and disorder of interest. The validated screening instruments should additionally have high sensitivity and specificity (SAMHSA, 2014). Sensitivity is the ability of the instrument to correctly identify individuals who actually have the disorder. In contrast, specificity is the ability of the instrument to correctly identify individuals that do not have the disorder (NIH/NIAAA, 2005).

Universal screening for alcohol use has been endorsed by the American Medical Association. However, the literature indicates that women are less likely than men to be screened or referred (ACOG, 2008). Nevertheless, Cannon et al. (2012) highly recommend using screening tools for identifying behaviors of dependent or risky drinking, drug use, or smoking in order to detect women at high risk of having a child with FAS. Agencies and venues that offer public assistance, substance abuse treatment, or services where women can be assisted in family planning may provide appropriate opportunities for risk-identification and intervention.

The Centers for Disease Control and Prevention (CDC), the National Task Force on Fetal Alcohol Syndrome and Fetal Alcohol Effect (NTFFAS/FAE), and a scientific working group (SWG) coordinated their efforts and developed the following diagnostic criteria for FAS (CDC/NCBDDD, 2004):

Facial Dysmorphism (All three facial features must be present.)

- 1. Thin vermilion border
- 2. Small palpebral fissures
- 3. Smooth philtrum (CDC/ NCBDDD, 2004)

Problems Related to Growth

- Confirmed pre- or postnatal weight or height or both, at or below the 10th percentile. Documentation can occur at any single point in time and should be adjusted for sex, age, race/ethnicity, and gestational age (CDC/ NCBDDD, 2004).

Abnormalities of the Central Nervous System

- Structural
 - Head circumference (OFC) at or below the 10th percentile when adjusted for sex and age
 - Imaging shows clinically significant brain abnormalities
- Neurological
 - Cannot be due to postnatal insult or fever, or other soft neurological signs outside normal limits
- Functional
 - Documentation of performance markedly below that expected for the person's schooling, age, or circumstances
 - Multiple domains of deficit exhibited in intellectual or global cognitive areas such that performance is below the 3rd percentile (i.e., at least 2 standard deviations below the mean on the standardized instrument); **OR**

- Documentation of deficits in three or more of the following (i.e., at least 1 standard deviation below the mean of a standardized instrument):
 - Executive functioning deficits
 - Cognitive/developmental deficits or discrepancies
 - Social skill deficits
 - Motor functioning delays
 - Problems in hyperactivity or attention
 - Other areas of deficit such as sensory, pragmatic language, memory, etc. (CDC/ NCBDDD, 2004)

Mother's Exposure to Alcohol

- Prenatal alcohol exposure confirmed
- Prenatal alcohol exposure unknown (CDC/NCBDDD, 2004)

Evidence exists that even persons who do not meet criteria for an alcohol use disorder (AUD) can be helped through screening and brief intervention (NIH/NIAAA, 2005). In fact, the use of brief interventions by physicians in clinical office settings have been shown to be both feasible and powerful (ACOG, 2008). The Institute for Health and Recovery's (IHR's) Integrated 5 P's Screening Tool has been used in alcohol screening of pregnant women and is in the public domain. Based on Dr. Hope Ewing's 4P's (Parents, Partner, Past, and Pregnancy), the tool is designed to ask about alcohol and other substance use by individuals who are most likely to be important in a pregnant woman's life: partner, parents, past, present, and peers). It further asks an additional question about tobacco use because of the link between tobacco use and alcohol use for pregnant women. Positive response to any of the 5 P's or the tobacco use questions means that the pregnant woman would receive a brief intervention (Watson, 2010). A copy of the tool can found in the module on Women in General/Of Childbearing Potential/Pregnant as well as the Screening Tools module in this document.

The IHT 5 P's Screening Tool has been used in conjunction with the Alcohol Screening Assessment in Pregnancy (ASAP) Project for many years. There is an ASAP Curriculum which is available for purchase at <http://www.healthrecovery.org/publications/detail.php?p=21> for a nominal fee plus shipping costs.

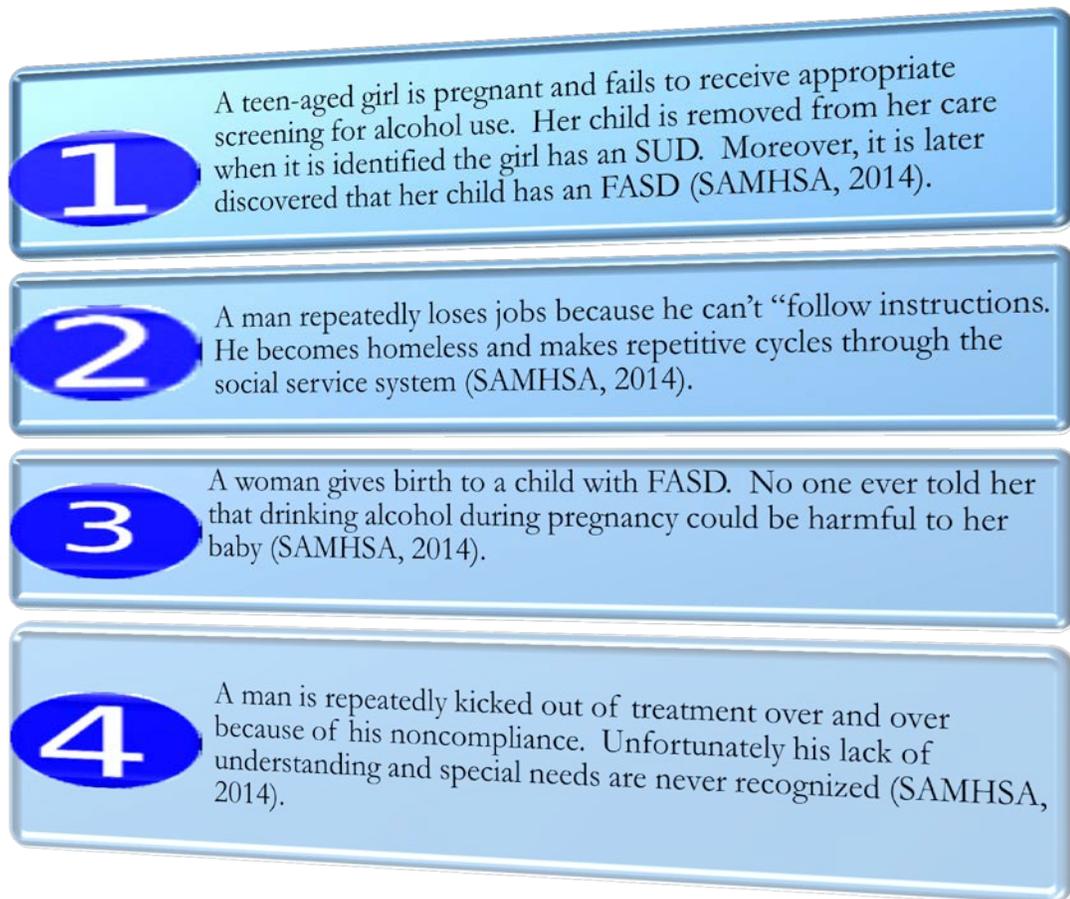
SAMHSA recently published a document addressing FASD that contains a Screening Decision Tree for Alcohol-Exposed Pregnancy (AEP) Prevention. This "tree" includes a procedure for an opening question about alcohol use and then moves onto screening if found necessary. Suggested screening instruments are provided, as well as next steps. The tool gives clinicians a quick resource to, as accurately as possible, determine if an individual is at risk of alcohol use/abuse and whether brief intervention and referral or treatment are warranted. Detailed scripts for working with diverse individuals are provided so that clinicians can comfortably handle a variety of situations. Tips are provided for working with women who themselves exhibit characteristics or symptoms that suggest they themselves have an FASD (SAMHSA, 2014).

Ideally, it is recommended that all patients/clients be screened. This recommendation especially includes women of childbearing potential, whether pregnant or not, and women who present for medical care services. In particular screening should be provided to women during prenatal visits

and when their medical-care-service visit is due to injury (Kvigne et al., 2008). The two possible exceptions to screening include:

- Children below the age of nine years, as it is unlikely that they drink alcohol.
- Patients/clients who may be too ill to answer screening questions during their visit (CDC/NCBDDD, 2014).

All-Too-Common Scenarios Involving FASD Issues



The above stories are not unusual. In fact, they are really very common. Moreover, the stories do not represent worse case scenarios. The stories do, however, reflect the realities of individuals with an FASD or women who wanted a healthy baby but did not receive the basic help they needed before and/or during their pregnancy (SAMHSA, 2014).

Signs and Symptoms

Many different sources may provide initial recognition of a potential problem in a child or older person. Parents generally start the comparison across their children, noticing differences between

the child with FASD and his or her siblings. School systems, including Head Start and other child care centers, typically provide recognition that someone is having difficulty as well. Professionals in social services agencies such as social workers frequently recognize children and other individuals having trouble and needing an evaluation. Health care providers, especially pediatricians, often tend to be the first to screen for and detect problems. Obstetricians might even refer a newborn because of their awareness of maternal alcohol use. Fortunately, the problem recognition that shows up with FAS is exactly what “well child” visits to physician’s offices are supposed to identify. This recognition should lead the provider to initiate the appropriate next step for the individual and his or her family (CDC/NCBDDD, 2004).

A challenging but promising method of early diagnosis of FASD is analyzing levels of fatty acid ethyl esters (FAEE) in the meconium. However, this method will not help with identification of babies exposed to alcohol in the earlier part of pregnancy. Meconium is produced only in the later part of pregnancy. At this time, screening via questionnaires administered to the mother appears to be the most effective way to detect alcohol use during pregnancy. Acute alcohol ingestion can be determined through urine, blood or breath markers but require routine testing of the mother. Markers of nonacute alcohol abuse are determined through objective analysis indicating damage or changes caused by alcohol or its metabolites. Research is ongoing to identify fetal biological markers to distinctively diagnose FASD (Ismail et al., 2010) given that markers of alcohol exposure are lacking (O’Leary et al., 2010).

Newborns of women who drank heavily during pregnancy may develop a distinct pattern of congenital malformations known as fetal alcohol syndrome (FAS) (Diav-Citrin, 2011).

Diagnostically FAS requires the presence (documentation) of all three of the following: CNS abnormalities; growth deficits; and three facial abnormalities.

Newborns of women who drank heavily during pregnancy may develop a distinct pattern of congenital malformations known as fetal alcohol syndrome (FAS) (Diav-Citrin, 2011).

Exposure to alcohol before birth can result in an array of structural issues, including small or diminished overall head circumference (i.e., the orbitofrontal cortex [OFC] falls at or below the 10th percentile) where abnormalities to the CNS are observable through imaging techniques. Structural neurological or a combination of functional deficits (abnormalities) must be documented to meet FAS diagnostic criteria. Retardation in height and/or weight are the typical criteria used to document FAS. In a majority of FAS studies, severe growth retardation is defined as at or below the 3rd percentile. Generally, criteria define growth retardation as at or below the 10th percentile. Finally, there should be three facial abnormalities (dysmorphia). Included are 1) small palpebral fissures (eye opening); 2) smooth philtrum (groove in midline of upper lip); and 3) thin vermilion border (upper lip). Other features that may be present consist of microcephaly (small head); narrow bifrontal diameter, and an elongated, hypoplastic and flattened midface (Balatbat, 2005; Diav-Citrin, 2011). It is also important to note that confirming prenatal alcohol use only strengthens the evidence for diagnosis but will not rule out the diagnosis (Balatbat, 2005).

Compared to children with Attention Deficit/Hyperactivity Disorder (ADHD), children with FASD may have problems with overstimulation (Kooistra, Crawford, Gibbard, Ramage, & Kaplan, 2010). Yet many youngsters with FASD are frequently misdiagnosed, often described as meeting criteria for Attention Deficit Disorder (ADD), ADHD, Oppositional Defiant Disorder (ODD), and

adolescent depression, e.g. (SAMHSA, 2014). These young people might also be diagnosed with reactive attachment disorder (RAD), conduct disorder (DC), and posttraumatic stress disorder (PTSD) (Chasnoff et al., 2015).

School performance, especially mathematics, may be impacted by prenatal alcohol exposure. Alcohol exposure has also been shown to be highly associated with insecure attachments between newborns and their mothers. When mothers of newborns exposed to alcohol prenatally are emotionally supportive, the children tend to cope better with frustration and have higher levels of attachment security than children both to unsupportive mothers, regardless of any alcohol exposure (NAIARC, 2012).

A recent study examined the rate of misdiagnoses and missed diagnoses in adopted and foster children who had been referred to a mental health center for services. The literature indicates higher prevalence rates in higher risk populations such as foster children (SAMHSA, 2014). An 18 percent sample was selected at random from 3,000 charts. Using the four-digit FASD code developed by the University of Washington, researchers observed that almost 30 percent met the FASD diagnosis. However, only about 20 percent of the children that met the FASD criteria had ever been diagnosed as being affected by prenatal alcohol exposure (PAE). This means that 80 percent had a missed diagnosis. Instead of an FASD diagnosis, these children were more commonly diagnosed as ADHD (Chasnoff et al., 2015).

Individuals with FASD will likely exhibit problems in the following functional domains:

- Abstract thinking/judgment
- Behavioral regulation/Sensory motor integration
- Memory/Learning/Information processing
- Motor/Oral motor control
- Planning/Temporal skills
- Social skills and adaptive behavior
- Spatial skills and spatial memory (SAMHSA, 2014)

A large percentage of persons diagnosed as FASD also tend to experience five adverse life outcomes, including:

1. Disrupted school experiences;
2. Trouble with the law;
3. Confinement in a jail, prison, or psychiatric inpatient setting;
4. Repeated inappropriate sexual behaviors; and

5. Alcohol and substance use/abuse issues (Ismail et al., 2010).

The number of individuals in the criminal justice system with an FASD has not specifically been determined (SAMHSA, 2014), but some researchers estimate the proportion is between 15-20 percent of offenders (juvenile and adult) (Woods, Greenspan, & Agharkar, 2011). Those values, though, are believed to be gross underestimates (Woods et al., 2011). A University of Washington study of 415 clinical patients with FASD observed 14 percent of children and 60 percent of adolescents and adults reported trouble with the law, including arrests and convictions. Other studies have supported the notion of disproportionate representation of persons with an FASD in the criminal justice system, including the juvenile system (SAMHSA, 2014).

Since publication of the seminal report on FAS by the Institute of Medicine (IOM) in 1996, clear consensus has been reached on two fundamental issues: 1) It is best to have an FASD diagnostic evaluation conducted by a team of professionals from multiple disciplines (medicine, psychology, occupational therapy, and speech-language) and 2) That the team should use rigorously case-defined and validated FASD diagnostic guidelines. The five most commonly used diagnostic guidelines for forms of FASD are the 4-Digit Diagnostic Code; guidelines developed by CDC; revised guidelines of IOM; original IOM guidelines; and Canadian guidelines. Only the CDC Guidelines address FAS. Further, neither the 4-Digit Code nor the Canadian Guidelines recognize alcohol-related birth defects (ARBD) as a FASD diagnostic classification (SAMHSA, 2014).

The 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM–5) addresses the psychiatric diagnosis, Neurobehavioral Disorder Associated with Prenatal Alcohol Exposure (ND-PAE). Individuals who meet IOM criteria for an FASD diagnosis may also meet criteria for ND-PAE. Essential features common to the DSM–5 psychiatric diagnosis and the IOM medical diagnoses are central nervous system (CNS) involvement and prenatal alcohol exposure. Evidence of CNS involvement can be functional (e.g., motor and coordination problems, cognitive and behavioral deficits) or structural (e.g., alterations in specific brain regions or small brain size). Advanced imaging studies have shown differences in brain structure and activity that are consistent with data from neuropsychological testing, including deficits in behavior, cognition, and sensory processing for individuals with FASD, compared to people that do not have FASD (NIH/NIAAA, 2015).

Prevention

The Centers for Disease Control and Prevention (CDC) reported that there is no safe period of time during pregnancy for alcohol consumption (CDC, 2005; Ismail et al., 2010). Alcohol can harm a

The CDC recommends that any woman considering pregnancy, at risk of becoming pregnant, or currently pregnant abstain from consuming alcohol of any amount, type, or consistency (Ismail et al., 2010).

fetus at any stage of pregnancy (CDC, 2005). Moreover, too much is unknown regarding the exact mechanisms through which alcohol acts as a teratogen. Hence, the CDC recommends that any woman considering pregnancy, at risk of becoming pregnant, or currently pregnant abstain from consuming alcohol

of any amount, type, or consistency (Ismail et al., 2010). The 2005 advisory to women from the United States Surgeon General was clear and uncompromising in its message:

- During pregnancy, the expectant mother should not drink alcohol.
- If the woman has consumed alcohol during pregnancy, she should stop immediately to minimize any further risk.
- ***Any woman who has plans to become pregnant should abstain from alcohol consumption.***
- Women of childbearing potential should consult their physician and take steps that reduce any possibility of prenatal alcohol exposure.
- Health care professionals should routinely ask women of childbearing potential about alcohol consumption, tell them about the risks during pregnancy, and strongly encourage them not to consume any amount of alcohol during pregnancy (CDC, 2005).

Actually the 2005 advisory is an updated version of the 1981 warning. The latter advisory recommended that women who were planning to become pregnant or already pregnant abstain from use of alcohol. Both advisories, though, were a far cry from the warnings of the first governmental advisory provided in 1977. The 1977 advisory was published by the National Institute on Alcohol Abuse and Alcoholism and placed thresholds around what constituted safe alcohol use. It advised that more than six drinks in a single day was dangerous and recommended drinking no more than two drinks in a day (Warren & Hewitt, 2009).

The Institute of Medicine (IOM) proposed several strategies to reduce the prevalence of FASD. Universal approaches focused on all members of the population, thus all women. Examples of these approaches are notices in restaurants, bars, and other points of sale; warning labels on alcoholic beverage containers; and broad media campaigns. Unfortunately research thus far has not demonstrated substantial effectiveness for universal prevention approaches in reducing alcohol use in women at highest risk for having a child with FASD (Warren et al., 2011). Universal prevention strategies have included alcoholic beverage labeling, media campaigns, and point-of-purchase signage and outcomes have not demonstrated either reductions in alcohol use or FASDs (Floyd et al., 2009). Labeling, e.g., may have a preventive effect for women who indulge in light drinking but has not been shown to have impact on women at the greatest risk of bearing a child was FAS, those who engage in heavy drinking (NIH/NIAAA, 2000).

Selected and indicated prevention approaches have shown more promise.

Selected prevention

approaches focus on the

screening efforts for special risk groups such as women who commonly engage in binge drinking (Floyd et al., 2009). The T-ACE, has emerged as one of the more effective tools in identifying

The most frequently used indicated prevention strategies consist of aftercare programs and intensive case management, as well as programs that combine the promotion of contraceptive use with alcohol interventions (NIH/NIAAA, 2000).

women at risk for problem drinking (NIH/NIAAA, 2000). (The T-ACE is included in the module on Screening Tools.) Indicated prevention directly targets women known to be more vulnerable because of their high-risk drinking, e.g., common binge drinking (Warren et al., 2011). In other words, women targeted for indicated prevention are currently drinking at a level that is very likely to result in delivery of a newborn with FAS or the mother has already birthed at least one child with FAS. Researchers have much to consider when exploring the effectiveness of indicated prevention interventions. Among the considerations are whether comparisons should examine voluntary (e.g., motivational enhancement) and coercive therapies, individual and group strategies, and/or extended versus brief approaches. The most frequently used indicated prevention strategies consist of aftercare programs and intensive case management (after women have given birth to an FAS child/children), as well as programs that combine the promotion of contraceptive use with alcohol interventions (NIH/NIAAA, 2000). Strategies of promise for both selected and indicated prevention may also incorporate brief interventions. Brief interventions should involve establishment of a drinking goal, along with follow-up of progress with ongoing support (Floyd et al., 2009; NIH/NIAAA, 2000).

A number of prevention projects aimed at educating potential mothers at risk for conceiving a child with FASD have been funded. Included are projects such as Birth Control and Alcohol Awareness: Negotiating Choices Effectively (BALANCE) and the Changing High-Risk Alcohol Use and Increasing Contraception Effectiveness Study (CHOICES) (CDC/NCBDDD/DBDDD, 2015).

Project BALANCE was implemented at Virginia Commonwealth University with college students ages 18 to 24. Its objectives were to identify the prevalence of risky contraceptive and drinking behaviors and test the efficacy of the intervention through a randomized trial. The intervention addresses drinking and unprotected sex, and participating women can modify either or both behaviors (CDC/NCBDDD/DBDDD, 2015).

Project CHOICES incorporated brief interventions to prevent alcohol-exposed pregnancies among women of childbearing potential in select settings. All settings provided access to relatively large numbers of women of childbearing potential who not only drank alcohol at high-risk levels but also did not use contraception effectively. Study objectives included describing the women in the select settings and reducing the rate of alcohol consumption in women not using effective contraception while increasing contraception effectiveness in women who chose not to reduce their alcohol consumption (CDC/NCBDDD/DBDDD, 2015). So postponing pregnancy was as much a focus of the CHOICES intervention as reducing risk drinking (Floyd, 2006). It was determined that women who received both a brief motivational intervention and information were two times as likely to be at reduced risk for an alcohol-exposed pregnancy, compared to an information-only group. The CHOICES intervention has been tapped to be packaged, marketed, and disseminated (CDC/NCBDDD/DBDDD, 2015).

These educational resources are merely starting points in the prevention of FASD. Providing protection to the developing neurotransmitter pathways early during the pregnancy will be a potentially more powerful means for preventing the effects of FASD. However, more research continues to be needed (Ismail et al., 2010).

Two brief interventions have been recommended as selective prevention for women of childbearing potential who report alcohol use and have only one of two indicators: either they screen positive for at-risk alcohol use and are not pregnant OR they are pregnant and present a negative screen for at-risk alcohol use. “FLO” is one such intervention and involves a simple three-step approach of

feedback, listening, and providing options. The second intervention, “FRAMES”, is a more detailed, established method for motivating individuals toward change. Both interventions include action plans for changing alcohol-related behaviors and have demonstrated positive results (SAMHSA, 2014).

The Alcohol Screening and Brief Intervention (SBI) has been identified as a successful indicated intervention for women of childbearing potential who are pregnant and screen positive for at-risk

The Alcohol Screening and Brief Intervention has been used successfully with women of childbearing potential who are pregnant and screen positive for at-risk alcohol use (SAMHSA, 2014).

alcohol use. A workbook-based intervention, SBI takes 10-15 minutes to complete. Results have shown that SBI positively impacts

abstinence rates as well as key subsequent health factors in the newborn, including lower mortality and to complete. This intervention positively impacts abstinence rates as well as key subsequent health factors in the newborn, such as lower mortality and higher birth weight/length. As with all interventions, SBI should use appropriate, relevant FASD print materials in conjunction with the intervention (SAMHSA, 2014).

Treatment

Research has shown that early detection of FASD can reduce the severity of associated impairments. Research has further shown that children diagnosed early as FASD can escape the five adverse life outcomes previously mentioned if they are reared in a good stable environment (Ismail et al., 2010).

Of course, children with FASD can be extremely challenging to the parent/caregiver because of their significant emotional, cognitive, and behavioral difficulties. Strains in the parent/caregiver-child relationship can be evident early on and may accelerate the risk of negative developmental trajectories. Numerous studies have documented high rates of disruptive behaviors, including inattention, hyperactivity, impulsivity, and conduct problems in children with FASD. Such behaviors likely tax the internal coping abilities and internal resources of their parent/caregiver (Paley & O'Connor, 2011).

Researchers have studied the effectiveness of Families Moving Forward (FMF), a sustained model of supportive behavioral consultation in increasing parental/caregiver self-efficacy and reducing child behavior problems. The model provides guidance and instruction to parents/caregivers in the use of strategies to change the environment in reducing the problem behavior triggers. Compared to parents/caregivers receiving treatment as usual, those participating in the FMF group showed significant improvements in their sense of parenting efficacy, were more likely to perceive that their family needs were met, and engaged in more self-care behaviors. Additionally, the FMF group reported significantly greater improvements in child behavior problems post intervention. The intervention is manualized but can be customized to meet the needs of individual families (Paley & O'Connor, 2011).

Cognitive, executive functioning and behavioral impairments created by FASD that interfere with academic performance and learning contribute to the high rates of disrupted school experiences for these children. Therefore, interventions that focus on the enhancement of general learning skills and/or specific cognitive or academic skills sets and include environmental adaptations might be implemented to accommodate some of the behavioral and cognitive impairments.

A small study employed Cognitive Control Therapy (CCT) as a classroom intervention for one hour weekly over the course of a 10-month school year. CCT is designed to teach children strategies that will facilitate their ability to organize and/or acquire information more efficiently. In this study, it was delivered by trained, experienced therapists. A matched comparison group was used in the control condition. Results showed marked improvements in classroom behavior for the CCT group. Qualitatively, there were improvements in motivation, emotionality, self-confidence, writing, communication skills, and academic achievement (Paley & O'Connor, 2011).

Children with FASD can benefit from various other educational and cognitive interventions. Language and literacy training was found to be effective for improvements in syllable manipulation, letter knowledge, nonword spelling, and word and nonword reading. However, these improvements have not been shown to translate into broader gains in academic achievement. A neurocognitive training program, the *Alert Program*, has been adapted for use with school-aged children with FASD. The adaptation was designed to enhance self-regulation skills and remediate executive functioning deficits. There was a significant treatment effect though additional research is needed to investigate maintenance over time. Other interventions have included Mathematics training and working-memory strategies. Results for both have been encouraging for improvements in academics but there are still questions about whether demonstrated gains are maintained over time (Paley & O'Connor, 2011).

Deficits in adaptive and social functioning, as well as safety awareness, have been shown in individuals with FASD. Often intensive levels of support are required from parents/caregivers. They demand high levels of supervision, thus placing a great deal of stress on the parent or caregiver. Nevertheless, there are interventions that have raised the skill level of FASD children in one or more of those areas. For example, FASD children and their parents have benefitted from participation in the Children's Friendship Training (CFT) program. A group-based intervention designed to help the children achieve acceptance versus rejection from other people, CFT further included a parent-assisted peer network component. Results from a small-scale study, in addition to community-based findings, showed social skill improvements for CFT-participating children and parents when compared to a control group receiving standard, non-EBP, social skills training. Additionally, parents and therapists reported higher levels of satisfaction with the children's progress. FASD children have also demonstrated the ability to benefit from computer-based safety training (Paley & O'Connor, 2011).

Safety issues must be addressed first when working with adolescents or adults that have an FASD. Evaluate the individual's physical safety, including issues of violence, harm to self (e.g., self-mutilation) or others, victimization, doo, and adequate housing. These persons have a number of risk factors related to injury and accidents, impulsivity, impaired motor coordination, poor decision-making, attention, working memory, sensory and emotion regulation, and susceptibility to peer pressure. Examples of possible health and safety concerns in adolescents and adults with an FASD are decisions about illegal and legal substances, driving, medication schedules, and risk-taking situations in which poor social problem-solving, peer pressure, and impulsivity combine to

compromise safety. Thus, it is imperative that the clinician work with the caregiver in developing a personalized safety plan for these individuals (SAMHSA, 2014).

For women at high risk of having children with FAS, there is some evidence that enhanced case management can be beneficial and possible lower rates of FAS. Moreover, comprehensive and intensive home visitation showed promise in reducing pregnancies in which the unborn fetus is exposed to alcohol when the moms have been identified as abusers of alcohol and other drugs

(Cannon et al., 2012).

It is necessary that clinicians working with persons having an FASD be able to show flexibility and adaptability (SAMHSA, 2014).

It is further necessary that clinicians working with

persons having an FASD be able to show flexibility and adaptability. Counselors should:

- Address any negative self-perception associated with having an FASD;
- Address, acceptance, resistance, and denial;
- Assess comprehension on an ongoing basis;
- Be aware of the person's strengths;
- Consider using a mentor approach;
- Focus on personal and self-esteem issues;
- Help the person cope with loss;
- Set appropriate boundaries;
- Understand the impact of any abuse that the person has experienced; and
- Weigh the risks and benefits of individual versus group counseling (SAMHSA, 2014).

Other Treatment Considerations.

While it is important for clinicians to remember that adolescents are different from adults, it is equally important to remember that adolescents with an FASD are different from young people that develop in the typical fashion. Young people with an FASD may function at emotional and social levels well below their chronological age and present with uneven physical and cognitive profiles. Therefore, the treatment process should incorporate the nuances of the young person's experience. The adolescent's risk factors that led to the substance abuse must also be taken into account (SAMHSA, 2014).

In addition, clinicians should be mindful of issues that might be raised when working with individuals with an FASD. The clinician may feel resentment about being stuck with such challenging clients or harbor negative attitudes toward females who drank during their pregnancy. It is also possible that feelings of shame and guilt might surface for clinicians who themselves drank while pregnant or have a child with an FASD. Thus, it is paramount that clinicians keep Olson and colleagues' Reframe, Accommodate, and Have Hope strategies handy to help them deal more effectively with caregivers of persons with FASD and with themselves when issues arise (SAMHSA, 2014).

FASD Resources

FASD Prevention Tool Kit for Women's Health Care Providers.

In collaboration with the CDC, the American College of Obstetricians and Gynecologists (ACOG) has developed the Women and Alcohol Web site (<http://www.womenandalcohol.org/>). This Web site provides resources specifically for women's health care providers in identifying women who drink too much, as well as brief educational counseling to eliminate or reduce alcohol use. Information is also available for the general public, along with linked resources. Designed to be a one-stop choice, the Web site offers a cell phone app, current news articles, downloadable patient information sheets, and treatment referral information, among other tools.

NTI Upstream.

This organization is a multimedia production and publishing company dedicated to advance the conversation around the issues of social welfare and health. Its Web site contains a wealth of resources related to FASD.

Video: The Listening Heart.

This educational documentary chronicles the day-to-day challenges of children, parents, and families who struggle with the consequences of FAS. It offers a unique look into the world of FAS through the eyes of the children who are directly affected by the disorder, as well as medical experts and adoptive parents. Information about purchase of the video can be obtained from <http://ntiupstream.corecommerce.com/The-Listening-Heart-p26.html>.

Information about purchase of the special edition of the video can be found at <http://ntiupstream.corecommerce.com/The-Listening-Heart-Special-Edition-p27.html>. This version is designed to help both parents and professionals teach about FAS. Included is the 45-minute documentary along with a fully-scripted PowerPoint presentation on FASD.

Video: Moment to Moment: Teens Growing Up with FASD.

Available fall of 2014, this video explores the lives of four adolescents with FASD and the effects that prenatal alcohol exposure has had and continues to have on their ability to find independence,

fulfillment, and understanding of the world around them. Also captured in the documentary are the challenges families must overcome as children with FASD reach maturity and attempt to take on the world on their own as young adults. More information about content and access to this video can be obtained at <http://www.ntiupstream.com/moment>.

Substance Abuse and Mental Health Services Administration (SAMHSA).

Video: Recovering Hope: Mothers Speak Out about Fetal Alcohol Spectrum Disorders.

This award-winning video that tells the story of women who used alcohol during pregnancy and the effects the use had on their children. The hour-long video is divided into two half-hour segments to allow time for discussion within treatment sessions. A brochure is available to help counselors or facilitators prepare to show and discuss the video. There is also a brochure that can be distributed to the women after they have viewed and discussed the video. Other audiences such as family members or support groups of women who have completed treatment may also benefit from viewing and discussing this video. The video can be accessed free of charge from the SAMHSA store (1-877-SAMHSA-7), its Web site (<http://store.samhsa.gov/product/Recovering-Hope-Mothers-Speak-Out-About-Fetal-Alcohol-Spectrum-Disorders-FASD-/SMA09-3979>), or the YouTube page (<http://www.youtube.com/watch?v=m7zFJCW9Yco>) (FASD Center for Excellence, 2014a).

The Arc.

Brochure.

With funding from CDC, the Arc developed a brochure to help women evaluate actions they might take related to alcohol consumption, especially if they are pregnant. Titled “Think before You Drink”, it encourages women to think twice before they undertake any drinking. The brochure has gained tremendous popularity and can be found in physician’s offices, schools, public health clinics, etc. Efforts have been made to display the brochure anywhere more education on the dangers of drinking while pregnant is needed. Document download can occur at <http://www.thearc.org/document.doc?id=3674>.

Training and Contacts: Tennessee.

Our state is home to the Southeast Fetal Alcohol Spectrum Disorder (FASD) Regional Training Center. Also referred to as FASD Southeast, the training center is dedicated to improving the skills of medical and allied professionals, helping them to better address FASD and its prevention among women of childbearing potential. FASD Southeast is based at Meharry Medical College in the Department of Family & Community Medicine, Nashville, Tennessee (FASD Center for Excellence, 2014b). It is a cooperative effort among Meharry Medical College, Morehouse School of Medicine (Atlanta, GA), Tennessee State University, and the University of Louisville (KY) (Meharry Medical College Web site, n.d.).

FASD Southeast promotes its services to universities, colleges, hospitals, clinics, community health centers, as well as public and civic organizations within the southeastern United States. Service offerings are limited to the states of Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, South Carolina, and Tennessee, and include the following services:

- Annual FASD Train-the-Trainer workshops.
- Assistance in referral and connecting interested parties in on-site training through FASD Southeast faculty or speakers bureau.
- Participation in and hosting of local, state, and regional public events efforts or efforts events to increase awareness and disseminate FASD information.
- Technical assistance and support for collaborators and new speakers or satellite teams in the southeast.
- Training for health medical/health medical care students on FASD.
- Training for health medical/medical health care professionals on Fetal Alcohol Spectrum Disorders (FASDs).
- Training for medical/health care professionals on Fetal Alcohol Spectrum Disorders (FASD).
- Web site access to FASD links and information for medical professionals and in addition to the general public.

In addition, there are two FASD contacts for the state (FASD Center for Excellence, 2014b). Their contact information is provided below:

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Neonatal Abstinence Syndrome (NAS)

Quick Facts

936 Tennessee newborns experienced withdrawal from drugs their mothers used while pregnant in 2013 (A. Miller, personal communication, June 13, 2016; Miller & Warren, 2015).

- The 2013 statistic translates into greater than two neonates born with signs of drug withdrawal per day.

1,031 newborns in Tennessee experienced withdrawal from substances their mothers used during pregnancy in 2014 (A. Miller, personal communication, June 13, 2016; Miller & Warren, 2015).

- The number represents a 10 percent increase in neonates born with signs of drug withdrawal from 2013 to 2014.

1,039 newborns in Tennessee experienced withdrawal from substances their mothers used during pregnancy in 2015 (A. Miller, personal communication, June 13, 2016).

- The increase in cases from 2013 to 2015 was not statistically significant (A. Miller, personal communication, June 13, 2016).

The cost of care for neonates with NAS is **13** times more than cost for normal weight, average babies (Clarksville Online, 2014).

- **More Quick Facts** (*continued*)

- Using TennCare (2013) data, the average cost of births due to neonatal abstinence syndrome (NAS) was \$44,043, compared to \$7,753 for all live births and \$4,013 for non-low-birth-weight births.

Babies with NAS- are **overrepresented** in state custody with the Tennessee Department of Children's Services (Warren, 2013).

Research says that preterm newborns that experience NAS are **five** times more likely to be readmitted to hospitals for NAS than their full-term counterparts (Backes et al., 2012).

The incidence of NAS here in Tennessee has increased **15**-fold, compared to a three-fold increase nationally (TDH/DFHW, 2013).

Infants born in calendar year (CY) 2013 comprised **1.5** percent of infants (i.e., within one year of birth) in DCS custody. However, **20** percent of infants classified as NAS and born in CY 2013 were in DCS custody (TennCare, 2015).

What Is Neonatal Abstinence Syndrome (NAS)?

Neonatal abstinence syndrome (NAS) refers to the constellation of clinical signs associated with withdrawal from opioids in newborns and usually manifests as autonomic overreactivity, neurological excitability, and gastrointestinal dysfunction. The diagnosis is typically reserved for newborns that are part

Being born with NAS increases the risk of complications in the neonatal period and places a higher cost burden on the healthcare system (astho, 2014).

of a larger group of infants exposed to opioids, exhibit withdrawal, and require pharmacotherapy (astho, 2014). The World Health

Organization (2014) applies the term whenever a neonate is exposed to any psychotropic substances prenatally. The Tennessee Department of Health [TDH] (2015) has also noted that other substances have been implicated (Warren, Miller, Traylor, Bauer, & Patrick, 2015). Goetz & Rolloff (2012) indicate morphine, heroin, methadone, oxycodone, hydromorphone, hydrocodone, and buprenorphine as the most common substances leading to NAS. Being born with NAS increases the risk of complications in the neonatal period and places a higher cost burden on the healthcare system (astho, 2014). There are reports that NAS is a leading cause of developmental and medical problems in the newborn. However, NAS is a very identifiable condition that can be treated (GAO, 2015; Thigpen & Melton, 2014).

At least one study cited a 35 percent increase in neonatal hospital charges for NAS between 2000 and 2009. Nationally, total hospital charges nearly quadrupled between 2002 and 2009, from a cost of \$190 million to \$720 million. However, the mean length of stay (LOS) for NAS did not change. LOS continued to hover around 16 days (Jensen, 2014).

Among the complications associated with NAS are respiratory problems, seizures, prematurity, low birth weight, and feeding difficulties (astho, 2014; GAO, 2015; Siu & Robinson, 2014). An analysis of Medicaid claims data for states showed that a third of the newborns diagnosed with NAS were of low birth weight, weighing less than 5.5 pounds (2,500 grams) at birth (astho, 2014).

It should be noted that there are two major types of NAS. NAS can be caused by maternal use or prenatal use of substances that result in withdrawal symptoms in the newborn. There is further postnatal NAS that is secondary to the discontinuation of medications such as morphine or fentanyl used for pain therapy in the newborn (Hamdan, 2014).

However, this discussion will focus primarily on the NAS link to maternal use of opioids during pregnancy.

A laundry list of substances taken by pregnant mothers can be associated with NAS births (Bauer & Li, 2013; Hudak & Tan, 2012).

A laundry list of substances taken by pregnant mothers can be associated with NAS births, including buprenorphine, methadone, heroin, benzodiazepines, alcohol, barbiturates, and marijuana (Bauer & Li, 2013; Hudak & Tan, 2012). The clinical presentation of

NAS is a function of several factors, including maternal metabolism, the opioid, maternal substance-use history that takes into account the timing of the most recent use of the substance before delivery, placenta metabolism, net transfer of the substance across the placenta, infant metabolism and excretion, and other variables (Hamdan, 2014; Hudak & Tan, 2012). Its incidence ranges from 21 to 94 percent among opioid-exposed newborns, about half of whom require pharmacotherapy (Backes et al., 2012). Clinicians should be careful to rule out other factors that can cause NAS-like symptoms in newborns (Goetz & Rolloff, 2012).

Mortality is rarely associated with NAS withdrawal alone, but occurs as a consequence of infection, prematurity, and severe perinatal asphyxia. Additionally, the risk for sudden infant death syndrome (SIDS) is significantly higher among newborns that have been exposed to opiates in utero. Newborns exposed to methadone have a 3.7-fold higher risk of SIDS compared to controls. For newborns exposed to cocaine, there is a 2.3-fold higher risk for SIDS (Hamdan, 2014).

The increase in NAS births over the last decade corresponds to the rise in the number of mothers using or dependent on opiates at the time of delivery. This population of pregnant women with opioid dependence includes the spectrum addicted to heroin, abusing prescription opioids, in medicated-assisted treatment (i.e., buprenorphine maintenance or methadone maintenance), with polydrug abuse, and chronically using opioids prescribed for medical indications (astho, 2014). Opiate use in this country increased nearly five-fold from 1.2 to 5.6 per 1,000 births per year for 2000 to 2009. The incidence of NAS increased around three-fold, from 1.2 to 3.4 during the same time period. Thus, not all neonates born to mothers with a dependence on or using opiates at the time of delivery develop signs of NAS. Prenatal exposure to heroin and methadone is linked to a

In 2010, TennCare statistics showed that babies born with NAS cost nearly six times more than a baby without NAS and they were 18 times more likely than non-NAS babies to enter state custody (TDH, n.d.).

60-80 percent incidence of NAS. Associations with buprenorphine suggest a lower risk of NAS, though results have been inconsistent (Siu & Robinson, 2014). From 2000 to 2010, there has been a ten-fold increase in the number of NAS babies born

in our state (TDH, n.d.). More recent statistics now show a 15-fold increase of NAS births in the state (TDH/DFHW, 2013). In 2010, TennCare statistics further showed that babies born with NAS cost nearly six times more than a baby without NAS and they were 18 times more likely than non-NAS babies to enter state custody (TDH, n.d.). In calendar year (CY) 2013, the average TennCare cost for a NAS newborn was \$44,043 while the cost for a healthy newborn (i.e., non-low-birth-weight) was \$4,013. NAS babies had an average length of stay of 25.2 days compared to 2.6 days for healthy (non-low birth weight) births. Moreover, 20 percent were in DCS custody compared to 1.5 percent of infants in general within their first year of birth (TennCare, 2015).

Our state has a Neonatal Abstinence Syndrome (NAS) subcabinet comprised of commissioners and staff from the departments of Children's Services; Health; Human Services; Mental Health and Substance Abuse Services; and Safety and Homeland Security, along with TennCare, the state's Medicaid authority (astho, 2014; Clarksville Online, 2014; TDH, n.d.). This subcabinet was created to design and implement strategies around NAS at the three levels of prevention: primary, secondary, and tertiary (Bauer & Li, 2013; Miller & Warren, 2013; TDH, n.d.). Examples of the prevention levels include:

- Primary prevention – efforts to reduce the likelihood that women taking opioids will become pregnant while using and/or to reduce the numbers of women taking opioids
- Secondary prevention – efforts to assure pregnant women using opioids receive health care that minimizes the likelihood of delivering a baby with NAS or other problems
- Tertiary prevention – efforts to ensure newborns diagnosed with NAS receive high quality, cost effective care and are discharged to safe home environments (TDMHSAS, 2013)

The incidence of NAS in the state continued rising, along with the associated public health burden. Therefore, TDH made NAS reporting mandatory, effective January 1, 2013 (Warren et al., 2015). In fact, Tennessee was the first state to make NAS a reportable disease (Prevention Alliance of Tennessee, 2014). A total of 936 cases of NAS were reported during the 2013 calendar year (A. Miller, personal communication, June 13, 2016; Miller & Warren, 2015). Most of the cases were clustered in eastern Tennessee and slightly greater than six of every 10 cases occurred to mothers who were reported to be using one or more substances prescribed by a health care provider (e.g., maintenance medications for opioid dependency or opioid pain relievers. Such results further highlighted the need for primary prevention activities focused on the reduction of

Tennessee was the first state to make NAS a reportable disease (Prevention Alliance of Tennessee, 2014).

addiction/dependence among women of childbearing potential and prevention of unintended pregnancy among women who use opioids (Warren et al., 2015). Pregnancy Risk Assessment Monitoring System (PRAMS) 2009 data has shown that half of pregnant women in general experience unintended pregnancies compared to 86 percent of pregnant women who use opioids (Dreyzehner, 2015).

The Tennessee NAS surveillance system is an online reporting system that allows for secure and rapid collection of protected health information. Birthing hospitals report all data within 30 days of the newborn's diagnosis using a standard set of data fields. TDH staff extract the surveillance data weekly from the reporting system. Public health stakeholders have access to the data each week. Public health partners in the private and public sector use the data to inform local prevention efforts (Warren et al., 2015). Weekly summaries can be accessed from <http://tn.gov/health/article/nas-update-archive>. Summaries are available for each week starting with January 2013.

All cases of NAS included in final reports have clinical signs of NAS as a minimum requirement. Additional considerations are a maternal history of substances known to cause NAS, a positive neonatal screening test for NAS-causing substances, or a maternal screening test for NAS-causing substances. For calendar year (CY) 2015, about 72 percent of reported cases were exposed to at least one prescription drug, either prescription drugs only, or in combination with a diverted or illicit substance. Of those exposed only to prescription drugs, 81 percent were on supervised replacement therapies (i.e., medication-assisted treatment for substance abuse such as buprenorphine or methadone). Sixteen percent were exposed to supervised pain therapies and nearly 13 percent were exposed to neurologic or psychiatric therapies. It should be noted that the classes of prescription drug use are not mutually exclusive, hence percentages totaling greater than 100 percent. In CY 2014, 10 counties represented close to half of all the NAS cases: Knox, Sullivan, Davidson, Sevier,

Washington, Shelby, Greene, Putnam, Anderson, and Campbell (Miller & Warren, 2015). Exposure to only diverted or illicit drugs was more common in Middle and West Tennessee (Miller and Warren, 2015).

Screening

A medical evaluation is very important for newborns that are suspected of having NAS. Various conditions such as neurological illnesses, sepsis, and hypoglycemia may mimic NAS (SAMHSA, 2015).

There are several screens that are provided to newborns after birth. One such screener is the APGAR: Appearance, Pulse, Grimace, Activity, and Respiration measure. This test is performed at one minute and again five minutes after birth. The score at one minute tells how well the newborn tolerated the birthing process. At five minutes, the score tells the physician how well the baby is doing outside of the mother's womb. Total APGAR scores can range from 1 to 10, with higher scores indicative of better newborn functioning after birth. Scores of 7, 8, or 9 are desired as they represent normal. Scores below 7 may signal the need for the newborn to receive medical attention. Low scores at one minute are not necessarily troubling, especially if they rise near normal by five minutes (Zieve & Kaneshiro, 2011).

The American Academy of Pediatrics (AAP) recommends that every nursery caring for infants with NAS develop a protocol that defines procedures and indications for screening for substance use in the mother (astho, 2014).

The American Academy of Pediatrics (AAP) recommends that every nursery caring for infants with NAS develop a protocol that defines procedures and indications

for screening for substance abuse in the mother. In addition, AAP promotes the use of a standardized plan for evaluation and comprehensive treatment of newborns at risk of NAS or showing signs of withdrawal (astho, 2014). Neonatal intensive care units (NICUs) are further encouraged to use an abstinence scoring tool for determining when to begin, titrate, or stop pharmacotherapy (astho, 2014).

Withdrawal occurring in NAS is generally a function of the half-life of the substance to which the newborn was exposed, with substances having a long half-life typically showing later onset of withdrawal. Opiates produce the most dramatic effects. Heroin, an opiate, has a short half-life so withdrawal can begin as early as 24 hours

following birth, peaking between 48-72 hours in most newborns. In some cases, withdrawal might be delayed for as long as six days after birth.

Newborns exposed to sedative-hypnotics in

utero may not start withdrawal until after the newborn has been discharged from the hospital (e.g.,

This modified (Finnegan) scoring tool is becoming the international standard for assessing the degree of withdrawal and parameters for (NAS) treatment (Kelly et al., 2011; Siu & Robinson, 2014).

after two weeks) because of the longer half-life of those substances. Methadone has a half-life greater than 24 hours, but acute withdrawal can occur as early as the first 48 hours following birth or as late as seven to 14 days after birth. In some cases, withdrawal can be delayed as long as four weeks following birth and subacute signs can be evident up to six months following birth (Hamdan, 2014).

A scoring system, originally developed by pediatrician Loretta Finnegan in 1975, can be used to assist healthcare personnel in determining the best course of treatment for the substance-exposed newborn. Today, most newborn intensive care units (NICUs) employ the modified version of the Finnegan tool (Nelson, 2013). This modified scoring tool is fast becoming the international standard for assessing the degree of withdrawal and parameters for treatment (Kelly et al., 2011; Siu & Robinson, 2014). It is the most predominantly used tool in our country (Goetz & Rolloff, 2012). Scoring is done after feeding in two- or four-hour intervals (Kelly et al., 2011). The scoring system delineates the cluster of symptoms that might be exhibited by a newborn with NAS. Withdrawal symptoms occur through the central nervous system (CNS), autonomic nervous system (ANS), gastrointestinal system, and pulmonary system. Symptoms associated with the CNS are irritability, high-pitched cry, tremors, seizures, and excessive sucking or poor feeding. Yawning, mottling, and sneezing are symptoms linked to the ANS. Gastrointestinal symptoms include vomiting and diarrhea/loose or watery stools. Respiratory distress and increased apnea are symptoms that are associated with the pulmonary system. All total, 21 symptoms are identified through the scoring system. A score greater than eight (8) on two consecutive administrations typically results in the use of morphine with the newborns to help ease withdrawal (Nelson, 2013).

Clinicians are admonished to think about other things that can cause NAS-like symptoms in neonates. Among them are sepsis, neonatal encephalopathy, hypoglycemia, hyperviscosity, hypocalcemia, intercranial hemorrhage, metabolic disease, and hypothyroidism (Goetz & Rolloff, 2012).

Using morphine as a first-line agent for neonates during withdrawal is supported by numerous studies including a 2010 Cochrane database meta-analysis. Morphine use in newborns with NAS suppressed seizures, decreased diarrhea, and assisted with the development of the sucking reflex (Kelly et al., 2011). Clonidine and phenobarbital are medications that also might be used to ease substance withdrawal in the newborns (Nelson, 2013). Phenobarbital, in particular, alone or in addition to the morphine, is often considered for breakthrough seizures or in cases of abuse that involved nonnarcotic substances. While not as well supported in the literature by evidence for the treatment of newborn exposure to opiates, it is a familiar medication and often employed when withdrawal stems from unknown substances. Other alternatives are methadone, buprenorphine, or oral clonidine. ***In no case should clinicians use naloxone for resuscitation at birth in newborns who are at risk for NAS.*** Naloxone use has been linked to precipitation of acute withdrawal (Kelly et al., 2011).

Toxicological screenings on urine or meconium of newborns before starting treatment are typically recommended as well (astho, 2014). Urine tests give false-negative or false-positive results regarding prenatal exposure to opioids. Meconium analysis provides information about the last two trimesters but implementation is difficult. Sometimes meconium is available at birth but it can also be delayed. Hair analysis from the mother or the baby yields information from the last trimester but can be expensive (Kale-Çekinmez et al., 2012). Length of hair is important in identification of the exposure period, for example, a 90-day period versus a seven or eight day time frame. Moreover, many

newborns do not have much hair at birth, thereby making hair testing nearly impossible (Marin et al., 2013).

Modified Finnegan Neonatal Abstinence Scoring Tool

Modified Finnegan Scale		Date and Time in Hours										Neonatal Withdrawal Scoring Chart (Term infants)
System	Signs and Symptoms	Score										
Central Nervous System Disturbances	High-Pitched Cry	2										
	Continuous High-Pitched Cry	3										
	Sleeps <1 hour after feeding	3										
	Sleeps <2 hours after feeding	2										
	Sleeps >3 hours after feeding	1										
	Mild Tremors Disturbed	1										
	Mod-Severe Tremors Disturbed	2										
	Mild Tremors Undisturbed	3										
	Mod-Severe Tremors Undisturbed	4										
	Increased Muscle Tone	2										
	Excoriation (specify area)	1										
	Myoclonic Jerks	3										
	Generalised Convulsions	5										
Metabolic/Vasomotor/ Respiratory Disturbances	Fever (37.3°C-38.3°C)	1										
	Fever (38.4°C and higher)	2										
	Frequent Yawning (>3-4 times)	1										
	Nasal Stuffiness	1										
	Sneezing (>3-4 times)	1										
	Nasal Flaming	2										
	Respiratory Rate > 60/min	1										
	Respiratory Rate >60/min with retractions	2										
Gastrointestinal Disturbances	Excessive sucking	1										
	Poor Feeding	2										
	Regurgitation	2										
	Projectile Vomiting	3										
	Loose Stools	2										
	Watery Stools	3										
	Mas Score:41											
	Total Score											
	Scorer's Initials											

Source: Finnegan 1980 via WHO, 2009.

The tool is also one of several opioid withdrawal scales found in the *Guidelines for Pharmacologically Assisted Pharmacological Treatment of Opioid Dependence* at http://www.ncbi.nlm.nih.gov/books/NBK143185/pdf/Bookshelf_NBK143185.pdf.

Screening should start with a careful maternal history and physical examination that is supplemented with toxicological testing as needed. Among the risk factors that could prompt observation include maternal report of substance use, no prenatal care or late entry into care, previous unexplained late fetal demise, precipitous labor, and placental abruption. If a urine toxicological screening is done on the infant, the specimen should be collected as soon as possible after birth. This screen will only reflect recent drug exposure. Analysis of meconium reflects substance exposure during the previous

several months in utero. However, results are typically not available for several days which means they cannot guide real-time management of the newborn (astho, 2014). Moreover, there are difficulties associated with collection of meconium (Marin et al., 2013). Nevertheless, meconium drug testing, which has 94.6 percent specificity, is often cited as the best method for detecting drug exposure during pregnancy (Bio, Siu, & Poon, 2011). Research continues to be conducted on the utility of umbilical cord blood testing in screening for NAS (astho, 2014). Umbilical cords are readily available at birth and provide ample specimen for testing. Furthermore, research findings tend to be positive. In fact, research often shows the equivalence of umbilical cord tissue in relation to meconium in identifying fetal exposure to substances such as opiates, cocaine, amphetamines, and cannabinoids. The umbilical cord agrees with meconium 99.2% for cocaine, 96.6% for amphetamines, 94.9% for opiates, and 90.7% for cannabinoids. In addition, turnaround time for results involving the umbilical cord may be more rapid because there is not the need to wait for the meconium to pass (Montgomery et al. 2006). Umbilical cord testing will further allow for the testing of many prenatal nonmedical substance exposures (Wood et al., 2014)

Newborns that have been exposed to opioids should be observed in the hospital for four to seven days and symptoms assessed with the aid of an abstinence scoring tool. The most frequently used tool is the Modified Finnegan’s Neonatal Abstinence Scoring Tool (astho, 2014). (The Modified Finnegan may also be referenced in the literature as the Neonatal Abstinence Scoring System [NASS]. For example, see Jones & Fielder, 2015.). While comprehensive, the Finnegan tool may be too complex for routine use in many hospital nurseries. In such cases, the simpler Lipsitz Neonatal Drug-Withdrawal Scoring System might be used (astho, 2014). It has only 11 items, hence making the instrument less resource intensive than the modified Finnegan. A copy of the Lipsitz is displayed below.

Neonatal Drug Withdrawal: Lipsitz Scoring Tool

Instructions: Score each category with the highest score in that time interval. Score every 3 hours for first 72 hours (if exposed to narcotics or opiates) or for first 96 hours (if exposed to Methadone or Suboxone). **A total score of 4 is recommended for initiation of pharmacologic treatment.**

					Date:	Day of Life:	(DOB=DOL #1)					
SCORING CATEGORIES					INTERVALS (Note time in columns)						COMMENTS	
SIGNS	Score 0	Score 1	Score 2	Score 3								Time and Initial
Tremors (muscle activity of limbs)	Normal	Minimally increased when hungry or disturbed	Moderate/ marked increase when undisturbed; stop when fed or cuddled	Marked increase or continuous even when undisturbed, going on to seizure-like movements								
Irritability (excessive crying)	None	Slightly increased	Moderate to severe irritability	Marked irritability even when								

			when disturbed or hungry	undisturbed											
Reflexes	Normal	Increase d	Markedly increased												
Stools	Normal	Explosiv e, but frequenc y ≤8/day	Explosive, > 8 per day												
Muscle Tone	Normal	Increase d	Rigidity												
Skin Abrasions	No	Redness of elbows, heels, pressure points when supine	Breakdown of skin at pressure points												
Respiratory Rate (bpm)	<55	55-75	76-95												
Repetitive Sneezing	No	Yes													
Repetitive Yawning	No	Yes													
Forceful Vomiting	No	Yes													
Fever >38°C or >100.4°F	No	Yes													
TOTAL SCORE															
Screener Initials _____ _____ _____ _____															

Adapted with permission.

TDMHSAS, June 2016.

A score of at least 4 on the Lipsitz signals the possible need for medication therapy for the newborn (Siu & Robinson, 2014). All tools have their limitations but provide a more objective means of determining when pharmacotherapy is necessary (astho, 2014). Current tools were designed to describe withdrawal in term or near-term newborns (AAP Committee on Drugs, 1998). Definitions of severity have not been standardized. As a consequence, it is recommended that each institution establish a way to standardize the definition and educate staff. Instituting this definition-standardization strategy enhances interrater reliability and reduces interrater variability (Siu & Robinson, 2014).

Newborns exposed prenatally to antidepressant medications, especially selective serotonin reuptake inhibitors (SSRIs), are at increased risk of NAS as well. Symptoms tend to be reported more commonly with paroxetine and fluoxetine exposure. At this time, there is no evidence to suggest neonatal withdrawal problems when mothers have used marijuana during pregnancy. There may be other issues, however (Hamdan, 2014).

Symptoms

Symptoms of neonatal abstinence syndrome (NAS) are contingent upon several factors, including:

- The type of substance used by the mom;
- How the mother's body breaks down the substance;
- The amount of substance the mother was taking;
- Duration of substance use by the mother; and
- Whether the newborn was preterm or full term (A.D.A.M. Medical Encyclopedia, 2013).

In descending order, the most frequent symptoms associated with NAS are: tremors, high-pitched cry, sneezing, increased muscle tone, fist-sucking, and regurgitation (Kelly, Minty, Madden, Dooley, & Antone, 2011). With buprenorphine, NAS severity appears to be more a function of the use of other drugs rather than the dose (Soyak, 2013).

Other research has signaled the influence of estimated gestational age, infant birth weight, delivery type, maternal weight at delivery, maternal nicotine use and days of maternal study medication received, and the use of psychotropic medications in the expression of NAS severity in neonates exposed to buprenorphine or methadone (Kaltenbach et al., 2012).

NAS symptoms can manifest within one to three days following birth. However, symptoms may not appear for as long as five to ten days after birth (A.D.A.M. Medical Encyclopedia, 2013; GAO, 2015). Subacute withdrawal symptoms may last four to six months. These symptoms include agitation, irritability, poor socialization, and restlessness (Kelly et al., 2011; SAMHSA, 1993)

Prevention/Early Intervention

Prevention.

The most effective way to reduce substance use and/or addiction during pregnancy is to provide routine screening and education to women of childbearing potential *before conception* (Keegan, Parva, Finnegan, Gerson, & Beiden, 2010).

The most effective way to reduce substance use and/or addiction during pregnancy is to provide routine screening and education to women of childbearing potential before conception (Keegan, Parva, Finnegan, Gerson, & Beiden, 2010).

In advance of pregnancy:

- Women should discuss the use of voluntary, reversible long-acting contraceptives (VRLACs) with their obstetrician/gynecologist (OB/GYN) (Dreyzehner, 2015; Warren, n.d.; Warren, 2013). VLAC methods include birth control implants and intrauterine devices (IUD). These methods are highly effective in preventing pregnancy, easy to use, and last for several years. Equally important is the fact that VRLACs are reversible and can be removed at any time if the woman wants to become pregnant or stop using them (ACOG, 2014).
- Women should discuss all medications as well as alcohol and/or tobacco use with their health care provider.
- If already using substances, including tobacco and/or alcohol, women should ask their health care provider for help in curbing and ultimately stopping use as soon as possible (A.D.A.M. Medical Encyclopedia, 2013).

If already pregnant:

- Women should inform their health care provider about their substance use, including use of alcohol and/or tobacco, discuss the best way to stop using while keeping you and the fetus safe (A.D.A.M. Medical Encyclopedia, 2013).
- Women should discuss future use of voluntary, reversible long-acting contraceptives (VRLACs) with their obstetrician/gynecologist (OB/GYN) (Dreyzehner, 2015; Warren, 2013).

Consistent with recommendations from other medical specialties, the American Pain Society (APS) and the American Academy of Pain Medicine

(AAPM) admonish clinicians to provide counseling to women of childbearing potential about the

Clinicians should counsel women of childbearing potential about the risks and benefits of chronic opioid therapy during pregnancy and after delivery (astho, 2014).

risks and benefits of chronic opioid therapy during pregnancy, as well as following delivery (astho, 2014).

Early Intervention.

The most useful early intervention involves staff training. Lack of standardization of a definition of severity, even within hospitals, has been discussed previously. Therefore, nurses and/or other appropriate clinical staff should be properly trained in how to score screening tools such as the modified version of the Finnegan tool. Inaccurate scores will lead to inappropriate treatment and increased length of stay for the newborns, neither of which are positive outcomes (Nelson, 2013; Siu & Robinson, 2014).

Establishing interrater reliability is critical and some studies have examined gaps in staff scoring of the Finnegan instrument. For example, nurses in a level 3 neonatal intensive care unit (NICU) in Milwaukee, WI, conducted an interrater reliability study and observed that identification of moderate to severe tremors in the undisturbed (i.e., not being handled) newborn was the symptom scored incorrectly most often. Eighty-two percent failed to score the symptom correctly. About a fourth missed moderate tremors when the newborn was disturbed and almost 10 percent missed scoring the newborn for hyperactive moro reflex. They further found other gaps such as difficulty scoring the newborn for sleep when he/she always needed to be held or in a swing, for instance. Hence, such training is key, especially within the same facility.

Treatment

Treatment goals in the management of NAS should focus on prevention of complications associated with NAS and restoration of normal neonate activities (i.e., sleep, weight gain, nutrition intake, and adaptation to the social environment). Further potential risks and benefits of medication therapy for the neonate must be assessed. Prevention of possible complications would register as a benefit of treatment whereas hospitalization and prolonged medication exposure are potential risks. It is very likely that maternal-neonate bonding will be affected as well (Siu & Robinson, 2014).

Non-pharmacological Treatment.

Non-pharmacological management that incorporates behavioral treatments should be the first approach for all newborns exposed to opioids to help them eat, sleep, gain weight, and interact with caregivers (GAO, 2015; Siegler, DeLoache, & Eisenberg, 2010).

According to the American Congress of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics (AAP), initial treatment for newborns with NAS should not involve medication (GAO, 2015). Non-pharmacological

management that incorporates behavioral treatments should be the first approach for all newborns

exposed to opioids to help them eat, sleep, gain weight, and interact with caregivers (GAO, 2015; Siegler, DeLoache, & Eisenberg, 2010). Helpful non-drug, interventions include, but may not be limited to:

- Careful swaddling to avoid autostimulation in the newborn. Swaddling involves close wrapping the newborn in a cotton sheet or blanket. This technique gives the newborn a sense of comfort and security he/she once had in the mother’s womb. Swaddling helps the infant to remain calm and not become overwhelmed by his/her environment. Autostimulation theory contends that infants will spend less time in rapid eye movement (REM) sleep if they are exposed to a lot of stimulation during wakefulness. And REM sleep is important. It is hypothesized that the parts of the brain linked to memory and learning are stimulated during this phase of sleep. Moreover, REM sleep helps renew and restore energy to the body, which positively impacts overall health (Siegler et al., 2010).
- Minimizing stimuli such as sound and light.
- Early response to the newborn’s signals.
- Providing positioning and comforting techniques such as pacifier use, rocking, and swaying.
- Feeding in smaller, more frequent volumes, thus promoting adequate growth (astho, 2014). Experts indicate that feedings of hypercaloric formula might be necessary to meet the high caloric requirements for proper growth (Jensen, 2014). A caloric intake of 150 to 250 kilocalorie/kilogram/day should be achieved (Sui & Robinson, 2014).
- Complementary and alternative medicine techniques have also been explored for neonatal withdrawal. Physical therapy and massage therapy can be used to treat overstimulation and hypertonicity. Music therapy has been shown to calm neonates and regulate sleep patterns. Lavender aromatherapy and exposure to the mother’s scent have been shown to decrease cortisol levels and reduce stress in the newborns. Acupressure or acupuncture has additionally been offered as another potential alternative treatment for neonatal withdrawal (Sutter, Leeman, & Hsi, 2014).

Not all newborns exposed prenatally to narcotics will need specialized care. Initial appropriate hospital settings for newborns likely vary between institutions and by clinical severity. Infants at risk for opioid withdrawal may be

observed in neonatal intensive care units (NICUs) of varying levels, a Level 1 nursery apart from the mother, or rooming-in with the mother in a regular postpartum unit. A study

Not all newborns exposed prenatally to narcotics will need specialized care (Kelly et al., 2011).

conducted in England compared newborns with NAS who underwent treatment in the equivalent of a NICU to a group whose treatment was routine postnatal rooming-in. The researchers observed shorter length of stay for the latter group, with no other differences in outcome. A 2007 Vancouver study found that “rooming-in” was linked to a significant decrease in the need for treatment for

NAS and that the mothers of the “rooming in” newborns were more likely to take their babies home with them (Kelly et al., 2011; Sutter et al., 2014). There is further evidence that fostering the mother-infant dyad early in the neonatal period through examinations in the mother’s room and teaching mothers to respond to infant behavior can enhance nurturing behaviors that are crucial to infant development. Moreover, the practice of rooming-in appears to help support breastfeeding, when appropriate (Sutter et al., 2014).

It is likely that pharmacotherapy will be indicated to relieve moderate to severe NAS signs and prevent complications such as seizures, fever, and weight loss, especially if the newborn does not respond to the non-pharmacological support (astho, 2014; Siu & Robinson, 2014). All pharmacotherapy with newborns should be undertaken with caution because it can prolong the hospital stay and may interfere with mother-newborn bonding (astho, 2014).

Pharmacological Treatment.

First-line pharmacotherapy for withdrawal from opioids in newborns is treatment with an opiate. Survey data from our country and the United Kingdom indicate that most clinicians choose to use morphine or methadone as the first-line agent, 83 percent and 94 percent respectively. Morphine

First-line pharmacotherapy for withdrawal from opioids in newborns is treatment with an opiate (Siu & Robinson, 2014).

tends to be the more frequently used of the two agents (Siu & Robinson, 2014).

Typically the use of morphine in the treatment of NAS is limited to an inpatient setting (astho, 2014; Siu & Robinson, 2014). Several oral solution concentrations of 2, 4, and 20 milligrams (mg)/milliliters (mL) are commercially available. However, these solutions require further dilution from their original dosage form to a final concentration of 0.4 mg/mL. The Institute of Safe Medication Practices (ISMP) also recommends aqueous oral solution of morphine prepared from the morphine injection dosage formulation (Siu & Robinson, 2014).

Methadone can be used and weaned after discharge from the hospital. However, outpatient dosing would require consistent follow-up and teaching for families, especially for the mother or caregiver (astho, 2014). Because of its longer half-life, 26 hours versus 8 hours with morphine, methadone requires less frequent dosing and may potentially lead to drug accumulation. Methadone 1 mg/mL oral solution does not require further dilution. Methadone oral solution concentrations are also available in 2 and 10 mg/mL. Cases of QT prolongation from the use of methadone have been reported in adults, though none have been documented in pediatric services (Siu & Robinson, 2014). Isemann, Meinzen-Derr, & Akinbi (2011) explored factors associated with favorable response to methadone therapy for NAS infants. They observed that the severity of NAS might be mitigated if methadone was titrated to the lowest effective dose during pregnancy. This finding was especially prominent for preterm newborns. Encouraging breast milk feeds, weaned gradually, were also found to be helpful.

A Vermont study showed shorter hospital stays for newborns treated with methadone, compared to morphine. Newborns treated with methadone had average hospital stays of six days while the national average for hospital stays of newborns treated with morphine was 16 days (astho, 2014).

The study further pointed to the adverse effects linked to opioid therapy, including respiratory depression, constipation, urinary retention, sedation, twitching, and hypotension (Siu & Robinson, 2014).

Buprenorphine is a more recent entry into the treatment of NAS. It is metabolized by the cytochrome P450 enzyme 3A4 to the active metabolite, norbuprenorphine. Buprenorphine is only available commercially as an injection of 300 mcg/mL and as a sublingual tablet requiring extemporaneous compounding to a final concentration of 75 mcg/mL (Siu & Robinson, 2014).

A randomized, controlled, double-blind, double-dummy, flexible-dosing study (MOTHER: Maternal Opioid Treatment: Human Experimental Research) compared buprenorphine and methadone for use in comprehensive care of 175 pregnant women with opioid dependency at several sites in the United States and one each in Canada and Austria. In addition to a focus on NAS treatment, the study addressed prevention and understanding of NAS. Results revealed significantly less morphine treatment, shorter hospital stays, and shorter duration of treatment for NAS newborns whose mothers were treated with buprenorphine compared to methadone-treated mothers (Fullerton et al., 2014; GAO, 2015; Hamdan, 2014; Jones et al., 2010). There was no difference in the need for NAS treatment in methadone- versus buprenorphine-exposed neonates. Treatment continuance, however, was lower for women in the buprenorphine group compared to the methadone group (Siu & Robinson, 2014). [A number of studies, randomized and nonrandomized, have been evaluated in the work by Jones et al., 2012.]

Paregoric, an anhydrous morphine available as 0.4 mg/mL, was the earliest opioid used to control NAS. However, its use as a NAS treatment is no longer recommended. Paregoric contains various potentially toxic ingredients, such as camphor, ethanol 44%, noscapine and papaverine, anise oil, benzoic acid, and glycerin (Bio et al., Siu & Robinson, 2014). Tincture of opium has also been used in the treatment of NAS. It contains fewer toxic additives than paregoric, but the solution still contains multiple narcotic alkaloids (i.e., codeine) and ethanol 19%. Tincture of opium contains opium 10 mg/mL so it requires a 25-fold dilution to produce the 0.4 mg/mL morphine equivalent. An ISMP report addresses the dangers of mistaking tincture of opium for paregoric. Failing to dilute and prepare it in a 25-fold dilution to a final concentration of 0.4 mg/mL can potentially result in dangerous medication errors. The possibility of this potential danger causes many pharmacies not to prepare diluted tincture of opium for NAS treatment (Siu & Robinson, 2014).

Adjunct pharmacotherapy in the form of phenobarbital and clonidine may be indicated for newborns exhibiting withdrawal following polydrug exposure (astho, 2014). When carefully monitored, phenobarbital therapeutic drug levels of 20 to 30 mg/dL have demonstrated effective control of NAS symptoms. It should be noted, however, that phenobarbital for the treatment of NAS also has drawbacks. For example, phenobarbital causes CNS depression, lacks relief of gastrointestinal signs, impairs suck reflex, delays bonding between mother and newborn, produces rapid tolerance to sedative effect, and possesses pharmacokinetic/pharmacodynamic properties, such as being a cytochrome P450 inducer and having a prolonged half-life (45-100 hours) (Siu & Robinson, 2014).

Clonidine ameliorates autonomic overactivity, such as restlessness, diarrhea, hypertension, diaphoresis, and tachycardia, which may lead to rebound autonomic activity if clonidine is abrupt withdrawn. Other adverse effects linked to clonidine include hypotension and metabolic acidosis. Only a few studies involving clonidine in the treatment of NAS are available and they tend to consist of very small samples. However, when clients were treated with clonidine 0.5 to 1 mcg/kg orally

every six hours for NAS, the results showed clonidine may be a reasonable alternative (Siu & Robinson, 2014).

A study of medications primarily used to treat NAS from 2004 to 2011 found variation across hospitals. It appears that the type of medication used was linked to variance in length of stay, length of treatment, and hospital charges. Moreover, only slightly more than 35 percent of the hospitals studied employed the same treatment more than 80 percent of the time. Fourteen hospitals were included in the study (GAO, 2015). Research shows the incidence of newborns needing pharmacological therapy in the treatment of NAS ranges from 60 percent to 80 percent (Siu & Robinson, 2014).

When pharmacologic treatment is necessary for newborns with NAS, settings other than hospitals might be considered. Nearly 30 percent of special newborn units in the United Kingdom discharged the babies to their homes while they were on medications, including phenobarbital and morphine. Having safety plans for discharge was critical. Australia also tested sending newborns home with

It is imperative that newborns prenatally exposed to narcotics receive careful consideration and safety plans for discharge (Kelly et al., 2011).

families, even when families might be categorized as chaotic. These newborns were hospitalized for a minimum of 48 hours prior to going home in an effort to catch any late onset NAS symptoms. Study

researchers observed a 92 percent follow-up rate and shorter lengths of treatment with morphine or phenobarbital for the babies (Kelly et al., 2011).

Other Findings.

Infants with greater birth weights may have greater stores of opiates and experience a longer period of withdrawal. This scenario further translates into longer length of stay (Bio et al., 2011).

NAS newborns treated with buprenorphine exhibited shorter lengths of stay and shorter treatment time than the morphine group (Bio et al., 2011; Jones et al., 2012).

Morphine was determined more effective than phenobarbital in reducing the length of treatment for NAS (Bio et al., 2011).

A combined inpatient/outpatient treatment study was conducted at The Ohio State University Medical Center for methadone-treated mothers and their methadone-exposed newborns. This study established community-based strategies in conjunction with inpatient care of the NAS newborns. A single dedicated physician delivered both inpatient and outpatient care to the families, providing a long-term relationship. In addition, outpatient staff assigned to the family were appropriately trained on NAS and its effects on the infant, mother, and/or other family members. Family members were also taught how to monitor and care for NAS symptoms. Results showed substantial reductions in cost of care and hospital stay (Backes et al., 2012).

Aftercare

It is imperative that newborns prenatally exposed to narcotics receive careful consideration and safety plans for discharge. At the very least, the at-risk newborns should remain in the hospital for at least 48 hours to monitor any late onset NAS symptoms. It is further possible that some newborns may be good candidates for outpatient treatment and weaning from medication (Kelly et al., 2011).

Breastfeeding of babies with NAS whose mothers participated in opioid-replacement therapy via buprenorphine or methadone is highly encouraged, especially if the mothers are not HIV-positive, not using additional drugs, and there are no other contraindications (ACOG, 2012; Kelly et al., 2011; Prasad, 2014; Thigpen & Melton, 2014). Research involving mothers on opioid-replacement therapy has sufficiently demonstrated that concentrations of buprenorphine or methadone in breast milk are low (Prasad, 2014). Research has additionally shown that neonates exposed to opioid-replacement medications have lower rates of NAS (Kelly et al., 2011). Breastfeeding by mothers on opioid-replacement therapy is supported by the American Association of Pediatrics (AAP) (Backes et al., 2012)

Breastfeeding of babies with NAS whose mothers participated in opioid-replacement therapy via buprenorphine or methadone is highly encouraged, especially if the mothers are not HIV-positive, not using additional drugs, and there are no other contraindications (ACOG, 2012, e.g.).

In the event of intoxication at birth, it may be necessary to pump and discard the first feed. However, there should be no concerns past the first pump (Kelly et al., 2011). Outcomes for breastfed newborns are positive as well. LOS is shorter and significantly fewer NAS scores have to be done (McQueen, Murphy-Oikonen, Gerlach, & Montelpare, 2011; Pritham, Paul, & Hayes, 2012). The American Association of Pediatrics (AAP) highly suggests that breastfeeding mothers that use substances be treated with methadone because of its minimal transfer into human milk, irrespective of the methadone dosage (ACOG, 2012; Backes et al., 2012).

Care at Home/After the Hospital.

It is possible that withdrawal symptoms may continue for as long as six months following the newborn's hospital stay. Below are examples of behaviors the newborn may exhibit along with calming suggestions:

Prolonged and/or high-pitched crying:

- Reduce loud noises, bright lights, excessive handling.
- Hold the baby close to your body.
- Try humming or gentle rocking (WAPC, n.d.).
- Give the baby a warm bath.
- Take the baby for a ride in the car or stroller.
- Offer the baby a pacifier. This may help satisfy your baby's need to suck. However, **never** put the pacifier on a cord or string around the baby's neck and **never** use a nipple for a pacifier (The OSU Wexner Medical Center, 2012).

Sleeplessness:

- Change to a clean, dry diaper and watch closely for rash or skin irritation. Treat as directed by your baby's health care provider.
- Feed the baby on demand and provide frequent nursing (breastfeeding).
- Reduce noise, bright lights, patting or touching the baby too much.
- Try playing soft, gentle music and/or provide gentle rocking (WAPC, n.d.).

Excessive sucking of fists:

- Avoid using lotions or creams as the baby may suck on them.
- Cover the baby's hands with mittens or soft gloves if his/her skin becomes damaged.
- Keep areas of damaged skin clean (WAPC, n.d.).

Difficult or poor feeding:

- Allow time for rest between sucking.
- Feed in quiet, calm surroundings with very little noise or disturbances.
- Feed small amounts often (WAPC, n.d.).

Sneezing, stuffy nose or breathing troubles:

- Always place the baby to sleep on his or her back.
- Avoid overdressing or wrapping baby too tightly in blankets.
- Feed the baby slowly, allowing for rest periods between feedings.
- Keep the baby in semi-sitting position, well supported and supervised.
- Keep the baby's nose and mouth clean.
- Use smaller, more frequent feedings (WAPC, n.d.).

Spitting up or vomiting:

- Burp the baby each time he/she stops sucking and after each feeding.
- Keep the baby and his/her bedding clean. Any unclean smells may increase irritability and/or irritate the baby's skin.
- Support the baby's cheeks and lower jaw to enhance sucking/swallowing efforts (WAPC, n.d.).

Hyperactivity:

- Avoid excessive handling of the baby.
- Avoid over wrapping the baby.
- Keep the baby in a quiet room (WAPC, n.d.).

In addition, the new mom should:

- Keep all appointments for the baby;
- Seek help from family/friends/other supports to care for the baby so she can get necessary breaks;
- Use available community services; and
- Consult with your health care provider, including substance abuse treatment specialist, about your progress and/or any adjustments in your treatment (WAPC, n.d.).

The East Tennessee Children’s Hospital (ETCH) Pediatric Medical Group has also identified withdrawal signs and symptoms, information on why babies experience these symptoms, and strategies that parents/caregivers can use if the symptoms occur:

Signs & Symptoms	Why Babies Have This	What Parents/Caregivers Can Do
Excessive/continuous high pitched cry	Withdrawal from drugs can make the baby very irritable. It can be very uncomfortable and sometimes painful.	Swaddle the baby, holding him or her close, or offer a pacifier.
Sleep cycle problems	Symptoms of withdrawal can make it difficult for the baby to sleep.	Newborns need sleep in between their feedings. If the baby wakes up, offer a pacifier to help the baby go back to sleep. During feeding is the best time to hold the baby.
Hyperactive Moro reflex	Moro reflex is a normal reflex for newborns. Babies experiencing withdrawal have sensitive CNSs that can cause extra abnormal movements (jerks and/or jitters) after the Moro reflex.	Come near the baby quietly. Do not speak loudly. Also use a firm, yet gentle, pressure when touching the baby. Do not stroke the baby.
Increased muscle tone	Withdrawal can make the baby stiff and hard for him or her to bend the legs and arms.	This symptom will eventually go away but it may take several weeks to disappear. Be very gentle during diaper changing.
Excoriation (skin breakdown)	When irritable during withdrawing, the babies will rub their chins, elbows, noses, cheeks, knees, and toes against sheets, blankets, or clothing.	Keep the baby swaddled. It may be helpful to place mittens on the baby’s hands to prevent him or her from scratching the face.
Myoclonic jerks (jerking or twitching of legs and/or arms)	Babies in withdrawal can have extremely sensitive CNSs which can be easily stimulated by touch and/or sound.	Come near the baby quietly. Do not speak loudly. Also use a firm, yet gentle, pressure when touching the baby. Do not stroke the baby.
Seizures	Rare but a very serious symptom of withdrawal.	Call 911 immediately.
Sweating	This is not usual for babies, but withdrawing increases metabolism which will sometimes cause them to sweat.	Do not overheat the baby. Keep him or her in light clothing or just a diaper while the baby is swaddled.
Increased temperature (hyperthermia): greater than 99 axillary (armpit)	As with sweating, withdrawing increases metabolism which may cause the baby to run a fever.	Do not overheat the baby. Keep him or her swaddled in a light blanket. Do not give any medicines to the baby without first talking to the baby’s doctor.
Frequent yawning	This is not usual for babies, but withdrawing may cause the baby to yawn often.	This symptom improves as withdrawal symptoms subside.
Mottling	This is marbled, discoloration of the skin, especially on the trunk, chest, legs, and arms.	This symptom is not harmful and can be normal for babies in withdrawal. It will go away.

Signs & Symptoms (continued)	Why Babies Have This (continued)	What Parents/Caregivers Can Do (continued)
Nasal stuffiness	Babies breathe through their nose so it can be frustrating for babies in withdrawal to get stuffed up. It is a symptom of withdrawal and does not mean they are sick.	Do not suction the nose frequently as this action can make the stuffiness worse. Suction the nose only if there is drainage.
Sneezing	Sneezing is not normal for babies and is a symptom of withdrawal.	This symptom eventually goes away as the symptoms of withdrawal subside.
Nasal flaring	Flaring of the nostrils during breathing is a sign that babies may be having a difficult time breathing.	Hold the baby upright to help him or her breathe easier.
Increased respiratory rate (breathing greater than 60 times per minute)	Breathing fast is a symptom of withdrawal. Sometimes the baby's ribs can be seen when he or she breathes. This is called "retraction".	Keep the baby calm, holding him or her upright especially after a feeding.
Excessive sucking	Sometimes babies in withdrawal will suck excessively on their hands, pacifier, or anything else that comes near their mouth.	Keep the baby calm, especially before a feeding. Wrap him or her tightly in a blanket and offer a pacifier.
Poor feeding	Sucking on a bottle may be difficult even if the baby sucks well on a pacifier.	Do not stimulate or rock the baby while bottle feeding. Keep him or her swaddled during feeding. Help pace the baby while feeding by removing the bottle at intervals and allowing him or her to choose the eating pace.
Regurgitation or vomiting	A wet burp or little spit up during or after a feeding is normal for a baby. Babies in withdrawal may spit up more than is normal. Vomiting excessively during or after a feeding is also not normal and known as feeding intolerance.	Talk to the doctor about this problem. He or she can tell you if your baby is getting enough to eat in order to gain weight. Pacing the baby while feeding may help in the meantime.
Watery or loose stools	Babies in withdrawal sometimes get upset stomachs and stomach cramps. This can cause loose, diarrhea-like stools that lead to a red, irritated bottom.	Be especially gentle when changing the baby's diaper. Use sterile water wipes and put skin barrier (i.e., diaper rash cream) on the bottom for protection, even if the bottom is not red yet.

Source: Cook, 2015.

Many of these care strategies have been put into practice in Huntington, WV. In 2013, about seven of every 1,000 babies born had a diagnosis of NAS. However, the number was 37 of every 1,000 babies for the state of West Virginia and 108 of every 1,000 babies for the large regional hospital in Huntington that served individuals within a three-hour radius. In 2014, 139 of the babies born in that hospital were diagnosed as NAS. Thus, these babies were taking up a preponderance of the

beds in the neonatal intensive care units (NICUs) and causing the hospital to turn down sick and needy babies from other hospitals (Shiffman, 2015).

With significant help, a transition from the hospital to home was born in Huntington: **Lily's Place**. This place allows babies to heal faster and their mothers to learn how to successfully parent them. Each baby is provided a room of its own. Program requirements include having the mother: 1) visit the baby six times each week; 2) help the nurses care for the baby; 3) take parenting classes; 4) learn the baby's stress cues and how to address them; 5) meet regularly with the social worker; and 6) attend her scheduled addiction recovery sessions. Enrollment in the program requires that the

(Lily's Place) Program requirements include having the mother: 1) visit the baby six times each week; 2) help the nurses care for the baby; 3) take parenting classes; 4) learn the baby's stress cues and how to address them; 5) meet regularly with the social worker; and 6) attend her scheduled addiction recovery sessions (Shiffman, 2015).

mother sign the baby over to state custody. Upon successful completion of the program, the mother gets the baby back (Shiffman, 2015).

In short, the mothers are given education and knowledge at **Lily's Place** to be able to successfully take care of

their infant at home. Upon program entry, each mother watches a video that informs her that she will not be taking home a completely normal newborn. The mother is also told that the baby will have some bad days. However, mothers are instructed on the importance of remaining calm during this period. Mothers are given "calm" strategy options, such as putting the baby in a car seat or on the floor and walking away for a few minutes to collect themselves if they find themselves becoming frustrated. Mothers are admonished to never do anything that could harm the baby, which includes not shaking the baby (Shiffman, 2015).

Alternative Terminology

NAS was initially described in the 1970s. However, clinical features and treatment of withdrawal by neonates from opioids has been deemed a specific form of NAS and recently termed neonatal opioid withdrawal syndrome (NOWS) (Sutter et al., 2014). At the time of this writing, it is unclear whether NOWS will replace the NAS terminology. This mention is included merely to point out that other terminology may be used to describe drug withdrawal of neonates, especially when exposure involves opiates.

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