

Neonatal Abstinence Syndrome: A Literature Review

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Executive Summary

Rates of neonatal abstinence syndrome (NAS) appear to be increasing in countries like the United States, England, western Australia, and Canada (Davies et al., 2016; Lisonkova et al., 2019). However, estimating the prevalence of this condition is challenging because cases are generally under-reported, there is a lack of standardized protocol for assessing NAS, there are reporting issues within the research literature, and stigma related to maternal substance use during pregnancy can deter reporting. In addition to the physical and psychosocial consequences related to NAS, there are extensive associated medical costs for mothers, infants, families, hospital units, healthcare providers, and other community resources (Patrick et al., 2012).

The existing literature on NAS has been criticized by some researchers for failing to adopt high-quality research methodology and generally not being extensive enough to provide a comprehensive understanding of this condition, including how to best assess and treat it (Conradt et al., 2018; Wachman, Schiff et al., 2018). The research literature is also problematic due to the predominant focus on opioid-related NAS. Prioritizing opioid-related NAS may largely be the result of concerns related to the opioid epidemic in countries like Canada and the United States (Gibson et al., 2019; Government of Canada, 2017a, 2017b; Haas, 2018), as well as an increase in the reported number of cases of opioid-related withdrawal symptoms among newborns (Filteau et al., 2018; Lacaze-Masmonteil et al., 2019; Lisonkova et al., 2019).

The purpose of this report is to provide a thorough description of NAS, including its correlates and effects on mothers and their infants. Information about modes of assessment and treatment options for healthcare professionals, and care guidelines for parents and caregivers is also included. The first section of this literature review summarizes information related to the development, characterization, and effects of NAS. The second section presents practices and tools for assessing NAS. The third section outlines various treatment options for NAS, including non-pharmacological and pharmacological options as well as recommendations for discharging newborns home. This section also presents and provides commentary on available guidelines for parents and caregivers of newborns with NAS. The fourth section briefly discusses primary prevention strategies for NAS aimed at mothers who use/depend on substances. The fifth/final section considers additional topics related to research on NAS, including stigma and stereotypes of mothers.

Overall, there appears to be a lack of cohesive, standardized guidelines for assessing and treating infants with NAS. However, there appears to be consensus among researchers and healthcare professionals regarding the severity of these cases, as well as the desire to decrease the rates of neonatal substance exposure and development of this condition. There are also numerous recommendations for the assessment, treatment, and prevention of NAS, much of which the research evidence strongly corroborates. Additionally, while there are numerous guidelines available online for parents and caregivers of children with NAS that seem to be in alignment with the current literature, it is unclear whether most of them are based on the most sound and up-to-date literature. As such, there may be a need to develop more current, research-informed guidelines for parents and caregivers.

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1. Introduction

Neonatal abstinence syndrome (NAS) is a condition whereby some infants exposed to particular substances (prescription, licit, or illicit) in utero experience a constellation of postnatal withdrawal symptoms shortly after birth (Haas, 2018; Harder & Murphy, 2019; Lacaze-Masmonteil et al., 2019; Lisonkova et al., 2019; Puvitharan et al., 2019; Sanlorenzo et al., 2018).¹ Increased rates of NAS have been reported in the United States, England, Western Australia, and Canada over the past decade (Lisonkova et al., 2019). Between 2003 and 2014, rates increased in Canada from 1.8 to 5.4 per 1,000 live births, with provincial incidence in 2014 ranging from 2.7 in Alberta to 9.7 in New Brunswick (Filteau et al., 2018). In Saskatchewan, incidence rates increased from 5 per 1,000 in 2003 to 8.9 per 1,000 in 2013, and then back down to 7 per 1,000 in 2014 (Filteau et al., 2018). More recently, between 2016 and 2017 (across Canada, excluding Quebec), approximately 1,850 infants were born with NAS (Canadian Institutes of Health Information [CIHI], n.d.; Lacaze-Masmonteil et al., 2019). Reports indicate that the number of infants born with NAS is increasing, but overall, cases are generally under-reported (Brogly et al., 2017; Lacaze-Masmonteil et al., 2019). Prevalence estimates can vary due to researchers not specifying which substance-related NAS they are referencing, lack of standardized assessment protocol for determining cases of NAS, and under-reporting due to stigma associated with maternal substance use during pregnancy.

Beyond the physical and psychosocial consequences related to NAS, which will be discussed later in this literature review, the medical costs of NAS place significant burdens on mothers, infants, families, hospital units, healthcare providers, and other community resources (Patrick et al., 2012). Infants born with NAS are often admitted to neonatal intensive care units (NICUs) and spend on average 15 days and up to 23 days in hospital care (Filteau et al., 2018; Hall et al., 2014; Ko et al., 2016; Lacaze-Masmonteil et al., 2019; Patrick, Burke et al., 2015). In Canada between 2010 and 2014, total NAS-related costs increased from \$15.7 to \$26.9 million CDN and mean per-patient costs rose from \$14,629 to \$17,367 CDN (Filteau et al., 2018). A similar trend has been occurring in the United States. One article reported that after adjusting for inflation, total hospital costs to treat infants with NAS not covered by Medicaid between 2004 and 2014 increased from \$65.4 million to \$462 million USD (Winkelman et al., 2018). Another article reported that associated costs per case range from \$66,700 to \$93,000 USD, depending on whether pharmacological treatment is required (Ko et al., 2016; Patrick, Davis et al., 2015).

The purpose of this report is to provide a description of NAS, including its correlates and effects on mothers and their infants, as well as to present modes of assessment and treatment options outlined in the research literature for healthcare professionals and care guidelines for parents and caregivers. However, there are two main caveats to this review:

- 1) The existing research literature has been critiqued for many reasons: low sample sizes; lack of consideration of confounding stressors and/or effects of polysubstance exposure; lack of

¹ When withdrawal symptoms are the result of in utero exposure to opioids, the condition is called neonatal opioid withdrawal syndrome (NOWS) (Harder & Murphy, 2019).

appropriate comparison groups (Conradt et al., 2018); uncontrolled study designs; use of single-point or retrospective data; and lack of randomization (Wachman, Schiff et al., 2018).² Additionally, there is some debate regarding how best to characterize infants exposed to substances who do not meet the diagnosis criteria for NAS and/or do not require pharmacologic treatment (Wachman, Schiff et al., 2018). As such, there is a need for improving NAS-related research and improving the overall understanding of the underlying mechanisms of in utero exposure to substances that can lead with neonatal withdrawal.

- 2) Most reports use the “umbrella” term NAS, but do not always make it clear which NAS-inducing substance they are discussing. For example, research may discuss NAS, which may be taken as an indication that they are talking about infant withdrawal more generally, when in fact they focus solely on the effects of in utero opioid exposure (i.e., NOWS). Concerns regarding the opioid epidemic in Canada and the United States have seemingly resulted in an increased trend of researchers examining the effects of in utero exposure to opioids more so than any other substance. As such, efforts have been made in this report to clarify the literature when possible.

The first section of this literature review summarizes information related to the development, characterization, and effects of NAS. The second section presents practices and tools for assessing NAS. The third section outlines various treatment options for NAS, including non-pharmacological and pharmacological options as well as recommendations for discharging infants home. This section also presents and provides commentary on available guidelines for parents and caregivers of infants with NAS. The fourth section briefly discusses primary prevention strategies for NAS aimed at mothers who use/depend on substances. The fifth/final section considers additional topics related to research on NAS, including stigma and stereotypes of mothers.³

2. Development, Characterization, and Effects of NAS

2.1 How does an infant develop NAS?

The development of NAS can result from in utero exposure to substances such as alcohol, barbiturates, caffeine, nicotine, benzodiazepines, and selective serotonin reuptake inhibitors⁴ (Hudak & Tan, 2012; Puvitharan et al., 2019), often in the context of polysubstance use (Brandt & Finnegan, 2017). However, NAS is most commonly discussed as the result of in utero exposure

² Other critiques include: not accounting for concurrent non-pharmacologic care measures while analyzing pharmacologic interventions; variability in length of opioid treatment; variability in length of hospital stay; use of NAS scoring tools with poor internal consistency; only including late preterm or term infants in studies; and only examining intermediate outcomes and not adequately accounting for important maternal sociodemographic factors, addiction severity, and psychiatric comorbidities (Wachman, Schiff et al., 2018).

³ Where possible, inclusive, gender-neutral language has been adopted to reflect the fact that cis-gender women, transgender men (biological females who transition to a male gender expression), and gender non-binary individuals all have the potential to be pregnant. However, much of the literature on NAS focuses on cis-gender women. As such, for the sake of congruency, the terms “women” and “mothers” are primarily used.

⁴ The Regina Qu'Appelle Health Region (2016) reported that the following substances are associated with the development of NAS: codeine, Tylenol 1, 2, 3 (contains codeine), fentanyl, heroin, methadone, morphine, hydromorphone, oxycodone, cocaine, pentazocine, propoxyphene, barbiturates, amphetamines, diazepam (Valium), lorazepam (Ativan), diphenhydramine (Benadryl), alcohol, cannabis, nicotine, SSRIs (fluoxetine, paroxetine, sertraline, citalopram), caffeine, and chlordiazepoxide.

to opioids (Behnke & Smith, 2013; Lisonkova et al., 2019). Opioids are a class of drug used primarily for pain relief/management that include synthetic opioids, which produce the same effects as drugs naturally derived from the opium poppy and opiates (American College of Obstetricians and Gynecologists [ACOG], 2017; Coyle et al., 2018; Finnegan, 2013). Opioids are often distinguished as either “street drugs” like heroin or fentanyl; prescription pain relievers like oxycodone, hydrocodone, codeine, and morphine; or opioid-dependence treatment medications like methadone and buprenorphine (Brandt & Finnegan, 2017; Conratt et al., 2018; Harder & Murphy, 2019; Reddy et al., 2017).

Most current research seems to focus on opioid-related NAS due to the high availability and uptake of opioids (largely prescribed) in westernized countries like Canada, the United States, England, and Australia (Coyle et al., 2018; Ryan et al., 2019; Wu & Carre, 2018). There are also concerns regarding the “opioid epidemic” (Gibson et al., 2019; Haas, 2018), as well as the rise in opioid-related morbidities and mortalities (Government of Canada, 2017a, 2017b). Overall, research suggests that rates of licit/prescribed and illicit/street opioid use during pregnancy has been increasing (ACOG, 2017; Cook et al., 2017; Forray, 2016; Hensley et al., 2018; McQueen & Murphy-Oikonen, 2016). Accompanying this, there is a reported increase in cases of opioid-related development of withdrawal symptoms among infants (Filteau et al., 2018; Lacaze-Masmonteil et al., 2019; Lisonkova et al., 2019).

Reports vary, but anywhere from 50% to 75% (Casper & Arbour, 2014), 48% to 94% (Osborn et al., 2010), and 60% to 80% of infants exposed to opioids in utero will develop opioid-related NAS (Patrick et al., 2012). In general, it is challenging for clinicians to be certain that an infant exposed to a substance will develop NAS, largely because factors related to development of symptoms and severity are not well-defined (Sanlorenzo et al., 2018). There is some evidence of the relationship of development and severity of NAS to specific genes (i.e., those related to opioid addiction such as mu-opioid receptor [OPRM1], multidrug resistance [ABCB1], and catechol-o-methyltransferase [COMT]) (Sanlorenzo et al., 2018), as well as in utero polysubstance exposure (e.g., anti-depressants, benzodiazepines, and gabapentin) (Huybrechts et al., 2017; Wachman et al., 2013). In addition, compared to full-term infants, preterm infants have been found to be at a lower risk for developing NAS (Ruwanpathirana et al., 2015). This is presumably due to shorter in utero exposure time, decreased placental transmission, inability to fully excrete drugs by immature kidneys and liver, minimal fat stores leading to lower substance deposition and activity, and limited capacity to express classic NAS symptoms by an immature brain (Hudak & Tan, 2012).

Understanding of potential sex differences related to the development and expression of NAS is low, largely due to the design of studies (e.g., insufficient sample sizes, low statistical power) (Conratt et al., 2018). However, Jansson et al. (2007) found that male infants showed more symptoms of opioid-related NAS, expressed more severe symptoms, and were more likely to need pharmacological treatment compared to female infants. A more recent study reported that male infants were more likely to be diagnosed with opioid-related NAS compared to female

infants, but sex differences in severity of opioid-related NAS was not found (Charles et al., 2017). Overall, more research is required related to sex differences in the development and presentation of NAS.

2.2 How is NAS characterized?

NAS is defined predominantly by signs and symptoms of withdrawal in an infant following in utero maternal drug exposure (Mangat et al., 2019). More specifically, it is characterized mainly by hyperactivity of the central autonomic nervous system (CNS), autonomic nervous system (ANS), and gastrointestinal tract (Finnegan, 2013; Hudak & Tan, 2012; Sanlorenzo et al., 2018; Wachman, Grossman et al., 2018). Symptoms of NAS can include:

- decreased sleep, tremors, seizures, increased muscle tone, sweating, fever, irritability, gastrointestinal dysfunction (loose/watery stools, vomiting) (Ainsworth, 2014; Hudak & Tan, 2012; Stover & Davis, 2015)
- poor sleep patterns, feeding difficulties, nutrition deficits, low weight gain (Lacaze-Masmonteil et al., 2019)
- high-pitched crying, inability to be consoled, reduced brain volume, increased risk of sudden infant death syndrome (SIDS) (Ko et al., 2016)
- hyperactive Moro reflex, excoriation (i.e., skin picking), frequent yawning, mottling (i.e., blotchy skin colouring), nasal stuffiness, sneezing, nasal flaring, increased respiratory rate, and excessive sucking (Lacaze-Masmonteil et al., 2019)

Signs and symptoms of withdrawal can present within 24 to 75 hours of life (Lacaze-Masmonteil et al., 2019; Lisonkova et al., 2019), but often do not emerge until 5 to 7 days after birth when most infants are already discharged from hospital and are at home (Lacaze-Masmonteil et al., 2019; Patrick & Schiff, 2017; Stover & Davis, 2015). At the current time it is generally thought that presentation of withdrawal symptoms can depend on the type of substance exposure (including polysubstance use); the frequency, dose, and timing of last exposure; gestational age; and maternal metabolism (Lacaze-Masmonteil et al., 2019). It is also thought that depending on timing and duration of exposure in utero, exposure substance(s), and withdrawal treatment type, symptoms of withdrawal can last from weeks to months (Maguire et al., 2016). Overall, the current research on the specific effects of each of these contributing factors is unclear.

There is some evidence that exposure to substances such as nicotine and SSRIs can result in mild and transient withdrawal symptoms, while exposure to substances like cocaine can result in what are called toxidromes (i.e., combinations of specific signs and symptoms reflecting drug class effects on particular neuroreceptors) (Food and Drug Administration [FDA], 2016). More specific and severe withdrawal symptoms are often associated with prolonged in utero exposure to opioids (FDA, 2016). Further, polysubstance exposure of certain substances (e.g., antidepressants, benzodiazepines, and gabapentin) has been shown to increase the risk of developing NAS by 30% to 60% (Huybrechts et al., 2017), and often results in a wider range of symptoms (Clearly et al., 2010).

Secondary conditions associated with NAS include tachypnea (i.e., abnormal, rapid breathing), meconium aspiration (i.e., feces breathed into the lungs), respiratory distress (i.e., fluid in the lungs), jaundice (i.e., yellowing of skin and white in eyes from liver issues), and sepsis (i.e., imbalanced responses to chemicals that fight infection in the body) (Patrick, Davis et al., 2015). Increasing evidence has also found that prenatal exposure to opioids, specifically, can lead to development of adverse infant visual outcomes (Coyle et al., 2018). Reported outcomes include nystagmus (involuntary eye movement), strabismus (abnormal alignment of the eyes), reduced visual acuity, delayed visual maturation, impaired voluntary eye movements, and absent binocular vision (Gupta et al., 2011; Hamilton et al., 2010; McGlone et al., 2013; Myerscough & Reddy, 2013; Patrick, Davis et al., 2015). In addition to the development of withdrawal symptoms, infants exposed to substances such as opioids are at risk for being born prematurely (<37 weeks gestation) and having a lower birth weight (<2500g) (Fill et al., 2018).

2.3 What are the potential long-term effects of NAS?

Reports on the longer-term effects of NAS rarely parse out the different substances that can lead to the development of this condition. Most of the current studies focus specifically on the potential long-term effects of opioid exposure.

Studies related to behavioural outcomes in infants with NAS are relatively sparse (Harder & Murphy, 2019). The available evidence suggests that compared to infants without NAS who are the same age, infants with opioid-related NAS tend to have higher negative affect, lower self-regulation (Bakhireva et al., 2019), less interest in activities, and less involvement with those around them (Konijnenberg et al., 2016). Infants with opioid-related NAS also tend to be rated higher on “sensation seeking” (i.e., more likely to search for additional sensory stimulation via oral [biting/mouthing] or physical [touching] means) (Harder & Murphy, 2019). There is evidence that children born with opioid-related NAS are at risk for having lower cognitive and motor performance scores in early childhood (Baldacchino et al., 2015; Hunt et al., 2008), including being more likely to be diagnosed with learning disabilities later in life (e.g., developmental delays, speech/language disorders) than children who are similar in age, sex, race/ethnicity, and birth region (Fill et al., 2018; Maguire et al., 2016).

3. Assessment of NAS

In general, there is a lack of standardization for assessing NAS in infants (Patrick et al., 2014). A variety of assessment tools are available for use, but recommendations on which is most appropriate have recently shifted as will be elaborated on below.

3.1 NAS assessment tools

Shortly after birth, toxicology screening through urine, hair, meconium, or umbilical cord sampling can be completed to identify infant exposure to opioids and other substances (Lacaze-Masmonteil et al., 2019; McQueen & Murphy-Oikonen, 2016). Due to cost, ethical issues, and legal issues (including validity and reliability of testing, obtaining maternal consent for testing,

and securing knowledge of who will have access to the results), toxicology screens are not universally completed (Levy et al., 2014). In Canada, these types of screens are done only if a mother discloses using substances like opioids (Haas, 2018).

Some researchers recommend the use of a scoring system to measure the severity of withdrawal symptoms and to determine whether additional monitoring, nursing, medical, and pharmacological therapy are required (Newnam, 2014). There are several guidelines and tools available for the assessment of NAS symptoms in infants (e.g., Finnegan, 1986; Lipsitz, 1975; Ostrea, 1993; Zahorodny et al., 1998). The original and modified versions of the Finnegan Neonatal Abstinence Scoring System (FNASS; Finnegan et al., 1975) is cited as the most commonly used assessment tool (Coyle et al., 2018; Sanlorenzo et al., 2018; Wachman, Grossman et al., 2018). The FNASS assigns a score to 21 “cue-related”, subjective clinical signs and symptoms of NAS to determine the severity of the condition, which then guides pharmacological treatment, specifically (Coyle et al., 2018; Grisham et al., 2019; Orlando, 2014; Sanlorenzo et al., 2018). Assessment and scoring is meant to take place every four hours, and signs/symptoms that are strongly related to adverse outcomes receive the highest score (Orlando, 2014). Further, scoring is meant to be dynamic (i.e., in the moment) and observations should include even behaviours such as yawning or sneezing (Orlando, 2014). It is recommended that infants with a score of eight or higher on three consecutive assessments receive pharmacological treatment (Orlando, 2014). It is important that multiple rounds of scoring take place and for more than one healthcare professional to complete scoring with this tool to ensure inter-observer reliability (Orlando, 2014). D’Apolito and Finnegan (2010) published a manual and DVD for educational purposes on how to ensure inter-observer reliability with this tool.

Overall, while the FNASS has been validated and shown to be useful in improving outcomes for infants with NAS (Hudak & Tan, 2012), it has been criticized for only being validated in term and late preterm, opiate-exposed infants (Ruwanpathirana et al., 2015). It has also been criticized for not assessing how symptoms affect the functionality of the newborn (Grisham et al., 2019). The need for extensive training on using the tool, as well as the length and complexity of the tool, may be considered barriers to using it routinely (Grisham et al., 2019; Orlando, 2014). It has also been criticized for leading to the treatment of infants as numbers and not as patients (Grossman, Osborn et al., 2017).

A more recent approach developed by Grossman and colleagues (Grossman, Berkwitt et al., 2017) called Eat, Sleep, Console (ESC) is a functional scoring tool (as opposed to a cue-related tool). It uses three parameters for the clinical assessment of NAS: the infant’s ability to eat, to sleep, and to be consoled. These behaviours/functions are assessed because they are indicative of the infant’s ability or inability to perform activities of daily living and their experience of withdrawal symptoms (Grisham et al., 2019). The following guidelines are used to evaluate an infant:

- A newborn should eat an appropriate amount based on days of age. For a newborn that is 1 to 2 days old, they require at most an ounce of breast milk or formula per feeding, whereas those who are 3 days old should have an ounce or more per feeding.
- A newborn should sleep undisturbed alone or while being held for at least 1 hour.
- A newborn should be consolable within 10 minutes. If not, they may require further non-pharmacologic interventions, a second caregiver making attempts to console, or eventually, pharmacologic treatment (Grisham et al., 2019).

The ESC approach has been shown to be effective in reducing the use of postnatal opioid treatments (Grisham et al., 2019; Sanlorenzo et al., 2018). Other reported benefits include decreased length of hospital stay, decreased cost, simplified assessment, and prioritizing the family in the treatment process (Grisham et al., 2019; Wachman, Grossman et al., 2018). However, further standardization and validation of this approach, as well as correlation with long-term outcomes, is recommended (Wachman, Grossman et al., 2018).

Isemann et al. (2017) also developed a “symptoms only tool” for predicting the need for pharmacologic treatment for NAS. The three main symptoms the tool is used to assess include increased muscle tone, tremors when disturbed, and excoriation (i.e., urge to pick at skin) (Isemann et al., 2017). Pupillary response (Heil et al., 2012) and skin conductance (Schubach et al., 2016) have also been proposed as complements to observer-rated NAS scores and useful as diagnostic parameters of NAS severity and treatment response. Further research regarding these approaches has been recommended (Brandt & Finnegan, 2017).

Overall, improved education for nurses and other healthcare professionals in identifying signs and symptoms of NAS (including exposure to substances and withdrawal symptoms) and appropriate management of infants with NAS is recommended (Brandt & Finnegan, 2017; Haas, 2018). Many healthcare professionals have also expressed concern regarding a lack of Indigenous-informed and culturally responsive practices (Brandt & Finnegan, 2017).⁵

3.2 Recommended protocols for screening mothers of infants with NAS

In order to identify infants with or at-risk for NAS, it is essential to identify and treat individuals who are pregnant or may become pregnant and also use substances problematically or have a substance use disorder (Coyle et al., 2018). Universal drug testing of mothers and potential mothers has been recommended as a strategy to determine infants at-risk for NAS (ACOG, 2017; Haas, 2018). Despite the potential for improving identification of at-risk infants, this proposed strategy raises ethical and social considerations such as the need for consent, handling of sensitive data, and the issue of false positive results (ACOG, 2012; Brandt & Finnegan, 2017). Positive results may also lead to legal consequences for mothers, including child apprehension (Coyle et al., 2018). Therefore, it has been suggested that such a strategy should only be used

⁵ Specific definitions and guidelines regarding Indigenous-informed and culturally responsive NAS-specific care practices were not found.

if a positive urine test is taken only to be indicative of recent substance use (Coyle et al., 2018). The potential legal consequences of universal drug testing may result in pregnant women avoiding prenatal care and attempting to deliver outside of the hospital environment (Stone, 2015). Therefore, researchers have suggested that universal testing without adequate protection of women's legal and social rights can have negative effects on both maternal and child health (Price et al., 2018).

Universal maternal screening has also been proposed as a means for improving the identification of infants who may be at risk for the development of NAS (ACOG, 2017; Nikoo et al., 2017; Wexelblatt et al., 2015). Screening, or a brief intervention, differs from testing in that it does not involve acquiring and testing urine samples and instead involves implementing a brief standardized interview or questionnaire (Coyle et al., 2018). Screening can be as simple as engaging a patient in a brief, non-judgemental conversation about past and current alcohol use, illicit substance use, and prescription drug use using a validated screening tool, such as the "4Ps – Parents, Partner, Past, Present" (Pryor et al., 2017). Education, support for changing behaviour, and referrals for assessment and treatment should also be provided when required (ACOG, 2017; Nikoo et al., 2017; Wright et al., 2016). Patients should also be assured that disclosure of substance use will be kept confidential as long as it is within the confines of the law (Pryor et al., 2017).⁶ This approach would require open dialogue between healthcare providers and individuals who use substances who are or plan to become pregnant (Haas, 2018). The American College of Obstetricians and Gynecologists (ACOG), for example, recommends that screening occur for all individuals who are or plan to become pregnant, regardless of age, race, ethnicity, or socioeconomic status (Patrick & Schiff, 2017). However, some physicians have cited concerns around universal screening, including fear that a patient will leave their practice, personal bias as to who might use substances, and lack of knowledge of appropriate referral mechanisms (Coyle et al., 2018). If universal screening were to be employed, the use of a validated screening instrument along with a non-punitive, supportive treatment approach is recommended (ACOG, 2017; Coyle et al., 2018).

4. Treatment Options for NAS

There is no available evidence that suggests the need for more than routine care during delivery of infants exposed to substances related to the development of NAS (Lacaze-Masmonteil et al., 2019). General treatment protocols for infants with NAS vary across healthcare settings (Gibson et al., 2019; Provincial Council for Maternal and Child Health, 2016; Sanlorenzo et al., 2018). The Canadian Paediatric Society recommends that newborns with known in utero exposure to opioids be monitored for a minimum of 72 hours (Lacaze-Masmonteil et al., 2019); four to seven days of inpatient monitoring is recommended by the American Academy of Pediatrics (Patrick & Schiff,

⁶ Healthcare professionals are required to report cases of suspected child abuse to the Ministry of Social Services, local First Nations Child and Family Services Agencies, or the police, according to Section 12 of the Child and Family Services Act (Government of Saskatchewan, 2017). Exposing children to substance abuse is considered a form of physical neglect (Government of Saskatchewan, 2017).

2017; Stover & Davis, 2015). Length of stay in hospital can depend on prenatal substance(s) exposure, severity of withdrawal, symptoms, treatment, and social factors (e.g., home and family circumstances) (Smirk et al., 2014). Treatment and observation of infants can occur in a variety of hospital settings such as newborn nurseries, inpatient pediatric wards, and NICUs (Lisonkova et al., 2019; Sanlorenzo et al., 2018). In general, treatment goals include preventing complications associated with NAS (e.g., poor sleep patterns, feeding difficulties, nutrition deficits, low weight gain) and restoring normal activities for newborns (e.g., sleep quality, sufficient feeding, weight gain, environmental adaptation, etc.) (Lacaze-Masmonteil et al., 2019).

As with the assessment of NAS, there is no clear standardization of treatment for this condition (Sanlorenzo et al., 2018). Improving understanding of which medication is best for pharmacological intervention as well as strategies for weaning is recommended (Sanlorenzo et al., 2018). In addition to pharmacological treatment options, there are a variety of non-pharmacological treatments available, both of which are discussed further below.

4.1 Pharmacological treatment options

For infants with increasingly severe withdrawal signs or consecutively high NAS scores despite supportive/non-pharmacological measures to reduce or manage symptoms, pharmacological therapy is often recommended (Lacaze-Masmonteil et al., 2019). Particularly if infants with NAS are medically unstable, they may require admission to a special care nursery or NICU for cardiorespiratory monitoring and observation while being treated with medications (Lacaze-Masmonteil et al., 2019). Once stabilized, infants can be transferred back to a care-by-parent area (e.g., rooming-in), as long as assessment, parent education, and medication weaning monitoring are ongoing; infant-mother attachment is supported; and comprehensive discharge planning can be initiated (Holmes et al., 2016). Some researchers suggest that the overall goal of intervening with pharmaceuticals should be to balance providing the least amount of medication while also improving weight gain and an infant's ability to be soothed and consoled (Coyle et al., 2018).

Relatively few studies have examined the efficacy of pharmacological treatment for NAS (Lacaze-Masmonteil et al., 2019), and the research findings from those that do exist are mixed. For infants with opioid-related NAS, pharmacological substances that have been used to decrease symptoms include morphine, methadone, phenobarbital, clonidine, and buprenorphine (Lacaze-Masmonteil et al., 2019). Morphine and methadone, both replacement opioids, are commonly administered to treat infants with opioid-related NAS (Bagley et al., 2014; Patrick et al., 2016). There is research underway on the use of phenobarbital for the treatment of opioid-related NAS (Lacaze-Masmonteil et al., 2019). Recent research suggests that the use of buprenorphine is associated with shorter length of stay in hospital (Hall et al., 2016, 2017; Kraft et al., 2008, 2017), likely because it is associated with shorter treatment duration compared to treatment with morphine (Kraft et al., 2017). A randomized controlled trial conducted by Davis and colleagues (2018) found evidence that methadone was more effective in decreasing length of hospital stay and length of drug treatment for infants with opioid-related

NAS compared to those treated with morphine. However, a recent evidence review indicated that presently there is no conclusive evidence to support the recommendation of one pharmacological treatment regimen over another (Wachman, Schiff et al., 2018).

Some guidelines regarding initial dosing, dosing increments, initiating additional treatments, and weaning have been published (e.g., Smirk et al., 2014). However, based on the results of the previously discussed evidence review, researchers have cautioned that there are areas of uncertainty regarding the treatment of infants with NAS with medications (Wachman, Schiff et al., 2018). For example, it is unclear how best to assess when to begin medication therapy, what the optimal medication treatment is (type and dosing frequency), what the best location for weaning is (outpatient vs. inpatient), and whether different treatment types are associated with different neurodevelopmental outcomes in infants (Wachman, Schiff et al., 2018).

The use of naloxone during the resuscitation of infants exposed to opioids in utero is not recommended because it has been associated with seizures in newborns (Gibbs et al., 1989), although there is a need for more current research regarding this relationship.

4.2 Non-pharmacological treatment options

There is evidence that pharmacological interventions can prolong hospitalization, disrupt mother-infant attachment, and subject an infant to medications that may not be necessary (Lacaze-Masmonteil et al., 2019). As such, many researchers and medical professionals recommend adopting non-pharmacological treatment strategies whenever possible. Generally, non-pharmacologic interventions are employed with the intention of facilitating supportive parenting behaviours and/or decreasing external stimuli that can exacerbate infant withdrawal symptoms (Maguire, 2014; Velez & Jansson, 2008). There is evidence to support the ability of non-pharmacological interventions to reduce the effects of withdrawal (Dow et al., 2012), decrease the need for pharmacological treatment, and decrease length of hospital stay (Lacaze-Masmonteil et al., 2019; Ryan et al., 2019; Wachman, Schiff et al., 2018). It is recommended that these practices be implemented as soon as possible after birth (Dow et al., 2012).

Non-pharmacological interventions include skin-to-skin contact (i.e., kangaroo care), safe swaddling (i.e., secure but not too tight), soothing, gentle waking, quiet environment, minimal stimulation, lower lighting, developmental positioning (i.e., moving the head and body in ways that promote healthy growth and development⁷), music therapy, and massage therapy (Jansson et al., 2009; Maguire, 2014). An older study regarding sleeping positions found that prone-positioned infants showed decreased NAS scores while supine-positioned infants showed increased caloric intake (Maichuk et al., 1999). Another older study examining the benefits of non-oscillating waterbeds found that use of these beds led to lower NAS scores, improved weight gain, and less need for pharmacological intervention (Oro & Dixon, 1988). However, another study found that compared to standard beds, infants with NAS who were in a rocking

⁷ Head in midline, shoulders forward, face to midline, hips toward midline, knees flexed, and feet neutral (Hallsworth, 1995).

bed showed increased withdrawal symptoms, poorer sleep patterns, and decreased neurobehavioural functioning (D’Apolito, 1999). More recently, the use of laser acupuncture was found to decrease lengths of stay and pharmacological treatment for infants with NAS (Raith et al., 2015).

The Canadian Pediatric Society published a practice point in 2019, highlighting the importance of supporting families to remain together during treatment of infants with NAS (Lacaze-Masmonteil et al., 2019). For example, the practice of “rooming-in” where mothers and their infants stay together from birth has been linked to lower NICU admissions, higher breastfeeding initiation rates, less need for pharmacological treatment, and shorter hospital stays (Hodgson & Abrahams, 2012; Holmes et al., 2016; MacMillan et al., 2018; McKnight et al., 2016). Based on the available research, a recent review recommended that when it is safe and feasible, infants with NAS should be cared for outside of a NICU, room-in with their parents, and be breastfed if there are no contraindications⁸ (Wachman, Schiff et al., 2018). However, results of a questionnaire completed by a sample of Canadian paediatricians and paediatric sub-specialists in active practice suggest that there are potential barriers to address in order to encourage rooming-in care (Puvitharan et al., 2019). Reported barriers include monitoring and evaluation concerns, insufficient nursing resources, and the need for appropriate healthcare staff education and training (Puvitharan et al., 2019). In addition, not all mothers are able to remain at the hospital (i.e., have other children to care for, have to return to work) (Coyle et al., 2018). In response to this issue, some hospitals have volunteer staff on hand to care for newborns when a parent cannot be present (Coyle et al., 2018).

The encouragement of breastfeeding is recommended as there is evidence that it can delay the onset and decrease the severity of withdrawal symptoms, and even decrease the need for pharmacological treatment (Abdel-Latif et al., 2006; Mangat et al., 2019; Wachman, Schiff et al., 2018). Breastfeeding is thought to provide optimal nutrition and encourage maternal-infant attachment (Lacaze-Masmonteil et al., 2019). There do not appear to be any concerns regarding the transfer of methadone and buprenorphine to breast milk (Jansson et al., 2016). However, there may be a need to provide extra support to mothers with a substance dependency because it has been found that they are less likely to initiate breastfeeding and more likely to stop breastfeeding early (Wachman et al., 2010). In some cases, breastfeeding cessation may relate to impaired feeding behaviours in infants with NAS (e.g., poor feeding and sucking abilities) (LaGasse et al., 2003; Maguire et al., 2015). For infants with NAS who are unable to gain enough weight through breastfeeding, supplementation with formula to increase caloric and fluid intake is recommended (MacMullen et al., 2014).

Overall, additional evidence on the efficacy of both non-pharmacologic and pharmacologic interventions for managing and treating infants with NAS is required (Maguire, 2014). It is

⁸ Contraindications for breastfeeding include maternal infection with viruses like HIV and untreated active tuberculosis that can be transferred through breast milk (Centers for Disease Control and Prevention [CDC], 2019).

recommended that a multidisciplinary approach to care be applied that involves physicians, nurses, social workers, occupational therapists, case managers, and parents (Coyle et al., 2018).

4.3 Recommendations for discharge and at-home care

Some medical and research sources have made recommendations for what to assess prior to infant discharge. For example, infants who will need to be treated with medication at home should demonstrate tolerance of medication tapering, have consistent withdrawal scores⁹, and have a clear, documented medication weaning plan in place for the primary healthcare professional and family to follow (Lacaze-Masmonteil et al., 2019). Transitions from hospital to home are more successful when continuity of care by an inter-professional team is ensured and anticipatory planning for when the infant is ready to go home is achieved (Lacaze-Masmonteil et al., 2019). There is some debate regarding the outcome of discharging infants home on medication. Some literature suggests that this action can reduce hospital length of stay and initial hospital costs (Summey et al., 2018), while others have found it can prolong the length of treatment (Maalouf et al., 2018). More research is required to understand the implications of this practice (Coyle et al., 2018).

There are limited standardized guidelines for the outpatient treatment of infants with NAS (Coyle et al., 2018). However, there are a number of recommendations for discharge planning, such as: 1) appropriate referral to a primary healthcare provider familiar with treatments for NAS, nutritional and family supportive resources, and infant neurodevelopmental assessment; 2) communication with the infant's family and primary healthcare practitioner about the discharge plan and follow-up; 3) arrange medical and social follow-up, when required and available; 4) ensure that families and/or guardians can provide a supportive and safe home environment; and 5) consider the need for and availability of community referrals such as ongoing maternal substance use treatment programs, public health services, child and youth services, community support workers, infant development programs, and parenting support groups (Coyle et al., 2018; Johnston et al., 2010; Lacaze-Masmonteil et al., 2019). As previously discussed, outpatient/home-based treatment settings are appropriate for some infants (Backes et al., 2012), and potential benefits include: decreasing length of hospital stay and associated healthcare costs, promoting infant-caretaker attachment, and increasing breastfeeding rates (Marcellus et al., 2015).

Overall, management of infants with withdrawal symptoms is dependent on the provision of appropriate medication(s) when required, using an accurate tool to measure and evaluate the severity of symptoms, creating a soothing physical environment (e.g., low lights, low sounds), and having a knowledgeable and experienced healthcare team (Lacaze-Masmonteil et al., 2019). Teams that consist of inter-professional members (i.e., those specialized in nursing, neonatal medicine, social work, pharmacy, nutrition, and community resources) are recommended for

⁹ When there are 3 consecutive scores of <8 or when the average of 2 scores or scores for 2 consecutive intervals is ≥ 12 (Provincial Council for Maternal and Child Health, 2016).

ensuring seamless management and discharge of infants with NAS (Ordean & Chisamore, 2014). Further, healthcare professionals should hold positive, non-judgemental attitudes when caring for mothers of and infants with NAS to help promote effective parent-child interactions (Fraser et al., 2007; Maguire, 2014).

4.4 Guidelines for parents and caregivers of infants with NAS

There are numerous guidelines available online for parents and caregivers regarding how to care for an infant with NAS (see Appendix). For example, Regina Qu'Appelle Health Region (2016), St. Joseph's Healthcare in Hamilton (n.d.), Health Sciences North in Sudbury (n.d.), and Kingston General Hospital (2014) each published a set of accessible guidelines for parents and caregivers. While these guidelines outline many aspects related to care (e.g., caring for an infant while in the hospital, preparing for an infant's homecoming, what to expect with hospital discharge, etc.), it is not clear whether the information provided is based on research literature (i.e., citations are missing from the document), and if so, whether the research is current and of high quality. For example, Bluewater Health in Sarnia (n.d.) published guidelines, but cited only one original research source (i.e., Hudak & Tan, 2012). Despite this, it does seem that many of the recommendations align with much of the research literature.

One set of guidelines that is research-informed, as indicated by the extensive reference list and the information provided (i.e., the information reflects the research literature), are those published by the Ministry of Children and Family Development Vancouver Region (2000, revised in 2014), in partnership with the Ministry of Children and Family Development Vancouver Coastal Health and Vancouver Aboriginal Child & Family Services Society. These accessible and comprehensive guidelines for caring for infants with NAS provide recommendations for parents and caregivers regarding:

- infant sleep (importance of sleep, sleep stages, signs of tiredness, signs of over-tiredness, normal sleep patterns, helping babies sleep, sleep positions)
- crying (normal crying behaviour, how babies comfort themselves, how to help babies comfort themselves, what to do when a baby cries a lot, comforting techniques)
- feeding (normal feeding patterns, breastfeeding importance, breastfeeding how-to, formula feeding, what to do when babies do not feed well, feeding red flags, when to introduce solid food)
- development (milestones, delays, growth, vision, hearing, speech and language, early reflexes, encouraging infant development)
- illness care (reducing risk of infection, routine practices/"universal precautions", immunizations, infectious diseases, dental care, teething, fever, caring for an ill baby, breathing difficulties, digestion issues, giving medications)
- home care (taking care of yourself as a parent/caregiver, preparing your home for the baby, safety considerations, what to expect in the first few weeks)
- community resources (online information websites, community agencies)

Table 1 outlines some of the recommendations in this parent/caregiver guideline. In general, the information included in this document relates to caring for any child, regardless of whether they have NAS. However, some of the more NAS-specific guidelines relate to watching for muscle tone and common signs of stress such as arching (extending the spine, shoulders, and legs), tremors, yawning, and hiccups.

Table 1. Sample recommendations outlined in the Ministry of Children and Family Development Vancouver Region (2014) guidelines for caring for infants with NAS

Issue	Information
Caring for babies with NAS	<p><i>Caring for babies who have been prenatally exposed to substances requires:</i></p> <ul style="list-style-type: none"> • An understanding that other than alcohol and drugs, things like the mother’s health, stress level, and nutrition impacts how a baby grows in the womb. • An understanding of the importance of preserving the parent-baby relationship, the baby’s cultural heritage, and family and community connections. • An understanding of the importance of infant attachment. • An ability to make a special connection to a baby. • An understanding about how to listen to babies and respond to their needs. • Caregiving strategies and “tools” for challenging times. • An ability to recognize problems with growth and development early on so that help can be received as soon as possible. • Knowledge about how to access community resources that assist and support caregivers and babies. • Recognizing that each individual infant is unique.
Social and emotional development	<p><i>Be aware of the baby’s history and experiences of the world and respond accordingly.</i></p> <ul style="list-style-type: none"> • When babies have experienced traumatic events (e.g., lengthy hospitalization, family violence), inconsistent caregiving, or multiple placements, they may display signs of stress and may over-respond to things around them. Be aware of triggers for the baby, such as certain sounds, smells, tastes, sensations, and environments. Help them to slowly learn to tolerate these events without stress. <p><i>Use eye contact and gentle touch whenever possible.</i></p> <ul style="list-style-type: none"> • Some babies may not want too much eye contact, or may be sensitive to holding and snuggling. Again, listen to the baby about how much and when to use eye contact and gentle touch. <p><i>Build and support healthy emotional regulation.</i></p> <ul style="list-style-type: none"> • When caregivers respond sensitively to a baby’s physical and emotional needs, they are laying the foundation for future social emotional development. Consistent and predictable daily routines (for instance routines for sleeping, feeding, playing, and bathing) help babies gain trust in their world and the people in it. <p><i>Limit the number of caregivers for the baby.</i></p> <ul style="list-style-type: none"> • Frequent changes in caregivers cause stress for babies. Try your best to use the same qualified childcare and respite providers.

Issue	Information
Infant sleep	<p><i>Helping babies sleep.</i></p> <ul style="list-style-type: none"> • Encouraging consistent bedtime and naptime routines – put your baby down in her crib as soon as she shows signs of tiredness. Routines like bath, story, and feeding may help babies settle down and learn it’s time to go to sleep. • Encouraging regular feeds during the day and using other settling methods when baby is fussy but not hungry (cuddling, activity, soothing). • Turning lights on during day (except during nap) and off at night (keep room darkened with less noise). • Placing baby to sleep in a crib in a quiet area of the home. • Encouraging self-soothing behaviours (putting baby to sleep drowsy, but awake, and allow baby to suck on hands/fist when hands are near the mouth).
Infant fussing	<p><i>Soothing strategies.</i></p> <ul style="list-style-type: none"> • Touch: massage, kissing, rocking, warm bath. • Sound: singing, humming, playing music, white noise (fan or vacuum). • Sight: mobiles, dim lights, darkness. • Motion: swings, cradles, rocking chair, going for a walk, baby carriers. • Self-soothing: letting baby fall asleep on his own can promote longer and better sleep. Babies are self-soothing when they are put down to sleep drowsy, but awake, and are allowed to suck on their hands/fist to settle themselves.

Descriptions of NAS (causes, signs and symptoms), recommendations for non-pharmacological care strategies (e.g., providing a calm and quiet environment, swaddling, skin-to-skin contact, head and body positioning), and provision of community and online resource suggestions were consistent across all of the guidelines. St. Joseph’s Healthcare in Hamilton (n.d.) and Bluewater Health in Sarnia (n.d.) specifically included information for parents about what they can do when they feel overwhelmed caring for a newborn with NAS (e.g., take breaks, rest, go for walks, talk to a support person), while the Regina Qu’Appelle Health Region (2016) provided guidelines for preparing to bring a baby home.

It is unclear whether the available guidelines identified above are truly accessible to all parents and caregivers. While they are all generally written using clear and simple language and seem to target whole families (not just mothers), it is unclear whether they would resonate with people from all sectors of society. For example, the length of the documents may be a deterrent (ranging from 12 to 104 pages), and they are written in English. It is unclear if translations are available and if so, in what languages. It is also unclear which societal groups the authors had in mind when developing the guidelines. Generally, the parent/caregiver guidelines seemed to target specific societal groups and may not appeal to a wider range of people who could have children with NAS. For example, some guidelines were written for an audience with low reading level, included kitschy clipart, and used stock photos that did not depict a wide range of families.

As such, there may be a need to adopt more culturally and socially appropriate approaches that appeal to a wider audience.

5. Primary Prevention of NAS

5.1 Treatment options for mothers who use/depend on opioids¹⁰

For individuals trying to manage their opioid use/dependence while pregnant, detoxification or medically assisted withdrawal with methadone has traditionally been the gold standard treatment (Coyle et al., 2018; Harder & Murphy, 2019). However, some evidence suggests that buprenorphine may be more appropriate (Coyle et al., 2018; Harder & Murphy, 2019). Both options may be considered harm reduction approaches as there are still potential risks associated with each as treatment for opioid use/dependence in pregnant individuals. Generally, the difference between methadone and buprenorphine on the severity scores for opioid-related NAS is unclear, as some researchers report no difference (Jones et al., 2005), while others report greater severity on average for methadone-exposed infants compared to those exposed to buprenorphine (Gaalema et al., 2012; Lemon et al., 2017). There is also evidence that infants exposed to buprenorphine in utero may require less pharmacological intervention after birth (Brogly et al., 2017; Hall et al., 2016; Jones et al., 2010; Tolia et al., 2018;) and spend less time in the hospital (Kraft et al., 2017). Despite potentially better outcomes for infants, more women reported dissatisfaction with using buprenorphine in one study and discontinued use of it (Jones et al., 2010). With respect to long-term developmental and behavioural outcomes, one longitudinal study found very little difference in outcomes at three years between methadone- and buprenorphine-exposed infants (Kaltenbach et al., 2018).

When prescribing opioids to patients, the ACOG (2017) recommends that healthcare providers: 1) ensure that opioids are necessary; 2) discuss the risk and benefits of use; 3) review treatment goals; and, 4) take a thorough history of substance use and determine whether patients have received a prior opioid prescription. In cases where patients experience chronic pain, alternative pain therapies (e.g., exercise, physical therapy, behavioural approaches) and non-opioid pharmacologic treatments can be explored rather than prescribing opioids for pain management (ACOG, 2017). Opioid agonist pharmacotherapy is also recommended for pregnant women with an opioid use disorder (ACOG, 2017). This approach is preferred compared to medically supervised withdrawal because of the high relapse rates associated with withdrawal (ACOG, 2017). However, more research is needed regarding this treatment approach (ACOG, 2017).

6. Additional Considerations

6.1 Reported characteristics of mothers of children with NAS

Based on the available research literature, women are more likely to use prescription opioids, more likely to develop dependence, less likely to seek treatment (El-Bassel & Strathdee, 2015),

¹⁰ Because most of the literature on NAS frames it as an opioid-specific issue, there is less focus on how to aid mothers who use or are dependent on other substances.

and in many regions (e.g., United States, United Kingdom) are more likely to overdose from prescription opioid use compared to men (Martins et al., 2015). Approximately 4.7 million women worldwide have been diagnosed with opioid use disorder (Coyle et al., 2018). Reported reasons that women use opioids include pain relief, self-medication for mental health, as a diet aid, and to combat exhaustion (Coyle et al., 2018). Because many pregnancies are unplanned, women may unknowingly expose a fetus to opioids (Coyle et al., 2018). Further, in the United States many women are prescribed opioids while pregnant (Bateman et al., 2014; Desai et al., 2014).

There are numerous research reports that focus on the demographic characteristics of mothers of infants with NAS. For example, a recent 2019 publication reported that mothers were “more likely to be younger, multiparous, residing in rural areas, have low residential socioeconomic status, and have pre-pregnancy diabetes mellitus and anemia” (Lisonkova et al., 2019, p. 4). These mothers were also more likely to test positive for HIV (Lisonkova et al., 2019). Samples and correlations like these may be misleading though, because certain segments of society may not be included in the research and as a result, the findings may not provide an accurate picture (Coyle et al., 2018). The reality is that women who use opioids (licit/prescription or illicit) while pregnant can represent all sectors of society (Brandt & Finnegan, 2017; Coyle et al., 2018; Finnegan, 2013).

6.2 Stigma related to mothers of children with NAS

There is an abundance of potentially stigmatizing language used to describe mothers within the research literature on infants with NAS. Examples include referring to individuals as “drug-dependent mothers” (Abdel-Latif et al., 2006), “substance misusing women” (Balain & Johnson, 2014; Davis et al., 2018), and “opioid-addicted mothers” (Brogly et al., 2017; Kocherlakota, 2014). This language is problematic because it dehumanizes people by prioritizing their use of substances over who they are as person (Canadian Centre on Substance Use and Addiction [CCSA], 2019). Beyond being hurtful and disrespectful, the use of stigmatizing language around substance use can discourage people from seeking help, affect the quality of and access to healthcare services, and affect policy around treatment accessibility (CCSA, 2019). By using person-centred language instead, the identity of a person is prioritized and separated from their use of substances (CCSA, 2019). Even the ACOG (2017) described the need for “expanded sexually transmitted infection testing” for pregnant women with an opioid use disorder. This language perpetuates the stereotype of women who use substances as being promiscuous or as people who engage in risky sexual behaviours.

Additionally, many research reports on NAS describe women as being “of childbearing age” and generally discuss pregnancy and motherhood as inevitabilities (e.g., Hudak & Tan, 2012). While there are many women who may become pregnant and use substances at the same time, not all women plan to have children. Further, many women who use substances become pregnant unintentionally, which partly explains why recommendations have been made for universal

screening. Treating all women as potential mothers (as evidenced by recommendations for universal screening) has been called pronatalistic (Heitlinger, 1991).

Finally, there is a lack of gender-inclusive language within the literature on infants with NAS. This occurs in two main ways: 1) non-binary and transgendered individuals are not considered (i.e., presumption that all mothers are binary cis-women); and 2) the role of fathers in the lives of infants with NAS is not considered.¹¹ Lack of inclusivity and failing to account for varying familial contexts can ultimately result in missed opportunities for care.

7. Conclusions

Despite the lack of cohesive, standardized guidelines for assessing and treating infants with NAS, there appears to be consensus among researchers and healthcare professionals regarding the severity of these cases, as well as the desire to decrease the rates of exposure and development of this condition. There are numerous recommendations for the assessment and treatment of NAS, much of which the research evidence strongly corroborates. Overall, management of infants with withdrawal symptoms includes the provision of appropriate medication(s) when required, correct scheduling, using an accurate tool to measure and evaluate the severity of symptoms, creating a soothing physical environment (e.g., low lights, low sounds), and having a knowledgeable and experienced healthcare team that is interdisciplinary, positive, and non-judgemental. In terms of a measurement tool, the Eat, Sleep, Console (ESC) scoring tool is recommended for assessing NAS because it has been shown to be effective in reducing the use of pharmacological treatments and is easier for health professionals to use (as opposed to the Finnegan Neonatal Abstinence Scoring System). Even though pharmacological treatments may be necessary in cases of opioid-related NAS, there are many non-pharmacologic treatment options available, which have been found to be efficacious in reducing withdrawal symptoms, decreasing the need for pharmacological treatment, and decreasing length of hospital stay. It is recommended that, whenever possible, families stay together, or room-in, and infants be breastfed when not medically contraindicated.

There are also numerous guidelines available online for parents and caregivers of infants with NAS that seem to be in alignment with the current medical research literature. In particular, these documents provide information on how to ensure children receive adequate sleep, soothing, feeding, illness care, and home care, as well as how to detect and ensure developmental milestones are reached. Further, many of the available guidelines make parents aware of who they can contact for further information and support to care for their children or themselves when they are feeling overwhelmed. However, it is unclear whether all of the available guidelines are based on the most sound and up-to-date information and if they are appropriate for a wide range of cultural and social groups. As such, there may be a need to develop more current, research-informed guidelines for parents and caregivers from multiple sectors of society, potentially reflecting the Saskatchewan context.

¹¹ No research articles specifically examining the role of fathers in the lives of children with NAS were found. The parental care guidelines for children with NAS generally referred to parents and caregivers and did not single out fathers or mothers.

Although there appears to be some consensus on issues related to assessment, prevention, and treatment of NAS, there are numerous critiques of the research literature and repeated recommendations have been made for additional, methodologically sound studies. In particular, longitudinal, randomized controlled trials (RCTs) which measure individual- and family-level outcomes are recommended (Wachman, Schiff et al., 2018). More specific research gaps include: 1) best practices for medication-assisted treatment for women who are pregnant and dependent on substances like opioids; 2) barriers to accessing treatment for substance dependence; 3) screening and diagnosis of NAS; 4) treatment of NAS (both pharmacological and non-pharmacological); and, 5) long-term effects of in utero substance exposure (Patrick, 2015). Addressing issues of stereotyping and stigma of individuals who use or depend on substances is also essential for researchers and healthcare professionals in order to provide the best care possible for mothers and their infants.

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Appendix A. Canadian Parent/Caregiver Guidelines on Caring for Infants with NAS.

Bluewater Health in Sarnia (n.d.)

Neonatal Abstinence Syndrome: A Guide for Caregivers with a Newborn Withdrawing from Drugs and Medications

<https://www.bluewaterhealth.ca/sites/default/files/NAS%20Parent%20Handbook%20-%20FINAL%20Nov12.pdf>

Health Sciences North in Sudbury (n.d.)

Neonatal Abstinence Syndrome: A Guide for Families

<https://www.hsnsudbury.ca/portalen/Portals/0/Programs-Services/FamilyChild/NEOKids/NAS%20Guide%20for%20Families.pdf>

Kingston General Hospital (2016)

Neonatal Abstinence Syndrome Clinical Practice Guidelines

<https://www.pcmch.on.ca/wp-content/uploads/2016/12/NAS-Clinical-Guideline-Update-2016Nov25.pdf>

Ministry of Children and Family Development Vancouver Region (2014)

Baby Steps: Caring for Babies with Prenatal Substance Exposure

https://www2.gov.bc.ca/assets/gov/family-and-social-supports/foster-parenting/baby_steps_caring_babies_prenatal_substance_exposure.pdf

Regina Qu'Appelle Health Region (2016)

Neonatal Abstinence Syndrome: Parent and Caregiver Guide

<http://www.rqhealth.ca/rqhr-central-files/neonatal-abstinence-syndrome-parent-and-caregiver-guide>

St. Joseph's Healthcare in Hamilton (n.d.)

Neonatal Abstinence Syndrome: A Guide for Caregivers with a Newborn Withdrawing from Drugs and Medications

<https://www.stjoes.ca/patient-education-k-o/patient-education-k-o/patient-education-k-o/neonatal-abstinence-syndrome-book.pdf>