1.0 PURPOSE:

1.1 To assess at risk infants with a standardized, objective scoring tool. This includes:
- Infants born to mothers known or suspected to have used addictive drugs, substances or alcohol during the pregnancy, especially, but not exclusively, within 72 hours prior to delivery;
- Infants with symptoms of withdrawal.

1.2 To provide guidelines for infant management and monitoring.

2.0 DEFINITIONS:

2.1 **Neonatal Abstinence Syndrome (NAS)**: is the response of infants who are withdrawing from addictive drugs or substances they were exposed to in utero.

2.2 **Neonatal Substance Exposure (NSE)**: When the neonate has been exposed in utero before birth to substances that may not cause withdrawal symptoms, but may cause adverse neurological symptoms.

3.0 GUIDELINES:

3.1 **Infant Assessment**

3.1.1 Infant assessment is a shared responsibility of the entire health care team.

3.1.2 Identify infants who are at-risk for NAS and NSE and document known maternal drug or substance use or suspicious events or behaviors on the infant's health record. See tables in Appendix A.

3.1.3 Admit all infants who were exposed to the drugs in Table 1, Appendix A, within 72 hours before birth, to the Intermediate Care Nursery (IMCN) or Neonatal Intensive Care Unit (NICU) for at least 72 hours after birth for assessment and management of NAS. Infants born to mothers with other disclosed usage are assessed for signs of NAS, discharged according to normal newborn criteria and followed up by Public Health at discharge. Initiate scoring (see 3.3) if symptoms develop.

3.1.4 Assess the infant using the Neonatal Abstinence Scoring Form (NASF), form # NS00286. Base scores on assessment over time rather than at just one point in time.

3.1.5 Determine frequency of scoring based on the following criteria:

Criteria	Frequency of Scoring
Birth to 2 h of age	Observe for clinical features & symptoms of NAS (see Appendix B)
At 2 hours of age	Calculate NAS Score – the sum of values for all symptoms observed since birth. Initial score: • 7 or less – Score every 4 h • 8 or higher – Score every 2 h **AND** *notify physician or midwife*
2 h to at least 72 h of age	Scores: • 7 or less for 24 h, score every 4 h • 7 or less for 72 h, discontinue scoring • 8 or higher at any time, score every 2 h
infants receiving medication for NAS at any time	At start of treatment, score every 2 h for at least 24 h then: Scores: • 7 or less for 24 h, score every 4 h • 7 or less for 72 h, discontinue/wean medication and score every 4 h • 7 or less for 72 h after discontinuation of medication, discontinue scoring Score 8 or higher at any time, score every 2 h **AND** *notify physician or midwife*

3.2 **Infant Management**

3.2.1 Provide supportive treatment to all high risk or symptomatic infants:
- Calm, quiet environment.
- Skin-to-skin contact /holding by parent.
- Decreased sensory stimulation as much as possible.
- Swaddling and gentle handling.
- Frequent breastfeeding or provision of expressed breast milk if available (see References).
- Frequent small feeds to ensure caloric needs, which may be high, are met.
- Consider hypercaloric formula (Enfamil 24) or supplements added to breast milk.
- IV fluids and electrolyte support as indicated.

3.2.2 *Consider* pharmacologic support if:
- Scores 8 or higher for three consecutive intervals; OR
- The average of three consecutive scores is 8 or higher.

3.2.3 Provide pharmacologic support if:
- Scores 12 or greater for two consecutive intervals;
- The average of two consecutive scores is 12 or higher.

3.2.4 Select the pharmacologic intervention based on the type of drug or substance infant was exposed to, the severity of infant's symptoms and assessment of the risks and benefits of therapy. **NOTE**: Naloxone use is contraindicated if chronic opiate use is suspected as it will precipitate acute withdrawal symptoms. Provide medications with feeds.

3.2.5 For opiate withdrawal, particularly methadone or oxycontin:
- First line treatment is morphine.
- If morphine is ineffective add clonidine or phenobarbital.
- Consider using clonidine earlier in course of NAS to reduce the duration or need for morphine.
- If these measures are insufficient, consult a pharmacist and or addiction services for additional advice.

See Appendix C for dosages and routes and further information about pharmacologic options.

3.2.6 For alcohol, caffeine or central nervous system stimulants (except cocaine) treat with Phenobarbital:
- Loading dose: 10 mg/kg/dose – may repeat in 30 minutes PRN.

- Maintenance dose started 12-24 hours after the load: 5 mg/kg/day twice a day.
- Treat for 72 hours or individualize based on description and severity of symptoms.

3.3 **Family Support**

3.3.1 Consult social worker to provide family assessment and support.

3.3.1.1 Explain to the family the "family support worker" is part of the team in caring for all infants and families. The social worker describes to the family the role of Social Work within the HSC.

3.3.2 Facilitate contact between mother and baby and encourage the family to participate in care as much as possible.

3.3.3 Provide a non-judgmental atmosphere for the family.

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5.0 RESOURCES:

5.1 Leanne Landriault, Nurse Educator, Women's Health Program

5.2 Dr. Chelsea Ruth, Assistant Medical Director, IMCN

5.3 Jarrid McKitrick, Clinical Pharmacist

5.4 Child & Women's Health Social Work Manager & Team

APPENDIX A

Potential Drugs of Abuse

Table 1:
Drugs when used within 72 hours before birth place the infant at risk for Neonatal Abstinence Syndrome.

Opioids	CNS Depressants	Hallucinogens
Morphine Codeine Heroin Hydromorphone (Dilaudid) Meperidine (Demerol) Methadone Oxycodone (Percodan) Pentazocine (Talwin)	Alcohol Barbiturates Benzodiazepines (e.g. Valium)	Inhalants ("sniff"): solvents & aerosols (glue, gasoline, paint thinner, nail polish)

Table 2:
Drugs that may cause adverse neurological symptoms but not withdrawal symptoms:

CNS Stimulants	CNS Depressants	Hallucinogens	Other
Caffeine Cocaine Methamphetamine "crystal meth", "speed" Methylphenidate (Ritalin) Phenylpropanolamine	Marijuana Hashish	Nitrites Nitrous Oxide	Nicotine (in large quantities)

High Risk or Suspicious Events or Behaviours Exhibited by Women

When addictive drugs or substances are being abused, poly-substance abuse is common. Many women will not admit to use unless asked directly. Many who do not admit to use will display suspicious behaviors or have suspicious events occur antenatally.

High Risk Indicators	**Other Indicators**
• ***Loss of custody of other children***	• Repeated injuries
• No or limited prenatal care (avoidance of prenatal care), missed appointments	• Preterm delivery; preterm labour; premature rupture of membranes or previous preterm delivery
• Signs of intoxication or altered mental state e.g. incoherent, unconscious, lethargic, combative	• Smoking cigarettes during pregnancy (smokers have a higher probability of using drugs or alcohol)
• Smell of alcohol or inhalants (solvent)*	• Second or third trimester vaginal bleeding or placental abruption
• Physical evidence of drug use e.g. track marks, abscesses, scars over veins	• Marijuana use (thought to be a harmless drug by users so they may admit to its use; however, often a stepping stone for use of other drugs)
• Signs and symptoms of withdrawal	• Numerous emergency room visits
• Previous child(ren) with Fetal Alcohol Spectrum Disorder	• Previous fetal demise, or spontaneous abortion (in combination with other suspicious behaviour)
	• Family history of substance abuse

APPENDIX B

Clinical Features & Symptom Descriptions of Neonatal Abstinence Syndrome

The clinical presentation of neonatal drug withdrawal is dependent upon the drug(s), timing and amount of the last maternal use, maternal and infant metabolism and excretion, and other less definable factors.

W	Wakefulness
I	Irritability
T	Tremulousness, Temperature instability, Tachypnea
H	Hyperactivity, High-pitched cry, Hyperacusia, Hyper-reflexia, Hypertonia
D	Diarrhea, Diaphoresis, Disorganized suck
R	Rub marks, Respiratory Distress, Rhinorrhea
A	Apnea, Autonomic dysfunction
W	Weight loss
A	Apathy, Alkalosis, Acidosis, Appetite increased or decreased
L	Lacrimation, Lassitude

Neurologic Excitability	Gastrointestinal Dysfunction	Autonomic Signs
• Tremors • Irritability • ↑wakefulness • High-pitched cry • ↑muscle tone • Hyperactive deep tendon reflexes • Exaggerated Moro reflex • Seizures • Frequent yawning and sneezing	• Poor feeding • Uncoordinated & constant sucking • Vomiting • Diarrhea • Dehydration • Poor weight gain	• ↑sweating • Nasal stuffiness • Fever • Mottling • Temperature instability

Symptom Descriptions for Neonatal Abstinence Scoring Form (NASF)	
Myoclonic Jerking OR **Generalized Convulsion** ***Call physician STAT***	With myoclonic activity, jerking will NOT stop when the limb is held. Jerking that ceases when the limb is held is a moderate to severe tremor (see below). A generalized convulsion may occur at any time, but may be preceded by myoclonic jerks.
Excessive Cry **Continuous Cry**	Cry may be high-pitched. Excessive cry: requiring more consolation than usual for an infant but is consolable. Continuous cry: not consolable, ceases only for brief periods.
Sleep < 1 hour after feeding **< 2 hours after feeding** **< 3 hours after feeding**	Do NOT score for diminished sleep if to the infant must be wakened to do the scoring. The score is assigned according only to how long the infant has slept after feeding.
Hyperactive Moro Reflex **Marked Hyperactive Moro Reflex**	Wake the infant to do this (unless there has been an extended wakeful period of 12-18 h without sleep). The Moro may be very exaggerated and occur frequently (like they are "stuck" on doing this). It is due to hyperacusia and hyperreflexia and may also be exhibited very frequently when the infant is awake.
Disturbed Tremors **Undisturbed Tremors**	First observe for tremors when the infant is <u>undisturbed.</u> If no tremors when undisturbed waken or stimulate and observe for disturbed tremors. Development of undisturbed tremors denotes a worsening, or higher level of symptoms. Score only the highest level of symptoms in this category.
Muscle Tone	Quiet the infant, if possible, before assessing tone. Tone is often increased.
Excoriation	Note areas of excoriation, especially on hands, elbows, face, knees, toes, and fingers. Increased movement from agitation will cause rub marks. Some infants will wear the skin off their fingers and thumbs with excessive sucking. Excessive rooting will cause rub marks on cheeks.
Sweating	Sweating may occur due to increased metabolism. If sweating is due to excessive bundling, no points are taken.
Temperature (Normal 36.4 to 37.2°C)	Axilla. Mild pyrexia is an early sign that heat is being produced by central nervous system disturbance causing hypertonia and tremors.
Frequent yawning **Frequent sneezing**	Significant if they occur more than 3 or 4 times during the scoring interval. Classified as an autonomic disturbance.
Mottling of the Skin **Nasal Stuffiness** **Nasal Flaring**	Oxygen consumption is increased due to increased metabolism. An increased cellular demand will cause the baby to breathe faster and possibly display other signs of respiratory distress. Also the vasomotor effects of some drugs cause respiratory distress.
Respiratory Rate > 60/minute **Respiratory Rate > 60/minute with retractions**	Quiet the infant first and count respiration for a full minute.
Excessive Sucking/Rooting	Take points for this if infant demonstrates excessive sucking or rooting. Sometimes an infant will root frequently but will not latch onto nipple or soother. Take points here for excessive eating. An infant may consume 2-3 times the usual fluid requirement to meet metabolic demand, and not gain weight.

Symptom Descriptions for Neonatal Abstinence Scoring Form (NASF)	
Poor Feeding	Score for poor suck, uncoordinated suck, or bottle feeding that takes longer than 30 minutes to complete. Often the infant does not suck vigorously or lets milk run out the side of the mouth.
Regurgitation, Projectile Vomiting	Alterations in feeding may be caused by increased metabolism, increased motor activity, increased oxygen demand and consumption, and increased or decreased GI motility.
Loose Stools, Watery Stools	Document the frequency, colour, consistency, and odour (may smell of solvent)

APPENDIX C

Pharmacologic Interventions, Dosages & Monitoring

General Principles in Pharmacotherapy of NAS:

- Refer to 3.2.2 and 3.2.3 for guidelines for when to initiate pharmacologic therapy. The dose of medication will vary with the clinical situation. For example, the infant exposed to methadone from a mother treated for chronic pain will require less intervention than in the case of mother managed for opiate addiction, possibly because of methadone dose or polysubstance exposure.
- Although treating the NAS with a medication in the same class as the causative agent is logical (e.g. lorazepam for diazepam exposure, morphine for morphine, codeine or methadone exposure), the published literature documents poor control unless the dose is escalated. Further, the duration of treatment with monotherapy is often prolonged (e.g. median durations of methadone or morphine therapy for NAS 40 days, range 10 – 100 days).
- Combination therapy is superior to monotherapy (e.g. phenobarbital plus morphine or clonidine, clonidine plus chloral hydrate, etc.).
- Titrate dose of medication to achieve treatment goals but do not increase faster than the time it takes to achieve or get close to steady state or the drug will accumulate and produce undesirable effects that will interfere with the discharge of the infant.
- Administer medications q4h (range q3-5h with feeds).
- If necessary, increase dose by 50% in each category

Drug	Initial Dose	Titrate	Monitoring, Additional Information
Chloral Hydrate PO/OG	Load: 50 mg/kg/dose x 1 dose Maintenance: 25 – 30 mg/kg/dose TID,PRN or scheduled	increase dose every 48 hours range: 25 – 50 mg/kg/dose TID, PRN or scheduled	• used in combination with clonidine TID for methadone withdrawal
Chlorpromazine PO/OG			• although a traditional agent for NAS, the long half-life of chlorpromazine makes it a less desirable agent; consider using methotrimeprazine
Clonidine PO/OG	1 - 2 microgram/kg/dose q6-8h (TID or QID)	increase by 1 microgram/kg/dose every 48 hours range: 3 – 10 micrograms/kg/24h	• may use alone or in combination with phenobarbital or chloral hydrate • excellent second or first line agent for methadone or oxycodone induced NAS

Drug	Initial Dose	Titrate	Monitoring, Additional Information
			For doses of clonidine < 10mcg/kg/day, monitor BP prior to dose and 1hr post dose: • for the first 2 doses when therapy is initiated • for 2 doses following each dosage increase For doses of clonidine > 10mcg/kg/day, monitor BP baseline and 1hr post dose **for the first 24 hours** following each dosage increase.
Lorazepam IV or PO/OG	0.05 mg/kg/dose	0.03 – 0.2 mg/kg/dose q4 – 8 h PRN or scheduled	• alternative to phenobarbital for benzodiazepine withdrawal or ethanol or caffeine intoxication
Methotrimeprazine			•
PO/OG	Load: 0.05 mg/kg/dose x 1 dose Maintenance: 0.025 mg/kg/dose q4 – 24h start with q8h therapy	increase or decrease dosing frequency based on NAS score; when scores improved for 48 hours, may switch to PRN or decrease frequency if necessary, increase by 0.025 mg/kg/dose every 48 hours range: 0.025 – 0.05 mg/kg/dose	• useful agent for SSRI/SNRI NAS • no specific data for use in opiate NAS but preferred alternative to chlorpromazine (less risk of EPS but more sedating)
IV	Mtce: 0.02 mg/kg/dose q4 – 24h		
Morphine			
PO/OG	Load: 0.1 – 0.2 mg/kg/dose q2h PRN until symptoms controlled (max. 1 mg/kg/24h) Maintenance: 0.05 – 0.1 mg/kg/dose q4-6h	↑ maintenance. dose by 0.05 mg/kg/dose every 24 hours to keep NAS score < 11 (max. 2 mg/kg/24h) range: 0.025 – 0.5 mg/kg/dose	• monitor respiratory rate q10min x 4 after each loading dose or increase in maintenance dose • risk of respiratory depression with doses ≥ 1 mg/kg/24h, especially in combination with other sedatives (e.g. phenobarbital)
IV	Load: 0.05 – 0.1 mg/kg/dose q2h PRN until symptoms con-trolled (max. 0.5	↑ maintenance. dose by 0.025 mg/kg/dose every 24 hours to keep NAS score < 11 (max. 0.2 mg/kg/dose)	• IV route useful for titration and initial control of NAS but oral therapy preferred, especially after

Drug	Initial Dose	Titrate	Monitoring, Additional Information
	mg/kg/24h) Maintenance: 0.02 – 0.05 mg/kg/dose q4-6h		loading regimen • refer to Pediatric Parenteral Drug Manual for required monitoring
IV Infusion	Load: as for IV Infusion: 0.005 – 0.03 mg/kg/h	↑ infusion dose by 0.005 mg/kg/h every 24h to control NAS Repeat load as necessary for breakthrough NAS score > 11	• uncommon route but smooth control on NAS • do not increase infusion more than every 24h to prevent drug accumulation and respiratory depression • refer to Pediatric Parenteral Drug Manual for required monitoring
Phenobarbital IV or PO/OG	Load: 20 mg/kg/dose; may administer as 10 mg/kg/dose q4h x 2 doses Maintenance: 5 mg/kg/24h divided q6 - 12h start 6 – 8 hours after load	Maintenance: 5 – 7.5 mg/kg/24h divided TID or QID Load: if need to increase maintenance. dose of phenobarbital, repeat load of 10 mg/kg/dose x 1 dose	• maintenance dose of 7.5 mg/kg/24h useful for high dose methadone exposure; alternatively use 5 mg/kg/24h divided QID in combination with higher dose of clonidine (less sedation) • If patient requires total loading doses greater than 30 mg/kg or if very sedated, consider obtaining a serum phenobarbital concentration. Target serum concentration: 30 – 50 mg/L.

Category	NAS Score	Morphine Oral Solution 1 mg/mL
O	0 – 8	no dose
I	9 - 12	0.1 mg
II	13 – 16	0.2 mg
III	17 – 20	0.3 mg
IV	21 – 24	0.35 mg
V	≥ 25	0.4 mg