MINNESOTA
NEONATAL
PHYSICIANS P.A.

UPDATED VERSION COMING SOON!

Neonatal Abstinence Syndrome 2.0

I. Admission and Monitoring:

Patients with known or suspected in utero drug exposure will room in with their mothers and receive routine newborn cares. Additionally, Finnegan Scoring will be done. Finnegan scoring should be done after a feed and diaper change when the baby is awake. The baby should not be wakened solely for Finnegan scoring. Throughout the hospitalization always consider a broad differential diagnosis including, but not limited to: sepsis, meningitis, hyperthyroidism, hypoglycemia, asphyxia. Patients need to have inpatient Finnegan scores monitored for a minimum of:

- Four days for a short acting opiate e.g. hydrocodone, oxycodone, heroin
- Five to seven days for opiate with longer half-life e.g. Methadone, Buprenorphine

II. Non-Pharmacologic Treatments:

The first line of treatment for infants at risk for NAS will be to consistently optimize non-pharmacologic therapies.

Family Involvement:

- Parents will be encourage and welcome to room in the entire stay.
- Parents are to be actively involved with all cares (feeding, holding, skin to skin time, swaddling, rocking, swaying, etc).

Environment:

- Private rooms will be used, when appropriate and available.
- Low Light and Noise Exposures will be optimized.
- Interruptions (for medical cares & by visitors) will be limited.

Feeds:

- Breast feeding will be encouraged and used as the primary nutritional source, unless contraindicated.
- On demand feeding will be provided.
- 22 cal/oz formula will be considered if metabolic demands are excessive.
- Low-Lactose Formulas will be considered if diarrhea is excessive.
- NG tube support will be considered if oral feeds skills are poor.

Comforts:

- Pacifiers, Swaddling, Holding, Rocking, Swing or Stroller Time, Therapeutic Sounds or Music will be optimized.
- Time with Volunteer Holders will be provided, as available.

III. Pharmacologic Treatment:

- Patients with scores ≤7 will receive non-pharmacologic treatment.
- Treatment will be considered for two consecutive scores ≥ 12 or three consecutive scores ≥8.
- Prior to any pharmacologic treatment, a multidisciplinary team meeting, involving (as available) parents, nurse, NNP and MD will occur. During that meeting, a review of the baby's needs, ways to improve comfort cares, a review of Finnegan scores, and an assessment of the baby's activities of daily living will be discussed.

- If it is concluded that non-pharmacologic therapies have been optimized, and medication to treat NAS is indicated,
  - PRN Morphine (0.05 mg/kg/dose PO q 3 hrs) will be provided. This can be used up to twice daily before scheduling morphine or methadone.

- Infants exposed to short-acting opiates in utero will be treated with scheduled morphine when needed.
- Infants exposed to long-acting opiates in utero will be treated with scheduled methadone when needed.
- If patient appears over-sedated, decrease next dose by 50%. Do not hold doses unless patient has apnea.

A. Morphine:

1. Starting Dose: 0.05 mg/kg/dose po q three hours or 0.03 mg/kg/dose IV q three hours
2. Escalation:
   I. If Finnegan score >8 but < 12 after two doses, increase dose by 0.025 mg/kg every three hours until scores are < eight.
   II. If Finnegan score >12, increase dose to 0.1 mg/kg/dose po every three hours
3. Maintenance:
   I. Once therapeutic (scores <8), maintain dose for 24-36 hours

B. Methadone:

1. Initial methadone dose based on Finnegan score at time treatment initiated.
2. Maximum methadone dose 0.2 mg/kg/dose
3. Starting Dose:
   a. If Finnegan score ≤12: Methadone 0.05 mg/kg/dose po every six hours.
   b. If Finnegan score >12: Methadone 0.1 mg/kg/dose po every six hours
4. Escalation:
   a. If Finnegan score >8 but < 12 after two doses, increase dose by 0.025 mg/kg every six hours until scores are < 8.
   b. If Finnegan score > 12, increase dose by 0.05 mg/kg/dose po every 6 hours
5. Maintenance:
   a. Once therapeutic (scores <8), maintain therapeutic dose for 24-36 hours.

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IV. Discharge Planning:

A. Written Social work/Child Protection Services verification for disposition of infant, i.e. family, foster care.
B. Every patient requiring pharmacologic treatment needs a referral to Early Intervention.
C. Home Health Visit after discharge. Twice/week is optimum.
D. If outpatient medication indicated it must be obtained from a Children's pharmacy. The discharging MD needs to have a conversation with the accepting primary care physician to determine who will manage/prescribe methadone (Primary care physician or Pain & Palliative Care physician). This should be documented in the chart.
E. Methadone script written for a one-week treatment course with no refills.
F. If outpatient phenobarbital required, recommend wean to off within 30 days.
G. Parent/guardian needs to have follow-up appointment scheduled with follow up physician prior to discharge order being written.

V. Rationale:

A. In a subgroup of patients treated for NAS, the treatment process is more complex and monotherapy is not as effective. Early institution of a second medication may minimize inpatient stay.
B. Compared to morphine, methadone has a higher bioavailability, longer half-life, and is metabolized by the P450 cytochrome pathway.
C. Methadone is a synthetic opioid agonist that selectively binds to the mu-receptor exerting morphine-like effects.
D. Morphine is metabolized by glucuronidation in the liver and excreted by the kidney.
E. Opioid receptor affinities are different between morphine and methadone. Morphine is specific to the mu-receptor and is metabolized more rapidly than methadone. Methadone has affinity for a broader range of receptors.
F. Methadone, as opposed to morphine, has NMDA antagonistic effects, which may explain differences in efficacy for withdrawal.

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EXAMPLE

3.0 kg baby exposed to maternal methadone. Finnegan score 15 at 8 hours of age. Started on methadone 0.1 mg/kg/dose = 0.3 mg every 6 hours on first day of life. Scores 3-7 for the next 36 hours so weaning commenced as follows

DAY OF LIFE	DOSE	NAS SCORE	WEANED? Y/N
1	0.3mg	3-7	No
2	0.3	3-7	Yes, by 10%
3	0.27	2-7	Yes, by 10%
4	0.24	3-7	No
5	0.21	2-7, 9	Yes, by 10%
6	0.21	2-6	Yes, by 10%
7	0.18	1-6	Yes, by 10%
8	0.15	2-8	Yes, by 10%
9	0.12	2-6	Yes, by 10%
10	0.09	2-6	Yes, by 10%
11	0.06	2-8, 9, 9	No
12	0.06	1-5	Yes, by 10%
13	0.03	1-5	Med DC'd
14	None	1-7	
15	None	2-4	
Patient DC'd to home			