Harley Christopher Lee

harley

4.12.12

12:41 a.m. • 5lbs. 7oz. • 18 inches

2013 Transforming Neonatal Drug Withdrawal

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There is a Problem and It’s Time for a Change Both in Maternal and Neonatal Care

OBJECTIVES

- Are there problems with present maternal and infant care?
- Describe the physical and behavioral problems of neonates exposed prenatally to substances of abuse
- Describe features of neonatal abstinence syndrome
- Delineate supportive measures for treating infants with withdrawal
- Identify medical treatments for neonates with withdrawal
- Outline outpatient care of NAS patients
- Review short and long term concern

Is There a Maternal Problem? – YES.

Any exposure of the brain, whether in-utero or extrauterine, to a neuroaffective substance, may alter the brain's function for life!!!

How Big is the Maternal Problem?

- Nationally the number of infants coded at discharge with neonatal withdrawal increased from 7,653 in 1995 to 11,937 in 2008 (Hudak & Tan, 2012)
- The rate of current drug use among the youngest and possibly the most vulnerable pregnant women was highest 16.2% for 15-17 year olds, 7.4% for 18-25 year olds, and 1.9% for 26-44 year olds (Behnke & Smith, 2013)
- Illegal drug use among pregnant women remained relatively stable from 2007-08 (5.1%) to 2009-10 (4.4%) (Behnke & Smith, 2013)
- By 2009, 77.6% of charges for NAS were attributed to state Medicaid programs (Bio et al., 2011)

YES – We Have a Problem

Some of the Common Drugs Moms Now Use that We Must Worry About in Their Babies

Summary of Effects of Prenatal Exposure

TABLE 2 Summary of Effects of Prenatal Drug Exposure

	Nicotine	Alcohol	Marijuana	Opiates	Cocaine	Methamphetamine
Short-term effects/birth outcome						
Fetal growth	Effect	Strong effect	No effect	Effect	Effect	Effect
Anomalies	No consensus on effect	Strong effect	No effect	No effect	No effect	No effect
Withdrawal	No effect	No effect	No effect	Strong effect	No effect	*
Neurobehavior	Effect	Effect	Effect	Effect	Effect	Effect
Long-term effects						
Growth	No consensus on effect	Strong effect	No effect	No effect	No consensus on effect	*
Behavior	Effect	Strong effect	Effect	Effect	Effect	*
Cognition	Effect	Strong effect	Effect	No consensus on effect	Effect	*
Language	Effect	Effect	No effect	*	Effect	*
Achievement	Effect	Strong effect	Effect	*	No consensus on effect	*

* Limited or no data available.

(Behnke & Smith, 2013)

Barbiturates / Alcohol

Commonalities

- Depressants
- Cross placenta readily
- Addictive
- Produce withdrawal

A Note About SSRI Antidepressants

Neonates whose mothers were on meds like Prozac, Effexor, etc may have withdrawal like behavior – or what is termed “neonatal maladaptation”. They usually do not have classic withdrawal symptoms but may be very irritable, jittery and have seizures or seizure like activity.

How to Solve the Maternal Problem Pregnancy

- Prenatal care – Stepp Clinic, Comp-Drug
- Drug screening
- Counseling
- Pharmaco therapy research
- Effective drug program benefits
  - Reduction drug seeking behavior
  - Decrease illicit substance abuse
  - Decrease preterm birth
  - Decrease infant mortality
- Drug treatment – methadone, suboxone
- And what benefit to the infant if different maternal medication buprenorphine/naloxone or methadone?

How to Solve the Maternal Problem Pregnancy

Neonatal outcomes following in-utero exposure to buprenorphine/naloxone or methadone

Maternal Characteristics

Characteristics	Methadone (n=83)	Buprenorphine/naloxone (n=49)	P-value
Age, years	27.1 (4.0)	26.8 (4.7)	.72
Admitted for medication stabilization	22 (27%)	30 (61%)	<.001
Maintenance dose at time of delivery(2)	93.9 (34.6)	113.6 (41.1)	.004
Smoking	60 (72%)	44 (90%)	.03
Known Hepatitis C	23 (27%)	12 (24%)	.69
Mode of delivery Vaginal Caesarian	 65 (78%) 18 (22%)	 34 (69%) 15 (31%)	.25
% drug screens positive for stabilizing med(3)	n=76 95%	n=33 97%	.03
% drug screens for illicit substances (3)	n=75 61%	n=47 91%	.08

1. Data presented as frequency (%) or mean (SD) unless otherwise indicated
2. Approximate mg of methadone (50 mg methadone~8mg buprenorphine/naloxone)
3. Number of mothers with at least one drug screen

(Gawronski, K.M. et al. - submitted for publication - AJOG verbal permission from author)

Neonatal Characteristics

Characteristics	Methadone (n=76)	Buprenorphine/naloxone (n=46)	P-value
Admitting service			
Newborn	66 (80%)	36 (73%)	.42
NICU	17 (20%)	13 (27%)	
Gender			
Female	34 (41%)	23 (47%)	.50
Male	49 (59%)	26 (53%)	
Birth weight, grams	2903 (535)	2954 (553)	.29
Gestational age, weeks	38.1 (2.0)	38.4 (2.0)	.11
Preterm birth (<37 weeks)	21 (25%)	8 (16%)	.59
Apgar 1 minute	8.5 (1.0)	8.3 (1.2)	.44
Apgar 5 minutes	8.8 (0.7)	8.7 (0.6)	.89
Required adjunctive phenobarbital	4 (5%)	3 (6%)	.71
Discharged on oral methadone	41 (49%)	24 (49%)	.85

(Gawronski, K.M. et al. - submitted for publication - AJOG verbal permission from author)

Neonatal Outcomes

	Methadone (n=83)	Buprenorphine/naloxone (n=49)	P-value
Primary Outcomes			
Inpatient oral morphine Equivalents, milligrams[2]	10.7 (8.9-13.0) n=59	7.6 (5.8-9.9) n=31	.04
Secondary Outcomes			
Received NAS treatment as an inpatient	59 (71%)	31 (63%)	.35
NAS-related LOS, days[2]	7.8 (6.5-9.4) n=59	5.7 (4.3-7.6) n=31	.03
Hospital LOS, days	7.9 (6.8-9.3)	7.9 (6.5-9.5)	.58
Total inpatient methadone cost, US dollars[2]	$68 ($53-$88) n=56	$43 ($30-$60) n=29	.01

1. Data presented as frequency (%) or geometric mean (95% confidence interval) unless otherwise indicated
2. Corresponds to analysis of log-transformed data

(Gawronski, K.M. et al. - submitted for publication - AJOG verbal permission from author)

Discussion

- Fewer neonates in the buprenorphine/naloxone group were treated for NAS, and duration of NAS treatment was shorter
- The median time to NAS onset, NAS scores, or hospital LOS were not different between groups
- Total oral morphine equivalents has yet to be evaluated
- Buprenorphine/naloxone is a safe alternative to methadone for the treatment of opioid-dependence during pregnancy

What About the Neonatal Care Problem

- There have been no improvements in NAS treatment efficiency over the past decade as measured by length of stay. But health expenditures have increased! (Hayes & Brown,2012)
- In the United States, the number of drug affected infants (including opiates) has increased 300% since the 1980s and the health care expenditures in their treatment has been estimated to be as much as 112.6 million dollars per year. (Backes et al.,2011)
- So let’s look at ways to decrease length of stay, decrease costs and get care for this implicated problem. Can they be cared for in outpatient setting? (Backes et al.,2011)

Site of Neonatal Care

- Postnatal ward (Saiki,et al., 2009)
- Well baby nursery 80% - The Ohio State University
- Neonatal intensive care unit 20%

Conditions	Neonatal abstinence syndrome	All other U.S. hospital births
Respiratory diagnosis	30.9%	8.9%
Low birth weight (less than 2500g)	19.1%	7.0%
Feeding difficulty	18.1%	2.8%
Seizure	2.3%	0.1%

Table 1 Maternal and infant demographics by time period

	Group A (2002–2005)	Group B (2006–2007)	
N	42	18	
Maternal age (years)	31 (19–40)	29.5 (19–43)	0.928
Number of cigarettes smoked[a]	6–10	6–10	0.07
Drug abuse			
Methadone alone	9 (21%)	2 (11%)	
Methadone plus other drugs[b]	19 (45%)	7 (39%)	
Drugs other than methadone[b]	14 (33%)	9 (50%)	
Antenatal care	33 (79%)	18 (100%)	0.212
Primigravid	12 (29%)	7 (39%)	0.549
Vaginal delivery	32 (76%)	13 (72%)	0.747
Gestational age (weeks)	39.1 (26–42)	39.5 (28–41)	0.119
Birth weight (kg)	2.86 (1.09–4.01)	2.91 (1.96–4.75)	0.567
Head circumference (cm)	33 (27–37)	34 (30–38.8)	0.146
Feeding			0.580
Breastfeeding	12 (29%)	4 (22%)	
Bottle feeding	25 (59%)	10 (56%)	
Bottle and breast feeding	5 (12%)	4 (22%)	
Infant discharged home with mother	25 (60%)	13 (67%)	0.264

Data are demonstrated as number (%) or median (range)

[a] The number of cigarettes smoked was recorded by the midwives as 0–5, 6–10 or 11–20

[b] Other drugs were: cocaine, heroin, amphetamines, cannabis, benzodiazapines, marijuana, morphine and other opiates

(Saiki et al., 2009)

Table 2 Neonatal outcomes by time periods

	Group A (2002–2005)	Group B (2006–2007)	*p* value
N	42	18	
Infants requiring treatment	19 (45%)	2 (11%)	0.012
Duration of treatment (days)	12.7 [0] (0–55)	7.3 [0] (0–65)	0.05
Duration of hospital stay (days)	19.8 [12.5] (3–65)	15.9 [6] (0–74)	0.012
Discharged home with mother	25 (60%)	13 (67%)	0.264

Data are demonstrated as number (%) or mean [median] (range)

(Saiki et al., 2009)

Table 2 Neonatal outcomes

	Traditional	*Combined*	P-*value*
Infants no.[a]	75	46	
Gestational age (weeks)	37 ± 3[b]	38 ± 2	NS
34–36 weeks gestation no. (%)	26 (34)	14 (31)	NS
⩾37 weeks gestation no. (%)	49 (66)	30 (69)	NS
Males no. (%)	33 (44)	20 (43)	NS
Birth weight (g)	2677 ± 580	2858 ± 426	NS
Discharge weight (g)	3156 ± 634	3012 ± 470	NS
Breastfeeding no. (%)	6 (8)	11 (24)	<0.01
Highest NAS score	13 ± 3	13 ± 4	NS
Peak NAS score (day)	3 ± 2	3 ± 3	NS
Hospital stay (days)	25 ± 15	13 ± 5	<0.01
Methadone treatment (days)	21 ± 14	37 ± 20	<0.01
Cumulative methadone dose (mg/kg)	3.1 ± 5	3.6 ± 3	NS
Patients also on phenobarbital no. (%)	18 (24)	13 (28)	NS
Phenobarbital treatment (day)	14 ± 11	19 ± 14	NS

Abbreviation: NAS, neonatal abstinence syndrome.
[a]Number.
[b]Mean ± s.d.

(Backes et al., 2011)

Neonatal Abstinence Syndrome

Differential Diagnosis

- Hypoglycemia
- Hypocalcemia
- Hypomagnesemia
- Hyponatremia
- CNS insult

- All must be considered and evaluated

Clinical Presentation

- Withdrawal from narcotics may be present at birth but more often do not peak for 2-3 days
- Symptoms may not appear for 10-14 days
- Opiate withdrawal may persist for 4-6 months with peak symptoms at 6 weeks of life
- Abnormal reflexes can persist for 7-8 months

Clinical Signs of Neonatal Abstinence Syndrome

Neurologic Signs

- Hypertonia
- Tremors
- Hyperreflexia
- Irritability and restlessness
- High-pitched cry
- Sleep disturbances
- Seizures

Automatic system dysfunction

- Yawning
- Nasal stuffiness
- Sweating
- Sneezing
- Low-grade fever
- Skin mottling

(Jansson & Velez, 2011)

Clinical Signs of Neonatal Abstinence Syndrome

Gastrointestinal abnormalities

- Diarrhea
- Vomiting
- Poor feeding
- Regurgitation
- Dysmature swallowing
- Failure to thrive

Respiratory signs

- Tachypnea
- Increased apnea

Miscellaneous

- Skin Excoriation
- Neurobehavioral anomalies

(Jansson & Velez, 2011)

Neonatal Abstinence Scoring

- Designed for opiate withdrawal
- Not applicable for exposure to other substances such as cocaine, methamphetamines, marijuana, SSRIs
- Once treatment is started, titrate to effect with each dose
- Usual goal is consistent scores <8- but depends on constellation of symptoms

Neonatal Abstinence Scoring

- Scoring tries to take somewhat subjective signs and symptoms and make them more objective
- Use variability - need to train nurses
- High pitched cry is common sign of true withdrawal
- Scoring systems
  - Assessment tools
    - Lipsit
    - Neonatal Withdrawal Inventory
    - Neonatal Narcotic Withdrawal Index
    - Finnegan

Supportive Non-Pharmacological Intervention

- This is a cornerstone in the management of NAS
- Supportive care should be started at birth and continued throughout the infant's hospitalization
- Up to 30% of infants may be managed without medication

Supportive Care Includes

- Dimly lit, quiet environment to decrease sensory stimulation
- Swaddling, rocking, swinging
- Pacifier for excessive sucking
- Positioning to reduce spitting or vomiting
- Frequent diaper changes for loose and frequent stools
- Special formula
- Medication for diaper rashes and colic
- Breastfeeding

Pharmacologic Therapy Guidelines

- Drug therapy should be individualized based upon the severity of the withdrawal and most importantly, on the infant's specific drug exposure
- An abstinence scoring method should be initiated within 2-4 hours of birth in all infants exposed to methadone or other known substances of abuse and in any infant suspected of having significant exposure to drugs of abuse
- Infants without significant sign/symptoms of withdrawal (Finnegan scores ≤ 7) do not require therapy, despite the mother's history

(Hudak & Tan, 2012)

Pharmacologic Therapy Guidelines

- Pharmacologic treatment of withdrawal is indicated when, despite maximal supportive care, the average of 3 consecutive scores are ≥ 8 or 2 consecutive scores are > 12
- Treatment of non-opiate withdrawal with opiates is contraindicated
- Medications should be started within 2-4 hours after infant has met criteria for pharmacologic intervention. The more severe the abstinence, the greater the need to start medications as soon as possible. Delay in treatment is associated with increased infant mortality
- Vomiting and diarrhea associated with dehydration due to narcotic withdrawal are indications for treatment even in the absence of high abstinence scores

(Hudak & Tan, 2012)

What Drugs May Be Used – Specific Pharmacologic Therapy

- Methadone
- Oral morphine
- Phenobarbital
- Clonidine – over sedation
- Chlorpromazine – ½ life – 3 days
- Diazepam – ½ life – 4 weeks
- Paregoric
- Diluted tincture of opium
- Chloral hydrate
- Buprenorphine (Suboxone)
- Subutex – Suboxone without Naloxone (Ativan)

(Bio et al., 2011)

Methadone

Consider

- Initiate or consider if indicated drug therapy of Methadone for maternal Methadone daily dosage of = or >80 mg

Dose

- IV and PO preparations available (concentration 1mg/1ml)
- Longer duration of therapy
- Methadone will be the initial drug of choice in the treatment of opioid withdrawal. The IV dose is ½ of the oral dose (IV therapy for NSCU infants only)
- Methadone suggested dosing: 0.05 mg – 0.2 mg/kg/dose ordered every 8-12 hours orally with initial dose suggested 0.1 mg/kg/dose every 12 hours

Methadone

Dose

- Consider increasing the dose after the following:
  - NAS score ≥8 on 3 consecutive occasions; in combination with weight loss, feeding difficulties, or excoriation of the skin
  - NAS score ≥12 on 2 consecutive occasions; in combination with weight loss, feeding difficulties, or excoriation of the skin
  - Increase dose 0.02 mg/kg every 1-2 days and increase duration to every 6-8 hours as needed

Methadone

Wean

- Reduce Methadone by 20-25% every 1-2 days as long as goals of therapy achieved. Discharge goal is medically stable at 0.04 – 0.05 mg/kg/dose of Methadone every 8-12 hours with further weaning and prescriptions through NCH abstinence clinic.
- Alternate weaning plan based on scores, feeding, stool pattern and weight gain

Phenobarbital

Consider

- Drug of choice for non-opiate withdrawal
- Suppresses agitation well
- Phenobarbital level should be followed as clinically indicated
- Has no effort on diarrhea or other GI symptoms
- High doses may cause significant sedation and interfere with bonding and sucking
- Has a long half life
- Has not prevented seizures due to opiate withdrawal

Phenobarbital

Dose

- Phenobarbital is suggested as a second drug to control withdrawal symptoms
- Suggested dosing 15 mg/kg loading dose then 2.5 - 5 mg/kg/dose every 12 hours or every 24 hours orally as maintenance dose
- Phenobarbital alone may be considered for poly-substance or non-narcotic withdrawal (benzodiazepines, sedatives, alcohol, barbiturates)

Wean

- Once off Methadone then continue Phenobarbital at 2.5 mg/kg/dose bid x1 week then 2.5 mg/kg/dose x1 week then discontinue if stable

Goals of Therapy

- Average NAS scores <8
- Stable feedings with weight gain
- Established sleep and feeding schedules every 3 hours
- Avoid adverse drug reaction – lethargy, sedation, impaired ability to feed
- Consider early discharge if appropriate criteria

Weaning – Hospital

Methadone or Methadone and Phenobarbital

- Reduce Methadone by 20% - 25% every 1-2 days if goals of therapy achieved
- Discharge goal is medically stable at 0.04 - 0.05 mg/kg/dose of Methadone every 8-12 hours with further weaning and prescriptions through the NAS clinic
- If Phenobarbital is used as sole medication:
  - Wean Phenobarbital by 25% every 3 days
  - Stop Phenobarbital dosing at 2.5 mg/kg/day
  - Weaning based on scores, feeding, stool patterns and weight gain

Worries???? Ongoing!!!!

Neonatal

- NAS
- Poor feeding
- Jaundice
- PPHN
- Sepsis
- Seizures
- Malabsorption
- IUGR
- Brain – atrophy, HIE
- Hepatitis B, C exposure
- Late onset drug withdrawal post discharge and readmission

(Behnke & Smith, 2013)
(Kandall & Gartner, 1974)

Outpatient NAS Programs

1. Methadone Guideline: 4/1/08-7/4/10 – 154 infants, 95 treated (61%)
   - Discharged to local pediatricians
   - Discharged on home monitors
   - Methadone weaned 10% at 1-2 week intervals
   - 93% (89) discharged on methadone with average length of stay 13 days (6-42)

(Napolitano et al., 2013)

Outpatient NAS Programs

2. Primary Pediatricians - Concerns
   - Poor parent compliance
   - Lack of NAS scoring consistency
   - Methadone administration by caregivers
   - Difficulty weaning methadone
   - No pharmacies available for methadone prescriptions on weekends, holidays, nights

So changed to Morphine!

(Napolitano et al., 2013)

Outpatient NAS Programs

3. Morphine Guideline: 7/5/10-6/30/12 – 175 infants, 112 treated (64%)
   - Discharged only on Phenobarbital
   - Disadvantages
     - frequent dosing
     - Prolonged inpatient stay – 13 days → 29 days → 20 days
     - Increased bed utilization (15 – 20% NICU)
     - Increased costs
     - Increased nursing burnout

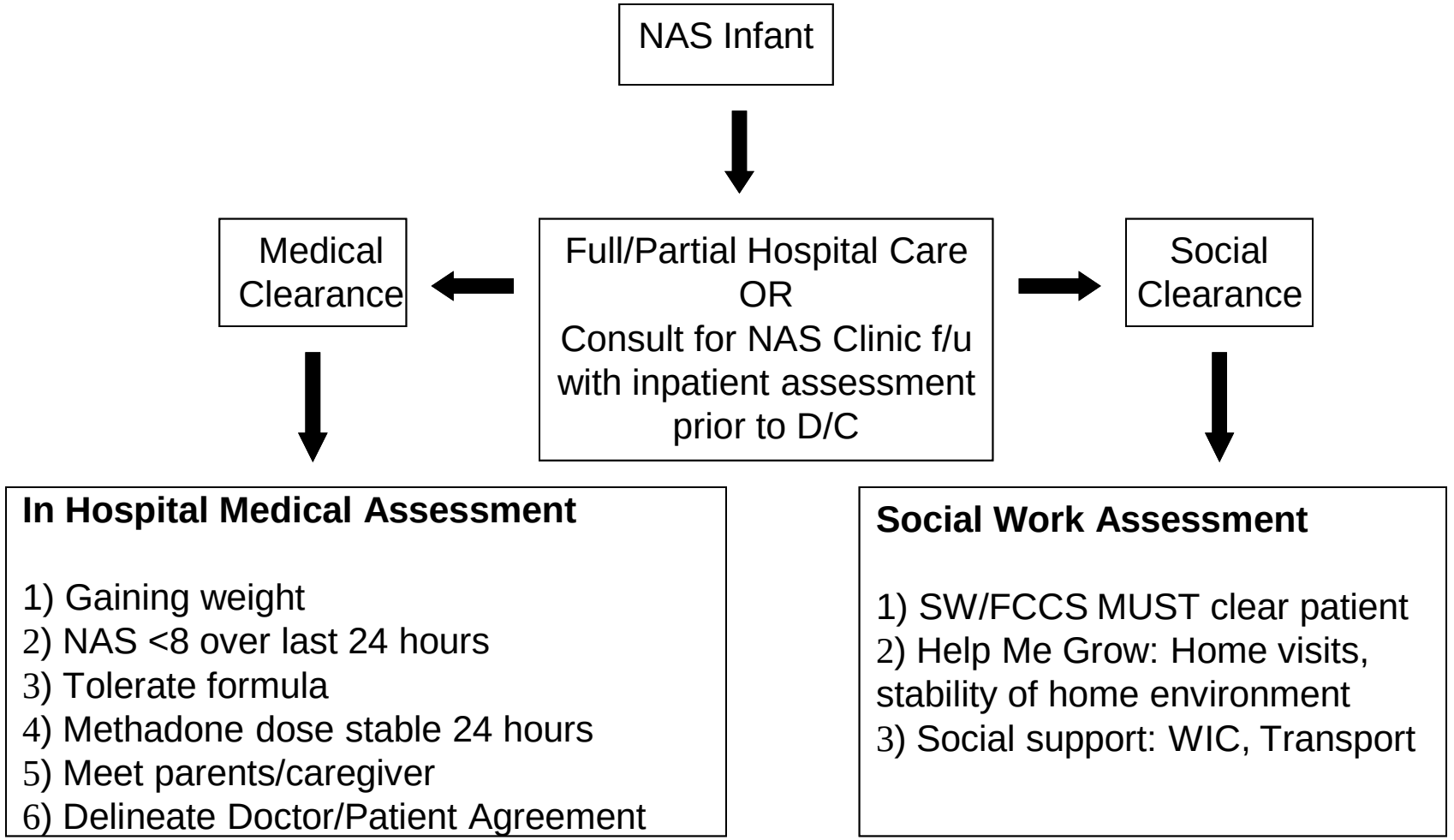
(Napolitano et al., 2013)

Outpatient NAS Programs

- Advantages
  - Wean every 24-48 hours if daily scores <6
  - Off morphine at discharge
  - Phenobarbital – used more – indications
    - NAS signs at dose of morphine 0.15 mg/kg/dose
    - Failed X2 morphine – stopping attempts
    - Morphine need ≥ 0.25 mg/day at day 10 of life
  - Discharge NAS scores <8 and 48 hours off morphine
  - Phenobarb wean at home over 3 weeks
- Burden on neonatologist, not community pediatrician

(Napolitano et al., 2013)

Neonatal Care Outpatient Discharge Criteria



(Backes et al., 2011)

Neonatal Care Outpatient

- Discharge criteria
- Home medication
  - Guidelines
  - Pharmacy syringe
- NAS Clinic team
  - Initial team assessment
  - Home scoring system
  - Methadone change
  - Methadone “hubs”
  - Nursing assessment

Neonatal Care Outpatient
NAS Clinic Team

- Carl Backes, DO
  614-265-0070
- Patti Krause (coordinator/scheduler)
  614-722-4511
- Patty Gruber, RN, CPN (clinic nurse)
  614-722-4532
- Bethanie Combs, MSW, LSW
  614-722-2805
- Nationwide Children's Outpatient Pharmacy
  614-722-2160 weekdays 8:30a-11:00p
  614-722-9199 weekends 10:00a-6:00p
- Kathy Stuart, PT, DPT
  614-722-4249
- To schedule an appointment: fax the NAS Clinic Intake form to: 614-722-4541. We will call you regarding available appointments.

Neonatal Care Outpatient

History: Birth Hospital _____

Mom's name: _____ Baby's name _____

Maternal: Age ____ G ___P ___ Complications

_____

_____

____

Maternal drugs: _____ tox

_____

STDS/Virology _____

Hep B: neg pos Hep C: neg pos

Delivery info: complications

_____

Vag CS Apgars: __ __ date_____ to NBN to NICU

GA _____ BW _____L _____ HC _____

Nursery course

_____

DC date _____ DC weight _____

DC meds _____

Custody arrangements

_____

NBS: normal no info abn: _____Hearing: pass fail left

Hep B date: _____

Neonatal Care Outpatient

NAS visit worksheet **Date** _____

Name_____ Caregiver _____

PCP _____ Visit # _____

Meds: Methadone: dose _____ Freq _____ (start new on _____)

Phenobarb: _____

Illnesses/issues since last visit: _____ ER visits? Yes No

Systems review: HENT: nasal congestion/stuffiness sneezing: occas. frequent

Eyes: drng redness

Resp: tachypnea cough

Heart: murmur

GI: emesis _____stool:_____ freq: _____gas? _____

Neuromuscular: Incr tone_____ tremors _____

Neuro/behavior: mild fussiness significant fussiness Disturbed sleep pattern

sleeps _____ hrs in between feeds. Where? Crib/bass with parents

sleep position: _____ excessive sucking_____

Skin: diaper rash excoriation sweating

Nutrition: Formula_____ amt _____freq _____

Caregiver concerns:

Spiritual or cultural concerns? Feel safe?_____ Learning Barriers: _____

How learn best: visual auditory written hands on

Next appointment in ____weeks_____ 9 10 11 1 2 3

T- _____ HR _____ RR _____

Wt _____ L _____ HC _____

Previous wt: _____ (_____ days ago) gain per day _____

GA _____ chron age _____ CCA _____

Plan: Starting on _____ (incr decr) methadone to ___mg,(tid bid daily) for _____days then on _____wean to _____mg (tid bid daily) for _____ days

Neonatal Care Outpatient Home Scoring System

Week:

Dr. Backes' NAS Outpatient Clinic
Caregiver Home Scoring System

	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Symptoms														
CNS														
Abnormal crying														
Increased Tone														
Tremors														
GI														
Vomiting														
Loose Stools														
Poor Feeds														
SKIN														
Diaper Rash														
Skin irritation														
SLEEP														
Abnormal Sleep Pattern														
Total														

Guidelines for Use:
Yes = 1
No = 0

Parent/Caretaker to record date & time to discuss at next visit.

Neonatal Care Outpatient Home Medication

Dr. Backes's methadone administration guidelines for parents/caregivers

- Your baby has been prescribed methadone to ease the symptoms of drug withdrawal. The methadone prescription must be filled at Nationwide Children's Hospital. Each dose is drawn up in a small syringe for you to give.
- Nationwide Children's Hospital (NCH) has 2 pharmacies. One on the first floor of the new main hospital (on the corner of Livingston and Parsons Ave) and one on the first floor of the Outpatient Care building (at 555 S. 18th St).

Neonatal Care Outpatient Home Medication

Filling your first prescription:

- **Monday through Friday:** The hospital can fax the methadone prescription to the pharmacy in the **outpatient building** prior to discharge. The parent will then need to take the original prescription to the pharmacy to obtain the methadone. **They cannot give you the methadone unless you bring the prescription with you.** They are open from 8:30 am to 11 pm. Be aware it may take up to 4 hours for them to fill the prescription from the time they receive the fax.
- **Saturday and Sunday:** The hospital can fax the methadone prescription to the pharmacy in the **main hospital** prior to discharge. The parent will then need to take the prescription to the pharmacy to obtain the methadone. **They cannot give you the methadone unless you bring the prescription with you.** They are open from 10 am to 6 pm. Again, it may take up to 4 hours for them to fill the prescription from the time they receive the fax.

Neonatal Care Outpatient Home Medication

Filling your first prescription:

- Your child's doses will be drawn up in small syringes and put into a baggie that is labeled with the dose. You may receive 2 separate baggies if your child is prescribed one dose for a number of days and then another dose for a number of days. The baggies are labeled, the dose is highlighted in yellow, and the baggie you will use first will be labeled "use first".
- When you receive the baggies, put the baggie you are **not** currently using in a safe place away from children until you are done with the first baggie. This will help avoid mistakes related to using the wrong baggie/dose.

Neonatal Care Outpatient Home Medication

Getting refills at an appointment:

When you come to the clinic (about every 2 weeks) Dr. Backes will decide if your child is ready to have their medication decreased (weaned). A new prescription will be written and you will take this to the pharmacy in the **outpatient care building** at the end of your appointment. On Wednesdays, we have a pharmacist who only fills methadone prescriptions so the wait time should be only 30-45 minutes.

Neonatal Care Outpatient Home Medication

Administering your prescription:

- To give the dose, remove the foil and cap and place the syringe gently into the side of your child's mouth and push the end of the syringe in to give the dose. Wait for them to swallow. **Do not try to get the small amount out of the end of the syringe. This is not part of the dose.** Dr. Backes calls the small amount left in the end of the syringe a "hub". Please keep these "hubs" as he may have you use them in the future. After giving the dose, replace the cap and put this syringe in a separate baggie for "hubs" only.
- **You must bring all unused medication and all the "hubs" to each appointment.** This will help us determine how much medication to give you at your next appointment.

Neonatal Care Outpatient Methadone “Hubs”

- A “hub” is the small amount of methadone left in the end of an oral syringe after the ordered dose has been given.
- The use of “hubs” can be a helpful adjunct in the methadone management of infants with Neonatal Abstinence Syndrome. Each hub contains approximately 0.005 mg of methadone. 1-2 hubs can be given to help an infant who is experiencing withdrawal symptoms in between regular doses or after methadone has been discontinued for the first week or so.
- All use of “hubs” should be discussed with Dr. Backes prior to use.
- “Hub” administration
  - The methadone in the end of the syringe can be mixed with a small amount of water to create a “hub”. The parent should receive the methadone administration guidelines prior to discharge so they are aware of what a “hub” is, how to mix it and administer it if asked to do so by Dr. Backes.
- Disposal of “hubs”
  - All full and empty methadone syringes should be brought to each clinic appointment. Only 10-14 “hubs” at a time should remain with the family for use. Any excess hubs present at an appointment should be disposed of in a sharps container in the clinic.

Neonatal Care Outpatient Follow-Up Screening

- Dedicated physician: 24 hour access (on-call pager
- Trained nursing staff: follow-up/compliance, screening
- Maternal education: physician at Comp-Drug 2x/month, Stepp Clinic
- PT/OT/Speech (if needed)
- Developmental screening: Bayley 3- initial 9-12 months of age
- Maternal evaluation: financial, legal, housing, child welfare, domestic violence

(Backes et al., 2011)

- Social Service assessment
- Breast feeding
- OT/PT, developmental and behavioral assessment
  - Patients followed NAS Clinic 1/1/12 – 3/1/13

Development - Ongoing

- Logan et al., 2013
  - Illicit poly drug use with 40% concurrent problematic alcohol abuse
  - Adverse outcomes
    - Illicit opiates and companion interactive and
    - additive effects from co-occurring risk factors
      - Abuse of alcohol
      - Tobacco
      - Other prescription medication
      - Socioeconomic status
      - Low level of education
      - Poor nutrition
      - Poor prenatal care

Development - Ongoing

- Logan et al., 2013 (con't)
  - Predictors of NAS severity
    - Maternal methadone dose third trimester
    - Dose of maternal methadone
    - Duration of drug exposure
    - Genetic contribution
      - Single nucleotide polymorphisms of the μ -opioid receptor (OPRM1, variant A11AG) catechol-O-methyl transferase (COMT genes affect NAS severity and need for medication

(our preliminary follow-up data)

Development - Ongoing

- Hunt et al., 2008
  - Mental developmental index lower in opioted exposed infants at 18 and 36 months
- Bernstein et al., 1984
  - less social responsivity
  - Shorten attention span
  - Poor social engagement

BUT

- Messinger et al., 2004
  - Better accounted for by socio demographic factors – birth weight, poor care giving, maternal absenteeism
- Logan et al., 2013
  - 9 years of age – 37.5% motor delay, but with co-morbid alcohol and methadone (low cognitive and language by BSID-3)

Short and Long Term Follow-up

- Readmits
- Seizures
- Hepatitis B, C exposure – cirrhosis
- SIDS
- GERD
- Diarrhea
- Eye abnormalities – nystagmus
- Growth
- Development
- Nutrition
- Behavioral – ADD/CD/ODD
- Learning

Short and Long Term Follow-up

Occupational/physical therapy/developmental evaluation – NAS Clinic

- Initial meeting
  - Introduction/comments
  - Learning barrier
  - Cultural, religious, social considerations
  - Current services
  - Care giver concerns
- Evaluation – Bayley III (Scales of Infant and Toddler Development, 3rd Ed)
  - Muscle tone and strength
  - Sensory, behavior or social concerns
  - Oral motor skills
  - Pain assessment
  - Fine motor skills
  - Gross motor skills
  - Cognitive skills
  - Receptive language skills
  - Expressive language skills

Outpatient NAS Treatment

You Can

You Could

You Should

It's Better

- Better for mom
  - 100% compliance to NAS clinic to get methadone
  - No mom took baby's medicine
  - No re-admits after NB hospitalization and follow-up our NAS clinic
- Better for baby
  - Bonding
  - Less high scores with modified scoring system
  - Caregiver involvement
- Better for hospital
  - Decreased hospital stay
- Better for state
  - Marked decreased costs

But You Must

- Have an NAS follow-up clinic and NAS team must see infant 5-7 days
- Cooperating well newborn physician nursery staff to refer all infants exposed to illicit drugs whether treated or not in the newborn hospital
- Inform primary care follow-up physician of care plan (see NAS clinic while on, or considering medication; and developmental and behavioral follow-ups 8-9 months, 20-24 months, 4-5 years of age)
- NCH provides this service and we would be glad to assist any referring hospital with these infants

Summary

1. Continued efforts to have prenatal program
2. Appropriate neonatal screening
3. Provide care outside the NICU
4. Establish outpatient follow-up clinic for ALL neonates exposed to
5. Early discharge criteria and once established outpatient methadone to avoid prolonged hospitalization if needed
6. Team effort in the NAS Clinic to monitor short and long term potential complications

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