Providing Optimal Care for Neonates with Neonatal Abstinence Syndrome

by
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Vanderbilt University School of Nursing

Faculty Disclosure
- I have no affiliation with any of the drug companies that produce the medications I will be discussing.
- I am the developer of the inter-observer reliability program for the Finnegan Scoring Tool.

Objectives
1) Describe the incidence of NAS in the US and hospital costs
2) Identify drugs associated with NAS.
3) Describe the appropriate way to assess neonates for signs of NAS.
4) Identify non-pharmacologic, pharmacologic and caregiving strategies for managing neonates with NAS.

What is NAS?
- Also known as Neonatal Withdrawal Syndrome
- Constellation of behavioral and physiologic signs caused by cessation of exposure to licit and illicit drugs.

What is NAS?
- Two types:
  - Maternal use during pregnancy
  - Postnatal use (fentanyl, morphine)

What is NAS?
- Causes alterations in functioning:
  - CNS disturbances
  - Metabolic, vasomotor, Respiratory Disturbances
  - Gastro-Intestinal Disturbances

Hamdan, 2010
Finnegan, et al, 1975
Drugs Associated with NAS

- Opioids:
  - Heroin
  - Methadone
  - Fentanyl
  - Morphine
  - Demerol
  - OxyContin

- Nonopioid CNS Depressants
  - May present with some or mimic symptoms of NAS
  - Benzodiazepines
  - SSRI’s
  - Barbiturates
  - Anticonvulsants
  - Antipsychotics
  - Alcohol

Epidemic of Prescription Opiate Use/Abuse

Prescription drug abuse is a growing national epidemic.

- Addiction, overdoses and deaths involving non-medical prescription drug use have risen significantly over the last decade.

Hansen et al. 2011

In 2006 the estimated total cost in the United States of nonmedical use of prescription opioids was $53.4 billion

- $42 billion was attributable to lost productivity,
- $8.2 billion to criminal justice costs
- $2.2 billion to drug abuse treatment
- $944 million to medical complications.

Hansen et al. 2011

Opiate Pain Relievers (OPR’s)

- Deaths from OPR’s:
  - increased 5 fold between 1999 and 2010 for women.
- More women have died each year from drug overdoses than from motor vehicle accidents.
- In 2010 enough OPR’s were prescribed to medicate every adult in US with a typical dose of 5 mg of hydrocodone taken every 4 hours for 1 month.

CDC MMWR, July 5, 2013

Illicit Drug Use In Pregnancy (2011)

- 20.9% pregnant teens
- 8.2% - pregnant women 18 to 25 years old
- 5.0% - overall (less than non-pregnant 10.8%)

http://www.samhsa.gov/data/NSDUH/2k11Results/NSDUHresults2011.pdf

Mothers Use of Opiates per 1,000 Hospital Births

Patrick, 2012
Magnitude of Problem

- Estimated that 13,500 babies are born each year with NAS from non-iatrogenic causes in 2009
- One baby born each hour in the US with signs of neonatal abstinence.

Patrick et al, 2012

Cost of Care

- 2000 - $190 million
- 2009 - $720 million
- 5 fold ↑ # women using opioids during pregnancy
- 3 fold ↑ in babies diagnoses with NAS

Patrick et al, 2012

Reported LOS

- 8-79 days with average of 30 days
- LOS is varied because optimal treatment for NAS has not been identified
- 60-80% of these babies will require pharmacologic management


NAS in Tennessee

- 10 fold increase between 2000 – 2010
- TennCare – represents a cost of 5.6 times more than a baby without NAS in 2010
- Infants in TennCare system are 18 times more likely to enter state custody than infants without NAS

http://health.state.tn.MCN/PDFs/NAS/NAS_FAQ.pdf

Ohio Statistics

Figure 1: NAS inpatient hospitalization rate per 10,000 live births, Ohio, 2004-2011

Massatti, R., et al., 2013
Tennessee Exposure Over Time

![Tennessee Exposure Over Time Graph]

*The change in exposure source over time was not statistically significant.

Exposure Over Time Ohio

![Exposure Over Time Ohio Graph]

Frequency of NAS

- 50-80% of heroin exposed infants develop NAS
- 60-90% of methadone and buprenorphine exposed infants develop NAS
- 50-75% of infants with NAS will require pharmacologic management

Presentation

- Depends upon:
  - Type of drug
  - Additional substances
  - Timing of maternal dose
  - Infant metabolism
  - Gestational age and birth weight
  - Genetics???

Hudak, 2012

Detection and Screening

- Testing for drug exposure:
  - Urine
    - Obtain as soon as possible after birth
    - High false-negative (up to 60%) rate because only reports recent drug exposure
  - Meconium
    - Better than urine
    - Drug exposure from 16 weeks GA

Ostrea, 2001
Detection and Screening

Hair Analysis:
- Radio immunoassay
- Grows 1 cm/month
- Metabolite present for life of hair
- Tells you drug use for months
- Gets into microfibrils
- Can use neonatal hair

Ostrea, 2001

Detection and Screening

Umbilical Cord
- 10 cm section of cord at delivery
- Rise with sterile saline
- Place in sterile container
- ELISA based test
- Information: www.usdtl.com

Montgomery et al, 2008

Compared to Meconium

<table>
<thead>
<tr>
<th>Drug</th>
<th>UC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamine</td>
<td>Agreement – 96.6% Specificity – 97% Sensitivity – 95%</td>
</tr>
<tr>
<td>Opiates</td>
<td>Agreement – 95% Specificity – 96% Sensitivity – 78%</td>
</tr>
</tbody>
</table>

Montgomery, et al, 2005

Compared to Meconium

<table>
<thead>
<tr>
<th>Drug</th>
<th>UC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocaine</td>
<td>Agreement – 99% Specificity – 100% Sensitivity – 75%</td>
</tr>
<tr>
<td>Cannabinoids</td>
<td>Agreement – 91% Specificity – 91% Sensitivity – 89%</td>
</tr>
</tbody>
</table>

Montgomery, et al, 2005

Detection and Screening

Maternal history
- History of drug use
- Methadone treatment (high dose does not mean infant will have NAS)
- Family history of drug abuse
- Prior involvement with CPS
- Incarceration for drug abuse

Clancy et al, 2010

Detection and Screening

Differential Diagnosis:
- Infection
- Hypocalcemia
- Hypomagnesemia
- Hyperthyroidism
- Hypoglycemia
- CNS injury

Detection and Screening

- Assess infant for signs of withdrawal
  - Central Nervous System Excitability
  - Gastrointestinal Dysfunction
  - Autonomic signs

Hamdan et., al, 2012

Common Signs of NAS

<table>
<thead>
<tr>
<th>Physiologic</th>
<th>Alcohol</th>
<th>Marijuana</th>
<th>Barb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sneezing</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Stuffy Nose</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Spitting/drooling</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Diarrhea</td>
<td>X</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td>X</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Poor Feeding</td>
<td>X</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Sweating</td>
<td>X</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Tachypnea</td>
<td>X</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Tachycardia</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Drugs Associated with NAS

- Opioids:
  - Heroin
  - Methadone
  - Fentanyl
  - Morphine
  - Demerol
  - OxyContin
- Nonopioid CNS Depressants
  - Benzodiazepines
  - Antidepressants (SSRI’s)
  - Barbiturates
  - Anticonvulsants
  - Antipsychotics
  - Alcohol

Common Signs of NAS

<table>
<thead>
<tr>
<th>Neurobehavioral</th>
<th>Alcohol</th>
<th>Marijuana</th>
<th>Barbiturates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fist sucking</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Irritability</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Restlessness</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Tremors</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>High-pitched cry</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Seizures</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Yawning</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Disturbed sleep</td>
<td>X</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>Increased crying</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Convulsions</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Hypertonicity</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Drowsiness</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Increased sleep</td>
<td>-</td>
<td>X</td>
<td>X</td>
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</tbody>
</table>

Common Signs of NAS

<table>
<thead>
<tr>
<th>Neurobehavioral</th>
<th>SSRI</th>
<th>Cocaine</th>
<th>Metham</th>
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<tr>
<td>Fist sucking</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Drowsiness</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Increased sleep</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Tobacco

- Linked to:
  - LBW infants
  - Prematurity
  - Placental Abruption
  - Intrauterine Death
  - SIDS

Salihu and Wilson, 2007

Signs of Tobacco Exposure

- Excitability
- Increased muscle tone
- More handling to be calmed
- Increased sucking
- Gaze aversion
- Abnormal sucking

Law et al., 2003

Tobacco

- Inability to self regulate (inability to quiet self)
- 2-4 weeks & 7 months
  - More negative effect
  - Sadness
  - Distress in response to limitations
  - Decreased ability to be soothed

Schuetze and Eiden, 2007

Preterm Infants

- Lower risk of having signs of NAS
  - < 35 weeks (Doberczak, et al, 1991)
  - Less fat stores (Hudak & Tan, 2012)
  - Differences in total drug exposure

Onset of NAS

- Several factors
  - Half-life of the drug
  - Timing of maternal last dose
  - Infant metabolism of the drug

Ashraf et al, 2014

Onset of NAS

- Heroin or opioids with short half-life – within 12 to 24 hours with peak 72 hours (Kraft et al, 2012)
- Methadone: 48 hours to as long as 7-14 days (longer half-life)

Hamdan et al, 2012
Onset of NAS

- Cocaine/Methamphetamine
  - After the first week of life
  - First week: signs are drug effect
    - Irritability
    - Hyperactivity
    - Tremors
    - Increased crying
    - Increased sucking

  Oro & Dixon, 1987

- SSRI’s
  - Several hours to several days
  - Resolve in 1-2 weeks
  - Withdrawal linked to 3rd trimester use

- Alcohol
  - Within the first 3-12 hours

- Sedatives
  - 1-3 days

Tierney, 2013

Multiple Drug Use

- Drugs of Abuse

Neonatal Abstinence Scoring System (Finnegan)

- Diagnostic tool
- Divided into 3 systems with 21 total items
- 1) CNS disturbances
- 2) Metabolic, vasomotor and respiratory
- 3) Gastrointestinal

Finnegan, et al, 1975

Finnegan Neonatal Abstinence Scoring Tool (FINSST)

<table>
<thead>
<tr>
<th>Signs &amp; Symptoms</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Nervous System Disturbances</td>
<td></td>
</tr>
<tr>
<td>Crying: Excessive High Pitched</td>
<td>2</td>
</tr>
<tr>
<td>Crying: Cont. High Pitched</td>
<td>3</td>
</tr>
<tr>
<td>Sleeps ≤ 1 hr After Feeding</td>
<td></td>
</tr>
<tr>
<td>Sleeps ≤ 2 hr After Feeding</td>
<td>2</td>
</tr>
<tr>
<td>Sleeps ≤ 3 hr After Feeding</td>
<td>3</td>
</tr>
<tr>
<td>Hyperactive Musc Reflex</td>
<td>3</td>
</tr>
<tr>
<td>Markedly Hyperactive Musc Reflex</td>
<td>3</td>
</tr>
<tr>
<td>Mild Tremors; Disturbed</td>
<td>7</td>
</tr>
<tr>
<td>Mod Severe Tremors; Disturbed</td>
<td>7</td>
</tr>
<tr>
<td>Mild Tremors; Undisturbed</td>
<td>4</td>
</tr>
<tr>
<td>Mod Severe Tremors; Undisturbed</td>
<td>4</td>
</tr>
<tr>
<td>Increased Muscle Tone</td>
<td>2</td>
</tr>
<tr>
<td>Excoriation (Specific Area)</td>
<td>2</td>
</tr>
<tr>
<td>Maraschino: Jerk</td>
<td>1</td>
</tr>
<tr>
<td>Generalized Consultations</td>
<td></td>
</tr>
<tr>
<td>Metabolic, Vasomotor &amp; Respiratory Disturbance</td>
<td>5</td>
</tr>
</tbody>
</table>
## Reliability in Scoring
- Will everyone on your unit score the infant using the same criteria?
- Item definitions
- Staff training
- Inter-observer reliability on the unit

### Crying
- Score 2 if excessive high pitched and unable to self console in 15 sec or continuous up to 5 minutes despite intervention.
- Score 3 if unable to self console in 15 sec or continuous >5 min despite intervention.

### Sleep
- Based on longest period of sleep light or deep after feeding.
- Score 3 if <1 hour
- Score 2 if <2 hours
- Score 1 if <3 hours

---

### Table: Metabolic, Vasomotor And Respiratory Disturbance

<table>
<thead>
<tr>
<th>Condition</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweating</td>
<td>1</td>
</tr>
<tr>
<td>Fever &lt; 101 (37.2-38.3°C)</td>
<td>2</td>
</tr>
<tr>
<td>Fever &gt; 101 (38.4°C)</td>
<td>2</td>
</tr>
<tr>
<td>Frequent Yawning (&gt; 3)</td>
<td>1</td>
</tr>
<tr>
<td>Mottling</td>
<td>1</td>
</tr>
<tr>
<td>Nasal Stuffy</td>
<td>1</td>
</tr>
<tr>
<td>Sneezing (&gt;3)</td>
<td>1</td>
</tr>
<tr>
<td>Nasal Flaring</td>
<td>2</td>
</tr>
<tr>
<td>Respiratory Rate (&gt; 60/Min)</td>
<td>1</td>
</tr>
<tr>
<td>Respiratory Rate (&gt;60/Min With Retractions)</td>
<td>2</td>
</tr>
</tbody>
</table>

### Table: Gastrointestinal Disturbances

<table>
<thead>
<tr>
<th>Condition</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive Sucking</td>
<td>1</td>
</tr>
<tr>
<td>Poor Feeding</td>
<td>2</td>
</tr>
<tr>
<td>Regurgitation</td>
<td>2</td>
</tr>
<tr>
<td>Projectile Vomiting</td>
<td>3</td>
</tr>
<tr>
<td>Loose Stools</td>
<td>2</td>
</tr>
<tr>
<td>Watery Stools</td>
<td>3</td>
</tr>
</tbody>
</table>

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### Table: Sleep

<table>
<thead>
<tr>
<th>Time</th>
<th>Feeding</th>
<th>Time Fall Asleep</th>
<th>Time Awake</th>
<th>Time Awake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noon</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Evening</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night</td>
<td></td>
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</tr>
</tbody>
</table>

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*D’Apolito & Finnegan, 2010*
Moro Reflex

- **Hyperactive:** elicit from quiet infant.
- Score 2 for hyperactive-jitteriness that is rhythmic, symmetrical, and involuntary.
- Markedly Hyperactive:
  - Score 3 for jitteriness as above with clonus of hands/arms. May test at hands or feet if unclear (more than 8 to 10 beats).

Tremors Disturbed

- **Tremors are involuntary, rhythmical muscle contraction and release involving to and from movements**
  - Disturbed:
    - Score 1 for mild/disturbed of hands or feet while being handled.
    - Score 2 for moderate/severe disturbed - of arms or legs while being handled.

Tremors Undisturbed

- **NOT touching baby after the infant has been handled** (wait 15-30 seconds)
- Score 3 for mild undisturbed - Tremors of hands or feet when not handled.
- Score 4 for moderate/severe undisturbed - Tremors of arms and/ or legs or both when not handled.

Increased Muscle Tone

- **To test:** perform pull to sit maneuver.
- Score 2: no head lag with total body rigidity. Do not test while asleep or crying. Other maneuvers may be used.

Excoriation

- Score 1 if present at nose, chin, cheeks, elbows, knees, or toes.
- Do not score for diaper area. This is related to loose or watery frequent stools.

Myoclonic Jerks

- **Involuntary twitching of muscle.**
- Score 3 for twitching at face/ extremities or jerking at extremities (more pronounced than jitteriness of tremors).
Generalized Seizure
- Score 5 for tonic seizures with extension or flexion of limb(s). Does not stop with containment. May include few clonic beats and/or apnea.

D’Apolito & Finnegan, 2010

Sweating
- Score 1 for wetness at forehead, upper lip, or back of neck.
- Do not score related to the environment (be consistent with linen)

D’Apolito & Finnegan, 2010

Fever
- Score 1 if 37.2-38.3 C (101F or <).
- Score 2 if 38.4 C (>101F)

D’Apolito & Finnegan, 2010

Frequent Yawning
- Score 1 if >3 within interval.

D’Apolito & Finnegan, 2010

Sneezing
- Individual or serial within testing interval
- Score 1 for >3 during scoring interval.

D’Apolito & Finnegan, 2010

D’Apolito, 2010
Mottling
- Marbled appearance (pink or bluish & white).
- Score 1 if present at chest, trunk, arms, or legs.

Nasal Stuffiness
- Nares partially blocked from drainage with noisy respiration.
- Score 1 if present with/without runny nose.

Nasal Flaring
- Nostrils flared out during respirations.
- Score 2 if present.

Respiratory Rate
- Tachypnea >60 with/without retractions.

Excessive Sucking
- Rooting with attempts to suck fist, hand, or pacifier before or after feeding.
- Score 1 for >3 attempts noted.

Poor Feeding
- Excessive sucking as above but infrequent or uncoordinated with feeding. Gulping with frequent rest periods to breath.
- Score 2 for either.

D'Apolito & Finnegan, 2010
Regurgitation
- Effortless (not associated with burp).
- Score 2 for 2 or > episodes.

 Projectile Vomiting
- Forceful during or after feed.
- Score 3 for 1 or > episodes.

Stools
- Score 2: Loose, curdy, seedy, or liquid without water ring.
- Score 3: Soft, liquid or hard with water ring.

Accuracy in Assessing Infants for Neonatal Abstinence
- Know item definitions
- Complete a training program
- Monitor inter-observer reliability frequently
- Re-educate if reliabilities are low

Reliability Testing
- Initial
- Each new staff member caring for the baby
- Two staff score at same time
- Annual

<table>
<thead>
<tr>
<th>Percent Score</th>
<th>Total Number of Item Agreements</th>
<th>Total Number of Item Disagreements</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>90% or greater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D’Apolito &amp; Finnegan, 2010</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How Long Should We Assess for Signs?
- Low dose prescription opioid such as hydrocodone – discharge after 3 days of age
- Opioid with long half-life such as methadone – observe for minimum of 5-7 days
- Outpatient follow-up

Hudak & Tan, 2012

Plan of Care with Scores
- Score of 0 is optimal.
- Scores of 1 to 7: manage with conservative measures.
- Scores of 8 to 10: require pharmacological intervention.
- Scores >10: increased scores require increased dosing.

Plan of Care:
Non-pharmacological
- Swaddling, holding firmly & close to body, and slow rocking.
- Modify environmental stimulation such as light & noise.
- Soothing music
- Minimal handling
- Non-nutritive sucking

Valez & Jansson, 2008

Plan of Care:
Non-pharmacological
- Consider small frequent feedings of hypercaloric (24 cal/oz) formula and total caloric intake to provide 150-250 cal/kg/day to maintain growth
- Do not overfeed
- Gavage feeding may be necessary with disorganized suck

Velez & Jansson, 2008

Plan of Care with Scores
- Withdrawal from Opiates – give oral morphine
- Withdrawal from other substances (e.g. barbiturates, ethanol, sedatives, hypnotics, give Phenobarbital

Kocherlakota, P., 2014
**NAS Treatment**

- “Control” withdrawal signs
- Attain a score of < 8 on Finnegan Scoring Tool
- Provide non-pharmacologic interventions
- Provide pharmacologic treatment – Oral morphine or methadone – Second line treatment

**Pharmacologic Management**

- Withdrawal from Opiates – give oral morphine
- Withdrawal from other substances (e.g. barbiturates, ethanol, sedatives, hypnotics, give Phenobarbital

**Pharmacologic Management**

- Oral Morphine
  - Diluted solution: 0.4mg/ml dilution from concentrated oral morphine sulfate solution.
  - Administered Q 3 or 4 hours

**Oral Morphine**

- Concentration - 2 and 4 mg/ml
- Dosing
  - High dose: 0.08 to 0.1 mg/kg PO q 4 h
  - Low dose: 0.03 to 0.04 mg/kg PO q 4 h
  - Increase by 20% of initial dose q 8 h until symptoms controlled
  - Maximum: 0.2 mg/kg per dose
  - Taper dose by 20% every other day after 3 days of controlled signs

**Methadone**

- PO q 6 - 8 h
- Increase by 0.05 mg/kg until symptoms controlled
- Decrease frequency to q 12 to 24 h once symptoms controlled
- Taper dose by 10% to 20% every week to a dose of 0.05 mg/kg per day before discontinuing

**Phenobarbital**

- Not drug of choice for opioid withdrawal
- Ok for non-opioid NAS
- Can be used as second line drug when infants have NAS due to poly-drug exposure in utero

**AAP, 1998**

**AAP, 1998; Burgos & Burke, 2009**

**AAP, 1998; O’Grady, Hopewell & White, 2009**
Phenobarbital
- Does not prevent seizures
- Does not prevent GI signs
- Depressant effects may produce poor feeding
- Can prolong hospital stay

O’Grady, Hopewell & White, 2009

Phenobarbital
- LD of 16 mg/kg IV per 24 h
- MD of 2 to 8 mg/kg IV or PO per 24 h
- May taper MD by 10% to 20% every day or Q other day once signs controlled
- Goal plasma concentration: 20 to 30 mg/mL

AAP, 1998; Burgen & Burke, 2009

Clonidine
- A2 adrenergic receptor
- Located on vascular pre-junctional terminals in CNS & PNS
- Inhibits the release of norepinephrine (noradrenaline) in a form of negative feedback
- Causes decrease in heart rate and blood pressure

Baker, 2012

Clonidine
- ID - 0.5 to 1.5 g/kg PO
- Increase over 1 to 2 d to target dose
- 3 to 5 g/kg per day divided every 4 to 6 hours
- t½ 44-72 hours
- Duration of action – 6-10 hours
- Taper 25% of the total daily dose every other day as tolerated


Breastfeeding
- OK, providing mother is being monitored in a methadone treatment program
- Small amounts of the drug are transferred to the breast-milk
- Suggested that breastfeeding may decrease the severity of withdrawal signs

Abdel-Latif, et al, 2006; AAP, 2001

ACOG Guidelines
- Negative for HIV
- Abstain from using alcohol, illicit drugs and amphetamines
- Have no other contraindications for breastfeeding

ACOG, 2012
Breastfeeding

The AAP previously advised women not to breastfeed if the maternal methadone dose was more than 20 mg/24 hours. This has been rescinded.

AAP, 2012

Breastfeeding

Opioid-dependent women can be informed that regardless of maternal methadone dose, the treatment of NAS with breast milk that contains methadone has been found to be safe and effective.

Ballard, 2000; Jansson, et al., 2007; 2008a; 2008b

Breastfeeding

Concentrations of methadone and buprenorphine found in human milk are low, there may be enough of the substance in the breast milk to help ameliorate the NAS symptoms such as skin-to-skin, rooming in and swaddling.

Pritham, 2013

New Ideas

Keep infant with his or her mother in the room (Jambert-Gray, 2009)

Manage infant in a unit outside the NICU where monitoring can occur (Saiki, et al, 2010)

Outpatient management (Backes et al, 2012).

– At methadone treatment clinic

– Mother and baby can be managed

References 1


References 2

References 3


References 5