Neonatal Abstinence Syndrome

Emily Scott, MD FAAP
Historical background

1804: Morphine isolated
1817: Marketed as analgesic
1827: Commercial production

1853: Hypodermic needle developed

1874: Heroin synthesized
1898: Commercial production

1875: First reported case of neonatal withdrawal
1892: Series of 12 infants, 9 died. Paregoric was tried

1903: Morphine treatment for neonates reported

1937: Methadone developed
1964: Methadone maintenance treatment

1967: Buprenorphine developed
1996: Buprenorphine use in France
2002: FDA approval for opioid dependence

Opioid analgesic medications:
Vicodine (1984)
Oxycontin (1989)
Percocet (1999)

2002: First reported case of NAS due to oxycontin
2012: Epidemic of NAS

1971: Methadone withdrawal in 5 neonates
1997: First reported case of buprenorphine withdrawal
2001: Series of buprenorphine withdrawal in 13 infants

Kocherlakota 2014
OUD at the time of delivery quadruples in 15 years

Neonatal Abstinence Syndrome (NAS)

- Defined as the constellation of clinical findings associated with drug withdrawal in newborns
  - *Opioids
  - Benzodiazepines
  - Alcohol
  - SSRIs
- Most newborns exposed to opiates in utero will undergo some withdrawal
Symptoms of NAS

- Inconsolable, high pitched cry
- Poor sleep and feeding patterns
- Tremulous and jittery
- Diarrhea and vomiting
- Yawning and sneezing
- Increased tone
- Tachypnea
- Fever

- Seizures
- Failure to thrive
- Dehydration
Timing of withdrawal

- Symptom onset depends on substance half-life
  - Heroin: 24 hours
  - Prescription short-acting opioids: 36-72 hours
  - Methadone/Buprenorphine: 48-72 hours (*can be delayed to 5-7 days)
Scoring systems

• Multiple scoring systems available
  • Modified Finnegan score
• Semi-objective with concerns for interobserver reliability
• Consistent practice is the key!
Length of monitoring

• Infants exposed to low-dose prescription opiates with short half-life (hydrocodone) can be safely discharged if there are no signs of withdrawal by **3 days** of life

• Infants exposed to methadone/buprenorphine should be observed for minimum of **5-7 days**

• Discharged babies need close follow-up

Hudak 2012
Initiating medication therapy

- Morphine (or other opioid)
  - “Capture” baby’s symptoms, then slow wean as tolerated
- Phenobarbital/clonidine as adjunctive meds
- Following a protocol makes a difference!
- Prolonged length of stay (weeks)
Paradigm shift

- Families (optimal and intensive supportive care) are the first line therapy for neonatal abstinence syndrome
# Family-Centered NAS Care – Dartmouth Study

<table>
<thead>
<tr>
<th>Traditional Model</th>
<th>Family Centered Model</th>
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<tbody>
<tr>
<td>Opioid exposed baby at risk for NAS admitted directly to NICU</td>
<td>Opioid exposed baby at risk for NAS remains with mother on postpartum unit, then transitions to pediatrics floor where family can “room in”</td>
</tr>
<tr>
<td>Finnegan score done on an exam table away from family</td>
<td>Finnegan score is done after a feed while being held by parents</td>
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<tr>
<td>Decision to start morphine based on Finnegan scores alone</td>
<td>Decision to start morphine based on overall clinical picture, with Finnegan score being a part of that picture</td>
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</tbody>
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Holmes 2016
Results of Family Centered NAS Care

- Need morphine to treat: 46% → 27%
- Adjunctive use of phenobarbital: 13% → 2%
- Average length of stay for morphine treated: 16.9 → 12.3 days
- Average hospital costs per at risk infant: $11,000 → $3,500
Maternal Substance Abuse and Breastfeeding

• Any maternal illicit drug abuse is not compatible with breastfeeding
  – Moms on methadone/buprenorphine should be encouraged to breastfeed if currently abstinent from any drugs of abuse
Exclusive breastfeeding and NAS

- Finnegan scores
- Infants required morphine
- Length of stay

- Supportive care for infant
- Maternal bonding
- Maternal stress relief

Abdel-Latif 2006
Eat, Sleep, Console?

An Initiative to Improve the Quality of Care of Infants With Neonatal Abstinence Syndrome

Matthew R. Grossman, MD, Adam K. Berkowitz, MD, Rachel R. Osborn, MD, Yaqing Xu, MS, Denise A. Esserman, PhD, Eugene D. Shapiro, MD, Matthew J. Bizzarro, MD

• Can the baby breastfeed effectively or take > 1 oz from the bottle?
• Can the baby sleep for > 1 hour undisturbed?
• Can the baby be consoled within 10 minutes?
• If yes – no morphine!

*if morphine started – given PRN

Grossman 2017
Eat, Sleep, Console?

- Length of stay – 22.4 to 5.9 days
- Morphine treatment – 98% to 14%
- Average cost - $45,000 to $10,000
Preparing for Hospital Discharge

• Who will be in the home
• Who will be mom’s support
• What support services are already in place?
• Is mom going to be weaning off her maintenance medication soon?
Long term outcomes

• Research is mixed

• Infants diagnosed with NAS are likely at risk for many comorbidities throughout childhood including
  - Feeding difficulties
  - Failure to thrive
  - Hypertonicity
  - Developmental delay
  - Strabismus
  - Behavior concerns
Risks to wellness

• Children with opioid exposure in utero are 2.5 times more likely to be readmitted to the hospital in the first month of life.

• Throughout their childhood, more likely to be readmitted for:
  - Assaults
  - Maltreatment
  - Poisoning
  - Mental/behavioral disorders
  - Visual disorders

Patrick 2015
Uebel 2015
After hospital discharge

• Children exposed to substances prenatally require:
  – Close follow-up with a pediatric provider
  – Ongoing assessment of feeding and growth
  – Close monitoring of development, behavior and vision
    • Early referrals to First Steps and subspecialty care if needed
  – Hepatitis C testing *if indicated
  – Frequent and thorough assessments of social determinants of health
    • Referral to community supports
References


- Agthe, AG. Kim, GR, Mathias KB, et al. Clonidine as an adjunct therapy to opioids for neonatal abstinence syndrome: a randomized controlled trial.


References

References