IHS Webinar: Neonatal Abstinence Syndrome

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Learning Objectives

- **Define Neonatal Abstinence Syndrome (NAS) and identify signs and symptoms of NAS**
- **Recognize the essentials of clinical assessment and pharmacologic management of infants with NAS**
- **Recognize the essentials of non-pharmacologic management of infants with NAS**

Disclosures

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What is NAS?

- **Drug withdrawal syndrome a newborn experiences after birth if the mother was dependent on opioids or other substances during the pregnancy**
- **Variable, complex spectrum of signs of neonatal behavioral dysregulation**
- **Autonomic dysfunction, gastrointestinal dysfunction, neurologic irritability**
- **It is not defined by need for pharmacotherapy**
- **Substances: Opioids > nicotine, benzodiazepines, selective serotonin re-uptake inhibitors (SSRIs)**

Epidemiology

- **Nationally, opioid exposure during pregnancy affects 5.6 infants per 1,000 births, with rates as high as 30 per 1,000 in some states**
- **Neonatal Abstinence Syndrome (NAS) affects 60-80% of infants exposed to chronic in-utero opioids**
- **Incidence of NAS has tripled in the past decade**
- **From 2004 – 2013, NICU admissions for NAS increased from 7 to 27 cases per 1000 admissions**
- **Increasing healthcare costs: $53,000 per infant; 80% Medicaid patients**

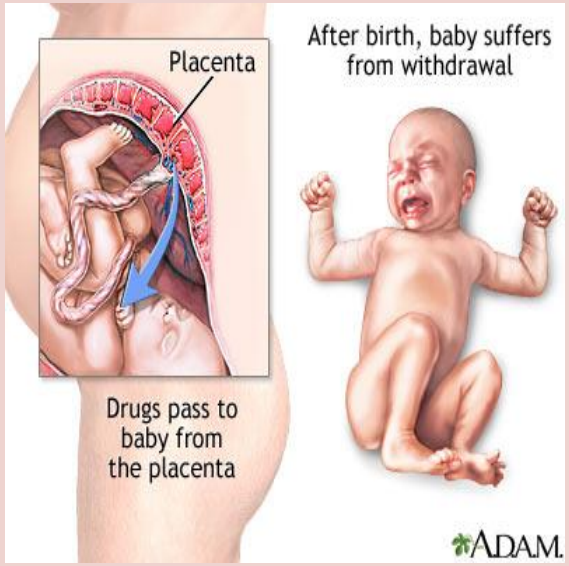
Neonatal Opioid Withdrawal

- **Opioids:**
  - **Methadone**
  - **Buprenorphine (Subutex, Suboxone)**
  - **Shorter acting: Oxycodone, Oxycontin**
  - **Recent use**

- **Timing of Presentation:**
  - **Typically within 48-72 hours**
  - **Wide range from birth – 7 days**

- **What % require medication treatment: 60-70%**
- **Inability to predict**
- **Inpatient monitoring period of at least 5 days**

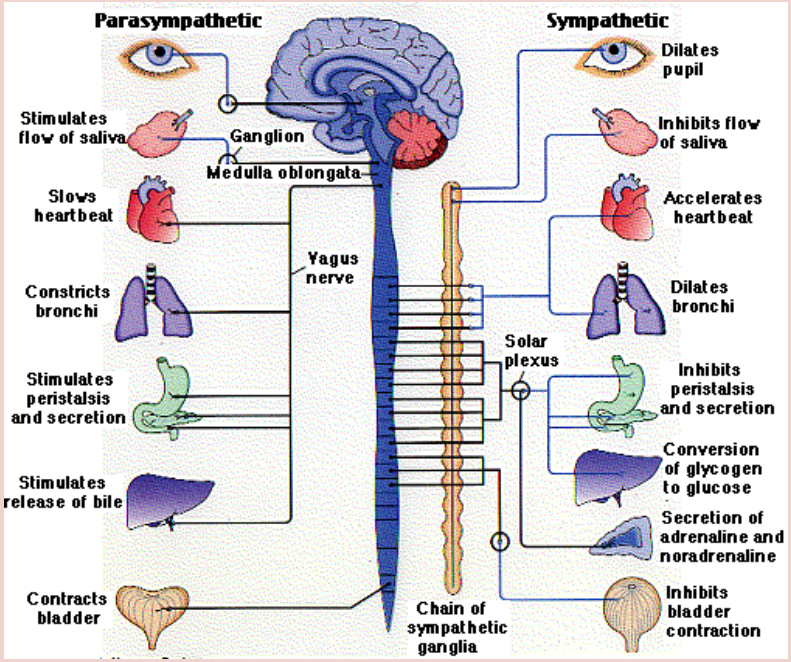
NAS Manifestations

System	Symptoms
Central Nervous System 	**Tremors** **Irritability** **Sleep disturbance** **High pitched crying** **Hypertonia** **Hyperactive reflexes** **Myoclonic Jerks** **Generalized convulsions**

NAS Manifestations

System	Symptoms
Gastrointestinal System 	**Poor feeding** **Vomiting** **Diarrhea** **Excessive sucking**
Respiratory System 	**Tachypnea** **Apnea** **Respiratory distress**

NAS Manifestations

System	Symptoms
Autonomic Nervous System 	**Sneezing** **Nasal stuffiness** **Yawning** **Mottling** **Fever** **Sweating**

Will the infant require medication?

- **Factors increasing risk:**
  - **Nicotine Smoking**
  - **Methadone > Buprenorphine**
  - **Benzodiazepines**
  - **SSRIs**
  - **Polypharmacy**
  - **No clear link to maternal opioid dose**
  - **Genetic factors**

- **Protective Factors:**
  - **Breastfeeding**
  - **Maternal stability and presence at the bedside**
  - **Prematurity**

Boston Medical Center

- **Boston Medical Center (BMC) sees the largest population of NAS infants in Massachusetts:**
  - **5-7% of all deliveries**
  - **Over 90% of babies are born to mothers on prescribed methadone or buprenorphine seen in Project RESPECT prenatal substance use disorder prenatal clinic**
  - **100-150 infants annually**
  - **5-10 hospitalized infants at all times**
  - **75% of infants require pharmacologic treatment**
  - **25% of infants require 2 medications**
  - **Average length of hospital stay is 17-20 days**
  - **Standardized NAS care guidelines and large quality improvement multi-disciplinary team**

NAS Basic Care Orders

- **Social Work Consult**
- **51A filed on all mothers with substance use disorder in current pregnancy**
- **Occupational / physical therapy consultation**
- **Lactation consultation**
- **24 kcal/oz formula**
- **Toxicology Screening (see next slide)**
- **Scoring = every 3-4 hours with cares / feedings**
  - **Scoring to begin within 4 hours of life**
  - **Score should encompass the entire 3-4 hour period since the last score**
  - **Parents may be a part of scoring**
  - **Infant can be scored on the mother**

Toxicology Screening

Screening Test	Substances Included	Time Interval
Urine toxicology basic screen	• Amphetamines • Barbituates • Benzodiazepines • Cocaine • Opiates	• Every prenatal visit • Mother on any hospital admission (Titration, Emergency Room, Triage, L&D) • Infant on admission • Postpartum visits
Urine expanded opioid panel	• Methadone • Buprenorphine • Oxycodone • Fentanyl	• Every prenatal visit • Mother on any hospital admission (Titration, Emergency Room, Triage, L&D) • Infant on admission • Postpartum visits
Meconium toxicology screen	• Phencyclidine (PCP) • Cocaine • Benzodiazepines • Barbituates • Amphetamines • Methadone • Opiates	• Infant on admission

Rooming-In Model

- **Families are counseled starting prenatally on importance of their presence at the bedside throughout the hospitalization**
- **Family given hand-out on non-pharmacologic care prenatally**
- **Encourage skin-to-skin and breastfeeding**
- **Infant housed in mother's postpartum room until mother is discharged, then transferred to inpatient pediatrics unit where parent can continue to room-in**
- **Higher parental presence associated with shorter length of hospitalization and lower Finnegan scores**

Finnegan Scale

Central Nervous System Disturbances	Metabolic, Vasomotor, and Respiratory Disturbance	Gastrointestinal Disturbance
Excessive High Pitched Crying – 2 Continuous High Pitched Crying - 3	Sweating – 1	Excessive Sucking – 1
Sleep < 1 Hr After Feeding – 3 Sleep < 2 Hr After Feeding – 2 Sleep < 3 Hr After Feeding – 1	Fever < 101 (37.2 – 38.3 C) – 1 Fever > 101 (38.4 C) – 2	Poor feeding – 2
Hyperactive Moro Reflex – 2 Markedly Hyperactive Moro Reflex – 3	Frequent Yawning (>3) – 1	Regurgitation – 2 Projective Vomiting – 3
Mild Tremors Disturbed – 1 Mod – Severe Tremors Disturbed – 2	Mottling – 1	Loose Stools – 2 Watery Stools – 3
Mild Tremors Undisturbed – 3 Mod – Severe Tremors Undisturbed - 4	Nasal Stuffiness – 1	
Increased Muscle Tone - 2	Sneezing (>3) – 1	
Excoriation – 1	Nasal Flaring – 2	
Myoclonic Jerk – 3	Respiratory Rate (>60) – 1 Respiratory Rate (>60 with Retractions) – 2	
Seizures – 5		

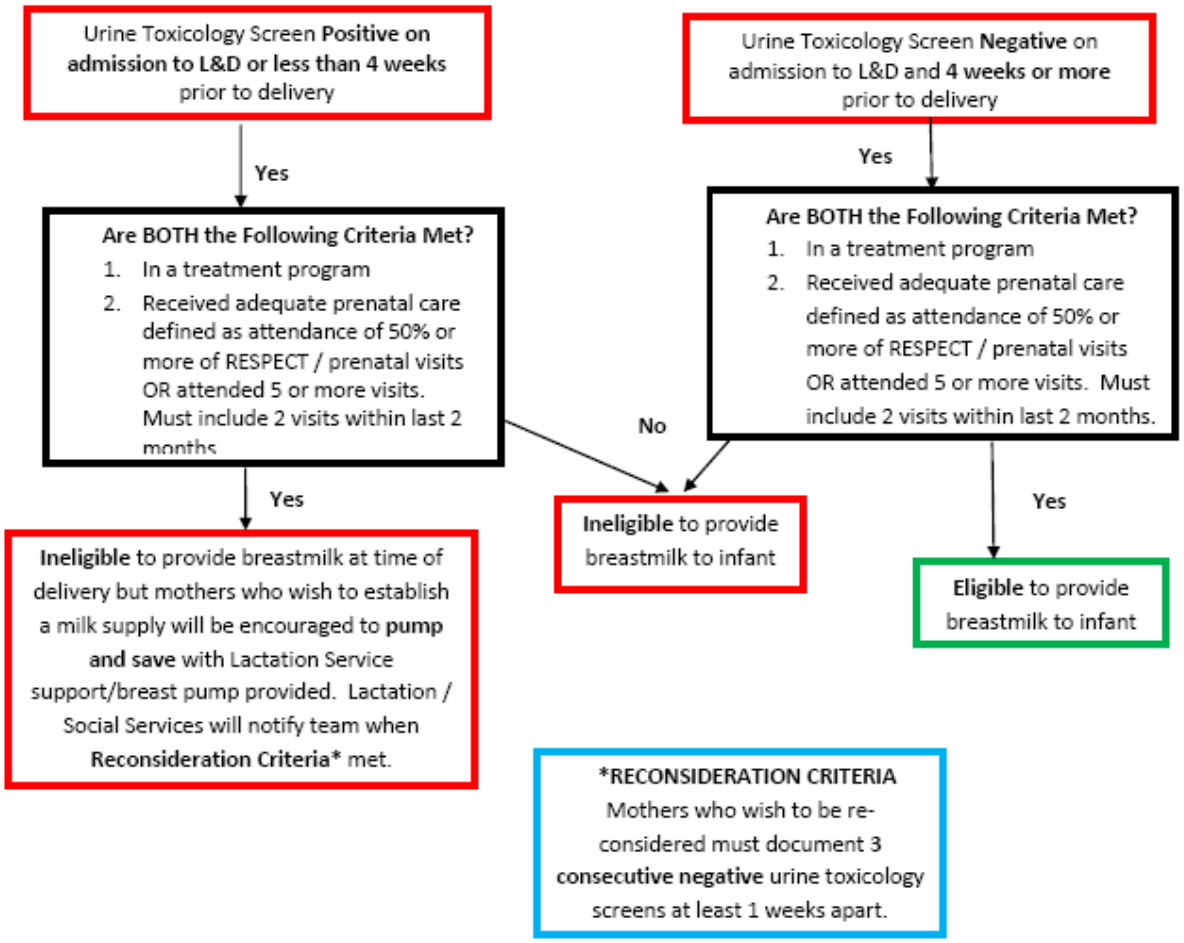
Counseling Parents

- **Length of monitoring = 5 to 7 days**
- **Review of scoring and symptoms**
- **75% of infants require treatment**
- **Most start treatment on day 2-3**
- **25% of infants require 2 medications**
- **Average length of stay is 3 weeks**
- **Review medication guidelines**
- **Emphasize presence at the bedside and non-pharmacologic care**
  - **Breastfeeding**
  - **Skin to skin contact**
  - **Swaddling**
  - **Environment (low lights, clustering care, quiet)**

Breastfeeding

- **Non-Pharmacologic Care**
- **Benefits for all mother-infant pairs**
- **Additional benefits for those with substance use disorder**
- **Approved by all major national organizations for women on methadone and buprenorphine**
- **Minimal transfer of medications in breast milk**
- **Reduces need for pharmacologic treatment for NAS by 30-50% with associated reduction in length of hospitalizations**

Breastfeeding Guidelines



If Prenatal Records Not Available:

1. Mother will be informed of our Breastfeeding Guidelines
2. Mother will sign a release allowing us to obtain her records
3. Provided negative Urine Toxicology on admission to L&D, may initiate breastfeeding while awaiting records

First line treatment: Methadone vs Morphine

- **80% Morphine vs 20% Methadone across the U.S.**
- **Nothing is FDA approved with lack of large randomized trials to guide standardized practice**
- **Maine randomized controlled trial (RCT) in 31 infants: Methadone length of stay 14 days vs 21 days with morphine**
- **On-going multi-centered RCT enrolling 184 infants from 8 centers**
- **Outpatient treatment protocols for methadone**

Medication Therapy Overview

- **Initiate medication for 2 consecutive scores ≥8 or 1 score ≥12**
- **4 levels of medication dosing (0.3 – 0.9mg/kg/day)**
- **Increase to the next level for 2 scores ≥8 or 1 score ≥12**
- **Start second-line medication if scores ≥8 on Level 4 medication or unable to wean**
- **Stabilize for 24-48 hours (scores on average <8)**
- **Wean by 10% maximum dose once every 24 hours**
- **Discontinue medication at 20% of the maximum dose**
- **Monitor for 24-48 hours off medication prior to discharge**

Second Line Treatment: Clonidine vs Phenobarbital

- **Phenobarbital:**
  - **Better for polypharmacy (benzodiazepines, illicit drugs) and severe neurologic symptoms**
  - **Concerns for neurodevelopmental outcomes**
  - **No standardized weaning plan**
  - **BMC Protocol:**
    - **Load with 20mg/kg -> Maintenance 5mg/kg/day**
    - **Can re-load with 10mg/kg x 2 for high scores**
    - **Can increase maintenance up to 6.5 – 8mg/kg/day**
    - **Ideal serum trough level 20-30 mg/mL**
    - **Wean by 20% weekly after discharge**

Clonidine

- **Alternative second-line therapy for opioid-only exposed infants or those with co-exposure to SSRIs**
- **1 mcg/kg PO every 4 hours**
- **Monitor blood pressure every 8 hours**
- **Once stable, wean off morphine, then decrease clonidine dose every 24 hours as tolerated by extending the dosing interval from q4hr to q8hr to q12hr, then off**
- **After discontinuation, observe for a minimum of 48 hours before preparing for discharge**
- **Preliminary studies have shown benefit as adjunctive therapy**

Discharge Planning

- **Hepatitis C Follow-up with Pediatric Infectious Disease**
  - **30-50% of mothers are Hepatitis C positive**
  - **Liver function tests and Hep C DNA PCR at 1 month of life**
- **Ophthalmology Follow-up at 4-6 months of age**
- **High risk infant follow-up clinic referral**
- **Early Intervention Referral (occupational / physical therapy)**
- **Encourage BMC for pediatric primary care**
- **3 post-partum visits at Project RESPECT**

Conclusions

- **Standardized approach can lead to improved outcomes**
- **Focus on non-pharmacologic care and partnership with parents**
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- **Rooming-in model of care**
- **Standardized education for all physicians**
- **Standardized education for all nursing providers on Finnegan Scoring**
  - **http://www.neoadvances.com/program.html**
- **Contact: Elisha.Wachman@bmc.org**

Acknowledgements & References

- **Acknowledgements:**
  - **Boston Medical Center NAS Quality Improvement Team**
  - **NAS Project RESPECT Research Group**

- **References:**

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