Caring for Babies and Families Struggling with Neonatal Abstinence Syndrome (NAS) at Nationwide Children’s Hospital

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Substance Use in Pregnancy

• 15.8 million women (or 12.9 percent) ages 18 or older have used illicit* drugs in the past year. (SAMHSA, 2014)

• Pregnant women under-report drug use

• 55-99% of women in substance abuse treatment have experienced trauma (sexual abuse, domestic violence) (TIP 51, Addressing Specific Needs of Women, 2009)

• Work to change health care providers’ attitudes from “what’s wrong with her?” to “what happened to her?”
Opioid Effects on Fetus and Newborn

Neonatal Abstinence Syndrome (NAS)

• Irritability
• Tremors
• Seizures
• poor sleep
• High pitched crying
• Diarrhea
• Overeating
• Emesis
• Hypertonic
• Poor suck
• Restlessness
• Sweating

Other effects:
• Poor fetal growth (HC, long bones)
• Prematurity
• Low birth weight
• Neurobehavioral abnormalities
• Urogenital abnormalities
• Cerebral vascular anomalies/accidents
• Necrotizing Enterocolitis in term newborns
• STD- Hep B and/or C; HIV (in Ohio, 26% of moms +HCV)
• Prolonged QTc with methadone
Drug Effects on Fetus and Newborn

Cocaine
Prematurity
Microcephaly, neural tube defects
Vascular accidents

Heroin
low birth weight

SSRI
CNS irritability, feeding problems

Amphetamine
Cardiac anomalies
Drug Effects on Fetus and Newborn

Alcohol
  Birth defects
  Fetal Alcohol Syndrome

Nicotine
Concentrations higher in fetal compartment than maternal serum levels
  Preterm labor
  Poor growth, esp head
  Risk of SIDS
  Childhood asthma
  ADHD
Drug Effects on Fetus and Newborn

Marijuana
Remains in body up to 30 days, increases fetal and neonatal exposure

Infant neurobehavioral effects:
- Decreased self-quieting ability
- Fine tremors and startles
- Sleep pattern changes

Longer term:
- Disturbed nocturnal sleep

Behavior problems
- Inattention, impulsivity and hyperactivity,
- Delinquency and externalizing problems
- Self-reported depressive and anxiety symptoms
Long Term ND Outcomes

• Altered arousal regulation at 1 month and visual evoked potentials at 6 months of age

• Auditory event-related potentials and dysregulation abnormalities

• Poor grade school performance (Oei et. al., 2017)

• Documented adverse neurodevelopmental outcomes from nicotine, alcohol, THC exposure

• Direct impact on outcomes- environment and social factors
National Incidence and Cost of NAS

• 1999-2013
  – Rate of NAS increased 300% from 1.5 to 6 cases per 1000 hospital births (Ko et. al., 2016)
  – Rate of antepartum maternal opiate use increased 500% from 1.19 to 5.63/1000 deliveries
  – Hospital charges per patient related to NAS increased from $39,400 to $53,400 (Patrick et al., 2012)
  – National healthcare costs increased from $200 million in 2000 to $1.5 billion in 2012 (Patrick et al, 2012)
Local Data

• 2015-2017
  – 160 babies treated for drug withdrawal in NCH NICUs
  – NCH services 33 counties in Ohio
    • Delaware county- n= 4
    • Fairfield county- n=21
    • Franklin- n= 45
    • Marion- n= 6
Neonatal Drug Withdrawal

• 20-90% of drug exposed infants will exhibit withdrawal symptoms, depending on:
  – Type of drug/s- singular or multiple, half life
  – Concomitant SSRI and tobacco use
  – Maternal weight, drug dosage and timing
  – Infant weight, gestation
  – Infant’s intrinsic metabolism
Neonatal Drug Withdrawal

• Symptom Onset: 24 hours to days
  – onset of BUP withdrawal later than Methadone

• Symptom Duration: 16 days to months, self limiting

• AAP Monitoring Recommendations:
  – Minimum 2-3 days for any maternal history of drug use
  – 5-7 days if mom on multiple and/or long acting drugs
NAS Assessment Tools

<table>
<thead>
<tr>
<th>Scale</th>
<th>Finnegan</th>
<th>Neonatal Withdrawal Inventory (NWI)</th>
<th>Neonatal Narcotic Withdrawal Index (NNWI)</th>
<th>Lipsitz</th>
<th>Ostrea</th>
</tr>
</thead>
<tbody>
<tr>
<td>N DOL</td>
<td>Term neonates up 28 DOL</td>
<td>80 term neonates</td>
<td>24 hours old, 50 FT methadone exposed vs 40 FT non-exposed</td>
<td>41 neonates 35-40 GA</td>
<td>196 neonates 37 GA</td>
</tr>
<tr>
<td>Scored items</td>
<td>31 items</td>
<td>7 items Scale 0-4</td>
<td>7 items + “other” Scale 0-2</td>
<td>11 items Scored 0-3</td>
<td>6 items Rank order</td>
</tr>
<tr>
<td>Withdrawal assessed</td>
<td>Opiates</td>
<td>Opiate (methadone, heroine)</td>
<td>Opiate (Methadone 40-65 mg/day, +/- heroine)</td>
<td>“narcotic addicted mothers”</td>
<td>Opiate (methadone &gt; or &lt; 20 mg/day; heroine)</td>
</tr>
<tr>
<td>Comments</td>
<td>Comprehensive Complex Originally developed as clinical research tool</td>
<td>Tx at score of 8 Established inter-rater reliability, sensitivity, specificity</td>
<td>Tx for 2 scores 5+ in 24 hrs Established reliability, inter-rater reliability</td>
<td>Highly subjective (yes/no, normal/abnormal) Compared healthy term and near term to NAS</td>
<td>No guidelines for therapy Not comprehensive</td>
</tr>
</tbody>
</table>
Neonatal Drug Testing

**Urine**
- Detects recent use of nicotine, opiates, cocaine, amphetamine, TCH
- High rate of false negatives
- Bagged specimen can be difficult to obtain
- Parent, staff stress related to trying to collect sample
- Turnaround time
- Relatively inexpensive

**Meconium**
- Detects more long-term use of nicotine, alcohol, opiate, cocaine, amphetamine, THC
- ? Effect of urine, transitional stool on sample
- Can be difficult to collect
- May pass in utero/during birth.
- May not be timely -obstruction, short stay, delayed stooling
- Parent, staff stress related to trying to collect sample
- Turnaround time

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Nationwide Children's
When your child needs a hospital, everything matters.
Neonatal Drug Testing

Hair
● Highly reliable
● Detects long term exposure to nicotine, alcohol, cocaine, amphetamine
● Valid
● Specimen collection difficult for newborns

Umbilical Cord
● Highly reliable and valid
● Expanded panel of drugs
● Chain of custody
● Turnaround time
● Expense
● Ease of collection
● Storage
Nonpharmacologic Care

Dyad care when possible
  Decrease in LOS and NICU admissions
Decrease stimuli
  Cluster care
  Quiet environment
  Containment- then transition to back to sleep
  Pacifier
  ?Kangaroo care
  Slow, smooth rhythmic rocking/swaying
Small, frequent feeds
Skin care
Breastfeeding

Benefits:
- Attachment
- Nutritional benefits
- Other health benefits
- Financial benefits, convenience
- Decreased NAS severity
- Could improve mom’s abstinence or treatment adherence

Risks:
- Medical
  - Drug transfer
  - Type of drug/s
  - Maternal infections
- Legal
  - State Law
  - Organizational Policies
Pharmacologic Management

- Used to relieve symptoms not controlled with non-pharm (seizures, weight loss)

- Prolongs hospital stay and/or exposure to drugs

- No evidence for improved long term outcomes with drug therapy

- No evidence for short or long duration drug therapy
Pharmacologic Management

Paragoric
  Toxic ingredients; high concentration of alcohol (~45%)

Tincture of Opium
  Highly concentrated morphine solution- increases possibility of medication errors; contains alcohol

Morphine
  Short half life; allows for quicker weans
  Given Q3 hours with feeds- interrupts ad lib/breastfeeding

Methadone
  Longer half life; given frequently- easier with breastfeeding
Pharmacologic Management

Buprenorphine
Shows promise; clinical trials underway

Phenobarbital
Treatment of seizures, sedation; neuronal toxin with prolonged exposure

Clonidine
Used to help decrease tachycardia, hypertension, diaphoresis, diarrhea; effective as primary or adjunct treatment

Benzodiazepine
Impaired excretion, late onset seizures
Discharge Management

Safe Home Environment:
– States, counties vary related to reporting and disposition
– Work through Social Worker

Family Education
– ? Ongoing scoring
– Nutrition
– Well baby parenting

Follow Up
– Developmental screening
– ? Exposure to HBV, HBC, HIV
The Nationwide Children’s Hospital Experience

Nationwide Children’s Hospital (NCH) is a large, free-standing academic pediatric facility in Columbus, Ohio with 450 licensed beds.

Neonatal Services (NS)
9 Intensive Care Nurseries
254 Neonatal beds
2300+ admissions/year
Neonatology Service Line
Length of Stay Issues

Background:
In 2009 at NCH
- 7.6% of all NICU/NSCU admits (approx. 120 patients/year)
- Average Length of Stay (ALOS) 35.5 days on the main campus, 78 days in an off-campus unit

Significance:
Long LOS negatively impacts psychosocial situation
Created backlog of NICU/NSCU beds
Caregiver stress
Resource expenditure:
More than $70 million in healthcare expenses, 1,649 admissions – roughly five per day- and nearly 19,000 days in Ohio in 2011 (OPQC, 2014)
NAS Taskforce
Interprofessional Committee: information, education, lessons learned and potentially better practices are shared

Monthly interdisciplinary collaborative meetings:
  Education, awareness of maternal substance use and abuse
  Developed NAS practice guidelines
  Enhanced antenatal professional education, communication, collaboration
  Outreach education and support for providers in the Region.

MOD Grant:
  Improved maternal Methadone treatment retention rate by 25%
Nationwide Children’s Hospital and NAS

Developed Volunteer Cuddler Program

Established NCH NAS Follow up Clinic for ongoing medical management, developmental screens

Ohio Perinatal Quality Collaborative (OPQC)
https://www.opqc.net/projects/NAS

Maternal Opiate Medical Support (M.O.M.S.) Pilot Project Program http://momsohio.org/about/

Vermont Oxford Network iNICQ NAS Collaborative
https://public.vtoxford.org/quality-education/nas-universal-training-program/
Outcomes: Length of Stay

Less than 5% 30 day readmission rate
Healthcare Savings

Since 2013:
  Cared for 541 babies with NAS in the NCH NICUs

In 2016:
  Cared for 648 babies
  Avoided $1.3 million in NICU expenses
Continued Steps

- Medical and non-pharmacologic infant care
- Family integrated and supported care
- Follow up and early access to services
- Pediatric prevention strategies
In Summary

• Incidence of maternal drug use, NAS is increased
• Profound impact on baby, family, providers, healthcare system
• Each unit should have an NAS protocol:
  – Screening and testing of mom and baby
  – Assessment/scoring
  – Treatment- non pharm and pharm
  – Discharge management and Follow Up
• LOS can shortened by decreasing variability in treatment
• Staff challenged /stressed when caring for NAS patients and families
• Staff attitudes and bias impact collaboration with family
• Much research is needed!
Questions?

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References

References


References


• Substance Abuse and Mental Health Services Administration: (SAMHSA). Retrieved from: http://www.samhsa.gov/data/

• Vermont Oxford Network (VON). (2013)
