Journeys of the Inconsolable: Neonatal Abstinence Syndrome

Lance Wyble, MD, MPH
Neonatologist
Pediatrix Medical Group, Tampa, FL
Clinical Associate Professor
USF College of Medicine, Tampa, FL

The speaker has disclosed that he will discuss the use of off-label medications during this presentation. He has also indicated that he has no significant financial interest or relationship with the companies or the manufacturer(s) of any commercial product and/or service that will be discussed as part of this presentation.

Session Summary

The pharmacobiology of NAS makes this epidemic a difficult problem to manage. However, new directions in management are promising.

Session Objectives

Upon completion of this presentation, the participant will be able to:

- improve management of current health issues in the pediatric population with the knowledge gained from this activity;
- recognize new advances in pediatric medicine;
- apply the principles of evidence-based medicine to their practice of pediatrics.

References


**Session Outline**

See presentation handout on the following pages.
NEONATAL DRUG WITHDRAWAL

Lance Wyble MD, MPH
Medical Director, Morton Plant Hospital
Clinical Associate Professor
University of S. Florida College of Medicine

Use & Abuse of Drugs, Alcohol, and Tobacco
(All ages / and sexes)

Use of Illicit Drugs in past Month: 8.7%
Binge or Heavy Alcohol: 23.7%
Use of Tobacco Products: 27.7%

Use of Illicit Drugs (Pregnant Women 15-44)
Expl: THC, Cocaine, Hallucinogens, Heroin,
Methamphetamines, AND Medical/ Non-Medical Prescription Drugs

Nationally: 4.5%*
Locally: 6.8%

INTRAUTERINE EXPOSURE TO CERTAIN DRUGS

Congenital Anomalies +/- IUGR
Increased risk of Preterm Delivery
Signs of Neonatal Toxicity / Withdrawal
Impair Normal Neurodevelopment

Risk of Death Considerations with Opioid Use

INFORMATION SOURCES:

2009 Nat'l Survey on Drug Use and Health
Morrison Medical IRB# 97, Teresa Kek Final, MS, and Glidewell Zona, MD, FRCP(C)

Rates of maternal drug abuse depend on risk status:
• 1.2-8.7% for broad-based screening
• 17% for high-risk group

Several reports show increasing rates of drug abuse during pregnancy
Abstinence patterns in newborn

<table>
<thead>
<tr>
<th>Alcohol</th>
<th>Stimulants</th>
<th>Antidepressant</th>
<th>Opiates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset</td>
<td>3-12 h</td>
<td>rapid</td>
<td>1-3 days</td>
</tr>
<tr>
<td>Duration</td>
<td>days</td>
<td>days</td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Data from reference lab for drug screening

### NEONATAL WITHDRAWAL SYNDROME

**Ten Fold Increase in Florida**

1995 2008

Nationally (Absolute #): 7653 11,937

Florida (Per 1000 births): 0.4 4.4

* AAP Clinical Report, 2/2012

### NEONATAL WITHDRAWAL SYNDROME

**30 Years ago**

**Neonates Exposed to Opiates In Utero - Any Signs**

Withdrawal signs 55% to 94% of Infants

Harper, Pediatrics, 1974
Fricker, AJDC, 1978
Madden, AJOG, 1977
Ostrea, J Peds, 1976

### NEONATAL WITHDRAWAL SYNDROME

**Use (>1mo) of Rx Narcotics in Pregnancy**

Five-fold Increase from 1998 to 2008

5.6% of Infants Manifested Signs of Withdrawal

* Kellogg et al, AJOG, 2011
OPIOIDS

- Natural, endogenous, and synthetic compounds that activate mu opioid receptors in the CNS to produce “supra-spinal analgesia”.

- Also induces sedation & euphoria, as well as resp. depression and decreased GI motility.

- Prolonged use results in physiological and psychological DEPENDENCE.

- The inter-patient range to achieve the same effect is wide because of genetic differences in pharmacokinetics & pharmacodynamics.

Narcotic equivalency table

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose (mg)</th>
<th>Equianalgesic to Morphine 10 mg IM</th>
<th>Half-Life (h)</th>
<th>Duration (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>20-30*</td>
<td>10</td>
<td>2-3</td>
<td>2-4</td>
</tr>
<tr>
<td>Morphine CR</td>
<td>10-20</td>
<td>10</td>
<td>2-3</td>
<td>8-17</td>
</tr>
<tr>
<td>Methadone</td>
<td>20</td>
<td>10</td>
<td>12-100</td>
<td>4-12</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>10 (oral)</td>
<td>1</td>
<td>2-3</td>
<td>2-4</td>
</tr>
<tr>
<td>Oxycodone CR</td>
<td>5</td>
<td>5</td>
<td>2-3</td>
<td>8-10</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>7.5</td>
<td>1.5</td>
<td>2-3</td>
<td>2-4</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>7-12</td>
<td>10-14</td>
<td>16-24</td>
<td>48-72</td>
</tr>
</tbody>
</table>

OPIOIDS

- Endogenous opioids are released by the brain, so the Brain has Opioid Receptors.

- They play a natural role in sedation & euphoria of complex behavior patterns.

- Opioids acutely inhibit the release of NorEpinephrine at synaptic endplates (ie sedation)

- Chronic exposure leads to TOLERANCE because the rate of NorEpinephrine release over time INCREASES to maintain a normal level.

OPIOIDS AND NEURON DAMAGE

- INITIALLY, Opioids acutely INHIBIT the release of NorEpinephrine at synaptic endplates (PROTECTIVE)

- Chronic exposure leads to TOLERANCE

- The rate of NorEpinephrine release over time INCREASES to maintain a normal level

- This INCREASED RATE of NorEpinephrine release over time CAUSES NEURONAL APOPTOSIS
METHADONE

Methadone exerts a secondary effect by acting as a NMDA Receptor ANTAGONIST.

It blocks the actions of Glutamate, which is the primary EXCITATORY NEUROTRANSMITTER in the CNS.

OPIOID WITHDRAWAL SX

- Abrupt discontinuation of chronic exogenous opioids results in SUPRA-NORMAL RELEASE of NorEpinephrine.
- Since Opioids acutely inhibit the release of NorEpinephrine from synaptic endplates,
- This SUPRA-NORMAL RELEASE produces Autonomic and Behavioral signs and symptoms which we consider NAS.

Variable Exposure & Variable Risk

Variable NAS Clinical Symptom Onset

- Which Opioid
- Gestational Age
- Timing of most recent drug exposure and fetal metabolism
Variable NAS Clinical Symptom Onset

- Net transfer of drug across placenta
- Placental Metabolism
- Poly-Drug

Confounders

- Exposure to unknown agents
- Amount of time exposed in utero
- Weight at birth
- Underlying neurologic damage from fetal neurotoxins eg. alcohol, cocaine, etc.

Risk factors associated with NAS

- No prenatal care
- Low socioeconomic status
- Other drug abusers in family
- Mental health problems
- Placental abruption (cocaine, amphetamine)
- History of alcohol or tobacco use
- Prolonged ICU narcotic treatment
- Maternal history of drug abuse

Abuse of Multiple Drugs

Common Problem

May (or may not) affect Onset, Presentation and LOS

Compared infants of methadone addicted mothers who smoked ≥20 cigarettes/days (N=13) v ≤10 cigarettes/day (N=16)

NAS scores higher: 9.8 v 4.8
Onset of symptoms took longer: 113 h v 37.8 h
Preterm infants were less symptomatic than term infants.

**Approach to Determining In-Utero Exposure**

**NAS Screening**
Self Reporting and OB Urine Samples
MAY MISS CASES.

Anticipation of the Problem frequently leads to “Screening” for Prenatal exposure to drugs of abuse.

**Newborn Sx of Maternal Drug Use**
Similar to Sepsis, Respiratory Conditions, Hypoglycemia, Hypocalcemia, Hyperthyroidism, ICH, HIE, and Hyperviscosity.

**Neonatal Drug Screen for Drugs of Abuse**

<table>
<thead>
<tr>
<th>Site</th>
<th>Formation &amp; exposure times</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Urine</td>
<td>Days before delivery (3-4 d)</td>
<td>Must be first urine, may reflect L&amp;D meds.</td>
</tr>
<tr>
<td>Meconium</td>
<td>12-18 weeks gestation</td>
<td>Takes a while to collect depending on GI function.</td>
</tr>
<tr>
<td>Umbilical Cord</td>
<td>Not clear</td>
<td>Need 4 in umbilical cord. May miss sample if not suspected at delivery.</td>
</tr>
<tr>
<td>Hair</td>
<td>20 weeks gestation</td>
<td>Not widely available for measurement.</td>
</tr>
</tbody>
</table>

**Assessment of Signs in the Newborn and Non-Pharmacologic Treatment**
Frequency of Clinical Signs

- Disturbed sleep – 53%
- Mottling 53%
- Excess sucking 45%
- Tremors 43%
- Tachypnea – 43%
- Hypertonia 41%
- Fever 40%
- Seizures 2-11% (often later)

Preferred abstinence scoring system in different surveys:

<table>
<thead>
<tr>
<th>Year</th>
<th>Score</th>
</tr>
</thead>
</table>
| USA 2008 | 55%
| USA 2007 | 53%
| UK 2009 | 49%
| USA 2010 | 47%

Is Finnegan Score as useful when the neonate gets older?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Median Score (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestational age (weeks)</td>
<td>39 (33-41)</td>
</tr>
<tr>
<td>Birth weight (kg)</td>
<td>2.95 (1.8-4.22)</td>
</tr>
<tr>
<td>Birth weight (g)</td>
<td>2920 (1205-4750)</td>
</tr>
<tr>
<td>Apgar score at 1 minute</td>
<td>8 (6-10)</td>
</tr>
<tr>
<td>Apgar score at 5 minutes</td>
<td>7 (5-10)</td>
</tr>
<tr>
<td>Rh factor</td>
<td>33 (11-62)</td>
</tr>
<tr>
<td>Duration of labor (hr)</td>
<td>48 (3-62)</td>
</tr>
<tr>
<td>C-Section delivered (%)</td>
<td>18 (4-5)</td>
</tr>
<tr>
<td>Delivery by nurse (%)</td>
<td>9 (0-10)</td>
</tr>
</tbody>
</table>

Non-pharmacologic Treatment Options for Neonatal Abstinence Syndrome

**Must be part of any therapeutic intervention for NAS**

- Swaddling
- Minimizing stimulation
- Positioning (flexion vs. extension)
- Reduced lighting/noise
- Small, frequent feedings
- Use of pacifier to reduce excessive crying
- Relaxation baths/massage/waterbeds

Pharmacologic Treatment for Narcotic Abstinence Syndrome

**BACKGROUND**
Pharmacologic Options for Neonatal Narcotic Abstinence Syndrome

- Tincture of opium (Morphine 10 mg/mL)
- Paregoric (Morphine 0.4 mg/mL)
- Morphine
- Methadone
- Buprenorphine
- Phenobarbital
- Chlorpromazine
- Diazepam / Lorazepam / other Benzodiazepine
- Clonidine / other alpha-2 agonists
- Chloral hydrate

Measures of Efficacy

- % patients controlled with single drug
- Days to reach target symptom score (mean, all scores, consecutive scores?)
- % of patients with most serious symptoms eg. seizures
- Length of treatment needed
- Time to discharge from the hospital

Issues to consider in drug selection

- Days to symptom resolution
- Efficacy - % requiring 2nd drug
- Duration of hospitalization
- Severe NAS sx eg. seizures
- Ease of use (eg. frequency of dosing, taste, storage, etc.) - affect compliance
- Toxicity – short term
- Toxicity – long term
- Risk of outpatient use / abuse / overdose
- Cost

Pharmacologic Treatment for Narcotic Abstinence Syndrome

PAST STUDIES

AND

META-ANALYSES

Tincture of Opium Vs Paregoric

<table>
<thead>
<tr>
<th>Tincture of Opium</th>
<th>Paregoric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred drug (AAP)</td>
<td>One of first drugs used</td>
</tr>
<tr>
<td>18% alcohol</td>
<td>Potentially toxic additives:</td>
</tr>
<tr>
<td>No toxic additives</td>
<td>Camphor (CNS stimulant)</td>
</tr>
<tr>
<td>Must be diluted 25-fold</td>
<td>Anise oil (habituation)</td>
</tr>
<tr>
<td>(0.4 mg morphine equivalent per ml)</td>
<td>Benzoic acid (gasing baby syndrome, jaundice)</td>
</tr>
<tr>
<td></td>
<td>Glycerin (diarrhea)</td>
</tr>
</tbody>
</table>

2005

- Term infants with methadone addiction
- Rx: Tincture of Opium 1% (N=16), Morphine 0.4 mg/mL (N=17)
- Finnegan score >8 required increase treatment dose

Outcome:

| Hospital days (median): TO = 30.5, M = 38 |
| Days Pharmacologic tx: TO = 23.2, M = 33 |
| Days Finnegan score >8: TO = 9.8, M = 11.7 |

- Authors opinion in text:
  - “CLONIDINE may be effective and should be studied”
  - Phenobarbital use for several months unacceptable

2005

Hypnosis of the neonatal abstinence syndrome with tincture of opium or morphine drops.
Pharmacologic Treatment for Narcotic Abstinence Syndrome

**HAVE WE FOUND THE SAFEST ANSWER?**

**WILL IT WORK AS WELL?**

---

**TABLE 5: Methadone Weaning Protocols After Opioid Therapy for 7 to 14 or >14 Days**

<table>
<thead>
<tr>
<th>Short-term Therapy Protocol (7-14 d)</th>
<th>Long-term Therapy Protocol (&gt;14 d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1: give 00 P.O. every 6 h for 24 h</td>
<td>Day 1: give 00 P.O. every 8 h for 24 h</td>
</tr>
<tr>
<td>Day 2: reduce OD 25% (give P.O. every 6 h for 24 h)</td>
<td>Day 2: give OD, change to P.O. every 8 h for 24 h</td>
</tr>
<tr>
<td>Day 3: reduce OD 25%, give P.O. every 8 h for 24 h</td>
<td>Day 3: reduce OD 20%, give P.O. every 12 h for 24 h</td>
</tr>
<tr>
<td>Day 4: reduce OD 20%, give P.O. every 12 h for 24 h</td>
<td>Day 4: reduce OD 20%, give P.O. every 16 h for 48 h</td>
</tr>
<tr>
<td>Day 5: reduce OD 15%, give P.O. every 24 h for 48 h</td>
<td>Day 5: reduce OD 10%, give P.O. every 48 h for 48 h</td>
</tr>
<tr>
<td>Day 6: reduce OD 10%, give P.O. every 48 h for 48 h</td>
<td>Day 6: reduce OD 5%, give P.O. every 48 h for 48 h</td>
</tr>
<tr>
<td>Day 7: reduce OD 5%, give P.O. every 48 h for 48 h</td>
<td>Day 7: reduce OD 5%, give P.O. every 48 h for 48 h</td>
</tr>
</tbody>
</table>

Dosage adjustments are made every 8-24 h. Opioid weaning protocols should take into account the half-life of methadone. Short-term therapy should be completed within 14 days, and duration of and need for long-term therapy should be individualized. O.D. indicates original dose; D.O. indicates new dose; P.O. by mouth.

CLINICAL EXPERIENCE

- 7 neonates withdrawing from maternal methadone maintenance.
- Clonidine 3-4 mcg/kg/day
- 6 of 7 responders, 1 failed to respond

Clonidine: alpha2:alpha-1 activity ratio = 220:1
Dexmedetomidine (Precedex®):
alpha2:alpha-1 activity ratio = 1620:1
(8 times more specific than clonidine)

WHAT ABOUT LONG TERM OUTCOMES?

Some babies will be coming to you on Phenobarb.
Some will have been on Clonidine (i.e., Check BP)
Purified brain cells are from 16-22 week fetuses.

Effect markedly impaired when cells were pretreated with naloxone.

Intestinal issues, dehydration and poor weight gain can be symptoms of NAS.

What about breastfed infants?

Nutrition
SUMMARY

- Initial attempts should be made to control symptoms with Non-pharmacologic measures.
- The detailed history of all facets of the maternal drug use will be critical to the expectations and management in the case.
- Initial mono-therapy should start with Morphine per the AAP.
- Adding additional drugs in therapy may be associated with a shorter Length of Stay.

AAP STATEMENT

At this time, no optimal pharmacologic regimen for the prevention or treatment of acquired opioid and/or benzodiazepine dependency can be recommended, because necessary comparative studies of safety and efficacy are not available.

Reasonable Points (AAP)

- Have a protocol that Defines indications and procedures for screening before, at, or after birth.
- Nurseries should develop and adhere to a Standardized Plan for the evaluation and comprehensive treatment of at-risk and withdrawing infants.

Reasonable Points (AAP)

- Screening should use multiple methods- urine, meconium and umbilical cord testing
  - Positives don’t require confirmation
  - False negatives can be proven using more than one method
- Signs should be scored by a published tool.
- Drug exposed infants- Treat only if Sx (Watch 5-7 days)
Reasonable Points (AAP)

- The optimal threshold score to start drug therapy is unknown.
- Breastfeeding / Breast milk is encouraged if not contraindicated for other reasons.
- Seizures are treated with anticonvulsants and other causes should be looked for.

Reasonable Points (AAP)

- Vomiting and Diarrhea assoc w/ dehydration and poor weight gain are relative indications for treatment (even if scores aren’t high).
- Based on Limited Evidence, start with oral Morphine or Methadone when Rx treatment is indicated.
- Growing evidence shows that Clonidine is also effective as primary or adjunctive therapy.

Reasonable Points (AAP)

- Efficacy & Safety of Buprenorphine for NAS requires additional comparative study.
- Insufficient evidence about exposure to Multiple Drugs of Abuse regarding best treatment “class of drugs” (i.e. Opioid, Barbiturate, Other, or Combo)
- Severity of Sx (or treating drug withdrawal) has not been shown to translate into different Developmental Outcomes

OUR MEDICATION PROTOCOL

- If 3 consecutive NAS scores ≥ 8, 2 scores ≥ 12, or any ≥ 15 admit patient to NICU
- In NICU (after Therapeutic Handling started), start Morphine 0.04mg/kg/dose q 3-4h (Usu. q 3 hours)
- Starting dose may be anywhere from >0.04 to 0.08mg/kg/dose IF baby has higher scores (ie.15 would probably start at 0.08/kg/dose q 3 hr).
- Increase by 0.02 mg/kg/dose every 3 hours until target abstinence score achieved.
- If control not achieved (ie dose 0.12/kg), consider adding 2nd drug, if supportive care is optimal and no other cause for symptoms.

EARLY MEDICATION PROTOCOL

2nd DRUG IN ACHIEVING CONTROL

If scores DURING FIRST 1-2 days of withdrawal continue ≥ 8 intermittently, or 2 scores ≥ 12, or any ≥ 15 despite Morphine doses > 0.12mg/kg/dose, a 2nd drug may be started.
- Phenobarbital is more familiar to most of our Doc’s
- Concern about Seizures frequently adds to the reason for choosing Phenobarb.
- Consideration of Poly-Drug/ Tobacco use by Mom (& other Dx) becomes a driving factor in the choice.
- We typically act based on the data about that concern (ie Load with Phenobarbital with ? of routine dosing)

NAS MEDICATION PROTOCOL

2nd DRUG for Maintaining CONTROL

If scores after 1-2 days of controlled withdrawal sx return to levels ≥ 8, Morphine dose in increased.
- Phenobarbital is more familiar to most of our Doc’s
- Again, consideration of Poly-Drug use by Mom (& other Dx) becomes a driving factor in the choice.
- We typically add Phenobarbital either as a single loading dose or by routine dosing)
- Clonidine at 1 microgram/kg/dose q3-4 is also an acceptable alternative.
NAS MEDICATION WEANING PROTOCOL

• If 3-5 consecutive days with NAS scores < 8 are achieved, weaning is started, consideration of hx is a factor
• Morphine dose is usually decreased by 10% for any change.
• If patient is on q3h dosing, an attempt may be made to go to q4h dosing at this point
• This represents a critical period, so maximal effort should go into consistent scoring and Non-Rx efforts.
• Increased scores require at least a return to the previous dose, but an increase by 0.02 mg/kg/dose every 3 hours (until target scores are achieved) may be needed.

NAS MEDICATION FINAL WEANING

• If morphine dose is < 0.03 mg/kg/dose and there have been 2-3 consecutive days with NAS scores < 8, Interval weaning is started. (ie q4 to q6 to q8-12 to off)
• Weaning of Clonidine (& ? Phenobarb) needs to also occur in this period.
• An adequate period of scoring vs observation is important, but MAY (OR MAY NOT) need to remain inpatient more than 2 days after last day of q12 h dosing (Depending on score ).
• A return of withdrawal sx can occur even 2 weeks after stopping all drugs for NAS.

BAYCARE EXPERIENCE

REMEMBER
Use of Illicit Drugs
(Pregnant Women 15-44)

Expl: THC, Cocaine, Hallucinogens, Heroin, Methamphetamines, AND Medical/ Non-Medical Prescription Drugs

Nationally: 4.5%*
Locally: 6.8%
* 2009 Nat’l Survey on Drug Use and Health

NEONATAL WITHDRAWAL SYNDROME

TEN FOLD INCREASE IN FLORIDA

In Our Area

About 1/3 of Exposed Newborns WILL Develop NAS
### 2011 NAS DATA
**What drugs were they taking?**

<table>
<thead>
<tr>
<th>BAYCARE</th>
<th>NICU A</th>
<th>NICU B</th>
<th>NICU C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt's w/ NAS</td>
<td>63 pt's</td>
<td>56 pt's</td>
<td>51 pt's</td>
<td>170 pt's</td>
</tr>
<tr>
<td>Methadone</td>
<td>38%</td>
<td>70%</td>
<td>39%</td>
<td>49%</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>48%</td>
<td>45%</td>
<td>55%</td>
<td>49%</td>
</tr>
<tr>
<td>Benzodiazepine</td>
<td>21%</td>
<td>29%</td>
<td>33%</td>
<td>27%</td>
</tr>
</tbody>
</table>

1 infant had Maternal use of Methamphetamines

### 2011 NAS DATA **POLYDRUG**

<table>
<thead>
<tr>
<th>BAYCARE</th>
<th>NICU A</th>
<th>NICU B</th>
<th>NICU C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt's w/ NAS</td>
<td>63 pt's</td>
<td>56 pt's</td>
<td>51 pt's</td>
<td>170 pt's</td>
</tr>
<tr>
<td>Methadone</td>
<td>38%</td>
<td>70%</td>
<td>39%</td>
<td>49%</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>48%</td>
<td>45%</td>
<td>55%</td>
<td>49%</td>
</tr>
<tr>
<td>Polydrug</td>
<td>44%</td>
<td>61%</td>
<td>61%</td>
<td>55%</td>
</tr>
</tbody>
</table>

### 2011 NAS Length of Stay DATA

<table>
<thead>
<tr>
<th>BAYCARE</th>
<th>NICU A</th>
<th>NICU B</th>
<th>NICU C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt's w/ NAS</td>
<td>63 pt's</td>
<td>56 pt's</td>
<td>51 pt's</td>
<td>170 pt's</td>
</tr>
<tr>
<td>Methadone</td>
<td>38%</td>
<td>70%</td>
<td>39%</td>
<td>49%</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>48%</td>
<td>45%</td>
<td>55%</td>
<td>49%</td>
</tr>
<tr>
<td>Avg LOS (d)</td>
<td>26.7</td>
<td>26.7</td>
<td>18.8</td>
<td>24</td>
</tr>
</tbody>
</table>

### How should we apply this at St Joseph’s Women’s Hospital?

AAP Recommends Delaying Newborn Discharge in cases of Known Prenatal Opioid Exposure FOR 5-7 DAYS

### What is the Average LOS for a Newborn at Your Hospital?

**IN 2011**
Average LOS for Newborns at St. Joseph’s Women’s

**2.35 Days !**

### 2011 NAS DATA
**What is concerning?**

<table>
<thead>
<tr>
<th>BAYCARE</th>
<th>NICU A</th>
<th>NICU B</th>
<th>NICU C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt's w/ NAS</td>
<td>63 pt's</td>
<td>56 pt's</td>
<td>51 pt's</td>
<td>170 pt's</td>
</tr>
<tr>
<td>Methadone</td>
<td>38%</td>
<td>70%</td>
<td>39%</td>
<td>49%</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>48%</td>
<td>45%</td>
<td>55%</td>
<td>49%</td>
</tr>
<tr>
<td>Birth No.</td>
<td>~7000</td>
<td>2500</td>
<td>~2800</td>
<td>27%</td>
</tr>
</tbody>
</table>

1 infant had Maternal use of Methamphetamines
What is the statistically EXPECTED Annual Number of NAS Newborns at St Joseph’s Women’s Hospital?

DELIVERIES IN 2011: ~7000
Approximate Number Mom’s Pos.: 280
33% Should Show Sx Withdrawal= ~100
Newborns admitted for NAS: 63

What more can we imply at St Joseph’s Women’s Hospital?

BAYCARE HOSPITALS

Hospital B  No Nsy for Exams
Hospital C  90% NB Exams in Room
Hospital A  90% NB Exams in Nsy

QUESTIONS???