BENEFITS OF ROOMING-IN FOR BABIES & FAMILIES WITH NAS:
Lessons Learned from Dartmouth-Hitchcock

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No financial arrangements or affiliations with a commercial entity to disclose

All of the drugs used in the treatment of NAS are used “off label”
LEARNING OBJECTIVES

- Identify 1-2 innovations implemented at Children’s Hospital at Dartmouth-Hitchcock (CHaD) that support infants (and their families) with NAS

- Describe a benefit of identified innovations to the parent of an infant with NAS
U.S. NAS STATISTICS

- Incidence
  - 1.2 → 3.9 → 5.8/1000 live births
  - ~ Twice as many at risk

- Cost (charges)
  - $39,400 → $53,400 → $75,700 → $93,400 per patient
  - 80% Medicaid (vs 45.5 % all others)
  - $730 million annually in 2009 → $1.5 billion in 2012

WHY IS NAS CARE SO COSTLY?
NAS due to In-utero Opioid Exposure

- ≥ 3/4 infants develop some degree of NAS
- Symptoms start on DOL 2, peak ~ DOL 3-4
  - No rel’p b/w dose of opioid-substitution agent and NAS severity or duration of Rx
- AAP recommendation: Observe for 5-7 days minimum
- In most studies, ≥ 1/2 infants require Rx for NAS

NAS AND LOS

- If Rx required, LOS can be lengthy

- **Length of Treatment (LOT):** Days to months depending on severity of NAS, poly-substance exposure, hospital setting / center, medication used

<table>
<thead>
<tr>
<th>Medication</th>
<th>length of stay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>12 to 34 days</td>
</tr>
<tr>
<td>Methadone</td>
<td>14 to 52 days</td>
</tr>
<tr>
<td>Phenobarbital</td>
<td>34 to 93 days</td>
</tr>
</tbody>
</table>

- **Average LOS:** 23 days nationally; variation 2-12 weeks

Increasing Incidence of the Neonatal Abstinence Syndrome in U.S. Neonatal ICUs

Veeral N. Tolia, M.D., Stephen W. Patrick, M.D., M.P.H., Monica M. Bennett, Ph.D., Karna Murthy, M.D., John Sousa, B.S., P. Brian Smith, M.D., M.P.H., M.H.S., Reese H. Clark, M.D., and Alan R. Spitzer, M.D.

BACKGROUND

The incidence of the neonatal abstinence syndrome, a drug-withdrawal syndrome that most commonly occurs after in utero exposure to opioids, is known to have

Proportion of NICU days, by NICU

>20% of US NICU days attributed to NAS care


(N=299)
**NEED FOR IMPROVEMENT IN NAS CARE**

- **Variation in NAS care common & standardization lacking**

<table>
<thead>
<tr>
<th>Variation in Care in BORN Nurseries</th>
<th>Observation %</th>
<th>Treatment %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low level lighting</td>
<td>63</td>
<td>74</td>
</tr>
<tr>
<td>Quiet environment</td>
<td>79</td>
<td>84</td>
</tr>
<tr>
<td>Vibrating or moving seat/bed</td>
<td>30</td>
<td>42</td>
</tr>
<tr>
<td>Non-nutritive sucking (pacifier)</td>
<td>76</td>
<td>82</td>
</tr>
<tr>
<td><strong>Parental care</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin to skin</td>
<td>75</td>
<td>59</td>
</tr>
<tr>
<td>Breastfeeding when appropriate</td>
<td>86</td>
<td>76</td>
</tr>
<tr>
<td><strong>Rooming-in</strong></td>
<td>71</td>
<td>40</td>
</tr>
<tr>
<td>Holding</td>
<td>82</td>
<td>74</td>
</tr>
</tbody>
</table>

Bogen et al. *Acad Pediatr.* 2016. (pending publication)
## More Rooming-In Needed

<table>
<thead>
<tr>
<th>Rooming-In Care</th>
<th>Observation %</th>
<th>Treatment %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>1</td>
<td>41</td>
</tr>
<tr>
<td>Rarely</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td>Occasionally</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Sometimes</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Usually</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Almost</td>
<td>73</td>
<td>11</td>
</tr>
<tr>
<td>always</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unsure</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Bogen et al. Acad Pediatr. 2016. (pending publication)
NAS CARE IMPROVEMENT VIA STANDARDIZATION

- Promotion of standardized care has potential to improve outcomes for infants with NAS

- VON’s NAS iNICQ Initiative
  - **Aim:** Engage centers in a multi-center QI collaborative focused on improving the quality, safety and value of care for substance-exposed infants and families through rapid-cycle adoption of AAP’s NAS guidelines, standardizing NAS-relevant policies and practices.
VON’s iNICQ Intervention’s Components

- NAS QI Toolkit
- 8 Potentially Better Practices (PBPs)
- Virtual Video Visit to Center of Excellence
  - Trauma-informed, family-centered care
- Structured educational curriculum
  - Expert-led Webinar Series
  - List-Serve coaching
- Data-driven improvement stories
- Data audits and feedback
8 Potentially Better Practices (PBPs)

- **PBP 1**: Develop and implement a standardized process for the Identification; Evaluation, Treatment; Discharge management for infants with NAS.

- **PBP 2**: Develop and implement a standardized process for measuring and reporting rates of NAS and drug exposure.

- **PBP 3**: Create a culture of compassion, understanding and healing for the mother-infant dyad.

- **PBP 4**: Provide care for infants and families in sites that promote parental engagement in care and avoid separation of mothers and infants.
VON’S POTENTIALLY BETTER PRACTICES

- **PBP 5:** Engage mothers / family members in providing non-pharmacologic interventions as “first-line” therapy for all substance-exposed infants.

- **PBP 6:** Develop clear eligibility criteria for breastfeeding and actively promote and support breastfeeding by eligible mothers.

- **PBP 7:** Develop a standardized process to ensure safe discharge into the community.

- **PBP 8:** Provide Interdisciplinary Universal Education / Training to All Caregivers Who May Encounter Substance-Exposed Infants and Families.
• Increasing % of substance-exposed infants in our region

• In 2006, implemented comprehensive substance-exposed policy:
  • Multi-disciplinary
  • Evidence-based
  • Inconsistently implemented
Higher rates by 2012: 1.5% vs 0.6% nationally

Source: NH Department of Health and Human Services, Maternal and Child Health
- **Rural children’s hospital in academic tertiary care center in Lebanon, NH**
  - 18-basinette mother-baby LDRP unit: ~ 1200 births/year
  - 30-bed Level II and III NICU: ~450 admissions/year
  - 23-bed pediatric inpatient unit: ~ 2500 admissions/year

- **2012: Joined VON iNICQ collaborative**
  - Multidisciplinary QI team of over 40 members:
    - OB, Psychiatry, Newborn Nursery, NICU, Inpatient Pediatrics, Social Work, Lactation
A NEED TO IMPROVE FURTHER

<table>
<thead>
<tr>
<th></th>
<th>Pre-intervention 2012</th>
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<tbody>
<tr>
<td>% infants at-risk</td>
<td>4%</td>
</tr>
<tr>
<td>% infants treated</td>
<td>46%</td>
</tr>
<tr>
<td>Ave LOS</td>
<td>16.9 days</td>
</tr>
<tr>
<td>Cumulative morphine dose</td>
<td>13.7 mg</td>
</tr>
<tr>
<td>Mean hospital costs/treated infant</td>
<td>$19,737</td>
</tr>
<tr>
<td>Mean hospital costs/at-risk infant</td>
<td>$11,000</td>
</tr>
</tbody>
</table>
VIRTUAL VIDEO VISIT – NURTURE THE MOTHER - NURTURE THE CHILD

- Vancouver: Integrated model of care that addresses the social determinants of health
  - Fir Square inpatient unit
  - Sheway community care center
- Putting a human face on addiction . . . Empowering women to teach us how to best partner with them
- Maternal presence: Mother is main treatment
  - Rooming-in
  - Mother-baby contact
TOOLS TO IMPACT ATTITUDES

A trauma-informed, family-centered approach to supporting women with substance use issues who are pregnant and newly parenting.

Nurture The Mother – Nurture The Child
A Trauma-Informed, Family-Centered Approach to Supporting Women with Substance Use Issues Who Are Pregnant and Newly Parenting

Video Companion
Pre-QI NAS Care

- **BP Rooming-in observation**
  - Scored in bassinette
  - Q 4hr -> q 2hr if score ≥ 8
- **Transfer to ICN for 3 scores of ≥ 8 or 2 of ≥ 12**
  - No rooming-in
  - No privacy
  - Stimulating environment
- **Pediatrics for wean**
  - Scoring as per BP
  - Rooming-in
- **Mothers noted judgment and not being involved in care**
WHY IS THIS A NICU ISSUE?
THIS SHOULD NOT BE AN NICU ISSUE!

- Babies not critically ill or medically complex
  - Most babies in NH/VT born outside facilities w/ L3 NICUs
  - Most babies transferred to NICU for treatment

- NICU beds cost a lot

- In the NICU:
  - Excessive stimulation present
  - Interference with mother-infant bonding
  - Barriers to skin-to-skin & breastfeeding
  - Rooming-in difficult
# The Vancouver Experience at She-Way/Fir Square

**Table 4. Infant outcomes by study cohort and adjusted relative risks**

| OUTCOMES                          | BCWH ROOMING IN  
| N 32 N (%) | BCWH HISTORICAL  
| NOT ROOMING IN  
| N 38 N (%) | RELATIVE RISK  
| (95% CONFIDENCE INTERVAL) | SURREY HOSPITAL  
| NOT ROOMING IN  
| N 36 N (%) | RELATIVE RISK  
| (95% CONFIDENCE INTERVAL) |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Treated with morphine*          | 8 (25.0)        | 21 (55.3)       | 0.40 (0.20-0.78)| 19 (52.8)       | 0.39 (0.20-0.75)|
| Admitted to an NICU*            | 12 (37.5)       | 34 (89.5)       | 0.41 (0.25-0.65)| 30 (83.3)       | 0.45 (0.11-0.57)|
| Discharged in custody of mother*| 23 (71.9)       | 12 (31.6)       | 2.23 (1.43-3.98)| 17 (42.5)       | 1.52 (1.15-2.53)|

BCWH—British Columbia Women’s Hospital, NICU—neonatal intensive care unit.
*Adjusted for methadone dose at delivery.
*Adjusted for postpartum admission of mother.
*Adjusted for history of apprehension of a child.

<table>
<thead>
<tr>
<th>MEAN (SD)</th>
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<th>P</th>
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</tr>
</thead>
<tbody>
<tr>
<td>No. of days of morphine treatment</td>
<td>5.9 (14.2)</td>
<td>18.6 (23.4)</td>
<td>.007*</td>
<td>18.6 (20.1)</td>
</tr>
<tr>
<td>No. of days in hospital</td>
<td>11.8 (9.1)</td>
<td>23.5 (24.6)</td>
<td>.014</td>
<td>25.9 (19.7)</td>
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BCWH—British Columbia Women’s Hospital, NICU—neonatal intensive care unit, SD—standard deviation.
*Among those receiving morphine.

**BENEFITS OF ROOMING-IN / COUPLETT CARE**

- **Decreased Need for Pharm Rx:**

- **Decreased LOT:**

- **Decreased LOS:**
BENEFITS OF ROOMING-IN / COUPLETT CARE

- Rooming-in facilitates privacy for mothers to provide frequent skin-to-skin, intimate contact with infant, and fosters breastfeeding
  - Practices known to help infants with neurologic symptoms of NAS and likely to shorten LOS
    McQueen et al. Advances in Neonatal Care. 2011.
  - Skin-to-skin and breastfeeding linked with significant improvements in health and neurodevelopmental outcomes of infants - especially important for this population of infants who are at significant medical and psychosocial risk
CHaD’s QI Work

Jan 2013: Formed Multi-D VON NAS QI team
April 2013 - Oct 2014: 11 PDSA cycles

1. RN scoring training/ reliability
2. Family interviews
3. Baby-centered scoring & care
4. Prenatal education
5. Parent symptom diary
6. Standardize score interpretation
7. Rooming-in pilot
8. “Cuddlers”
9. Full rooming-in
10. Addiction training
11. Transfers

October 2014

April 2013
NAS Care & Scoring Bundle

- Provide NAS parent education
- Rooming-in through entire stay
- Family involvement in scoring
- Encourage STS and (breast)feeding pre-scoring
- Score baby STS in mom’s arms
- Score on baby’s schedule – encourage feeding at least q 3 hr
- Evaluate at bedside for 3 scores of ≥ 8 or 2 of ≥ 12
  - Assess & interpret score
  - Determine Rx criteria (e.g. not feeding/sleeping/consoling well)
Decreased Need for Pharm Rx

% Opioid-exposed Newborns Receiving Morphine

- Baseline: 46%
- Intervention Year 1: 51%
- Intervention Year 2: 27%

% Opioid-exposed Newborns Receiving Adjunctive Agents

- Baseline: 13%
- Intervention Year 1: 7%
- Intervention Year 2: 2%

N = opioid-exposed infants per year

Decreased Length of Stay

Decreased Hospital Costs

# Rooming-In to Treat NAS: Improved Family-Centered Care at Lower Cost

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<td>$5,300</td>
</tr>
</tbody>
</table>
## Presence of Hospital NAS Policies

<table>
<thead>
<tr>
<th>Maternal substance use screen</th>
<th>February 2013</th>
<th>August 2013</th>
<th>February 2014</th>
<th>August 2014</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Evaluation and treatment</td>
<td>76</td>
<td>83</td>
<td>88</td>
<td>95</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Standardization scoring</td>
<td>45</td>
<td>59</td>
<td>67</td>
<td>77</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Non-pharmacologic treatment</td>
<td>59</td>
<td>66</td>
<td>69</td>
<td>84</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pharmacologic treatment</td>
<td>68</td>
<td>81</td>
<td>84</td>
<td>92</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>49</td>
<td>55</td>
<td>57</td>
<td>72</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

# Improved Neonatal Outcomes

<table>
<thead>
<tr>
<th></th>
<th>February 2013</th>
<th>August 2013</th>
<th>February 2014</th>
<th>August 2014</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOT (days)</strong></td>
<td>16 (10, 27)</td>
<td>15 (10, 23)</td>
<td>15 (10, 24)</td>
<td>15 (10, 24)</td>
<td>0.008</td>
</tr>
<tr>
<td><strong>LOS (days)</strong></td>
<td>21 (14, 33)</td>
<td>20 (14, 28)</td>
<td>20 (14, 29)</td>
<td>19 (15, 28)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

N=3458

POTENTIAL TO SCALE-UP?

- Reducing LOS by 2 days could result in an estimated savings of $170 million dollars in U.S. hospital charges
  

- Standardized weaning protocols (at state-level) may prove even more (cost)effective
  
  - ↓ pharm Rx by ~14 days and LOS by ~10 days: Hall *et al.* *Pediatrics.* 2014.
  - ↓ pharm Rx by 11 days and LOS by ~8 days: Hall *et al.* *Pediatrics.* 2015.
ROOMING-IN MAY BE ASSOCIATED WITH EVEN GREATER SAVINGS

- Decreased need for pharm Rx:

- Decreased LOT by:

- Decreased LOS by:
WHERE DOES NAS CARE OCCUR IN YOUR HOSPITAL?
WHAT ARE YOUR BARRIERS TO ROOMING-IN?

TIME TO MOVE BEYOND THE NICU WALLS AND ROOM-IN!