



Neonatal Abstinence Syndrome in a Rural State

Alexa Craig, MD, MSc



Cancer | Cardiology & Heart Surgery | Geriatrics | Gynecology
Nephrology | Orthopedics | Pulmonology | Urology



Disclosures

- Tufts Clinical and Translational Science Institute (KL2 TR001063)
- Maine Medical Center Research Institute
- Center for Nursing Research and Quality Outcomes
- The Maine Medical Center Neurosciences Service Line and Department of Pediatrics

Objectives

- Define Neonatal Abstinence Syndrome.
- Facts and stats: newborns and opiates in Maine
- Innovation projects at Maine Medical Center
 - Qualitative work
 - Eat, Sleep and Console Assessment
 - Bonding study of mothers
 - Hepatitis C work
 - Head circumference and developmental outcomes
 - Foster care

SPECIAL ARTICLE

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.

ABSTRACT

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 increased during the past decade. However, recent trends in the incidence of the syndrome and changes in demographic characteristics and hospital treatment of these infants have not been well characterized.



Neonatal abstinence syndrome (NAS)

Neonatal abstinence syndrome (also called NAS) happens when a baby is exposed to drugs in the womb before birth. A baby can then go through drug withdrawal after birth.

NAS most often is caused when a woman takes opioids during pregnancy. Opioids are painkillers (used to relieve pain) your provider may prescribe if you've been injured or had surgery.

Prescription opioids include:

- Codeine and hydrocodone (Vicodin®)
- Morphine (Kadian®, Avinza®)
- Oxycodone (OxyContin®, Percocet®)

Can using other drugs lead to neonatal abstinence syndrome in your baby?

Yes. In addition to opioids, using these drugs during pregnancy can lead to NAS in your baby:

- Antidepressants (prescription drugs used to treat depression)
- Benzodiazepines (sleeping pills)

[https://www.marchofdimes.org/baby/neonatal-abstinence-syndrome-\(nas\).aspx?gclid=EAlaIqobChMIzYywka3c3gIVi4bACh1Wkg3WEAAYASAAEgLL__D_BwE](https://www.marchofdimes.org/baby/neonatal-abstinence-syndrome-(nas).aspx?gclid=EAlaIqobChMIzYywka3c3gIVi4bACh1Wkg3WEAAYASAAEgLL__D_BwE)

REVIEW ARTICLE

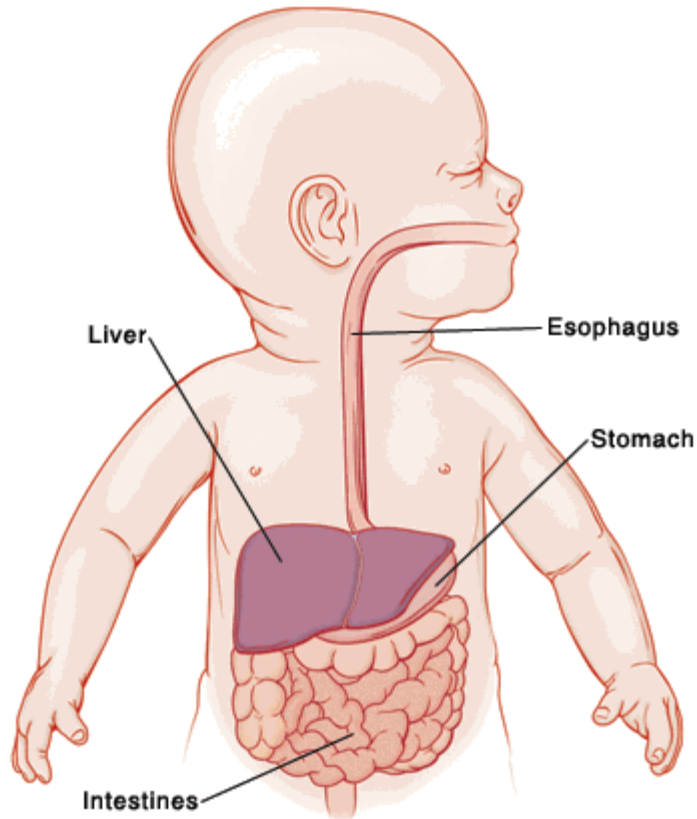
Dan L. Longo, M.D., *Editor*

Neonatal Abstinence Syndrome

Karen McQueen, R.N., Ph.D., and Jodie Murphy-Oikonen, M.S.W., Ph.D.

“However, gaps still exist, including a lack of clarity and consistency in how the syndrome is defined, measured, and managed. In addition, much of the research has focused on the infant in isolation from the mother, and many hospitals lack protocols to guide treatment.”

Mu Receptors



Directly activated by positive reinforcement from opioid or indirectly by alcohol, cannabinoids, nicotine activation

Table 2. Clinical Manifestations and Outcomes of the Neonatal Abstinence Syndrome.*

Metabolic, vasomotor, and respiratory manifestations

Fever

Frequent yawning

Sneezing

Sweating

Nasal stuffiness

Respiratory rate >60 breaths per minute, with or without retractions

Mottling

Tachypnea

Gastrointestinal manifestations

Projectile vomiting

Regurgitation

Loose or watery stools

Weight loss

Poor feeding

Excessive sucking

Central nervous system manifestations

Tremors

High-pitched crying

Sleep disturbances

Increased muscle tone

Excoriation

Myoclonic jerks

Irritability

Seizures

Outcomes

Admission to neonatal intensive care unit

Pharmacologic treatment for 60–80% of infants

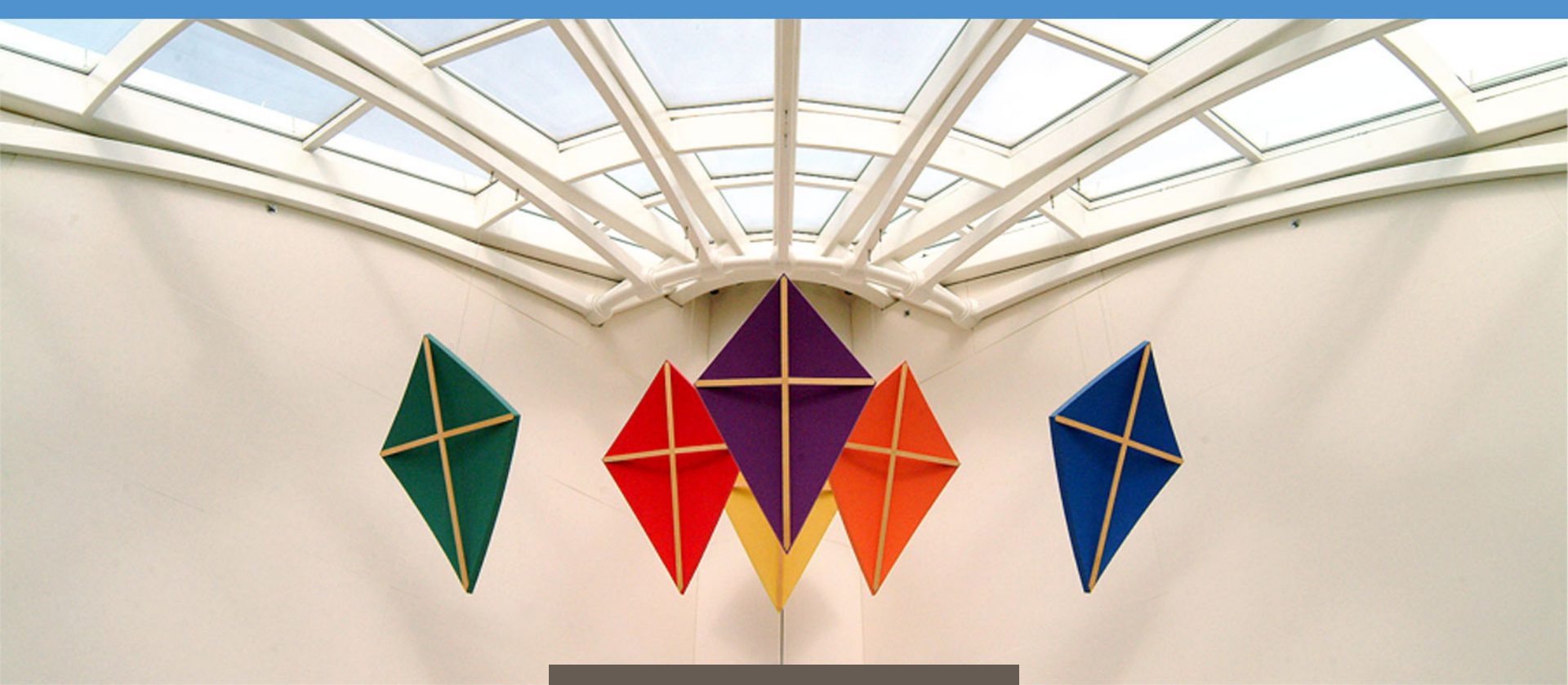
Prolonged hospitalization (average, 17 days)

Increased risk of birth complications (e.g., low birth weight, jaundice, and feeding difficulties)

Disrupted bonding

Child-safety concerns

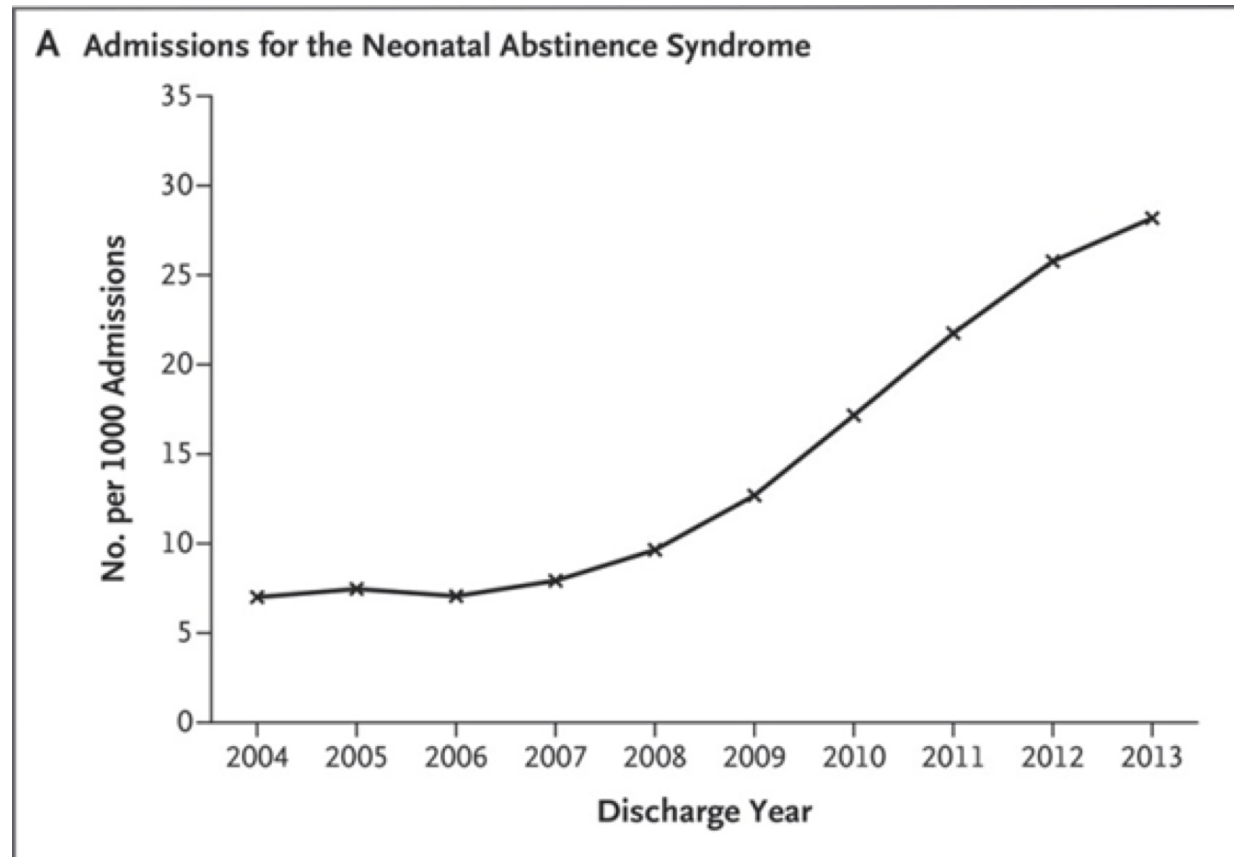
* Data on manifestations are from Finnegan et al.,¹ Newnam et al.,³⁴ and D'Apolito,³⁵ and data on outcomes are from Patrick et al.,^{5,6} Jansson and Velez,²³ Lee et al.,²⁴ Uebel et al.,³⁶ Cleary et al.,³⁷ and Wachman et al.³⁸



A Growing Problem

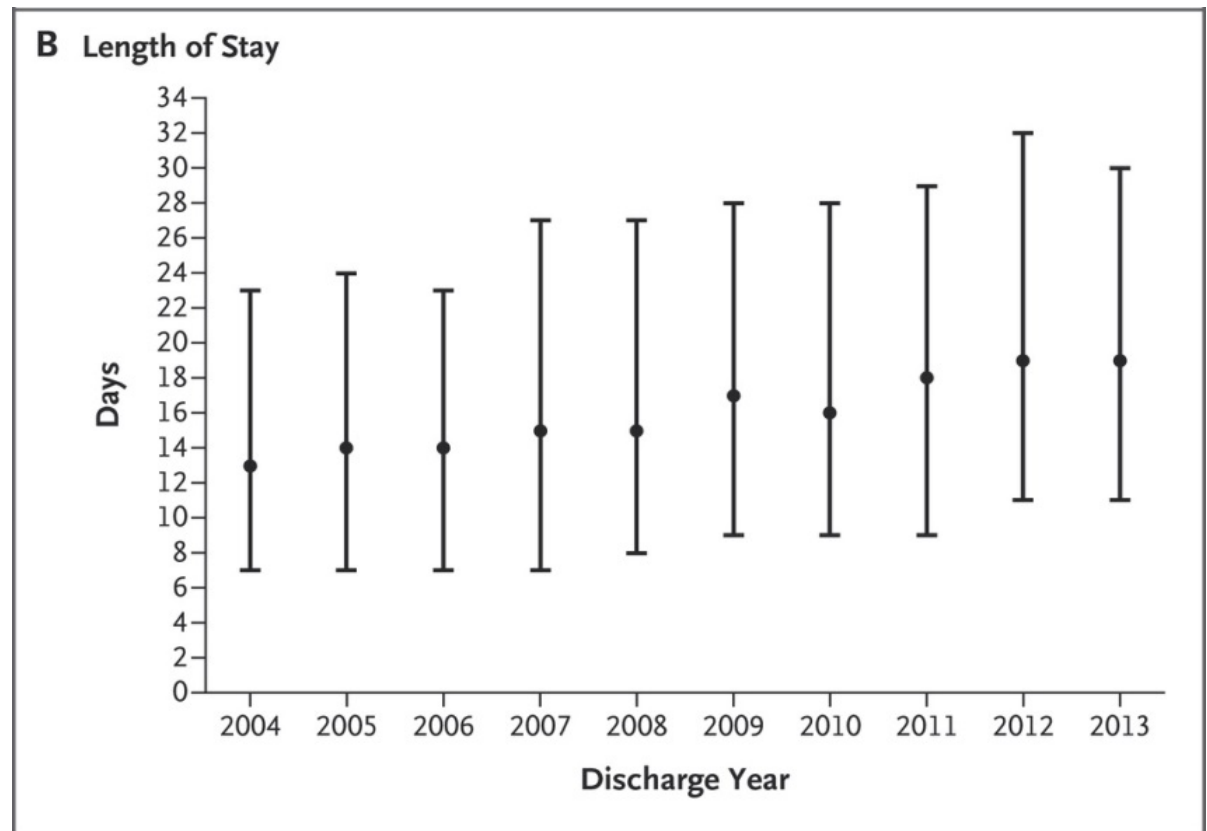
NAS: Number of Admissions

2004-2013- rate
of NAS NICU
admissions when
from 7 to 27
cases per 1000
admission



NAS: Length of Stay

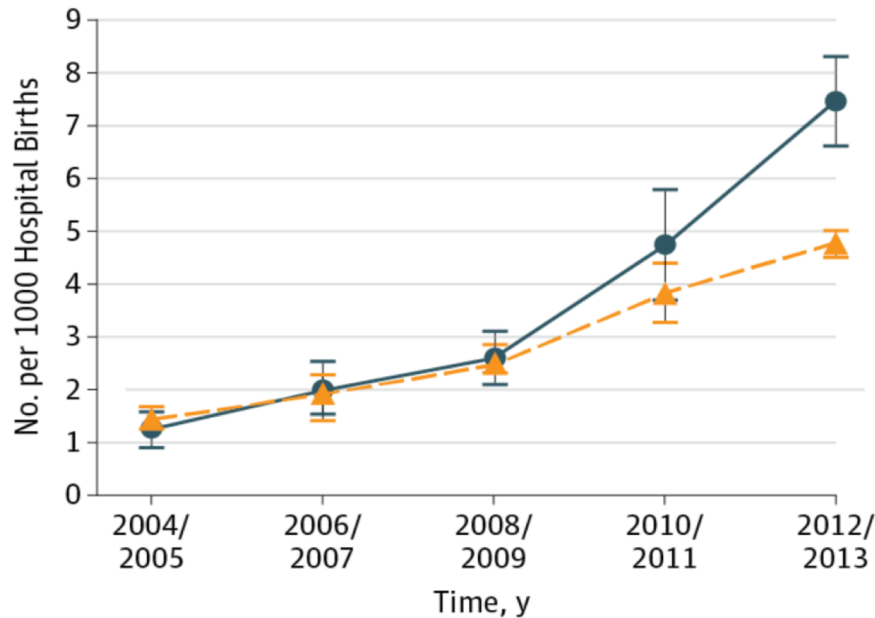
2004-2013
median LOS
increased from 13
to 19 days



From: **Rural and Urban Differences in Neonatal Abstinence Syndrome and Maternal Opioid Use, 2004 to 2013**

JAMA Pediatr. 2017;171(2):194-196. doi:10.1001/jamapediatrics.2016.3750

A Neonatal abstinence syndrome



B Maternal opioid use

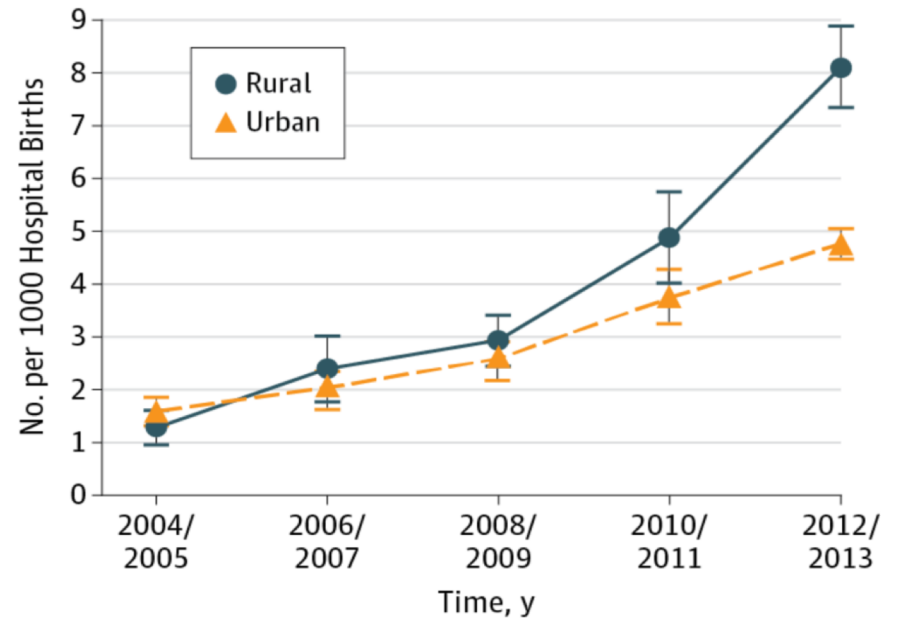


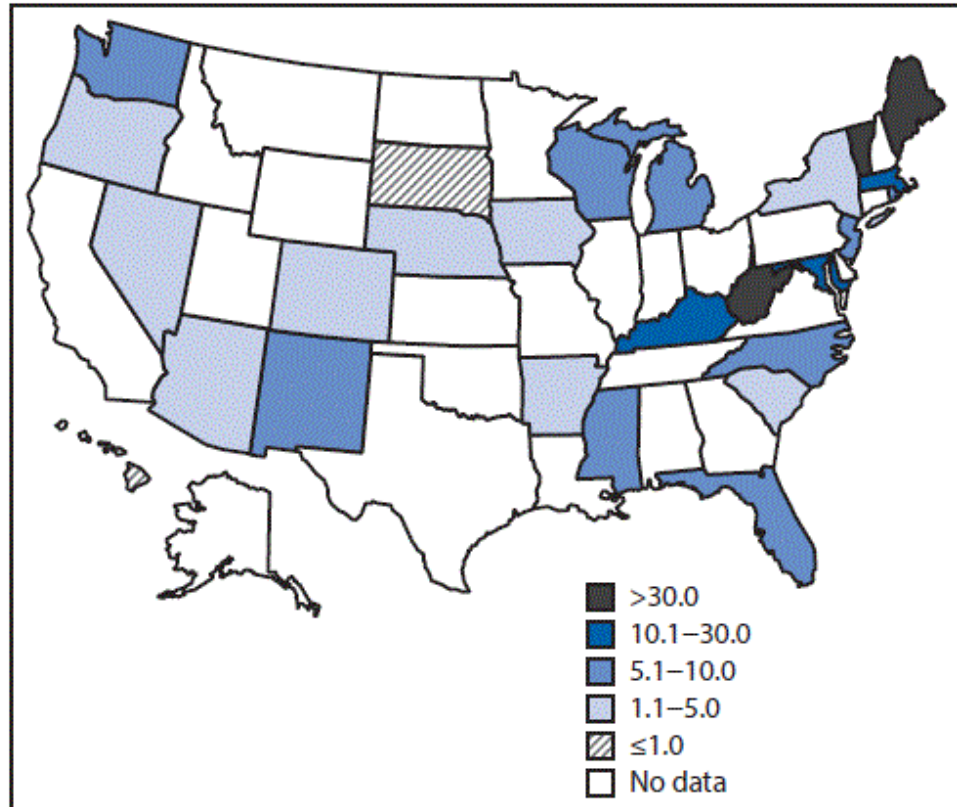
Figure Legend:

Changes in Opioid-Related Diagnoses Among Infants and Mothers by Urban/Rural Status Frequency of neonatal abstinence syndrome (A) and maternal opioid use (B) per 1000 hospital births by rural vs urban status, displayed as 2-year combined estimates.

Copyright © 2017 American Medical Association. All rights reserved.

Date of download: 5/9/2018

NAS Incidence Rates per 1,000, 25 states from 2012-2013



Ko JY, Patrick SW, Tong VT, Patel R, Lind JN, Barfield WD. Incidence of Neonatal Abstinence Syndrome — 28 States, 1999–2013. *MMWR Morb Mortal Wkly Rep* 2016;65:799–802. DOI

NAS in Maine by County

COUNTY	**2004	**2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
ANDROSCOGGIN	5	14	18	19	37	36	55	82	97	121	104	128	134
AROOSTOOK	1	13	12	19	31	25	35	36	59	67	58	60	76
CUMBERLAND	14	25	32	40	41	56	50	69	63	102	109	103	83
FRANKLIN	0	0	1	1	6	4	10	13	15	16	7	16	10
HANCOCK	1	3	14	8	14	12	21	26	33	30	37	36	38
KENNEBEC	2	10	11	33	36	69	73	84	89	103	102	83	109
KNOX	2	4	4	6	9	9	20	23	37	32	19	27	36
LINCOLN	2	2	3	6	7	3	8	11	17	13	30	23	18
OXFORD	0	5	5	7	14	11	7	19	11	27	34	28	32
PENOBSCOT	12	48	65	73	81	139	162	155	187	182	226	239	213
PISCATAQUIS	0	3	3	7	3	7	8	1	18	15	16	24	21
SAGadahoc	2	2	1	2	6	3	8	6	9	17	8	15	10
SOMERSET	1	4	7	13	16	21	28	42	43	70	56	59	58
WALDO	2	4	2	12	17	16	26	29	23	29	32	33	54
WASHINGTON	1	7	8	9	6	21	18	27	32	47	41	42	41
YORK	7	18	11	18	18	18	38	43	38	55	82	96	91
Unknown/Non-Maine Resident	1	3	4	1	1	1	5	2	1	1	0	1	0
TOTAL	53	165	201	274	343	451	572	668	772	927	961	1013	1024

53

165

201

274

343

451

572

668

772

927

961

1013

1024

Neonatal Abstinence Syndrome and Associated Health Care Expenditures

United States, 2000-2009

Stephen W. Patrick, MD, MPH, MS

Robert E. Schumacher, MD

Brian D. Benneyworth, MD, MS

Elizabeth E. Krans, MD, MS

Jennifer M. McAllister, MD

Matthew M. Davis, MD, MAPP

Context Neonatal abstinence syndrome (NAS) is a postnatal drug withdrawal syndrome primarily caused by maternal opiate use. No national estimates are available for the incidence of maternal opiate use at the time of delivery or NAS.

Objectives To determine the national incidence of NAS and antepartum maternal opiate use and to characterize trends in national health care expenditures associated with NAS between 2000 and 2009.

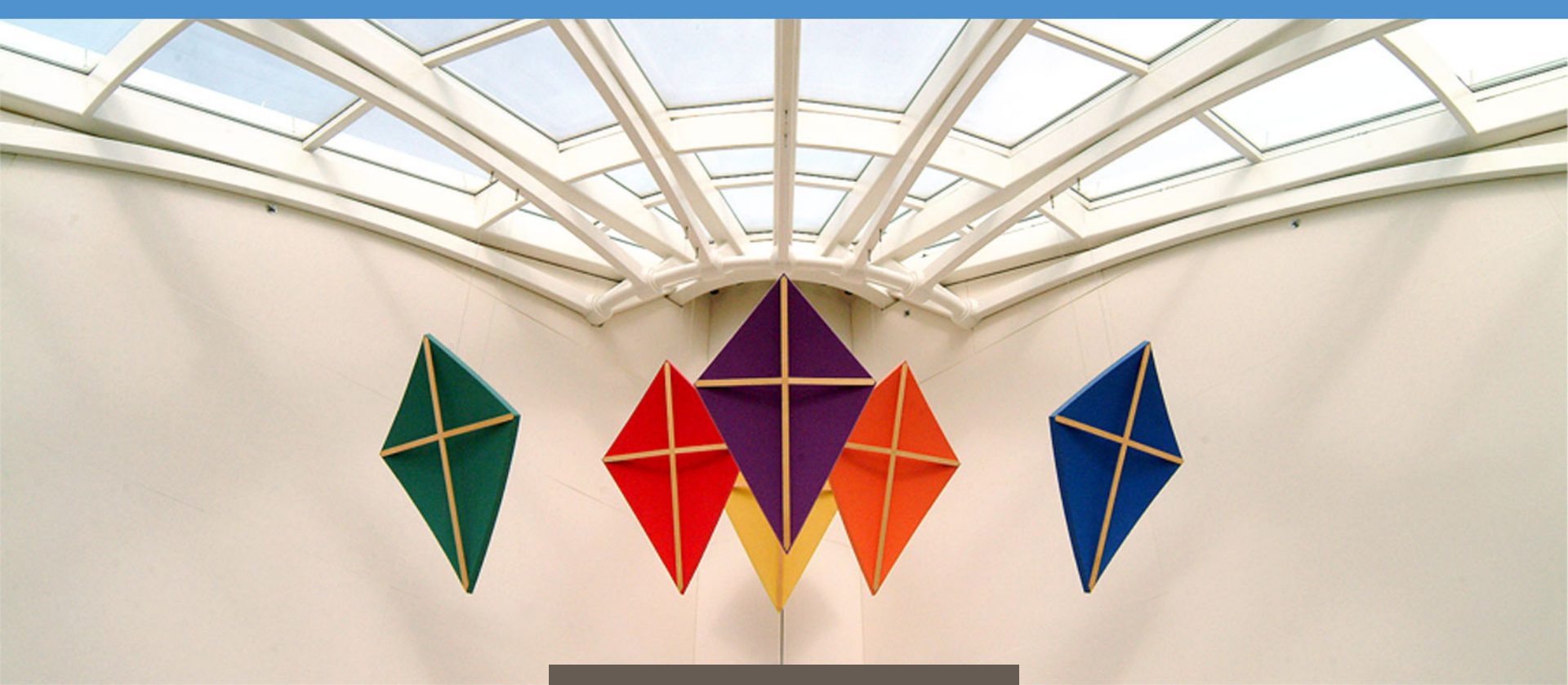
Design, Setting, and Patients A retrospective, serial, cross-sectional analysis of a nationally representative sample of newborns with NAS. The Kids' Inpatient Database (KID)

Table 3. Mean Hospital Charges and Length of Stay for Neonatal Abstinence Syndrome vs All Other US Births

	Mean (95% CI)				P for Trend
	2000	2003	2006	2009	
Neonatal Abstinence Syndrome					
Unweighted sample, No.	2920	3761	5200	9674	
Length of stay, d	15.8 (14.2-17.3)	15.9 (14.5-17.3)	15.8 (14.6-16.8)	16.4 (15.8-17.1)	.80
Hospital charges, 2009 US \$	39 400 (33 400-45 400)	47 900 (40 800-55 100)	44 600 (40 400-48 900)	53 400 (49 000-57 700)	<.001
All Other US Births					
Unweighted sample, No.	784 191	890 582	1 000 203	1 113 123	
Length of stay, d	3.1 (3.0-3.1)	3.2 (3.1-3.2)	3.2 (3.2-3.3)	3.3 (3.3-3.4)	<.001
Hospital charges, 2009 US \$	6600 (5800-7300)	7300 (6900-7600)	8200 (7800-8600)	9500 (9000-9900)	<.001

“Costs” at Maine Medical Center

	2013	2014	2015	2016	Total
LOS tx	18	24	24	20	21
LOS not tx	7	7	6	6	6.6
Charges tx	\$71,012	\$104,561	\$102,451	\$86,863	\$88,716
Charges not tx	\$22,889	\$22,037	\$21,711	\$21,501	\$22,252
Payments tx	\$16,216	\$15,904	\$13,897	\$9,077	\$15,120
Payments not tx	\$7,229	\$6,668	\$62,07	\$7,084	\$6,868
Treatment rate	43%	45%	42%	35%	43%

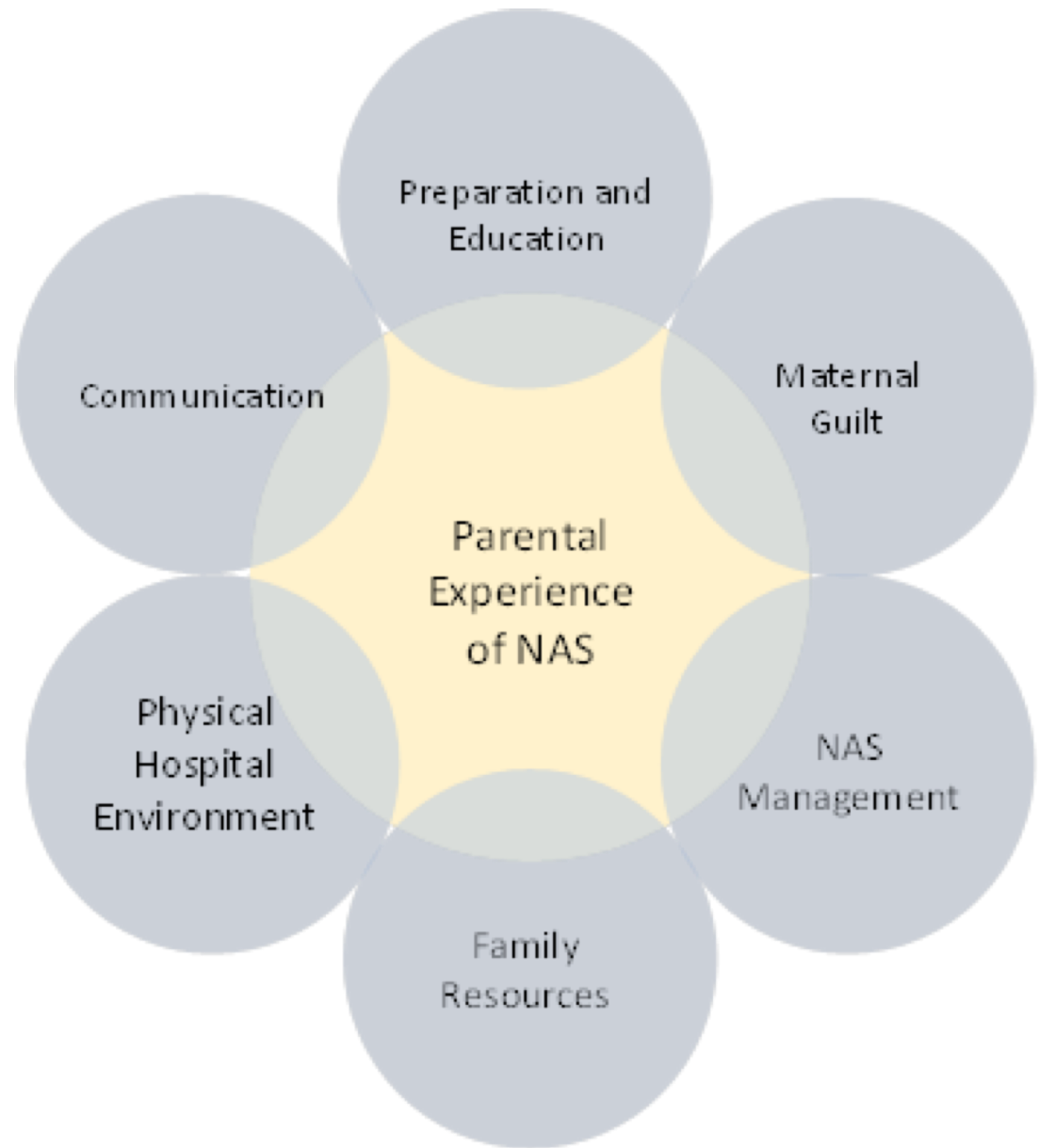


Themes of the Parent Experience

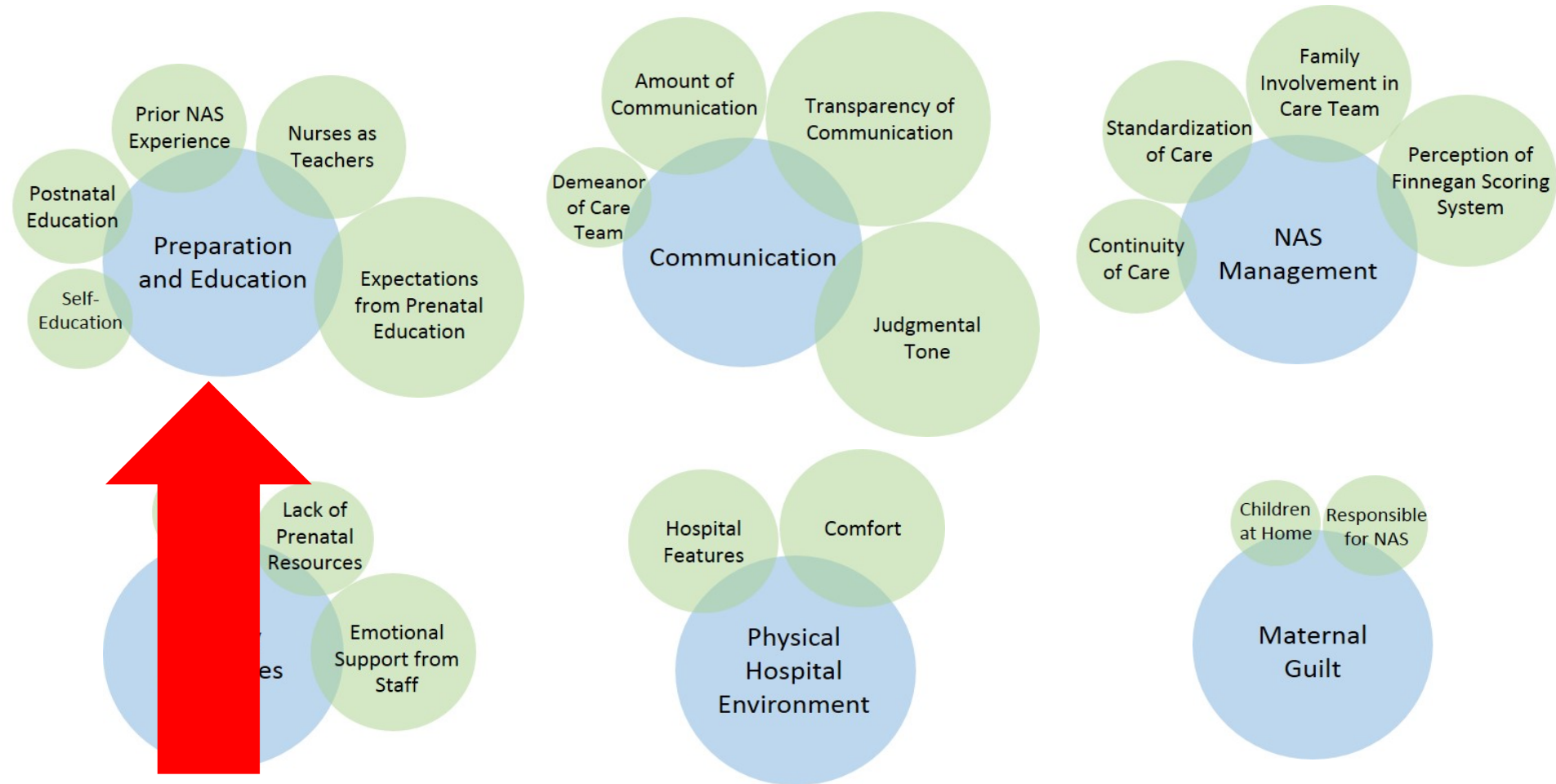
Qualitative Study (n=15)

Primary opiate exposure, n (%)	Methadone	4 (27)
	Oxycodone	1 (7)
	Subutex or Suboxone	10 (67)
Other prenatal exposures, n (%)	Alcohol	1 (7)
	Benzodiazepine	2 (13)
	Gabapentin	2 (13)
	Nicotine	9 (60)
	Ranitidine	2 (13)
	SSRI	3 (20)
Pharmacological treatment for NAS, n (%)		9 (60)
Primary location of infant's stay, n (%)	Newborn nursery	6 (40)
	Level II NICU	8 (53)
	Level III NICU	1 (7)

Primary Themes



Secondary Themes



Parents Desire Education

- The Children's Hospital at Dartmouth-Hitchcock
 - Parents' desire for education about NAS
 - Parents valuing their role in the care team
 - Inconsistencies between units and among providers



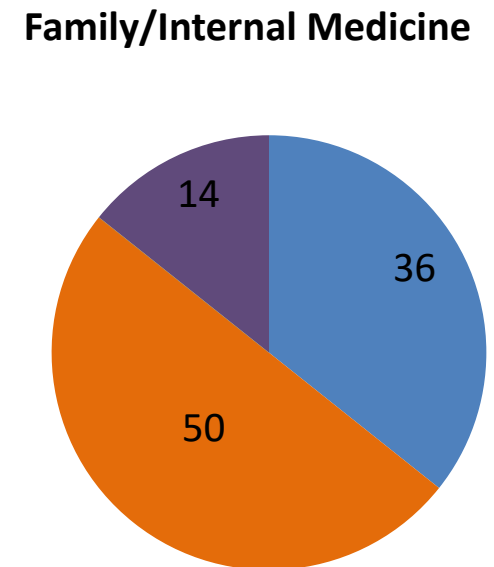
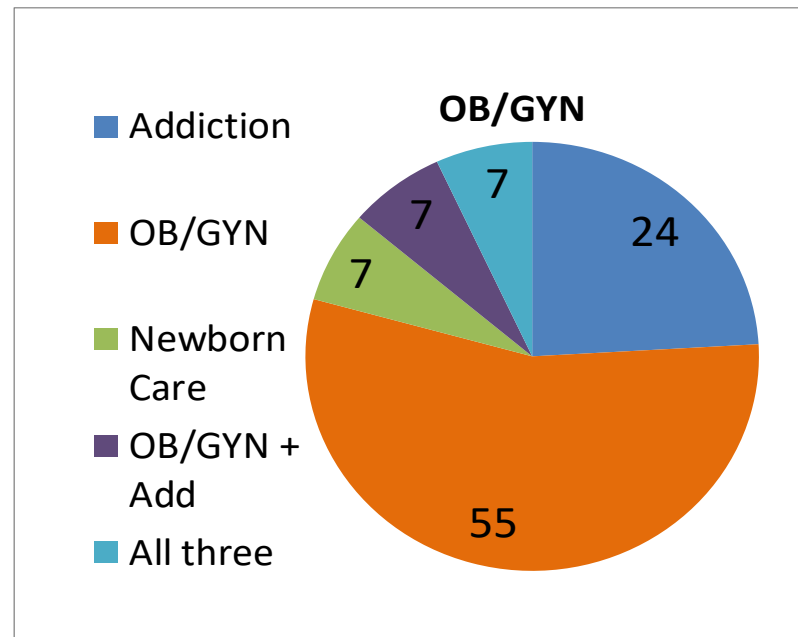
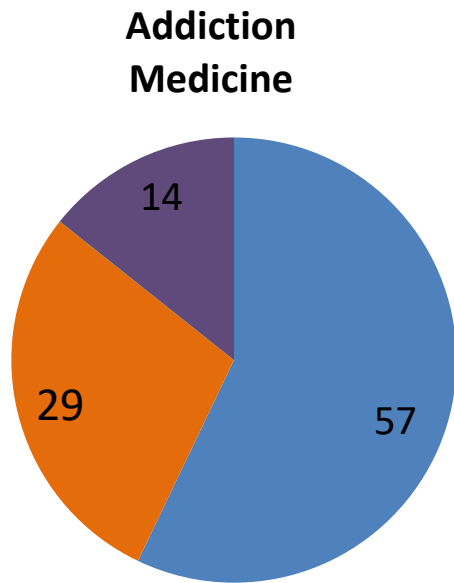
Atwood, et al. A Qualitative Study of Family Experience with Hospitalization for Neonatal Abstinence Syndrome. *Hospital Pediatrics* 2016; 6(10): 626-632.

Image accessed from <https://www.dartmouth-hitchcock.org/news/newsdetail/72320/> on April 15, 2018.

Provider Survey

	OB/GYN	Family/Internal Medicine	Addiction Medicine
Completed survey	31	14	7
Maternal buprenorphine (expected LOS)	3-14	5-7	3-10
Maternal methadone (expected LOS)	5-14	7-10	3-20

“In your opinion, which provider has the primary responsibility to counsel expecting mothers about NAS?”



Parent Education (pre-natal)

Maine Resources

INFORMATION ON NAS

March of Dimes

- 🌐 [www.marchofdimes.org/complications/neonatal-abstinence-syndrome-\(nas\).aspx](http://www.marchofdimes.org/complications/neonatal-abstinence-syndrome-(nas).aspx)

SUBSTANCE ABUSE RESOURCES

MaineHealth Learning Resource Center

- ☎ 1 (866) 609-5183
- 🌐 www.mainehealthlearningcenter.org/resources/treatment-for-drug-addiction

Maine Alliance for Addiction Recovery (MAAR)

- Free recovery support program and recovery housing help.*
- ☎ (207) 621-8118

Office of Substance Abuse Information & Resource Center

- ☎ 1 (800) 499-0027

Substance Abuse & Mental Health Services Administration

- 🌐 www.samhsa.gov

The Woman's Project

- ☎ (207) 523-5049

RESOURCES FOR NEW PARENTS

Public Health Nursing in Maine (Statewide Central Referral)

- ☎ 1 (877) 763-0438

Text4Baby

Free smartphone app that sends you tips and helpful information.

- 🌐 www.text4baby.org

Maine Families

Free visits from child development professionals and parent educators.

- ☎ (207) 624-7900
- 🌐 www.maineamilies.org

Lactmed

Free app and website providing information about taking medications or supplements while breastfeeding.

Classes at MMC

- 🌐 www.mmc.org/childbirth-parenting-education

MMC New Parent Website

- 🌐 www.mmc.org/parent-resources

INFORMATION FOR PREGNANT WOMEN

Neonatal Abstinence Syndrome (NAS)



The Barbara Bush
Children's Hospital
At Maine Medical Center
bbch.org 

143674 11/16

Parent Education (post-natal)

Maine Resources

INFORMATION ON NAS

March of Dimes

- [www.marchofdimes.org/complications/neonatal-abstinence-syndrome-\(nas\).aspx](http://www.marchofdimes.org/complications/neonatal-abstinence-syndrome-(nas).aspx)

SUBSTANCE ABUSE RESOURCES

MaineHealth Learning Resource Center

- ☎ 1 (866) 609-5183
- www.mainehealthlearningcenter.org/resources/treatment-for-drug-addiction

Maine Alliance for Addiction Recovery (MAAR)

- Free recovery support program and recovery housing help.*
- ☎ (207) 621-8118

Office of Substance Abuse Information & Resource Center

- ☎ 1 (800) 499-0027

Substance Abuse & Mental Health Services Administration

- www.samhsa.gov

The Woman's Project

- ☎ (207) 523-5049

RESOURCES FOR NEW PARENTS

Public Health Nursing in Maine (Statewide Central Referral)

- ☎ 1 (877) 763-0438

Text4Baby

Free smartphone app that sends you tips and helpful information.

- www.text4baby.org

Maine Families

Free visits from child development professionals and parent educators.

- ☎ (207) 624-7900
- www.maineamilies.org

Lactmed

Free app and website providing information about taking medications or supplements while breastfeeding.

Classes at MMC

- www.mmc.org/childbirth-parenting-education

MMC New Parent Website

- www.mmc.org/parent-resources

INFORMATION FOR NEW PARENTS

Neonatal Abstinence Syndrome (NAS)



The Barbara Bush
Children's Hospital
At Maine Medical Center

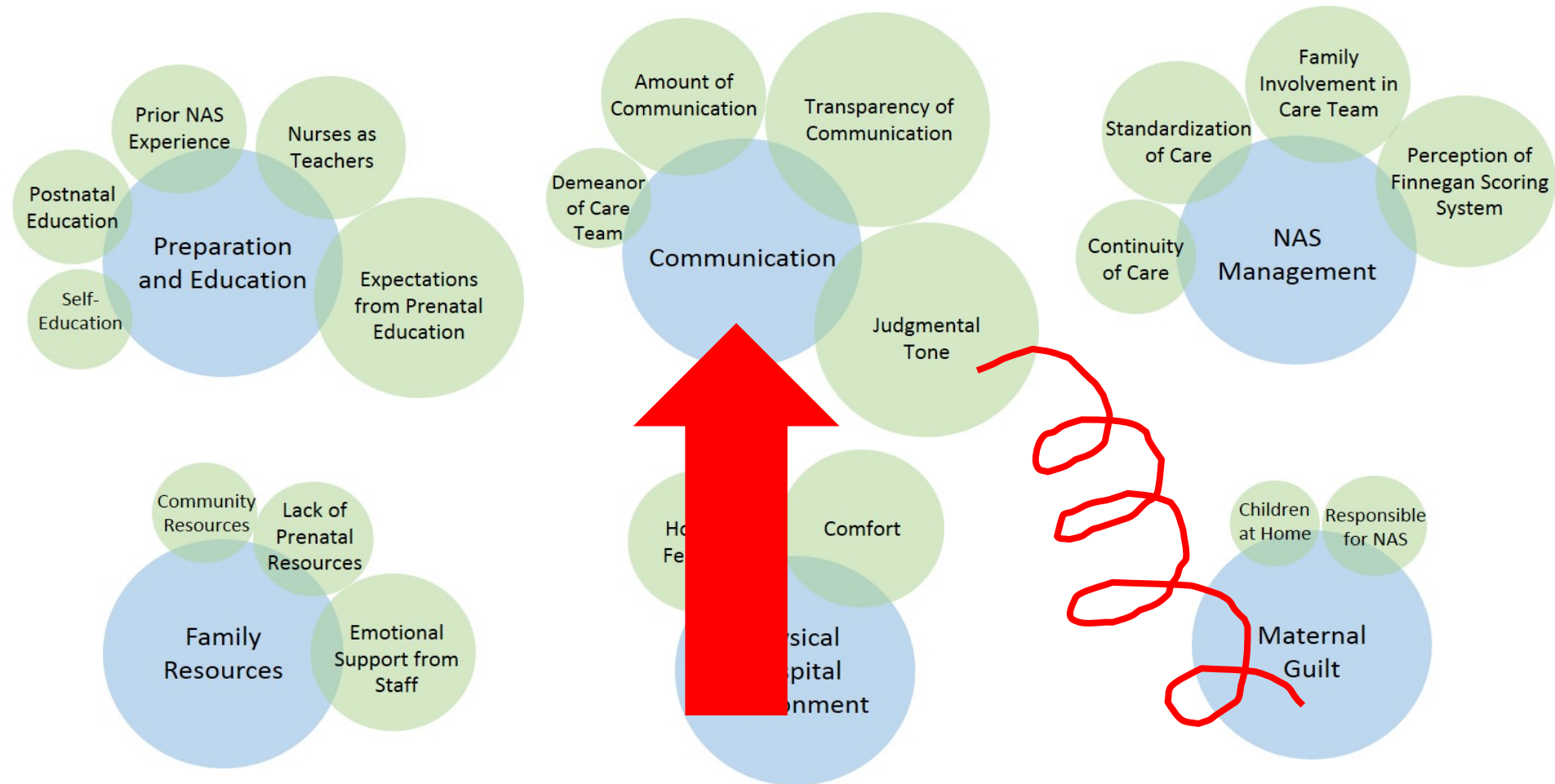
bbch.org



32 Week Visit

- Educational visit for mothers on MAT
- Done by a Newborn Attending
- Describe the hospitalization
- Describe how infant will be assessed
- Manage expectations

Secondary Themes



The Experiences of NICU Nurses in Caring for Infants with Neonatal Abstinence Syndrome

Jodie Murphy-Oikonen, MSW, RSW

Keith Brownlee, PhD

William Montelpare, PhD

Keri Gerlach, HBK, MSc. Kin

“I try very hard to be nonjudgmental with the parents. I still worry about what these babies are going home to and whether they will get lost in the cracks once they go home.”

NEONATAL NETWORK

308

SEPTEMBER/OCTOBER 2010, VOL. 29, NO. 5

“I pictured myself caring for acutely ill babies and parents who were going through every emotion in the book. But I find myself caring for demanding babies who NEVER stop crying, walking around and around the nursing station with a baby in my arms or in a stroller, spending up to one hour trying to get a baby to eat a small amount of formula, but the poor thing is too disorganized to figure out how to suck. Dealing with parents can be just as time-consuming and frustrating. I did not intend on becoming a social worker.”

“It has been very frustrating, sad, and taxing, emotionally, mentally, and even physically. It is unbelievable how much time and energy these babies require. The level of care they require compromises the amount of time and level of care that the nurse(s) have with other babies in the unit. How can you properly care for a sick child when all of your time is spent trying to console, feed, and care for unruly babies that will not sleep, [or] eat, and scream all the time. It is disruptive to the other babies and the entire unit, especially when the majority of the babies at a specific time are NAS.”

The Mother's Perspective

- 15 mother of infants with NAS from San Antonio, TX
 - Guilt and shame
 - Feeling judged
 - Lack of trust in nurses
- Reluctance to stay at the hospital due to above

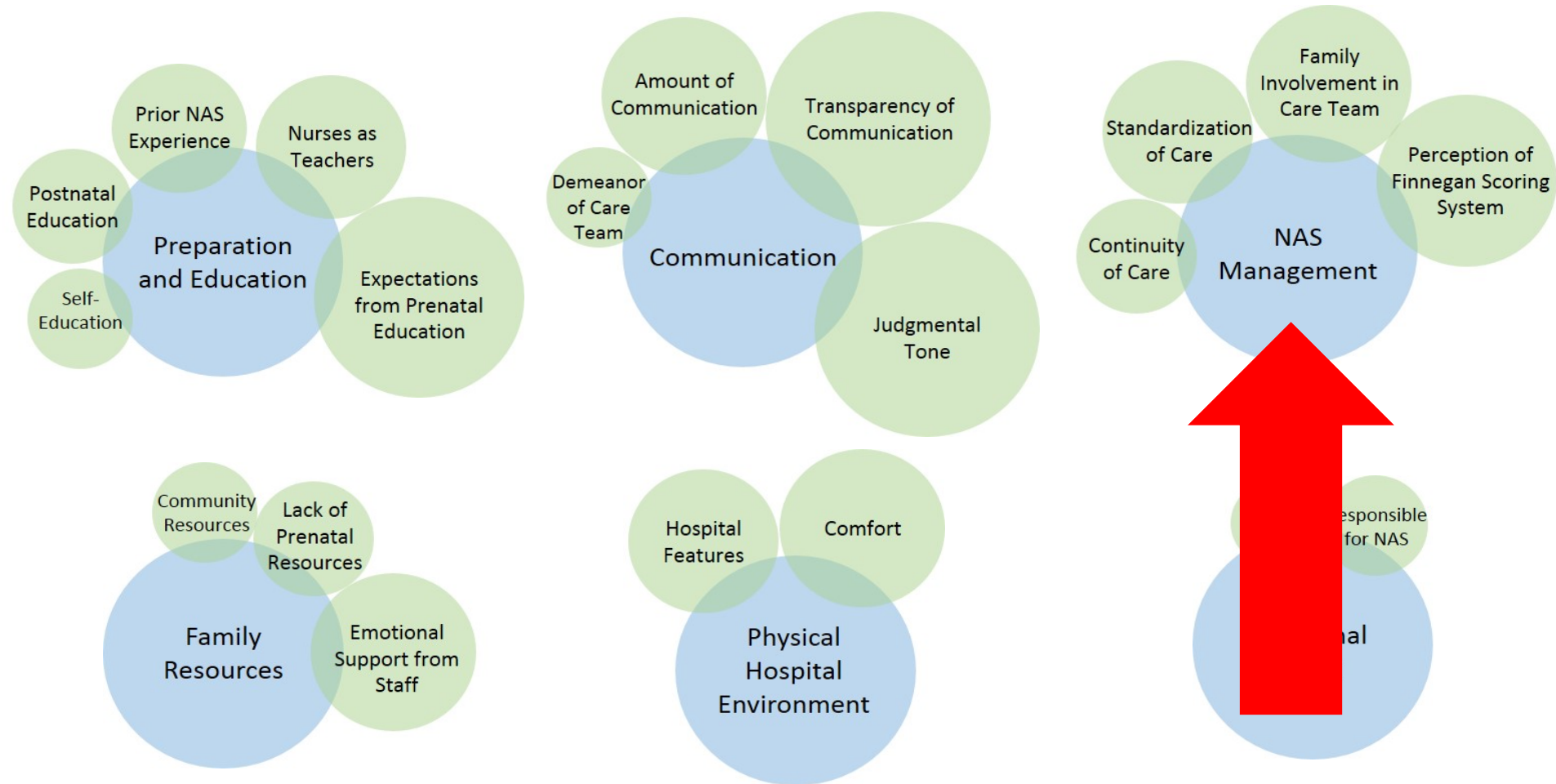


Cleveland and Gill. "Try Not to Judge": Mothers of Substance Exposed Infants. *The American Journal of Maternal/Child Nursing* 2013; 38(4): 200-205.

Cleveland and Bonugli. Experiences of Mothers of Infants with Neonatal Abstinence Syndrome in the Neonatal Intensive Care Unit. *JOGNN* 2014; 43: 318—329.

Image from Cleveland, et al. *The Mommies Program Workshop*, 2017.

Secondary Themes

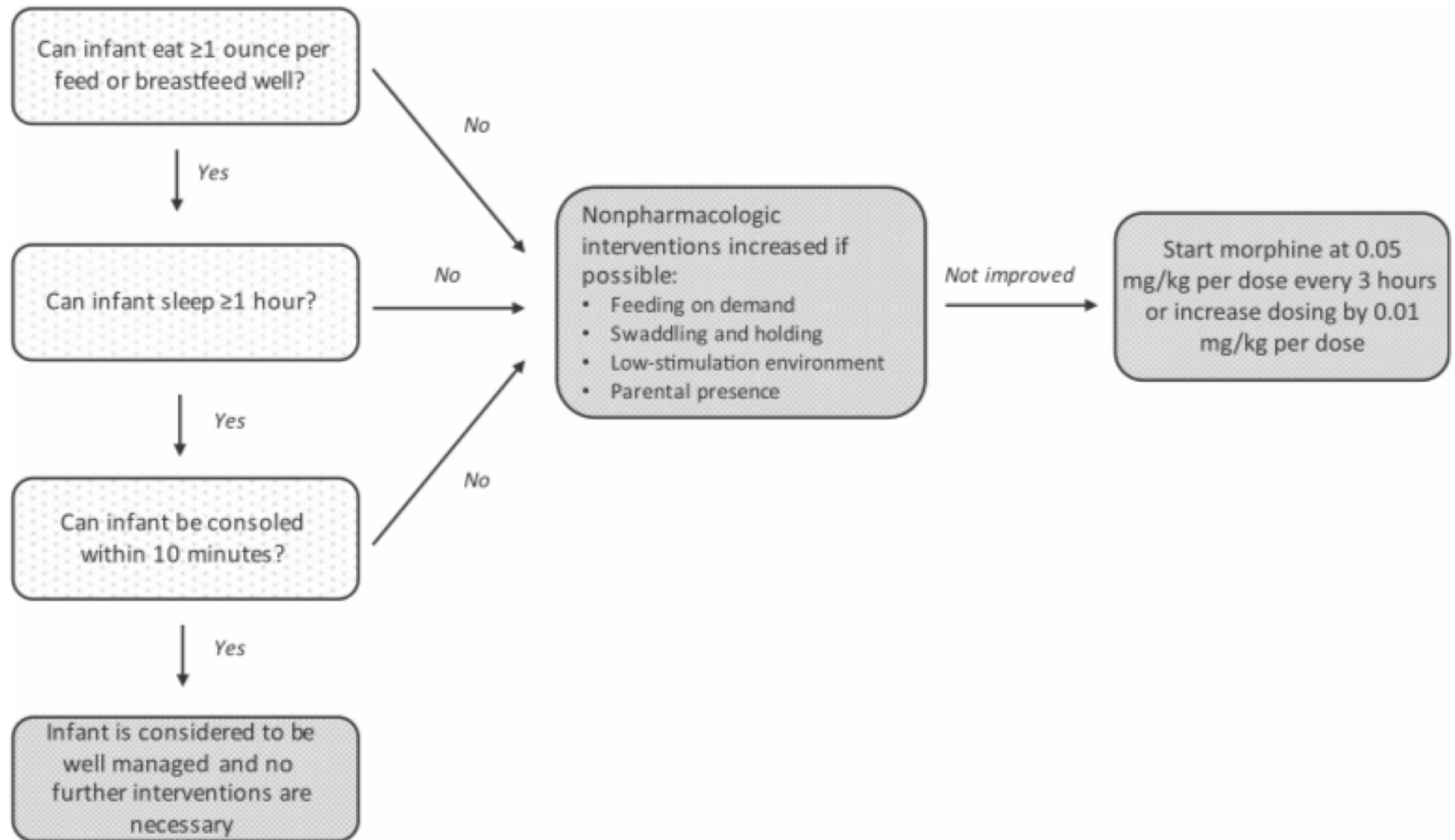


SYSTEMS	SIGNS AND SYMPTOMS	SCORE	AM						PM						DAILY WT.	
			2	4	6	8	10	12	2	4	6	8	10	12		
CENTRAL NERVOUS SYSTEM DISTURBANCES	High Pitched Cry	2														
	Continuous High Pitched Cry	3														
	Sleeps < 1 Hour After Feeding	3														
	Sleeps < 2 Hours After Feeding	2														
	Hyperactive Moro Reflex	2														
	Markedly Hyperactive Moro Reflex	3														
	Mild Tremors Disturbed	2														
	Moderate Severe Tremors Disturbed	3														
	Mild Tremors Undisturbed	1														
	Moderate Severe Tremors Undisturbed	2														
	Increased Muscle Tone	2														
	Excoriation (specify area): _____	1														
	Myoclonic Jerks	3														
Generalized Convulsions	3															
METABOLIC VASOMOTOR/ RESPIRATORY DISTURBANCES	Sweating	1														
	Fever < 101°F (39.3°C)	1														
	Fever > 101°F (39.3°C)	2														
	Frequent Yawning (> 3-4 times/interval)	1														
	Mottling	1														
	Nasal Stuffiness	1														
	Sneezing (> 3-4 times/interval)	1														
	Nasal Flaring	2														
	Respiratory Rate > 60/min	1														
Respiration Rate > 60/min with Retractions	2															
GASTROINTESTINAL DISTURBANCES	Excessive Sucking	1														
	Poor Feeding	2														
	Regurgitation	2														
	Projectile Vomiting	3														
	Loose Stools	2														
	Watery Stools	3														
SUMMARY	TOTAL SCORE															
	SCORER'S INITIALS															
	STATUS OF THERAPY															

**Finnegan
Scoring
System:
21 items
Score Q4 hrs
Treat for >8 on
2-3 occasions
or >12
on
1-2 occasions**

A Novel Approach to Assessing Infants With Neonatal Abstinence Syndrome

Matthew R. Grossman, MD,^a Matthew J. Lipshaw, MD,^a Rachel R. Osborn, MD,^b Adam K. Berkwitz, MD^a



HOSPITAL PEDIATRICS Volume 8, Issue 1, January 2018

Non-pharmacological Care

- Skin to skin contact with parents
- Decreased stimulation (light, noise, and tactile)
- Swaddling
- Use of pacifiers
- Breastfeeding





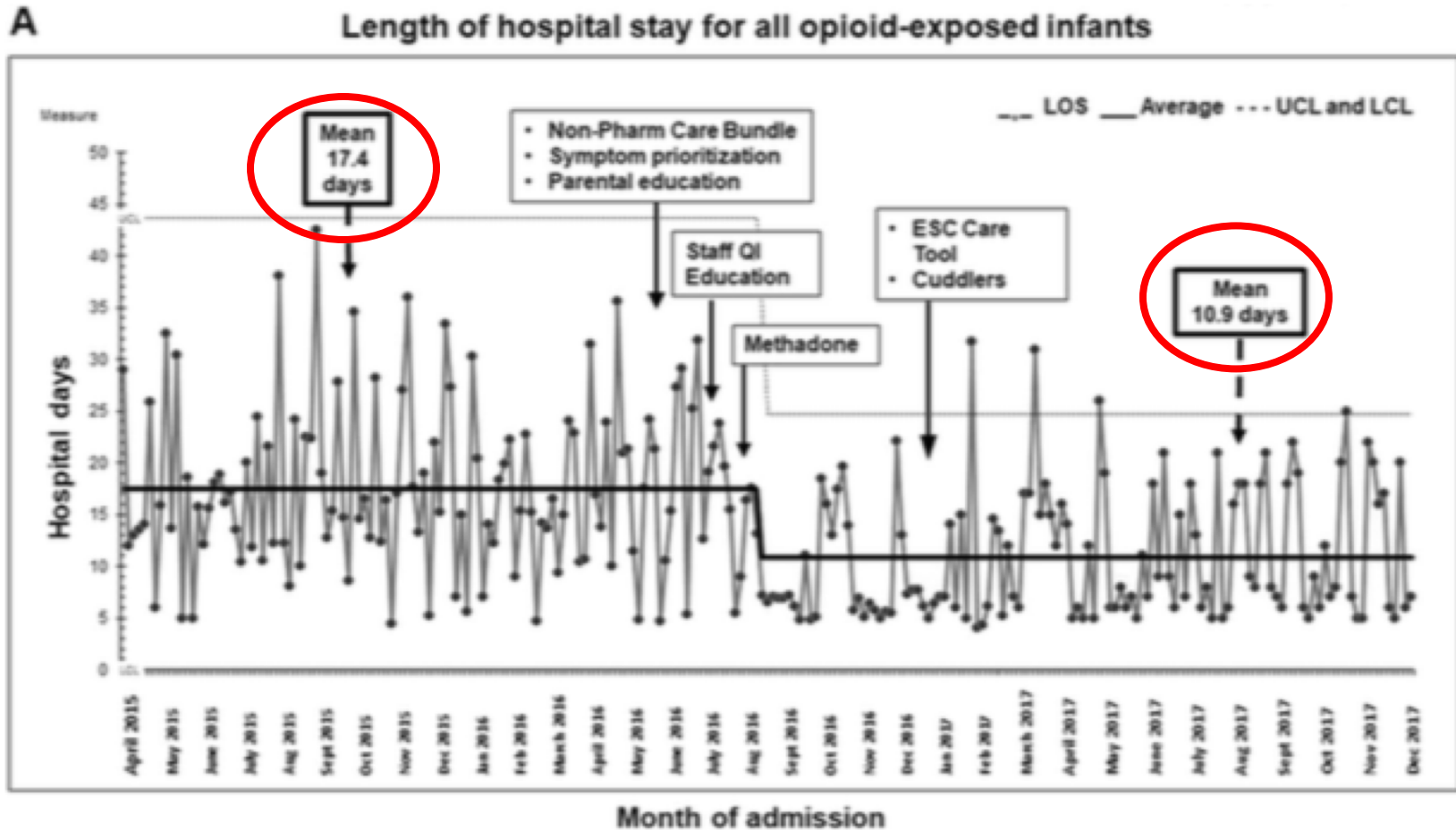
Quality improvement initiative to improve inpatient outcomes for Neonatal Abstinence Syndrome

Elisha M. Wachman¹ · Matthew Grossman² · Davida M. Schiff^{1,3} · Barbara L. Philipp¹ · Susan Minear¹ · Elizabeth Hutton¹ · Kelley Saia⁴ · FNU Nikita⁵ · Ahmad Khattab⁶ · Angela Nolin⁶ · Crystal Alvarez⁵ · Karan Barry¹ · Ginny Combs¹ · Donna Stickney¹ · Jennifer Driscoll¹ · Robin Humphreys¹ · Judith Burke¹ · Camilla Farrell⁷ · Hira Shrestha¹ · Bonny L. Whalen⁸

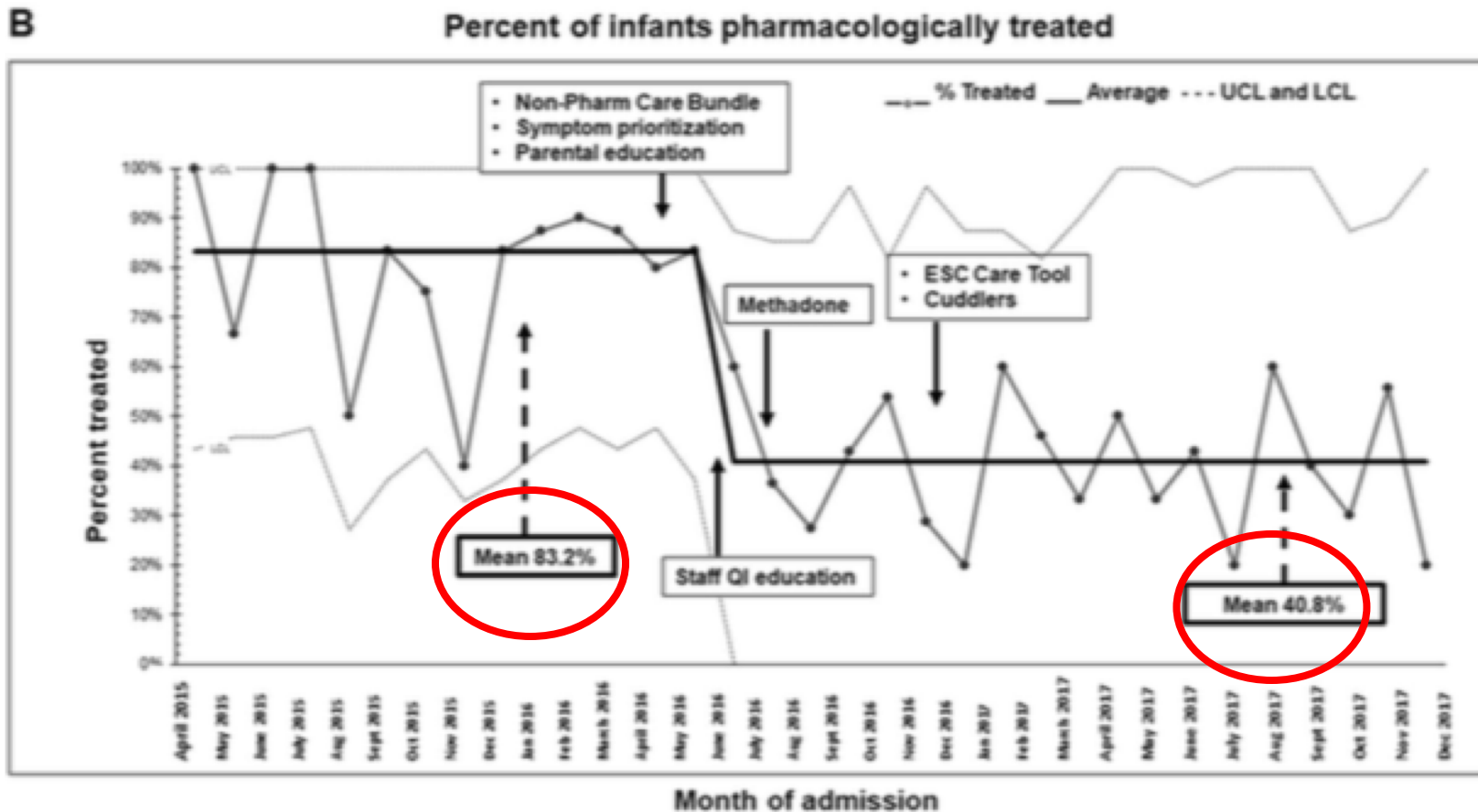
Received: 6 January 2018 / Revised: 1 March 2018 / Accepted: 5 March 2018 / Published online: 8 May 2018

© Nature America, Inc., part of Springer Nature 2018

Length of Stay



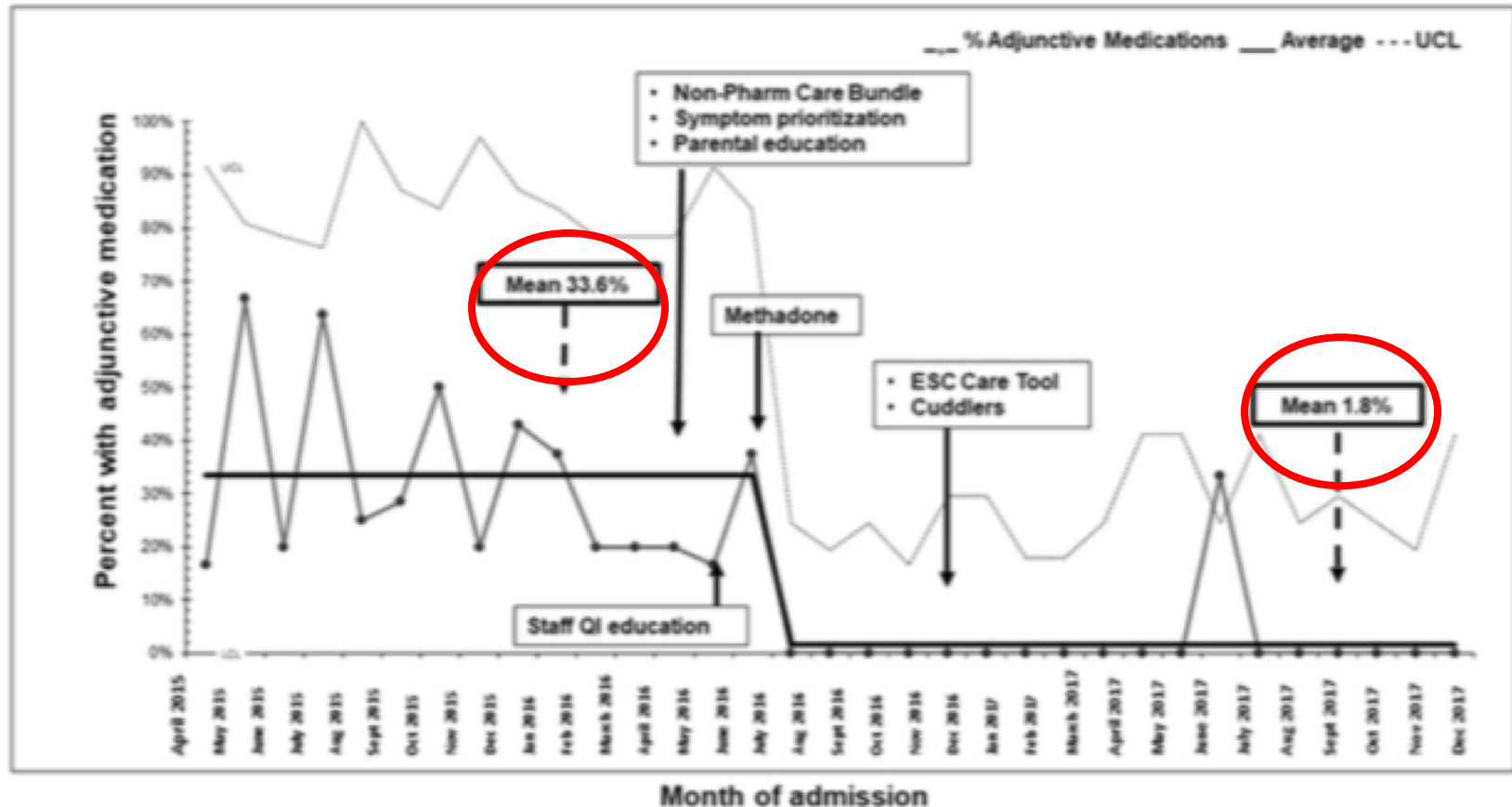
Infant Pharmacological Treatment

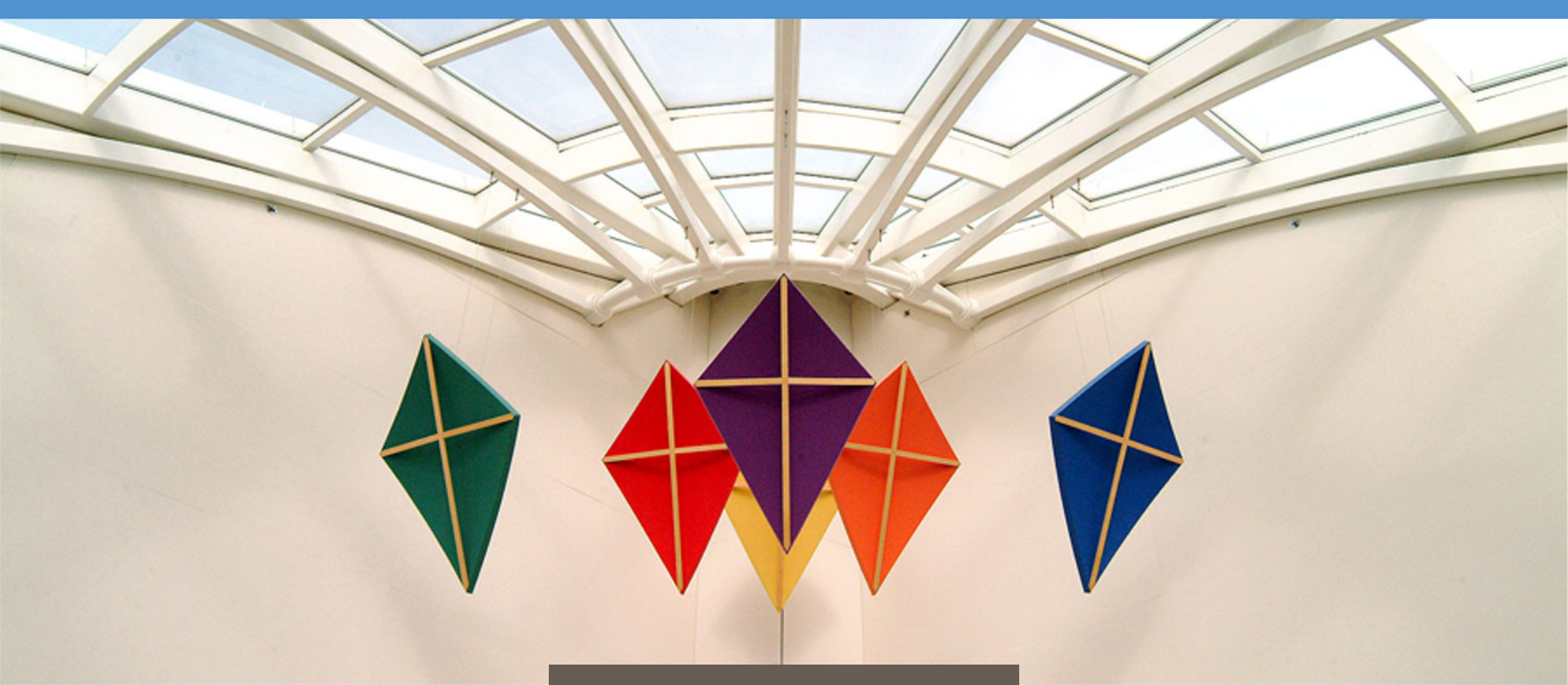


Second Medication Treatment

C

Pharmacologically treated infants who received adjunctive medication





A Qualitative Study of Mother Infant Bonding

Bonding Between Mothers and Babies with NAS at MMC

- Specific aims
 - Identify barriers to bonding between mothers and their babies with NAS.
 - Identify familial, community, and inpatient resources in place to support mothers and their babies with NAS.

Clinical Characteristics of Mothers

Maternal Characteristics	n (%)
Comorbid conditions	
<u>Anxiety</u>	9 (69)
Bipolar disorder	2 (15)
<u>Depression</u>	10 (77)
Headaches, chronic pain	6 (46)
Hepatitis C virus	7 (54)
HPV and/or STD	7 (54)
<u>Trauma, PTSD</u>	4 (31)
Medications used during pregnancy	
Benzodiazepines	5 (35)
Buprenorphine	13 (100)
Gabapentin/muscle relaxants	3 (23)
SSRIs	3 (23)
Substances used during pregnancy	
Cocaine	2 (15)
Heroin	2 (15)
Marijuana	3 (23)
<u>Tobacco</u>	12 (92)

Trying To Do What Is Best

I hear [my baby's] crying, and I want to be with him. I feel bad that I did [buprenorphine] when I was pregnant, but yet again, I feel like I did [buprenorphine] because I was trying to do the right thing. So it's a torn feeling.



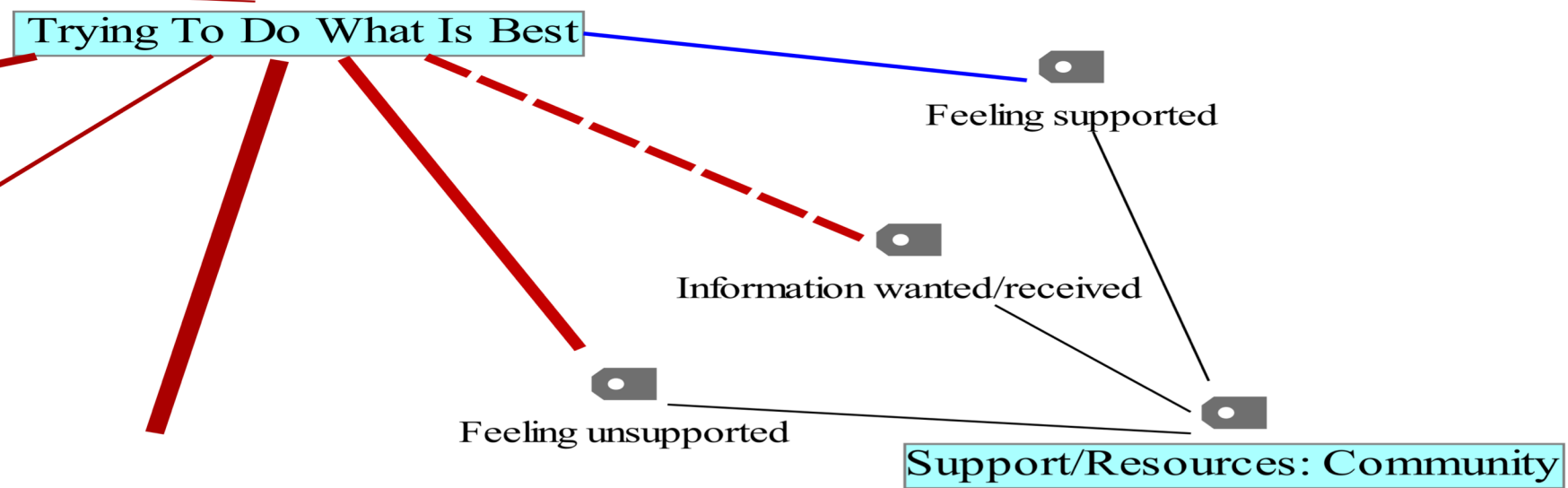
His dad has been really supportive through the whole thing. And to stay with us and I can tell how much he loves him. He's not like not blaming it you know, on me - what happened...He tries to comfort me.

Support: Family/Friends

Infant's father

Out there I heard 'em all joking about, oh, fathers don't know anything... I felt like saying, well the father of my child does. You never see a post about a father's group or... there are no father's groups... she needs just as much bonding with him as she does me.

Trying To Do What Is Best



I have a counselor, and she's amazing... She's a recovering drug addict, and she had a child that was born [with NAS]... I feel like she actually knows what I'm going through.

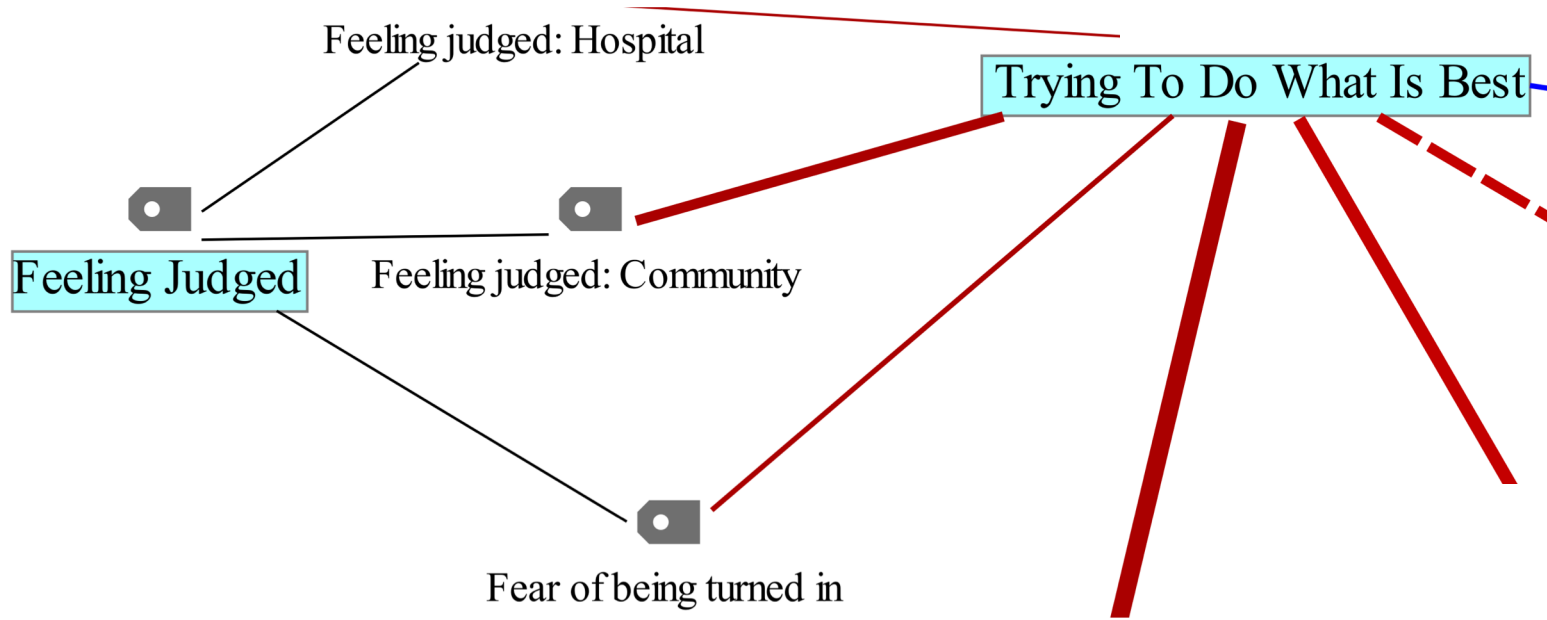
I Googled a lot of stuff, reached out and talked to as many... moms that I knew who maybe went through a similar situation. I think it would be huge if the OB clinic or prenatal care provided information more than just a packet that's one page... If mom's were really educated and given information about what to expect, I think it would be huge on them emotionally, physically, mentally.

I wish I could go back and fight through the anxious feelings rather than have that crutch of the [buprenorphine]... When I found out that it might have [caused withdrawal], I had a hard time even looking at my baby. It was awful... I felt so bad. I literally didn't want to look at him. I didn't want anything to do with him. And even that gave me guilt. I feel guilty for feeling guilty, basically.

Trying To Do What Is Best

Taking medications/substances in pregnancy

Guilt



I think that's why a lot of women don't go into treatment programs and try to do it on their own because they don't feel comfortable or safe going into treatment programs feeling like DHHS will be called on them and they will have their kids taken away, when they're trying to do the right thing.



Infant Withdrawal

Scoring system

Takes a toll on parents

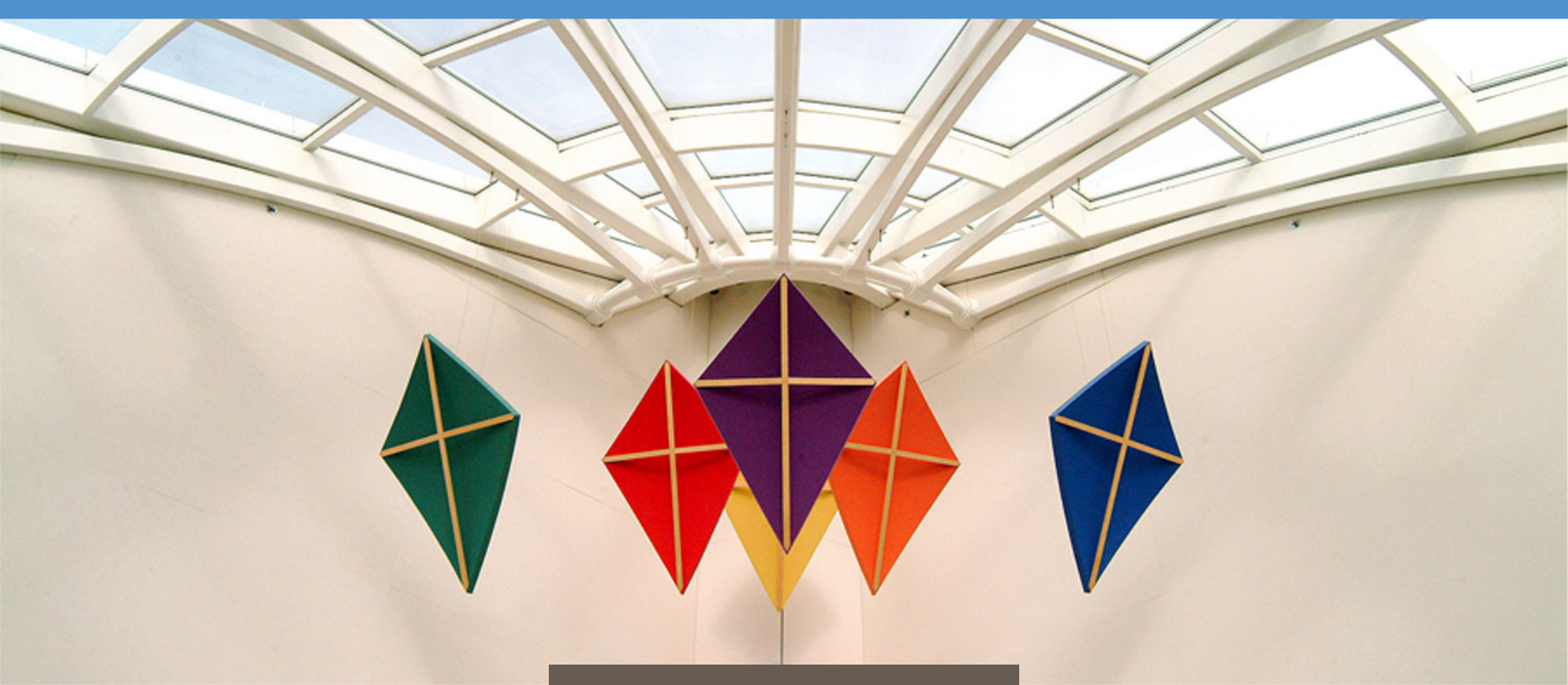
Trying To Do What Is Best



If a woman doesn't know what to expect, and she has a baby and the baby starts going through [withdrawal], and she doesn't know why the baby is crying all the time. 'Why can't I console them, what's going on here?'... It really does take a mental and emotional toll on a mom and a dad when they don't know.

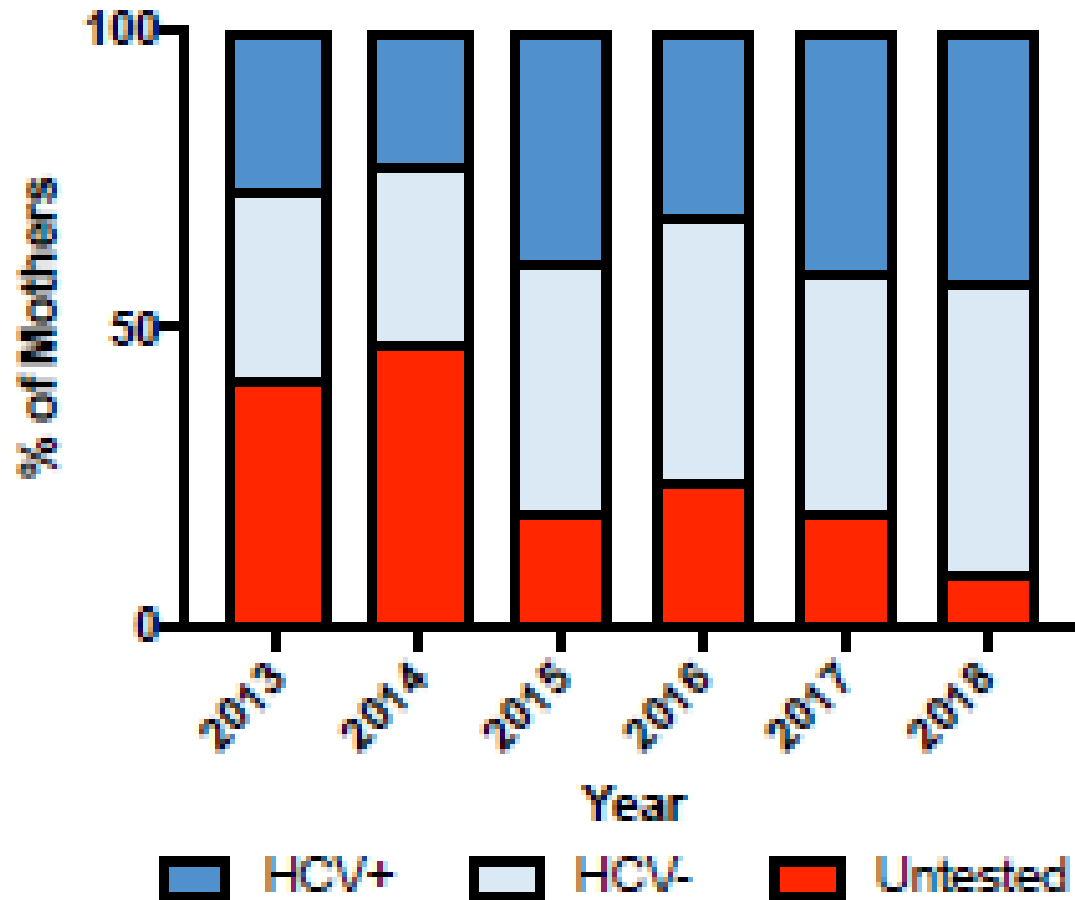
Mothers Try to Do What is Best

- Face barriers including;
 - Experiencing guilt
 - Feeling judged
 - NAS scoring tools
 - Symptoms of NAS
- Supports include;
 - Reassurance from providers, male co-parents, and peers
 - Consistent education about NAS
 - Maternal-infant bonding sensitive care in hospital

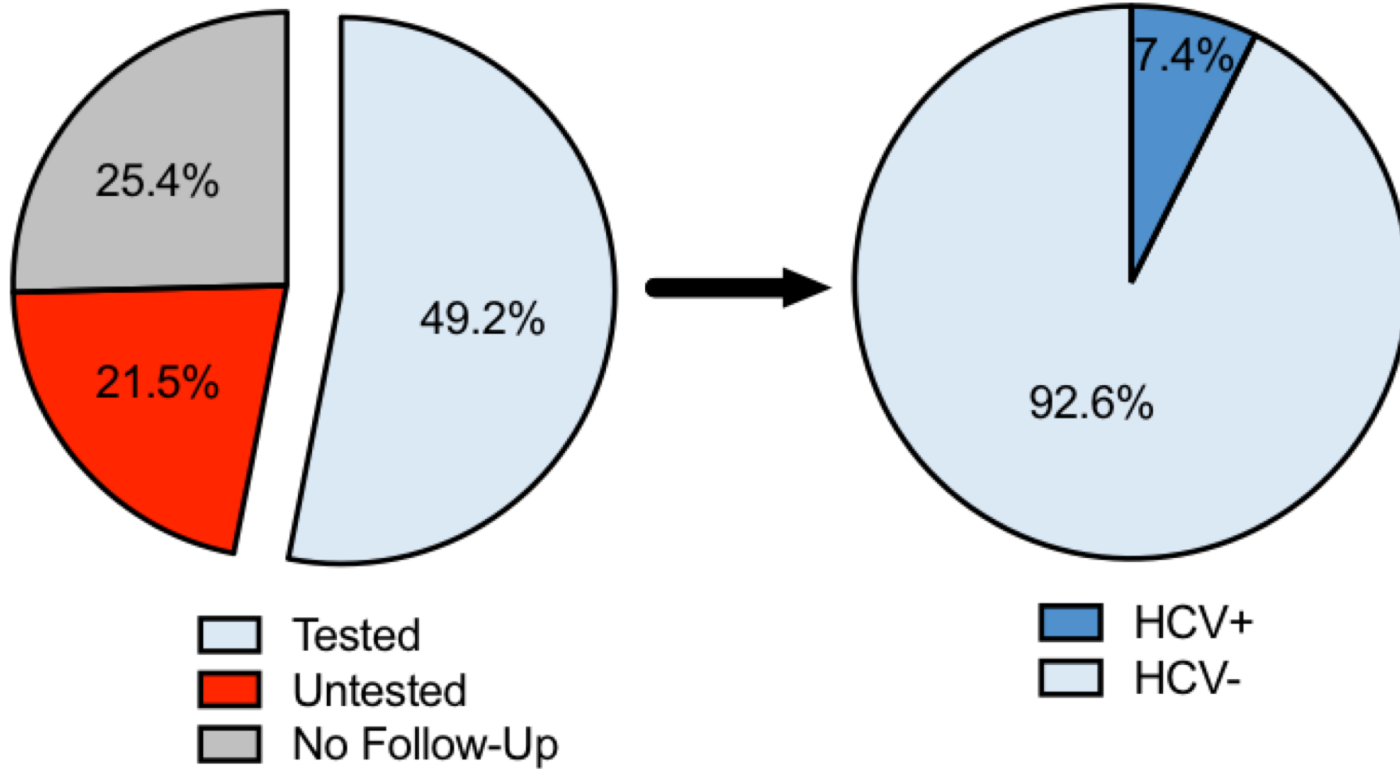


Hepatitis C

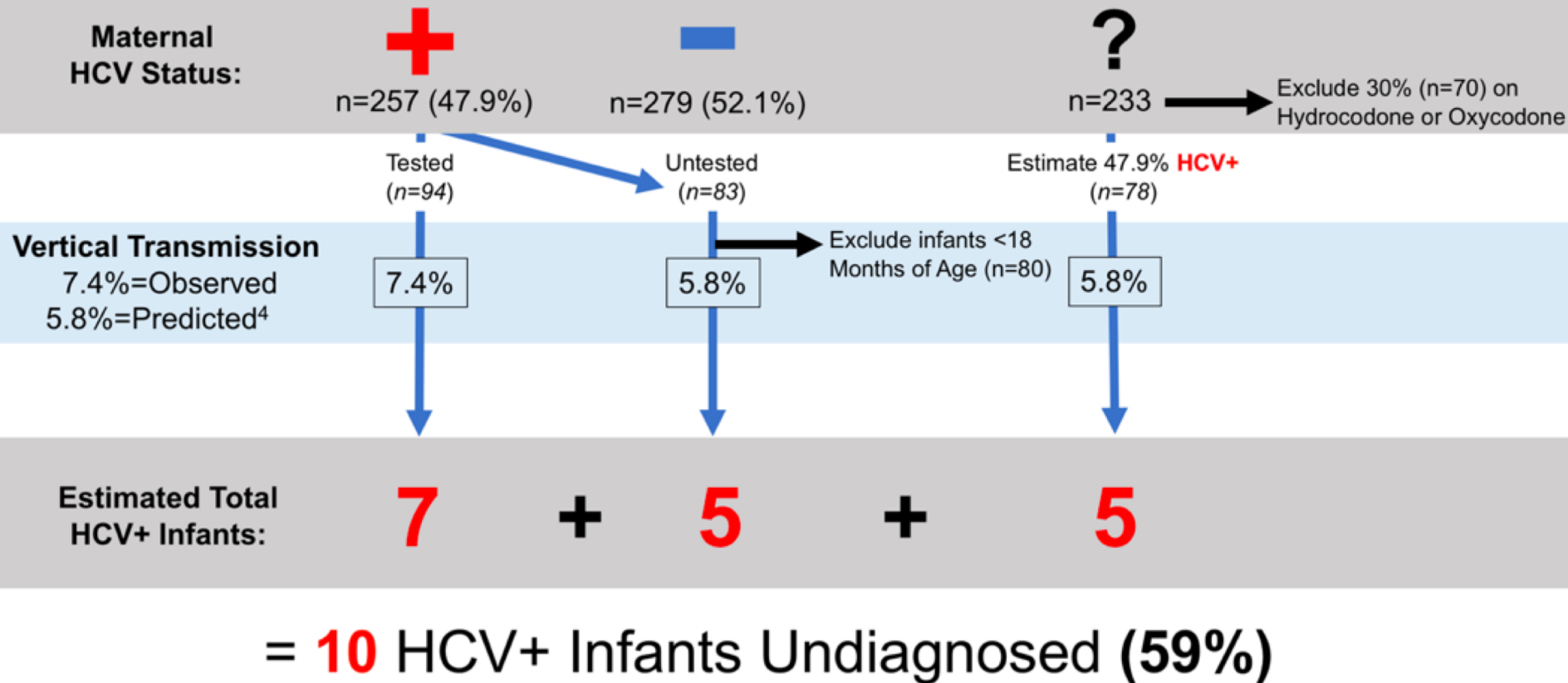
Maternal Testing

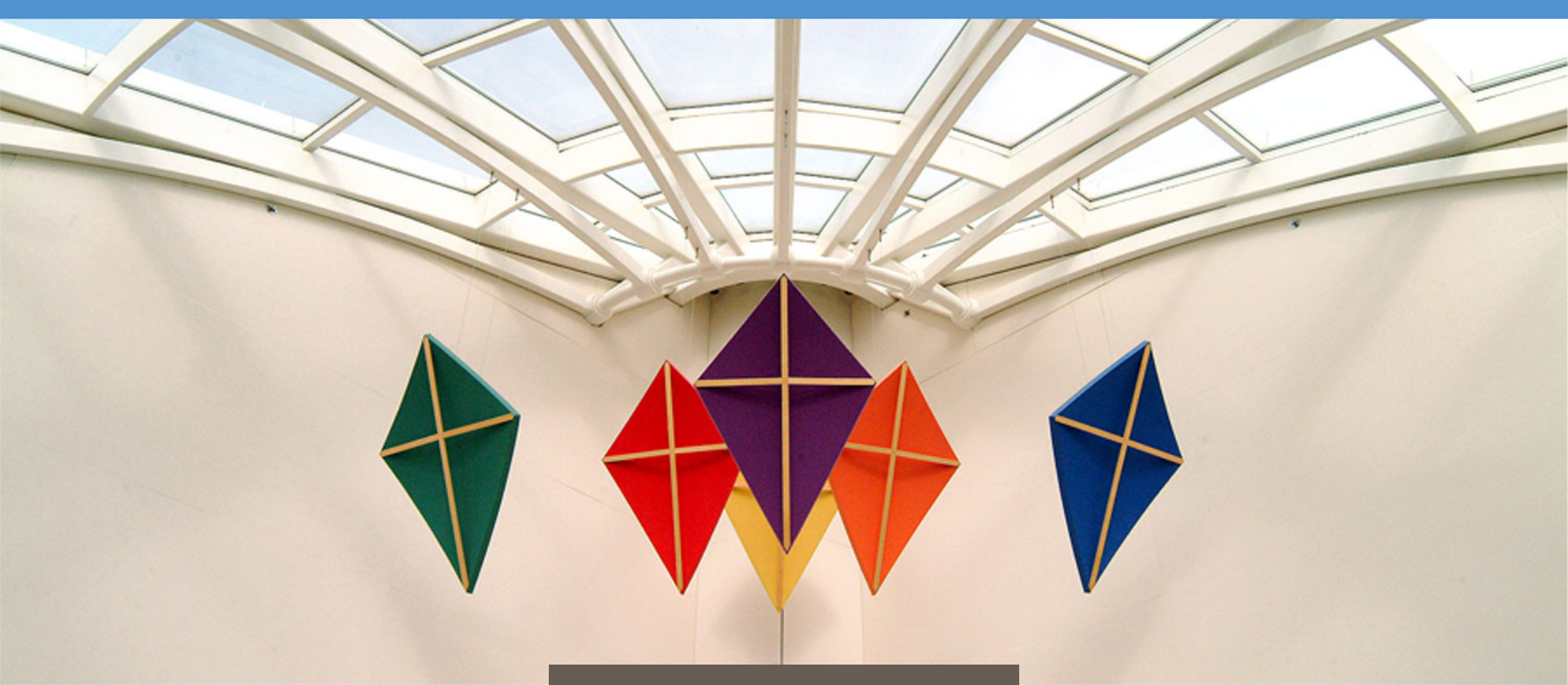


Infant Hepatitis C Testing



Hepatitis C: Potential Missed Cases





Head Circumference

Long term outcomes?

- “Potential long-term effects of prenatal methadone exposure on infant and toddler development are not known”

Clin Obstet Gynecol. 2013 March ; 56(1): 186–192.

- Hunt et al assessed opiate-exposed infants at both 18 and 36 months using the Bayley Scales of Infant Development, Second Edition (BSID-II). Mental Development Index (MDI) was significantly lower in opiate-exposed children at 12 and 18 months

Hunt RW, Tzioumi D, Collins E, et al. Adverse neurodevelopmental outcome of infants exposed to opiate in-utero. Early Hum Dev. 2008; 84(1):29–35.

Challenges in Assessing Outcome

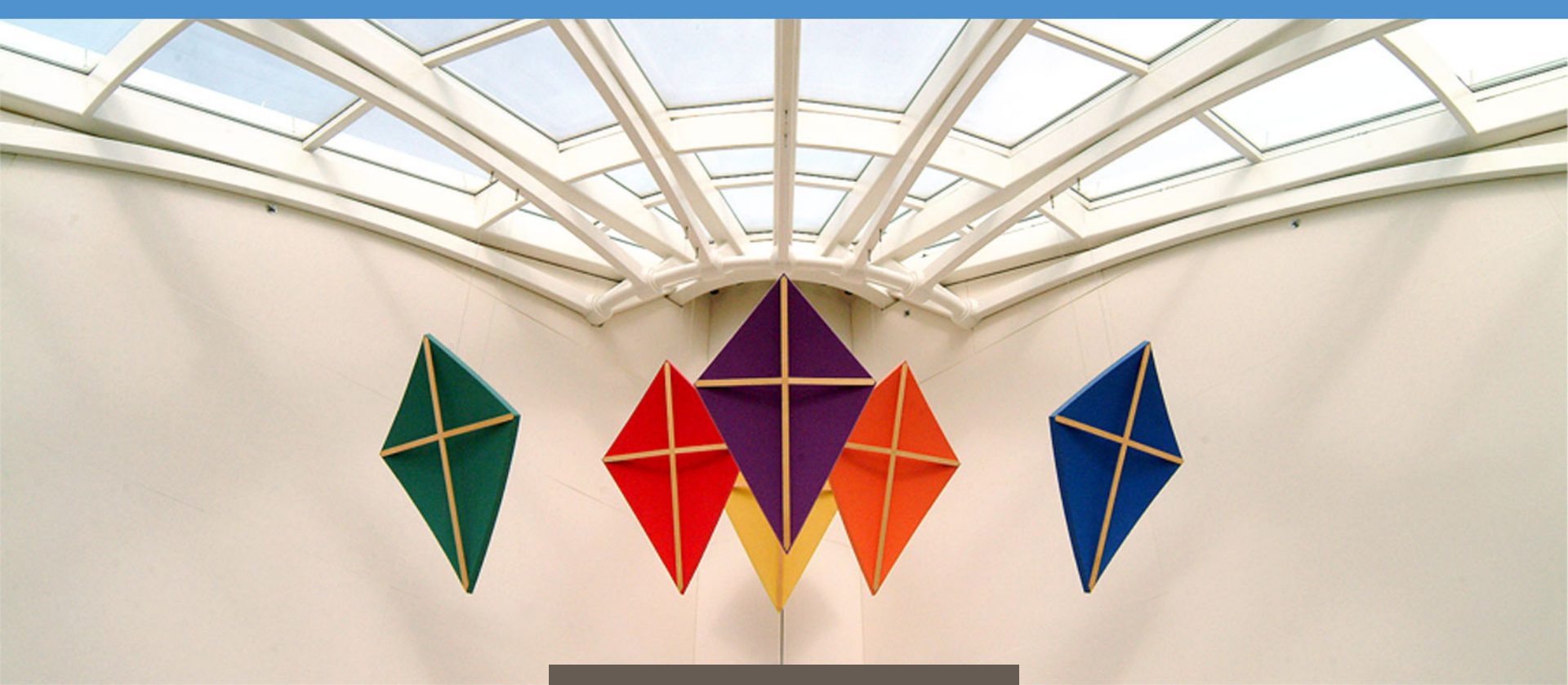
- Other substance exposure
 - Alcohol
 - Tobacco
 - Other illicit drugs
- Environmental risk factors (lead)
- Medical risk factors (mental health issues, poor maternal nutrition, SGA)
- Socioeconomic status
 - Poor prenatal care
 - Housing instability
 - Foster care

Are we doing all that can be done?

- https://www.ted.com/talks/johann_hari_everything_you_think_you_know_about_addiction_is_wrong/transcript?language=en#t-251438



..... Rat Park Experiment, Bruce Alexander, Canadian Psychologist, published 1981



Questions??