Understanding NAS - a neonatologist's perspective

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AHCA External Quality Review meeting

11/8/17

USF UNIVERSITY OF SOUTH FLORIDA

TGH Tampa General Hospital Children's MEDICAL CENTER

FPQC Florida Perinatal Quality Collaborative

Disclosure statement

- I have no relevant financial relationships with manufacturers of any commercial products or providers of commercial services discussed in this activity.

- I do not intend to discuss an unapproved or investigative use of a commercial product or device in my presentation.

“I just don’t understand…”

Objectives

1. Understand the epidemiology & impact
2. Describe an interdisciplinary model of care
3. Discuss opportunities for improved management

NAS

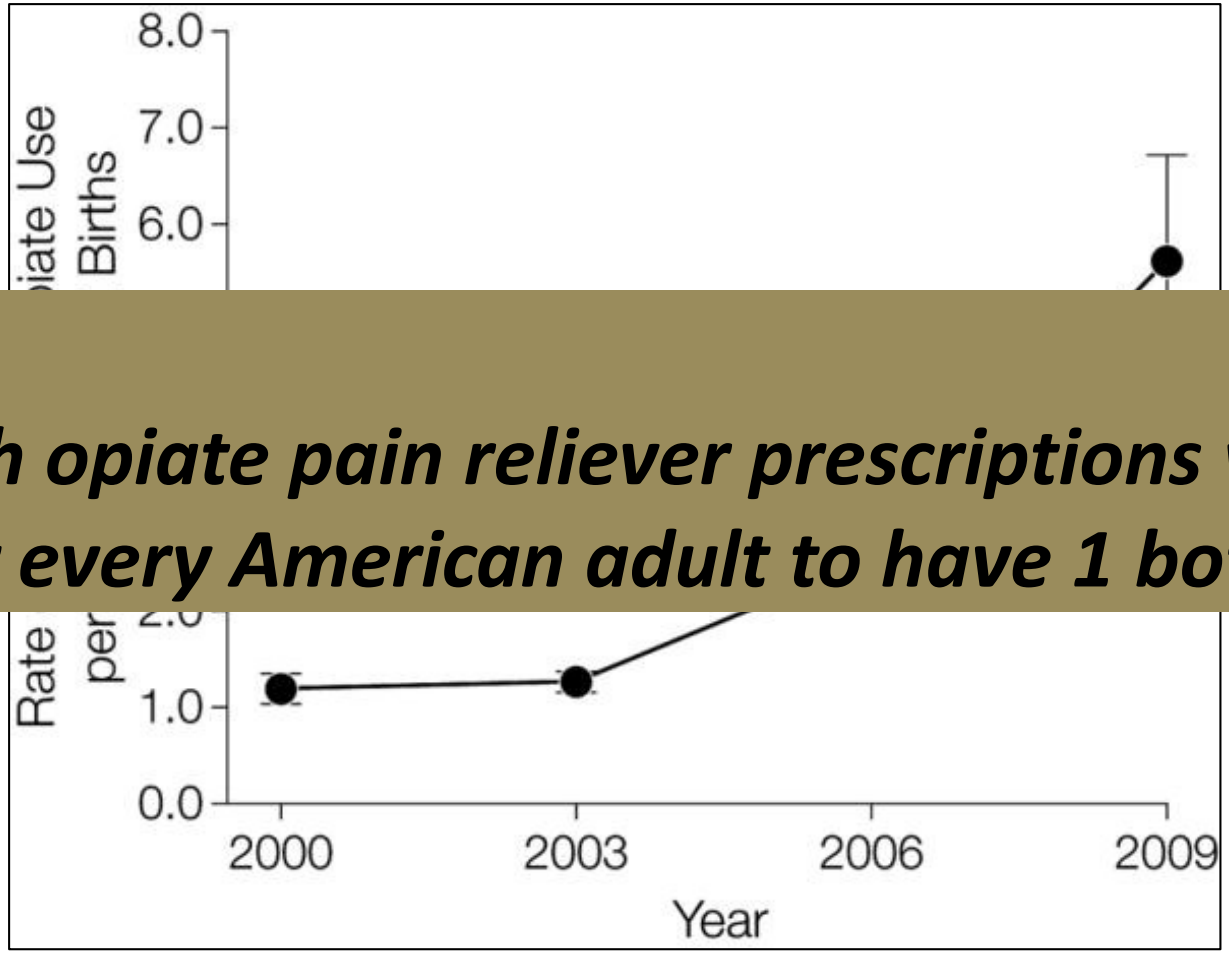
Nonspecific signs & symptoms of drug withdrawal in infants with in-utero exposure

Opioids	CNS stimulants	CNS depressants
morphine methadone buprenorphine oxycodone heroin	methamphetamines amphetamines SSRIs SNRIs	benzodiazepines barbiturates

Neonates are not "addicted" or psychologically dependent

1. Wiles JR, Isemann B, Mizuno T, Tabangin ME, Ward LP, Akinbi H, et al. Pharmacokinetics of Oral Methadone in the Treatment of Neonatal Abstinence Syndrome: A Pilot Study. *J Pediatr*. 2015.
2. Nayeri F, Sheikh M, Kalani M, Niknafs P, Shariat M, Dalili H, et al. Phenobarbital versus morphine in the management of neonatal abstinence syndrome, a randomized control trial. *BMC Pediatr*. 2015;15:57.
3. Asti L, Magers JS, Keels E, Wispe J, McClead RE. A quality improvement project to reduce length of stay for neonatal abstinence syndrome. *Pediatrics*. 2015;135(6):e1494-1500.

Drug use remains a problem in the US

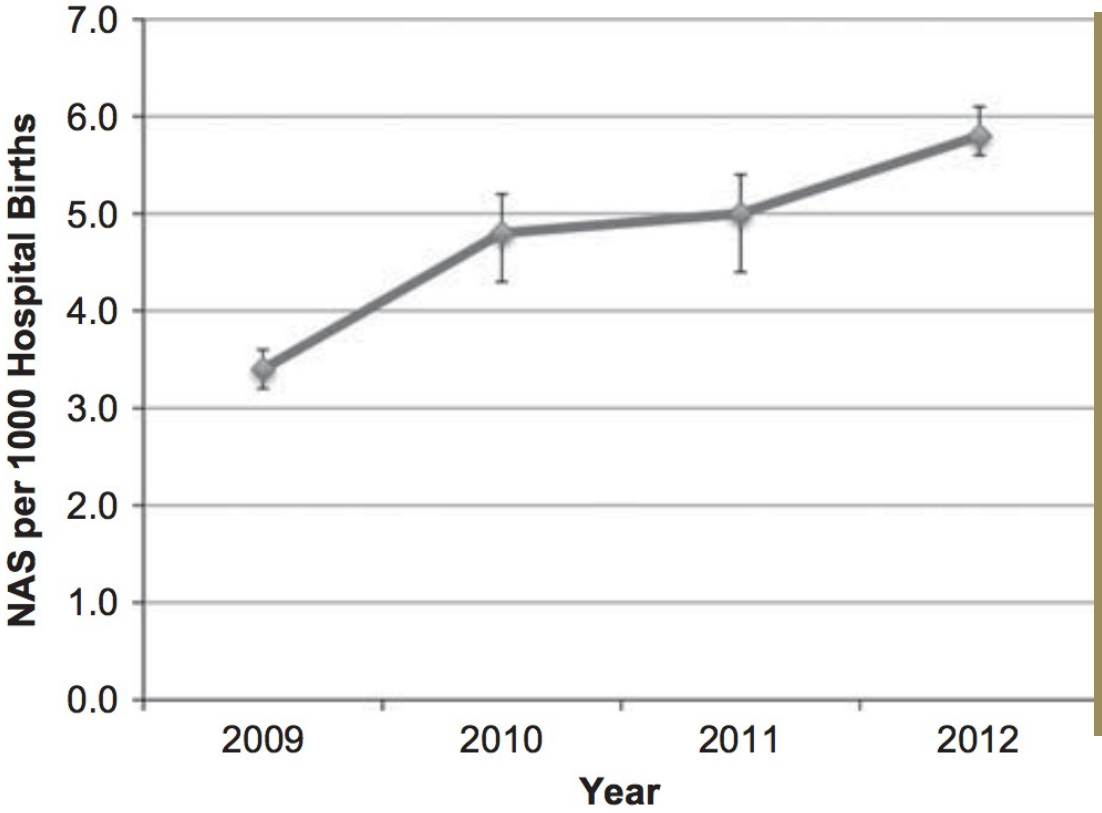


Enough opiate pain reliever prescriptions written for every American adult to have 1 bottle

Data from National Inpatient Sample developed by Agency for Healthcare Research & Quality's HCUP

1. Wiles JR, Isemann B, Mizuno T, Tabangin ME, Ward LP, Akinbi H, et al. Pharmacokinetics of Oral Methadone in the Treatment of Neonatal Abstinence Syndrome: A Pilot Study. *J Pediatr*. 2015.
2. Patrick SW, Davis MM, Lehman CU, Cooper WO. Increasing incidence & geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012. *J Perinatol*. 2015;35(8):667.
3. Patrick SW, Schumacher RE, Bennywort BD, Krans EE, McAllister JM, Davis MM. Neonatal Abstinence Syndrome & Associated Health Care Expenditures, United States, 2000-2009. JAMA 2012. 307 (18): 1934-40.
4. Hall ES, Wexelblatt SL, Crowley M, Grow JL, Jasin LR, Klebanoff MA, et al. A multicenter cohort study of treatments & hospital outcomes in neonatal abstinence syndrome. *Pediatrics*. 2014;134(2):e527-534.

More babies are experiencing NAS….

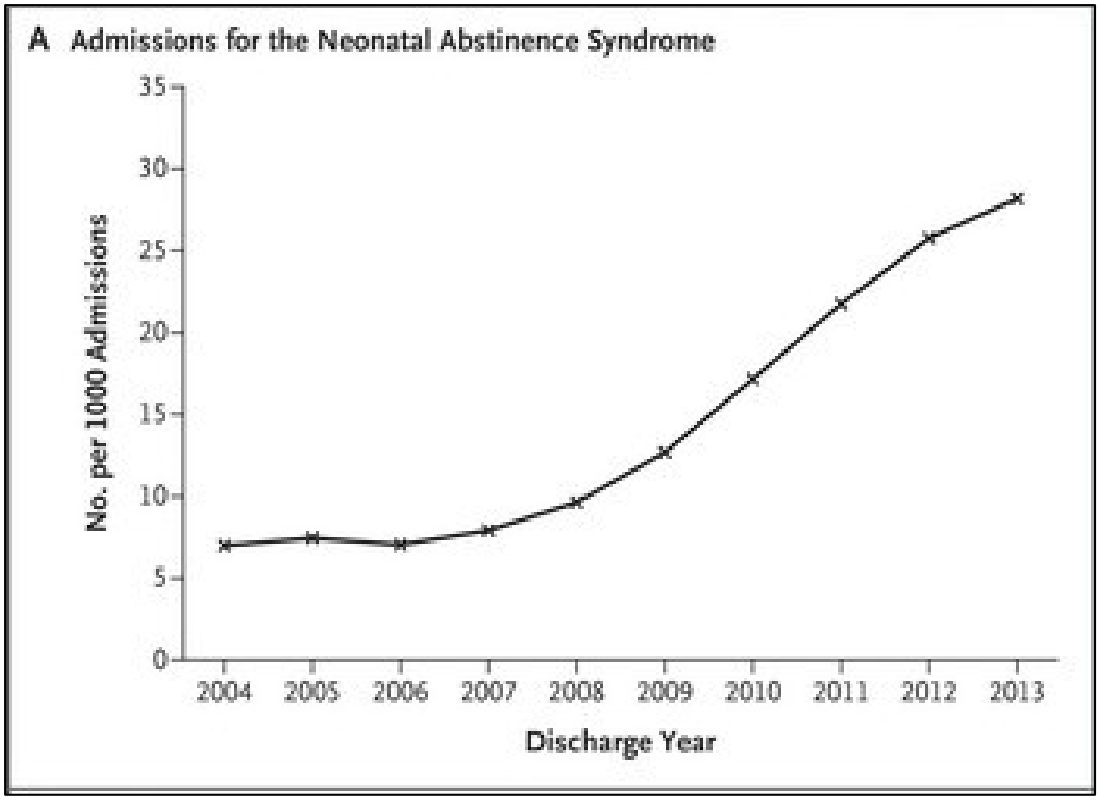


"In 2012, the estimated number of newborns w/NAS was 21,732 or 1 infant born every 25 minutes…"

Data from Healthcare Cost & Utilization Project's Kids' Inpatient Database

1. Patrick SW, Davis MM, Lehman CU, Cooper WO. Increasing incidence & geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012. *J Perinatol*. 2015;35(8):667.
2. Patrick SW, Davis MM, Lehman CU, Cooper WO. Increasing incidence & geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012. *J Perinatol*. 2015;35(8):667.
3. Hall ES, Wexelblatt SL, Crowley M, Grow JL, Jasin LR, Klebanoff MA, et al. Implementation of a Neonatal Abstinence Syndrome Weaning Protocol: A Multicenter Cohort Study. *Pediatrics*. 2015;136(4):e803-810.

…and are admitted to the NICU…



NAS becoming responsible

for a growing portion of NICU resources nationwide

Tolia VN, Patrick SW, Bennett MM, Murthy K, Sousa J, Smith PB, Clark RH, Spitzer AR. Increasing incidence of the neonatal abstinence syndrome in the U.S. neonatal ICUs. *N Engl J Med.* 2015; 372(22):2118-26.

…diagnosed with…

Table 1. Characteristics of infants with neonatal abstinence syndrome vs all other hospital births, 2012

	Infants with neonatal abstinence syndrome (N = 21 732)		*All other hospital births* (N = 3 716 916)		P-value
	N	%	N	%	
Female	9902	45.6	1 817 513	48.9	< 0.001
Clinical characteristics					
Low birthweight	5308	24.4	267 885	7.2	< 0.001
Respiratory diagnoses					
Transient tachypnea	2552	11.7	113 483	3.1	< 0.001
Meconium Aspiration syndrome	613	2.8	13 235	0.4	< 0.001
Respiratory distress syndrome	977	4.5	74 001	2.0	< 0.001
Jaundice	7134	32.8	708 872	19.1	< 0.001
Feeding difficulty	3765	17.3	111 288	3.0	< 0.001
Seizures	309	1.4	4208	0.1	< 0.001
Sepsis	3218	14.8	81 845	2.2	< 0.001
Insurance					< 0.001
Private	2688	12.4	1 717 308	46.2	
Medicaid	17 717	81.5	1 726 432	46.4	
Uninsured	853	3.9	144 137	3.9	
Other	405	1.9	118 918	3.2	

Point estimate (standard error) *N* for NAS = 21 732 (857); unweighted sample *n* = 16 254. Point estimate (standard error) *N* for all other hospital births = 3 716 916 (55 864); unweighted sample *n* = 1 094 748.

Patrick SW, Davis MM, Lehman CU, Cooper WO. Increasing incidence & geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012. *J Perinatol*. 2015;35(8):667.

Healthcare burden of NAS

Table 2. Mean length of stay and inflation-adjusted hospital charges for all infants with neonatal abstinence syndrome, infants with neonatal abstinence syndrome with a length of hospital stay >6 days and uncomplicated term infants, 2009–2012

Year	*2009* N *(95% CI)*	*2010* N *(95% CI)*	*2011* N *(95% CI)*	*2012* N *(95% CI)*
Neonatal abstinence syndrome				
Mean length of stay (days)	16.5 (15.9–17.2)	17.2 (15.8–18.5)	16.6 (15.1–18.1)	16.9 (16.0–17.7)
Mean hospital charges (2012 US$)	53 800 (49 400–58 300)	59 000 (49 600–68 400)	62 300 (52 900–71 700)	66 700 (61 800–71 600)
Pharmacologically treated neonatal abstinence syndrome				
Mean length of stay (days)	22.7 (21.9–23.4)	22.9 (21.6–24.1)	22.8 (21.5–24.2)	23.0 (22.2–23.8)
Mean hospital charges (2012 US$)	75 700 (69 500–82 000)	80 500 (68 000–93 100)	87 700 (76 300–99 100)	93 400 (86 900–100 000)
Uncomplicated term infant				
Mean length of stay (days)	2.1 (2.1–2.1)	2.1 (2.1–2.1)	2.1 (2.1–2.1)	2.1 (2.1–2.1)
Mean hospital charges (2012 US$)	2800 (2700–2900)	3500 (3300–3800)	3700 (3400–3900)	3500 (3400–3600)

Abbreviation: CI, confidence interval. All US$ inflation adjusted to 2012 and rounded to nearest hundred.

Despite awareness of NAS management issues, there has been little difference in length of stay….

1. Patrick SW, Schumacher RE, Bennywort BD, Krans EE, McAllister JM, Davis MM. Neonatal Abstinence Syndrome & Associated Health Care Expenditures, United States, 2000-2009. JAMA 2012. 307 (18): 1934-40.
2. Patrick SW, Davis MM, Lehman CU, Cooper WO. Increasing incidence & geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012. *J Perinatol*. 2015;35(8):667.
3. Hall ES, Wexelblatt SL, Crowley M, Grow JL, Jasin LR, Klebanoff MA, et al. Implementation of a Neonatal Abstinence Syndrome Weaning Protocol: A Multicenter Cohort Study. *Pediatrics*. 2015;136(4):e803-810.
4. Asti L, Magers JS, Keels E, Wispe J, McClead RE. A quality improvement project to reduce length of stay for neonatal abstinence syndrome. *Pediatrics*. 2015;135(6):e1494-1500.

Why focus on LOS[1]?

Often used as an indicator of efficiency

- Medication errors
- Adverse events (e.g. CLABSI, VAP, pressure ulcers, SSE)
- Impaired parent-infant attachment
- Increased stress on families already stressed
- Increased financial burden on families & society

[1]LOS: Length of hospital stay

Hauck K, Zhao X. How dangerous is day in the hospital? A model of adverse events & length of stay for medical inpatients. Med Care. 2011; 49 (12): 1068-75.
Patrick SW, Schumacher RE, Bennywort BD, Krans EE, McAllister JM, Davis MM. Neonatal Abstinence Syndrome & Associated Health Care Expenditures, United States, 2000-2009. JAMA 2012. 307 (18): 1934-40.

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NOTE: Hospital charges do not equal hospital costs, & do not include professional fees.

Hospital charges for NAS continue to increase

1. Patrick SW, Schumacher RE, Bennywort BD, Krans EE, McAllister JM, Davis MM. Neonatal Abstinence Syndrome & Associated Health Care Expenditures, United States, 2000-2009. JAMA 2012. 307 (18): 1934-40.
2. Patrick SW, Davis MM, Lehman CU, Cooper WO. Increasing incidence & geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012. *J Perinatol*. 2015;35(8):667.
3. Patrick SW. The Triple Aim for Neonatal Abstinence Syndrome. *J Pediatr*. 2015.

"We have to stop treating addiction as a moral failing, and start seeing it for what it is: a chronic disease that must be treated with urgency and compassion."

Dr. Vivek H. Murthy

US Surgeon General

https://www.surgeongeneral.gov/priorities/opioids/

We have an opioid crisis

Surgeon General's #TurnTheTide Campaign

2 of 5 Americans say they personally know someone who has been addicted to prescription painkillers

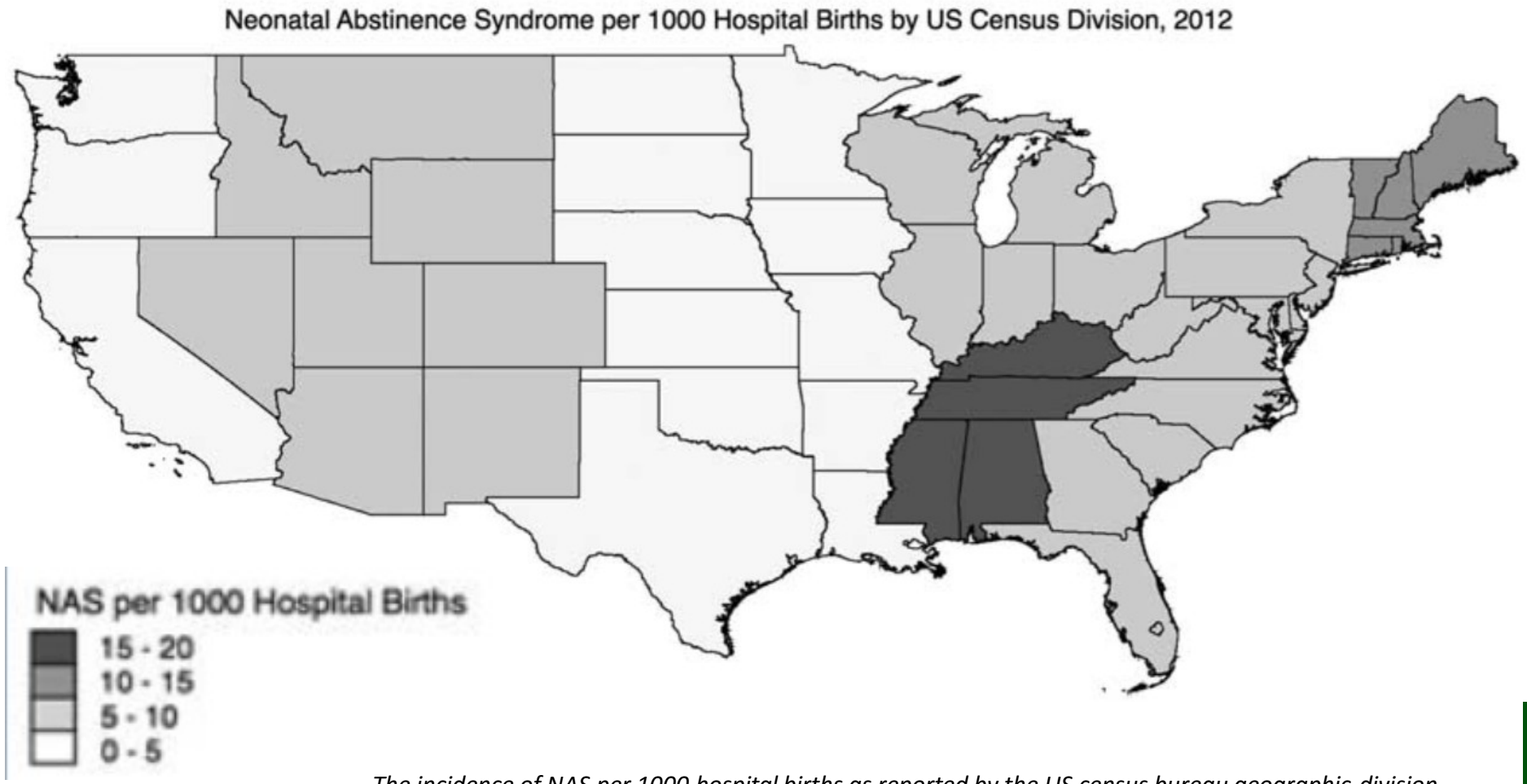
No change in overall amount of pain that Americans report

à 4x as many opioid prescriptions written since 1999

78 Americans die every day from opioid overdoses

https://www.surgeongeneral.gov/priorities/opioids/
http://turnthetiderx.org/

Where is the NAS problem?

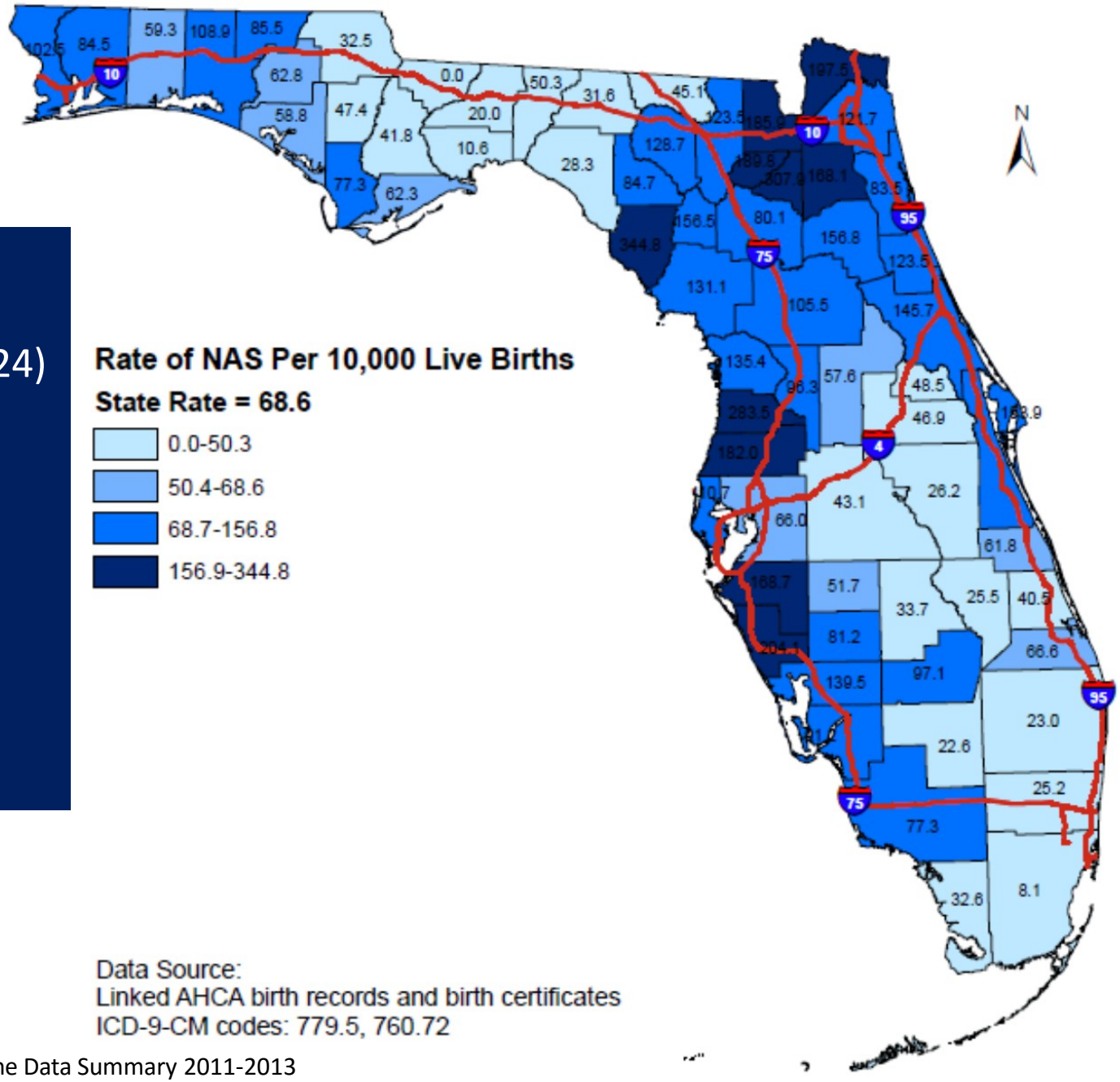


The incidence of NAS per 1000 hospital births as reported by the US census bureau geographic division.

Patrick SW, Davis MM, Lehman CU, Cooper WO. Increasing incidence & geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012. *J Perinatol*. 2015;35(8):667.

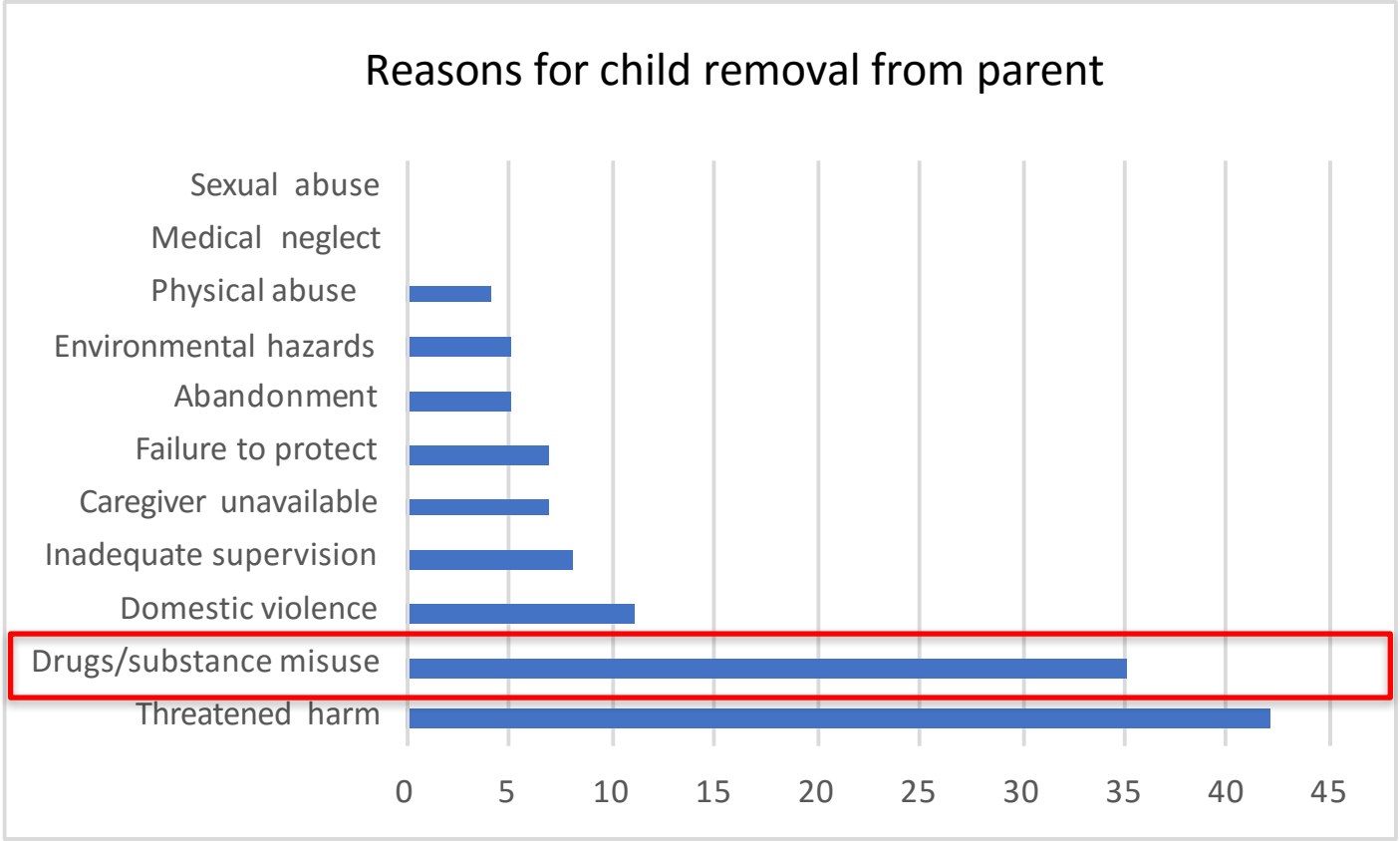
Top 10 counties

1. Duval (450)
2. Hillsborough (324)
3. Pinellas (276)
4. Pasco (256)
5. Brevard (231)
6. Orange (219)
7. Volusia (201)
8. Sarasota (175)
9. Lee (173)
10. Manatee (170)



Data Source:
Linked AHCA birth records and birth certificates
ICD-9-CM codes: 779.5, 760.72

	Monthly shelter report 4/2017
# children in shelters	79
# children sheltered	140
Children in relative placement	41
Children in non-relative or foster placement	85



Age:

35%: 0-1 years

27%: 2-5 years

23%: 6-10 years

Hillsborough County Sherriff's Office Child Protective Investigation Division. 4/2017 report.

2017 Policy Academy: Improving outcomes for pregnancy and postpartum women with opioid use disorders and their Infants, families, and caregivers.

Healthcare burden of NAS

ülncreased incidence of antenatal drug use

ülncreased incidence of NAS

ülncreased healthcare expenditures

Increase public health measures:

- Reduce antenatal exposures
- Improve NAS management strategies

Office of Drug Control Policy

Medicaid or
Private insurance

Healthy Start
Healthy Families

Social workers

Mother

Lactation

Judicial systems

Governor's office
or Taskforce Representative

MENTAL HEALTH SERVICES

Inpatient & Outpatient
Pediatrics, Neonatology,
Obstetrics, & Primary care
(Physicians ± trainees, NPs)

Hospital Associations

Early intervention programs

Psychosocial & environmental support services

EARLY CHILDHOOD EDUCATION

Medication assisted treatment facilities

AHCA

Child welfare agencies,
Child protection services,
Child abuse prevention,
Family reunification

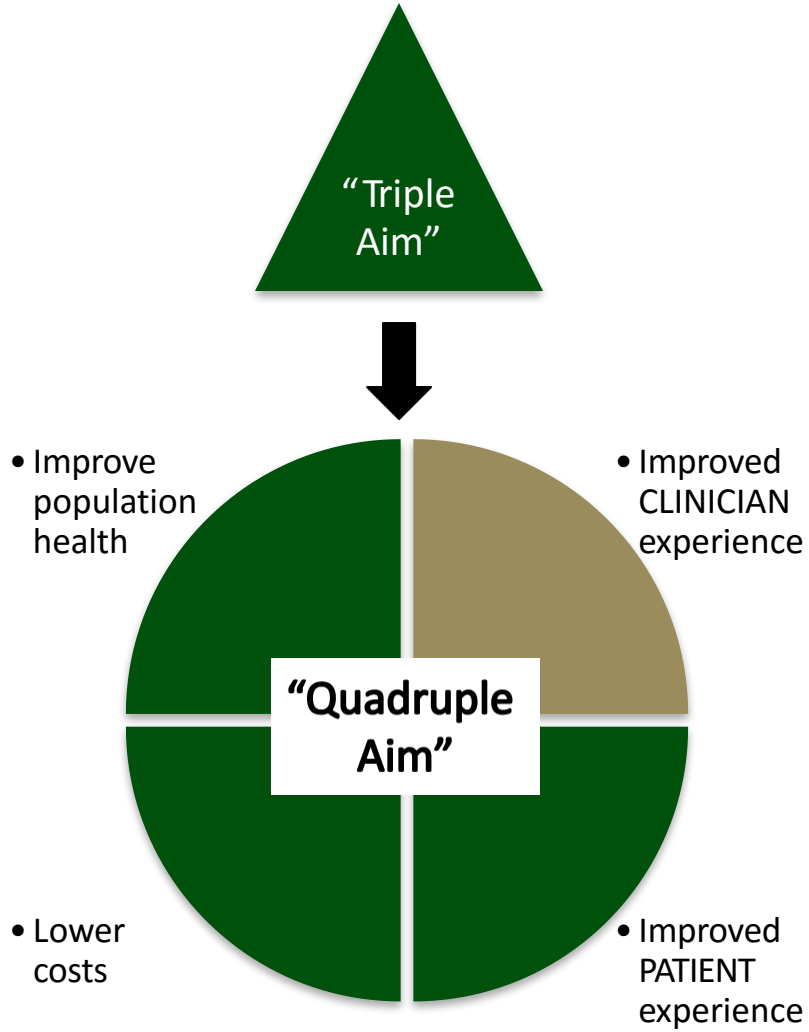
Maternal & Child Health Department/Public Health services

A A P

Table. Applying *Crossing the Quality Chasm* improvement aims for improving care to infants with NAS

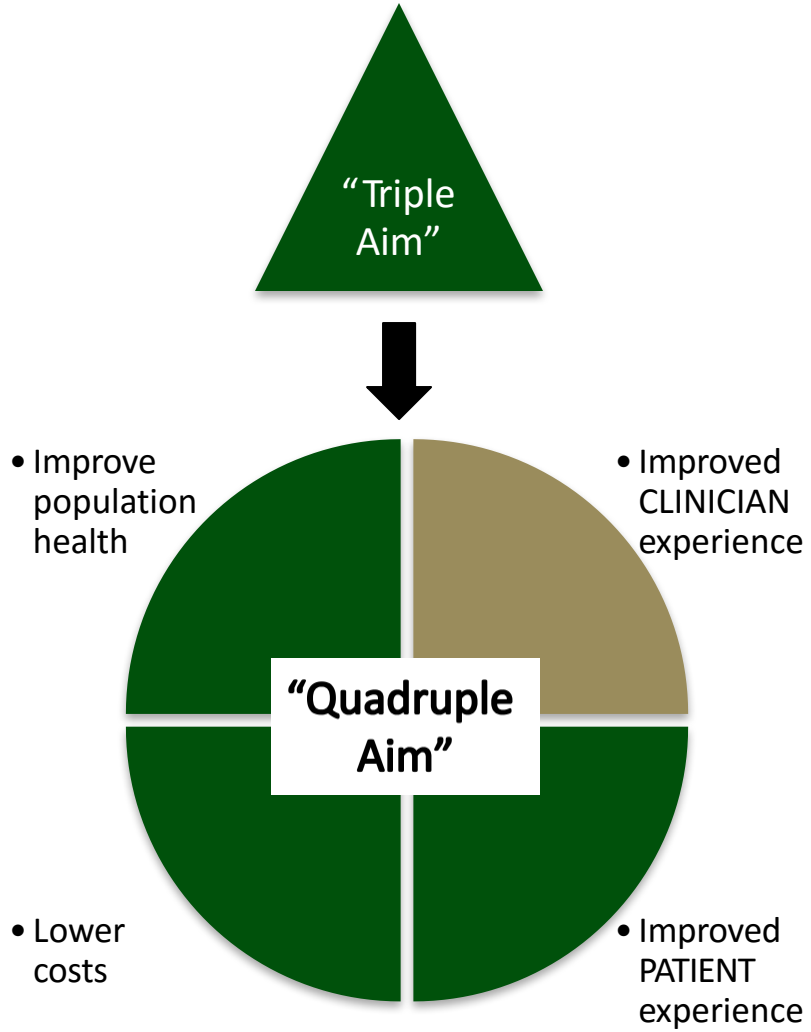
Crossing the Quality Chasm aim	NAS example
Safe	Minimizing risk from opioid administration, including decreasing total administration and appropriate monitoring.
Effective	Ensuring that all care practices are evidenced-based and eliminate practices not likely to yield benefit.
Patient-centered	Ensuring that, when possible, the maternal/infant dyad remains intact.
Timely	Ensuring that infants needing treatment (nonpharmacologic and pharmacologic) receive it without delay, minimizing exacerbation of their clinical signs.
Efficient	Reducing waste by eliminating unnecessary pharmacotherapy and excess length of hospital stay.
Equitable	Ensuring that infants with NAS and their families are treated just as other families in the neonatal intensive care units.

Patrick SW. The Triple Aim for Neonatal Abstinence Syndrome. *J Pediatr*. 2015.



- Improve knowledge
- Standardize management
- Address attitudes

1. Patrick SW. The Triple Aim for Neonatal Abstinence Syndrome. *J Pediatr*. 2015.
2. Sikka R, Morath JM, Leape L. The Quadruple Aim: care, health, cost, & meaning in work. *BMJ Qual Saf*. 2015; 0:1-3.



- Improve knowledge
- IOM dimensions
- Mother-Infant dyad

1. Patrick SW. The Triple Aim for Neonatal Abstinence Syndrome. *J Pediatr*. 2015.
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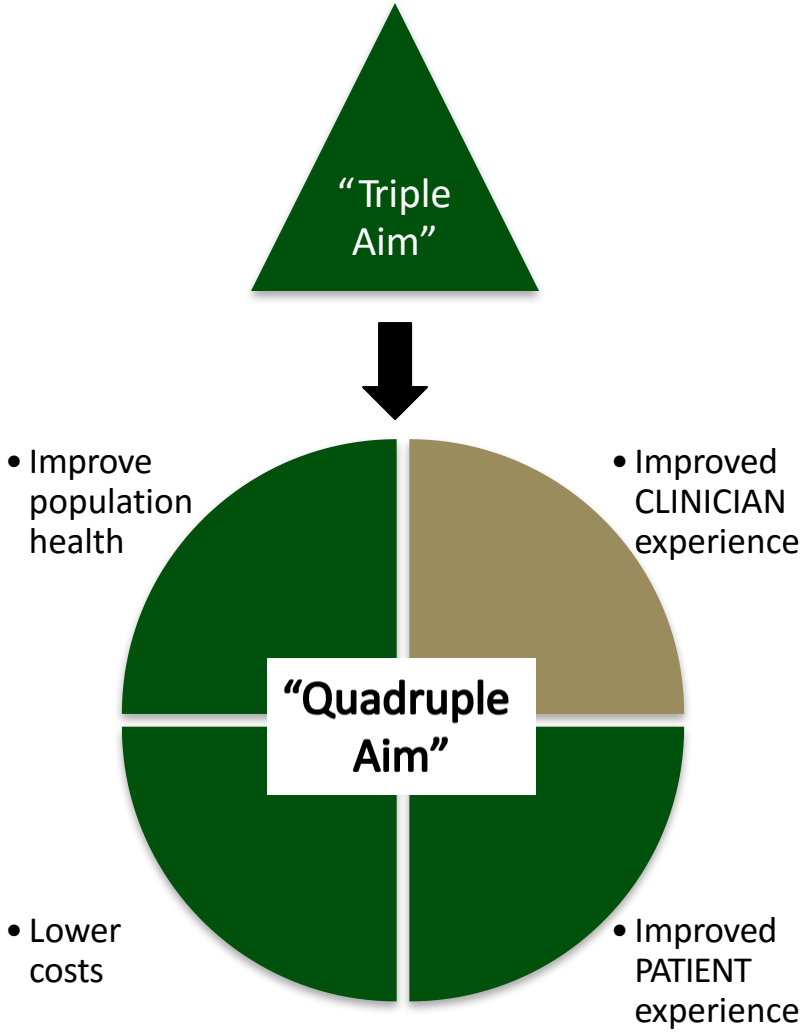
- Access to substance dependency treatment
- Limit high risk opioid prescribing practices
- Increase drug control systems



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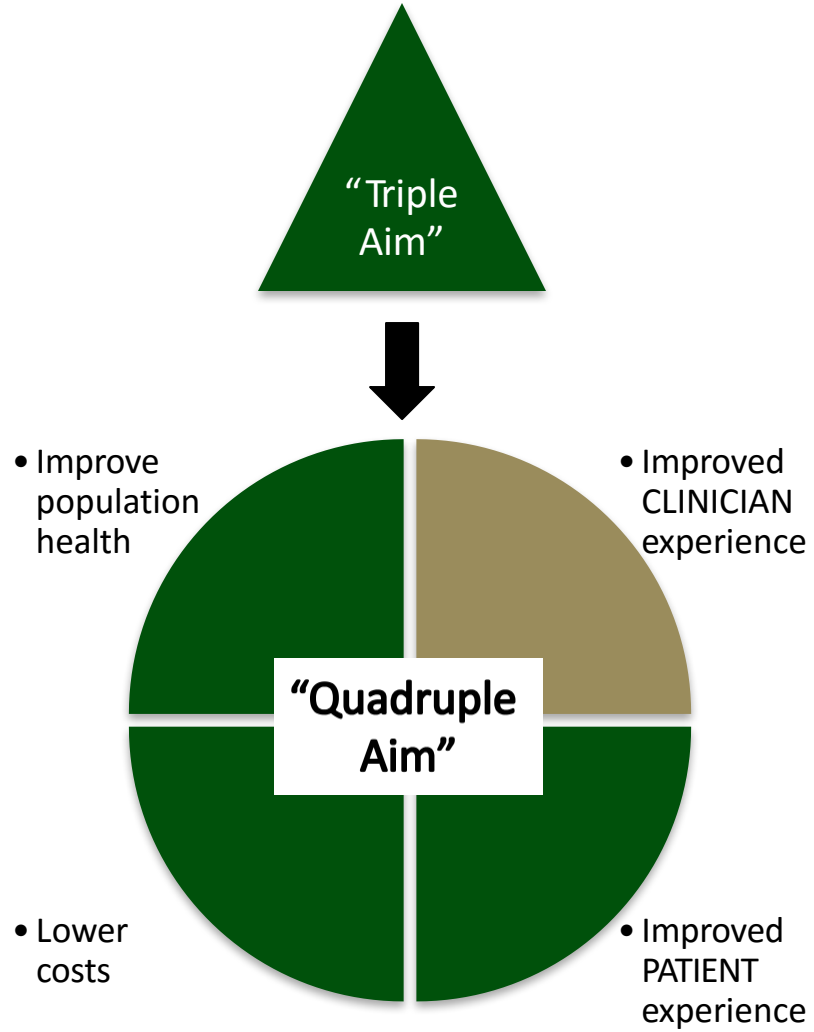
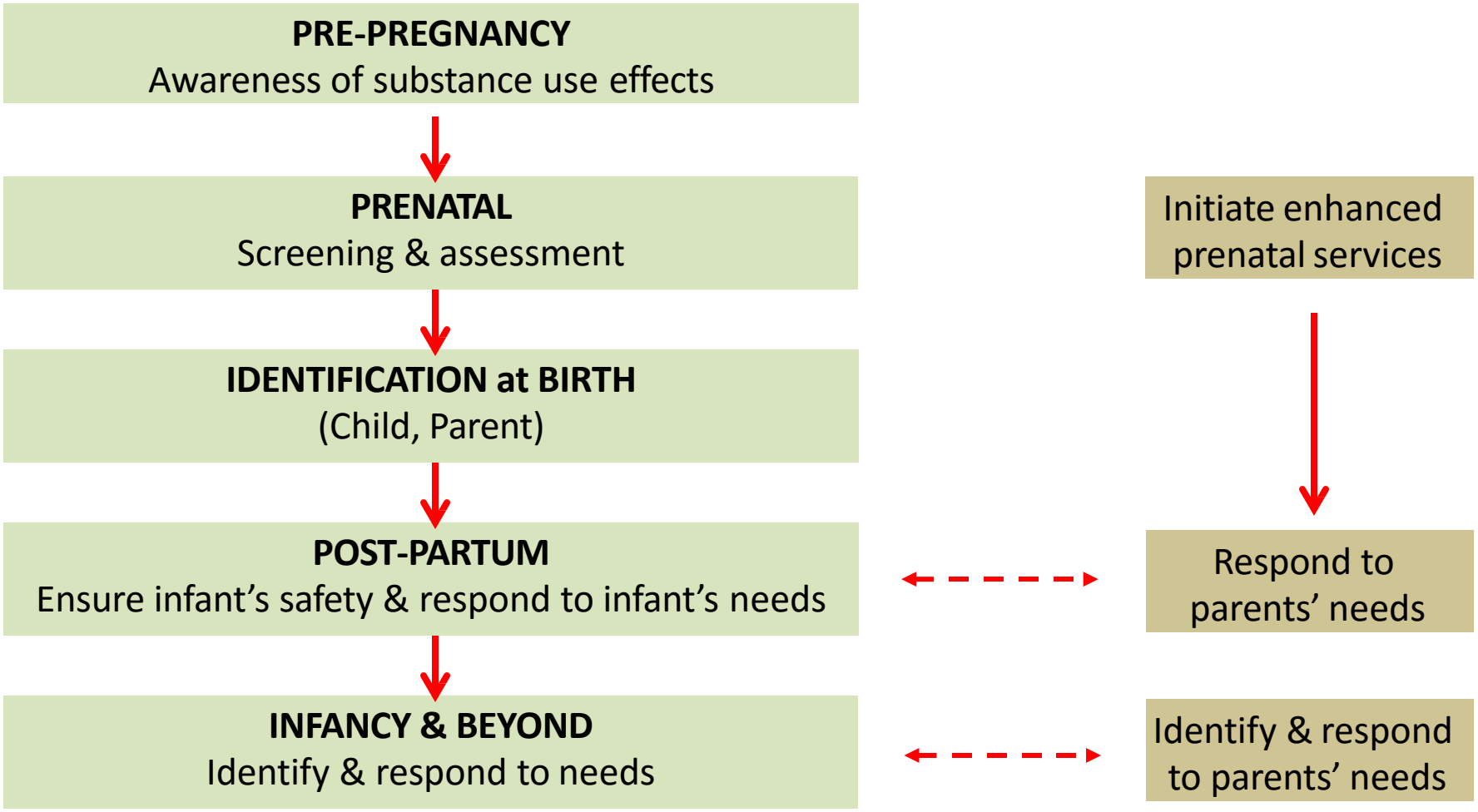


- Support research & QI initiatives

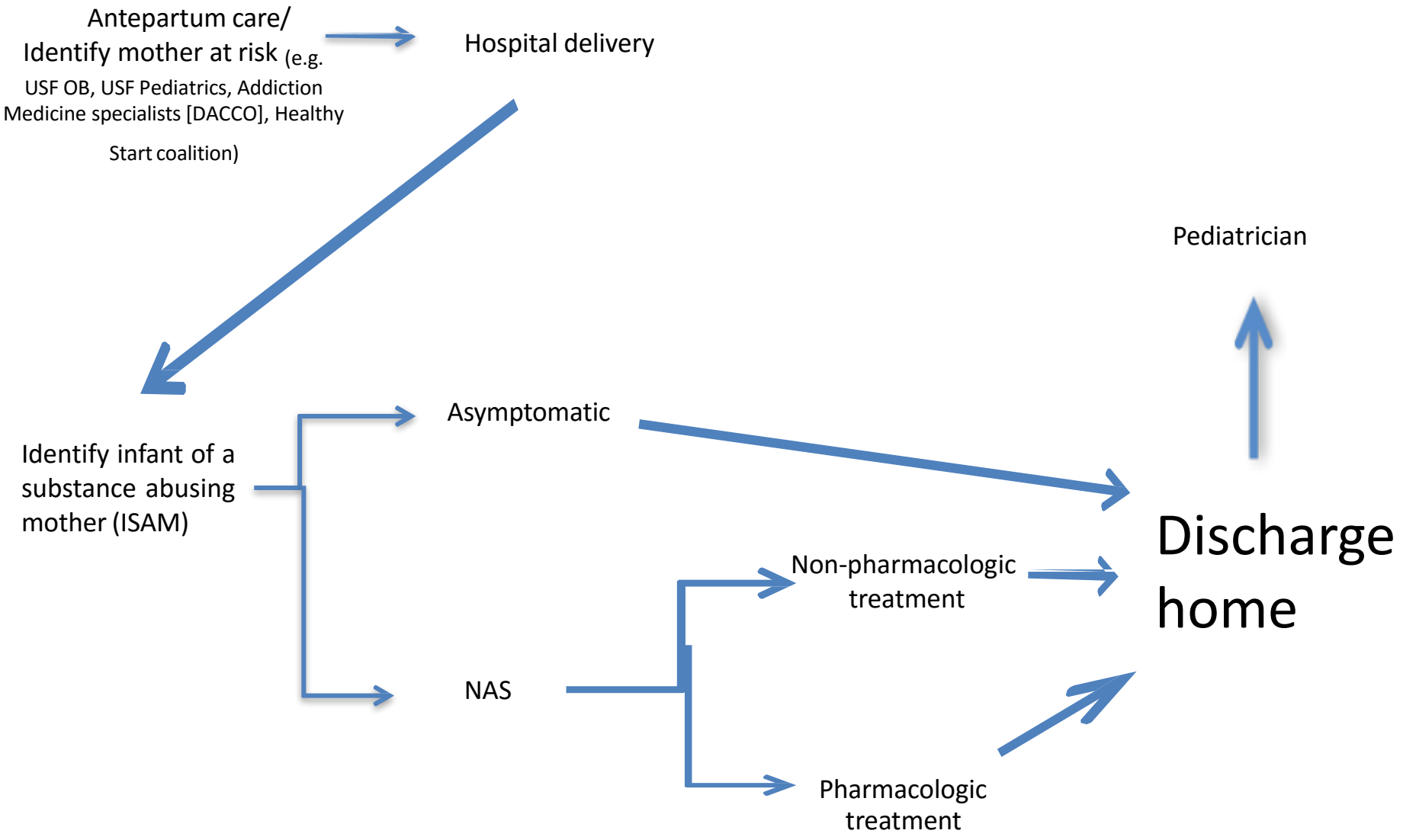
1. Patrick SW. The Triple Aim for Neonatal Abstinence Syndrome. *J Pediatr*. 2015.
2. Sikka R, Morath JM, Leape L. The Quadruple Aim: care, health, cost, & meaning in work. *BMJ Qual Saf*. 2015; 0:1-3.

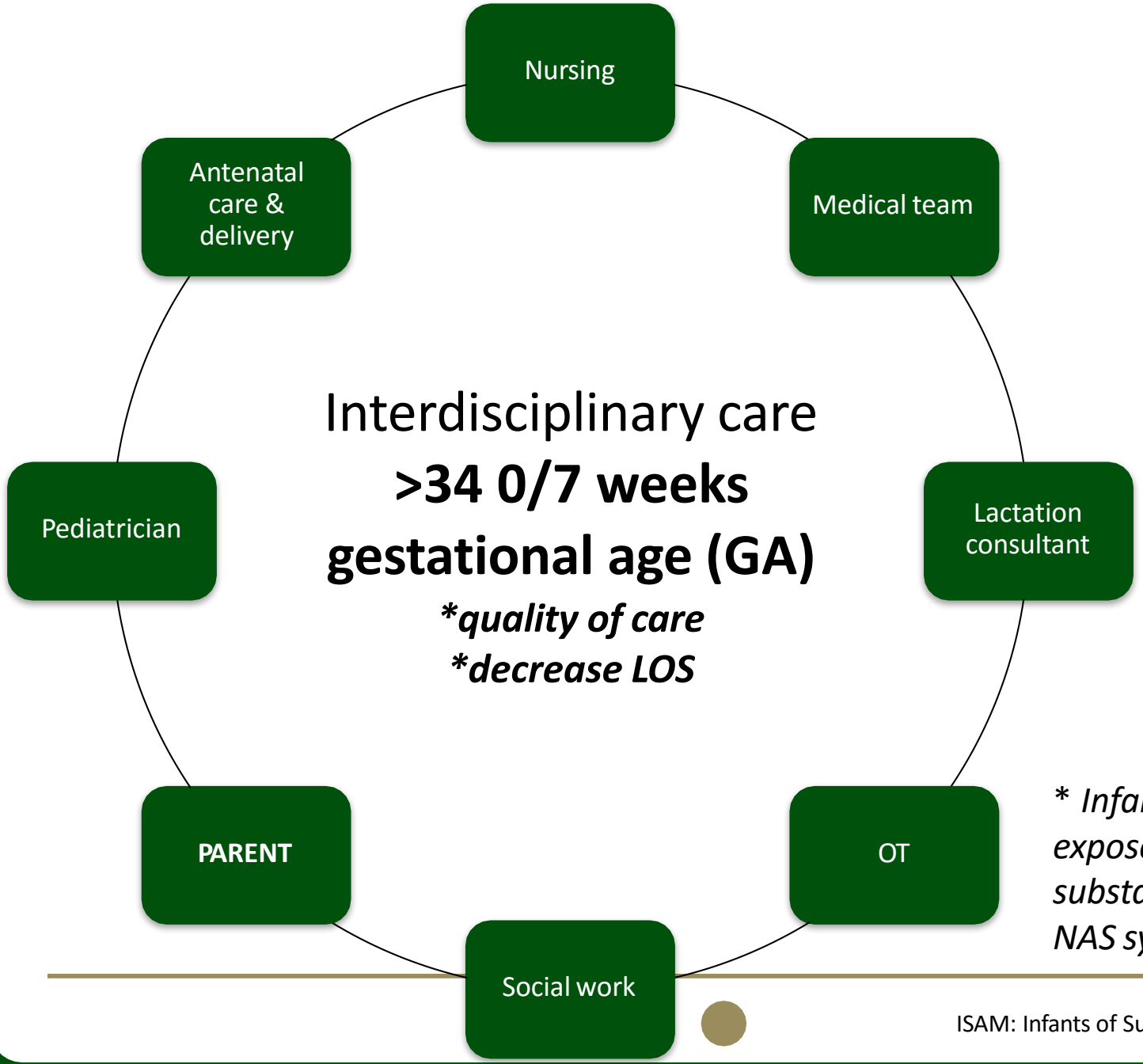
Five-points Framework

Substance Exposed Infants Framework



2017 Policy Academy: Improving outcomes for pregnancy and postpartum women with opioid use disorders and their Infants, families, and caregivers.


Antepartum care/
Identify mother at risk (e.g.
USF OB, USF Pediatrics, Addiction Medicine specialists [DACCO], Healthy Start coalition)
Hospital delivery
Pediatrician
Identify infant of a substance abusing mother (ISAM)
Asymptomatic
Discharge home
Non-pharmacologic treatment
NAS
Pharmacologic treatment



Opioids
morphine methadone buprenorphine oxycodone heroin

CNS depressants
benzodiazepines barbiturates

CNS stimulants
methamphetamines amphetamines SSRIs SNRIs

** Infants <34 wks GA or exposed to other substances may exhibit NAS symptoms*

ISAM: Infants of Substance Abusing Mother

Main opportunities for improvement

- **Identify at risk infants**
- Optimize nonpharmacologic care
- Standardize pharmacologic management
- Comprehensive discharge planning

Antenatal management

- Early identification of mothers at risk for drug abuse
  - Obtain maternal UDS[1]
  - Referral to drug treatment facility ASAP
  - Provide education, support,& conversion to alternative therapy (e.g., Medication-assisted treatment)
- Methadone maintained mothers (vs. heroin):
  - Higher access to prenatal care
  - Infants w/higher birth weight
  - Experience less pregnancy complications (e.g., preterm birth)

[1]UDS: Urine drug screen

1. Patrick SW, Davis MM, Lehman CU, Cooper WO. Increasing incidence & geographic distribution of neonatal abstinence syndrome: United States 2009 to 2012. *J Perinatol*. 2015;35(8):667.
2. Maguire D. Care of the infant with neonatal abstinence syndrome: strength of the evidence. *J Perinat Neonatal Nurs*. 2014;28(3):204-211; quiz E203-204.
3. Brown MS, Hayes MJ, Thornton LM. Methadone versus morphine for treatment of neonatal abstinence syndrome: a prospective randomized clinical trial. *J Perinatol*. 2015;35(4):278-283.

TGH[1] NAS parent pamphlet

- Education about NAS
- Discusses signs & symptoms
- Behavior-specific comforting techniques
- Patterns of activity
- Pharmacologic management

[1]TGH: Tampa General Hospital. USF neonatologists solely practice in the TGH NICU.

Identify infants at risk

- Obtain UDS[1] w/in 24 hours of life
  - Short term exposures (24-72 hrs from delivery)

Risk factors
• Engaged In High Risk Behaviors • Known H/O Drug Use Or Abuse • Enrollment In Drug Treatment Facility • Inadequate Or No Prenatal Care • Previous Unexplained IUFD Or SIDS • Placental Abruption • At Request Of Primary Physician/OB • At request of Child Protective Services (i.e. open case, h/o child abuse, suspected domestic violence)

TGH's standard UDS
Cannabinoids Cocaine Amphetamines Phencyclidine Barbiturates Benzodiazepines Opiates **Methadone**

*Does not test oxycodone or buprenorphine (Subatex/Suboxone)

[1]UDS: Urine drug screen

CNS	• **High pitched cry** • Hyperirritability • **Tremors** • **Increased muscle tone** • **Sleep disturbances** • Seizures • Skin excoriation
ANS	• Temp. elevation • **Sweating** • **Tachypnea** • Nasal flaring • Mottled color • Sneezing • Nasal stuffiness • Yawning
GI	• Poor feeding • **Excessive sucking** • Emesis • Weight loss • Loose stools

NAS symptoms

Many babies exhibit withdrawal symptoms, but not all require pharmacologic therapy

NAS symptoms	
W	Wakefulness
I	Irritability
T	Temp. elevation Tremors/Seizures
H	Hyperactivity High pitched cry Hypertonicity
D	Diarrhea Disorganized sucking
R	Respiratory distress Rhinorrhea/nasal stuffiness Rub marks

1. amining the evidence surrounding *Adv Neonatal Care*. 2014;14(3):181-186.
2. A quality improvement project to reduce *Pediatrics*. 2015;135(6):e1494-1500.
3. Maguire DJ, Rowe MA, Spring H, Elliott AF. Patterns of Disruptive Feeding Behaviors in Infants With Neonatal Abstinence Syndrome. *Adv Neonatal Care*. 2015.

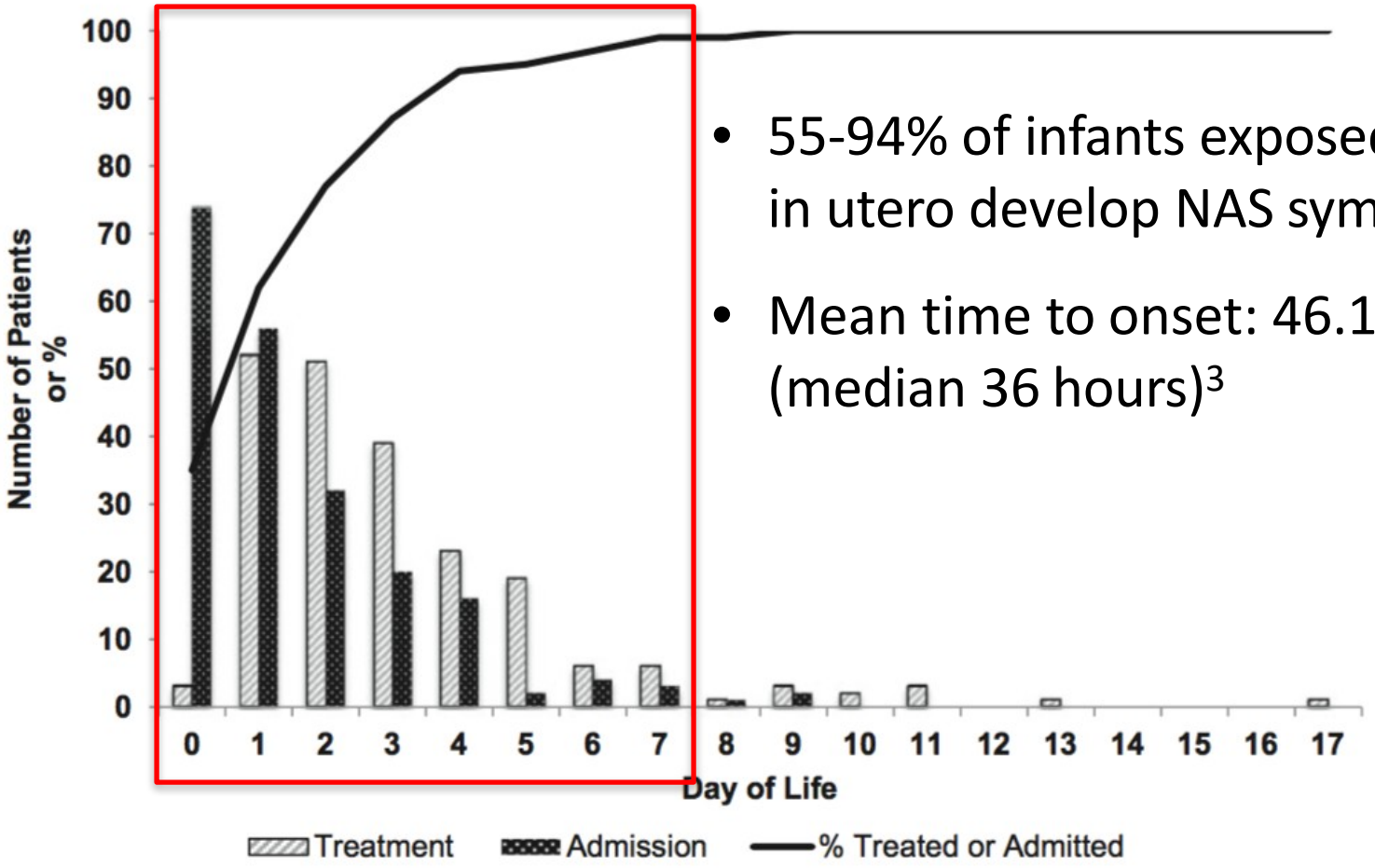
Finnegan Scoring

- Predominantly cue-related
- Only validated in:
  - Term & late preterm
  - Narcotic exposed
- Dynamic scoring
- Highest point value for items with greatest risk for adverse outcome

SIGNS AND SYMPTOMS	SCORE
Excessive Cry	2 - 3
Sleeps < 1 hour after feeding Sleeps < 2 hours after feeding Sleeps < 3 hours after feeding	3 2 1
Hyperactive Moro Reflex Markedly Hyperactive Moro Reflex	1 2
Mild Tremors: Disturbed Moderate-Severe Tremors: Disturbed	1 2
Mild Tremors: Undisturbed Moderate-Severe Tremors: Undisturbed	1 2
Increased Muscle Tone	1-2
Excoriation (specific area)	1 - 2
Generalized Seizure	8
Fever > 37.2 C	1
Frequent Yawning	1
Sweating	1
Nasal Stuffiness	1
Sneezing	1
Tachypnea (Respiratory Rate> 60/min)	2
Poor Feeding	2
Vomiting	2
Loose Stools	2
Failure to Thrive (weight gain ≥ 10% below birth weight)	2
Excessive Irritability	1 - 3
TOTAL SCORE / CATEGORY	

1. Orlando S. An overview of clinical tools used to assess neonatal abstinence syndrome. *J Perinat Neonatal Nurs*. 2014;28(3):212-219.
2. Ruwanpathirana R, Abdel-Latif ME, Burns L, Chen J, Craig F, Lui K, et al. Prematurity reduces the severity & need for treatment of neonatal abstinence syndrome. *Acta Paediatr*. 2015;104(5):e188-194.
3. Orlando S. An overview of clinical tools used to assess neonatal abstinence syndrome. *J Perinat Neonatal Nurs*. 2014;28(3):212-219.

Length of inpatient monitoring



- 55-94% of infants exposed to opioids in utero develop NAS symptoms[2]
- Mean time to onset: 46.1 hours (median 36 hours)[3]

1. Smirk CL, Bowman E, Doyle LW, Kamlin CO. How long should infants at risk of drug withdrawal be monitored after birth? *J Paediatr Child Health*. 2014;50(5):352-355.
2. Asti L, Magers JS, Keels E, Wispe J, McClead RE. A quality improvement project to reduce length of stay for neonatal abstinence syndrome. *Pediatrics*. 2015;135(6):e1494-1500.
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Main opportunities for improvement

- Identify at risk infants
- **Optimize nonpharmacologic care**
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Nonpharmacologic management

Should be standard of care for all at risk for NAS

Goals:

- Decrease symptoms
- Promote growth & weight gain
- Facilitate parental attachment & address staff attitudes

Nonpharmacologic interventions

Table 2. **Nonpharmacologic interventions: characteristics of potentially helpful interventions for infants with NAS supported by expert opinion only[16]**

Intervention	Purpose/use
Decreased environmental stimuli	Room should be quiet, dimly lit, and use slow infant handling
Frequent small/demand feedings	May help in infants with motor or tone dysregulation
Holding	Infants who have poor motor control (thrashing or exaggerated rooting) respond to gentle head/limb restraint by helping them regulate
Nonnutritive sucking	Helps organize a dysregulated infant and prevents disorganization
Swaddling	Helps maintain regulation, self-soothe, and better tolerate stimulation (such as diaper change)
Containment	Gentle containment or pressure supports motor and tone control
Rubbing	Rubbing often better than patting when burping during feedings to avoid triggering Moro reflex
Vertical rocking	Facilitates relaxation and eye contact; more soothing than "regular" rocking or side to side.

Other alternatives

- Kangaroo care
- Music therapy
- Massage
- Acupuncture
- Non-oscillating water beds

Maguire D. Care of the infant with neonatal abstinence syndrome: strength of the evidence. *J Perinat Neonatal Nurs*. 2014;28(3):204-211; quiz E203-204.

BF[1], Methadone mothers, & the AAP

BF[1] rates in methadone-maintained mothers are lower than the national average

AAP

- 1983-2000: no BF[1] if methadone >20 mg/day
- 2001: no dose restriction

Benefits of BF[1] outweigh any theoretical minimal risk from excretion in breast milk

- Barriers: mother, healthcare provider, community

[1]BF: Breastfeeding

1. Hilton TC. Breastfeeding considerations of opioid dependent mothers & infants. MCN Am J Marten Child Nurs. 2012. 37(4): 236-40.
2. Maguire D. Care of the infant with neonatal abstinence syndrome: strength of the evidence. *J Perinat Neonatal Nurs*. 2014;28(3):204-211; quiz E203-204.

Facilitating parental attachment

Share information with parents

- Discuss possibility of NAS & postnatal management w/parent
  Symptom monitoring, length of stay, types of management
- Family centered rounds where daily goals & care plan are discussed
- Inpatient NAS informational packets
  TGH NAS parent pamphlet, Inpatient NAS magnet, Music CD
- Help parents interact with their infant:
  OT: Individualized care plan & handouts

Inpatient NAS magnet

Symptoms to watch for: difficulty feeding, vomiting, diarrhea shakiness when resting, fast breathing, cranky behavior.

- Erasable, magnetic tablet
- Posted on whiteboard in patient room

<u>Goals:</u>

- Care plan
- Recognition of 6 NAS symptoms
- Routines
- Soothing techniques

Staff attitudes

- Infant – Caregiver -- Medical team
- Nursing in-services
  - Provide education regarding substance abuse
  - Address staff attitudes & parent perceptions

"You have the opportunity to impact someone's life with education & words of encouragement or praise…"

1. Doyle C, Lennox L, Bell D. A systematic review of evidence on the links between patient experience & clinical safety & effectiveness. BMJ Open. 2013; 3 (1) e001570.
2. Maguire D. Care of the infant with neonatal abstinence syndrome: strength of the evidence. *J Perinat Neonatal Nurs*. 2014;28(3):204-211; quiz E203-204.

Main opportunities for improvement

- Identify at risk infants
- Optimize nonpharmacologic care
- **Standardize pharmacologic management**
  - Evaluation strategy
  - Initiation of pharmacologic treatment
  - Medications used (1st & 2nd line)
  - Escalation & weaning parameters
- Comprehensive discharge planning

Need a standardized protocol

Most important predictors

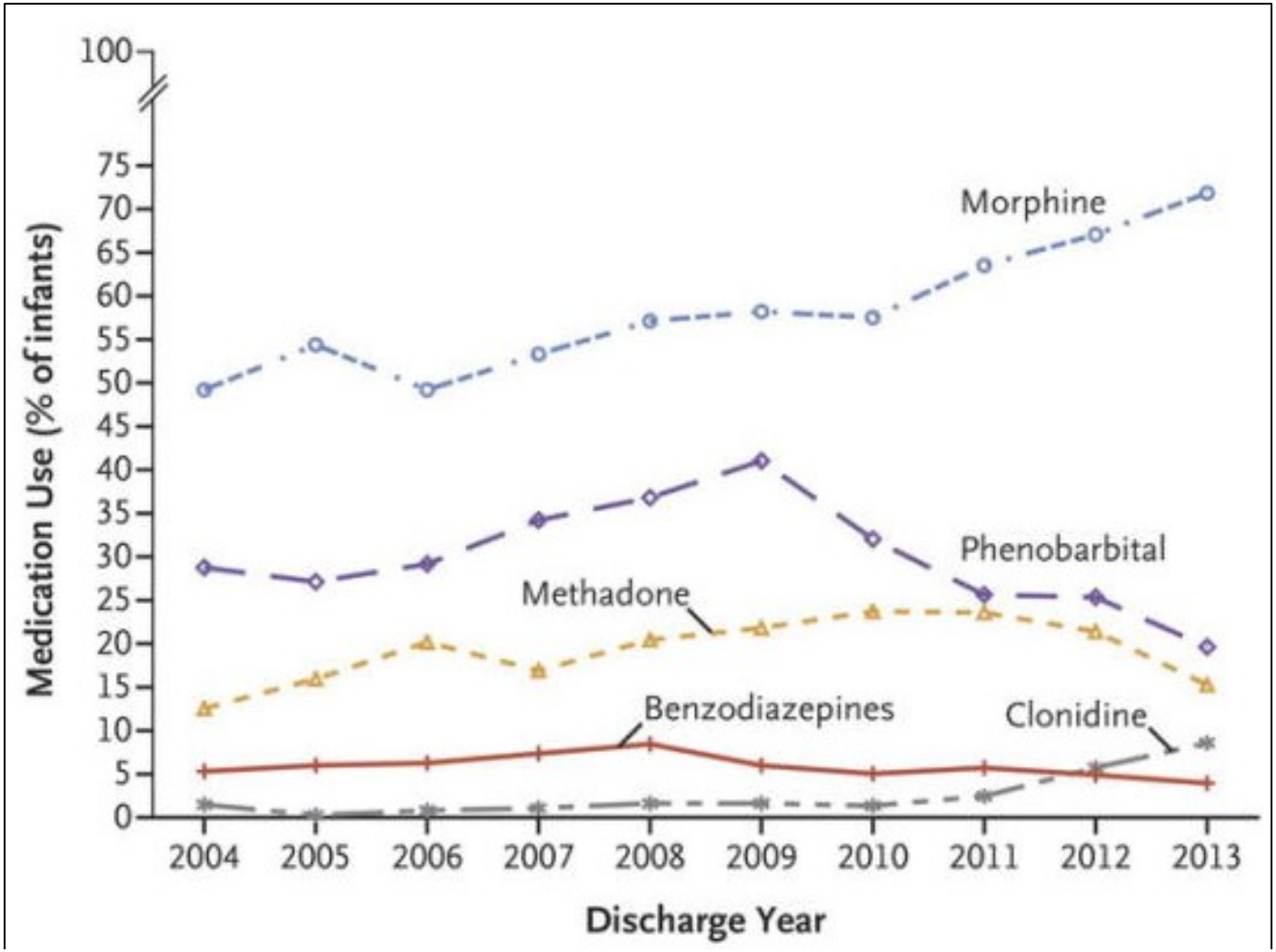
for LOS & duration of opioid treatment

- Starting dose
- Escalation & weaning parameters
- Minimize ambiguity

"…it is not easy to alter medical practices or clinician behavior, even when there is compelling evidence to do so…"

1. Hall ES, Meinzen-Derr J, Wexelblatt SL. Cohort Analysis of a Pharmacokinetic-Modeled Methadone Weaning Optimization for Neonatal Abstinence Syndrome. *J Pediatr*. 2015.
2. Sarkar S, Donn SM. Management of neonatal abstinence syndrome in neonatal intensive care units: a national survey. *J Perinatol*. 2006;26(1):15-17.
3. Hall ES, Wexelblatt SL, Crowley M, Grow JL, Jasin LR, Klebanoff MA, et al. A multicenter cohort study of treatments & hospital outcomes in neonatal abstinence syndrome. *Pediatrics*. 2014;134(2):e527-534.

Pharmacologic management for NAS



1. Tolia VN, Patrick SW, Bennett MM, Murthy K, Sousa J, Smith PB, Clark RH, Spitzer AR. Increasing incidence of the neonatal abstinence syndrome in the U.S. neonatal ICUs. *N Engl J Med.* 2015; 372(22):2118-26.
2. Asti L, Magers JS, Keels E, Wispe J, McClead RE. A quality improvement project to reduce length of stay for neonatal abstinence syndrome. *Pediatrics*. 2015;135(6):e1494-1500.

Main opportunities for improvement

- Identify at risk infants
- Optimize nonpharmacologic care
- Standardize pharmacologic management
- **Comprehensive discharge planning**

Discharge planning

- Length of stay is minimum **5-7 days**

Drug	Recommended length of stay
SSRI	5 days
Non-opioid	5-7 days
Opioid	7 days

Hudak M, et al. Pediatrics, 2012.

- USF Pediatrics: outpatient methadone management
  - Clonidine is not an outpatient medication at USF/TGH

Hall ES, Wexelblatt SL, Crowley M, Grow JL, Jasin LR, Klebanoff MA, et al. Implementation of a Neonatal Abstinence Syndrome Weaning Protocol: A Multicenter Cohort Study. *Pediatrics*. 2015;136(4):e803-810.

Safe plan of care w/methadone

- Methadone may be considered if:
  - Social services clearance
  - Tolerating full oral feeds easily for caregiver
  - Appropriate weight gain
  - On a once daily dose of methadone <0.15 mg/kg/dose
  - Consistent scores ≤ 5 for 48-72 hours

- Parents have demonstrated:
  - Care for, soothing,& feeding of infant
  - Education regarding NAS symptoms
  - Methadone: dosing, administration, & storage
- Other issues:
  - Support system assessment, feeding, consults (OT, lactation), Pediatrician, Early intervention services, community resources

- Method for caregiver to observe & record 6 NAS symptoms
- Should bring this to all Pediatric appointments

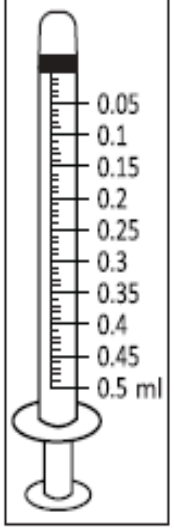
Health Start Coalition of Hillsborough County

WEEK 1

Date:	Weight:	Dose (ml):	Last ↑ or ↓:	Next appointment:

	Difficulty feeding			Vomiting			Diarrhea			Shakiness when resting			Fast breathing			Cranky behavior		
	No	Some	Big	No	Some	Big	No	Some	Big	No	Some	Big	No	Some	Big	No	Some	Big
Monday																		
Tuesday																		
Wednesday																		
Thursday																		
Friday																		
Saturday																		
Sunday																		
Comments:																		

New medication dose (ml):

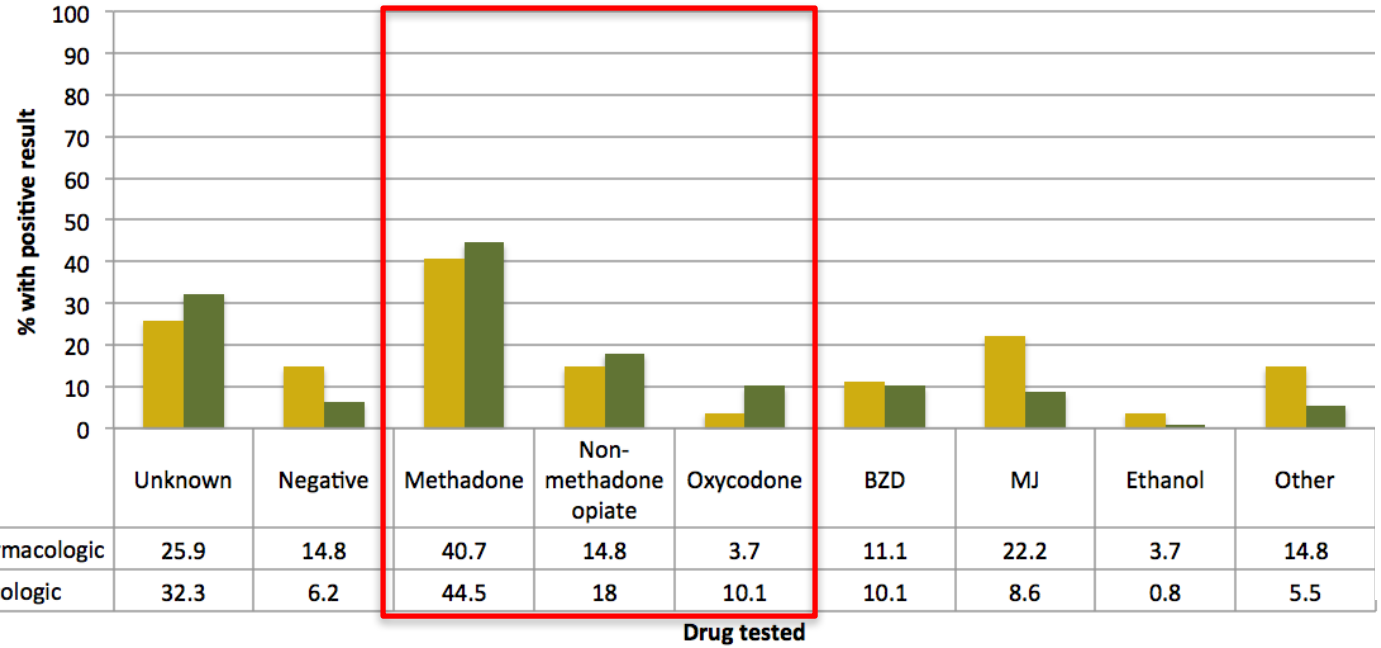


Who are our patients?

	Nonpharmacologic	Pharmacologic
%(n)	17% (27)	83% (128)
Male, %(n)	63% (100)	
GA (wks)	38 ± 1.5	
BW (g)	3006 ± 478	

***159** NAS patients discharged from TGH NICU from 10/1/12 to 1/31/15*

Maternal Urine Drug Screen results in NAS infants



	Unknown	Negative	Methadone	Non-methadone opiate	Oxycodone	BZD	MJ	Ethanol	Other
Nonpharmacologic	25.9	14.8	40.7	14.8	3.7	11.1	22.2	3.7	14.8
Pharmacologic	32.3	6.2	44.5	18	10.1	10.1	8.6	0.8	5.5

*Total does not equal 100% as polysubstance abuse occurred in mothers
*Other refers to: PCP, Cocaine, Barbiturates, & Amphetamines

USF's Quality Improvement initiative

- Improved consistency of care
  - Increased infants benefiting from improved intensive non-pharmacologic management
  - Decreased number of infants requiring outpatient pharmacologic management
- Decreased average LOS in those receiving pharmacologic management by 69% (avoiding ~20 hospital days)

LOS[1] & Healthcare costs

Outcome measures							
	0	1	2	3	4	5	6
LOS *all* infants, average (SD)	29 (21)	16 (12)	19 (16)	23 (16)	21 (15)	10 (8)	9 (8)

[1]LOS: Length of stay defined as the difference between date of NICU admission & date of NICU discharge

N=159

Average of 20 days saved per patient

Total days saved = 159 patients x 20 days = 3,180 days

- Patrick et al: Average cost for NAS patients ~$3,337.50/day
- Potential cost savings= $3,337.50 x 3,180 = $10, 613, 250

Hall ES, Wexelblatt SL, Crowley M, Grow JL, Jasin LR, Klebanoff MA, et al. A multicenter cohort study of treatments & hospital outcomes in neonatal abstinence syndrome. *Pediatrics*. 2014;134(2):e527-534.

Approach to Quality Improvement

International
(e.g., VON)

State
(e.g., Ohio Perinatal Quality Collaborative)

Hospital/Institution
(e.g., USF NICU)

Is one approach better than another?

Goal of most collaboratives

- Meet challenges of growing demands & limited resources
- Increase ability to quickly implement evidence-based treatments & improvement methods
- Provide infrastructure
- Common approaches:
  - Guideline implementation strategies
  - Collaborative breakthrough method

Ovretveit J, Klazinga N. Learning from large-scale quality improvement through comparisons. Int J Qual Health Care. 2012 Oct; 24(5): 463-9.

All of Florida's mothers and infants will have the **best health outcomes** possible through receiving **high quality evidence-based** perinatal **care**.

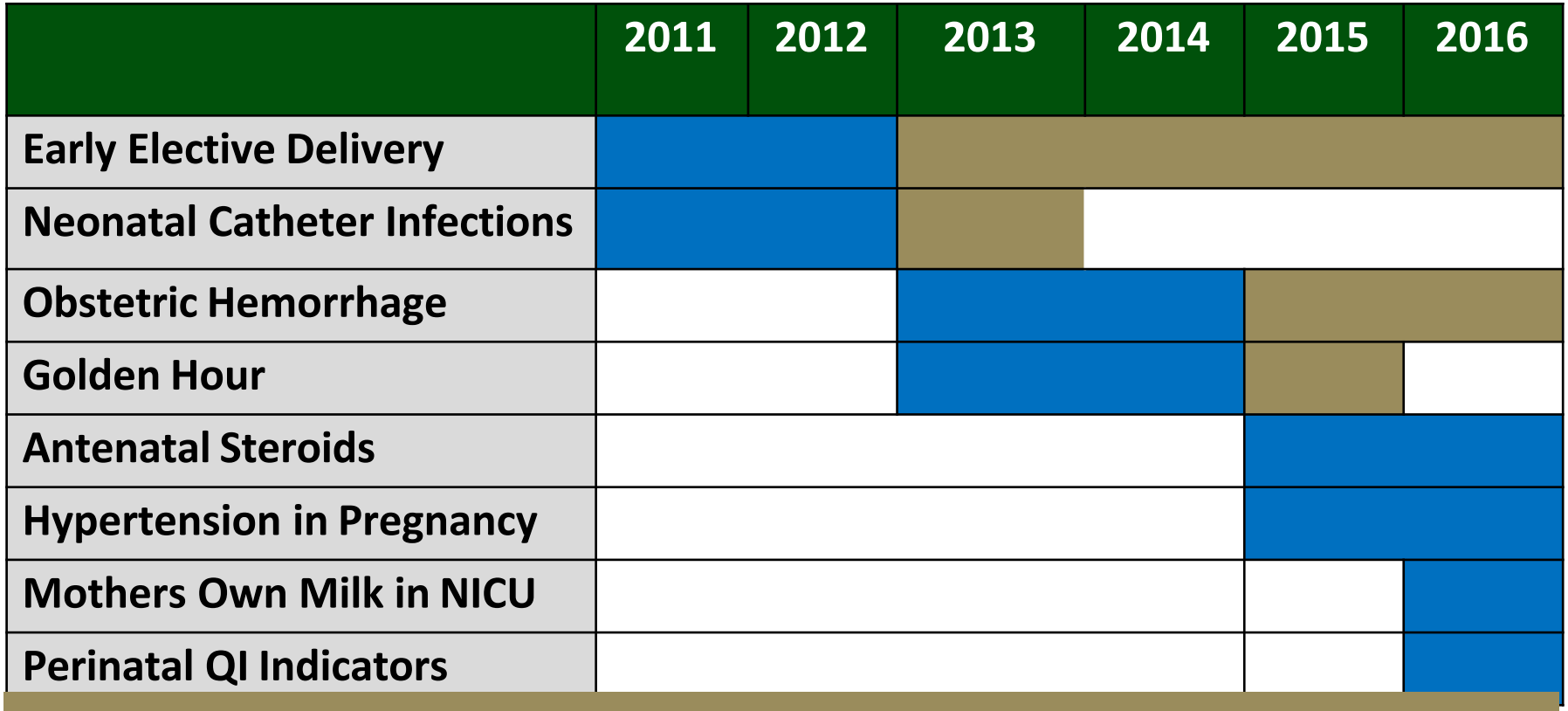
FPQC's Mission

Advance perinatal health care quality and patient safety for all of Florida's mothers and infants through the **collaboration of FPQC stakeholders** in the development of **joint quality improvement initiatives**, the advancement of **data-driven best practices** and the promotion of **education and training**.

FPQC Partners and Funders

- Florida Health
- Agency for Health Care Administration (AHCA)
- Council on Patient Safety in Women's Health Care
- AWHONN Florida Promoting the Health of Women and Newborns
- Florida Affiliate of the American College Nurse-Midwives With women, for a lifetime®
- The American College of Obstetricians and Gynecologists Women's Health Care Physicians
- Florida Hospital Association
- Florida Society of Neonatologists
- March of Dimes®
- Florida Blue Cross Blue Shield
- Preeclampsia Foundation

FPQC Initiatives



Next Infant Health Initiative is NAS

1/2017: Planning phase

6/2017: Projected start

To help these mothers & infants

- What can we do?
- What should we do?
- How can we work together?

Opportunities

- Geographic variation of NAS
- Interventions to
  - Decrease prevalence
  - Decrease Infant mortality, SUIDs, Child abuse
  - Increase early identification
  - Promote safe sleep
  - Smoking/Alcohol cessation
- Medication-assisted treatment
- Inter-conception care
- Communicating between hospital & community partners
- Best place to care for NAS
  - Inpatient vs. Outpatient
  - NICU vs. Special care nursery vs. Pediatric floor
- Improve consistency & quality
- Measurement for NAS severity
- Decrease length of stay
- Infant "Plan of Safe Care"
- Coordinating post-discharge supportive services (support groups, counseling, home visits, housing services, infant follow-up services)
- Developmental outcomes

Thank you to the interdisciplinary team!

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Saumil Patel, PharmD, BCPS

OT:

Diane Allen, OTR-L

Lactation:

Ivonne Hernandez, IBCLC
Leslie Turner, IBCLC
Patricia Hanning, IBCLC

Potential future team members: Parents