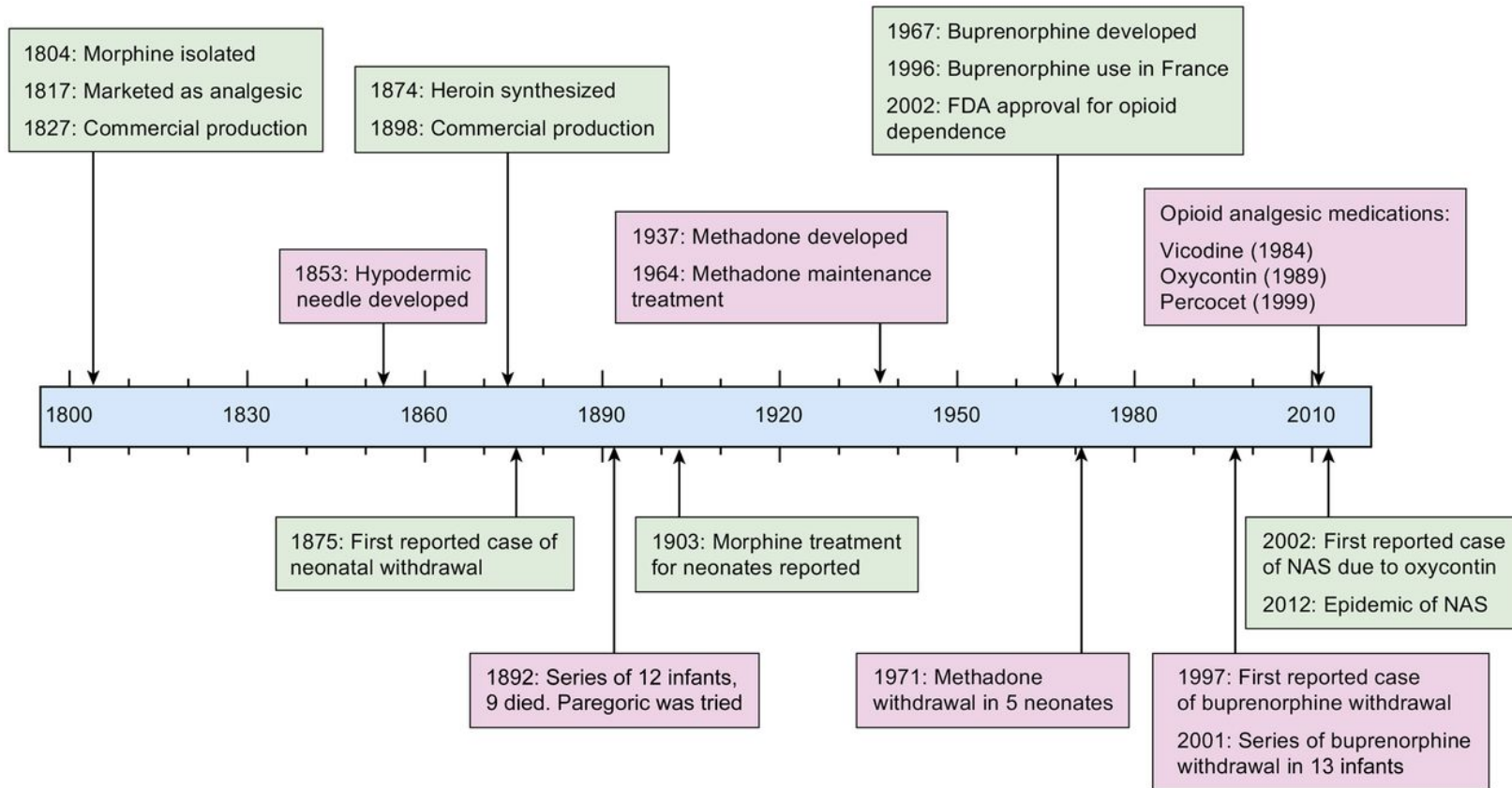

Neonatal Abstinence Syndrome

Emily Scott, MD FAAP



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Historical background



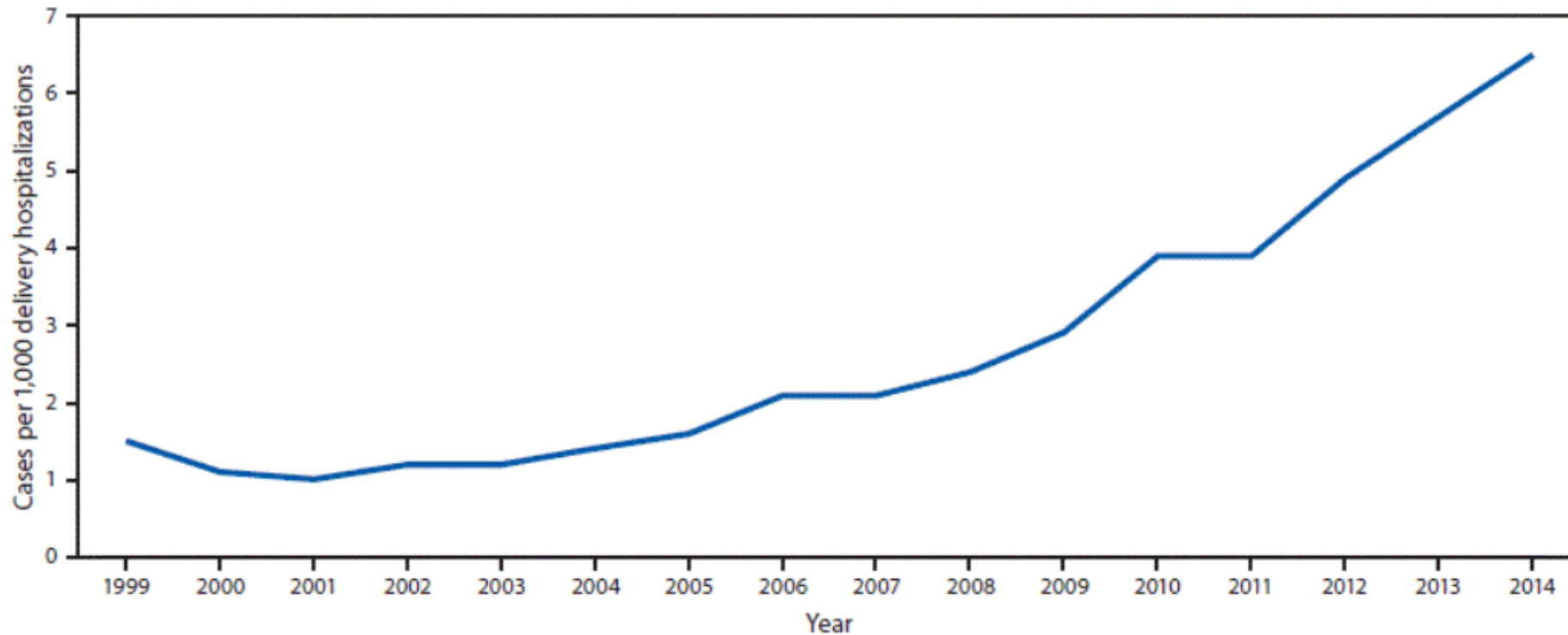
Kocherlakota 2014



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OUD at the time of delivery quadruples in 15 years

FIGURE 1. National prevalence of opioid use disorder per 1,000 delivery hospitalizations* – National Inpatient Sample (NIS),[†] Healthcare Cost and Utilization Project (HCUP), United States, 1999–2014



Haight SC, Ko JY, Tong VT, Bohm MK, Callaghan WM. Opioid Use Disorder Documented at Delivery Hospitalization – United States, 1999–2014. *MMWR Morb Mortal Wkly Rep* 2018;67:845–849.



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Neonatal Abstinence Syndrome (NAS)

- Defined as the constellation of clinical findings associated with drug withdrawal in newborns
 - *Opioids
 - Benzodiazepines
 - Alcohol
 - SSRIs
- Most newborns exposed to opiates in utero will undergo some withdrawal

Symptoms of NAS

- Inconsolable, high pitched cry
- Poor sleep and feeding patterns
- Tremulous and jittery
- Diarrhea and vomiting
- Yawning and sneezing
- Increased tone
- Tachypnea
- Fever
- Seizures
- Failure to thrive
- Dehydration



Timing of withdrawal

- Symptom onset depends on substance half-life
 - Heroin: 24 hours
 - Prescription short-acting opioids: 36-72 hours
 - Methadone/Buprenorphine: 48-72 hours (*can be delayed to 5-7 days)



Scoring systems

- Multiple scoring systems available
 - Modified Finnegan score
- Semi-objective with concerns for interobserver reliability
- Consistent practice is the key!

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														
TOTAL SCORE																
SCORER'S INITIALS																
STATUS OF THERAPY																

Finnegan L. Neonatal abstinence syndrome: assessment and pharmacotherapy. Neonatal Therapy: An update, F. F. Grant, editors. Elsevier Science Publishers B.V. (Biomedical Division), 1986: 122-146





Length of monitoring

- Infants exposed to low-dose prescription opiates with short half-life (hydrocodone) can be safely discharged if there are no signs of withdrawal by **3 days** of life
- Infants exposed to methadone/buprenorphine should be observed for minimum of **5-7 days**
- Discharged babies need close follow-up

Hudak 2012

Initiating medication therapy



- Morphine (or other opioid)
 - “Capture” baby’s symptoms, then slow wean as tolerated
- Phenobarbital/clonidine as adjunctive meds
- Following a protocol makes a difference!
- Prolonged length of stay (weeks)

Paradigm shift



- Families (optimal and intensive supportive care) are the first line therapy for neonatal abstinence syndrome



Family-Centered NAS Care – Dartmouth Study

Traditional Model	Family Centered Model
Opioid exposed baby at risk for NAS admitted directly to NICU	Opioid exposed baby at risk for NAS remains with mother on postpartum unit, then transitions to pediatrics floor where family can “room in”
Finnegan score done on an exam table away from family	Finnegan score is done after a feed while being held by parents
Decision to start morphine based on Finnegan scores alone	Decision to start morphine based on overall clinical picture, with Finnegan score being a part of that picture

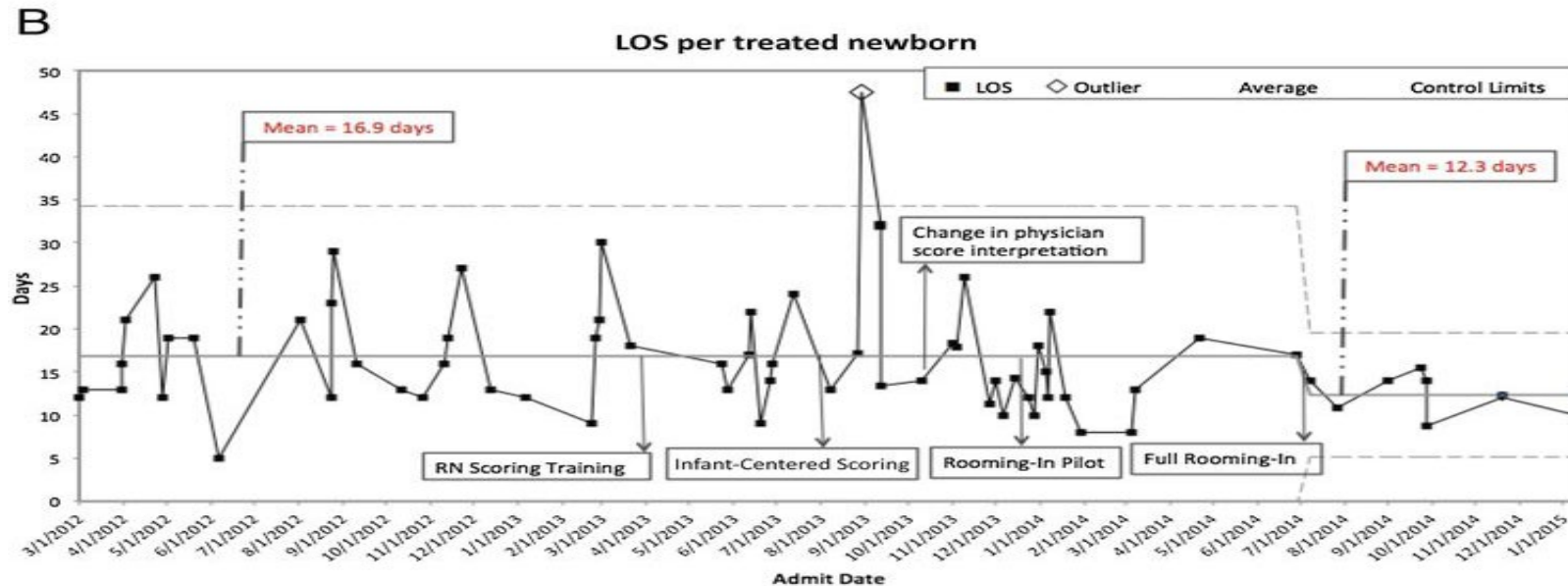
Holmes 2016



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Results of Family Centered NAS Care

- Need morphine to treat
↓ 46% → 27%
- Average length of stay for morphine treated
↓ 16.9 → 12.3 days
- Adjunctive use of phenobarbital
↓ 13% → 2%
- Average hospital costs per at risk infant
↓ \$11,000 → \$3,500



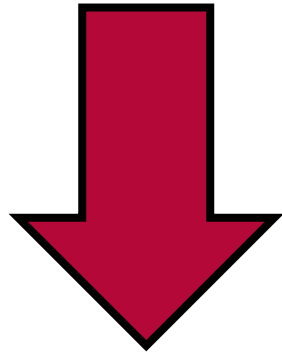
Holmes 2016

Maternal Substance Abuse and Breastfeeding

- Any maternal illicit drug abuse is not compatible with breastfeeding
 - **Moms on methadone/buprenorphine should be encouraged to breastfeed if currently abstinent from any drugs of abuse**



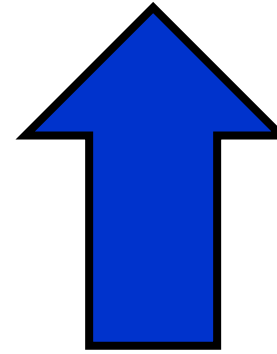
Exclusive breastfeeding and NAS



Finnegan scores

Infants required morphine

Length of stay



Supportive care for infant

Maternal bonding

Maternal stress relief

Abdel-Latif 2006



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Eat, Sleep, Console?

An Initiative to Improve the Quality of Care of Infants With Neonatal Abstinence Syndrome

Matthew R. Grossman, MD,^a Adam K. Berkwitz, MD,^a Rachel R. Osborn, MD,^a Yaqing Xu, MS,^b
Denise A. Esserman, PhD,^b Eugene D. Shapiro, MD,^{a,c} Matthew J. Bizzarro, MD^a



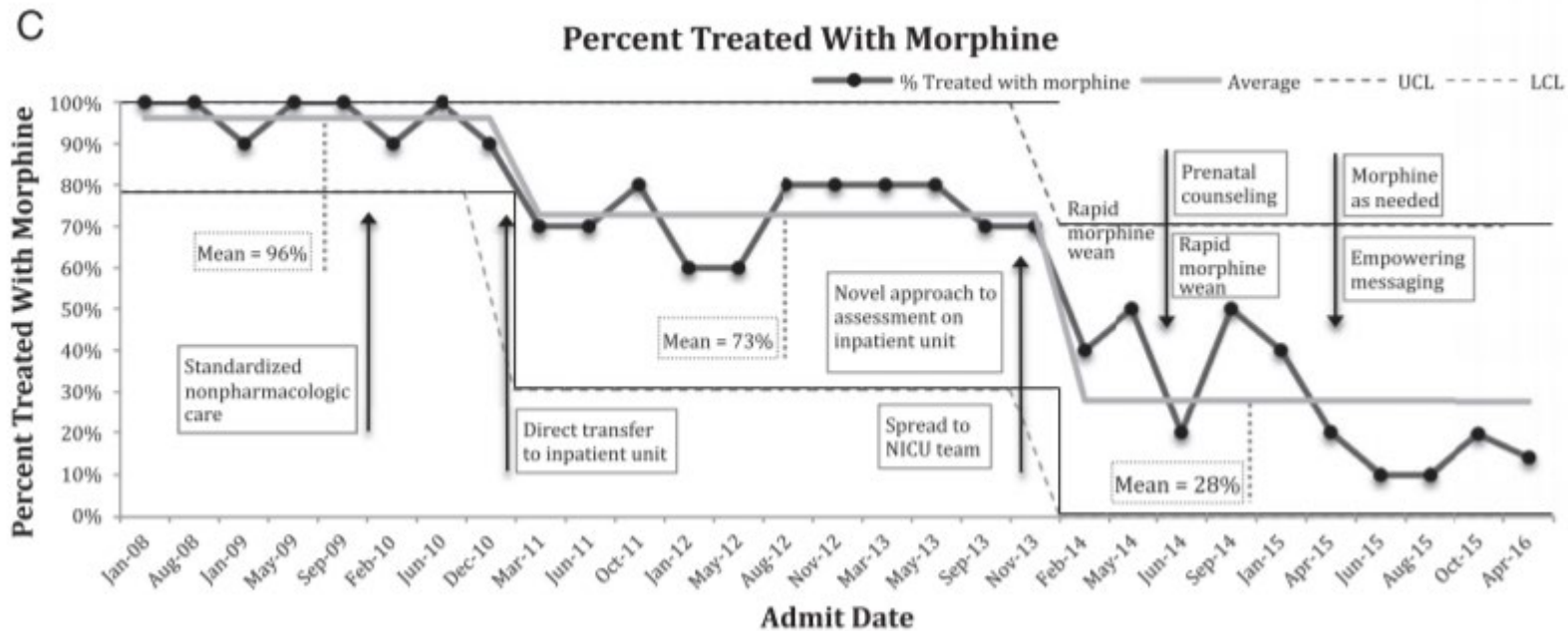
- Can the baby breastfeed effectively or take > 1 oz from the bottle?
- Can the baby sleep for > 1 hour undisturbed?
- Can the baby be consoled within 10 minutes?
- If yes – no morphine!

***if morphine started – given PRN**



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Grossman 2017

Eat, Sleep, Console?



- Length of stay – 22.4 to 5.9 days
- Morphine treatment – 98% to 14%
- Average cost - \$45,000 to \$10,000



Preparing for Hospital Discharge

- Who will be in the home
- Who will be mom's support
- What support services are already in place?
- Is mom going to be weaning off her maintenance medication soon?



Long term outcomes

- Research is mixed
- Infants diagnosed with NAS are likely at risk for many comorbidities throughout childhood including
 - Feeding difficulties
 - Failure to thrive
 - Hypertonicity
 - Developmental delay
 - Strabismus
 - Behavior concerns





Risks to wellness

- Children with opioid exposure in utero are 2.5 times more likely to be readmitted to the hospital in the first month of life.
- Throughout their childhood, more likely to be readmitted for:
 - Assaults
 - Maltreatment
 - Poisoning
 - Mental/behavioral disorders
 - Visual disorders

Patrick 2015
Uebel 2015

After hospital discharge

- Children exposed to substances prenatally require:
 - Close follow-up with a pediatric provider
 - Ongoing assessment of feeding and growth
 - Close monitoring of development, behavior and vision
 - Early referrals to First Steps and subspecialty care if needed
 - Hepatitis C testing *if indicated
 - Frequent and thorough assessments of social determinants of health
 - Referral to community supports



Labor of Love
Helping Indiana Reduce Infant Death

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