



Neonatal Abstinence Syndrome

The Tiniest Victims of the Opioid Crisis





“As the number of
opioid overdoses and
deaths increase at an
alarming rate, we
must take action. It’s
time to call this what
it is –
an **emergency**.”

Governor Ducey
June 15, 2017





Opioid Epidemic In Arizona



consumes **80 %** of the global opioid supply

&

4 out of **5**



new heroin users start by misusing prescription painkillers

More than 2 Arizonans die each day from an opioid overdose



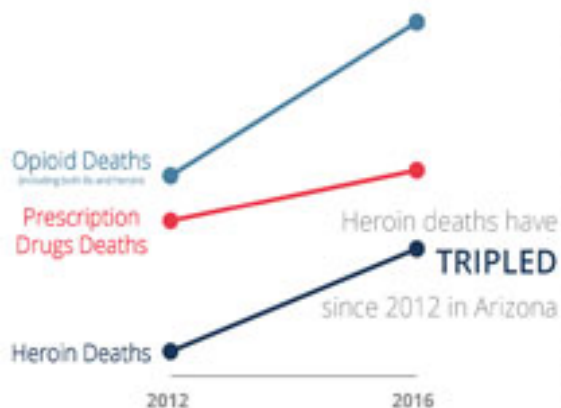
4 out of **10**

Arizona adults know someone addicted to **prescription painkillers**

431 MILLION

opioid pills were prescribed in 2016

enough for **every** Arizonan to have a **2.5 week supply**



Drug overdoses* take **more lives** than car crashes in Arizona

*Includes overdoses from opioids, cocaine, meth, marijuana, and other illicit drugs.



In the last 5 years, **86%** of persons who died from an opioid related cause were using **multiple substances**





Opioid Use Disorder (OUD)

A Brain Disease, not a moral failure!

Understanding that **opioid use disorder** is a complex interplay of biology and environment.



Maternal OUD Treatment Cold Turkey?

Why not???

- Increases the risk of miscarriage
- High incidence of relapse
- Not recommended by ACOG
- MAT: "Gold Standard" for pregnant mothers with OUD

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5457836/>



Medication-Assisted Treatment (MAT)

Harm Reduction and Evidence-Based Treatment for OUD

- Combines behavioral therapy and medications to treat substance use disorders
- Proven efficacy with Opioid Use Disorder



Medication-Assisted Treatment (MAT)

**Methadone, Buprenorphine (Subutex), Suboxone
(Buprenorphine/Naloxone), Naltrexone (Vivitrol)**

- Decrease HIV/AIDS
- Decrease mortality
- Decrease healthcare costs
- Decrease in drug-related crime
- Decrease IV drug use
- Improved family stability
- Improved pregnancy outcomes



More than **2 babies** are born passively dependent in AZ every day.



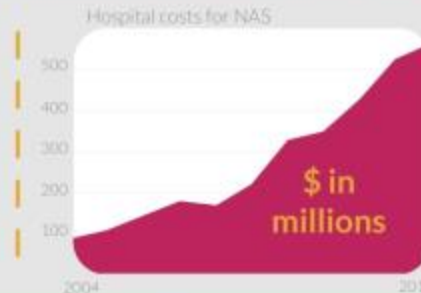
Incidence and costs of neonatal abstinence syndrome are rising



Neonatal abstinence syndrome (NAS) is a withdrawal syndrome in infants born to mothers who used opioids during pregnancy.



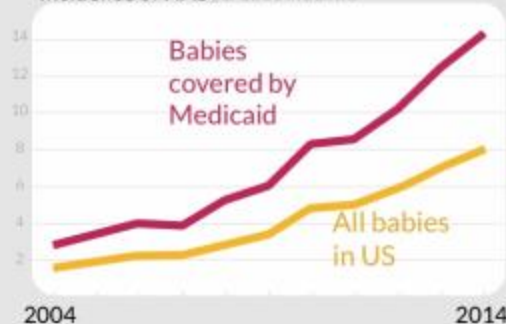
Every 15
minutes
a baby is born
with NAS



Hospital
costs for NAS
have grown
more than **6x**
since 2004

Infants with Medicaid are disproportionately affected

Incidence of NAS per 1000 live births



NAS resulted in
approximately
\$2 billion
in excess costs
among Medicaid-
financed deliveries



Infants with NAS
covered by
Medicaid
are more likely to



be transferred to
another hospital for care



have longer lengths
of hospital stay

Moms need resources & compassionate care



Prevention and treatment of substance
use disorders are vital for women
before, during, and after pregnancy





Neonatal Abstinence Syndrome

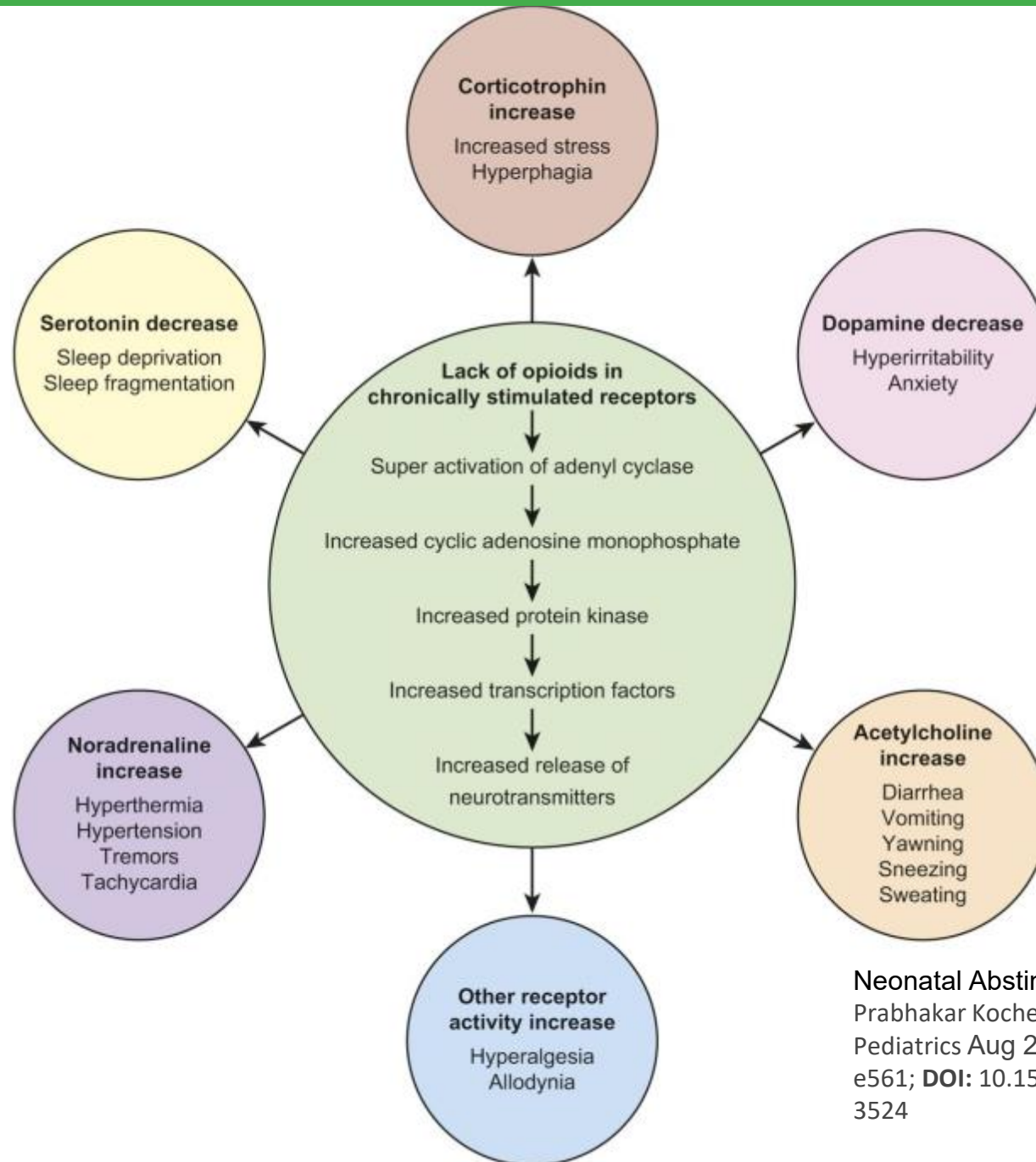
Is a constellation of signs of withdrawal in newborns following *in utero* exposure to medication or illicit drugs, containing opioids (including opioid agonists used for treatment of opioid use disorder or pain relievers), benzodiazepines and barbiturates.

Source: National Office/Council of State and Territorial Epidemiologists (CSTE) 2019



Neonatal Abstinence Syndrome (NAS) and Neonatal Opioid Withdrawal Syndrome (NOWS)

- Terms often used inter-changeably
- NAS is a complex disorder with many factors contributing to incidence/severity and is caused by a variety of substances
- NOWS is an expected and treatable condition following the maternal use of opioids during pregnancy causing postnatal drug withdrawal



Neonatal Abstinence Syndrome
Prabhakar Kocherlakota, MD
Pediatrics Aug 2014, 134 (2) e547-
e561; DOI: 10.1542/peds.2013-
3524



Withdrawal Symptoms

- Vomiting
- Diarrhea
- Mottling of skin
- Skin breakdown
- Tremors, jittery
- Sweating
- Stuffy nose and sneezing
- Inconsolable
- High-pitched cry
- Poor feeding
- Excessive sucking
- Inability to sleep
- Tachypnea
- Seizures



Mottling of Skin





Excoriation to Face and Limbs





Hypertonicity





Causes

- Prescription medications
- “Over the counter” medications
- Street drugs
- Herbal remedies (Kratom)
- Alcohol
- Cigarettes/Vaping/Nicotine
- Caffeine

Prabhakar Kocherlakota, MD

Pediatrics Aug 2014, 134 (2) e547e561; DOI: 10.1542/peds.2013-3524



Causes

Morphine

Methadone

Buprenorphine

Oxycodone

Hydrocodone

Vicodin

Fentanyl

Tramadol

Codeine

SSRI's

Benzodiazepines

Heroin



Substances that Cause Few or No Withdrawal Symptoms

- Cocaine
- Crack
- Methamphetamines
- Speed
- Ecstasy

Prabhakar Kocherlakota, MD

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METH?

Methamphetamine or Methadone?

Babies withdraw from Methadone.

Methamphetamines don't typically cause withdrawal.

Prabhakar Kocherlakota, MD

Pediatrics Aug 2014, 134 (2) e547e561; DOI: 10.1542/peds.2013-3524



Factors that May Modify the Risk or Severity of NAS

Increase:

- Gestational age >37 weeks
- Appropriate birth weight for gestational age
- Polysubstance abuse
- Smoking
- Concomitant Benzodiazepines use
- Concomitant SSRI use
- Genetic Polymorphisms (OPRM1 118AA, COMT 158AA)

Decrease:

- Biological Parents
- Breastfeeding
- Minimizing Environmental Stimuli
- Careful Swaddling



Assessment Tools

Babies should be closely monitored for 5-7 days minimum.

ESC (Eat Sleep Console)

Decreased length of stays and need for
pharmacologic treatment

Modified Finnegan scoring system

Most commonly used

21 symptom assessment

A Novel Approach to Assessing Infants With Neonatal Abstinence Syndrome. Matthew R. Grossman, Matthew J. Lipshaw, Rachel R. Osborn, Adam K. Berkowitz Hospital Pediatrics Dec 2017, hpeds.2017-0128; DOI: 10.1542/hpeds.2017-0128

Addiction Science & Clinical Practice 2014;19 <https://doi.org/10.1186/1940-0640-9-1>



NEONATAL ABSTINENCE SCORING SYSTEM

Modified Finnegan Neonatal Abstinence Score Sheet ¹¹													
System	Signs and Symptoms	Score	AM				PM				Comments		
Central Nervous System Disturbances	Excessive high-pitched (or other) cry <5 mins	2											
	Continuous high-pitched (or other) cry >5 mins	3											
	Sleeps <1 hour after feeding	3											
	Sleeps <2 hours after feeding	2											
	Sleeps <3 hours after feeding	1											
	Hyperactive Moro reflex	2											
	Markedly hyperactive Moro reflex	3											
	Mild tremors when disturbed	1											
	Moderate-severe tremors when disturbed	2											
	Mild tremors when undisturbed	3											
	Moderate-severe tremors when undisturbed	4											
	Increased muscle tone	1											
	Excoriation (chin, knees, elbow, toes, nose)	1											
	Myoclonic jerks (twitching/jerking of limbs)	3											
	Generalized convulsions	5											
Metabolic/Vasomotor/ Respiratory Disturbances	Sweating	1											
	Hyperthermia 98.96-100.94° F	1											
	Hyperthermia >101.12° F	2											
	Frequent yawning (>3-4 times/scoring interval)	1											
	Mottling	1											
	Nasal stuffiness	1											
	Sneezing (>3-4 times/scoring interval)	1											
	Nasal flaring	2											
	Respiratory rate >60/min	1											
	Respiratory rate >60/min with retractions	2											
Gastrointestinal Disturbances	Excessive sucking	1											
	Poor feeding (infrequent/uncoordinated suck)	2											
	Regurgitation (≥2 times during/post feeding)	2											
	Projectile vomiting	3											
	Loose stools (curds/seedy appearance)	2											
	Watery stools (water ring on diaper around stool)	3											
	Total Score												
	Date/Time												
Initials of Scorer													



Management of NAS

- Parents, Parents, Parents!!!
- Decrease stimulation
- Dim the lights
- Quiet environment
- Skin-to-skin
- Rooming-in
- Don't wake a sleeping baby
- Warm compresses to tummy
- Avoid rubbing and stroking
- Swaddle baby- hands to face and knees to chest
- Pacifier
- Swing
- Shush- mimics mother's heartbeat
- Deep Yoga Breaths
- Squat while swaddled
- Smoking can be an irritant

Demonstration of NAS Management





Nutrition

Feeding issues can be secondary to withdrawal.

- **Encourage Breastfeeding**
- Don't make them wait
- Warm formula
- Similac Sensitive, Gentle Ease or Elemental formula
- Increasing calories might be necessary
- Simethicone 20mg q 6 hours PO



Pharmacologic Management

- **Morphine** – opiate replacement

Most often used in Arizona NICUs

Dose- 0.05mg/kg/dose q 3 hours or prn

- **Methadone**- opiate replacement

Recent studies indicating a decreased LOS

- **Clonidine**- adjunct therapy.

Helps to stabilize the autonomic nervous system

- **Phenobarbital**- adjunct therapy.

Usually continued after discharge.



Consequences of NAS

Growth and nutritional assessments

- Failure to thrive
- Short stature
- Feeding issues
- Reflux
- Oral aversion

*Proctor-Williams, Louw, Ratliff, 2017
Hart BJ, Viswanathan S, Jadcherla SR, 2018*



Consequences of NAS

Psycho-behavioral assessments

- Hyperactivity
- Impulsivity
- Attention-deficit in preschool-aged children
- Behavioral problems in school-aged children

Proctor-Williams, Louw, Ratliff, 2017



Consequences of NAS

Neurodevelopmental assessments

- Cognitive delays
- Motor deficits
- Sensory Processing Disorder
- Obsessive Compulsive Disorder
- Attention Deficit Hyperactivity Disorder

Proctor-Williams, Louw, Ratliff, 2017



Consequences of NAS

Ophthalmology Concerns

- Reduced acuity
- Nystagmus
- Delayed visual maturation
- Strabismus
- Refractive errors
- Cerebral visual impairment



Prabhakar Kocherlakota, MD, Pediatrics Aug 2014, 134 (2) e547e561;

DOI: 10.1542/peds.2013-3524



Prenatal Substance Use: Short- and Long-term Effects on the Fetus

TABLE 2 Summary of Effects of Prenatal Drug Exposure

	Nicotine	Alcohol	Marijuana	Opiates	Cocaine	Methamphetamine
Short-term effects/birth outcome						
Fetal growth	Effect	Strong effect	No effect	Effect	Effect	Effect
Anomalies	No consensus on effect	Strong effect	No effect	No effect	No effect	No effect
Withdrawal	No effect	No effect	No effect	Strong effect	No effect	*
Neurobehavior	Effect	Effect	Effect	Effect	Effect	Effect
Long-term effects						
Growth	No consensus on effect	Strong effect	No effect	No effect	No consensus on effect	*
Behavior	Effect	Strong effect	Effect	Effect	Effect	*
Cognition	Effect	Strong effect	Effect	No consensus on effect	Effect	*
Language	Effect	Effect	No effect	*	Effect	*
Achievement	Effect	Strong effect	Effect	*	No consensus on effect	*

* Limited or no data available.

Observed Effects of Prenatal Substance Use in the Newborn

	<u>Nicotine</u>	<u>Alcohol</u>	<u>Marijuana</u>	<u>Cocaine</u>	<u>Opioids</u>	<u>PCP</u>	<u>Meth</u>	<u>Benzos</u>
<u>Prematurity</u>	Yes	Yes	No	Yes	Yes/No	No	Yes/No	Yes
<u>Low Birth Weight</u>	Yes	Yes	No	Yes	Yes/No	No	Yes	Yes
<u>Neuro - Behavioral SX</u>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<u>NAS</u>	Yes	Yes	No	No?	Yes	Yes/No	Yes?	Yes
<u>Congenital Malformations</u>	Yes/No	Yes	No?	Yes/No	No	Yes	Yes?	Yes/No
<u>SIDS</u>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<u>Child Abuse or Neglect</u>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Yes/No = both have been reported, **?** = controversial or unclear findings

Adapted from Jansson LM, Velez ML. Peds in Review. Jan 2011



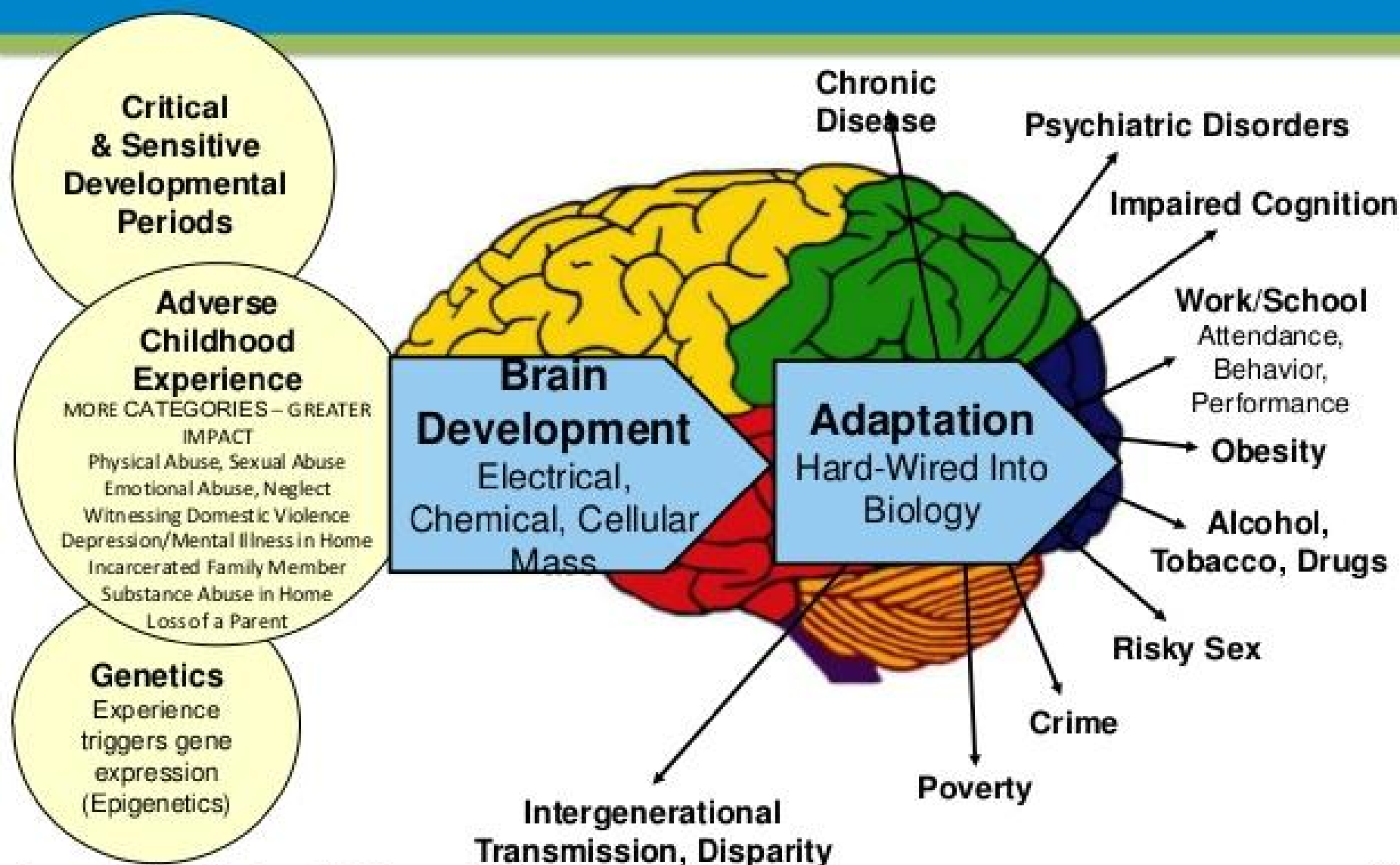
Adverse Childhood Experiences Study (1998) - 7 Domains

- 3 Types of Abuse
 - Physical
 - Sexual
 - Emotional
- Mental Illness in household
- Substance abuse in household
- Evidence of Criminal Activity in household
- Mother abused in the household





Lifespan Impacts of ACEs





NAS Impact

- 136,762 neonatal encounters from 23 hospitals from 2013-2016 (2% had a diagnosis of NAS)
- Neonates with NAS had a **longer LOS** (18.7 vs 2.9 days; $P = .004$).
- **Average costs per admission were 10 times higher for neonates with NAS** (\$37,584 vs \$3,536; $P = .003$).
- Of neonates with NAS, 70% were treated pharmacologically with wide variation in hospital rates of pharmacotherapy (range: 13%–90%).
- **Pharmacologically-treated neonates with NAS experienced a longer LOS** (22.0 vs 10.9 days; $P = .004$) than other neonates with NAS.
- **Total costs for pharmacologically-treated neonates with NAS were over 2 times higher** (\$44,720 vs \$20,708; $P = .002$) than neonates with NAS treated without pharmacotherapy.



Children with NAS were significantly more likely to have a subsequent educational disability.

7,256 Children (1,815 children with a history of NAS)

RESULTS:

Children with NAS were significantly more likely

- referred for a disability evaluation
- to meet criteria for a disability
- to require classroom therapies or services



Recommended Follow-up

EARLY INTERVENTION IS KEY!

Trauma-Informed Approach

- Pediatrician
- Developmental Specialist
- Ophthalmologist if indicated
- OT, PT, Speech if indicated
- Referral to Home Visiting Programs
- NAS/NOWS Parent Support Groups



Five Point Intervention Framework

- Pre-pregnancy – promote awareness of the effects of substance use
- Prenatal – encourage health care providers to screen pregnant women for substance use
- Birth – encourage testing of newborns for substance exposure at birth
- Neonatal – conduct developmental assessments and provide services to newborns and families
- Throughout Childhood and Adolescence – coordinate services for child and family

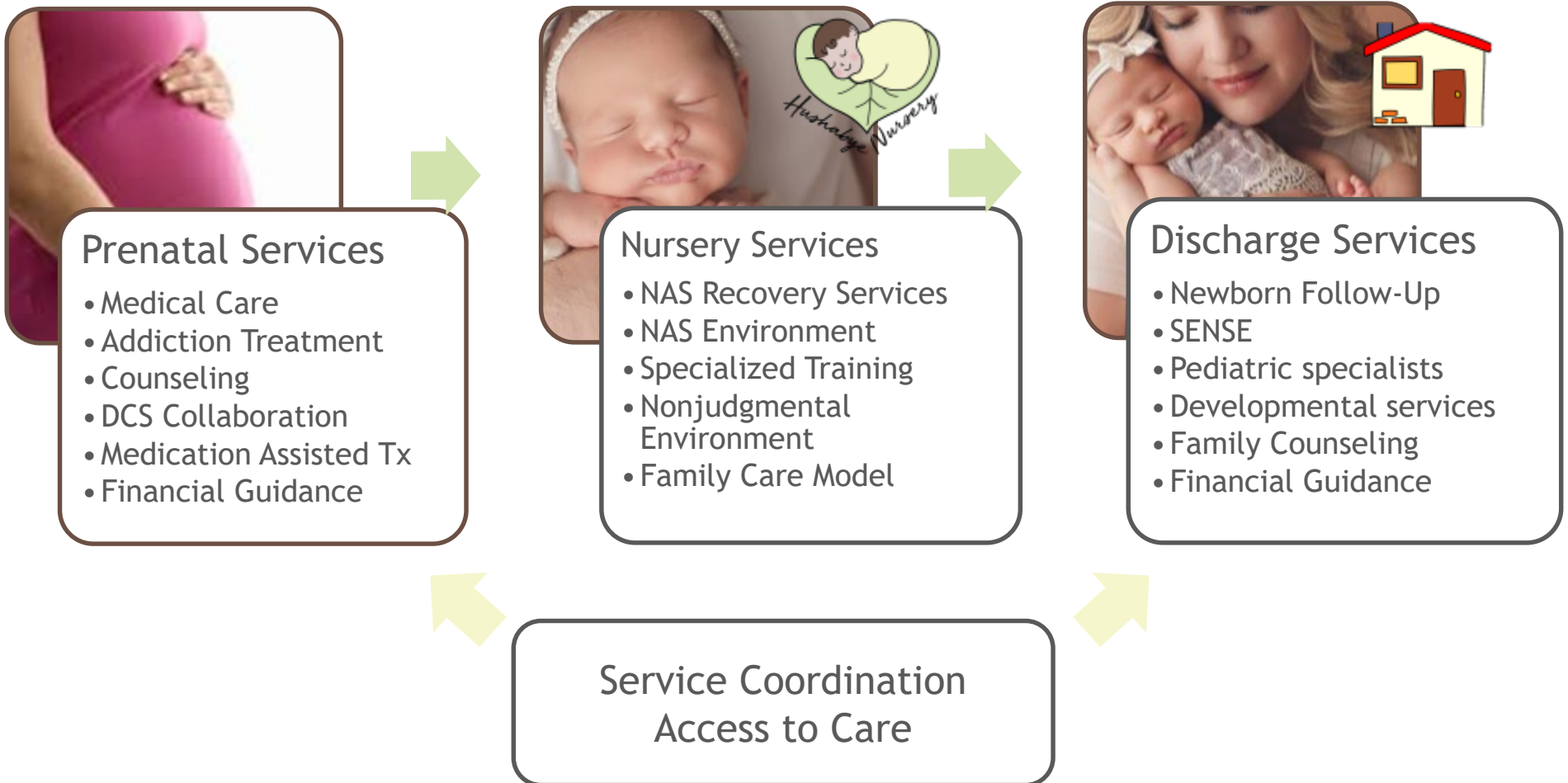


What if we started prenatally?

- Congratulations!!!
- Trauma Informed Approach
- Obstetrician referral
- Responsible opioid prescribing
- Non-opioid therapy for pregnant women with chronic pain
- Prenatal labs including HIV & Hepatitis C
- Birthing classes (OUD/SUD specific)
- No THC
- DCS plan
- Identify safety monitors
- Withdrawal symptoms and interventions
- Encourage breastfeeding



Example of a Care Model Using 3 Points of Intervention: Hushabye Nursery





Support Resources

- 24 hour MAT: www.communitymedicalservices.org
- AHCCCS Opioid Use Disorder & Treatment:
www.azahcccs.gov/Members/BehavioralHealthServices/OpioidUseDisorderAndTreatment
- Arizona Governor's Office of Youth, Faith & Family Statewide Treatment Locator: www.SubstanceAbuseAZ.gov
- Arizona Opioid Assistance & Referral Line (AZ OAR line):
1-888-688-4222
- Arizona Opioid Related Data, Guidelines & Resources: www.azhealth.gov/opioid
- Arizona Pain & Addiction Curriculum: www.azhealth.gov/curriculum



Support Resources, continued

- Arizona Poison & Drug Information Center:
www.azpoison.com, 1-800-222-1222
- Arizona Rx Misuse & Abuse Initiative
Toolkit: www.rethinkrxabuse.org
- Birth to 5 Helpline: 877-705-KIDS (5437)
- Dump the Drugs (list of prescription drug drop boxes): www.DumpTheDrugsAZ.org
- Home visiting support: www.strongfamiliesaz.com
 - Home visiting referrals in Maricopa County only:
www.parentpartnersplus.com
- Mental & Behavioral Health Information & Resources, MARC
Community Resources: 480-994-4407



Support Resources, continued

- MotherToBaby (medications and more during pregnancy & breastfeeding, ask the experts): 1-888-285-3410;
www.mohtertobabyaz.org
- NAS Clinic for Newborns: www.jacobshopeaz.org
- NAS/NOWS & Navigating the system:
www.hushabyenursery.org
- National Council on Alcoholism & Drug Dependence helpline:
1-800-622-2255; www.ncadd.org
- Postpartum Support for Postpartum Depression:
www.psiazona.org
- Treating for Two: www.cdc.gov/pregnancy/meds



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