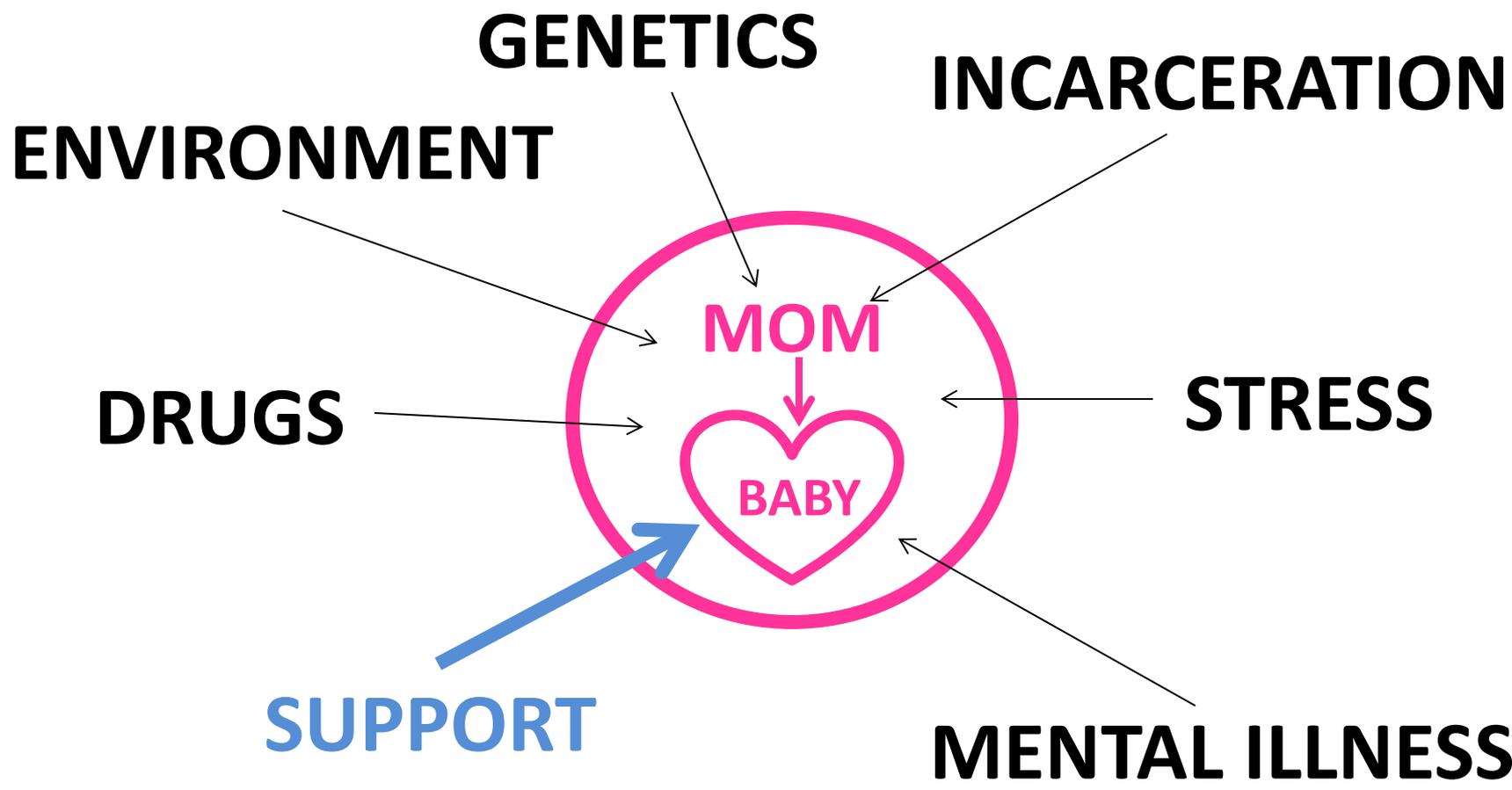




# Neonates and Maternal Opioids

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# Fetal Development

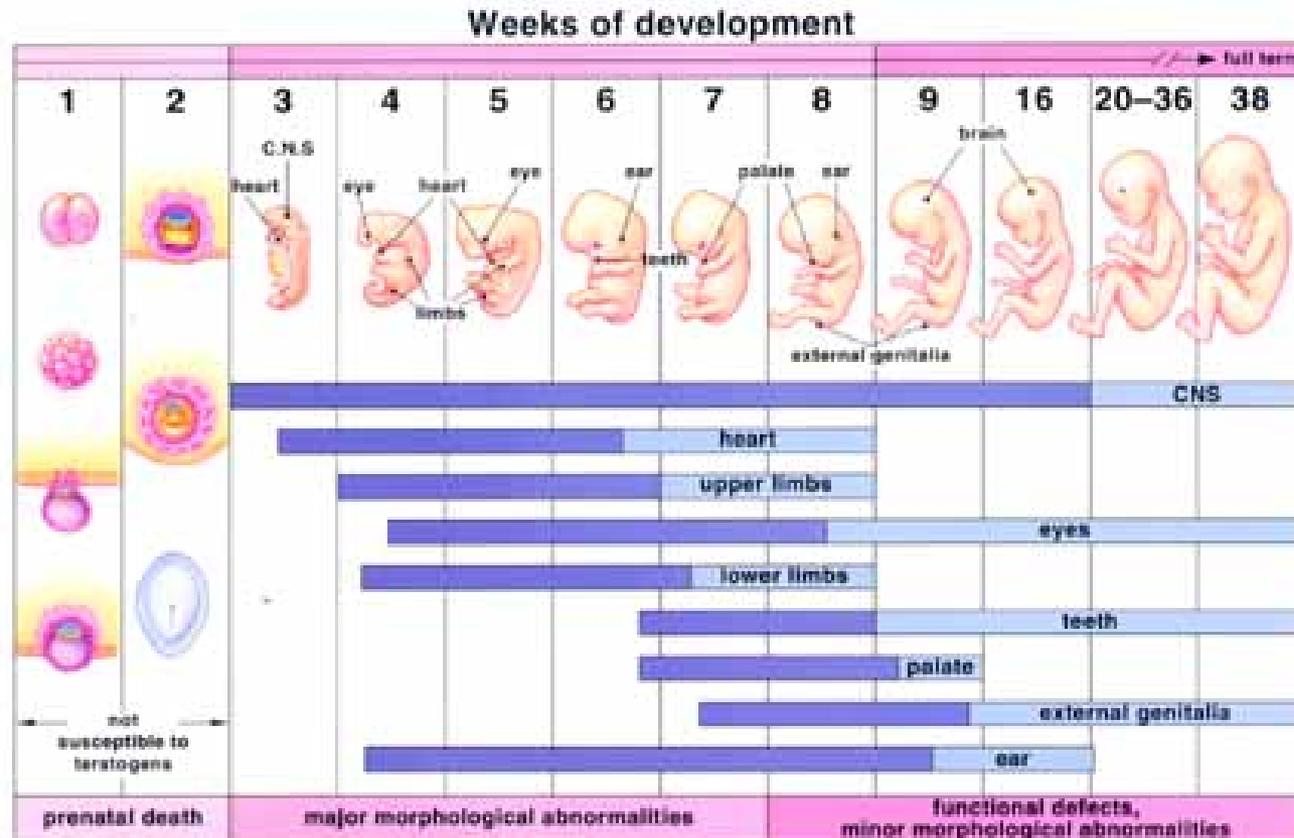
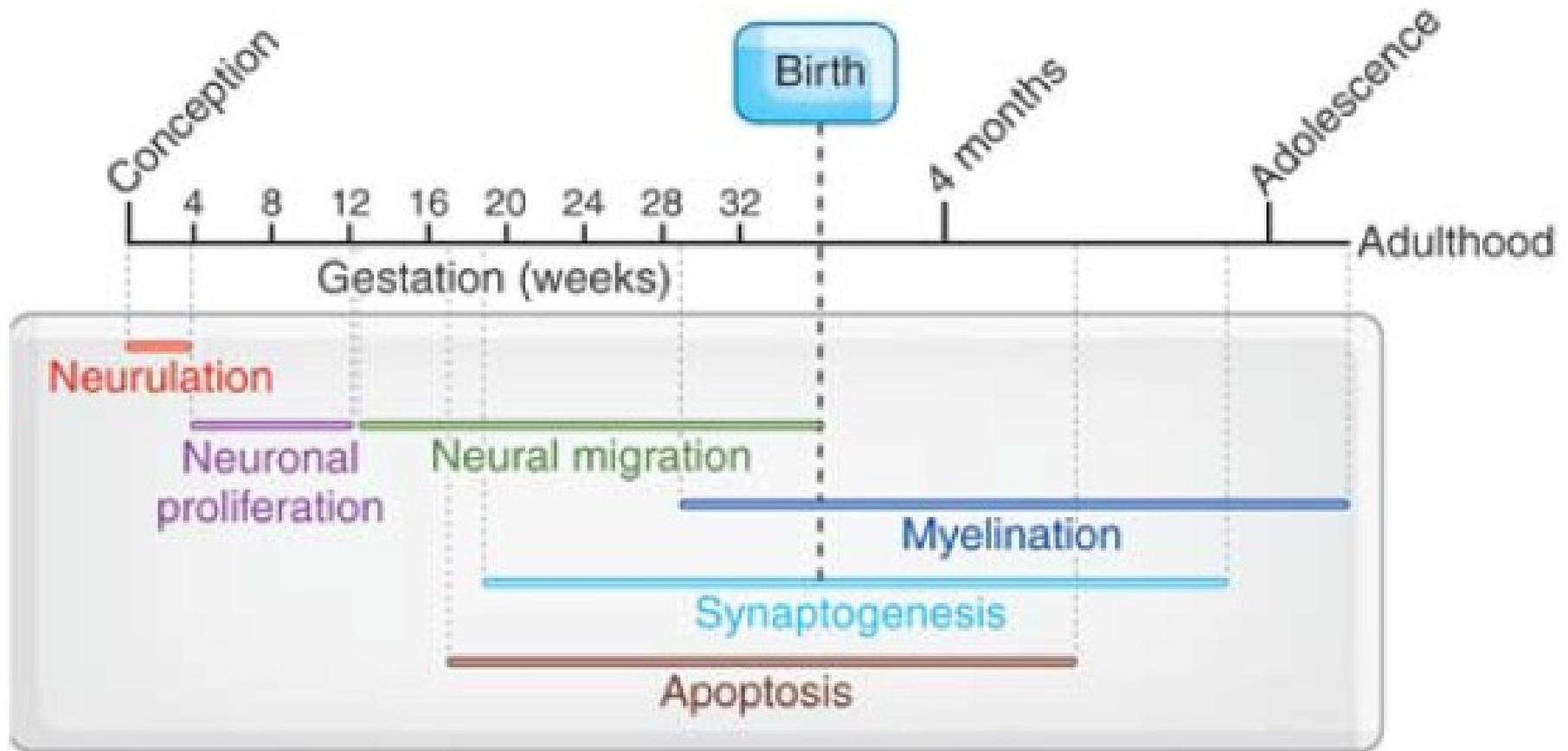


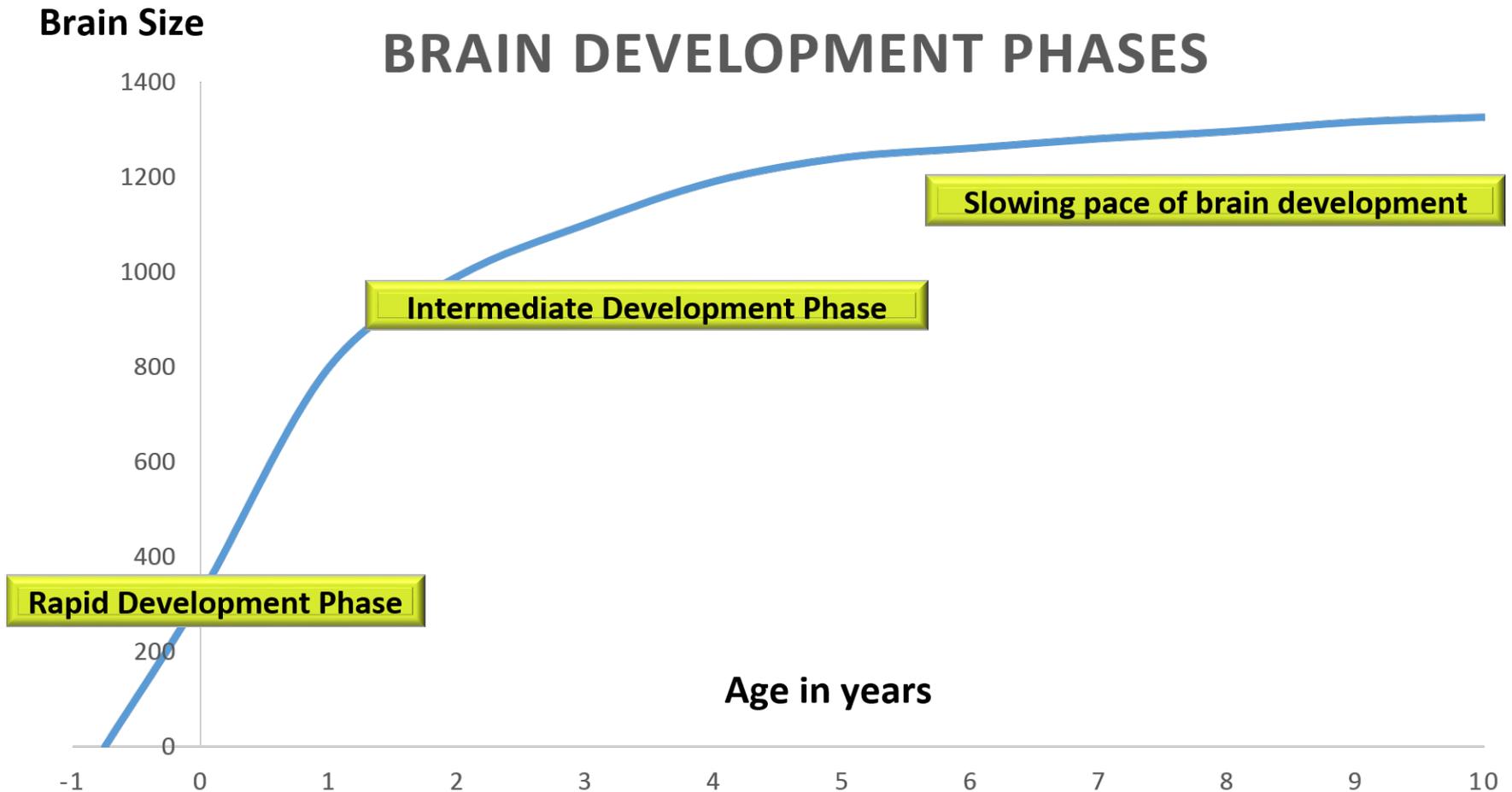
Fig. 34.24 Sensitivity to Teratogens during pregnancy.

# Brain Development



# Brain Development

## BRAIN DEVELOPMENT PHASES





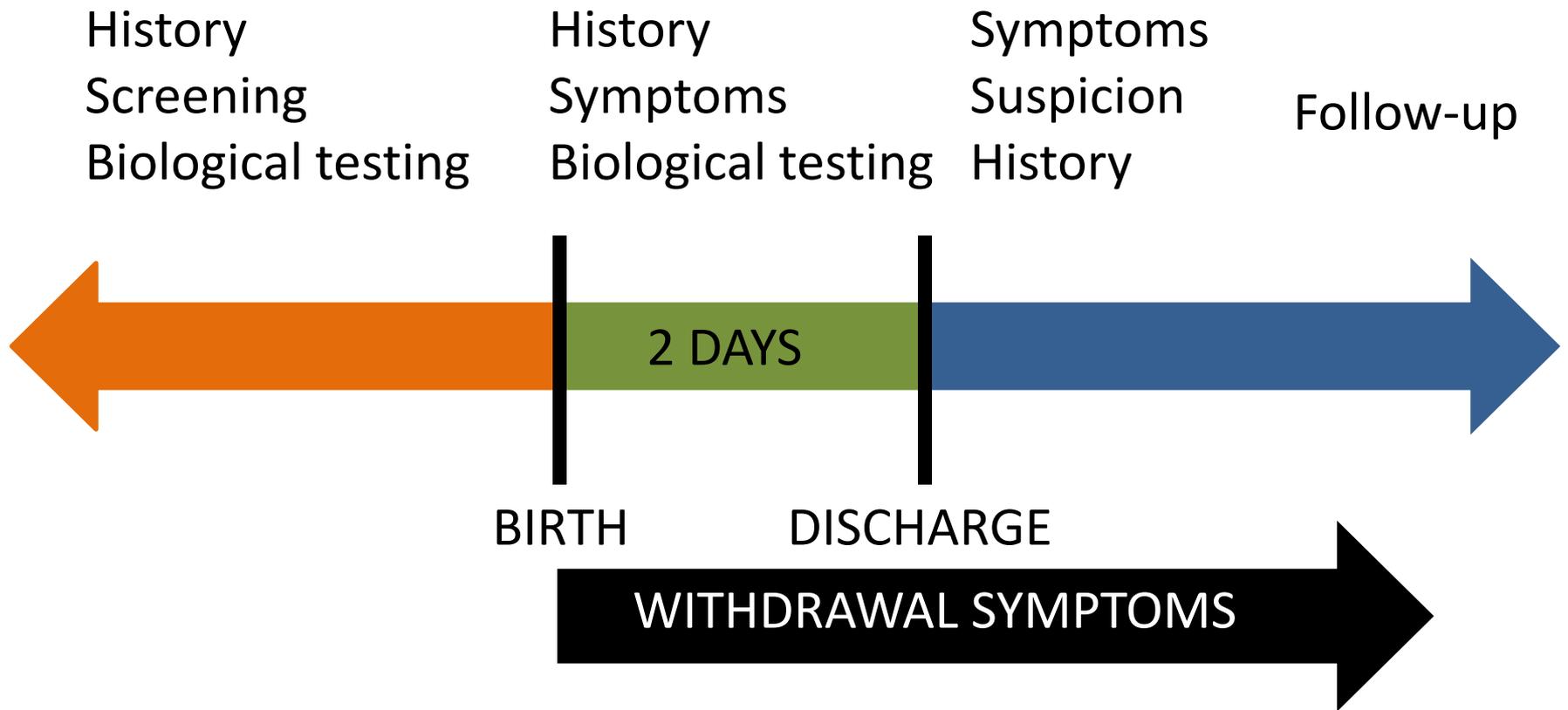
# Definition: Neonatal Abstinence Syndrome

*A postnatal opioid withdrawal syndrome that can occur in newborns whose mothers were addicted to or treated with opioids while pregnant.*

# AAP recommendations

- Protocol defining indications/procedures for screening; standardized plan for evaluation/treatment of infants
- Screen using multiple methods
- Initial approach—non-pharmacological methods
- Score withdrawal using published tool
- Breastfeeding, unless contraindicated
- Observe for 4-7 days

# NAS Timeline



# Communication

*Facilitate communication between obstetric and pediatric care providers to allow connection of pregnancy issues to the infant's medical record and permit accurate diagnosis of the infant.*

# Assessment: Maternal risk

- Prescribed opioids
- Early labor
- Drug/alcohol use/abuse
- Poor weight gain
- Lack of prenatal care

# Assessment: Infant

- Health care providers in the hospital use NAS scoring to measure how bad an infant's withdrawal symptoms are

System	Symptoms		
<b>Central Nervous System</b>	<ul style="list-style-type: none"> <li>• Irritability, fussiness</li> <li>• Increased muscle tone</li> <li>• Sleep problems</li> </ul>	<ul style="list-style-type: none"> <li>• High-pitched cry</li> <li>• Skin break down on knees and face</li> </ul>	<ul style="list-style-type: none"> <li>• Tremors</li> <li>• Seizures</li> </ul>
<b>Gastrointestinal</b>	<ul style="list-style-type: none"> <li>• Poor feeding</li> <li>• Spitting up</li> </ul>	<ul style="list-style-type: none"> <li>• Skin breakdown on buttocks</li> <li>• Dehydration</li> </ul>	<ul style="list-style-type: none"> <li>• Diarrhea</li> <li>• Excessive sucking</li> </ul>
<b>Metabolic, Vasomotor, Respiratory (breathing)</b>	<ul style="list-style-type: none"> <li>• Nasal stuffiness, sneezing</li> <li>• Frequent episodes of hiccups</li> <li>• Sweating</li> </ul>	<ul style="list-style-type: none"> <li>• Frequent yawning</li> <li>• Fast breathing</li> </ul>	<ul style="list-style-type: none"> <li>• Fever</li> <li>• Forgetting to breathe</li> </ul>

# Modified Finnegan Neonatal Abstinence Score Sheet

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	<b>TOTAL SCORE</b>																
	<b>SCORER'S INITIALS</b>																
	<b>STATUS OF THERAPY</b>																

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

# NAS Scoring System

- HCPs use NAS scoring to monitor withdrawal symptoms
- HCPs will decide frequency of scoring
- Non-pharmacologic strategies
- Medications

# Gestational age and severity of NAS

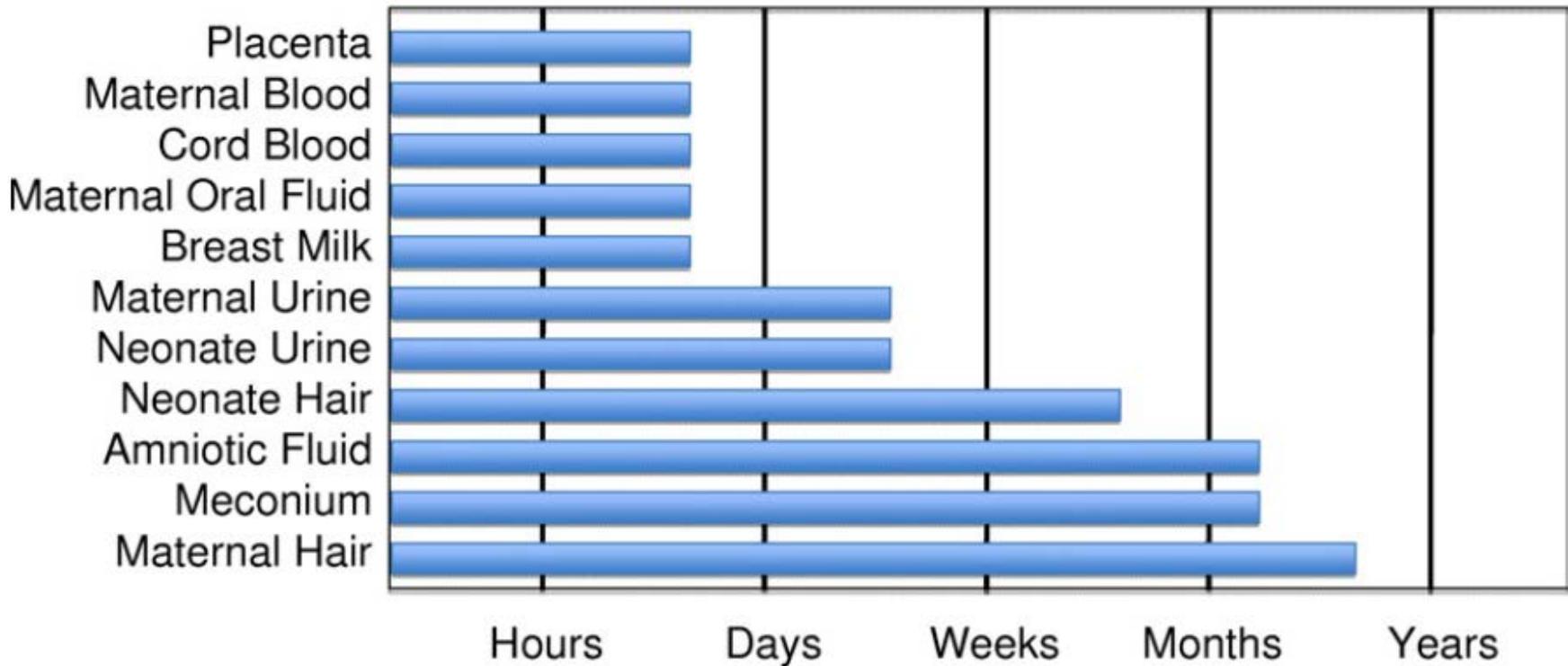
- Retrospective cohort study
- N=403 infants with maternal opioid exposure
  - 102 late preterm
  - 158 early term
  - 122 full term
  - 21 late term

# Gestational age and severity of NAS

	LPT	ET	FT	LT
Pharm.	44%	41%	45%	43%
Duration	16.0 d	22.5 d	23.0 d	22.0 d

# Testing

Window of Detection For Biological Specimens



# Interventions

**Supportive:** An infant experiencing withdrawal should receive supportive care.

<b>Quiet and calm environment</b>	Support the infant using slow, steady handling and quiet voices during cares. Infants with NAS often have trouble falling asleep. It is important to let them sleep undisturbed while minimizing noise, light, and visitors.
<b>Sucking</b>	Breastfeeding or bottle feeding when hungry, or pacifier use at other times, will help calm infants.
<b>Respond to distress cues</b>	Infants will communicate when they have had enough. If the infant is overstimulated, stop and give him/her a break.
<b>Overstimulation support</b>	Hold the infant close and rock gently in a quiet area. Talk to the infant's care provider about swaddling.
<b>Gradually introduce stimuli</b>	Introduce stimuli one at a time (light, sound, touch, voice). Gradually increase number of stimuli as tolerated.
<b>Feeding environment</b>	Feed the infant in quiet and calm surroundings with minimal noise and disturbances.
<b>Organize care</b>	Minimize handling, establish routine, and implement a demand feeding schedule.

# Breastfeeding

- Prescribed opioids for withdrawal are not an absolute contraindication to breastfeeding
- Women should not stop breastfeeding abruptly
- Women taking non-prescribed medications or drugs should not breastfeed
- If questions, she should talk to her HCP

# Rooming-in

*Rooming-in may facilitate a smooth transition to extrauterine life for substance-exposed newborns by decreasing NICU admissions and NICU length of stay for term infants, encouraging breastfeeding, and increasing maternal custody of infants at discharge.*

# Medications

**Medication:** Infants may receive some of these medicines

Name	Use	Side effects
Morphine sulfate	Morphine sulfate is a short-acting opioid. The infant's care provider will decrease the dose or frequency of the drug as the infant improves.	• Slow or shallow breathing
Methadone	Methadone is a long-acting opioid. The infant's care provider will decrease the dose or frequency of the drug as the infant improves.	• Slow heart rate
Phenobarbital	Phenobarbital is a barbiturate. Health care providers may prescribe phenobarbital with an opioid for withdrawal.	• Difficult to wake
Clonidine	Clonidine may be used alone or with an opioid to treat NAS.	• Excessive sleepiness
		• Constipation
		• Fewer wet diapers
		• Lower blood pressure (clonidine)

# Weaning off medications

- Doses will change
- Babies respond differently
- Babies may require prolonged hospitalizations

# Standardizing protocols

- Evidence-based, multidisciplinary NAS protocol
- Implemented weaning protocol
- NICU stay reduced by 10.35 days
- NICU stay after completing wean reduced by 2.79 days

# Parents' feelings

- Emotional roller coaster
- Hospital staff (should) understand that it is stressful and emotional
- The ride continues after discharge

# Maternal experiences

- N=15 Hispanic mothers of infants with NAS
- Method: Semistructured interview
- Results: Four themes describing the experience
  - Understanding addiction
  - Watching the infant withdraw
  - Judging
  - Trusting the nurses

Cleveland and Bonugli, 2014

# Parental support

- Nonjudgmental
- Promote trust
- Education
- Support parenting

# Legal issues

- Fetal protection laws to promote fetal health and combat *in utero* fetal drug abuse
- Consequences
  - Undermine relationship between women and health care providers
  - Discourage at-risk women from seeking medical attention
  - Longer term maternal and infant/child effects

Henricks, 2015

# Hospital discharge

- Symptoms may persist
- Feeding difficulties, colic, difficult to console, difficulty sleeping, poor weight gain
- Keep appointments
- Use medications appropriately
- Accept help from family/friends
- Use community services
- Take care of yourself

# Care after discharge

- Discharge summary
- Supportive interventions
- If on medications, who follows?
- Is there developmental follow-up?
- Who else sees the infant? What do they do?  
What questions do they ask?

# Infant mortality

- Retrospective study of live births, 1995-2002
- Compared four groups
  - Live births, maternal methadone, infant death
  - Live births, no maternal methadone, infant death
  - Live births, maternal methadone, no death
  - Live births, no maternal methadone, no death
- Results/Conclusions
  - Infant mortality 24.3/1000 compared to 4.0/1000
  - Single main cause—SIDS

Burns et al., 2010

# Follow-up

- Care of neonate may focus on identification/treatment of NAS
- Global aims should focus on mother/infant dyad
- Interventions should reinforce healthy parent-child attachment and interaction

# Developmental risks

- Motor and cognitive impairments
- Inattention
- Hyperactivity
- ADHD

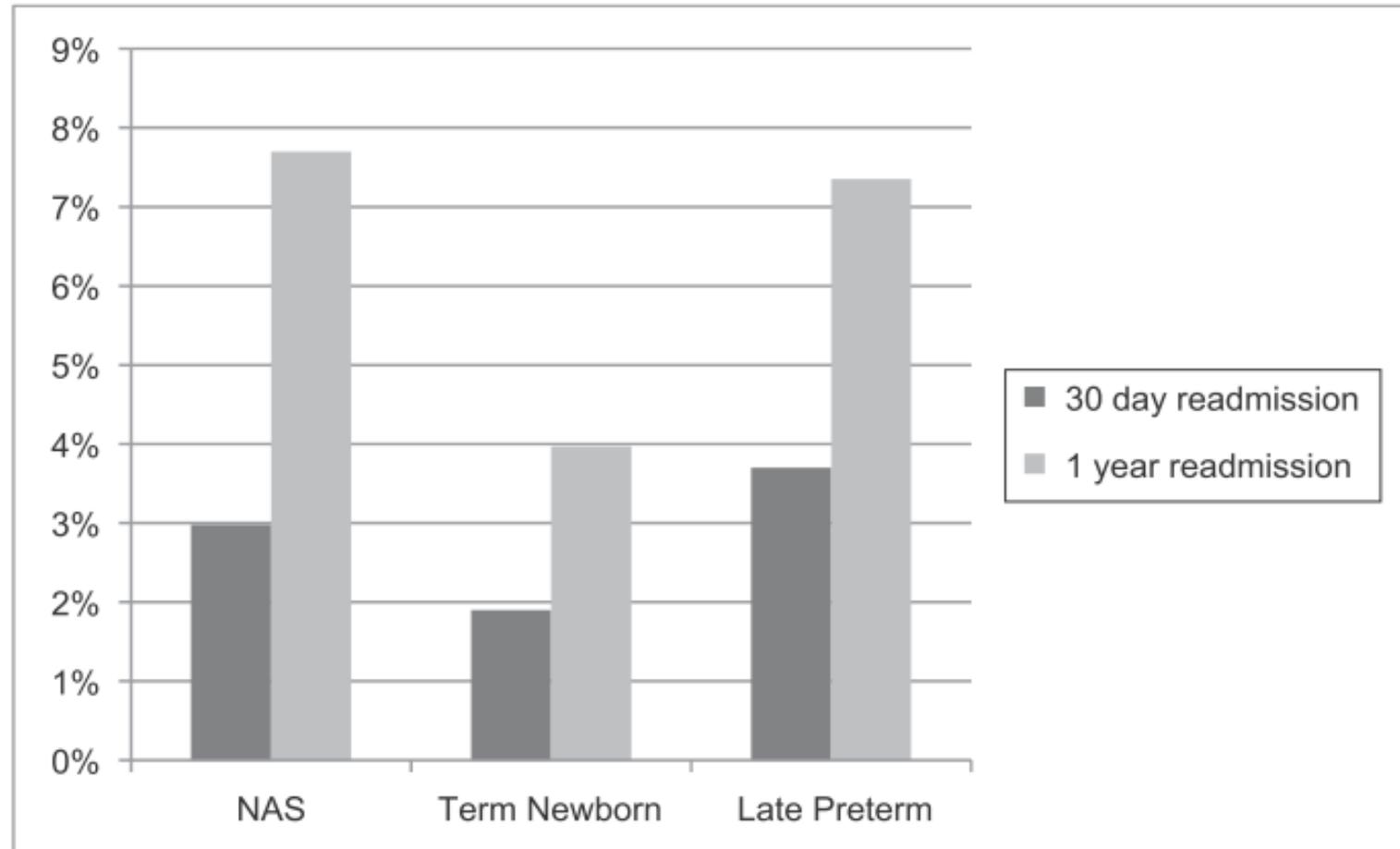
# Medical follow-up

*Almost a quarter of identified children of substance-using mothers are not accessing standard child health services in their first 2 years of life. This study provides support for increased attention to the provision of child health services for children of methadone using mothers. Further research into effective intervention strategies for children of illicit substance-using mothers is indicated.*

# Medical follow-up

- Longitudinal retrospective cohort study
- All births from 2006 to 2009 (N=700,613)
- NAS=1643 infants
- Results: Infants with NAS greater likelihood of readmission within 30 days of birth

# Medical follow-up



# Epigenetic consequences

- Epigenetics: the study of heritable changes in gene expression without changes to DNA
- Genes can be turned on or off
- Longer-term effects

# Out of hospital options

- Neonatal abstinence syndrome: transitioning methadone-treated infants from an inpatient to an outpatient setting.
- Neonatal Abstinence Syndrome: Influence of a Combined Inpatient/Outpatient Methadone Treatment Regimen on the Average Length of Stay of a Medicaid NICU Population.

# Policies

- Identify model legislation that promotes evidence-based responses to behavior
  - Non-punitive response to women with substance use disorders
  - Mandatory reporting of NAS

# Surgeon General's report

- Enhanced public education
- Widespread implementation of evidence-based prevention policies and programs
- Improved access to evidence-based treatment services, integrated with mainstream health care
- Recovery support services
- Research-informed public policies and financing strategies

# Public health systems approach

- Define the problem through systematic data collection
- Identify risk and protective factors
- Public/private sector collaboration
- Broad implementation of effective interventions and recovery support
- Monitor impact of interventions

