Neonatal Abstinence Syndrome:

Understanding the Role of the Pediatric Rehabilitation Team

IPRC
International
Pediatric Rehabilitation
Collaborative

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Children's
Specialized Hospital


GOOD SHEPHERD
Pediatrics

Our Presenters

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Objectives

- Summarize the etiology and defining characteristics of Neonatal Abstinence Syndrome (NAS)
- Explain the therapeutic weaning process
- Identify the scope and purpose of non-pharmacological treatment strategies, including the neuroprotective benefits of psychosocial well-being interventions
- Describe the process/components of medical and therapeutic collaboration for safe transition to the community.

Rate of Maternal Opioid Use:

5.63/1000 live births (23,091)

71% report prescription pain medication use**

15.6% report illicit drug use

10% report prescription psychoactive medication use

8% of teens report prescription medication use:

- Pain meds: Vicodin, Oxycontin
- Antidepressants: Prozac, Zoloft
- Anti-anxiety: Xanax
- Stimulants: Adderall, Concerta

Patrick, 2015

NAS Pathophysiology

- Opioid withdrawal is more complex in neonates due to:
  - Immature development and processing
  - Complex fetal placental pharmacokinetics
- Opiate drugs have low molecular weights, are water soluble and are easily transferable across the placenta to the fetus
- Synthetic opiates cross the placenta more easily compared to semisynthetic opiates
- Lack of opioids in chronically stimulated receptors increases the release of neurotransmitters, causing:
  - Corticotrophin increase
  - Serotonin decreases
  - Dopamine decreases
  - Noradrenaline increases
  - Acetylcholine increases

Kocherlakota, 2014

NAS Pharmacology

Withdrawal is a function of half life (neonatal liver metabolism and renal clearance)

- Morphine: withdrawal may present 24 hours after birth, but usually 24-48 hours
- Methadone: 24-72 hours after birth
- Buprenorphine: (partial agonist) 40-72 hours after birth; NAS less severe following maternal Buprenorphine and less medication required for infant treatment.

Jansson, 2012

Infant Behavioral Cues

- Prenatal exposure can elicit physiological and neurobehavioral problems
- NAS is a multisystem disorder primarily affecting central and automatic nervous system and gastrointestinal tract
- Dysfunction in autonomic regulations, state control, capabilities and sensory/motor functioning

Kocherlakota, 2014

Neurologic Excitability

- Excessive high pitched cry
- Excessive irritability
- Sleep/wake disturbances
- Alternation in infant tone/movement
- Hyperactive reflexes
- Hypertonicity
- Tremors
- Autonomic dysfunction
- Seizures
- Exaggerated moro reflex

Hudak & Tan, 2012; Kocherlakota, 2014

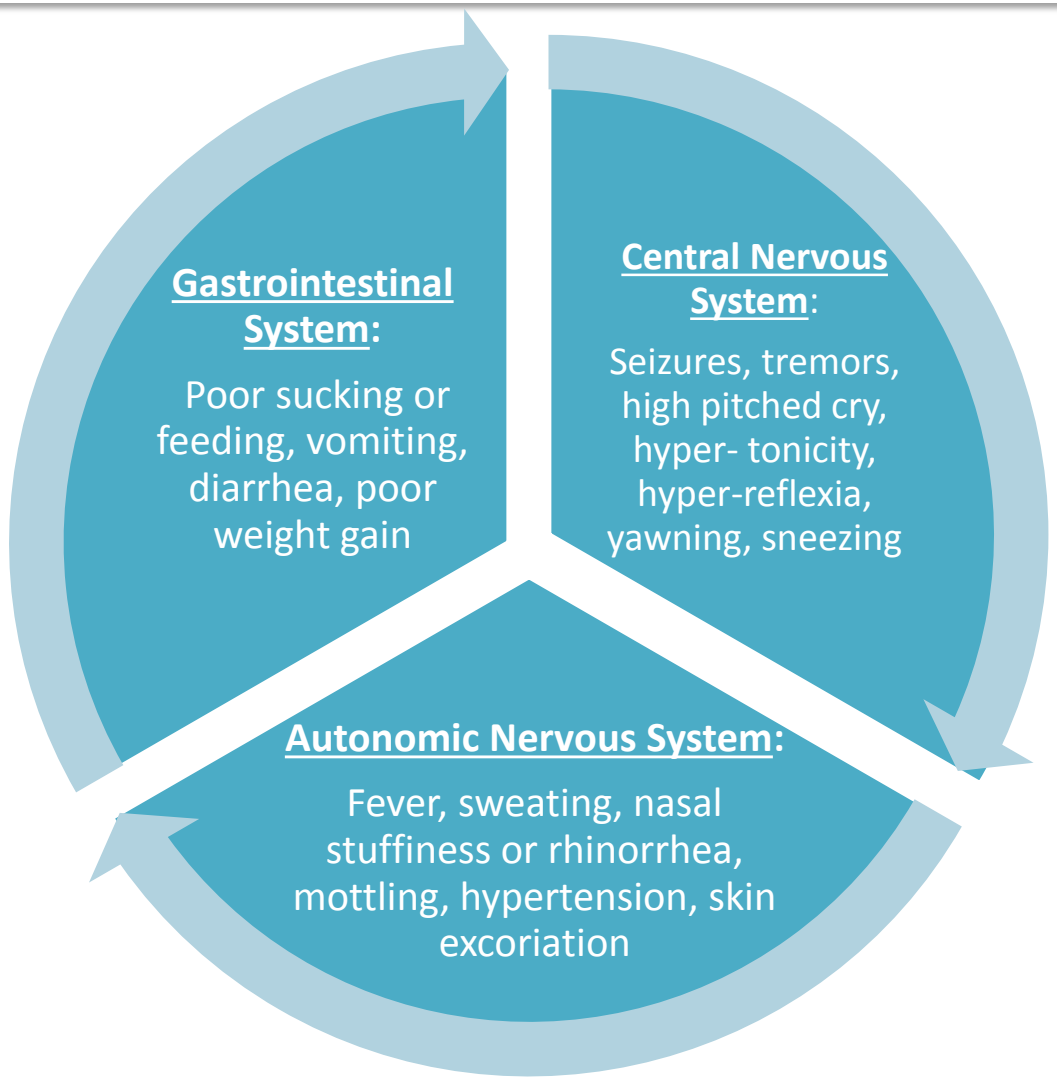
Gastrointestinal Dysfunction

- Poor oral feeding
- Uncoordinated, constant sucking
- Vomiting and regurgitation
- Diarrhea
- Dehydration and electrolyte imbalance
- Poor weight gain
- Autonomic signs
- Increased sweating
- Nasal stuffiness
- Mottling
- Temperature instability

Hudak & Tan, 2012; Kocherlakota, 2014

Finnegan Scale to Assess Withdrawal

- Score of 1 for least adverse effect
- Score of 3 for most adverse effect



Finnegan, 1986

Finnegan Scoring

Infant scored every 2 hours after birth, then every 4 hours

If score > 8 for two consecutive scores, consider medication treatment

Consider weaning medication every 1-2 days for three consecutive scores < 8; dose may be decreased by 10-20%

Medication my be discontinued when dose is <0.05mg/kg/dose methadone; 0.04mg/kg/dose for morphine

Hudak, 2012

SYSTEMS	SIGNS AND SYMPTOMS	SCORE	AM 2	4	6	8	10	12	PM 2	4	6	8	10	12	DAILY WT.
CENTRAL NERVOUS SYSTEM DISTURBANCES	High Pitched Cry Continuous High Pitched Cry	2 3													
	Sleeps < 1 Hour After Feeding Sleeps < 2 Hours After Feeding	3 2													
	Hyperactive Moro Reflex Markedly Hyperactive Moro Reflex	2 3													
	Mild Tremors Disturbed Moderate Severe Tremors Disturbed	2 3													
	Mild Tremors Undisturbed Moderate Severe Tremors Undisturbed	1 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) Fever > 101°F (39.3°C)	1 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 Respiration Rate > 60/min with Retractions	1 2													
GASTROINTESTINAL DISTURBANCES	Excessive Sucking	1													
	Poor Feeding	2													
	Regurgitation Projectile Vomiting	2 3													
	Loose Stools Watery Stools	2 3													
SUMMARY	TOTAL SCORE														
	SCORER'S INITIALS														
	STATUS OF THERAPY														

Pharmacological Intervention

Morphine	Short acting; start 0.05mg/kg/dose q 3-4 hr
Methadone	Longer acting; start 0.05 to 0.1mg/kg/dose q 12 hr
Phenobarbital	Adjunct therapy; load 16 mg/kg and maintenance of 1-4mg/kg/dose q12; monitor levels
Benzodiazepines	Adjunct therapy for polysubstance and alcohol, though not preferred for single opioid use
Paregoric and Tincture of Opium	Not recommended due to neurotoxic agents
Clonidine, buprenorphine	Isolated reports, require more studies; report shorter NAS duration
Naloxone	Precipitates seizures, apnea - not recommended

Kocherlakota, 2014

Non-Pharmacological Treatment Strategies

Non-Pharmacological Intervention: Identifying Dysregulation Cues

- Skin mottling
- Repetitive, sneezing, hiccupping, yawning
- High pitched cry
- Breath holding
- Frequent stooling
- Finger/toe splaying
- Arching
- Increased tone
- Gaze aversion
- Motoric disorganization
- Rapid state transitions

Velez, 2009; Kocherlakota, 2014

Non-Pharmacological Treatment: Therapeutic Techniques and Strategies

Improving Tolerance to Care

Relieving GI Discomfort

Facilitating State Regulation

Non-Pharmacological Treatment: Improving Tolerance to Care

- Care Routine Adjustments
  - Layering and fading of external supports during care
  - Careful consideration of daily routines (breaks between care tasks)
  - Positioning to support flexion during care
  - Techniques including swaddled bathing or boundaries within bath environment
- Environmental Modifications
  - Dim lighting
  - Minimal or unimodal auditory input
- Musical Intervention
  - Music supportive of entrainment or regulation
    - Heartbeat sound
    - Music with slow or consistent beats per minute

Als, 1997; Jansson, 2008; Jansson, 2012; Van Slewed, 2007

Non-Pharmacological Treatment: Relieving GI Discomfort

Therapeutic Strategies:

- Bowel massage (ILU stroke)
- Lower extremity cycling
- Gentle passive trunk rotation
- Positioning in elevated left sidelying

Liu, 2005; Lightdale, 2013; AAP, 2014

Non-Pharmacological Treatment: Facilitating State Regulation

Goal:

- For an infant to achieve and sustain quiet alert state for intervals appropriate for his/her age

Example:

- A 1 month old infant whose physiologic needs are met should be able to sustain quiet alert state for 20-30 minute intervals in order to engage in caregiver interaction and developmental progression

Therapeutic Interventions:

- Layering and fading external supports
- Layering environmental modifications and stimuli
- Facilitating midline approximation and hand to mouth suckling

Non-Pharmacological Treatment: Facilitating State Regulation

Therapeutic Strategies:

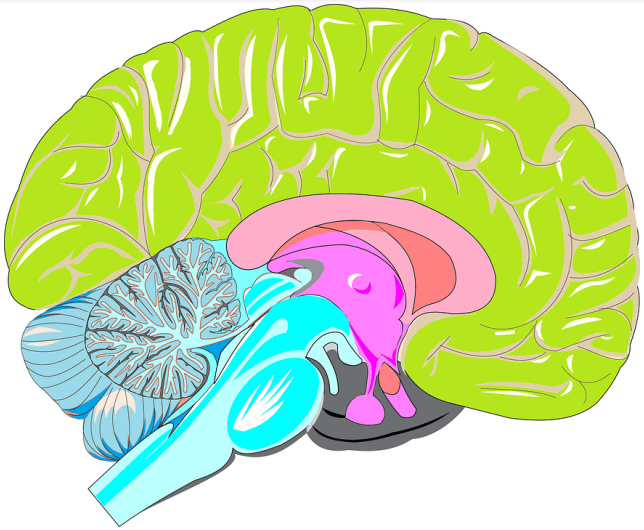
- Use of static, deep pressure
- Creating boundaries
- Swaddling
  - Double swaddle
  - Trunk swaddle
- Supports for flexion
- Vestibular input
- Vibration
- Use of supports during developmental activities
  - Social regard
  - Visual tracking
  - Swiping at toys

Als, 1997; Jansson, 2008; Velez, 2009; Van Slewed, 2007

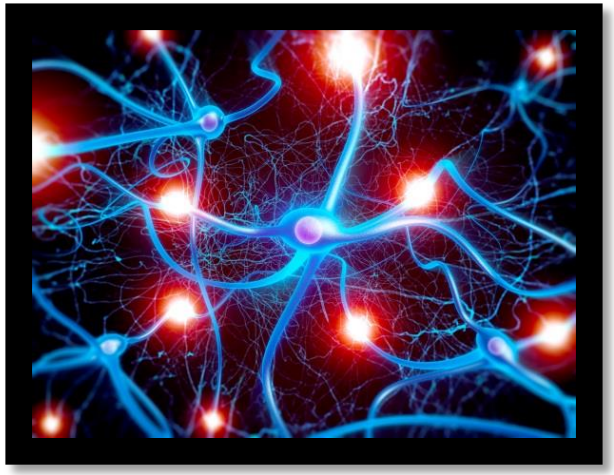
Fostering Psychosocial & Emotional Well-Being in Hospitalized Infants with NAS

Psychosocial Stress In Hospitalized Infants

Emotion is experienced, processed, and regulated through a complex neuroanatomical network:



Brain Regions:
Frontal Lobe
Temporal Lobe
Insula
Hypothalamic-Pituitary Axis
Thalamus
Basal Ganglia



Sensory Pathways:
A β Fiber Group
A δ Fiber Group
C Fiber Group*

Coughlin, 2016 & McGlone, 2012

Psychosocial Stress In Hospitalized Infants

Visual

- Harsh artificial light
- Alarm/monitor lights
- Limited access to natural light
- Technology screens

Auditory

- Crying/screaming (self and others)
- Alarms & Monitors
- Communication technology
- Hallway noise
- Housekeeping noise
- Family dynamics

Olfactory

- Chemicals/cleaning supplies
- Emesis
- Tube feedings

Tactile

- Tubing
- Tapes/Adhesives
- Heel pricks
- Exams
- IV/Needle sticks

Gustatory

- Emesis
- Reflux
- Medicine

Repeated exposure to noxious multi-modal stimuli in hospitalized infants has the possibility of altering how the physical world is coded emotionally in the brain

Beckes, 2015; Coughlin, 2016 ; Fraley, 2013

Hospitalized Infants with NAS

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Hospitalized Infants with NAS

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Excessive, high pitched crying

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Nasal stuffiness & sneezing

Olfactory

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Increased muscle tone & tremors

Excoriation

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Hospitalized Infants with NAS

Difficulty sleeping

Loose stools

Increased muscle tone & tremors

Excessive, high pitched crying

Nasal stuffiness & sneezing

Excoriation

Hyperthermia & Sweating

Visual

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Auditory

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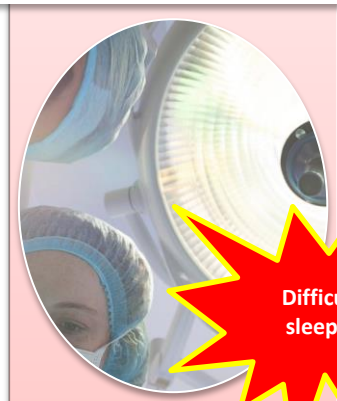
Hospitalized Infants with NAS



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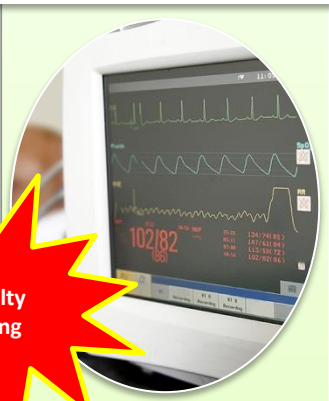

Excessive, high pitched crying

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Loose stools

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Olfactory

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Increased muscle tone & tremors

Hyperthermia & Sweating

Excoriation

Tactile

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- Tapes/
- Heel pri
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- IV lancile stick

Frequent vomiting & poor feeding

Gustatory

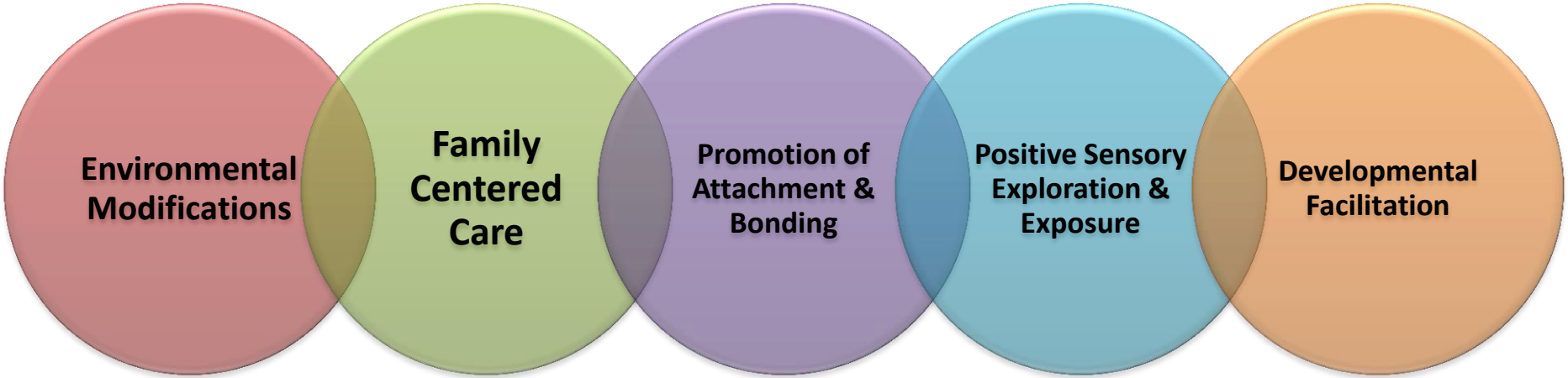
- Emesis
- Reflux
- Medicine

Repeated exposure to noxious multi-modal stimuli in hospitalized infants has the possibility of altering how the physical world is coded emotionally in the brain

Beckes, 2015; Coughlin, 2016; Fraley, 2013; Jansson, 2009

Psychosocial and Emotional Well-Being

The rehabilitation environment provides a unique opportunity to counteract psychosocial stress through positive sensory and social experiences



MacMullen 2014 ; Sublett, 2013

Psychosocial and Emotional Well-Being

Why does it matter?

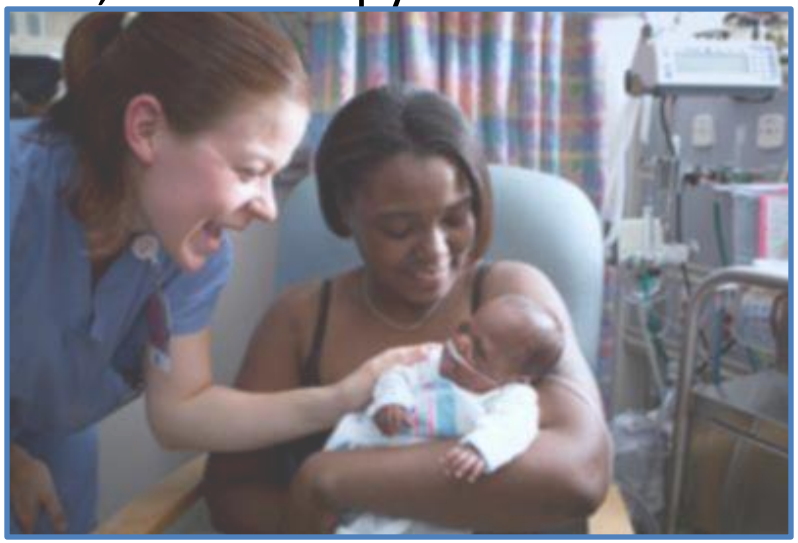
- Mitigates impact of negative overload of afferent sensory pathways in developing brain
- Emotional experiences coded in infancy may have long term effects on emotional regulation, behavior, attachment style, and mental representation of self, social & cognitive functioning, and adolescent romantic relationships

Beckes, 2015; Coughlin, 2016 ; Fraley, 2013

Medical and Therapy Collaboration: For Safe Discharge Home

Safe Transition to Home

- Collaboration between family, medical, and therapy staff
- Process begins at admission
  - Understanding family goals
  - Maternal recovery program
  - Identifying primary & secondary caregivers
  - Identifying if child protective agency is involved
  - Establishment of medical and therapy goals with family's involvement



- Establishing a non-judgemental atmosphere
  - Identifying how maternal guilt will affect treatment progress
  - Establish critical role of mother/caregiver in safe discharge home
  - Established collaborative atmosphere

Velez, 2008

Mother and Baby Dyad

- Identify each mother's unique characteristics
  - Therapy observations of infant and mother to assess and provide individualized care
  - Maternal ADAD
  - Maternal depression
- Assist mothers in ability to identify and understand their own emotions to promote improved awareness and engagement to infants
- Mother's personal mind frame will drive responses to infant

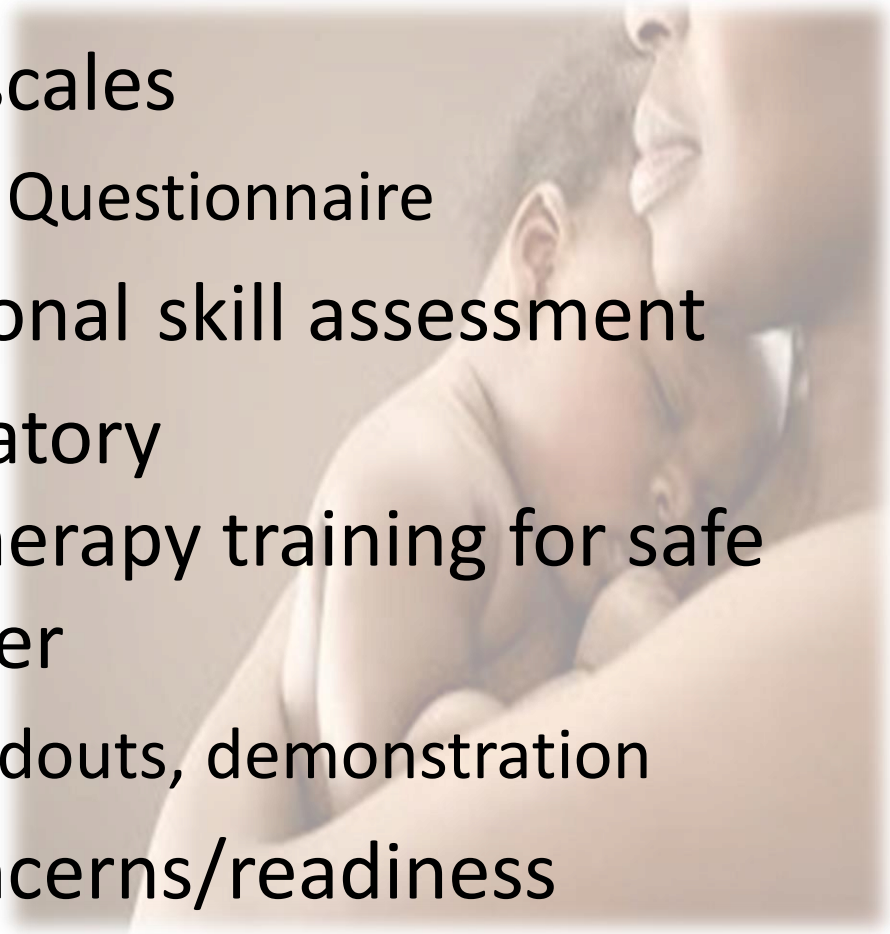
Rooming In

- Benefits of Rooming In:
  - Decreases pharmacological supports
  - Decreases length of stay
  - Decreases average hospital cost
  - No increased levels of re-admission

- The American Academy of Pediatrics recommends non-pharmacologic care as first-line treatment for infants with NAS.
  - Teaching parents to accurately read baby's cues and appropriately respond
  - Instruction in calming techniques
  - Non-judgemental culture

Caregiver Readiness

- Use of standardized scales
  - Maternal Confidence Questionnaire
- Completion of functional skill assessment
- Completion of mandatory medical, nursing & therapy training for safe and effective carryover
  - Video education, handouts, demonstration
- Parent expressed concerns/readiness



Caregiver Support

- Discuss and identify supports within family, community, religious, counseling, etc.
- Identify and complete training with identified secondary caregivers
- Supports based upon unique parental characteristics for individualized support
- Identify appropriate supports for infant post-discharge

Supports after Transition Home

- Continued supports for caregiver and infant after discharge from inpatient rehabilitation
  - Referrals to Early Intervention Services
  - Referrals to Outpatient Therapy Services
    - IHOP: In Home Outpatient Therapy
  - Neurodevelopmental follow-up and/or NICU follow-up
  - Follow-up with pediatrician 2-3 days after discharge
  - Visiting Nurse
  - Medical Daycare

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- IPRC values your opinion. Following the webinar, a survey link will be emailed to all registrants. Please share with all attendees.

- A certificate of attendance for today's presentation may be requested via the survey.

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Panel Discussion

THANK YOU!

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Group Discussion Questions

The following questions were designed for group reflection to guide discussion on this topic within your organization.

1. Think about the care that your organization provides for infants with NAS. Are there any areas or processes that require improvement? Are there any things that can be done differently to improve the care provided?
2. Assess your current resources. Are there any resources (items, education, contacts) that need to be gathered in order to provide optimal care?
3. How are the patient and the family unit supported throughout the rehabilitation experience? What can be done to promote and facilitate healthy relationships?
4. Evaluate your organization's goalsetting for this population. Are there additional/new areas that should be included or addressed?

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