Disclaimers

Financial	Non Financial
•Salaried employee, Abrazo Arrowhead Hospital	• Board Member, Neonatal Therapy Certification Board
• Co-Owner, Arizona NICU Follow-Up Specialists	• Communications Committee Chair, International Association for Pediatric Feeding and Swallowing
• Content creator and mentor, Feed the Peds	• PR Committee Member, American Board of Swallowing and Swallowing Disorders
• Mentor, Medical SLP Collective	
• Presenter stipend, Dr. Brown	

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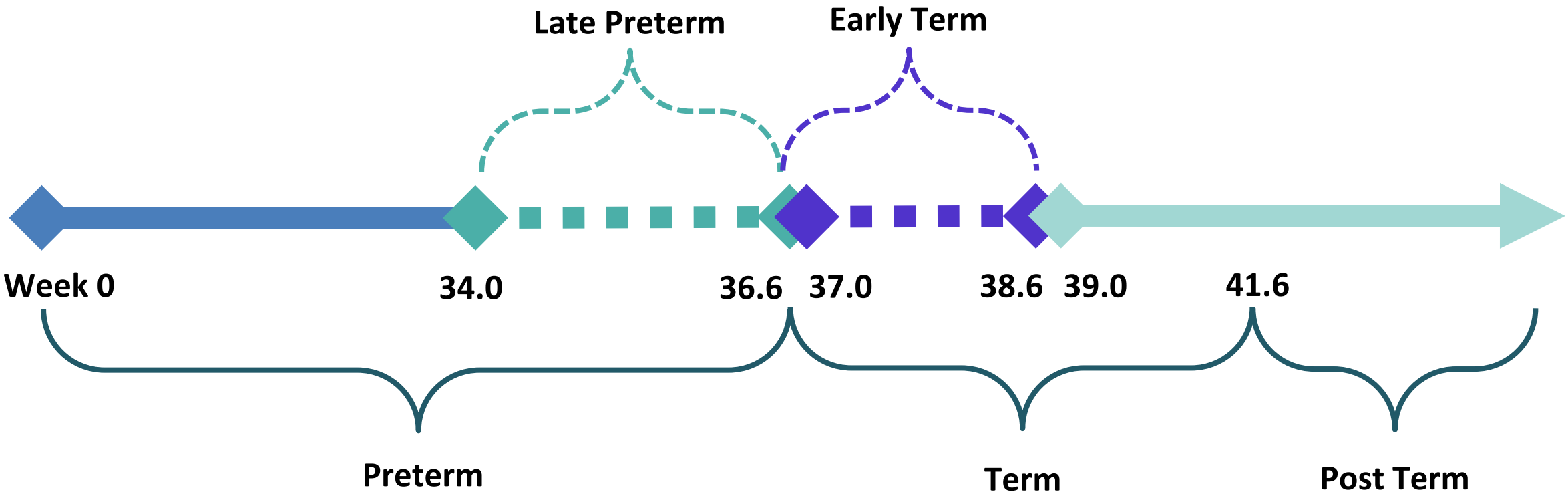
Objectives

Participants will be able to:

1. Identify at least two etiologies of late preterm and early term births
2. List at least two medical conditions impacting late preterm and early term infants
3. Select at least two methods of increasing collaboration between neonatal therapy and couplet care teams

Definitions



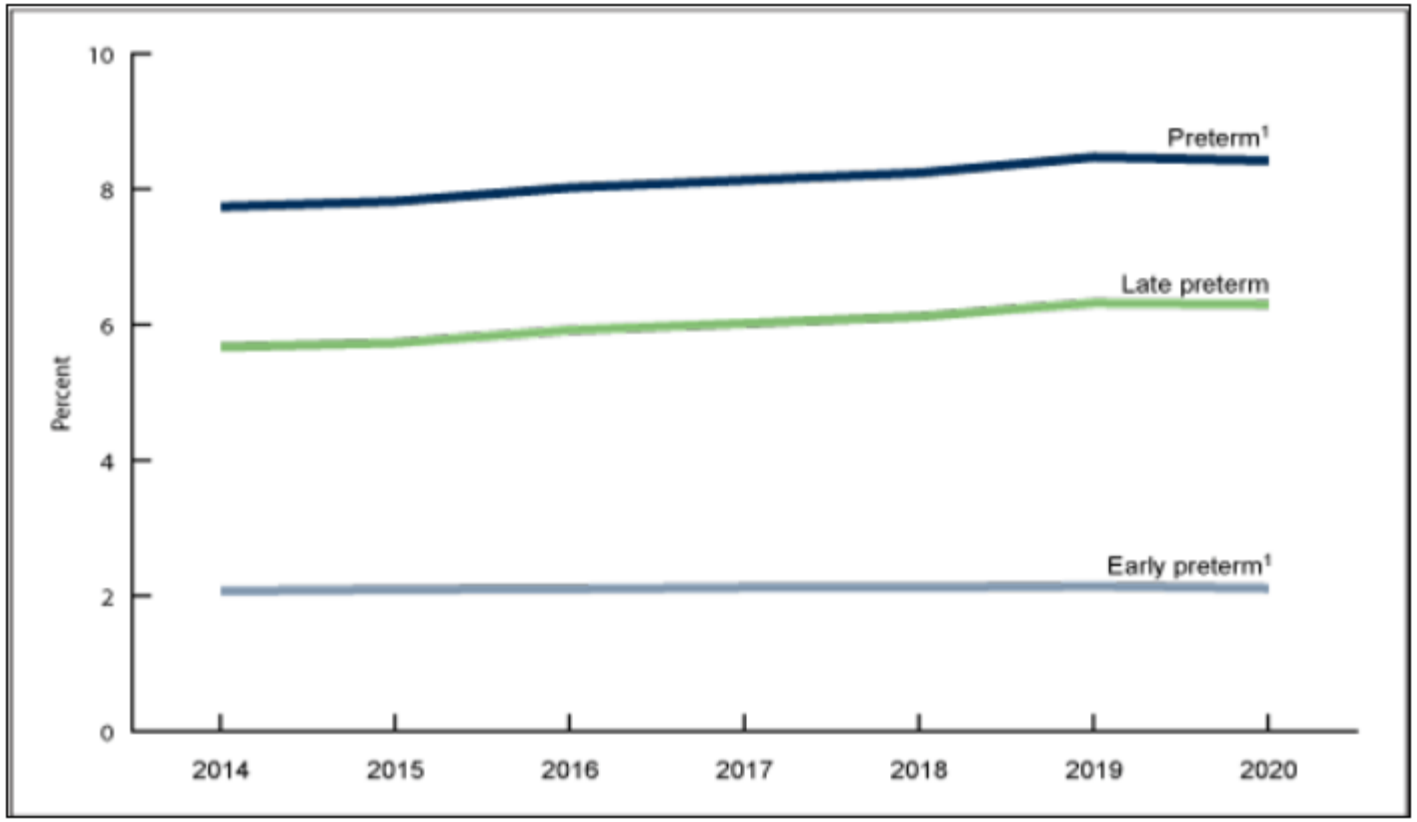
National Institute of Child Health and Human Development (NICHD)

Incidence & Prevalence

- **In the United States:**
  - Premature birth = birth before 37 weeks of pregnancy
  - In 2021, there were 383,979 preterm births in the United States
    - Preterm birth rate of 10.5%
    - 1 in 10 babies is born early

www.marchofdimes.org/mission/prematurity-campaign.aspx

Figure 1. Singleton preterm birth rates: United States, 2014–2020



Martin, J., & Osterman, M. (2022)

Causes of Late Preterm Deliveries

- Maternal age at conception
- Multiples vs. Singleton births
- Inter-relation between Assisted Reproductive Technology (ART) and multiples
- Spontaneous labor, Premature rupture of membranes
- Increasing maternal medical conditions
  - Chronic hypertension, Gestational diabetes
- Placental/uterine conditions
  - Placenta previa, placental accreta/increta/percreta, prior uterine health
- Increased fetal monitoring and surveillance
  - Fetal/congenital anomalies
  - Fetal growth restriction
- Rates of labor induction and cesarean delivery

Verklan M. T. 2009; Ramachandrappa, A. 2009; Engle, W. A. 2007;

Developmental Considerations

The Great Pretenders!

They are treated like term infants due to their size, however their physiologic and metabolic immaturities places them at increased risk for a spectrum of morbidities and mortality when compared to the term infants.

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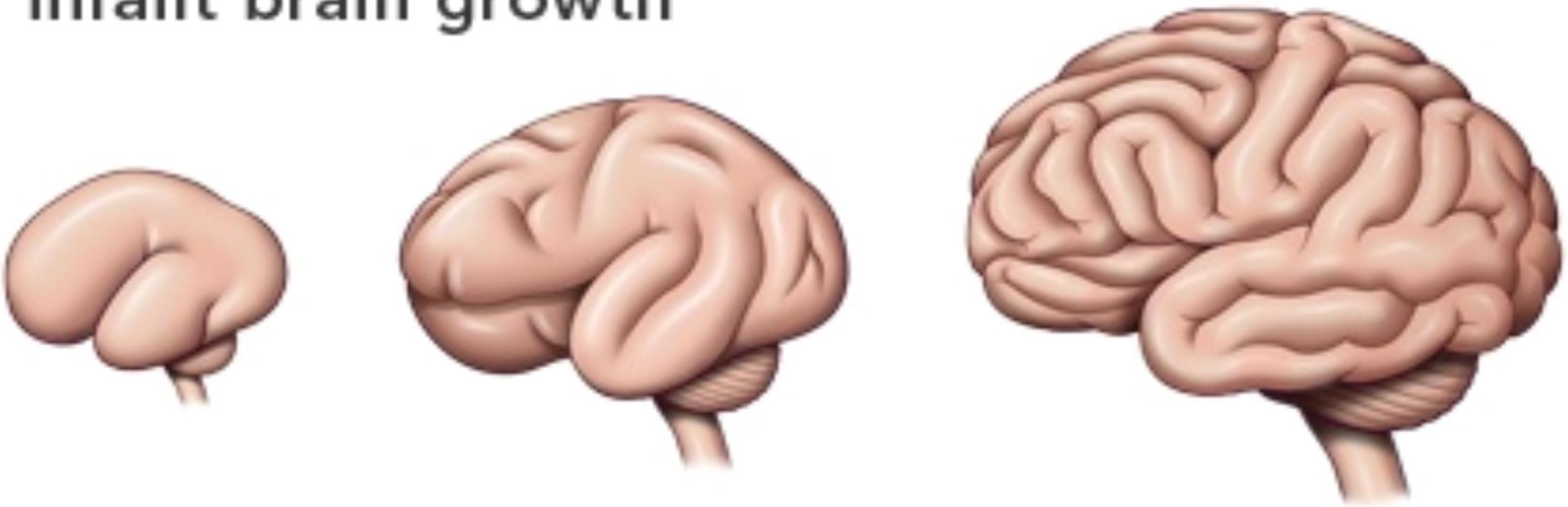
Infant brain growth



20 weeks

35 weeks

40 weeks

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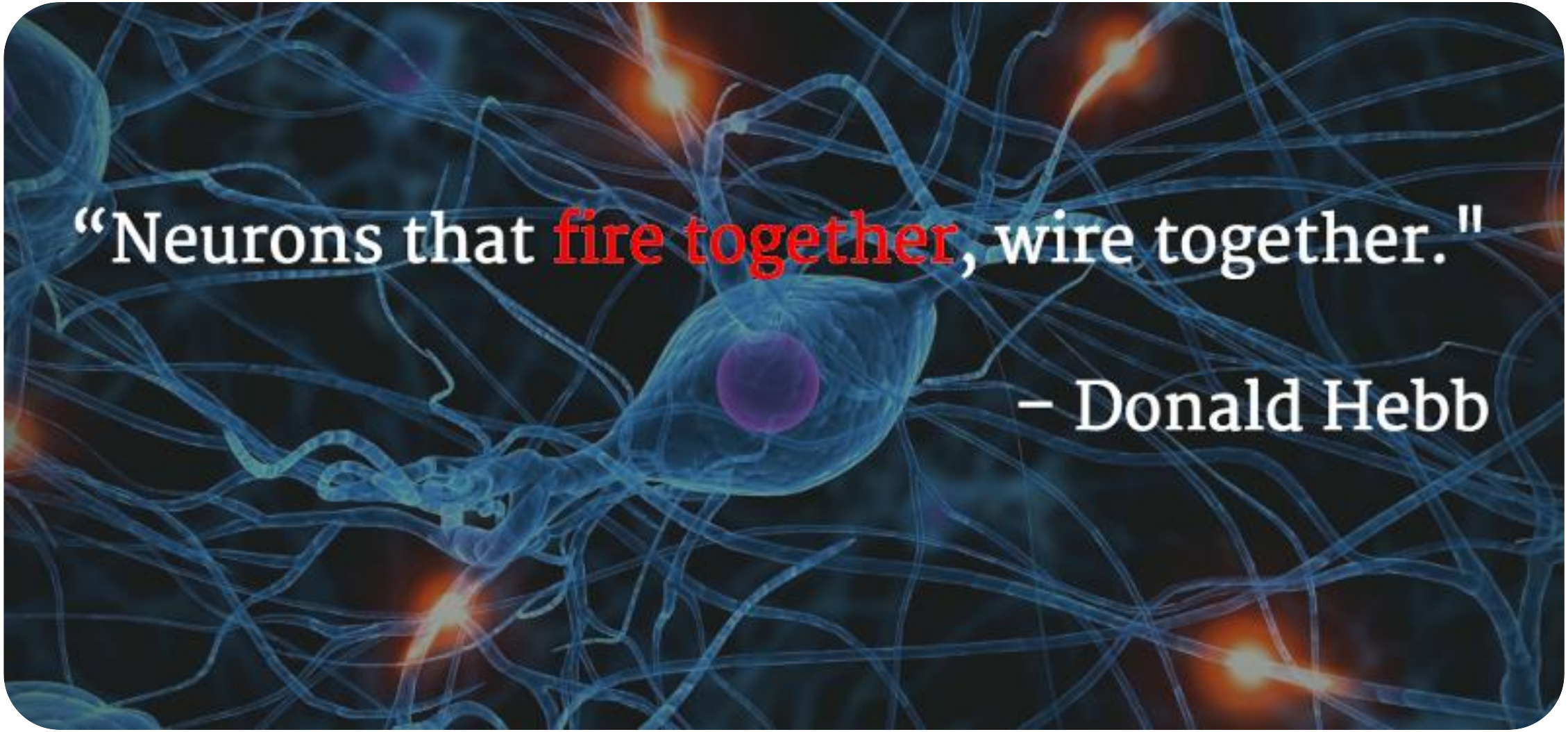
Murray, D. (2015)



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Neonatal Sensory Development

Tactile

Vestibular

Olfactory
Gustatory

Auditory

- **18-35wks**
- alarms, CPAP, delivery room noises, voice

Visual

- **38wks –Term**
- lights, phototherapy

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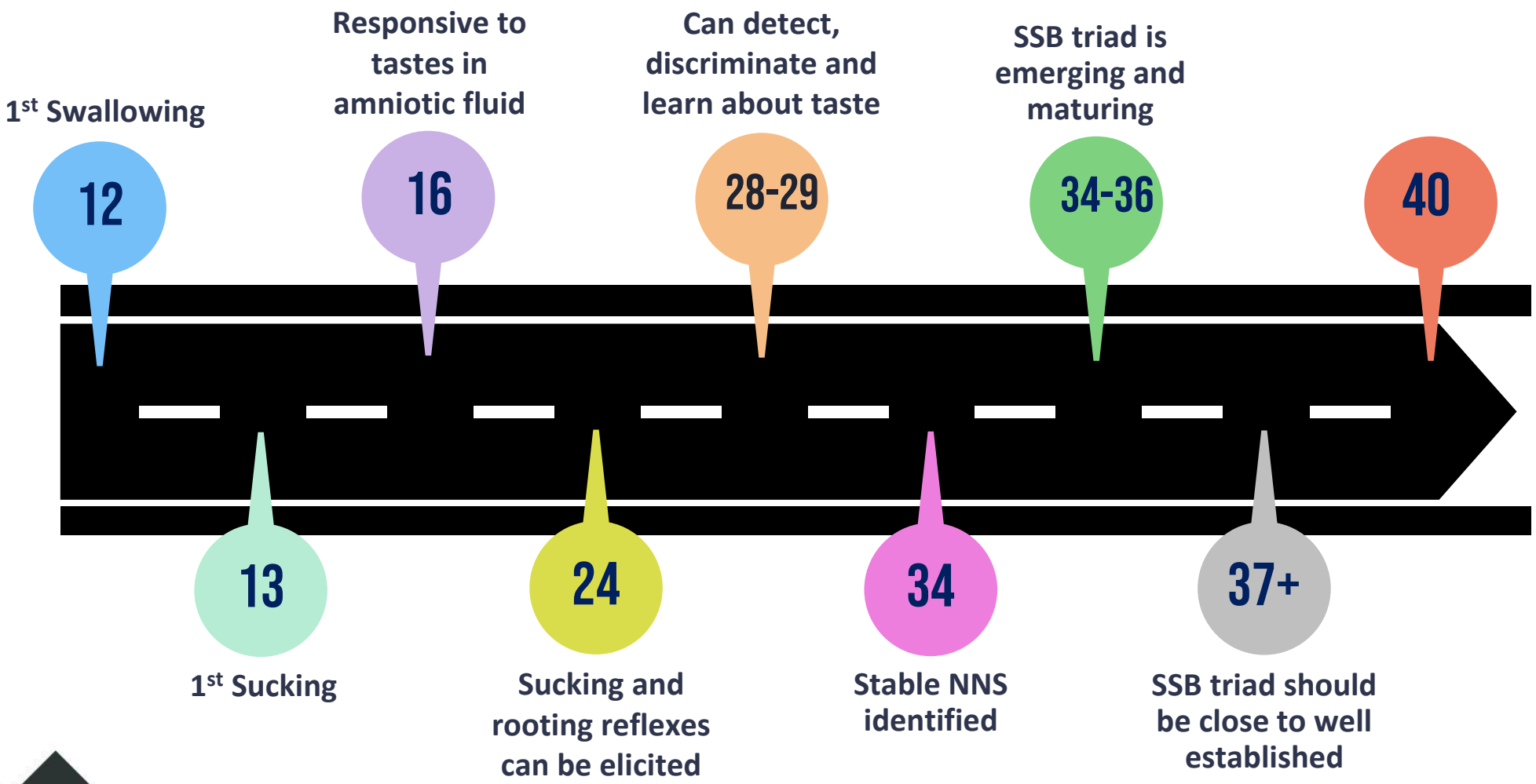
Development of Oral Feeding



Simpson, et all, 2002; Geddes, Kent, Mitoulas & Hartmann, 2008; Graven & Browne, 2008; Browne & Ross, 2011

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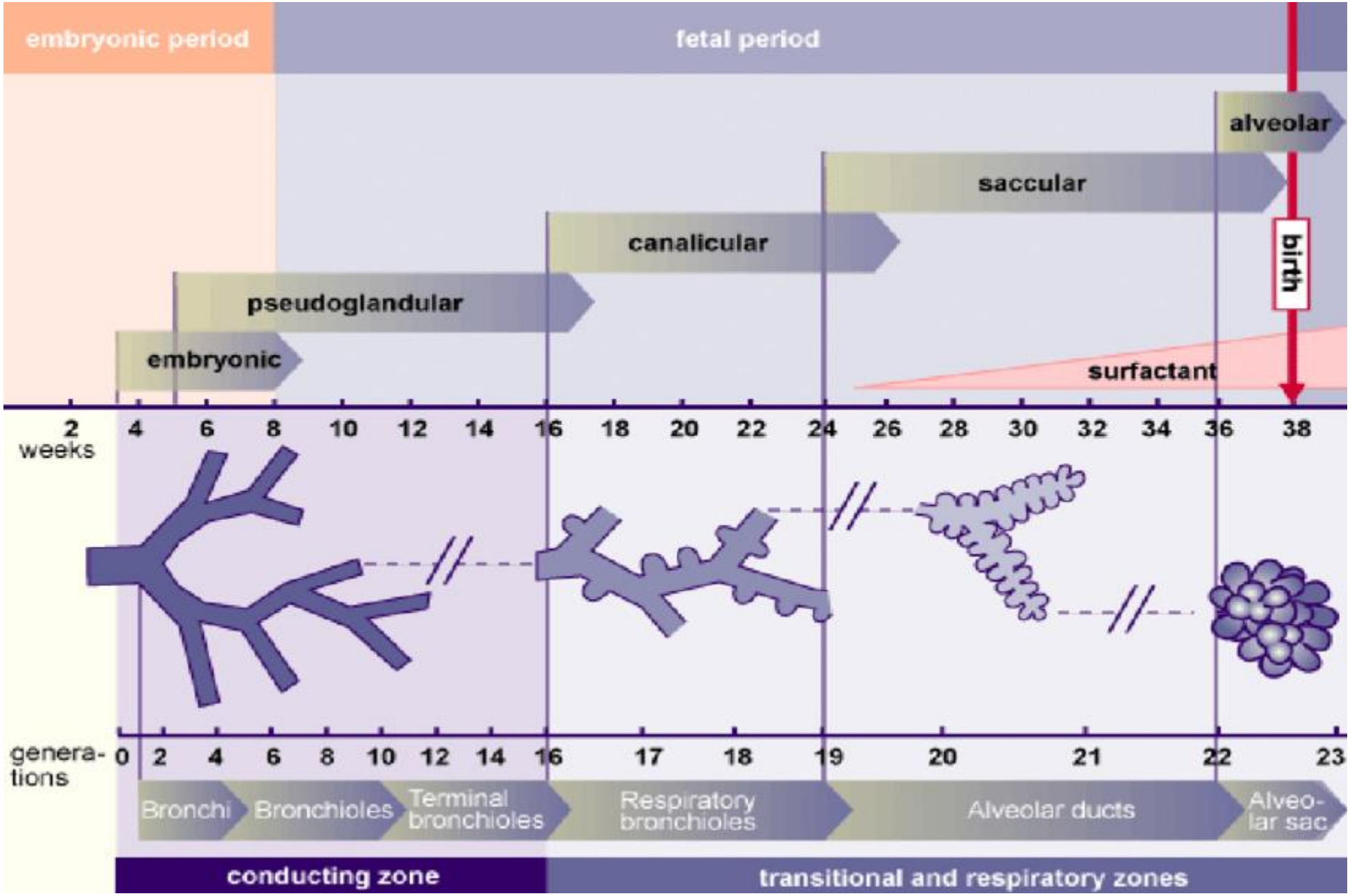
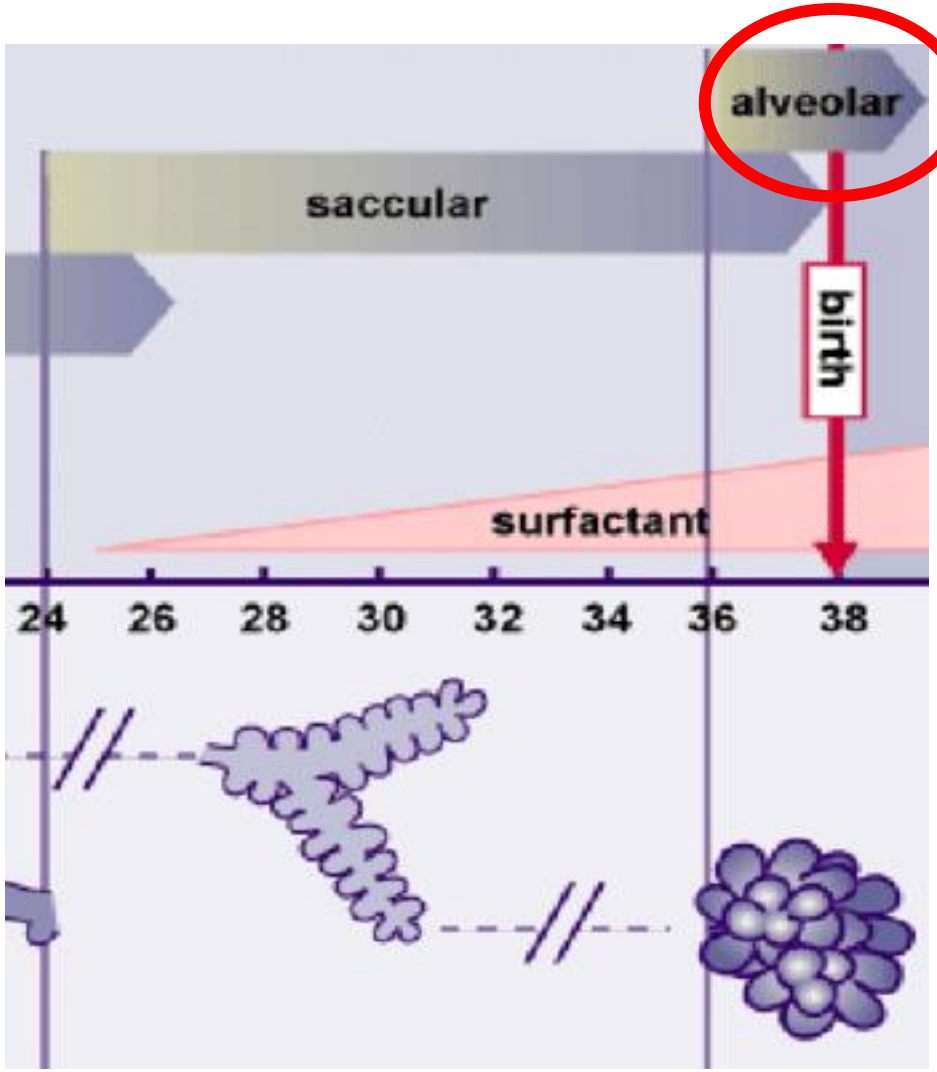


Turunen, Riikka. (2009). Systemic Inflammation in Preterm Infants



Adapted from Turunen, Riikka. 2009

Alveolar phase continues through 8yrs of age

An infant at 32-35wks GA is within the SAME STAGE OF LUNG DEVELOPMENT as an infant at 28-32wks GA

24–35 Weeks Gestational Age

36 Weeks Gestational Age to 3 Years of Age

Adapted from Moore and Persaud 2008

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Developmental Risk Factors

20-year follow-up of late preterm infants with no congenital anomalies

- Higher incidence of
  - Cerebral palsy: Relative risk (RR) 2.7
  - Mental retardation: RR 1.6
  - Significantly increased psychological development problems, behavioral and emotional disturbances, and other major disabilities
- Late preterm compared to term births through kindergarten
  - 36% higher risk for developmental delay or disability
  - 19% higher risk for suspension in kindergarten
- Repeat study controlling for neonatal complications
  - 35-36 week infants with admission to NICU had lower neurocognitive scores
  - Late preterm without complications were similar to term counterparts

Morse SB 2009; Baron IS 2011; McGowan, J. E. 2011

Common Co-morbidities Impacting the Late Preterm and Early Term Infant

The Late Preterm Infant is At Risk For…

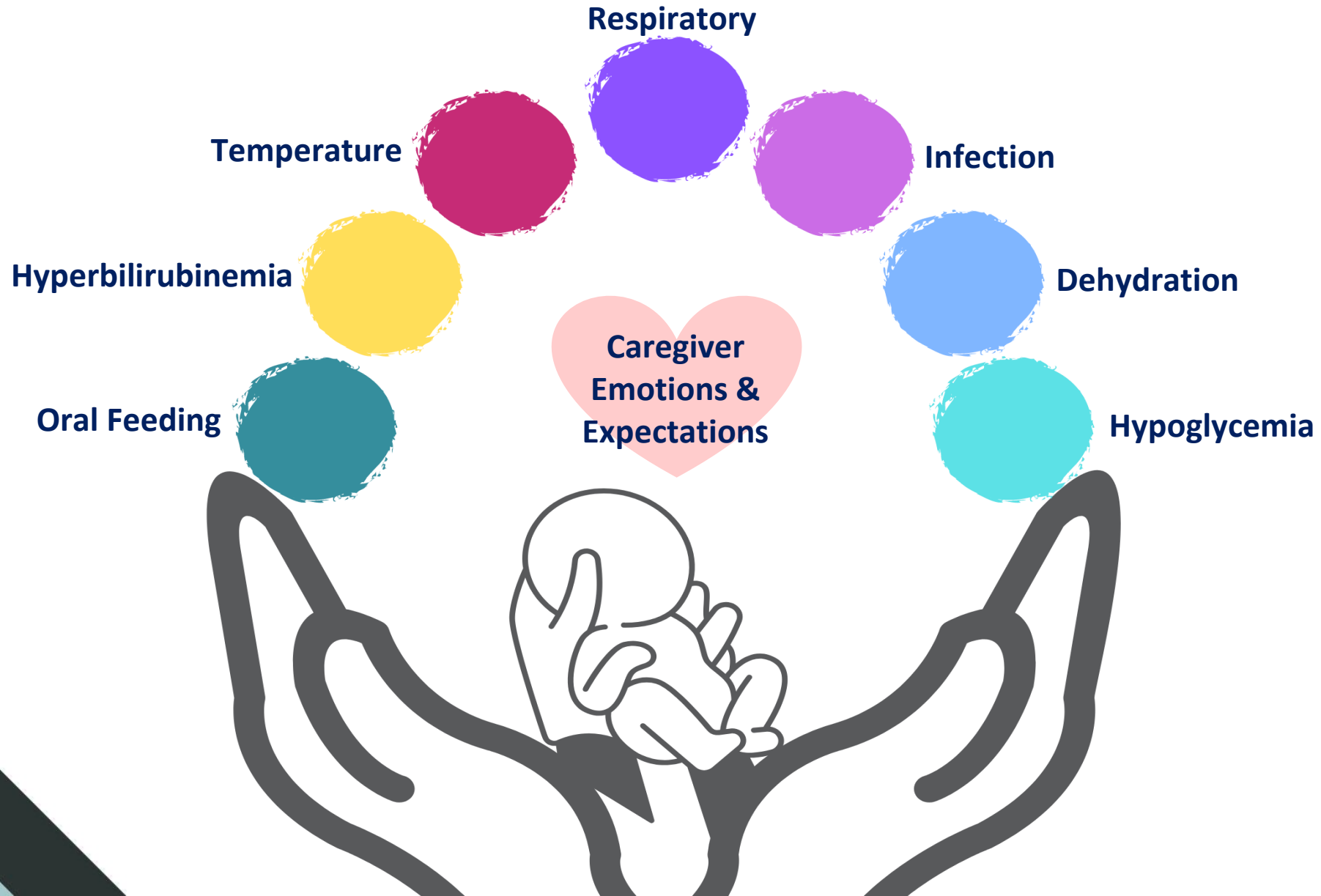


Image by Ramya Kumar

The Snowball Effect

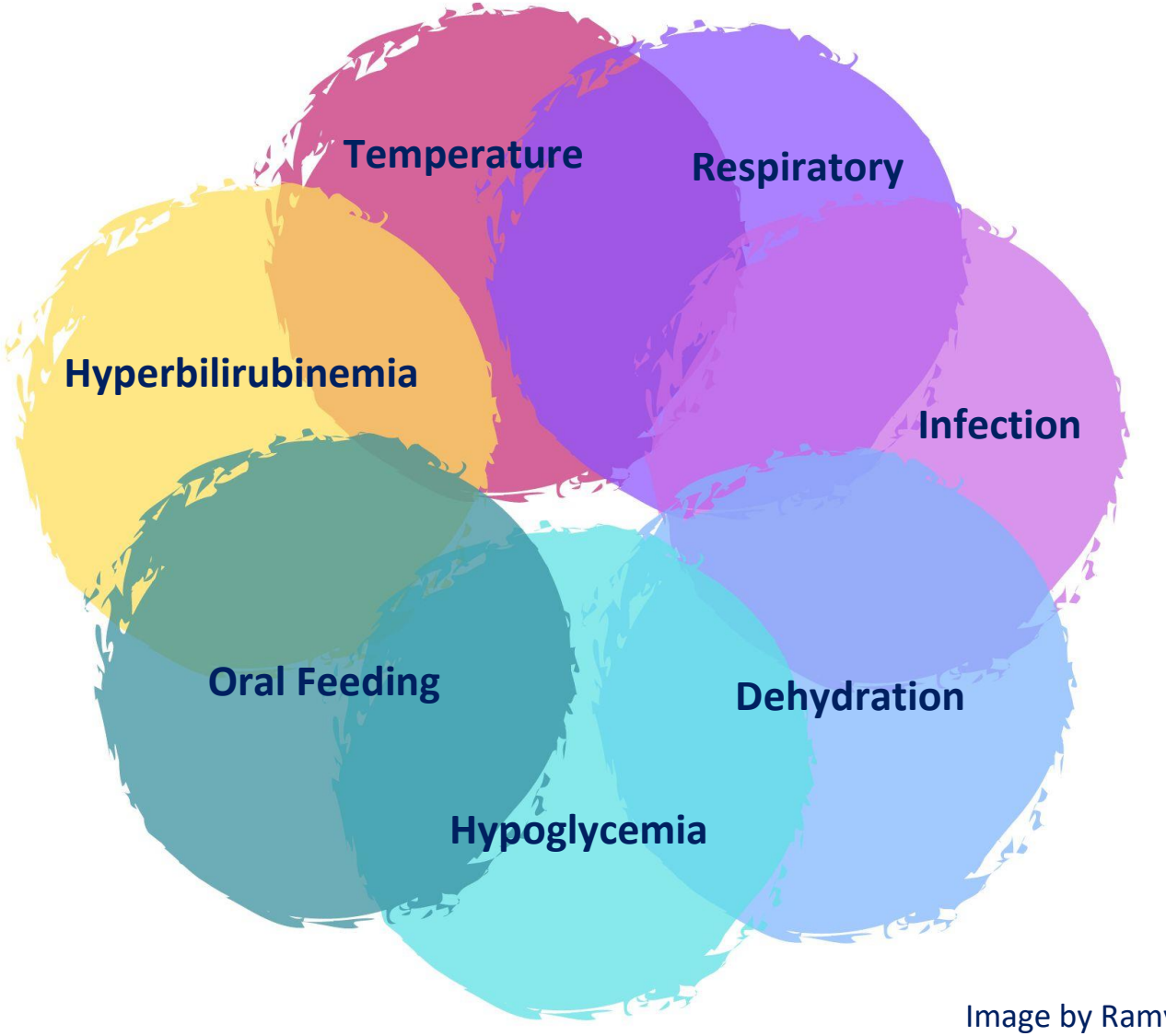
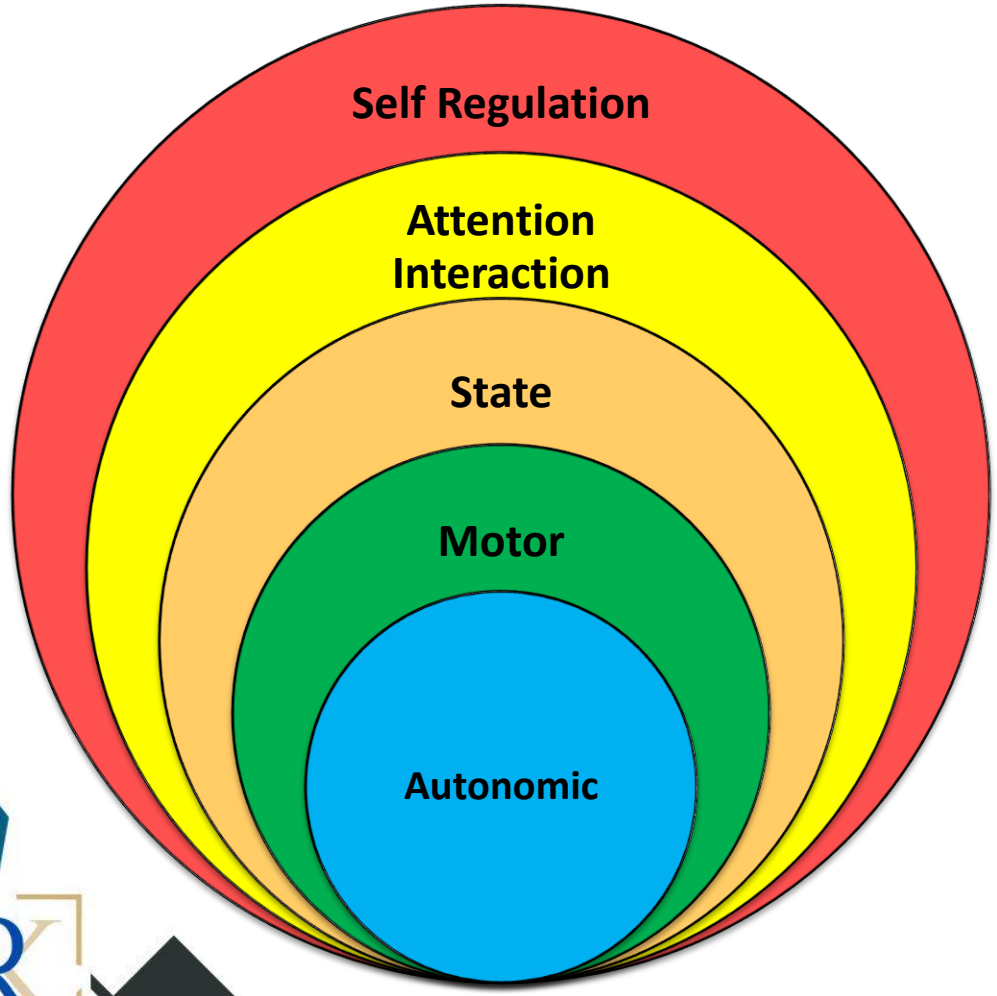
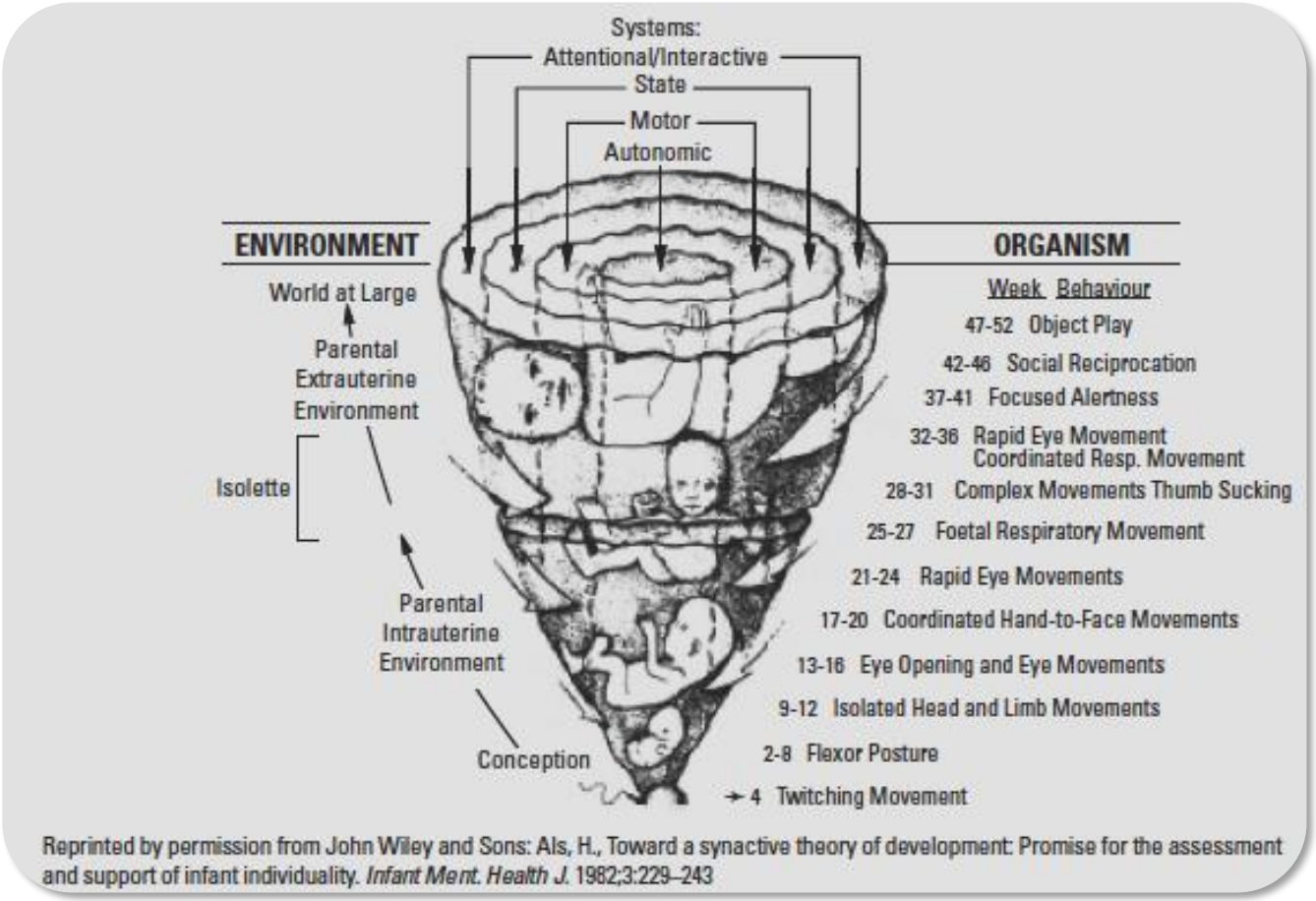


Image by Ramya Kumar

Neuroprotective Strategies to Consider: Synactive Theory of Development





Reprinted by permission from John Wiley and Sons: Als, H., Toward a synactive theory of development: Promise for the assessment and support of infant individuality. *Infant Ment. Health J.* 1982;3:229–243

Als, 1982

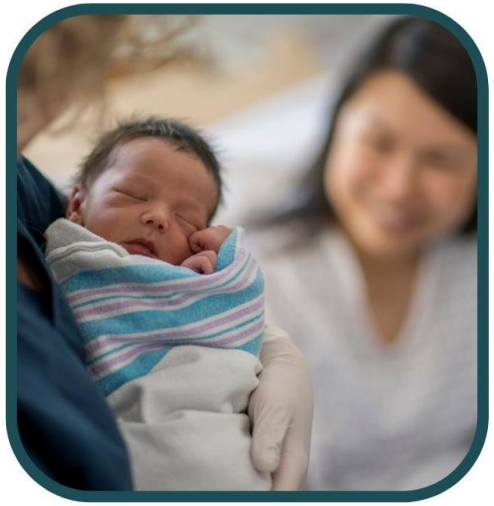
Neuroprotective Strategies to Consider

Skin to Skin

Postural Support, Temperature Conservation

Environmental modification, Decreasing Sensory Input, Protecting Sleep for Energy Conservation

Holding, Containment Purposeful Vestibular Input



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Neuroprotective Strategies to Consider: Swaddled Baths in Couplet Care

Several studies have shown that neonates who received swaddle bathing vs. routine/conventional bathing exhibit:

- Stable temperature and cardio-respiratory parameters
- Improved state regulation and engagement
- Reduced physical and behavioral stress
- Improved ability to feed after the bath

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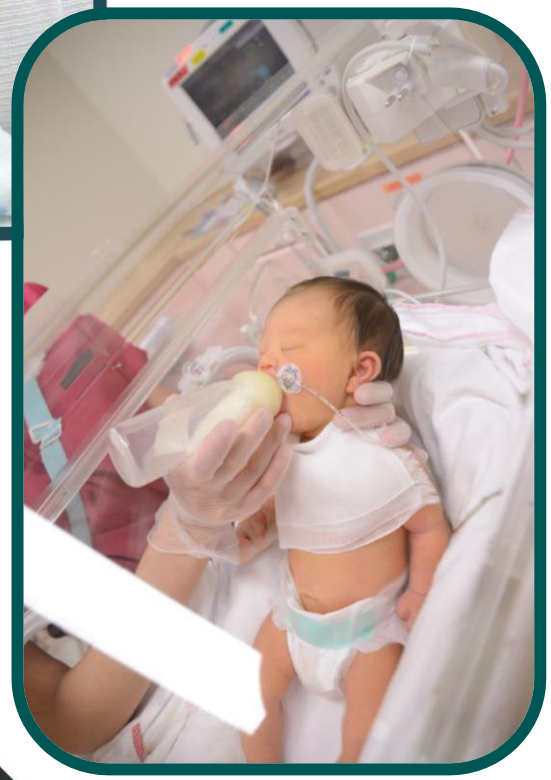
Lee, J., & Lee, Y. 2021; Elsharkawy, A. H. 2022; Rudhiati, F. and Murtiningsih, M. 2022

Neuroprotective Strategies to Consider: Oral Feeding Practices

Feeder Driven
Decreased Postural Support
Poor State Regulation
Exacerbates the LPT cascade



VS

Infant Driven
Increased Postural Support
Appropriate State Regulation

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Neuroprotective Strategies to Consider: Breastfeeding Considerations

- Factors associated with prematurity are also associated with delayed lactogenesis
  - Preterm delivery
  - Diabetes, hypertension of pregnancy
  - C/section delivery

- Oral feeding abilities of the preterm infant
  - Unable to completely empty breast
  - Decreased stimulation for mother's milk production

- Risk of maternal-infant separation due to sepsis evaluations, IV infusions, and phototherapy

Academy of Breastfeeding Medicine Protocol to Support the LPI

- Parent education about cues and arousal
- Advocate for ad lib feedings with minimum of 8 feeds in 24 hours
- Monitor weight loss closely, if >3% in 1 day or >7% in 2-3 days, intervene
- Thorough lactation evaluation
- Consider support through pumping, nipple shields, optimal flange fit etc
- **Vigilant observation and support of the dyad by lactation specialists**

Meier et al., 2007; Hallowell & Spatz, 2012; Raju et al., 2006

Discharge Readiness & Follow-Up

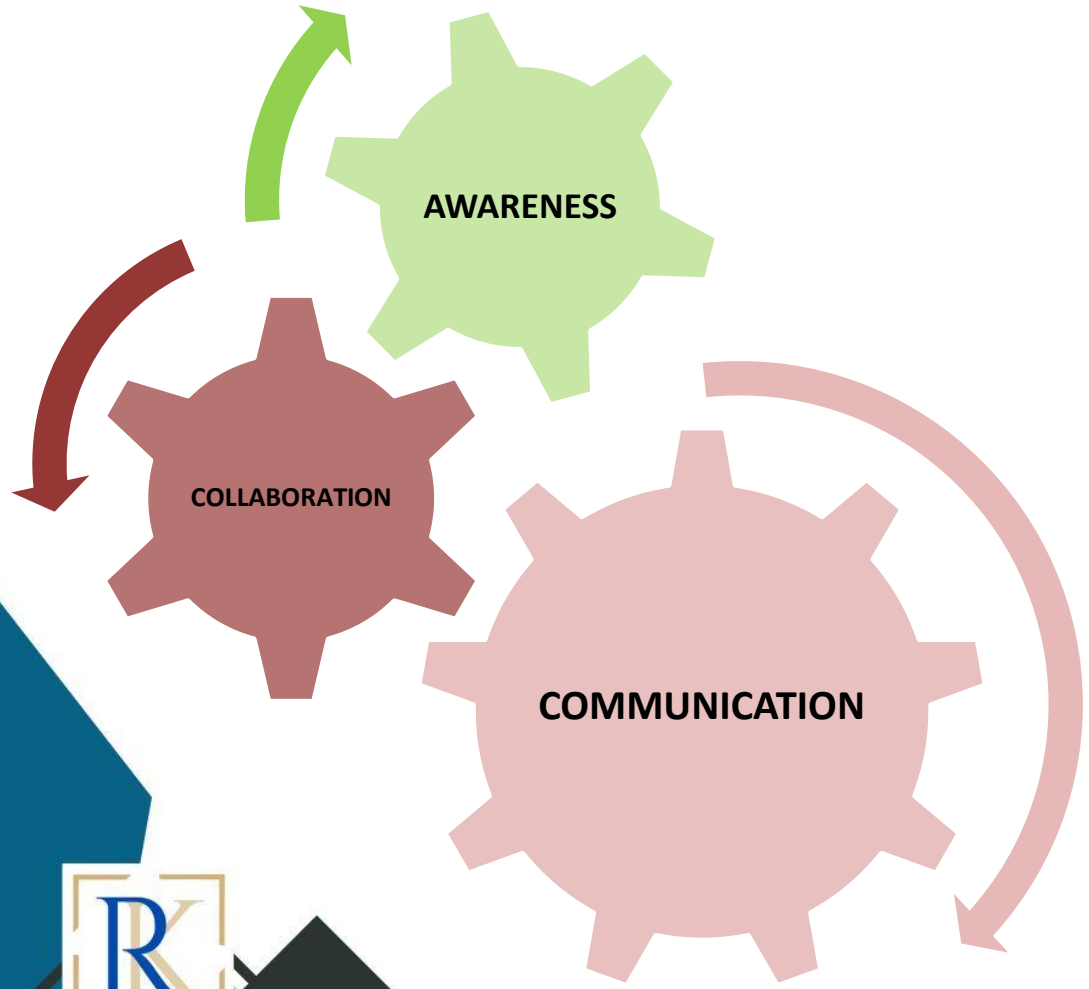
- Among newborns discharged early after vaginal delivery, **late preterm infants were 1.5 times more likely than term infants to require subsequent hospital-related care** and nearly twice as likely to be readmitted to a hospital in the first 28 days of life

- A large Kaiser cohort in 1998-2000 showed that **readmission occurred in 4.4% of LPIs compared to 2.0% of term infants**; 26% of the time this was due to poor feeding
  - Other factors are jaundice and/or dehydration

- The AAP published newborn discharge criteria in 1995 and 2004, and a clinical report regarding LPI care in 2007. However, a subsequent study found that **40% of vaginally born LPIs are still discharged early, before 48 hours of age**, in contradiction to the guidelines("Hospital stay for healthy term newborns," 2004)

Escobar et al., 2005; Tomashek KM et al.,2006; Engle et al., 2007; Goyal, N. K. 2011

Collaboration and Support Across the Care Team



- Availability of a pediatric therapy team
- Collaboration with nursing & medical team on mother-baby units
- Support through in-services, huddles, discharge resources
- Manageable referral criteria
- Building connections with lactation staff on mother-baby units
- Access to/Knowledge of policies related to the late preterm infant
- NPA resource
- Awareness of how recommendations impact workflow
- **Bite-sized changes**

Collaboration and Support Across the Care Team

	HEALTHCARE TEAM	FAMILY EDUCATION*
	glucose is still low or infant is unable to adequately feed, provide IV glucose and consult with next-level perinatal care provider about transferring infant to higher level of care.	
Reducing Risks of Feeding Difficulties References: 7, 12, 22, 23	• Identify maternal risk factors that may affect successful breastfeeding: » Multiple gestation. » Diabetes. » Pregnancy-induced hypertension. » Chorioamnionitis. » Cesarean delivery. • Provide assistance as needed to ensure adequate feeding frequency, at least 10–12 breastfeedings or 8–10 formula feedings per day. • Maintain nursing staff lactation competencies consistent with scope of practice and responsibilities. • Provide a dedicated lactation consultant, ideally an International Board Certified Lactation Consultant (IBCLC), whenever possible. • Provide (or refer to) a feeding specialist (occupational or physical therapist or speech/language pathologist) to evaluate infants with persistent feeding difficulties. • Adopt the Baby Friendly Hospital Initiative's Ten Steps to Successful Breastfeeding whenever possible (www.babyfriendlyusa.org/eng/10steps.html).	• Explain LPI's increased risk for inadequate feeding: » Immature suck/swallow/breathe coordination. » Inadequate breastmilk transfer due to low muscle t ineffective latch, and decreased stamina. » Low milk supply due to inadequate breast emptying. • Stress the value to mother and baby of exclusive breas feeding. » Explain the value of colostrum in providing immune protection and nutrition. » Reassure mothers small amounts of colostrum are usually adequate in the few days if baby is feeding frequently enough. • Teach how to recognize early feeding cues: » Opening » Moving head back and forth. » Opening mouth, ton thrusting, rooting, or sucking on hands/fingers. » Cryin (a late hunger cue often leading to difficulty with latch to infant frustration). • Explain the probable need to awaken infant for feeds d LPI's immature brain and increased sleepiness. » Infant transition to full cue-based feeds when closer to term gestational age. • Encourage mothers to ask for assistance as needed wit breastfeeding or formula feeding.
First Breastfeeding References: 7, 12, 24	• Assess mother's desire to breastfeed as well as her knowledge and level of experience. • Facilitate immediate, uninterrupted, and extended skin-to-skin contact for stable infants until after the first breastfeeding (usually within first 1–2 h).	• Remind mother that babies are born to breastfeed. » Review benefits of breastfeeding for baby: decreased risk of infection, diarrheal illness, Sudden Infant Death Syndrome (SIDS), and obesity. » Review benefits for mother: decreased risk of breast cancer, ovarian cancer, and osteoporosis. » Review risks of formula feeding, e.g., increased risk of infection due to increased gastric pH and change in gut flora, risk of cow protein allergy, increased risk of SIDS (www.health-e-learning.com/articles/JustOneBottle.pdf). • Explain reasons for formula use if formula is medically indicated. • Explain the importance of early and prolonged skin-to-skin contact: » Promote optimal physiological stability. » Facilitate the first breastfeeding.
Continued Breastfeeding References: 25, 26	• Monitor and document breastfeeding frequency. • A healthcare professional with appropriate education and experience in lactation support, such as a RN, midwife and/or certified lactation consultant, should assess breastfeeding at least twice per day by evaluating: » Coordination of suck, swallow, and breathing. » Mother's breastfeeding position and comfort. » Baby's latch and milk transfer. » Mother's questions regarding breastfeeding. • Consider use of ultrathin silicone nipple shield if infant has ineffective latch or milk transfer. » Use of shield requires close follow-up by knowledgeable healthcare professional. • Assess mother's level of fatigue and coping. • Refer mother to a qualified lactation specialist if feeding difficulties persist.	• Provide written and verbal information about breastfeeding and ensure mother's understanding. • Stress the importance of frequent breastfeedings, at least 10–12 times every 24 h, waking baby if necessary, and encourage recognition of and response to early feeding cues. • Educate about the size of a newborn's stomach and the adequacy of frequent, small-volume feedings of colostrum. » Use the phrase "when your milk supply increases" rather than "when your milk comes in" to avoid implying that no milk is present during the colostrum phase. • Stress the value of exclusive breastfeeding. • Encourage mother to ask for assistance if needed.
Monitoring Breastfeeding Success References: 25	• Monitor weight daily, ideally when the baby is unclothed (taking care to maintain a neutral thermal environment). » Weight loss of more than 3% per day or 7% by day 3 merits further evaluation and close monitoring. • Document voiding and stool patterns.	• Explain importance of tracking voids and stools to determine adequate feeding intake: » 3 voids and 3 stools by day 3. » 4 voids and 4 stools by day 4. » 6 voids and 4 stools by day 6 and thereafter.
Parent-Infant Bonding References: 77	• Assess family, home, and social risk factors that may affect bonding. • Assess maternal health and parents' ability to cope with challenges of newborn care and monitoring that can affect healthy bonding. • Assess signs of bonding and attachment: » Infant's ability to demonstrate cues. » Parents' ability to recognize and respond appropriately to infant's cues.	• Review parents' understanding of infant cues. • Encourage skin-to-skin contact of LPI with both parents. • Encourage parents to verbalize feelings about caring for their LPI and challenges they face that may affect healthy bonding and attachment.

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Phillips, R. M., et al (2013). Multidisciplinary guidelines for the care of late preterm infants.

Collaboration and Support Across the Care Team

	HEALTHCARE TEAM	FAMILY EDUCATION*
Developmental Care References: 45, 46, 47, 48, 49	• Assess parents' understanding about developmental care of preterm/LPI. • Model recognition of and sensitivity to infant's behavioral cues.	• Explain the differences between corrected gestational age (GA) and chronological age. » Developmental milestone expectations are based on corrected GA rather than chronological age. • Stress importance of close monitoring of corrected GA developmental milestones by primary care provider. • Provide written and verbal education about developmental care of preterms (including LPI): » Need for protection from overstimulation. » Need for positional support if low muscle tone. » Normal sleep/wake cycles and need for extra sleep. • Teach signs (behavioral cues) of stress and overstimulation, including: » Limb extension, finger or toe splaying. » Twitches or startles. » Arching or limpness. » Facial grimace or scowl. » Abrupt color changes. » Irregular breathing. » Gaze aversion. » Crying. • Teach signs of relaxation and readiness for engagement, including: » Limb flexion, relaxed fingers and toes. » Smooth movements. » Rounded, flexed trunk and back. » Relaxed face and mouth. » Normal color. » Regular breathing. » Eyes open and engaged. » Quiet-alert state. • Stress the importance of skin-to-skin holding for optimal brain development.

SCREENING		
Sensory Screening References: 105, 106, 107, 108	• Evaluate for sensory impairments, including hearing, sight, and sensory integration. • Follow-up brainstem auditory evoked response (BAER) results if referral had been made. • Monitor for syndrome of auditory neuropathy/auditory dyssynchrony (normal otoacoustic emission (OAE) with abnormal auditory brain response (ABR)).	• Provide education about increased risk for sensory impairments: » Hearing impairment or deafness. » Visual impairment or blindness. » Disorders of sensory integration. » Auditory and visual processing delay. • Stress importance of hearing or vision follow-up. » Review date, time, and location of follow-up appointments. • Stress importance of alerting primary care provider of any concerns about hearing, vision, or speech.
Developmental Screening References: 2, 4, 10, 47, 75, 77, 85, 106, 109, 110, 111, 112, 113, 114, 115, 116	• Perform regular developmental screening using valid and reliable assessment tools, such as: » Modified Checklist for Autism in Toddlers (MCHAT). » American Academy of Pediatrics' (AAP) Bright Futures, including Pediatric Symptom Checklist (ages 4 years and up). » Brief Infant Toddler Social Emotional Assessment (BITSEA), for age 12–36 months; parent can fill out in 7–10 min • See the AAP's websites for more tools (www.medicalhomeinfo.org) and (www.aap.org/sections/dbpeds). • Make referrals as indicated.	• Teach about LPI's increased risk for developmental delays: » Psychomotor delay. » Cerebral palsy. » Cognitive delay. » Delay in school readiness. » Increased need for special educational services. » Increased disability (74% of total disability associated with preterm birth). • Stress importance of developmental follow-up. » Review date, time, and location of follow-up appointments.
Behavioral Screening References: 77, 86, 106	• Ask parents about any signs of behavioral or emotional disturbances in toddler or child. • Assess family's support system and coping abilities. • Make referrals as indicated.	• Educate about LPI's increased risk for behavioral and emotional disturbances: » Attention disorders. » Hyperactivity. » Internalizing behaviors. » Autism. » Schizophrenia. • Stress importance of alerting primary care provider regarding abnormal behaviors.
Maternal Screening References: 36, 37, 38, 39, 40, 41, 42	• Review ingestion of illicit and prescription drugs or other substances during pregnancy and refer mother to drug or alcohol rehabilitation program, if indicated. • Review use of prescription or herbal medications or supplements of concern, if identified. • Review smoking history (present or past use). » Refer family members who smoke to smoking	• Provide referrals to smoking cessation, drug or alcohol treatment, psychiatric, or support services, if indicated. • Explain risks of secondhand smoke exposure. » Stress importance of providing a smoke-free environment for all infants and children, especially those born prematurely. » Secondhand smoke exposure is associated with apnea, Sudden Infant

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Phillips, R. M., et al (2013). Multidisciplinary guidelines for the care of late preterm infants.

Take Home Considerations

- Healthy late preterm infants face a high risk for developmental delay and school-related problems through the first 5 years of life.
- Lung development does not stop at 34wks or at 37wks
- 50% of the cortical volume is laid in the last 6wks of gestation. The brain is experience dependent and the LPI has an immature nervous system.
- The preterm infant is more dependent, than the full term infant, on its environment to help support and maintain balanced equilibrium.
- Neuroprotective strategies used in the NICU can be generalized to mother-baby units
- Collaboration with staff in mother-baby units with a special focus on lactation specialists is a critical component in supporting the LPI
- Neonatal therapy teams can play a vital role in supporting the LPI and subsequent developmental outcomes after discharge.

RAMYA KUMAR

“I would much rather take care of a 23weeker than a 36weeker…

The late preterm infant is just so unpredictable and hides under the guise of looking and acting older…until they don’t!”

Frequently mentioned by the care team

RAMYA KUMAR

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