Developmental Feeding Considerations for Acute and Critical Neonatal Care

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Disclosure Statement

• I do not have any conflict of interest nor will I be discussing any off-label product use.
• This class has no commercial support or sponsorship, nor is it co-sponsored.
Objectives:

• Learners will be able to describe components of safe and effective oral feeding.

• Learners will be able to develop strategies to improve oral feeding competency in NICU infants.

• Learners will be able to identify disengagement cues during feeding.
Seattle Children’s Hospital
OT/PT Infant Team
Feeding

• Most challenging task required of an infant in the NICU
• Feeding involves a *dynamic relationship* between infant and caregiver
• Early feeding experiences lay the foundation for future feeding skills and can impact the parent-infant bond
Three NICU babies
Three different paths of feeding

- Lauren: 30 weeks, minimal respiratory support, mom desires to breastfeed.
- Sofia: 31 weeks, emergency c-section, ventilatory support, VP shunt placed
- Arjun: 36 6/7 weeks, twin, minimal medical intervention, NICU re-admission
Lauren

- 30 week premature infant
- Born via vaginal delivery due to premature rupture of membranes
- Needed CPAP briefly after birth, transitioned to room air within 2 days
- Caffeine for apnea of prematurity, stopped at 34 weeks
- Parents have 2 year old twins who were born at 34 weeks
- Mom desires to breastfeed
Positive pre-feeding experiences

- Reduce negative medical interventions around face and mouth
- Elicit the rooting reflex (starting at 28 weeks) prior to entering the baby’s mouth for cares
- Use as little tape on the face as possible
- Transition from an OG to NG as soon as medically appropriate
- Allow infants to explore hands to face and mouth
- Opportunities for infants to smell mother’s milk
  - Improved transition to feeding (Yildiz, 2011)
Positive pre-feeding experiences

- Skin to skin with mom and opportunities to practice latching at the breast.

- Gentle oral care - using breastmilk whenever possible
  - Improved sucking skills, feeding interest (Rodriguez 2010)

- Oral motor/sensory intervention - positive touch to face/cheeks/lips, input to gums.

- Non-nutritive sucking using correct pacifier size
  - Shorter LOS; faster transition to full oral (Pimenta 2008, Foster 2016, Fields 1982)
Thoughtful First feedings

• Ideal Scenario:
  • Infant at least 32-34 weeks, depending on clinical status and cueing to feed.
  • If mother is intending to breastfeed, exclusive breastfeeding opportunities for at least 3 days.
  • Parents involved in decision to start
  • Parents at bedside to *participate if possible*
  • Either feeding therapist present OR the nurse is freed up to allow more time to devote to the session.
  • Set expectations appropriately, remember the goal is a positive practice experience NOT a volume goal.
Supporting breastfeeding in the NICU

• Most NICUs are striving to improve their rates of breastfeeding at discharge
• It’s important to include breastfeeding in each stage of oral feeding progression
• Power of language for negative influence
  • It’s easier for the baby to bottle feed
  • It is safer for us to know exactly how much he’s eating
  • If you want to leave here quicker, we can focus on bottle feeding
  • The scale shows he only took 2 mL…
Supporting breastfeeding in the NICU

- Careful positioning becomes even more important for small babies
- Tips for breastfeeding small babies
  - Ensure mom is in a well supported position
  - Remove barriers between mom and baby
  - Cross cradle hold works nicely, “tuck” infant under mom’s opposite breast
  - Have infant “hug” breast they are feeding from
  - Appropriate breast shaping in a “U” position
  - Mom’s input is using her wrist against infant’s shoulders
Lauren’s feeding progression

- 30-33 weeks: Regular skin to skin time, room air
- 33 weeks: Began latching to a recently pumped breast
- 34 weeks:
  - PO feedings per cues
  - Latching to a more full breast
  - Started practicing with Dr. Brown bottle with Preemie nipple.
- Prioritized breastfeeding for at least 3 feedings per day. If energy for more feedings, bottle was used.
- 37 3/7 weeks: D/C, breastfeeding ad lib and 4 bottles per day of fortified breastmilk.
Sofia

- 31 week premature infant, emergency c-section due to placental abruption
- Transferred to higher level care for ventilatory support and treatment for Group B strep sepsis, treated with 21 days of ampicillin
- Progressive increase in ventricular size and head circumference. VP shunt placed at 35 weeks
- Cranial ultrasound revealed Grade III, IV bleeds
- No oral interest or sucking skills observed between 35-37 weeks
- Mom not interested in breastfeeding.
Effective Infant Feeding

Wolf, Glass 1992
Coordination of S/S/B

- Breathing should occur at regular intervals during sucking (after every 1-2 sucks)
- Swallowing momentarily interrupts breathing
- Breathing rate is faster during pauses
  - Wolf, Glass 1992
Problems with Coordination of S/S/B
(Wolf, Glass 1992)

• Feeding induced apnea

• Short sucking bursts
Sofia: Feeding evaluation at 36 6/7 weeks

- Optimize feeding conditions:
  - Bottle/nipple choice
  - Feeding position
  - Pacing
Impact of Flow on Feeding

• The higher the flow, the more challenge to the SSB mechanism
• Increased likelihood of physiologic compromise, which leads to increased fatigue
• High flow puts an infant at risk for aspiration, even if swallow integrity is normal
• Low flow allows much more time for breathing and feeding in a comfortable manner
Common flow rates in our hospital

SLOWEST

- Binky trainer (can be used this way if needed)
- ULTRA Preemie nipple on Dr. Brown bottle system
- Preemie nipple on Dr. Brown bottle system
- Level 1 nipple on Dr. Brown bottle system
- Yellow Similac disposable nipple (variance in flow rate)
- Dr. Brown Level 2, 3, 4

FASTEST
Sidelying position for feeding

• Excellent position for young infants
• Sidelying provides good postural support/stability for an infant
• Consider partial swaddle
• Slows down the flow rate from the bottle
Feeding Position
Horizontal Bottle Position

**NO** – Gravity increases flow rate

**YES** – Gravity effect is minimal
Feeding In Upright with Horizontal Bottle Position

• Amount of support needed depends on head control, maturation, and general medical condition
  • To optimize feeding, want to give as much postural support as possible.
  • Less postural support may help keep baby awake, but carefully weigh cost and benefit.
Pacing

• Allows sufficient opportunity and time to breathe during feeding by interrupting the flow
  • For feeding induced apnea, stop flow after 2-3 sucks
  • For insufficient ventilatory support, stop flow after 5-10 sucks
Pacing

- Simple technique that can greatly improve the quality and comfort of an infant’s feeding
- Goal is to MAINTAIN physiologic stability rather than respond to distress
- Provides the neurobehavioral practice that facilitates development of mature skills
Pacing as a treatment technique for transitional sucking patterns

• First 18 infants were traditionally fed. Once discharged, nursing staff completed CE on paced feedings. Next 18 infants were given paced feedings.
• Demonstrated statistically and clinically significant decrease in bradycardic incidences during feeding and improved sucking efficiency.
Sofia’s feeding evaluation at 36 6/7 weeks

- Demonstrated improved interest and more organized sucking ability.
- Used ULTRA Preemie nipple, fed in elevated sidelying with VERY careful pacing due to feeding induced apnea.
- Took 13 mL with normal physiologic responses
- Plan: 10 mL 3-4x/day, ULTRA Preemie nipple, sidelying and pacing
Sofia’s feeding progression

• 37 2/7 weeks: feedings were going *OK*, but with occasional brady/desats. Trialed chilled liquids, with improved timing overall.
  • Feeding plan advanced to 20 mL 5x/day until she can do so without desats or bradys.
• Cold liquids have been shown to improve swallowing safety in pilot study. (Ferrara, 2018)
• The occurrence of deep penetration and aspiration decreased significantly with cold liquids compared to the room temperature liquids.
Cold liquids

Fig. 1 Comparative line graph of aspiration events (%) in the RTS versus the CS condition. The solid lines represent each of the nine participants’ percentage of aspiration from one condition to the other. The dashed line represents the mean percentage of aspiration for all nine participants, revealing a decreased frequency of aspiration events from the RTS condition to the CS condition.

Ferrara, 2018
Sofia feeding progression

- **37 6/7 weeks**
  - Advanced to PO 20 minutes per cues
  - Chilled liquid, ULTRA Preemie, pacing

- **38 1/7 weeks**
  - Advanced to Preemie nipple.
  - Taking 10-45 mL of 67 mL bolus feeding

- **39 6/7 weeks**
  - Tried to advance to cradle position coughing
  - Tried to reduce pacing coughing.
  - Advanced time limit to 30 minutes
  - Preemie, sidelying, chilled, consistent pacing.
Sofia feeding progression

- **41 2/7 weeks:**
  - Preparing to discharge
  - Full oral feeding with Preemie nipple, sidelying, chilled, pacing
  - Some nurses trialed Level 1 coughing
  - Education to father on feeding techniques
  - Plan for a VFSS outpatient at 44 weeks
Role of the Videofluoroscopic Swallow Study (VFSS)

- Evaluate safety of the pharyngeal swallow
- Can trial various treatment techniques
- Thoughtful timing of VFSS is crucial
  - What question do you want answered?
  - How will it change recommendations?
  - Need to be able to take a minimum
  - Not recommended for infants under 40 weeks

- Limitations:
  - Moment in time
  - Not designed to assess reflux or ascending aspiration
Sofia’s VFSS

- Done at 43 6/7 weeks as an outpatient
- Began test in upright position, with the intention of moving to sidelying if needed
- Used Preemie nipple
- Good participation
- Mom was primary feeder
Sofia’s VFSS

• Fatigue related changes in swallowing
• The bolus with room temperature liquid quickly moves down to the pyriform sinuses, putting her at risk for aspiration.
• Improved swallowing safety with chilled liquid.
• Able to maintain safe swallow through entire feeding volume using chilled liquid.
Sofia’s growth
Sofia’s growth and update

- Mom reports that feeding is going very well at home. Sofia enjoys eating and there is little to no stress surrounding feeding times.
- Sofia takes about 80 mL every 2-4 hours (8 feedings per day).
- Mom says cold milk is working well. She describes that she keeps a small refrigerator in the bedroom for evening bottles and a cooled lunch pack during the day when they are out.
Arjun

• Twin born at 36 6/7 weeks, initial NICU stay for 4 days, took 20-30 mL at a time, using disposable nipples, discharged to home with twin.

• Readmitted after three days at home due to thermoregulation difficulties, poor endurance, inadequate feeding.

• OT feeding evaluation at 38 4/7 weeks
  • 60 mL q 3 hours, taking 4-27 mL by mouth mainly with Enfamil slow flow nipple
  • High arched palate, short sucking bursts
  • Hyperalert baby, needs minimal stimulation/movement
  • Recommended use of Preemie nipple
Arjun

• 39 4/7 weeks
  • Similar feeding performance, 13-23 mL (out of 61 mL).
  • Continues to get very sleepy quickly.
  • Family interested in learning NG tube care and being discharged with NG tube.

• 40 1/7 weeks
  • Nursing had progressed him to Level 1 nipple (from Preemie)
  • NG tube removed and he is feeding PO ad lib, taking 50-61 mL at a time
  • Preparing for discharge with outpatient f/u
  • OT concerned with quality of feeding and “pushing” to complete feedings and meet daily goal volumes
Respect Infant’s Cues During Feeding

**WATCH** - especially the face
- Eye brows raised
- Eyes closed tight
- Eye blink
- Gaze aversion
- Brow furrow
- Color change

**FEEL** - the babies body
- Changes in tone
- Head pulls back or turns slightly

**LISTEN** – to breathing and swallowing
- Tachypnea, apnea, stridor, rattle, obstruction
- Time between breathing pauses
- Swallow sounds
- SSB timing
Why is this so important?

• Early feeding experiences in the NICU can potentially impact an infant and a family’s relationship with feeding far beyond discharge.

• Hawdon et al (2000)
  • Although less than 1% of preterm infants required supplemental tube feedings at time of discharge, over 50% of parents report problematic feeding behaviors at 18 and 24 months.
  • Parents of NICU graduates reported disorganized feeding- including coughing, vomiting, feeding refusal in 39% at 6 months and 37% at 12 months.
Prevalence of Feeding Problems

• Ross & Browne (2013)
  • Over 50% of parents describe difficulties in feeding their infant after discharge from the NICU.
  • Even in older children (6 years of age), extremely preterm infants (<28 weeks) are 3-5x more likely to have feeding problems.

• DeMauro et al (2011)
  • Feeding problems were prevalent in both the early born (25 to 33.6 weeks GA) and later born (34 to 36.6 weeks GA) groups evaluated at 3, 6, and 12 months.
Arjun outpatient follow-up

- 41 3/7 weeks:
  - Has been home for 9 days. Poor growth for the first week. Past few days, has gained 1 ounce per day.
  - Feeding every 2-4 hours, alternating between sidelying and cradle position with Level 1 nipple.
  - Quickly falls asleep during feeding, so significant stimulation is given even during normal breathing breaks.
  - OT recommended Level 1 nipple in sidelying position (or Preemie in cradle) and VFSS
Arjun VFSS

- 45 weeks PMA
  - Feedings take 1 hour
  - Weight gain below goal (20 grams per day)
- VFSS was limited due to significant refusal behaviors
  - Pulling away from bottle, turning his head, crying
  - Multiple episodes of laryngeal penetration
  - Improvement noted with $\frac{1}{2}$ strength nectar thick liquids
- Reviewed overall concerns with family, suggested might need to return to NG feedings
- Family would like to trial thickened feedings first.
Thickening

- Creates a more cohesive bolus and slows transit time.
- ALL thickeners have pros and cons.
- Balance medical considerations, nutritional/fluid needs, and oral motor skills.
- Formula: usually use Thick-It or rice cereal.
- Breastmilk: consistent thickening can only be achieved with gum based thickener (Gel Mix or Simply Thick).
- FDA advisory regarding Simply Thick
- SCH: we do not typically consider thickening as an option until 42-44 weeks
Arjun older infant

- Received early intervention for feeding therapy
- Feeding continued to be a struggle over the next 5 months, inconsistent weight gain, multiple respiratory illnesses.
- Repeat VFSS at 5 ½ months (adjusted age)
- Goal feeding volume is 4 ounces.
  - Feedings take 1 hour
  - First ounce by bottle using a Level 2 nipple
  - 3 ounces are then given by syringe
  - Needs 30 kcal/oz in order to gain weight
- Dysfunctional feeding pattern, tube feedings recommended
Arjun older infant

• 1 month later (6 ½ months adjusted age) admitted for NG placement. Mom made this decision based on impact of feeding on quality of life.

• Upper GI:
  • Persistent posterior impression upon the midesophagus raising suspicion for a vascular ring.

• CT scan
  • Left-sided ligament arteriosum in the setting of a right-sided aortic arch consistent with a vascular ring.
Arjun older infant

- Began NG feedings
- First slow bolus feedings, then moved to continuous drip due to vomiting
- Plan for G-tube placement and vascular ring repair
Arjun update

• Continuous G-tube feedings for 20 hours/day
• Mom reports things are going very well at home with little to no vomiting
• Excellent growth, increased energy level, happy overall, improved sleep
• Working on accepting some solids, focus of family time is on improving development skills and enjoying Arjun
Strategies to optimize oral feeding

- Provide positive pre-feeding experiences
- Thoughtful first feedings including family
- Offer opportunities for breastfeeding at each stage
- Lean toward slower flow with appropriate postural support and pacing as needed
- Follow infant’s cues for starting and stopping feedings
- Success should be defined in terms of *quality*, rather than in terms of *volume* or age of acquisition
- Promote a team approach to oral feeding progression
- Help parents feel comfortable and confident in feeding their infant, setting them up for increased success at home
Feedback/Questions?

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References


