Assessment & Intervention of Feeding in the Young Infant
Part I
DARS ECI Webinar Series
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Considerations for Working with Young Infants

FEEDING SPECIFICS
Why not wait?

• Feeding is a developmental process
• Early experiences are key to long-term success
• When interrupted, children may demonstrate
  – Oral sensorimotor dysfunction
  – Undernutrition (FTT)
  – Poor growth
  – Delayed development
  – Poor academic achievement
  – Psychological problems
  – Loss of overall health and well-being

• Oral sensorimotor function, swallowing, & respiration coordination are important processes that relate to development of normal feeding, eating, and speech motor skills

Red Flags

• Oral-motor dysfunction
• Dysphagia
• Medical Hx of Dx leading to feeding disruption
  – BPD, RDS, cardiac, neuro impairment, GERD
• Supplemental tube feedings
• Failure to match diet/quantity to dev. age
• Poor meal scheduling
• Poor/inappropriate parental feeding strategies
Factors that Limit Feeding Skill Development

– **Structural limitations**

  • Oral-Facial (Choanal Atresia, Cleft Lip/Palate, Micrognathia, Macroglossia, Dental Malocclusions, Short Lingual Frenulum)
  • Gastrointestinal (Esophageal Stricture, Pyloric Stenosis, Esophageal Atresia, Anal Atresia, Tracheoesophageal Fistula, Congenital Diaphragmatic Hernia, Hiatal Hernia, Short Bowel Syndrome)
  • Respiratory and Cardiac (Tracheomalacia, Laryngomalacia, Pulmonary Atresia/Stenosis, Aortic stenosis, etc.)

– **Physiological limitations**

  • Oral-Pharyngeal (aspiration)
  • Gastrointestinal (Gastroesophageal Reflux-GER, Esophagitis, Esophageal Dysmotility, Achalasia, Stomach Motility disorders, Delayed Gastric Emptying, Dumping Syndrome, Chronic Intestinal Pseudo-obstruction, Hirschsprung’s Disease, Diarrhea, Constipation)
  • Respiratory-Cardiac (Bronchopulmonary Dysplasia, Scoliosis/Kyphosis, Hypotonia/Hypertonia, Congestive Heart Failure)
Factors that Limit Feeding Skill Development

– Environmental limitations
  • Circumstances that impact child’s feeding and mealtime skills related to socioeconomic or mental-health issues of the family
  • Lack of resources (financial, personal)
  • Frequent moving between cities results in inconsistent healthcare
  • Inconsistent mealtimes and caregiving (lack of bonding with a primary caregiver, maternal depression, parents’ own issues with food)

Effects of Intervention

• What we know:
  – Infant feeding is a function of both maturation & experience
  – Primitive mechanisms support early feedings but are then integrated, and feeding is solely a learned skill beginning at 4 months
  – Medically fragile infants are most at risk for feeding problems
  – Immaturity and medical instability increase likelihood of aversive feeding experiences
  – Experience directly builds brain pathways
Effects on Outcomes

• We make a difference!
  – To the INFANT:
    • By understanding development so that we adjust our expectations
    • By supporting organization of physiological, motor and behavioral states so that infants can interact and attend to experiences
    • By ensuring experiences are as pleasurable as possible
  – To the FAMILY:
    • By supporting them so they can nurture their infant

(Erin Sundseth Ross, Ph.D.)

Why focus on feeding?

• In children with no known medical causes for failure to thrive or undernutrition, significant numbers were found to have oral-motor dysfunction that resulted in sucking, chewing, or swallowing difficulties

*The impact of early feeding on later feeding skills is huge!*  

(Reilly, Skuse, Wolke, & Stevenson, 1999)
Outcomes related to feeding

Preterm infants

- Many infants and children born preterm will require services for years to come, particularly for feeding
  - First, to learn to successfully feed orally
  - Later, to make a full transition to their families’ diet
    (Msall & Tremont, 2002)
- Approximately 31% of NICU graduates will experience feeding difficulties before one year of age
- 40% of children referred to an outpatient specialty clinic for feeding or growth concerns are former preemies (Hawdon, et al, 2002)

Outcomes related to feeding

- An increasing number of those born preterm are referred for significant and persistent feeding problems:
  - Eating only limited types of food, difficulty transitioning to textured foods, food refusal
    (Field et al, 2003; Hawdon et al, 2000; Rommel et al, 2003; Wood et al, 2003)
Interactions with the Family

• Points to remember:
  – Be observant for high levels of stress, post-partum depression, pressure from family members
  – Ask open-ended questions to get clues as to the problem.
  – Parents may not know what to ask. Allow for misunderstanding.
  – Train parents/caregivers as primary feeders
  – Work with them to help their child so every feeding can be therapeutic, not just the ones conducted by the therapist
  – Take the time to treat the entire family to ensure support of proper feeding techniques by the primary feeder
Effect of Overall Tone & Gross Motor Development on Feeding

• Looking at feeding and oral motor skills within the context of the whole body

☐ Everything is connected!
☐ Issues and patterns that affect normal motor development influence the mouth
☐ Development of stability: external sources of support to more internally controlled stability, becomes more dynamic

Effect of Overall Tone & Gross Motor Development on Feeding

• Looking at feeding and oral motor skills within the context of the whole body

☐ Mobility develops from a proximal base of stability, moving toward more distal control
  – Refined development of distal oral motor skills is affected if proximal stability is an issue
  – Oral stability is dependent upon development of neck and shoulder girdle stability, which are dependent upon trunk and pelvic stability
Effect of Overall Tone & Gross Motor Development on Feeding

• Looking at feeding and oral motor skills within the context of the whole body

□The jaw is proximal to the distal lips, cheeks, and tongue
  – The ability to stabilize the jaw is a prerequisite for development of skilled and refined tongue and lip movements

Effect of Overall Tone & Gross Motor Development on Feeding

• Key points:
  – STABILITY (proximal) before MOBILITY (distal)
  – Stability- related to muscle tone & coordinated contraction of muscles
  – Mobility- performance of the motor acts
  – Normal movement = balance between stability and mobility
Effect of Overall Tone & Gross Motor Development on Feeding

• Hypotonia
  – Poor postural stability = decreased control of trunk, shoulders, head & neck
  – Tries to compensate by “fixing” in a position or hyperextending (e.g., pulling back shoulders & extending jaw)
  – Tires easily and will cease feeding before full

Effect of Overall Tone & Gross Motor Development on Feeding

• Hypertonia
  – All movements against increased tension/resistance of muscles
  – Tends to fix spine & limit movements to small range
  – Tire easily due to increased work

– HYPER or HYPO-tonicity = WEAKNESS
Prerequisites to Normal Infant Feeding

☐ Rhythmicity

- Rhythm is the most consistent characteristic of feeding patterns during the first three months of life

- Newborns suck with a rapid, efficient, and regular movement

- Irregularities in the sucking rhythm have been identified as one indicator of brain dysfunction or damage in newborns

- Regular rhythm with a speed of 1 act/cycle per second is common in sucking and chewing patterns: tempo & rhythm of feeding patterns is similar to heel-to-toe gait in walking and the resting tempo of the heartbeat

Prerequisites to Normal Infant Feeding

• Sensory System

- Normal development of the infant’s sensory systems has a major impact on oral sensorimotor skills

- Mouth & hands have the highest number of sensory receptors per square inch of any other part of the body
  • Sensory receptors of the mouth are the earliest to emerge in fetal development
  • After birth, the infant seems to explore and learn predominantly by bringing everything to the mouth
  • Early mouthing activities provide the infant with abundant oral sensory input
Prerequisites to Normal Infant Feeding

Sensorimotor Development

- Normal sensorimotor development
  - Based on a series of themes that fit most babies and an abundance of variations that fit each individual child

- Variations in movement experiences and opportunities are provided by caregivers

- Variations in feeding skills are based on availability of experience and child’s unique characteristics

- Critically important for children to develop flexibility within their sensorimotor system that enables them to adjust to small variations in their environment

Coordination of Suck/Swallow/Breathe

- Breathing
  - Infants must stop breathing briefly with every swallow, lasting about one second
  - No agreement about when in respiratory cycle infant stops breathing
  - During continuous sucking, have a decrease in overall respiratory rate & lengthen expiratory phase /shorten inspiratory phase
    - Results in reduced ventilation > infant changes to intermittent sucking pattern
Coordination of SSB

• Sucking & Swallowing
  – Swallowing pattern related to flow and amount of liquid
    • Faster rate = swallow more often
    • Greater pressure suck = larger bolus & infant may have to adjust timing for initiating swallow

  – One suck per second, 1:1 ratio for suck:swallow
  – As infant nears 4-6 months, ratio may be 2-3:1
  – Newborn (healthy) baby – suck pattern will range from 10-30 sucking burst with 1:1:1 ratio of SSB

Reflex Integration

• Many reflexes present in full-term infant
• Integration occurs with maturity of cortical control
• Integration is not inhibition, but rather building of foundation for further refined skills
Normal Reflexes & Cranial Nerves

- Rooting
- Gag
- Phasic Bite
- Tongue Protrusion
- Transverse Tongue
  Suckling
- Swallowing

- V, VII, XI, XII
- IX, X
- V
- XII
- V, VII, IX, XII
- V, VII, IX, X, XII

Normal Reflexes & Integration

- Rooting
- Gag
- Phasic Bite
- Tongue Protrusion
- Transverse Tongue
  Suckling
- Swallowing

- 3-6 months
- Diminishes at 6 months
- 9-12 months
- 4-6 months
- 6-8 months
- Remains in adults
Nutritive vs. Non-Nutritive Suckling

**NUTRITIVE**
- At the beginning of a feeding, infant sucks with continuous burst, then changes to more intermittent sucking bursts
- One suck per second
- Young (1-3 mos) infant swallows with 1:1 ratio, with 2-3:1 ratio toward end of feeding. Older infant ratio moves to 2-3:1 consistently due to larger oral cavity and decrease in fatty pads.

**NON-NUTRITIVE**
- Pattern is much more repetitive than with nutritive suckling
- Six sucks per second
- Ratio of 6-8:1 sucks to swallows

Compression vs. Suction

**Compression**
- Positive pressure phase
- Hard palate and tongue
- Precedes suction

**Suction**
- Negative pressure phase
- Tongue latches with proper contact on nipple. Closed off system- jaw drops down and pulls fluid out (vacuum)

*Integration of compression AND suction leads to efficient suck*
Anatomical Supports

- Oral space is filled by the tongue, supporting compression/suction of breast or bottle nipple
- Oral structures are vertically compressed as well as the neck, shoulders, and head
- Buccal pads (fatty pads) provide stability
- Soft palate and epiglottis are in contact in posterior portion of oral cavity
- Epiglottis at C2, drops to C5-7 (3-4 mos)
- Larynx = 1/3 the size of adult

Tutor & Gossa, 2011

Cues for Readiness

- At least 34 weeks adjusted gestational age
- In quiet alert state for at least 5 minutes
- Shows “hunger cues”
  - Hands to mouth
  - Smacking
  - Tongue thrusting
  - Rooting
  - Non-nutritive sucking during gavage feeds
  - Crying (late hunger cue)
- Shows signs of physiologic stability such as:
  - Smooth and regular respiratory rate
  - Stable heart rate
  - Successfully demonstrates self regulatory behaviors
- Wakes before feeding time
- Demonstrates a sustained, rhythmical non-nutritive suck
Developmental Considerations

• Where is baby in process of development?
  – Development occurs in predictable fashion but on an individual timeline within parameters
  – Development is negatively influenced by medical comorbidities
  – Development influences the oral, pharyngeal, and esophageal phases of swallowing
  – *Every baby is an individual; you can’t go by gestational week (if the baby was born early).*

Developmental Considerations of Oral Phase

• Compression precedes suction (mouthing nipple)
• Integration of compression/suction = efficient suck
• If lack suction, likely one of following:
  – Developmentally in compression-only sucking pattern (immaturity)
  – Attempt to manage respiratory component of SSB by dropping suction
  – Neurologic/structural component
  – TEST? If can hold a pacifier in their mouth, are using suction- can rule out a neuro component

Mizuno et al., 2007; 2006; 2005; Craig et al., 2000; Eishima, 1991
What We Know

- Infant feeding is a function of both maturation and experience
- Primitive mechanisms support early feedings but are integrated, and *feeding is solely a learned skill beginning at 4 months*
- Medically fragile infants are most at risk for feeding problems
- Immaturity and medical instability increase likelihood of aversive feeding experiences
- Experience *directly builds brain pathways*  
  Delaney & Arvedson, 2008

Feeding Skills by Age

- **0-3 Months**: physiological flexion, suckle/swallow reflex, tongue, jaw & lips work as one unit, tongue movement in/out pattern, tongue is cupped to provide channel for backward movement of liquid, rooting reflex, phasic bite reflex, gag reflex
Feeding Skills by Age

• **4-6 Months:** suckle in anticipation of spoon, munch-chew pattern (5-6 mo), tongue & jaw move as one unit, poor coordination of suck, swallow, breathing, rooting decreased by 5 months, phasic bite reflex decreased by 5 months, gag reflex

Feeding Skills by Age

☐ **7-9 Months:** mixed tongue movements in/out & up/down, active lip movements for closure on bottle & cleaning spoon, unstable jaw during cup drinking, tongue protrusion on swallow, some jaw separation from tongue and lip during bite, transfer of food from side to center/center to side, lip closure for swallowing semi-solids, gag is slightly less sensitive
BREASTFEEDING 101

Anatomy & Physiology of Breastfeeding: Infancy & Puberty

• Infancy
  – Inverted nipples
  – Minimal glandular tissue

• Puberty
  – Breasts grow
  – Fat deposited
  – Milk ducts branch and grow
  – By age 20, breasts are finished growing, with exception of during pregnancy
Anatomy & Physiology of Breastfeeding: Pregnancy

- Breasts grow
  - Milk glands enlarge and by 5 months begin to produce colostrum
- Nipple/Areola darkens and enlarges
- Nipple sensitivity increases
- More branching of milk ducts
- Increased growth of milk-making cells
- Breasts ready to make milk by 16th week of pregnancy
- Contents of breast milk include:
  - Protein
  - Fat
  - Cholesterol
  - Iron
  - Calcium
  - Carbohydrates
  - Vitamins & Minerals

How Breastfeeding Works

- Stages of Milk
  - Colostrum
  - Transition Milk
  - Mature Milk
- Foremilk vs. Hindmilk
- Lactogenesis II- increase in prolactin levels to stimulate milk making cells (alveolar cells)
- The “Let Down” or Milk Ejection Reflex
- SUPPLY & DEMAND
Latch-On & Positioning

• Good Latch
  – Flanged lips
  – Cheeks rounded
  – Circular movement of jaw
  – Audible swallowing
  – Breast Compression
  – Non-distorted nipple
  – Emptying of breast
  – Infant appears satisfied/full

Latch-On & Positioning

• Bad Latch
  – Lips rolled in
  – Breast slides in and out of mouth
  – Baby only latches onto nipple only
  – Flattened/creased nipple
  – No breast changes after feeding
  – Inadequate stools and voiding
Positioning

• Cradle Hold

• Cross-Cradle Hold

Positioning

• Football Hold

• Side-Lying

• Australian Hold
Feeding Patterns

• Signs of hunger
• Sleep patterns
• How often do breast fed babies feed?
  – Demand vs. schedule feeding
  – First month (8-12x), 1-2 mos (7-9x)
  – Every 1½-3 hours, never longer than 4 hours
• Number of wet diapers/stools
  – 4-6 wet diapers, regular stools (3-4x per day, then less)
• Growth spurts (2-3 wks, 4-6 wks)

Common Problems that Impact Breastfeeding

• Sore Nipples
• Engorgement
• Flat/Inverted Nipples
• Plugged Ducts
• Mastitis
Additional Information

- Pumping/Storage
- WIC
- Medications
- Donating breastmilk/Milk banks

Storage of Breastmilk

<table>
<thead>
<tr>
<th></th>
<th>Temperature</th>
<th>Storage Time</th>
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</thead>
<tbody>
<tr>
<td>Freshly expressed milk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm room</td>
<td>73-77°F / 23-25°C</td>
<td>4 hours</td>
</tr>
<tr>
<td>Room temperature</td>
<td>66-72°F / 19-22°C</td>
<td>6-10 hours</td>
</tr>
<tr>
<td>Insulated cooler / icepacks</td>
<td>59°F / 15°C</td>
<td>24 hours</td>
</tr>
<tr>
<td>Refrigerated Milk (Store at back, away from door)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerator (fresh milk)</td>
<td>32-39°F / 0-4°C</td>
<td>8 days (ideal: 72 hrs)</td>
</tr>
<tr>
<td>Refrigerator (thawed milk)</td>
<td>32-39°F / 0-4°C</td>
<td>24 hours</td>
</tr>
<tr>
<td>Frozen Milk (Do not refreeze! Store at back, away from door/sides)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freezer compartment inside refrigerator (older-style)</td>
<td>Varies</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Self-contained freezer unit of a refrigerator/freezer</td>
<td>Varies: 0°F / -18°C</td>
<td>3-4 months</td>
</tr>
<tr>
<td>Separate deep freeze</td>
<td>0°F / -18°C</td>
<td>12 months (ideal: 6 months)</td>
</tr>
</tbody>
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*These guidelines are for milk expressed for a full-term healthy baby. If baby is seriously ill and/or hospitalized, discuss storage guidelines with baby’s doctor.*

To avoid waste and for easier thawing & warming, store milk in 1-4 ounce portions.
Date milk before storing. Milk from different pumping sessions/days may be combined in one container – use the date of the first milk expressed.
Breastmilk is not spoiled unless it smells really bad or tastes sour.
QUESTIONS?