Role of the Therapist in the NICU

* ASHA statement

“Speech-Language Pathologist who practice independently in the NICU environment and provide service to infants and families are required to hold the Clinical Competence in Speech-Language Pathology and abide by the ASHA Code of Ethics (2003), including Principle of Ethics II Rule B, which stated: “individuals shall engage in only those aspects of profession that are within the scope of their competence, considering their level of education, training, and experience.”

Role of Therapist

* Determined by need of NICU
* Team approach to ensure successful feedings
* Promote developmental care, positioning, infant massage and positive feeding
* Help ensure long term developmental maturation
* Provide education to hospital staff
* Empower Families through education, demonstration

Babies in NICU

* 35 weeks gestation or less
* Ill newborn
* Respiratory distress
* Cardiac Issues
* Congenital Anomalies
* Prenatal exposure to narcotics
* Difficult Delivery
**Brain Development at 36 Weeks Gestation**

**Motor**
- Variety resting postures
- Flexor tone extremities
- Reflexes present

**State**
- Wake on own
- Alert for up to 30 min.

**Feeding**
- Active root
  - 1 suck, 1 swallow, several breaths (immature pattern)
  - Mildly consistent burst-pause pattern
  - Consistent compression, but variable suction
  - Feeding completed in 30 min.

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**Intra-Uterine Development of Feeding**

- Sucking develops around 15 to 16 weeks gestation
- Swallowing develops around 14 to 17 weeks gestation and can be observed during ultrasound at 28 to 29 weeks gestation
- A fetus swallows approximately 15 oz of amniotic fluid per day
- The coordination of suck:swallow:breathe pattern evolves around 31 to 33 weeks and is mature around 37 to 38 weeks gestation

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**Development of Feeding**

**Newborn**
- Newborns demonstrate a coordinated suck:swallow:breathe pattern with 1 suck, 1 swallow and 1 breath throughout the feeding
- A consistent burst-pause pattern should be evident throughout the feeding
- Newborns exhibit a more efficient sucking pattern that has consistent suction along with compression
- Ability to exhibit feeding cues and demonstrate state regulation
- A newborn should be able to complete a feeding within 20 to 25 minutes

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**Development of Feeding**

**Infant**
- Suckling is demonstrated by an infant up until around 6 months of age
- Sucking begins around 6 months until weaned from bottle/breast feeding
- Oral skills for spoon feedings develop around 6 months of age
- Open cup may be introduced around 6 months of age
- Straw drinking may be introduced around 6 to 7 months of age
- Finger foods may be appropriate around 8 to 9 months
  - Dissolvable solids introduced when infant on hands and knees
  - Chewy solids when infant is walking
Development of Feeding
-continued
* Must consider corrected age for premature infants for initiation of each diet level
* New studies and AAP recommend waiting until 6 months to initiate solids to reduce allergies and childhood obesity
* Immature digestive system
* Poor head and trunk stability for safe swallow
* Reflexes versus volitional movements

Interventions Within NICU
* Indirect/Decreased lighting
* Monitoring of noise levels
* Pain management
* Odor neutral environment
* Positioning and positioning aids
* Baby Friendly which promotes breast-feeding

Developmental Care
Sensory System
* Tactile
* Visual
* Vestibular
* Olfactory
* Taste

Kangaroo Care
An evidence based practice involving skin to skin contact with mother/father of baby.
Benefits include, but not limited to, increased bonding, feeding success, temperature/sleep regulation, and pain management.
Infant Massage

Benefits include improved:
- Circulation, skin integrity, skin tone, weight gain, digestion, pain tolerance, and alert states for the neonates
- Attachment, interaction, and communication with parents
- Parental understanding of infant cues
- Prolactin levels in mothers
- Oxytocin levels in babies to promote growth, circulation, and decrease stress

What can complicate early feeding success?
- Multiple caregivers
- Prolonged use of OG/NG tubes
- O2 nasal cannula
- Bili lights
- Suctioning and intubation
- Preterm infants have to deal with a lot of sensory input.

Common reasons SLP is consulted:
- Difficulty coordinating breathing with eating or drinking
- Difficulty suckling from a bottle and/or breast
- When stress signs are noted/observed
- Concern for possible aspiration
- Recurrent pneumonia or respiratory infections
- Feeding periods longer than 30-40 minutes
- Sustained drooling with open mouth posturing not associated with teething
- Increase in work of breathing with feeding or breathing disruptions during feeding
- Excessive/consistent spitting up after feeding
- Craniofacial anomalies
- Weak suck
- Unexplained food refusal or failure to accept different textures of food
- Failure to thrive
- Choking, coughing, gagging, vomiting
- If alternative feeding methods are being considered.

Dysphagia clinical evaluation
- What the SLP assesses
  - Birth History
  - Oral structures/oral phase of feeding/swallowing
  - Initiation of the pharyngeal phase of swallow
  - Respiration/Work of breathing
  - Sensory System
  - State Regulation
  - Reflexes
  - Non-nutritive vs. Nutritive sucking
  - Stress signs
  - Gross motor
  - Risk for aspiration
  - Determine safest diet level
  - Determine need for VFSS
How Feeding Works

- Oral Phase
- Pharyngeal Phase
- Esophageal Phase

![Infant anatomy]

Work of Breathing

- Respiration is foremost a survival function!!!!
- Feeding is an infant's aerobic exercise and physiologic work (running a marathon every time they eat)
- Sucking may override breathing to the point of apnea.
- Increased work of breathing can lead to respiratory fatigue, shutdown and excessive burning of calories resulting in weight loss
- Always need to consider the impact of work of breathing on child's ability to be a successful oral feeder
- Increased work of breathing may delay gastric emptying resulting in reflux
- If an infant is not actively swallowing then the airway is open!!!

Respiratory System

- History and length of intubation and ventilation
- History of prematurity
  - Postconceptional age
  - Length of hospitalization
  - Need for oxygen
  - During hospitalization/after discharge
- History of respiratory infections
  - Bronchitis
  - RSV
  - Pneumonia
  - Chronic upper respiratory infection
- Current respiratory diagnosis or issues
  - Asthma
  - Allergies

Non-nutritive versus Nutritive sucking

<table>
<thead>
<tr>
<th>Non-nutritive</th>
<th>Nutritive</th>
</tr>
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<tbody>
<tr>
<td>2 sucks per second</td>
<td>1 suck per second</td>
</tr>
<tr>
<td>Involves only the sucking component</td>
<td>Involves the coordination of suck:swallow:breathe</td>
</tr>
<tr>
<td>Can be elicited in all states except deep sleep and crying</td>
<td>Most efficient in awake/alert state</td>
</tr>
<tr>
<td>Suck:swallow:breathe ratio: least 6 to 8 sucks prior to swallow</td>
<td>Suck:swallow:breathe pattern 1:1:1 ratio (preterm infants demonstrate difficulty with this coordination)</td>
</tr>
<tr>
<td>Not necessarily a predictor of feeding success</td>
<td></td>
</tr>
<tr>
<td>May increase the work of breathing and fatigue the infant prior to po feedings.</td>
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</tbody>
</table>
Oral Stimulation

- Need to monitor stress signs during all stimulation activities to maintain positive experience
- Hands to face
- Oral exploration of hands and/or pacifier
- Positive touch when oral gastric (OG), nasal gastric (NG) tube or oral ventilator tube present
- Tactile stimulation to cheeks and lips
  - sustained touch/pressure
  - stroking/movement

Positioning

- Maintain postural control
- Hands midline
- Swaddle
- Left/Right sidelying versus upright
- Head elevated above hips
  - angle of elevation dependent on nasal regurgitation
- Airway stability
  - ear, shoulder, hip in straight line
  - consider laryngo/tracheomalacia
- Transition to supine/upright as appropriate
  - 2 to 4 months in preparation for anatomical changes and spoon

Pacing

Why pace?
- Teaches the infant an organized pattern for safe feeding
- Allows infant to coordinate breathing during nutritive sucking

How to pace?
- To teach coordinated suck:swallow:breathe
  - Pre-term: 3 sucks then tip nipple downward for 3 second break for breathing for first 1 to 2 minutes of feeding or until infant begins to self pace
  - Term: 5-10 suck:swallow:breathe patterns then tip nipple downward to allow for catch-up breathing
  - Baby will show signs of when to resume feeding!!!

Cervical auscultation

- Use as a clinical tool to help determine S:S:B in infants and trigger of swallow in all age groups
- Swallowing is lower frequency and respiration is high frequency
- Use bell side of stethoscope to laryngeal area for swallow and diaphragm side for respirations
Videofluoroscopy Swallow Study
- View anatomical structures during dynamic swallow
- Determine severity of penetration/aspiration episodes and/or rule out silent aspiration
- Effectiveness of therapeutic/compensatory strategies
- Make suggestions/recommendations for direction of skilled therapy
- When appropriate establish goals
- Provide thorough description of swallow deficits to aid in safe progression of diet in treatment

VFSS Clips
- Nasal Regurgitation
- Work of Breathing

VFSS Clips
- Aspiration
- Thickened Liquids

Difficulty with Breast/Bottle Feeding
What to look for:
- Increased feeding time (longer than 20-30 minutes)
- Anterior loss
- Noisy feedings
- Demonstrates 2 or more stress signs
- Increased work of breathing
Breast and Bottle Feeding

Breastfeeding
- Infant is able to control the rate of milk
- Multiple streams which coat oral cavity
- More stability for tongue and jaw
- Infant able to pace better
- Better body position
- Mother may need to pump until let down occurs
- Suck:Swallow:Breathe coordination for breast feeding is earlier than for bottle feeding

Bottle Feeding
- Infant unable to control the rate of milk
- Steady stream from single hole nipple directed at posterior pharyngeal wall
- Less stability for tongue and jaw
- More difficulty self-pacing
- More difficulty to position
- Not nipple confusion but flow confusion
- Studies indicate increased obesity linked to bottle fed infants

BMH Feeding Protocol
- Pre-oral stage
- NPO/NG feeding only
- Non-Nutritive Suckling Stage
- NPO/NG feedings only
- Nutritive Sucking Stage I (critical stage)
  - Minimal oral intake 10%
- Nutritive Sucking Stage II
  - Mod. Oral intake > 10% vs <10% Oral/NG
- Nutritive Sucking Stage III
  - Full oral intake >10% Oral/24hours

Feeding Readiness Scale
- Use in overall evaluation to initiate oral feedings (1, 2 good)
- Used with each individualized assessment
- Used with cue based feeding practices
  - Assess & document feedings
  - Evaluate infant behavior: maturity, stability, interest in feeding
- Implementation per “Oral Feeding Pathway”
- Consistent scores of 4 or 5 referral to SLP

Quality of Nippling Scale
- Focuses on safe feedings
- Encourages observation of infant’s feeding behavior
- Documentation of behavior
- Assist caregiver in necessary techniques needed for oral feeding
- Evaluates fatigue, coordination, swallow, etc.
- Consistent scores of 4 or 5 referral to SLP
Initial/Early Stress Signs

- Occur prior to feeding or early in feeding
- Are subtle and may be easily missed
- May occur due to difficulties with reflexes, state regulation, sensory information, respiration and/or coordination/abnormalities of oral structures
- Infant is telling us "this does not feel good"

Moderate Feeding Stress Signs

- Occur when infant is pushed through a negative feeding experience
- The body begins to react to the negative event
- May occur due to difficulty with bolus flow rate, respiration, oral motor skills and/or coordination of suck:swallow:breathe
- Infant is telling us that the airway is compromised

Major Feeding Stress Signs

- Occur when infant is no longer able to maintain adequate airway protection
- May occur in attempt to prevent aspiration or following an aspiration or penetration event

Things to Consider

- Fat from breastmilk and formula provide energy for continued brain growth and cognitive development
- Between 3 to 6 months of age children may begin to refuse to eat or demonstrate more difficulties
- Around 6 months of age the nervous system matures and the sucking reflex fades. Feeding then becomes a volitional act
Bottles/Nipples

- Wide base/narrow base
- Tip to flange
- Material
- Levels/flow
  - standard, slit, y-cut, cross cut
- Venting system

Flow rate

Not all slow flow nipples are created equal
- Each manufacturer has their own rating and cannot be compared with other brands.
- A slow flow in one brand may be equivalent to a medium in another brand.
- Turn bottle upside down and watch the size and rate of drip.
- Utilize cervical auscultation during feedings

Flow rate of common nipple

<table>
<thead>
<tr>
<th>Nipple Brand</th>
<th>cc per 60 sec</th>
</tr>
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<tbody>
<tr>
<td>Dr. Brown preemie</td>
<td>7.5</td>
</tr>
<tr>
<td>Dr. Brown level 1</td>
<td>7.7</td>
</tr>
<tr>
<td>Enfamil green</td>
<td>8.8</td>
</tr>
<tr>
<td>Tommee Tippee</td>
<td>12</td>
</tr>
<tr>
<td>Enfamil blue</td>
<td>12.3</td>
</tr>
<tr>
<td>Ross yellow</td>
<td>15.5</td>
</tr>
<tr>
<td>Ross red</td>
<td>16.3</td>
</tr>
<tr>
<td>Avent #1</td>
<td>16</td>
</tr>
<tr>
<td>Medela Breast</td>
<td>16.3</td>
</tr>
</tbody>
</table>

Kelli Tracy Jackson, MPT
Why we like Dr. Brown

Pros
- Laser cut
- Shape and material promotes appropriate latch
- Variety of levels
  - Ultra-Preemie
  - Preemie
  - Level 1-4
  - Y cut
- Able to use with multiple populations
- Able to use with multiple thickening methods
- Other hospitals using Dr. Brown bottles?

Cons
- Multiple parts
- Cost/price?

Consistency

- Ultra-thin
- Thin
- 1/2 nectar
- Thin-nectar
- Nectar
- Thin-honey
- Honey

Thickening?

- Any patient on thickened liquids for swallowing difficulties needs to be followed by their physician and a certified feeding therapist
- Consider when infant on increased calorie formula with added scoops and the impact of thickening on digestive process including kidneys
- Consider type of bottle/nipple for thickened liquids that continue to promote age appropriate oral motor skills
  - standard versus cross cut
  - Why complete VFSS/MBS
  - Is thicker always better?
  - Type of thickeners
    - applesauce, yogurt, pudding, rice, oatmeal, Thik and Clear, Simply Thick

Types of Thickeners

- Starch based
  - Rice cereal—no age restriction
  - Thick—it—57 week gestation or older with need to be followed by a physician
  - Thicken up/Thicken up clear—3 years or older
- Gum based
  - Thik n Clear—currently no age restriction
  - Simply Thick—12 months or older and 12 years with a history NEC
Thickened Liquids

* Rice/oatmeal
* Pros
  * Cost
  * Ease of purchase
* Cons
  * Does not thicken breastmilk because of the amylase
  * Does not maintain consistency throughout feeding
  * Constipation (which can cause or worsen reflux)
  * Obesity versus growth
  * Thickens differently dependent on brand and method

Thickened Liquids

Thik and Clear

* Pros
  * Prepackaged for easy measuring
  * Used by many children's hospitals around the country
  * Mixes with variety of liquids including breastmilk
* Cons
  * No research
  * Can clump during mixing
  * May cause increased gas in GI system

Thickened Liquids

Simply Thick

* Pro
  * Maintains consistency
  * Mixes easily
  * Has more research within pediatric realm
* Cons
  * FDA warning for use in premature infants and more recently in infants
  * May cause increased gas in GI tract

Gastrointestinal Development

Development

* Develops based on input
* GI system provides sensory feedback
* Food acceptance, feeding schedules, amounts consumed are adjusted in response to this feedback
Gastrointestinal

Normal Reflux—Infants and Children

☆50% of 0-3 month olds regurgitate 2 or more times per day
☆70% of 4-6 month olds
☆25% of 7-9 month olds
☆Less than 10% of 10-12 month olds

Archives of Pediatrics and Adolescent Medicine, 1997

Successful Feeding

Volume vs. Experience

☆ When an infant is learning to oral feed, the experience is more important than the volume of P.O. intake
☆ Perfect practice makes perfect
☆ Feeding is a developmental skill.

Slow and Steady WINS the race.

Evidence Based Feeding

Goals for Discharge

☆ Preterm Infants demonstrate competent oral feeding skills prior to hospital discharge
☆ Infant driven model (cue based)
☆ Feedings are safe, functional, nurturing, individualized and developmentally appropriate
☆ PO all prescribed volume in 15 to 20 min
☆ Maintain steady weight gain
☆ Precise coordination of S:S:B maintaining physiologic stability
☆ Parents comfortable and ready
☆ Appropriate follow-up with SLP if warranted
☆ Improved communication between providers

When to refer for outpatient feeding evaluation

☆ Difficulty with or late initiation of oral feeding
☆ Inability for child to breastfeed
☆ Poor transition to bottle feedings from breast feeding
☆ Difficulty transitioning to spoon feedings
☆ Any use of thickened liquids
☆ Food preferences or avoidance
Things to consider during treatment after NICU

- Birth Trauma- nerve damage, neurological damage
- Heart defects can affect respiration and stamina
- Premature lungs- asthma, respiratory infections, respiratory disease
- Prenatal exposure withdrawal
- Weight and growth growth chart percentiles, FTT
- Sleep habits- snoring, frequent waking
- Voiding-freQUENCY
- Reflux- amount, frequency
- Respiratory system has a significant impact on feeding for all ages

Question Time????

References

- Emuna, Sandra, MD, PhD. CCC/SLP, Cheri Franker, MS, CCC/SLP, CLC, Laura Walbert, MS, CCC/SLP, CLC. "Pre-Chaining Programs for Infants & Children with Swallowing Disorders: Much to DO about Pediatric Dysphagia." Indianapolis, IN. November 4&5, 2011. Conference.

References

References
