Objectives

- Identify common feeding problems in the NICU graduate
- Review the epidemiology and pathophysiology of feeding problems in the NICU graduate
- Analyze current literature on feeding problems of the NICU graduate
- Discuss the feeding follow up needs of the NICU graduate and their family

Incidence

- > 500,000/yr infants born preterm in U.S.
- Moderately preterm infants compose 25% of the NICU population
- Over 40,000 are <28wks gestation at birth
- Over 70% survive and discharged
- LOS exceeds 2 wks for Moderate preterm
- COST= exceeds $30,000 per case

Prematurity as a risk factor

- Begin with developing oral feeding skills when they are in process of:
  - Developing motor and sensory neuropathways
  - Becoming competent at physiologic and behavioral regulation including neurodevelopmental organization
  - Discharged as sufficient oral feeders, but not yet "skilled"

Demands on the Premie to effectively EAT

Sense/react to variety of:
- Tactile
- Kinesthetic & Proprioceptive
- Auditory
- Visual Inputs
While they are also coordinating suck, swallow, breathing.....

While managing:

- Amount
- Duration
- Timing

Of sensory input that a feeding demands
Furthermore...

They must maintain:

- Alert state
- Maintain energy for the feeding
- Maintain body/oral-motor tone

Caregiver Variability

- Average number of different feeders in any given day/week in the typical NICU?

Poorly timed input

- Leads to interference with other emerging sensory development

BROSS
Baby Regulated Organization of Subsystems and Sucking

Ross & Browne 2003

Enhancement of subsystem organization

Should be offered at each stage

- Positioning
- Comfort
- Cyclicity of care giving
- Availability of mother’s sensory offerings

BROSS: 8 Steps

1. Subsystems Stability in Bed
2. Stability of Subsystems when Handled
3. Stability of Subsystems During NNS
4. Obligatory Phase
5. Intermittent Sucking Phase
6. Coordinated Phase
7. Integrated Phase
Subsystems Stability in Bed

- Initial/critically ill
- Typically disorganized

Stability of Subsystems when Handled

- Starting to tolerate handling/held
- Medical stable/not robust
- Not ready for oral feeding intro

Stability of Subsystems During NNS

- Finger
- Pacifier
- Mom’s empty breast

Obligatory Phase

- NNS to NS phase
  10-20 suck bursts without breathing to 3-5 suck bursts alternating w/breathing (however tachypnea recovery often occurs for catch-up breathing)

Intermittent Sucking Phase

- Further developmental organization
- 2-3 suck bursts with brief catch breaths and eventually longer sucking bursts
- Most robust alert state
- Beginning availability for some mild social interaction

Coordinated Phase

- Development of mature and coordinated sucking pattern
- 20-30 suck bursts w/integrated breathing and suck/swallow
- More robust alert state during entire feeding
- More predictable availability
- Most likely at home by now......
**Integrated Phase**

- Full coordination SSB without tachypnea
- Demanding feeding
- Social interaction uniqueness

**SOFFI**
**Supporting Oral Feeding in Fragile Infants**

Philbin & Ross (2011)

**Parents report**

- Infant’s feeding interest varies
- Often fatigue and low intake
- Child sensitive to who feeds them

**The Challenge**

- These infants have a developmental and learning need of successful oral feeding
- One that includes a diet that sustains growth and nutrition
- And ultimately requires the infant to transition to their families’ diet....someday

**The Beginning**

- It starts in the NICU (or before!)
- Safe and effective oral feedings
- Focus on the development of early feeding skills

**SOFFI**
Supporting Oral Feeding in Fragile Infants

Philbin & Ross (2011)
The Goals

- To understand the assessment and development of early feeding skills
- Determine readiness for oral feedings
- General and specific
- Support and promote the infant and families' progression, including breast feeding
- Follow up plan

Feeding Problems in the NICU Graduate

- Feeding Problem...a problematic definition
- By review, they include:
  - Vomiting
  - Colic
  - Food refusal
  (And those are for full term infants!)

Premature Infants

- Vomiting, spitting up
- Difficulty transitioning textures
- Food selectivity
- Oral motor abnormalities
- Food aversion or refusal

The Consequences

- Child’s growth and development
- Family’s well-being

At Risk For

- Nutritional deficiencies
- Somatic complaints
- Cognitive, motor, language delays
- Growth Faltering
- Strained parent-infant interactions
- Behavioral and emotional regulation disorders

Expression From a Developmental Perspective

- Infancy — loose lip seal on nipple to accommodate large fluid flow that exceeds swallowing capacity
- Functional in that it is safe, to prevent aspiration
- May lead to poor oral motor development of muscles around lips, which is required for spoon feeding
Persistent Feeding Problems
- Multifactoral...biological, behavioral and environmental factors
- Multisystem...neurological, gastrointestinal, respiratory, and caregiver
- The child...immaturity, sequelae of prematurity, post-discharge health issues

Prevalence of Feeding Problems
- Ranges 19-60%
- UK sample of 14,000 infants
- Feeding problems persisted >1 month of age were rare (<3.5%)
- <37 wks were 3 times more likely
- LBW infants 7 times more likely

Specialty Feeding Clinics
- 700 children
- Referred at 25 months for feeding problem
- 35.3% had preterm history
- The preterms had increase incidence of GI and Respiratory-based feeding problems, oral sensory and motor dysfunction and feeding refusal (Rommel et al., 2003)

Specialty Feeding Clinics
- 42% had history of prematurity
- Referred over a 7 year period
- Difficulty transitioning textures
- History of breathing assistance
- Exposure to tube feedings (Burklow et al., 2002)

Specialty Feeding Clinics
- More potential sequelae of premature-related feeding problems reported from study in Sweden
- <33 weeks gestation
- 781 females
- Age 10-21 years
- 3-fold increase in risk for later diagnosis of anorexia nervosa (Dnatlingius, Hultman, Dahl, & Sparen, 1999)

Outcome Studies
- 20 infants with BW <1000 gram
- <29 weeks gestation at birth
- 20 infants
- 6-8 months, corrected age
- No IVH, NEC, BPD or chromosome abn
- 80% had long-standing feeding problems
- Poor intake, fatigue with feedings, delayed feeding skills
Outcomes, con’t
- 40% had experienced episodes of aspiration
- 85% had GER
- Less: adaptable, persistent, attentive, cooperative, and robust
- More: demanding, easily frustrated and more likely to be fed non-textured pureed food
- Parents more concerned about adequate intake to achieve catch up weight

(Mathisen et al., 2002)

Outcomes
- At 24 months corrected
- <600 grams birth weight
- 20 children
- 62% had feeding problems
- 29% had Gastrostomy tubes

(Sweet, et al., 2003)

Outcomes
- 283 children in UK, Ireland
- <26 weeks gestation
- 33% had continued feeding problems at 30 months, CGA
- Food refusal, swallowing problems or both

(Wood, et al., 2003)

DISCHARGING THE NICU GRADUATE AT RISK FOR FEEDING PROBLEMS

What do we do well?

What should be do better?
Basic Screening Questions for the Pediatric Care Provider

- Key questions to ask parents regarding concerns related to the feedings
- Answers may not define the problem, however may help determine if a comprehensive feeding evaluation is needed

How long does the mealtime typically take?

If more than 30 minutes on a regular basis, there is a problem

Are mealtimes stressful?

If so, regardless of underlying factors, this requires further investigation

Does the child show any signs of respiratory stress?

Rapid breathing, gurgly voice quality, nasal congestion progression during meals, or panting by bottle feeding infant. Recent/frequent URI may be sign of aspiration

Has the child not gained weight in the past 2 to 3 months?

Weight gain important for brain growth in first 2 years of life, as well as overall growth.

Referral

- The available and the ideal…..
- Interdisciplinary Feeding Team
How Do We Identify the NICU Graduate at Risk for Feeding Problems?

References