Objectives

• Identify feeding and nutrition issues for the high risk infant.
• Recognize 3 important areas that interact in support of the feeding relationship.
• Explain the role of the RD for infants screened at nutrition risk.
Stories

- **Jade**
  - 35 weeks gestation
  - Birth weight: 4 lbs (1800 grams)
  - Breastfeeding

- **Micah**
  - 24 weeks gestation
  - Birthweight: 1 lb 5 oz (600 grams)
  - Breastmilk with human milk fortifier

- **Max**
  - 31 weeks gestation
  - Birth weight: 2 lb (900 grams)
  - Small for gestational age
  - Premature formula
CSHCN

- Are at increased risk for nutrition related problems. It has been estimated that up to 40% have nutrition risk factors that could be helped by referral to a registered dietitian (RD).
- Nutrition and growth problems may be complex and require more in-depth assessment and interventions.
- Complex issues may need to be addressed by multiple HCP and professionals.
The High Risk Infant

- Premature, low birth weight infant
  - Increased survival
  - Medical complications of birth
  - Morbidity associated with prematurity and medical complications
• Over the past ten years survival of the extremely low birth weight and preterm infant has dramatically improved.
• Infants 750-1000 grams now have an 80-90% survival rate.
• Infants <750 grams have a greater than 50% survival rate.
• Issues of morbidity have not experienced a similar trend.
• Premature and low birth weight are the major cause of infant mortality and morbidity.
Outcomes

• Reported estimates ELBW and VLBW infants show some variability
• Short term (18-30 months) v.s. longer term (school age)
• Multiple v.s. single
• Severity
Outcomes of Prematurity

- 50% of premature infants experience some degree of developmental deficits during preschool years.
- Higher rates of health problems including CP, poor growth, visual and hearing problems, asthma, bronchitis, croup, and otitis media when compared to term infants.
Outcomes

• Medical
• Neurodevelopmental
  – Estimates range from 30-70%
• Nutritional
Medical Outcomes

- Respiratory
  - BPD
  - RAD
- Recurrent illness
- Other
  - Renal, reflux, short gut, cardiac, hepatic, seizure disorders
Neurodevelopmental Outcomes

- CP
- Developmental Delays
- Hearing
- Language
- Motor
- School difficulties
- Visual
Maturity

- Development
  - Patterns of oral motor and neurodevelopmental changes may follow different timeline when compared to infants born at term
Nutritional Outcomes

- Failure to Thrive
- Hematological: Anemia
- Skeletal: osteopenia, rickets, fractures
Outcomes and Nutritional Risk

• In hospital goal is to achieve in utero rates of growth and nutrient accretion. However practices influence outcomes and individuals have individual nutrient needs.

• Postnatal growth restriction development of nutrient deficits in hospital.

• Outcomes increase nutritional risk.
Outcomes and Nutritional Risk

- Nutrition and medical history
- Outcomes
  - Medical
  - Developmental
  - Feeding, nutrition and growth
- Nutritional needs
Extrauterine Growth Restriction

• Extrauterine growth restriction refers to the development of severe nutrient deficits in premature infants during hospitalization.
Extraterine Growth Restriction

- NICHD Neonatal morbidity Research network
  - 16% ELBW infants are SGA at birth
  - At 36 weeks CA 89% demonstrate growth failure
  - Follow up at 18-22 months show 40% with weight, length, OFC <10%
Growth Failure

- Estimates of FTT in preterm infants
  - Variability
  - Population
  - Methodology
  - Range from 20-73%
  - ELBW <18 months 30% (NICHD)
Preterm Infants At Risk for Feeding Difficulties

- Medical/developmental outcomes
- Patterns of development
- Criteria for discharge
  - Growth and adequate feeding
Preterm Infants have Increased Needs for:

- Energy
- Protein
- Calcium
- Phosphorus
- Vitamin A
- Iron
- Vitamin E
- Folic Acid
- (??) Other
Nutritional Needs of the Preterm Infant

• How long do preterm infants have increased or altered nutrient needs when compared to term infants?
  – DRI
  – Preterm
  – other
Stories

• Jade
  – Discharged at 3 days of age. Lost 4% of birthweight. Transitioning to breastfeeding. Plan for lactation support and follow up.

• Micah
  – Discharged at 16 weeks of age. On nutrient enriched breastmilk by bottle and gaining 20 g/d. Has residual chronic lung disease on O2 and osteopenia.
Stories

- Max
  - Discharged after 6 weeks of hospitalization. Discharge weight is 4 lbs. Feeding every 2-3 hours on a premature formula at 24 kcal/oz. History of hypoglycemia and temperature irregularity.
Feeding: Development, Relationship, and Difficulties
Feeding Relationship

• Growth
  – Weight status and development

• Nurturing and nourishing
  – Security and relationships
  – Development

• Learning and play
<table>
<thead>
<tr>
<th>Age</th>
<th>Infant Development</th>
<th>Key parental roles</th>
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<tr>
<td>Birth to 3 months</td>
<td>Homeostasis</td>
<td>Calm and organize</td>
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<td>* regulation of state</td>
<td>Responsive to infant cues</td>
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<td></td>
<td>* neurophysiologic modulation</td>
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<td>2 to 6 months</td>
<td>Attachment</td>
<td>Reciprocal interactions</td>
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<tr>
<td></td>
<td>* “falling in love”</td>
<td>Engage</td>
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<td></td>
<td>* Sensorimotor modulation</td>
<td>Modulate arousal</td>
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<td></td>
<td>* purposeful movement and communication</td>
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<tr>
<td>6 to 36 months</td>
<td>Separation and Individuation</td>
<td>Opportunities to explore</td>
</tr>
<tr>
<td></td>
<td>* Somatopsychologic differentiation</td>
<td>Support drive for autonomy</td>
</tr>
<tr>
<td></td>
<td>* Behavioral Organization</td>
<td>Provides structure, sets limits</td>
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<tr>
<td></td>
<td>* Control</td>
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</table>

The Feeding Relationship

- Feeding is a reciprocal process that depends on the abilities and characteristics of both caregiver and infant/child.
- Is both dependent on and supportive of the infant’s development and temperament.
Feeding is an Interactive Task

Quality feeding occurs when the infant is:

- safe
- physiologically stable
- actively participating
- behaviorally organized
- comfortable

Note: nutritional status and energy intake are understood as baseline conditions.
Relationship

- Children do best with feeding when they have both control and support.
Supporting Homeostasis and Attachment

• Feed promptly, on demand, according to baby’s cues
• Hold securely but not restrictively
• Touch cheek, touch nipple to lip: to initiate rooting and opening mouth
• Baby regulates volume, pace and time
• Let baby pause, socialize and return to eating
• Engage but don’t overwhelm or disrupt feeding
• Stop according to baby’s cues
Establishing Healthy Feeding Relationships

- Recognize child’s developmental abilities
- Balance child’s need for assistance with encouragement of self feeding
- Allow the child to initiate and guide feeding interactions
- Respond early and appropriately to hunger and satiety cues
Tasks

• Infant
  – Time
  – How much
  – Speed
  – Preferences

• Caregiver
  – Food choices
  – Support
  – Nurturing
  – Structure and limits
  – Safety
Food Choices

• What factors influence food choices, eating behaviors, and acceptance?
Psychology and Sociology of Food

- Hunger
- Social Status
- Social Norms
- Religion and tradition
- Availability
- Nutrition and health (nourishing)
- Nurturing
- Experience
- Nourishing
- Relationship
- Development
- Emotion and Temperament
Food Choices

- Availability
- Cost
- Taste
- Value
- Marketing forces
- Health
- Significance
Food Acceptance

- Taste and preference
- Hunger and satiety
- Experience
- Feeding Relationship
- Development
- Repeat exposure
- Other
Taste and Smell

- Initial experience to flavors occur prior to birth
- Amniotic fluid flavors → maternal diet
- Breast milk odor/flavors → maternal diet
- Sweet preference (lactose)
  - More frequent and stronger sucking behavior in response to sucrose
  - Ability to detect other flavors (ie salt) emerge later (~ 4 months)
Mechanisms of Appetite Regulation

• Poorly and incompletely understood
• Genetics
• Pleasure seeking responses to food intake are mediated by humoral substances (endorphins, dopamine, etc)
• Interactions between hormones, nutrients, and neuronal signals with the CNS
• Appetite stimulus – ghrelin
• Appetite inhibition – CCK, Leptin, GLP-1
• GI volume sensitive feedback loops (ie distention)
Temperament

• Temperament theory categorizes enduring personality styles based on activity, adaptability, intensity, mood, persistence, regularity, responsivity, approach/withdrawal from novelty.

  – Chess and Thomas 1970
Experience

• Familiarity plays a significant part in food acceptance. Research indicates it may take up to 10-15 exposures to a new food for an infant to readily accept a food. Other modifiers include care givers attitude, positive experience, and observation of others eating.
Why Baby Won’t Eat

• Case reports of FTT/inadequate intake without any identifiable etiology
  – Tolia, et al
Parent Response
Survey of Parents of Premature Group

• “I felt I had to choose between growth and force feeding.”
Focus Group Parent Response from Gaining and Growing Website

• “I wasn’t afraid to bring home a baby that weighed only 3 pounds, but I was afraid to bring home a baby that wouldn’t eat.”
Parent Response
Survey of Parents of Premature Group

• The following feeding and growth problems were reported:
  – slow feeding
  – eating small amounts
  – choking, gagging, vomiting
  – no interest in feeding
  – fussiness during meals
  – emerged with introduction of solids
  – little endurance, tires
  – reflux
  – small size, little weight gain
  – lactation problems
Feeding

- Delays in feeding skills
- Feeding intolerance
- Behavioral
- Medical/physiological limitations
- Other
# Feeding Problems

<table>
<thead>
<tr>
<th>Developmental Stages</th>
<th>Feeding Problems</th>
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<tbody>
<tr>
<td>Homeostasis</td>
<td>Colic, poor growth, stressful feeding experiences</td>
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<tr>
<td>Attachment</td>
<td>Vomiting, diarrhea, poor weight gain, intensely conflicted or disengaged interactions around feeding</td>
</tr>
<tr>
<td>Separation and Individuation</td>
<td>Food refusals</td>
</tr>
</tbody>
</table>
Feeding Difficulties Related to Maturity, Medical and Neurodevelopmental Status

- State control
- endurance
- suck-swallow-breath coordination
- sleep-wake cycles
- cues and demand behavior
- temperament
- patterns of oral-motor development
The Complexity of Feeding Problems in 700 Infants and Young Children Presenting to a Tertiary Care Institution

• Multidisciplinary Assessment categorized feeding problems:
  – 86.1% medical
  – 61% oropharangeal dysfunction
  – 18.1% behavioral
Rommel, et al

- Multifactorial
  - 48.5% oral/medical
  - 1.5% oral/behavioral
  - 5.2% medical behavioral
Rommel, et al

- Medical/oral-motor
  - occurred more often <2 years of age
- Behavioral
  - occurred more often >2 years of age
Rommel, et al

- Single identified problem
  - 26.7% medical
  - 5.2 % oral/motor
  - 5.4% behavioral
Eating Disorders

- Complex problems caused by multiple factors within the lives of infants, children, and adults.
  - Medical/physical
  - Neurodevelopmental
  - Behavioral
  - Interactional
  - Environmental
  - Psychosocial
Jade

- At 1 week of age, Jade is still below birth weight.
- Mom describes her as “sleepy”.
- Breast feeds 6-7 times. Jade falls asleep at breast.
- Pre and post weights indicate “poor transfer”.
Micah

- Continues to have difficulties with growth, frequent hospitalizations due to illness and respiratory complications.
- At 4 and 6 months evaluated with some delays.
- Significant feeding difficulties include refusals, irritability, respiratory distress, and inadequate volume.
Max

- Growth continues at less than the 10\textsuperscript{th} percentile.
- Reported to be a “good eater” with bottle but “doesn’t like solids”.
- Taking formula in the bottle at 24 kcal/oz with adequate energy intake at 35-40 oz/day.
Assessment
The Nutrition Care Process is a systematic approach to providing high quality nutrition. Use of a care process provides a framework for the RD to individualize care, taking into account the patient’s needs and values and using the best evidence available to make decisions.
Steps to Evaluating Pediatric Nutrition Problems

- Screening
- Assessment
  - Data collection
  - Evaluation and interpretation
  - Intervention
  - Monitor
  - Reassessment
Screening and Assessment
Nutrition Screening: Purpose

• To identify individuals who appear to have or be at risk for nutrition problems.
• To identify individuals who require further assessment or evaluation.
Examples of Screening Risk Factors

- Growth measures $\leq$ than 5th %ile
- Growth measures $>\text{ }$ than 90th %ile
- Alterations in growth patterns
  - Change in Z-scores
  - Change 1-2 SD
  - Change percentiles
- Medical conditions
- Medications
- CSHCN
- Improper or inappropriate food/formula choices or preparation
- Bottle in bed
Comprehensive Nutrition Assessment

- Collection of nutritional data
- Interpretation of data
  - Linking information
  - Goals and expectations
  - Individual data
  - Evidence
  - Asking questions
- Individualized intervention
- Monitoring outcomes of intervention
Growth

- Patterns of growth v.s. absolute size
- Rate of growth
- Catch up growth
- Failure to thrive
- What growth charts to use
Sherry, et al

- The IHDP reference met the greatest number of evaluation criteria.
- The IHDP more closely matched external data sets for relative position on graphs and patterns for length for age.
- CDC charts more closely matched external data sets in growth pattern for weight for age.
“The choice of which to use depends on its purpose. The IHDP reference is the best available reference for comparisons of the growth of a VLBW infant with those of other VLBW infants. The CDC growth charts allow comparison of the growth of a VLBW infant with that of non VLBW infants.”
Corrected = Postconceptual Age

- Term = 40 weeks
- Calculate by: Actual age - weeks or months premature
Example: Corrected Age for Baby J

- Baby J was born at 28 weeks gestation
- It is 6 months since her birth
- $40 - 28 = 12$ weeks preterm (or 3 months)
- At 6 months, Baby J is $6 - 3 = 3$ months corrected age (CA)
Birth to 36 months: Boys
Length-for-age and Weight-for-age percentiles

NAME ___________________________ RECORD # ________

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Length: cm
Weight: lb

Mothers Stature: 
Father’s Stature: 
Gestational Age: 
Weeks: 
Date: Birth

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Comment:

Developed April 23, 2003
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000)
http://www.cdc.gov/growthcharts

PUBLIC HEALTH
ALWAYS WORKING FOR A SAFER AND
HEALTHIER WASHINGTON
Micah
Nutrition Assessment

- **Tools of Assessment**
  - Growth
    - Measurements
    - Growth charts
    - Absolute size (percentile)
    - Pattern
    - Body composition
      - Water, bone, muscle, fat
  - Intake
  - Additional information

- **Intake**
  - Food record, food recall, analysis

- **Additional information**
  - Medical
  - Development
  - Social
  - Laboratory
  - Other anthropometrics
  - etc
Information Collected: Current and Historical

- Growth
- Dietary
- Medical history
- Diagnosis
- Feeding and developmental information
- Psychosocial and environmental information
- Clinical information and appearance (hair, skin, nails, eyes)
- Other (laboratory)
Energy

- Correlate individual intake with growth
Etiology: Contributing Factors

Inadequate Intake
- Fluid, energy

Medical
- BPD, reflux, frequent illness

Feeding relationship
- Stress, history

Psychosocial
Intervention

- Adequate intake vs feeding relationship
- Concentrating formula vs fluid status
- Impact on tolerance, compliance, errors, cost
- Solution to problem vs. exacerbating problem
Stories

- Jade
- Micah
- Max

- How to support
  - Growth
  - Nutritional status
  - Feeding Relationship
Community Based Feeding Teams

Purpose:

- Interdisciplinary evaluation of feeding skills, oral motor development, nutritional status, growth, and eating development
- Development of family centered plan for community referrals and/or intervention
- Close to home
Participating Agencies May Include:

- Children’s Therapy Centers
- Elks Therapists
- Hospital or Medical Clinics
- Infant-Toddler Programs
- Local Health Departments
- Neurodevelopmental Centers
- School Based Special Services
- WIC Programs
• An interdisciplinary feeding team works with the family to identify, prioritize, and address feeding concerns.

• Team members may include family, behavioral psychologist, dental hygienist, nurse, nutritionist, occupational therapist, parent advocate, physical therapist, social worker, speech therapist.
Locating Resources, CSHCN RDs, and Feeding Teams in Washington

- http://depts.washington.edu/cshcnnut/resources/
Resources

- http://depts.washington.edu/growing/
- http://depts.washington.edu/pwdlearn/
Other References


Conferences: Assuring Nutrition in Pediatric Community

http://depts.washington.edu/nutrpeds
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HEALTHIER WASHINGTON