Children's Hospital of Pittsburgh of UPMC

Practice and Patience: Strategies to Address Feeding Problems in Early Childhood

September 23, 2016

John G. Rangos Research Center
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA

Course Directors

Sylvia S. Choi, MD, FAAP
Laura Panko, MD, FAAP
Feeding and Swallowing Center
The Paul C. Gaffney Diagnostic Service

Sponsored by the Feeding and Swallowing Center of Children's Hospital of Pittsburgh of UPMC and the University of Pittsburgh School of Medicine Center for Continuing Education in the Health Sciences

Welcome

On behalf of the Feeding and Swallowing Center of Children's Hospital of Pittsburgh of UPMC, we welcome you to “Practice and Patience: Strategies to Address Feeding Problems in Early Childhood.” This conference is directed toward providers involved in the care and feeding of toddlers and young children. Feeding patterns and practices during this rapidly evolving period of child development have the potential to be influenced by behavior and underlying medical problems. Specialized and evidence-based strategies may be required to support and advance feeding and nutrition in this age group. Presentations from Allied Health, Behavioral Health and Pediatrics will highlight common problems and offer guidance on evaluation and treatment of this patient population.

The Feeding and Swallowing Center at Children’s Hospital of Pittsburgh is an interdisciplinary team of specialists (Physician, PT, OT, SLP, Dietician, and Behavioral Health) who provide comprehensive assessment of infants and children experiencing feeding difficulties. The child’s plan of care is developed among the aforementioned specialists with referrals made when appropriate for ongoing family education/support, therapy services and further medical evaluation. Referrals to the Center are required from primary care physicians or other specialty services. Appointments may be scheduled at 412-692-FEED (3333) option 1, or the nurse coordinator may be contacted for further information via option 2.

We hope you find today’s conference worthwhile!

Sincerely,

Sylvia Choi, MD FAAP

Medical Director, Feeding and Swallowing Center

Associate Professor of Pediatrics

Children’s Hospital of Pittsburgh of UPMC

Laura M. Panko MD FAAP

Assistant Professor of Pediatrics

Children’s Hospital of Pittsburgh of UPMC

Conference Co-Directors

Conference Objectives:

Upon completion of the conference, the participant will:

- The provider will recognize family stressors and provide appropriate resources to assist the whole family unit.
- Improved knowledge of age appropriate nutritional recommendations for children ages 1-5 years old
- Improved knowledge of Blenderized enteral feeding diets and who may be candidate for this.

Conference Planning Committee

Judy Biernesser, BSHA RN CPC

Sylvia Choi MD, FAAP

Sheri L. Goldstrohm, Ph.D.

Kim Kubistek, OTD, OTR/L

Maxine Orringer, MA, CCC-SLP

Laura Panko, MD, FAAP

Linda Torres, MS, CCC-SLP/L

Nancy Weichler, RN, MSN, CNS

Continuing Education Information

UPMC

University of Pittsburgh School of Medicine

Center for Continuing Education in the Health Sciences

Access to online credit transcript:

http://ccehs.upms.com

Please allow up to 6 weeks for processing.

The University Of Pittsburgh School Of Medicine is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

The University of Pittsburgh School of Medicine designates this live activity for a maximum of 6.75 *AMA PRA Category 1 Credit(s)*™. Physicians should claim only credit commensurate with the extent of their participation in the activity.

Other health care professionals are awarded 0.6 continuing education units (CEUs) which are equal to 6.7 contact hours.

Faculty Disclosure:

All individuals in a position to control the content of this educational activity are required to disclose all relevant financial relationships with any proprietary entity producing, marketing, re-selling, or distributing health care goods or services, used on or consumed by, patients. No individual disclosed any relevant financial relationships with commercial entities.

Disclaimer Statement

The information presented at this CME program represents the views and opinions of the individual presenters, and does not constitute the opinion or endorsement of, or promotion by, the UPMC Center for Continuing Education in the Health Sciences, UPMC/University of Pittsburgh Medical Center or Affiliates and University of Pittsburgh School of Medicine. Reasonable efforts have been taken intending for educational subject matter to be presented in a balanced, unbiased fashion and in compliance with regulatory requirements. However, each program attendee must always use his/her own personal and professional judgment when considering further application of this information, particularly as it may relate to patient diagnostic or treatment decisions including, without limitation, FDA-approved uses and any off-label uses.

* **Registered Nurses, Physician Assistants, Service Coordinators, Behavioral Health, Nutritionists and Occupational Therapists please use link above.**

* **Speech Therapist if you have questions concerning ASHA credits please contact:**

- Maxine Orringer, MA, CCC-SLP at Maxine.Orringer@chp.edu
- Linda Torres, MS, CCC-SLP/L at torrlb@upmc.edu

Visit the UPMC Center for Continuing Education in the Health Sciences Web Site

Our internet address is: https://ccehs.upmc.com/home.jsf

The UPMC Center for Continuing Education in the Health Sciences invites you to visit our web location. Receive information on CME programs; earn CME credits on the internet, and access information about our formal courses and much more. Discover who we are and how you can contact us. Please visit our web location often to get updated information on upcoming programs.

Key Note Speaker

Sylvia S. Choi, MD, FAAP, is an attending physician in Children's Hospital of Pittsburgh of UPMC's Paul C. Gaffney Diagnostic Referral Service, which consists of pediatric hospitalists for Children's Hospital's General Medical Service.

Dr. Choi and her colleagues in the Diagnostic Referral Service help families and support primary care physicians by identifying a child's specialized medical needs while coordinating the best possible advanced treatment. The service is staffed by full-time physicians with special interest in the diagnostic challenges of general pediatrics, who specialize in multisystem diseases, complex single-system problems and basic pediatric problems. Based at Children's, the group serves as a consultative service for physicians whose patients have complex diagnoses because they have years of experience in diagnosing and managing a wide variety of the most complex pediatric medical conditions. That experience complements the referring physician's knowledge of the patient and provides a fresh perspective on what may be a challenging diagnosis and management.

Dr. Choi also serves as the medical director of Children's Limited Stay Unit, which provides focused, rapid treatment for those patients with simple diagnoses whose estimated length of stay is six to 48 hours. Also, Dr. Choi is the medical director of the Children's Feeding and Swallowing Center (FASC).

Dr. Choi, who is an assistant professor of Pediatrics at the University Of Pittsburgh School Of Medicine, is a member of the American Board of Pediatrics, American Academy of Pediatrics, Alpha Omega Alpha and the Ambulatory Pediatric Association, to name just a few. She has been a Pediatric Advanced Life Support instructor with the American Heart Association since 1997.

She received her medical degree and her doctorate at Boston University, and completed her pediatrics residency and chief residency at Children's Hospital of Pittsburgh.

Conference Faculy

Sylvia S. Choi, MD, FAAP*
Medical Director of Feeding and Swallowing Center
Associate Professor of Pediatrics, University of Pittsburgh School of Medicine
The Paul C. Gaffney Diagnostic Service
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA.
Choiss1@upmc.edu

Kelly Fill MOTR/L
Occupational Therapy Department
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA.
Kelly.fill@chp.edu

Matthew D. Ford MS, CCC-SLP
Cleft-Craniofacial Center
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA.
Matthew.Ford@chp.edu

Lynn A.C. Golightly MS, CCC-SLP
Department of Audiology and Speech-Language Pathology
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA.
Lynn.golighty@chp.edu

Jennifer Halper MSW, LCSW
Psychotherapist
Pittsburgh Psychotherapy Associates, LLC
9401 McKnight Road
Pittsburgh, PA. 15237
jhalper@pghpsychotherapy.com

Kim Kubistek OTD, OTR/L
Occupational Therapy Department
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA.
Kimberly.kubistek@chp.edu

Amy Loughner MOT, OTR/L
Occupational Therapy Department
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA.
Amy.loughner@chp.edu

Ann Condon Meyers MS, RD, LDN
Clinical Nutrition Department
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA.
Ann.Meyers@chp.edu

Laura Panko MD, FAAP *
Assistant Professor of Pediatrics, University of Pittsburgh School of Medicine
Feeding and Swallowing Center
The Paul C. Gaffney Diagnostic Service
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA.
Laura.panko@chp.edu

Katherine White MA, CCC-SLP
Department of Audiology and Speech-Language Pathology
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA.
katherine.white@chp.edu

Stacey Zettle, MS, RD, LDN
Clinical Nutrition Department
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA.
Stacey.zettle@chp.edu

Amy Zuraski MOT, OTR/L
Occupational Therapy Department
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA.
Amy.zuraski@chp.edu

*Moderators will be Sylvia Choi MD and Laura Panko, MD

Conference Schedule

7:30-8:00AM Registration/Breakfast

8:00-8:10AM **Welcome**

Sylvia S. Choi, MD, FAAP

8:10-9:00AM **Pediatrician's approach to Feeding Problems in Early Childhood**

Sylvia S. Choi MD, FAAP

9:00-9:45AM **Feeding Development from a Psychosocial Perspective**

Jennifer Halper MSW, LCSW

9:45-10:00AM Break

10:00-10:45AM **The Relationship Between Attainment of Developmental Milestones and Feeding Progression in Young Children: A Multidisciplinary Discussion**

Laura Panko MD, FAAP Ann Condon Meyers MS, RD, LDN Lynn Golightly, CCC-SLP

Kelly Fill MOTR/L

10:45-11:30AM **Sensory Sensitivities with Foods: How did we get here?**

Kim Kubistek OTD, OTR/L Amy Zuraski MOT, OTR/L

11:30-12:30 **Breakout Sessions:**

A.1. **Sensory Steps and Strategies**

Amy Zuraski MOT, OTR/L

B.1. **Building Oral Motor Skills**

Amy Loughner MOT, OTR/L

C.1. **Blenderized tube feedings**

Stacey Zettle MS, RD, LDN

D.1. **Physiological Changes of Swallowing in the Pediatric Tracheostomized and Ventilator Dependent Populations**

Katherine White MA, CCC-SLP

12:30-1:15PM LUNCH

1:15-2:00PM **Understanding Feeding Issues Associated with Orofacial Clefts and Craniofacial Anomalies**

Matthew D. Ford MS, CCC-SLP

2:00-3:00PM **Breakout session:**

A.2. **Sensory Steps and Strategies**

Amy Zuraski MOT, OTR/L

B.2. **Building Oral Motor Skills**

Amy Loughner MOT, OTR/L

C.2. **Blenderized tube feedings**

Stacey Zettle MS, RD, LDN

D.2. **Physiological Changes of Swallowing in the Pediatric Tracheostomized and Ventilator Dependent Populations**

Katherine White MA, CCC-SLP

3:00-3:15PM Break

3:15-4:00PM **Addressing Food Selectivity in Children on the Autism Spectrum**

Ann Condon Meyers MS, RD, LDN

4:00-4:10PM **Wrap up/Evaluations and Adjournment**

Pediatrician's Approach to Feeding Problems in Early Childhood

Sylvia Choi, MD FAAP
Associate Professor of Pediatrics
University of Pittsburgh School of Medicine
Children's Hospital of Pittsburgh of UPMC

Learning Objectives

- Provide overview of a pediatrician's approach to the evaluation of the young child with feeding difficulties
- Review symptoms that may provide clues to organic causes of feeding difficulties
- Discuss differential diagnoses of medical diseases that have associated feeding difficulties

Pediatric Feeding Issues

- Children fail to eat a developmentally appropriate diet, either quantity or quality
- Very Common:
  - ~25-35% normal children have minor problems
  - 40-80% of children born prematurely

  or with chronic medical conditions

Barriers to Normal Feeding

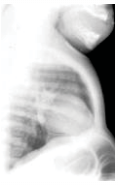
- Disrupted hunger / satiety regulation
- Inexperience with foods
- Disrupted learning style
- Disordered sensory processing / anxiety
- Psychosocial Issues
- Medical Issues
- Developmental functioning level

Symptoms of Feeding Issues

- Behavioral: Food refusal, irritability or anxiety around eating
- Psychosocial: Caregiver stress around eating

Symptoms of Feeding Issues

- Respiratory: History of coughing / congestion with feeds, recurrent pneumonia



Symptoms of Feeding Issues

- Gastrointestinal: Odynophagia, gagging, vomiting, constipation, anorexia

Symptoms of Feeding Issues

- Cardiac: Diaphoresis with feeds, becoming tired during feeding

Symptoms of Feeding Issues

- Neurologic: Developmental delay or loss of milestones

Symptoms of Feeding Issues

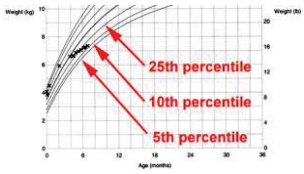
- Neurodevelopmental: Sensory difficulties, autism

Additional History

- Dietary History
- Medications
- Family History
- Social History

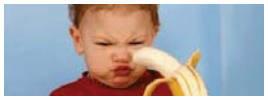
Physical Exam

- Abnormal growth pattern



Physical Exam

- Vital signs, pulse oximetry
- General observation of patient / parent behavior
- Physical Exam
- Observed feeding

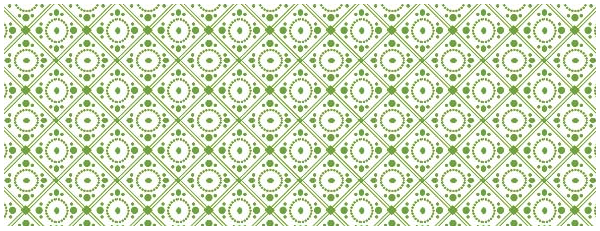


Diagnostic Testing

- Often, no routine pediatric testing is required after careful history / physical.
- Specific testing may be needed based on differential diagnosis.

Goals

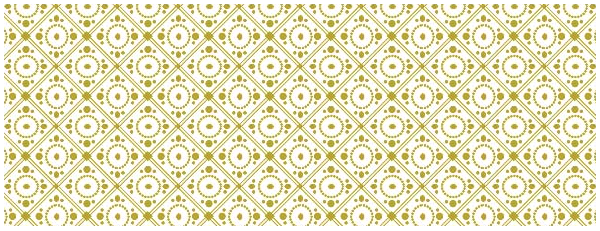
- Diagnose conditions that contribute to feeding issues
- Ensure patient is safe feeding
- Recommend treatment
- Partner with the caregivers to promote the safest and most pleasurable feeding experience for the patient with adequate nutrition



FEEDING DEVELOPMENT FROM A PSYCHOSOCIAL PERSPECTIVE

SPEAKER INFORMATION

Jennifer Halper, MSW, LCSW
jhalper@pghpsychotherapy.com



PSYCHOLOGICAL DEVELOPMENT

STAGE THEORIES IN TODDLERHOOD

Theory	Theorist	Stage	Age	Description
Psychosexual Stages of Development	Sigmund Freud	Anal	1-3 yrs.	Freud associates this stage with toilet training and with the transfer of libidinal energy to the anal area. Most children are weened by this age so transfer has to happen to serve pleasure principle. Stage associated with great struggles in self-control.
		Phallic	3-6 yrs.	Genitalia- Increased interest in both sexes, propensity toward self-stimulation. Emergence of the superego as a strong structure that aids in controlling unacceptable impulses.
Object Relations	Margaret Mahler	Object Constancy sub phase of Separation-Individuation	24-36 mo.	Positive, soothing view of the mother has been internalized. Internal representations of the object become functionally available. The presence of an internal image/representation allows others to serves as substitutes for mother in her absence.
Psychosocial Stages of Development	Eric Erikson	Autonomy vs. Shame and Doubt	2-4 yrs.	Conflict arises between desire for independence and doubt about abilities as well as shame over separating from the parent. Children are taking pride in development (motor control, language, etc.) but asking the question "Is it okay to be me?"

COMMON PATTERNS OF BEHAVIOR IN EARLY CHILDHOOD

- Cognitive Development
  - Rapid development of language skills
- Physical Development
  - Rapid development of gross and fine motor skills
- Social Growth
  - Interest in others
- Play
  - Imagination
- Autonomy
  - Separation from parent
- Anxiety in early childhood
  - Separation Anxiety
  - Neophobia

EMOTIONAL REGULATION

- Autonomy
- Emotional Dysregulation or Temper Tantrums
  - Causes
    - Language Limitations
    - Conflict between child wants and parental dictates
    - Over stimulation
- Parental Response
- Goodness of Fit

PARENTAL DEVELOPMENT

- Adjusting to changing needs, wants, and behaviors of child
- What they bring with them to the relationship
  - Family of Origin
  - Expectations
  - Evolving and/or conflicting life roles
- Anxiety

FEEDING DEVELOPMENT

FEEDING BEHAVIORS IN EARLY CHILDHOOD

- Skill Development
- Developmentally Appropriate Complications
  - Autonomy and Emotional Dysregulation
  - Neophobia
- Issues that further complicate feeding
  - Sensory Integration Disorder
  - Autism
  - Food Allergies

PROMOTING THE BEST FEEDING OUTCOME

- Scheduling
- Rule setting
- Consistency
- Expectations
- Adventurous attitude
- Playfulness

REFERENCES

REFERENCES

Amatea, E.S. (1988). Brief systemic intervention with school behavior problems: A Case of Temper Tantrums. Psychology in the schools, 25, 174-183.

Ashiabi, Godwin S. (2000). Promoting the emotional development of preschoolers. Early Childhood Education Journal, 28(2), 79-84.

Castle, Jill and Jacobson, Maryann (2013). Fearless Feeding: How to Raise Healthy Eaters from High Chair To High School. San Francisco: Jossey-Bass.

Dennis, Tracy. (2006). Emotional self-regulation in preschoolers: The interplay of child approach reactivity, parenting and control capacities. Developmental Psychology, 42(1), 84-97.

Lesser, J. and Pope, D. (2011). *Human Behavior and the Social Environment: Theory and Practice, 2nd Edition*. Boston: Allyn & Bacon.

Newman, Barbara M. and Newman, Philip R. (2012). Development Through Life: A Psychosocial Approach (11th ed., pp. 197-223). Belmont, CA: Wadsworth.

Wilson, Robert R. and Lyons, Lynn (2013). Anxious Kids, Anxious Parents: 7 Ways to Stop the Worry Cycle and Raise Courageous and Independent Children. Deerfield Beach, FL: Health Communications Inc.

"Attainment of Developmental Milestones and Feeding Progression in Young Children: A Mulitidisciplinary Discussion"

A PEDIATRICIAN'S VIEWPOINT

LAURA PANKO, MD

SEPTEMBER 23, 2016

Objectives

Focus on the toddler/early childhood period

Review "normal" acquisition of developmental milestones.

Understand that acquisition of developmental milestones allows a child to self-feed more independently.

Introduce the role of the pediatrician and concepts discussed at Well Child Checks.

Review the parent/child dyad with regard to feeding.

Well Child Visits

Standard Intervals
- 12mo, 15mo, 18mo, 24mo

Growth, development, parental concerns, immunization status all discussed

Limitations include time constraint of visit
- May range from 20-40 minutes

Anticipatory Guidance
- Verbal, print, online references

Follow up/Referrals

Developmental Surveillance

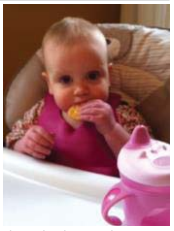
Review child's developmental milestones/evaluate for delays

Are children being fed developmentally appropriate foods?
- Lack of resources
- Lack of parental knowledge
- Parental concern for choking
- Concern for developmental delays/behavioral problems

Are children given the opportunity to feed independently?
- Low parental tolerance for mess at mealtimes
- Time constraints of family

Are children being fed in a safe way?
- Use of highchair/booster chair
- Adult supervision of mealtimes

Developmental Skills: 12months



Fine Motor
- pincer grasp mastered
- Independently feeds with fingers part of the meal
- Unable to spoon feed independently

Gross Motor
- Picks up/drinks from a cup independently
  - Will spill if not a sippy cup
  - May need assistance if not a handled cup

Receptive Language
- Recognizes objects
- Follows one step commands: "You eat the cookie"

Expressive Language
- Speaks a few words, points/reaches to desired objects

Social
- Shows objects to caregivers to engage: Ex. Offers cookie to family member during meal.

Anticipatory Guidance: 12mo

Age appropriate table foods
- easily chewed/meltable/mashable
- small pieces

Structured meals/snack times

Strategies for successful mealtimes
- pacing meals: prevent overstuffing/gagging
- allow toddler to self feed part of meal
- Assist with cup/spoon feeding

Weaning from bottle/breast

Transition from breastmilk/formula to cow's milk

Developmental Skills: 15months

Fine Motor Skills
- Uses a spoon with some spilling
- Chews well

Gross Motor Skills
- Walking well independently
- Able to run clumsily

Receptive Language Skills
- Follows one step commands

Expressive Language Skills
- Able to say a few words (usually 3-15)

Developmental Skills: 18months

Fine Motor Skills
- Spoon feeding skills evolving
  - can feed self almost entire meal
- Able to pick up and independently drink from a cup
  - Sippy or open cup
  - Can drink from straw

Gross Motor Skills
- running well
- can sit self in a child-sized chair

Receptive Language Skills
- Improving/more broad recognition of objects
- Understands commands: "Sit in chair."

Expressive Language Skills
- 10-25 words, maybe a few two word phrases

Anticipatory Guidance: 15-18mo

Adequate supervision/realistic expectations

Meals are messy!

Ongoing discussion about choking hazards
- Ex: NO hard candy, nuts, popcorn, hot dogs, grapes, etc.

Discussion about mealtime struggles
- Refusal to be fed
- Refusal of foods and "jags"
- Refusal to sit for meals
- Parental concerns about adequate daily intake

Elimination of bottle feeding

Developmental Skills: 24 months

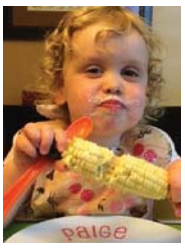
Fine Motor Skills
- Drinks from cup/straw independently
- Eating with a spoon mastered

Expressive Language Skills
- 50+words
- Two word sentences

Receptive Language Skills
- Can follow two step commands

Social Skills
- Temper tantrums emerging
- Potty training initiated, may develop constipation which can impact appetite.

Anticipatory Guidance: 24mo



Strategies to counter/prevent picky eating habits
- Provide limited choices to child
- ex. "Do you want peas or broccoli?"

Reward systems

Coping strategies for temper tantrums

Monitoring/treatment of constipation

Encouragement for parents

Summary

The toddler period is a time of rapid attainment of developmental feeding skills.

Evaluating parental expectations/knowledge and providing education about normal developmental and feeding practices is essential.

Regression or stagnation in developmental skills/feeding abilities with suboptimal growth are reasons for further investigation and possible referral if typical behavioral interventions are not working.

References

Scharf RJ, et.al. "Developmental Milestones." *Pediatrics in Review* 37 (2016): 25-38. Print

Guidelines for Health Supervision III. Elk Grove Village, IL: American Academy of Pediatrics, 2002. Print.

Kerner, B. "Clinical Investigation of Feeding Difficulties in Young Children: A Practical Approach." *Clinical Pediatrics* 48 (2009): 960-965. Online, accessed 7/13/16.

Aldridge, VK et.al. "Identifying Clinically Relevant Feeding Disorders and Problems." *Journal of Child Health Care* 14(2010): 261-270. Online, accessed 7/13/16.

Oral Motor Milestones Related to Feeding and Swallowing

LYNN GOLIGHTLY M.S. CCC-SLP

SEPTEMBER 23, 2016

Objectives

Focus on the toddler/early childhood period

Review "normal" acquisition of oral motor milestones.

Understand that acquisition of oral motor milestones allows a child to eat safely.

Goals for feeding

- Maintain nutrition and hydration in the least restrictive manner.
- Protect the airway; safety.
- Preserve/facilitate quality of life.

Oral Mechanism Exam

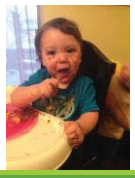
- Structural observations
- Face (Both upper and lower quadrants)
- Jaw
- Lips
- Tongue
- Cheeks
- Teeth

Oral Mechanism Exam

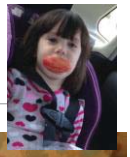
- Palate
- Voice
- Resonance
- Cough (unrelated to food presentation)
- Secretion management
- Respiratory status during assessment (prior to feeding)

Spoon Feeding

- Ability to bring their upper lip down to draw food from a spoon.
- Full lip closure.
- Consistent tongue lateralization with foods presented to the sides.
- Active movement of foods from the side of the mouth to the center.
- Mature tongue lateralization.



Chewing



- Diagonal rotary movements/Circular rotary movements.
- Ability to break off pieces of foods.
- Ability to clear food from the lips.
- Controlled biting.
- Full transfer of foods from sides, across midline.
- Ability to chew foods that contain juice.
- Ability to keep foods in the mouth during chewing.

Mature Chewing

- Use of tongue to gather pieces.
- Sweeping of pieces into a bolus with the tongue.
- Chew bigger pieces of food vs. smaller.
- Chewing strength.
- Management of chewing harder to chew foods.
- Chewing with lips closed.
- Circulatory jaw movements.
- Increasing speed, strength, and efficiency of harder to chew foods.

Bottle Transition

Sippy cup
Open cup
Straw cup

Safety Considerations for Feeding

- Endurance
- Significant oral residue after the swallow
- Drooling
- Prolonged mealtimes
- Excessive gagging
- Lip retraction/Limited upper lip movement
- Poor labial seal

Safety Consideration for Feeding

- Jaw thrust/clenching/retraction/instability/
- Tonic or phasic bite
- Tongue thrust/retraction/hypotonia/deviation/limited ROM
- Reduced buccal tone/sensory awareness
- Poor bolus formation and/or transport
- Delayed or difficult swallow initiation
- Multiple swallows to clear oral residue
- Cognitive ability/communicative ability
- Positioning

Information from Milestones

- Overall motor skill impression.
- How much you will need to consider from a sensory perspective.
- The types of foods/liquids you may be begin to initiate safely.

Summary

- Oral motor development and safety are very closely linked.
- Oral mechanism exams are a helpful indicator of safety.
- Always keep feeding pleasant and positive.

References

Carruth, B.R., Ziegler, P.J., Gordon, A., & Hendricks, K. (2004). Developmental milestones and self-feeding behaviors in infants and toddlers. *Journal of the American Dietetic Association, 104(1 Suppl1)*, s51-56.

Potock, Melanie. (2014) The ASHA Leader Blog, Step Away From the Sippy Cup!

Schwaab, L.M., Niman, C.W., % Gisel, E.G. (1986). Comparison of chewing cycles in 2-, 3-, 4-, and 5-year old normal children. American Journal of Occupational Therapy, 40(1):40-43.

Sealy, P.A., Farrell, N., & Hoogenboom, A. (2011). Caregiver self-report of children's use of the sippy cup among children 1 to 4 years of age. *Journal of Pediatric Nurses*, 26, 200-205.

Skinner, J.D., Carruth, B.R., Wendy, B., & Ziegler, P.J. (2002). Children's food preferences: a longitudinal analysis. *Journal of the American Dietetic Association*, 102(11) 1638-1647.

Torola H., Lehtihalmex, M., Yliherva, A., & Olsen, P. (2012). Feeding skill milestones of preterm infants born with extremely low birth weight (ELBW). Infant Behavior and Development; 35: 187-94.

Developmental Norms

Sensory Processing, Motor Skills & Self Feeding

CHILDREN'S HOSPITAL OF PITTSBURGH OF UPMC
SEPTEMBER 23, 2016
PANEL DISCUSSION

KELLY FILL, MOTR/L

Objectives

Appreciate correlation between motor skill development and feeding stage

Reinforce knowledge of self-feeding skill development during early childhood

Consider provision of guidelines for developmentally appropriate feeding progressions

Normal Sensory Processing

Range of tastes

Range of textures

Try new foods (within reason)

Accept mixed textures

Tolerate tooth brushing

Control saliva

Producing more sounds verbally

Normal Motor Skills & Habits

Walking to running

Transitioning among various positions

Increasing precision with fine motor skills
- Pincer grasp
- Digit Isolation
- Separation of the two sides of the hand
- Crossing midline
- Establishing hand preference

Eating meals & snacks

Napping

Age	Oral Motor	Hand & Body	Self Feeding	Mode of liquid intake	Diet
In utero	Sucking reflex begins in second trimester, well-established by 36 weeks gestation	Hands to mouth/face observed via ultra sound	--	--	--
0-4 mos.	- Suck/swallow reflex - Rooting reflex - Gag reflex - Tongue thrust reflex - Short suck bursts before swallowing and breathing - Suckle initially predominates	- Poor control of head, neck, trunk - Mouthing hands and fingers	n/a	- Breast/bottle	Breast milk or formula
4-6 mos.	- Reflexes diminish - Oral cavity expands and tongue musculature refines therefore tongue no longer fills entire mouth - Suck predominates - Tongue thrust with introductory spoon feeding, decreases with experience	- Sits with support - Good head control - Palmar/whole hand grasp - Bringing objects towards mouth/face	- Moves hands to bottle/breast while feeding - Opens mouth as spoon approaches - Mouths hands, toys, etc.	- Breast/bottle	Breast milk or formula is primary means of nutrition Spoonfuls of baby cereals (4-5 months) with transition to baby foods (5-6 months) &/or pureed foods mainly for stimulation & skill development
6-8 mos.	- Cleans spoon with upper lip - Munching pattern emerges on semi-solids - Less drooling, primarily when teething	- Begins to sit unsupported - Radial digital grasp - Transfers hand to hand	- Begins to finger feed - Uses sippy cup with help - May use bottle independently	- Breast/bottle - Sippy cup introduction	Breast milk or formula is primary means of nutrition however baby cereals, stage 1 and 2 baby foods and/or pureed foods begin to compromise portion of caloric intake Easily melt able/mash able foods (puffs, etc.) introduced with close supervision
8-12 mos.	- Begins lateralizing tongue - Lip closure while swallowing soft solids and possibly liquids from cup - Rotary chewing begins	- Sits independently - Protective responses - Pulling to stand, may be cruising or walking - Pincer grasp	- Able to hold bottle independently - Trying to hold sippy cup & bring to mouth - Plays with, bangs, grabs spoon - Finger feeds self	- Breast/bottle - Sippy cup - May begin straw - May begin open mouth cup with spills	Breast milk or formula continue to provide a significant amount of calories and nutrition Fork-mashed table foods; begin chopped texture Baby cereals, foods and/or pureed foods Small, soft dissolvable solids (cheese, crackers, pieces of soft bread) Diluted juice

Age	Oral Motor	Hand & Body	Self Feeding	Mode of liquid intake	Diet
12-15 mos.	- S/S/B for longer sequences - Rotary chewing - Lateralizes food when chewing - Lip closure intermittently when chewing, present when swallowing - Able to bite through harder foods with front teeth	- Walking - Transitioning between various positions - Increasing precision with fine motor skills	- Dips spoon in food - Moves spoon to mouth but is messy - Holds handled cups	- Possibly breast/bottle - Sippy cup - Straw - Open mouth cup with spills	Transition from formula to whole milk Fork-mashed table foods Finely chopped or ground foods Soft dissolvable solids (i.e. crackers, cookies) Elimination of baby foods
15-18 mos.	- Bites through crunchy foods - Chews	- Improving gross and fine motor coordination	- Scoops with spoon and feeds self with some spilling	- Possibly still breast 1-2 x/day only; weaning from bottle by 18 mos. - Sippy cup - Straw - Open mouth cup with spills	Fairly regular diet with avoidance of choking hazards
18-24 mos.	- Mature bolus formation - Can chew with lips closed	- Improving gross and fine motor coordination	- Wants to feed himself/herself - Can hold cup in one hand while drinking	- Sippy cup - Straw - Open mouth cup without spills	Fairly regular diet with avoidance of choking hazards
24-36 mos.			- Uses spoon independently - Begins to stab with fork with close supervision	- Sippy cup - Straw - Open mouth cup without spills	Regular diet
36 mos.++			- Eats independently	4 ½ to 5 yrs – able to drink from water fountain independently	Advanced textures (meats, whole fruits, etc.) Open mouth cup without spills

Autonomy vs. Shame & Doubt

Autonomy develops as child is becoming more independent, desires to control their bodies & environment

Shame & Doubt develop when a child is not given appropriate opportunities to foster independence

Self-Feeding

Self-Feeding Norms

12-14 months

- Refining finger feeding
- Utensil use may begin, grasping spoon with whole hand
- Holding cup with 2 hands, emerging skills for bringing to mouth
- Usually able to hold and tip bottle

14-16 months

- Efficient with finger feeding
- Refining utensil use
- Increasing independence with closed lid cup

Self-Feeding Norms (continued)

18-24 months

- Refining utensil use, impacted by behavior/mood/motivation
- Scoops with spoon
- By 19 months, can drink from an open cup with some spillage

24-36 months

- Total self-feeding
- Efficient with use of utensils
- Can drink from open cup without spillage, one-handed cup holding

When to Introduce

WHAT	WHEN
Sippy cup	~6-9 months
Straw	~8-10 months
Open cup	~10-12 months
Finger feeding	Puree-play can start ~5-6 months Finger feeding ~7-8 month range
Spoon	~8-12 months
Fork	~15-18 months

Self-Feeding Supports

Summary

Remember, normal development does exist

Encourage caregivers to support their child's evolving independence during a challenging stage of development

Consider the "big picture" when offering advice about appropriate diet and feeding progression

When in doubt, consult occupational therapy ☺

References

Butte N.F., Cobb K., Graney L,. Heird W.C., & Rickard,K.A. (2004) The Start Healthy Feeding Guidelines for Infants and Toddlers. *Journal of the American Dietetic Association*. 104: 442-454.

Carruth BR, Skinner JD. (2002) Feeding behaviors and other motor development in healthy children (2-24 months). *Journal of the American College of Nutrition*; 21 (2) 88-96.

Chatoor, Irene. (2009) Sensory food aversions in infants and toddlers. *Zero to three,* 44-49.

Schwartz, C., Scholtens, P., Lalanne, A., Weenen, H., & Nicklaus, S. (2011). Development of healthy eating habits early in life. Review of recent evidence and selected guidelines. *Appetite*, 57, 796-807.

https://www.healthychildren.org – *Ages and Stages*

http://www.infantandtoddlerforum.org/ - *Developmental Stages in Infant and Toddler Feeding*

Google image search terms: toddler self feeding, bent-handled utensils, divided plates, toddler utensils, NUK brush, fun bites, high chair, potty training, 360 cup, scoop bowl, Mr. Juice Bear, take n toss

Developing Toddler and Preschoolers into Healthy Eaters for Life

CHILDREN'S HOSPITAL OF PITTSBURGH

SEPTEMBER 23, 2016

PANEL DISCUSSION

ANN C MEYERS RD, LDN, MS

Objectives

Effective nutrition care in toddlers and preschoolers always demands a working knowledge of child development stages and feedings skills.

Teaching families what feeding skills to expect from their child now and how to develop new skills for the future will allow for smooth transitions from one feeding stage to the next.

The why of good nutrition…

- Practicing healthy eating behaviors during early childhood is essential for promoting optimal growth, development, and health.
- • Preventing immediate health problems (e.g. iron-deficiency anemia, undernutrition, obesity, early childhood caries).
- • Laying the foundation for lifelong health and reducing the risk of chronic disease (e.g., cardiovascular disease, type 2 diabetes mellitus, hypertension, some forms of cancer, osteoporosis).

Google images

Terrible 2s or thoughtful 2s?

- Toddlers tend to be leery of new foods and may refuse to eat them.
- They may need to look at the new foods and touch, smell, feel, and taste them—perhaps as many as 15 to 20 times before they accept them.
- Many toddlers pick food as one of their "control experiments" which can carry over to preschool years and beyond.

Worry for parents

- Toddlers and preschoolers will only grow a total of 5 ½ pounds per year. (Up until the age of 2, weight has quadrupled!)
- Parents often become alarmed when toddlers' eating behaviors change so much, and often so abruptly.
- Toddlers' growth rates decrease during early childhood; therefore, their energy needs per pound may also decrease.

Google images

Professional advice

- Parents are responsible for what, when, and where the toddler eats; toddlers are responsible for whether to eat and how much.
- Parents need help learning what is appropriate and healthy for their children at any age but especially during the transition from infant feeding to toddler eating.

Google images

Common Nutrition Problems

- Making the transition from high fat formula or breast milk (> 50% fat) to a diet in which fat is only 30% of total intake and carbohydrates are 50 – 60 % and protein is 15 – 20%
- Providing good sources of iron
- Providing less liquid and more solid foods
- Staying attentive but relaxed and positive as toddlers learn to feed themselves independently
- Providing missing nutrients when avoiding and entire food group
- Separating cultural diversity from inappropriate feeding practices

Small servings are key: Sample breakfast menu for a toddler

2 - 4 ounces of plain yogurt

2 T of chopped fruits such as banana, thin sliced and peeled apples

½ slice of toast with nut butter spread thin

4– 8 ounces of water

Beware of sample menus because intake is always variable at this age.

It is important to tell parents that a sample menu is only what could be offered NOT what the child should eat.

Food Group	Servings per Day	Portion Size for Ages 1 to 3	Portion Size for Ages 4 to 6	Portion Size for Ages 7 to 10
Fruits	2–3 servings	¼ cup cooked, frozen, or canned ½ piece fresh ¼ cup 100% juice	¼ cup cooked, frozen, or canned ½ piece fresh ⅓ cup 100% juice	½ cup cooked, frozen, or canned 1 piece fresh ½ cup 100% juice
Vegetables	2–3 servings	¼ cup cooked	¼ cup cooked ½ cup salad	½ cup cooked 1 cup salad
Grains	6–11 servings	½ slice bread ¼ cup cooked cereal, rice, or pasta ⅓ cup dry cereal 2–3 crackers	½ slice bread ⅓ cup cooked cereal, rice, or pasta ½ cup dry cereal 3–4 crackers	1 slice bread ½ cup cooked cereal, rice, or pasta ¾–1 cup dry cereal 4–5 crackers
Meats and other proteins	2 servings	1 ounce meat, fish, chicken, or tofu ¼ cup cooked beans ½ egg	1 ounce meat, fish, chicken, or tofu ⅓ cup cooked beans 1 egg	2–3 ounces meat, fish, chicken, or tofu ½ cup cooked beans 1 or 2 eggs
Dairy	2–3 servings	½ cup milk ½ ounce cheese ⅓ cup yogurt	½ cup milk 1 ounce cheese ½ cup yogurt	1 cup milk 1 ounce cheese ¾–1 cup yogurt

Adapted from Dietz WH, Stern L, eds. *Nutrition: What Every Parent Needs to Know*. 2nd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2012:194.

Sample menu for a toddler

Breakfast	½ cup whole milk ½ cup oatmeal with 2 tablespoons cooked raisins
Snack	½ peanut butter and jelly sandwich ½ cup orange juice
Lunch	½ cup whole milk Sandwich: ½ ounce ham, ½ ounce cheese, 1 slice whole grain bread 2 tablespoons cooked carrots ½ banana
Snack	½ cup fruit yogurt ¼ cup granola ½ cup water
Dinner	½ cup whole milk 1½ ounces chicken 2 tablespoons green beans 2 tablespoons mashed potatoes 2 tablespoons gravy 1 whole grain dinner roll ½ teaspoon margarine
Snack	¼ cup applesauce 2 graham crackers ½ cup whole milk

American Academy of Nutrition

Getting to the root of the problem with parents

- Do you have any concerns about your child's eating behaviors or growth?
- How does your child let you know when she is hungry and when she is full?
- What do you do if your child doesn't like a particular food?
- Do you enjoy sharing meals and snacks with your child?
- Do you have appropriate equipment for feeding (for example, cups, eating utensils, and an infant seat, highchair, or booster seat)?
- Do you have any concerns about the food served to your child when she/he is away from home?
- What is the source of your drinking and cooking water?
- Are you concerned about having enough money for healthy food?
- Has your child seen a dentist yet? Do you brush his or her teeth yet?

When an entire food group is missing…

Suggest alternate choices for that group:

1. Little meat or high protein foods in the diet?

Substitute softer meats (shredded chicken, fish, lentils, eggs, meat sauce on pasta etc.) for meats that require chewing.

2. No vegetables in the diet?

Offer more fruits and easy to chew vegetables such as avocados, well cooked carrots, soft cooked green beans, soft cooked broccoli, olives and even pickles! Allow the child to finger feed as much as possible.

3. No dairy products in the diet?

Serve an alternate beverage such as soy milk fortified with calcium. Dark greens, almond spread, and beans also have calcium in moderate amounts. It may be necessary to use a calcium supplement. Pediatric MVIs that have calcium only have 13% of the RDA for calcium.

Providing structure without interference with the joy of eating.

- Meals and snacks at the same time each day. Allow about 3 hours in between each "mini-meal".
- Expecting some socialization at meal times even though mini-meals are brief. (allow 5 min up to 30 min per mini-meal).
- No more than 4 - 6 ounces of liquid at any mini-meal until some solids have been consumed.
- Presentation may help entice toddlers to try a food but allowing self-feeding is more important.
- Most toddlers (and many preschoolers) like their foods separated. This may help them identify foods before they eat them.

google images

Preschoolers – what changes?

- Preschoolers can begin to learn the basics of table manners, preparation and clean-up. For example, they can serve themselves, pass food to others, use utensils and join in a conversation while eating.
- They are usually more accepting of new foods IF they see others eating these foods.
- Presentation can entice preschoolers to try new foods and enjoy them.
- Preschooler jaws are stronger than toddlers so they can chew tougher foods.

Specific Nutrition Concerns for Preschoolers

- Poor growth: too much or too little
- Anemia from lack of iron
- Pica – sensory problems vs. iron deficiency
- Selective eating leading to other nutritional deficiencies
- Misguided parenting efforts to “get my child to eat”
- Elimination problems such as diarrhea, constipation and encopresis.
- Influenced by other’s preferences, by TV advertising, by packaging.

Sample menu for a preschooler

Sample 1-Day Menu for a Child Ages 4 to 5 Years

Breakfast	½ cup whole or reduced-fat milk ¾ cup oatmeal with ¼ cup raisins and cinnamon
Snack	½ peanut butter and jelly sandwich ½ cup orange juice
Lunch	½ cup whole or reduced-fat milk Sandwich: ¾ ounce ham, ¼ ounce cheese, 2 slices whole grain bread ½ cup steamed carrots 1 small banana
Snack	¾ cup yogurt ¼ cup sliced fruit ¼ cup granola ½ cup water
Evening Meal	¾ cup whole or reduced-fat milk 2 ounces chicken 2 tablespoons green beans ¼ cup mashed potatoes 3 tablespoons gravy 1 whole grain dinner roll ½ teaspoon margarine
Snack	½ cup applesauce 5 whole grain crackers ½ cup water

American Academy of Nutrition

Google images

References

Brightfutures.org Supervision of Childhood Nutrition, ages 1 – 4.

Child of Mine by Ellyn Satter

Fearless Feeding by Castle and Jacobsen

MyPlate.org

Google images

SENSORY SENSITIVITIES WITH FOODS: HOW DID WE GET HERE?

KIMBERLY KUBISTEK, OTD, OTR/L AND AMY ZURASKI, MOT, OTR/L
CHILDREN'S HOSPITAL OF PITTSBURGH OF UPMC
SEPTEMBER 23, 2016

SENSORY JOURNEY

https://encrypted-tbn1.gstatic.com/images?q=tbnANd9GcT9-1r14GhJ8NGVrTZNrNbbAJ8ztHZMvYyXEWIP0CkyGAplaK

THE INFLUENCES OF EARLY INFANCY / CHILDHOOD EXPERIENCES

CHILDHOOD EXPERIENCES

CHILDHOOD EXPERIENCES

http://huffpost.com/gen/1679709/images/o-CRYING-CHILD-facebook.jpg
https://encrypted-tbn2.gstatic.com/images?q=tbn:ANd9GcS4Ivs0nkeyrlhanvuuJn7Yl1xTfJeprBxWzqGMbzfDRc9G_AK5cDQ

Google images

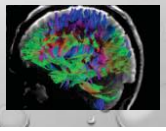
OVERVIEW

- A PREMATURE BABY IS ANY BABY BORN PRIOR TO 37 WEEKS GESTATION
- 90% OF PREMATURE BABIES SURVIVE
- IN THE UNITED STATES, ABOUT 500,000 BABIES ARE BORN PREMATURELY EACH YEAR
- INCREASED RISK FOR LONG TERM HEALTH DIFFICULTIES AND DEVELOPMENTAL DELAY

Weeks Gestation when born			
23 – 25 weeks gestational age	30% - 40% will develop typically without major health concerns or disabilities	25% - 40% will have mild to moderate disabilities	20% - 35% will have severe disabilities which will require significant medical care
26 – 28 weeks gestational age	15% - 40% will develop typically	50% - 60% will have mild to moderate disabilities	10% - 25% will have severe disabilities
29 – 32 weeks gestational age	60% - 70% will develop typically	15% - 20% will have mild to moderate disabilities	10% - 15% will have severe disabilities
33 – 36 weeks gestational age	The likelihood of severe disability is approximately the same as infants born full term (1%-2%); These babies are at higher risk for being diagnosed with mild forms of CP, developmental delay, and learning/behavior impairments		

CURRENT RESEARCH

- CURRENT LITERATURE REPORTS THAT STRESSORS IN THE NICU ARE ASSOCIATED WITH ALTERATIONS IN BRAIN STRUCTURE AND FUNCTION
- PRETERM INFANTS EXHIBIT ALTERED BEHAVIOR, POORER ORIENTATION, LOWER TOLERANCE FOR HANDLING, LOWER SELF-REGULATION, POORER REFLEXES, MORE STRESS, HYPER / HYPO-TONIA, AND MORE EXCITABILITY



http://dailymail.co.uk/i/pix/2013/03/06/article-2288995-1B79A3D000003DC-142_634x395.jpg
https://encrypted-tbn2.gstatic.com/images?q=tbn:ANd9GcSoTSe5e8TBDlmPlcMNGCLPmuI_V15Zp9y_mSprsVTTJhqqQV1lQ

BRAIN GROWTH IN FIRST 3 MONTHS - RESEARCH

OBJECTIVE – ASSESS WHOLE BRAIN GROWTH AND RATES OF CHANGE IN INFANTS IN FIRST 3 MONTHS OF LIFE

METHODS – MRI'S LONGITUDINALLY ON HEALTHY TERM AND NEAR TERM INFANTS

RESULTS AFTER 90 DAYS

- WHOLE BRAIN GROWTH RATE - 1% / DAY, SLOWING TO 0.4% / DAY BY END OF 3 MONTHS
- OVERALL GROWTH – 64%
- BRAIN WAS MORE THAN ½ SIZE OF ELDERLY ADULT BRAIN
- CEREBELLUM MORE THAN DOUBLED IN SIZE
- HIPPOCAMPUS SLOWEST GROWTH – 47%
- MALES GREW MORE RAPIDLY THAN FEMALES – 66% VS 63%
- LEFT VENTRICLE LARGER THAN RIGHT

RESULTS AFTER 90 DAYS

- LONGER GESTATION LED TO LARGER BRAIN SIZE AT BIRTH
- INFANT BORN 1 WEEK EARLY WAS 5% SMALLER IN BRAIN SIZE, AND AT 90 DAYS WILL NOT HAVE CAUGHT UP, BEING 2% SMALLER THAN AVG.

RELEVANCE

- MRI'S COULD BE USED TO IMPROVE DETECTION OF NEURODEVELOPMENTAL DISORDERS
- ?????? WHAT DO YOU THINK ?????

NICU ENVIRONMENT

- A NEWBORN BABY, EITHER PRETERM OR FULL TERM, IS EXTREMELY VULNERABLE TO THE ENVIRONMENTAL EFFECTS OF THE NICU
- NOISE – NOT ABOVE 60 DB
- LIGHT – INDIVIDUAL AND CONTROLLABLE, LIMIT BRIGHT LIGHTS FOR PROCEDURES, SHIELD EYES, CYCLED LIGHTING

Google Images

https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQbqymvA5xLTEvQLpQpfxb3:4fkCwEcx2ys5jWW

SENSORY DEVELOPMENTAL MILESTONES

- TACTILE – BEGINS DEVELOPING AT 8 WEEKS AND COMPLETE BY 24 WEEKS GESTATION (FULLY FUNCTIONING BY 32 WEEKS) HIGHER DENSITY IN PERIORAL, PERIANAL, PALMS OF HANDS & SOLES OF FEET, THEREFORE HEIGHTENED VULNERABILITY OF THESE REGIONS
- VESTIBULAR – COMPLETELY DEVELOPED BY 5 MONTHS OF AGE (CORRECTED)
- GUSTATORY – BEGINS DEVELOPING AT 8-9 WEEKS; POSSIBLE THAT INFANTS PERCEIVE TASTE BY 32 WEEKS
- AUDITORY – STRUCTURES INTACT BY 24-25 WEEKS; BEGINS FULLY FUNCTIONING BETWEEN 29 – 32 WEEKS
- VISUAL – STRUCTURES INTACT BY 23-24 WEEKS AND COMPLETE AFTER 40 WEEKS GESTATION

NEURODEVELOPMENTAL FACTS

FROM 26-40 WKS

- 250 BRAIN CELLS/SECOND
- 40,000 SYNAPSES/MINUTE

NEUROPRUNING

- CELLS AND SYNAPSES THAT DON'T GET USED DIE OFF
- CELLS AND SYNAPSES THAT ARE USED PROLIFERATE AND GROW

BUT….

WHAT FIRES TOGETHER
WIRES TOGETHER

Google Images: lasvegas.com

PRETERM BIRTH DOES NOT ACCELERATE EARLY SENSORY DEVELOPMENT PROCESSES, BUT CAN INTERFERE WITH THE SENSORY DEVELOPMENT WHEN EXPOSED TO STIMULI

2 EVENTS THAT HAVE BIGGEST AFFECT ON NEURODEVELOPMENT

- STRESS
- PAIN

Google Images

SENSORY STIMULI CAN BE

POSITIVE
- DIM LIGHTS
- LOW NOISE LEVEL
- LOVING FAMILY
- LOVING TOUCH
- POSITIVE FEEDING EXPERIENCES
- FEEL GOOD

NEGATIVE
- HIGH LIGHT AND SOUND LEVELS
- NUMEROUS MEDICAL PROCEDURES
- POOR POSITIONING
- CHALLENGING FEEDING EXPERIENCES
- CHALLENGES IN HEMODYNAMIC STABILITY
- LACK OF LOVING TOUCH

NEURODEVELOPMENT

- PHYSICAL, PSYCHOLOGICAL OR ENVIRONMENTAL STRESSORS IMPACT THE DEVELOPING BRAIN AT THE SUBCORTICAL LEVEL, WHICH CAUSES THE BABY WHO IS WIRED FOR SURVIVAL, HOW TO ADAPT
- STRESS HORMONES DESTROY NEURAL NETWORKS
- **INITIAL RESPONSE IS ADAPTIVE BUT LONG TERM RESPONSE IS MALADAPTIVE**

NEURODEVELOPMENT

- STRESS HORMONES TARGET NEURAL NETWORKS AT LEVELS OF THE BRAIN WHERE YOU HAVE EMOTIONS AND LEARN TO HAVE A RELATIONSHIPS AND INTERACT WITH OTHERS.
- AMERICAN ACADEMY OF PEDIATRICS HAS MANDATED THAT PEDIATRICIANS MONITOR TOXIC STRESS FOR THEIR PATIENTS
- BOTTOM LINE: DEVELOPING BRAINS EXPOSED TO TOXIC STRESS IS BAD, AND IF SUSTAINED OVER TIME IT INCITES NEUROTOXICITY, MELTING BRAIN CONNECTIONS

NEURODEVELOPMENT

- COPING MECHANISMS LIKE DISSOCIATING IS A SIGN OF PROFOUND STRESS, AND CAN BECOME HARDWIRED INTO BEHAVIORAL REPERTOIRE
- A CHILD'S MEANING OF LIFE STEMS FROM THE EMOTIONAL EXPERIENCES THEY HAVE HAD……INFANTS WON'T REMEMBER DETAILS ABOUT EXPERIENCES, THEY WILL REMEMBER FEELINGS
- IT'S THE "UGLY" EXPERIENCES THAT CAN FRAME RELATIONSHIPS FOR THE REST OF A CHILD'S LIFE

IN ADDITION

- "PSYCHOSOCIAL DEPRIVATION WITHIN ANY CAREGIVING ENVIRONMENT DURING EARLY LIFE MUST BE VIEWED WITH AS MUCH CONCERN AS ANY DEBILITATING CHILDHOOD DISEASE" JOHNSON 2011
- THE OXYTOCIN SYSTEM IS THE MOST POWERFUL WEAPON TO USE TO COUNTERACT THE EFFECTS OF STRESS IN A CHILD'S LIFE….SENSE OF TOUCH AND SOCIAL VOCALIZATION

WHY DO WE SEE FEEDING DIFFICULTIES?

FEEDING PATTERNS IN PRETERM INFANTS

FACTS

- PRETERM INFANTS DISPLAYED STATISTICALLY SIGNIFICANT DELAYS IN THEIR ORAL MOTOR SKILLS
- PRETERM INFANTS ALSO DISPLAYED STATISTICALLY SIGNIFICANT ALTERATIONS IN THEIR ORAL SENSITIVITY
- PRETERM INFANTS RECEIVED A STATISTICALLY SIGNIFICANTLY GREATER NUMBER OF FEEDS EACH DAY THAN FULL-TERM INFANTS
- PRETERM INFANTS DISPLAYED STATISTICALLY SIGNIFICANTLY LONGER MEAN DURATION OF FEEDS THAN FULL-TERM INFANTS
- PRETERM INFANTS TOOK STATISTICALLY SIGNIFICANTLY LONGER TO FEED EACH DAY THAN FULL-TERM INFANTS

Dodrill et al, 2008

MORE FACTS

- PRETERM INFANTS BEGAN BEGINNER (PUREED) SOLIDS EARLIER THAN FULL-TERM INFANTS
- HOWEVER, COMPARED TO FULL-TERM INFANTS, PRETERM INFANTS TOOK LONGER TO TRANSITION ONTO TEXTURED SOLIDS

Dodrill et al, 2008

INEFFICIENT FEEDING SKILLS = LONG TERM FEEDING CHALLENGES

Google Images:

https://encrypted-tbn1.gstatic.com/images?q=tbn:ANd9GcQxc3jdsQg-09BeAKxoTU292LW_FgCMqpvKgqFK4Pb__ebC7vE

BALANCING ACT

WHY IS SENSORY PROCESSING A KEY COMPONENT IN FEEDING?

- EATING IS THE ONLY ACTIVITY IN WHICH CHILDREN ENGAGE THAT INVOLVES ALL OF THE SENSORY SYSTEMS.
- A DISRUPTION IN ANY OF THESE SENSORY SYSTEMS CAN LEAD TO PROBLEMS WITH FEEDING.
- THE HANDS AND MOUTH HAVE THE HIGHEST NUMBER OF SENSORY RECEPTORS PER SQUARE INCH COMPARED TO ANY OTHER PART OF THE BODY.
- SENSORY RECEPTORS IN THE MOUTH ARE EARLIEST TO DEVELOP IN UTERO.

SENSORY SYSTEMS

- EIGHT TOTAL SENSORY SYSTEMS
- FIVE GIVE US INFORMATION ON THE EXTERNAL WORLD:
  - VISUAL
  - TACTILE
  - OLFACTORY
  - AUDITORY
  - GUTATORY
- THREE GIVE US INFORMATION ON THE INTERNAL WORLD:
  - PROPRIOCEPTION
  - VESTIBULAR
  - INTEROCEPTION

MILESTONES OF SENSORY DEVELOPMENT IN RELATION TO FEEDING

- 7-8 WEEKS GESTATION: APPEARANCE OF SPECIALIZED TASTE CELLS
- 8-10 WEEKS: APPEARANCE OF OLFACTORY BULBS
- 11-13 WEEKS: DEVELOPMENT OF TASTE BUDS
- 12 WEEKS: SWALLOWING BEGINS
- 16-24 WEEKS: NASAL PLUGS DISSOLVE, AIRWAY BATHES IN AMNIOTIC FLUID

MILESTONES OF SENSORY DEVELOPMENT IN UTERO

- 24 WEEKS: INCREASE IN SWALLOWING TO SWEET TASTES, DECREASE IN SWALLOWING TO BITTER/SOUR TASTES
- 29 WEEKS: FETUS CAN DETECT AND DISCRIMINATE SMELLS

FUN FACTS

- MOTHER'S DIET CHANGES THE FLAVOR PROFILE OF AMNIOTIC FLUID
- INFANTS ARE MORE RESPONSIVE TO FLAVORS THAT THEY EXPERIENCED WHILE IN UTERO
- INFANTS CAN RECOGNIZE MOTHER BY SMELL WITHIN HOURS IF BREAST FED

MILESTONES OF SENSORY DEVELOPMENT IN INFANCY AND CHILDHOOD

- 2 WEEKS OF AGE: REJECT BITTER TASTE
- 2 MONTHS: REJECT SOUR TASTES
- 3 MONTHS: CAN DETECT FLAVOR DIFFERENCES
- 4 MONTHS: PREFERENCE FOR SALTY TASTES DEVELOP
- BY 8 YEARS OF AGE: CHILD HAS SAME NUMBER OF TASTE BUDS AS ADULT BUT TASTE BUDS ARE MORE DENSE SECONDARY TO SMALLER TONGUE

MILESTONES OF SENSORY DEVELOPMENT IN UTERO

- 24 WEEKS: INCREASE IN SWALLOWING TO SWEET TASTES, DECREASE IN SWALLOWING TO BITTER/SOUR TASTES
- 29 WEEKS: FETUS CAN DETECT AND DISCRIMINATE SMELLS

FUN FACTS

- MOTHER'S DIET CHANGES THE FLAVOR PROFILE OF AMNIOTIC FLUID
- INFANTS ARE MORE RESPONSIVE TO FLAVORS THAT THEY EXPERIENCED WHILE IN UTERO
- INFANTS CAN RECOGNIZE MOTHER BY SMELL WITHIN HOURS IF BREAST FED

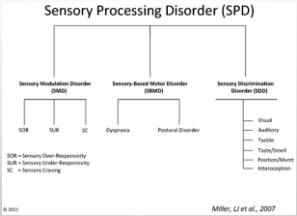
MILESTONES OF SENSORY DEVELOPMENT IN INFANCY AND CHILDHOOD

- 2 WEEKS OF AGE: REJECT BITTER TASTE
- 2 MONTHS: REJECT SOUR TASTES
- 3 MONTHS: CAN DETECT FLAVOR DIFFERENCES
- 4 MONTHS: PREFERENCE FOR SALTY TASTES DEVELOP
- BY 8 YEARS OF AGE: CHILD HAS SAME NUMBER OF TASTE BUDS AS ADULT BUT TASTE BUDS ARE MORE DENSE SECONDARY TO SMALLER TONGUE

FUN FACTS

- MOTHER'S DIET IMPACTS THE FLAVOR OF BREAST MILK.
- VARIATIONS IN FLAVOR OF MOTHER'S BREAST MILK MAY INCREASE INFANTS LIKELIHOOD TO ACCEPT NOVEL FOODS.
- BREAST MILK IS GENERALLY SWEET; WHEREAS, HYDROLYZED FORMULAS ARE MORE BITTER/SOUR.

SENSORY PROCESSING DISORDER NOSOLOGY



Obtained from www.spdfoundation.net

SENSORY MODULATION PATTERNS

- SENSORY OVER-RESPONSIVITY: MORE SENSITIVE, LOWER THRESHOLD
- SENSORY UNDER-RESPONSIVITY: LESS SENSITIVE, HIGHER THRESHOLD
- SENSORY CRAVING: CRAVES SENSORY INPUT RESULTING IN DISORGANIZATION, INSATIABLE DESIRE FOR INPUT

SENSORY OVER-RESPONSIVITY

- FEELS SENSATION TOO INTENSELY OR TOO EASILY
- TYPICALLY AVOIDS NON-PREFERRED SENSORY INPUT
- OFTEN DISPLAYED AS:
  - FEARFUL AND CAUTIOUS
  - NEGATIVE AND DEFIANT

GOOGLE IMAGES: http://www.nutritics411.com/sites/default/files/pickyeater.jpg

SENSORY OVER-RESPONSIVITY

- VISUAL OVER-RESPONSIVITY:
  - AVOIDS EYE CONTACT
  - LOOKS AWAY FROM FOOD OR CLOSES EYES
  - MOVES AWAY FROM THE TABLE
  - SQUINTING
  - EYE BLINKING, EYE WATERING
  - VOMITING

SENSORY OVER-RESPONSIVITY

- OLFACTORY OVER-RESPONSIVITY:
  - COVERS THE NOSE
  - EYES WATERING
  - TURNS AWAY FROM FOOD, LEAVES TABLE/ROOM
  - FACIAL GRIMACING
  - COUGHING, GAGGING

SENSORY OVER-RESPONSIVITY

- TACTILE OVER-RESPONSIVITY:
  - LIP SPLAYS
  - USES TEETH INSTEAD OF LIPS TO CLEAR UTENSIL
  - FACIAL GRIMACING
  - FREQUENT HAND OR FACE WIPING
  - SEEKS OUT OR AVOIDS UTENSILS
  - FINGER SPLAYS
  - AVOIDS CERTAIN FOOD TEXTURES
  - GAGGING/VOMITING

SENSORY OVER-RESPONSIVITY

- AUDITORY OVER-RESPONSIVITY:
  - REPEATED EYE BLINKING
  - STARTLES TO SOUND
  - AVOIDS VERY CRUNCHY FOODS
  - COVERS EARS DURING MEALS
  - DIFFICULTY EATING IN NOISY ENVIRONMENTS (SCHOOL CAFETERIA, RESTAURANT)

SENSORY OVER-RESPONSIVITY

- VESTIBULAR OVER-RESPONSIVITY:
  - STARTLES WHEN CHAIR IS MOVED
  - AVOIDS VERY CHEWY FOODS
  - AVOIDS USING OPEN CUP
  - WILL TUCK CHIN VERSUS EXTEND NECK WHEN DRINKING

SENSORY UNDER-RESPONSIVITY

- FEWER OR DECREASED RESPONSE TO STIMULI
- SLOWER RESPONSE TO STIMULI
- HIGHER INTENSITY OR LONGER DURATION OF STIMULI IN ORDER TO INVOKE A RESPONSE
- MAY WITHDRAW OR BE DIFFICULT TO AROUSE
- MAY NOT REGISTER THE STIMULI

GOOGLE IMAGES: http://huffpost.com/gen/1492467/images/o-BABY-FOOD-MESS-Facebook.jpg

SENSORY UNDER-RESPONSIVITY

- POCKETS FOOD
- OVERSTUFFS MOUTH
- DOES NOT REACT TO NOXIOUS SMELLS
- SWALLOWS FOOD WHOLE, DOESN'T CHEW COMPLETELY
- DIMINISHED REACTION TO VERY SPICY OR SOUR FOODS
- MESSY FACE/HANDS DURING MEALTIME
- CAN'T LOCATE FOOD IN THE MOUTH

SENSORY UNDER-RESPONSIVITY

- LACK OF HUNGER OR THIRST AWARENESS
- LACK OF SATIATION AWARENESS
- HUMMING, ROCKING, SELF-STIMULATORY BEHAVIORS DURING MEALS
- DECREASED AFFECT

SENSORY CRAVER

- SENSORY CRAVERS NEVER SEEM TO GET ENOUGH SENSORY STIMULATION
- SEEKS OUT STRONG FLAVORS OR TEXTURES
- PREFERS FOOD VERY COLD OR VERY HOT
- ALWAYS IN MOTION, POOR ABILITY TO SIT FOR MEALS
- LIKES TO CRASH AND CLIMB
- GRINDS TEETH
- VERY MESSY AT MEALTIMES

SENSORY DISCRIMINATION

- DIFFICULTY WITH IDENTIFYING BETWEEN THE SPECIFIC CHARACTERISTICS WITHIN A SENSE
- DISCRIMINATION REQUIREMENTS OF FEEDING CHANGE OVER TIME AS A CHILD'S DEVELOPMENT PROGRESSES AND AS THE TYPE OF FOOD OFFERED IS CHANGED

SENSORY DISCRIMINATION

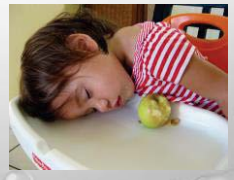
- VISUAL:
  - DIFFICULTY RECOGNIZING OBJECTS THAT ARE ROTATED, COVERED, CUT INTO PIECES
  - HYPER-FOCUS ON THE DETAILS
- GUSTATORY:
  - INCONSISTENT RESPONSE TO FLAVORS
- AUDITORY:
  - DIFFICULTY FOLLOWING MULTI-STEP DIRECTIONS
  - POOR ABILITY TO DETERMINE DIRECTION OF SOUND
- OLFACTORY:
  - UNABLE TO DISTINGUISH BETWEEN SMELLS

SENSORY DISCRIMINATION

- TACTILE:
  - INABILITY TO DETERMINE WHERE BEING TOUCHED
  - INABILITY TO LOCATE FOOD IN THE MOUTH
- PROPRIOCEPTIVE/VESTIBULAR:
  - DIFFICULTY JUDGING FORCE
  - RELIANT ON VISION TO DETERMINE WHERE BODY IS IN SPACE
  - AWKWARD OR INEFFICIENT GROSS AND FINE MOTOR SKILLS

SENSORY-BASED MOTOR DISORDERS

- POSTURAL DISORDER: APPEARS WEAK WITH POOR ENDURANCE, DECREASED CORE STRENGTH
- DYSPRAXIA: DIFFICULTY INITIATING, PLANNING AND/OR EXECUTING MOTOR TASKS



GOOGLE IMAGES: http://cdn2.mommyish.com/wp-content/uploads/2013/08/toddler-asleep-high-chair.jpg

POSTURAL DISORDER

- FATIGUES EASILY DURING MEALTIMES
- CONSTANTLY MOVING IN CHAIR
- PREFERENCE TO WALK OR STAND DURING MEALS
- MAY PREFER TO BE FED BY OTHERS
- OFTEN CHOSE FOODS WITH LOW ORAL MOTOR DEMANDS

DYSPRAXIA

- DIFFICULTY IMITATING OTHERS
- INCREASED TIME REQUIRED TO LEARN NEW TASK
- POOR COORDINATION WITH SELF-FEEDING
- MAY HAVE DIFFICULTY WITH FINE MOTOR SKILLS NEEDED TO USE UTENSILS
- DIFFICULTY CREATING NEW MOTOR PLANS LEADS TO PREFERENCE FOR PROCESSED FOODS OR FOODS PREPARED IN THE SAME WAY TO KEEP MOTOR DEMANDS THE SAME

PLAYDOUGH

Google Images: www.comc.org

MY CHALLENGE TO YOU

CREATE PREDICTABILITY AROUND EXPERIENCES IN ORDER TO ESTABLISH A PATTERN OF RESILIENCE

FACILITATE THIS!

https://encrypted-tbn3.gstatic.com/images?q=tbn:ANd9GcrA3ajJCdkIBGmOOgr6f5xsCqxNEYq5fuXfB8adO-cqGrcO_4
https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQ23:xHPQuZRuS2-ozEmwKmQuBUMNwY7 3dE7HwT1YFI1SQ

REFERENCES

- BUNDY, C., LANE, S., MURRAY, E. (2002). *SENSORY INTEGRATION THEORY AND PRACTICE*, 2ND *EDITION*. PHILADELPHIA, PA: F.A. DAVIS COMPANY.
- CASE-SMITH, JANE. (2001). *OCCUPATIONAL THERAPY FOR CHILDREN*, 4TH *EDITION*. ST. LOUIS, MO: MOSBY, INC.
- COUGHLIN, M. (2014). TRANSFORMATIVE NURSING IN THE NICU: TRAUMA-INFORMED AGE-APPROPRIATE CARE. SPRINGER PUBLISHING.
- COUGHLIN, M. (2014, APRIL). *TRAUMA-INFORMED CARE. A NEW PARADIGM IN THE NICU.* PRESENTATION AND POWER POINT SLIDES PRESENTED AT THE 4TH ANNUAL NANT CONFERENCE, ATLANTA, GA.
- DODRILL, P., & GOSA, M.M. (2015). PEDIATRIC DYSPHAGIA: PHYSIOLOGY, ASSESSMENT, AND MANAGEMENT. ANNALS OF *NUTRITION & METABOLISM, 66 (SUPPL 5)*, 24-31.
- DODRILL, P., CLEGHORN, G., DONOVAN, T., DAVIES, P. (2008). GROWTH PATTERNS IN PRETERM INFANTS BORN APPROPRIATE FOR GESTATIONAL AGE. *JOURNAL OF PEDIATRICS AND CHILD HEALTH, 44(6)*, 332-337.
- DODRILL, P. (2016, APRIL). *FEEDING DIFFICULTIES POST-NICU.* PRESENTATION AND POWER POINT SLIDES PRESENTED AT 6TH ANNUAL NANT CONFERENCE, ORLANDO, FL.
- ERNSPERGER, L. & STEGEN-HANSON, T. (2004). *JUST TAKE A BITE*. ARLINGTON, TX: FUTURE HORIZONS, INC.
- FRAKER, C., FISHBEIN, M., COX, S., & WALBERT, L. (2007). *FOOD CHAINING*. CAMBRIDGE, MA: DA CAMPO PRESS.
- GRAVEN, S. N., & BROWNE, J. V. (2008). SENSORY DEVELOPMENT IN THE FETUS, NEONATE, AND INFANT: INTRODUCTION AND OVERVIEW. *NEONATE AND INFANT NURSING REVIEWS, 8*, 169–172.

REFERENCES

- MCGRATH, J.M. (2015, APRIL) *EVERYTHING WE DO MATTERS! CARE OF THE NEONATAL BRAIN.* PRESENTATION AND POWER POINT SLIDES PRESENTED AT THE 5TH ANNUAL NANT CONFERENCE, PHOENIX, AZ.
- MILLER, L.J., PHD., OTR (2011). *ADVANCED INTENSIVE MENTORSHIP. DIAGNOSIS AND TREATMENT OF SPD* (SEMINAR MANUAL). GREENWOOD VILLAGE, CO. SENSORY PROCESSING DISORDER FOUNDATION.
- MILLER, L.J. (2006). SENSATIONAL KIDS. NEW YORK, NY. PENGUIN GROUP INC.
- MILLER, L. J., ANZALONE, M. E., LANE, S. J., CERMAK, S. A., & OSTEN, E. T. (2007). CONCEPT EVOLUTION IN SENSORY INTEGRATION: A PROPOSED NOSOLOGY FOR DIAGNOSIS. *AMERICAN JOURNAL OF OCCUPATIONAL THERAPY, 61*, 135–140.
- MORRIS, S.E. & KLEIN, M.D. (2000). *PRE-FEEDING SKILLS, A COMPREHENSIVE RESOURCE FOR MEALTIME DEVELOPMENT, 2ND EDITION.* TUSCON, AZ: THERAPY SKILL BUILDERS.
- SCHAAF, R. C., SCHOEN, S. A., SMITH ROLEY, S., LANE, S. J., KOOMAR, J., & MAY-BENSON, T. A. (2010). A FRAME OF REFERENCE FOR SENSORY INTEGRATION. IN P. KRAMER & J. HINOJOSA (EDS.), *FRAMES OF REFERENCE FOR PEDIATRIC OCCUPATIONAL THERAPY* (3RD ED., PP. 99–186). BALTIMORE: LIPPINCOTT WILLIAMS & WILKINS.
- SMITH, K. & GOUZE, K. (2004). *THE SENSORY-SENSITIVE CHILD.* NEW YORK, NY. HARPER COLLINS PUBLISHERS.
- TOOMEY, K., ROSS, E., KORTSHA, B. (2016). *WHEN CHILDREN WON'T EAT. PICKY EATERS VERSUS PROBLEM FEEDERS* (SEMINAR MANUAL). PITTSBURGH, PA: EDUCATION RESOURCES, INC.
- ALS, H., & MCANULTY, G. B. (2011). THE NEWBORN INDIVIDUALIZED DEVELOPMENTAL CARE AND ASSESSMENT PROGRAM (NIDCAP) WITH KANGAROO MOTHER CARE (KMC): COMPREHENSIVE CARE FOR PRETERM INFANTS. *CURRENT WOMEN'S HEALTH REVIEWS, 7*, 288–301
- BART, O., SHAYEVITS, S., GABIS, L. V., & MORAG, I. (2011). PREDICTION OF PARTICIPATION AND SENSORY MODULATION OF LATE PRETERM INFANTS AT 12 MONTHS: A PROSPECTIVE STUDY. *RESEARCH IN DEVELOPMENTAL DISABILITIES, 32*, 2733–2738.
- WICKREMASINGHE, A. C., ROGERS, E. E., JOHNSON, B. C., SHEN, A., BARKOVICH, A. J., & MARCO, E. J. (2013). CHILDREN BORN PREMATURELY HAVE ATYPICAL SENSORY PROFILES. *JOURNAL OF PERINATOLOGY, 33*, 631–635.

REFERENCES

- MITCHELLA.W., MOORE, E.M., ROBERTS, E.J., HACHTEL, K.W., BROWN, M.S. SENSORY PROCESSING DISORDER IN CHILDREN AGES BIRTH–3 YEARS BORN PREMATURELY: A SYSTEMATIC REVIEW. *AM J OCCUP THER* 2014;69(1):6901220030P1-6901220030P11
- CROZIER, S.C., GOODSON, I.Z., MACKAY, M.L., SYNNES, A.R., GRUNAU, R.E., MILLER, S.P., ZWICKER, J.G. SENSORY PROCESSING PATTERNS IN CHILDREN BORN VERY PRETERM. AM J OCCUP THER 2015;70(1):7001220050P1-7001220050P7
- CERMAK, S.A., DALNHAUER, L.A. SENSORY PROCESSING IN THE POSTINSTITUTIONALIZED CHILD. *AM J OCCUP THER* 1997;51(7):500-507
- YOUNG, N.Y., SMITH, P.B., GUSTAFSON, K.E., MALCOLM, W., ASHLEY, P., COTTON, C.M., GOLDBERG, R.N., GOLDSTEIN, R.F. (2016). IMPROVED SURVIVAL AND NEURODEVELOPMENTAL OUTCOMES AMONG EXTREMELY PREMATURE INFANTS BORN NEAR THE LIMIT OF VIABILITY. *EARLY HUMAN DEVELOPMENT, 95*, 5-8.
- REYNOLDS, L.C., DUNCAN, M.M., SMITH, G.C., MATHUR, A., NEIL, J., INDER, T., PINEDA, R.G. (2013). PARENTAL PRESENCE AND HOLDING IN THE NEONATAL INTENSIVE CARE UNIT AND ASSOCIATIONS WITH EARLY NEUROBEHAVIOR. *JOURNAL OF PERINATOLOGY, 33*, 636-641.
- CUESTA, J.M., SINGER, M. (2012). THE STRESS RESPONSE AND CRITICAL ILLNESS: A REVIEW. *CRITICAL CARE MEDICINE, 40*(12), 3283-3289.
- BEATRIZ, O.V., HOLSTI, L., LINHARES, M.B. (2015) NEONATAL PAIN AND DEVELOPMENTAL OUTCOMES IN CHILDREN BORN PRETERM: A SYSTEMATIC REVIEW. *CLINICAL JOURNAL OF PAIN, 31*(4), 355-362.
- SMITH, G.C.ET AL (2011). NEONATAL INTENSIVE CARE UNIT STRESS IS ASSOCIATED WITH BRAIN DEVELOPMENT IN PRETERM INFANTS. *ANNALS OF NEUROLOGY, 70(4), 541-549.*
- PINEDA, R.G., TJOENG, T.H., VAVASSEUR, C., KIDOKORO, H., NEIL, J., INDER, T. (2013). PATTERNS OF ALTERED NEUROBEHAVIOR IN PRETERM INFANTS WITHIN THE NEONATAL INTENSIVE CARE UNIT. *THE JOURNAL OF PEDIATRICS, 162* (3), *470–477.*

SENSORY STEPS AND STRATEGIES

Amy Zuraski, MOT, OTR/L
Children's Hospital of Pittsburgh of UPMC
September 23, 2016

Things to Consider

- #1: How can you use sensory motor activities to modulate arousal level?
- #2: How can you change the sensory input from the environment?
- #3: How can you change the sensory input from the food?

Sensory Modulation

- Think proprioception!
- Proprioception will override most other forms of sensory input
- Beneficial to both over-responders and under-responders
- Alerting for under-responders
- Calming for over-responders

Sensory Modulation Techniques

- Joint compressions/brushing
- Obstacle course
- Animal walks
- Massage
- Yoga
- Scooter board activities
- Tug of war, bear hugs
- Playdough, putty
- Weighted vest, lap pad
- Heavy work: cookie cutters, food choppers, rolling pin
- Move N Sit cushion, ball chair

Environmental Considerations

www.office.com

Environmental Considerations

- Think about your feeding patient's sensory needs
- Does he need more input (SUR) or less input (SOR)?
- How can you modify sensory input from the environment to set this child up for success?

Auditory Input

- Music
  - Try slow music at 60 bpm to calm and organize
  - Try fast-paced music to alert
- Complexity of instructions
  - Use less words, speak slowly, give time to process
  - Use pictures, signs, gestures
  - Use songs
- Volume of voices
  - Cue for “inside voices”
  - Decrease volume of therapist’s voice level

Visual Input

- Lighting: natural light when possible
- Color of foods:
  - Neutral colors (brown, white, yellow): less excitatory
  - Bright colors (red, blue, green): more alerting
- Food size:
  - One larger piece of food versus several smaller pieces
  - Present food in recognizable shapes
- Visual clutter:
  - Clear immediate space of clutter
  - Try simple white plate or bowl for meals

Tactile Input

- Food texture:
  - Hard foods have more consistent texture
  - Offer tool to initially interact with food
  - Touch food through napkin or baggie
  - Hand UNDER hand assist
  - Have child wear gloves
  - Keep napkin next to plate
- Clothing:
  - Have child wear short sleeves
  - Ask for second outfit in case of spills

Gustatory and Olfactory Input

- Big taste versus little taste
- Spice things up!
- Big smell versus little smell
- Serve foods chilled, as this decreases the smell

Postural Stability

- Supportive seating allows the brain to focus on eating rather than stability
- Allows for better hand-to-mouth movements
- Improves respiratory function
- 90-90-90

Postural Stability Experiment

Sensory Changes with Liquids

- Sight
- Sound
- Texture
- Taste
- Smell

Google images: http://worldartsme.com/images/cup-of-water-clipart-1.jpg

Sensory Changes with Purees

- Sight
- Sound
- Texture
- Taste
- Smell

Sensory Changes with Solids

- Sight
- Sound
- Texture
- Taste
- Smell

Google images: http://www.acclaimclipart.com/free_clipart_images/a_salted_pretzel_with_a_bite_taken_out_of_it_0071-0909-1914-0250_SMU.jpg

How do I expand the diet of a child with sensory-based feeding issues?

Google Images: www.momables.com

Expanding the Diet

- Baby steps!
- Offer new foods with preferred foods
- Single texture foods are easier to tolerate than mixed texture foods
- Think lateral shifts
- Work on acceptance of *any* new food not just *"healthy"* new foods
- Food chaining: introduce food that shares a characteristic of a preferred food

Food Chaining

- Think about food texture, shape, color, flavor
- Use condiments to link foods
- Goal is to gradually expand the diet
- Remember, food chaining takes time! It often takes multiple exposures to a food before a child will accept.

Food Chaining

Google Images: www.patheos.com

References

- Bundy, C., Lane, S., Murray, E. (2002). *Sensory Integration Theory and Practice, 2nd edition.* Philadelphia, PA: F.A. Davis Company.
- Case-Smith, Jane. (2001). *Occupational Therapy for Children, 4th edition.* St. Louis, MO: Mosby, Inc.
- Ernsperger, L. & Stegen-Hanson, T. (2004). *Just Take a Bite.* Arlington, TX: Future Horizons, Inc.
- Fraker, C., Fishbein, M., Cox, S., & Walbert, L. (2007). *Food Chaining.* Cambridge, MA: Da Campo Press.
- Miller, L.J., PhD., OTR (2011). *Advanced Intensive Mentorship: Diagnosis and Treatment of SPD* (Seminar Manual). Greenwood Village, CO: Sensory Processing Disorder Foundation.
- Miller, L.J. (2006). *Sensational Kids.* New York, NY: Penguin Group Inc.
- Morris, S.E. & Klein, M.D. (2000). *Pre-Feeding Skills, A Comprehensive Resource For Mealtime Development, 2nd edition.* Tuscon, AZ: Therapy Skill Builders.
- Smith, K. & Gouze, K. (2004). *The Sensory-Sensitive Child.* New York, NY: Harper Collins Publishers.
- Toomey, K., Ross, E., Kortsha, B. (2016). *When Children Won't Eat: Picky Eaters versus Problem Feeders* (Seminar Manual). Pittsburgh, PA: Education Resources, Inc.

Building Oral Motor Skills

Amy Loughner, MOT, OTR/L
9/23/16

Session Outline

- Review of typical motor & oral motor milestones
- Oral motor skills and feeding
- Examples of foods that can be used to build oral motor skills
- Examples of non-food tools that can be used to build oral motor skills

Building Oral Motor Skills

- Oral motor skills begin to develop prior to birth and continue to develop through early childhood
- Adequate oral motor skills are necessary to be able to eat effectively
- A child's developmental readiness determines when and how to introduce foods (texture, solids, etc.)

Building Oral Motor Skills

- Often children are observed avoiding certain foods
- This may be mistaken for difficulties with texture or sensory sensitivities when in fact the child may not have the oral motor skills to manage that food safely
- There are techniques using both food and non-food tools to help build the oral motor skills these children need in order to eat safely

Motor Skills

- Look at the whole body:
  - Feeding and oral motor skills are interconnected with normal motor development

Motor milestones necessary for feeding & postural stability

- 4-6 months:
  - Steady head control established which allows feeding in more upright position
  - Beginning hand to mouth play
  - Increased reaching skills (reaching for bottle or spoon when hungry)
  - Uses whole hand to grasp objects

Motor milestones necessary for feeding & postural stability

- 7–9 months:
  - Trunk control sufficient for independent sitting for more than 3–5 sec.; use of highchair for feeding
  - Stable head control in sitting
  - Transfers toys from hand to hand
  - Holds bottle with both hands

Motor milestones necessary for feeding & postural stability

- 8–10 months:
  - Trunk rotation and weight shift
  - Starting to move in and out of positions
  - Uses fingers to rake food
  - Intro to cup drinking
  - Puts finger in mouth to move food

Motor milestones necessary for feeding & postural stability

- 10–12 months:
  - Independent sitting in variety of positions
  - Pincer grasp developing; pokes food with index finger
  - Uses fingers to self feed soft chopped foods

Motor milestones necessary for feeding & postural stability

- 12-14 months:
  - Grasps spoon with whole hand; "co-feeds" with parent
  - Holds and tips bottle
  - Holds cup with 2 hands
- 14-16 months:
  - Efficient finger feeding
  - Practicing utensil use

Motor milestones necessary for feeding & postural stability

- 18-24 months:
  - Increasing utensil use; not efficient until after 24 months
  - Scoops purees and brings to mouth
- 24-36 months:
  - Uses fingers to fill spoon
  - Increasing fork skill
  - Can drink from open cup without spilling; holds cup with one hand

Postural Stability

- Postural stability is important for developing feeding abilities
- A stable base is necessary for development of movement and functional skills

Postural Stability

- Providing a secure stabile base of support through positioning/seating:
  - Allows for the motor aspect of the brain to focus on the process of eating
  - Allows for ROM in the jaw for chewing
  - Supports respiratory function
  - Allows for more refined distal control (fine motor coordination and tactile manipulation of foods)

Postural Stability

- Importance of seating recommendations and education:
  - Ensure that the child is forward enough for the knees to be over the edge of the seat (90-90-90)
  - Use side supports if needed
  - Provide a foot rest on the floor or high chair
  - The surface of the tray or table should fall between the child's belly button and chest

Oral motor milestones

- Newborn period
  - Oral space filled with tongue which is in full contact with gums and hard and soft palates
  - Structures are vertically compressed
  - Jaw, tongue, lips move as one unit
  - Reflexes present for protection and survival
- 2-4 months
  - Integrating reflexes
  - Transition to volitional sucking

Oral motor milestones

- 4–6 months:
  - Gag reflex starts to diminish
  - Movement of food from front to back of tongue to swallow
  - Spoon feedings introduced; baby starts to recognize sight and touch of spoon
  - Tongue protrusion at point of swallow pushes food out of mouth at first intro of spoon
  - Refinement of jaw and lip control
  - Up and down munching movements of jaw develops

Oral motor milestones

- 7–9 months
  - Able to bring upper lip down to draw food off spoon; full lip closure emerges
  - Consistent tongue lateralization seen when foods presented to sides of tongue
  - Active movement of foods from side of mouth to central tongue groove and back
  - Mature tongue lateralization emerging
  - Able to transition to slightly more texture (small lumps)
  - Munching of softer foods

Oral motor milestones

- 10–12 months
  - Emerging skill of clearing food from lips
  - More controlled and graded bite develops
  - Begin to eat coarsely chopped food or small pieces of soft cooked table foods
  - 12 month old may learn to drink through a straw

Oral motor milestones

- 13-15 months
  - Chews and swallows firmer foods without choking
  - Able to keep most bites in mouth while chewing
  - Diagonal rotary chewing occurs
  - Cheeks and lips provide more control to hold food in place
  - Tip of tongue can lift independently to explore roof of mouth

Oral motor milestones

- 16-24 months
  - Uses tongue to gather shattered pieces and sweep pieces into a bolus
  - Chews bigger pieces of soft table foods
  - Working on chewing foods with increasing texture "hardness;" working on increasing speed and efficiency
  - Chewing strength improves
  - Bites edge of cup for jaw stabilization when drinking
- 24-48 months
  - Vertical, diagonal, and circular rotary jaw movements used
  - Precise tongue-tip elevation for transfer of food across midline of mouth

Things to remember

- Children continue to develop eating and drinking skills with changing shape and size of mouth and lose/gain teeth
- Children need to be developmentally ready to move through levels of eating and drinking
- Children need to be given opportunities to explore and practice oral motor skills
- Spitting is part of normal developmental process of learning to eat

Food tools

- Licorice/twizzler
- Slim jims
- Cheerios
- Saltine cracker
- Baby safe feeder with foods
- Lollipops
- Flavor sprays

Non-food tools

- Z-vibe
- Nuk brush
- Chewy tubes
- Toothette
- Mirror
- Bubbles
- Rainbow ring
- Whistles
- Straws
- Cotton balls

Trial of tools

- Labs- trial
- Brainstorm ideas for activities

References

- Ernsperger, L. & Stegen-Hanson, T. (2004). *Just Take a Bite: Easy, effective answers to food aversions and eating challenges!* Arlington: TX Future Horizons.
- Evans Morris, S. & Dunn Klein, M. (2000). *Pre-Feeding Skills: A comprehensive resource for meal-time development, 2nd ed.* Austin: TX Pro-ed.
- Fracker, C., Fishbein, M., Cox, S., Walbert, L. (2007). *Food Chaining: The proven 6-step plan to stop picky eating, solve feeding problems, and expand your child's diet.* Cambridge: MA Da Capo.

BLENDERIZED TUBE FEEDS

Stacey Zettle, MS, RD, LDN
Children's Hospital of Pittsburgh of UPMC
September 2016

7 year old male

24 oz coconut milk
1 cup Cheerios
2 peaches
½ can black beans and 1 tsp flax oil
½ c rice with 1 tsp olive oil and 1 tsp rice bran oil
1 whole tomato and 1 stalk celery
½ avocado with 1 tsp olive oil
4 oz chicken with 1 tsp olive oil
¼ c brussels sprouts with ¼ c asparagus with 2 tsp olive oil
¾ c millet porridge with 2 tsp olive oil

5 year old female

16 oz whole milk
1 banana with 2 Tbsp peanut butter
2 cups chicken noodle soup with 3 oz chicken tender
½ c carrots and ½ c peas
1 Yoplait Whips yogurt cup
1 cup spaghetti with ½ cup sauce and 80/20 hamburger meat and Parmesan cheese
1 banana and 1 mandarin orange cup
Water

3 year old male

16 oz 2% milk
1 avocado
1 peach
6 oz canned unsweetened pumpkin
6 oz raw edamame
5 oz whole wheat pasta
1 hard boiled egg
4 tsp olive oil
2 Tbsp blackstrap molasses
Water

Overview

- History/background
- Reasons for implementing
- Benefits/drawbacks
- Requirements
- How to design and individualize
  - Baby foods
  - Blenderized table foods
  - Commercial "real food" formulas
- Nutrition issues, considerations, and challenges

Objectives

- Display basic understanding of blenderized tube feeding
- Identify children appropriate to start on a blenderized tube feeding regimen
- Identify 3 benefits of blenderized tube feeding

Why place a feeding tube?*

- Prematurity
- Cystic fibrosis
- Congenital heart disease
- GI tract disease and dysfunction
- Short bowel syndrome
- Hypermetabolic states
- Burn injury
- Trauma or head injury
- Dysphagia
- Cancer
- Neurological disease
- Cerebral palsy
- Failure to thrive

*Kleinman, Ronald (Ed.). *Pediatric Nutrition Handbook 6th Ed.* American Academy of Pediatrics, 2009. Print.

Why blenderized tube feeding – experience at CHP

- Provide more "natural" foods
- More control over what foods patient is receiving
- GI (and overall) benefits
- Dissatisfied with commercial formulas

PEDIASURE	JEVITY	COMPLEAT PEDIATRIC
Water	Water	Water
Sugar	**Corn maltodextrin**	**Corn syrup**
Corn maltodextrin	**Corn syrup solids**	Green pea puree
Milk protein concentrate	Sodium caseinate	Green bean puree
High oleic safflower oil	Calcium caseinate	Chicken puree
Canola oil	Soy protein isolate	Peach puree
Soy protein isolate	Canola oil	Sodium caseinate
Short chain FOS	Corn oil	Cranberry juice
Cellulose gel	FOS	Canola oil
Tuna oil	MCT	MCT
Carrageenan	Soy fiber	Guar gum
	Oat fiber	**Carrageenan**

- Shown to decrease gagging and retching that may occur s/p Nissen fundoplication*
- Increase in tolerance of feeds
  - Decreased administration time, increased bolus size
  - Decreased vomiting
  - Improved stooling
- Work toward increasing PO intake
- Psychological benefit to patient/caregiver

*Pentiuk, et al. Pureed by gastrostomy tube diet improves gagging and retching in children with fundoplication. *JPEN* 2011; 35:375-379.

Requirements/potential drawbacks - ***patient***

- Older than 12 months
- Has trialed a variety of foods
- Medically stable
- Feeds via G-tube
  - G-tube site is healed
- Should be able to tolerate bolus feeds
  - 2 hr max hangtime*

*Esaiu, A. Blenderized Tube Feedings: Suggested Guidelines to Clinicians. *Practical Gastroenterology* 2014; 136:58-66.

Requirements/potential drawbacks - ***caregiver***

- Caregiver must be motivated (time)
- Food safety
- Cost – likely not covered by insurance
- OK with formula as a "backup" option

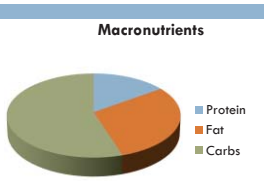
What is NOT a problem!

- Multiple food allergies
- Milk or soy protein intolerance
- Celiac disease
- High protein needs
- High/low fiber needs
- Low cholesterol

- *Ketogenic diet
- *Milk free + renal diet

Basic principles

- Regular pediatric diet:
  - 10-20% kcal from protein
  - 25-35% kcal from fat
  - 50-60% kcal from carb
- Iron, calcium, vitamin D, sodium
- Fluids
- Initiate slowly
- Food safety
- Portion sizes



Types of blenderized feeds

- Post-Nissen specific recipe
- Baby food based
- Whole foods based

- Formula as a base
- Commercial blenderized products

Post-Nissen recipe to prevent gagging ("pureed by gastrostomy diet")

- Needs to be heavier/thicker and calorie-dense
- Uses baby food
- Start with daytime boluses of PBGT and nighttime formula via pump
- 52% parents reported 75-100% decrease in gagging/retching*
- 73% parents reported at least 50% decrease*

*Pentiuk, et al. Pureed by gastrostomy tube diet improves gagging and retching in children with fundoplication. *JPEN* 2011; 35:375-379.

Pureed by gastrostomy diet - example

- 8 oz whole milk
- 1 jar stage 1 chicken
- 1 jar stage 2 bananas
- 1 jar stage 2 green beans
- 1 Tbsp oil
- **4 Tbsp cornstarch**
- **6 oz Greek yogurt**
- **8 Tbsp dry infant cereal**

Calories	980
Fat	30%
Carb	55%
Protein	15%

Designing a blenderized tube feeding recipe

Baby food based

- Similar to PBGT diet
- Main benefits:
  - Simplicity
  - More precise
  - Volume easily estimated

Steps – baby food

1. Set calorie goal
2. Choose a liquid base (milk or formula)
3. Determine amount of meat, fruit, and vegetable
4. Determine amount of fat
5. Add extras (sugar, juice, baby cereal)
6. Determine micronutrient additive
7. Determine if sodium is needed
8. Ensure adequate protein and fluids

Baby food based - examples

	700 calories	1500 calories
Whole milk	10 fl oz	18 fl oz
Baby food meat (2.5 oz)	2 jars	3 jars
Baby food veggie (4 oz)	2 jars	3 jars
Baby food fruit (4 oz)	1 jar	3 jars
Vegetable oil	2 tsp	2 Tbsp
Sugar	2 Tbsp	5 Tbsp
100% juice	3 fl oz	4 fl oz
Dry baby cereal	2 Tbsp	3 Tbsp
	Vitamin, Ca, Na supplement	Vitamin, Ca, Na supplement
	Water	Water

Calorie additives

1 Tbsp sugar	45 kcal
1 Tbsp Duocal	42 kcal
1 Tbsp cornstarch	30 kcal
1 Tbsp agave	60 kcal
1 Tbsp baby cereal	15 kcal
1 Tbsp olive oil	120 kcal
1 Tbsp honey	64 kcal
1 Tbsp blackstrap molasses	45-70 kcal; 80-175 mg Ca, 500-730 mg K+, 1-3.5 mg Fe
1 Tbsp nutritional yeast	20-30 kcal; 3 g protein; 40-180% DV B1, B2, B3, B6, B12, folic acid; also pantothenic acid, Se, Zn

Whole foods based

- Recipe based on caloric needs
  - Exchange Lists for Meal Planning
  - USDA food intake patterns
- Portion sizes extremely important
- Helpful but not necessary:
  - Food scale
  - High powered blender (Vitamix, Blendtec)
  - https://www.youtube.com/user/Blendtec?v=_3hAUaQNsX4
- More or less freedom depending on base
- Mix recipe for full day – not meal to meal

MyPyramid

Food Intake Patterns

The suggested amounts of food to consume from the basic food groups, subgroups, and oils to meet recommended nutrient intakes at 12 different calorie levels. Nutrient and energy contributions from each group are calculated according to the nutrient-dense forms of foods in each group (e.g., lean meats and fat-free milk). The table also shows the discretionary calorie allowance that can be accommodated within each calorie level, in addition to the suggested amounts of nutrient-dense forms of foods in each group.

Daily Amount of Food From Each Group

Calorie Level[1]	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200
Fruits[2]	1 cup	1 cup	1.5 cups	1.5 cups	1.5 cups	2 cups	2 cups	2 cups	2 cups	2.5 cups	2.5 cups	2.5 cups
Vegetables[3]	1 cup	1.5 cups	1.5 cups	2 cups	2.5 cups	2.5 cups	3 cups	3 cups	3.5 cups	3.5 cups	4 cups	4 cups
Grains[4]	3 oz-eq	4 oz-eq	5 oz-eq	5 oz-eq	6 oz-eq	6 oz-eq	7 oz-eq	8 oz-eq	9 oz-eq	10 oz-eq	10 oz-eq	10 oz-eq
Meat and Beans[4]	2 oz-eq	3 oz-eq	4 oz-eq	5 oz-eq	5 oz-eq	5.5 oz-eq	6 oz-eq	6.5 oz-eq	6.5 oz-eq	7 oz-eq	7 oz-eq	7 oz-eq
Milk[5]	2 cups	2 cups	2 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups	3 cups
Oils[6]	3 tsp	4 tsp	4 tsp	5 tsp	5 tsp	6 tsp	6 tsp	7 tsp	8 tsp	8 tsp	10 tsp	11 tsp
Discretionary calorie allowance[7]	165	171	171	132	195	267	290	362	410	426	512	648

1 **Calorie Levels** are set across a wide range to accommodate the needs of different individuals. The attached table "Estimated Daily Calorie Needs" can be used to help assign individuals to the food intake pattern at a particular calorie level.

2 **Fruit Group** includes all fresh, frozen, canned, and dried fruits and fruit juices. In general, 1 cup of fruit or 100% fruit juice, or 1/2 cup of dried fruit can be considered as 1 cup from the fruit group.

3 **Vegetable Group** includes all fresh, frozen, canned, and dried vegetables and vegetable juices. In general, 1 cup of raw or cooked vegetables or vegetable juice, or 2 cups of raw leafy greens can be considered as 1 cup from the vegetable group.

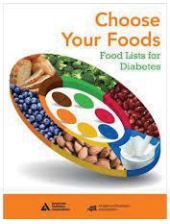
Steps – whole foods

1. Set calorie goal
2. Choose a liquid base (milk or formula)
3. Determine amount of protein, fruit, vegetable, starch and fat
4. Calorie additives if needed
5. Determine micronutrient additive
6. Determine if sodium is needed
7. Ensure adequate fluids

Whole foods based - examples

	1000 calories	2000 calories
Fruit	1	2.5
Vegetable	1	2.5
Starch	3	8
Milk/dairy	2	3.5
Meat/protein	3	6
Fat	5	8
	Vitamin, Ca, Na supplement	Vitamin, Ca, Na supplement
	Water	Water

- 1 **fruit** exchange =
  - 1 cup fresh/frozen/canned
  - 1 cup 100% fruit juice
- 1 **vegetable** exchange =
  - 1 cup raw (leafy should be packed)
  - ½ cup cooked vegetables or 100% vegetable juice
- 1 **starch** exchange =
  - 1 slice bread (1 ounce)
  - ½ cup cooked cereal/grain/rice/pasta
  - 1 cup ready-to-eat breakfast cereal
  - 1/3 cup dry baby cereal or raw oats
- 1 **milk/dairy** exchange =
  - 1 cup (8 fl oz) milk/milk alternative
  - 6 oz yogurt
- 1 **meat/protein** exchange =
  - 1 ounce cooked meat
  - 1 cooked egg
  - ½ cup cooked dried beans
  - 1 Tablespoon nut butter
- 1 **fat** exchange =
  - 1 teaspoon oil



Example whole foods recipe

- 1 c fresh broccoli
- 1 c fresh cauliflower
- ½ c strawberries
- 1 c blueberries
- 2.5 c ckd brown rice
- 3 c 1% milk
- 2 hard boiled eggs
- 3 oz ckd chicken breast
- 5 tsp olive oil

Nutrition Facts

Serving Size (1929g)
Servings Per Container

Amount Per Serving

Calories 1550 Calories from Fat 440

	% Daily Value*
Total Fat 49g	**75%**
Saturated Fat 13g	**65%**
Trans Fat 0g	
Cholesterol 545mg	**182%**
Sodium 700mg	**29%**
Total Carbohydrate 197g	**66%**
Dietary Fiber 22g	**88%**
Sugars 61g	
Protein 85g	

Vitamin A 90% • Vitamin C 360%

Calcium 110% • Iron 35%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories:	2,000	2,500
Total Fat	Less than		65g	80g
Saturated Fat	Less than		20g	25g
Cholesterol	Less than		300mg	300mg
Sodium	Less than		2,400mg	2,400mg
Total Carbohydrate			300g	375g
Dietary Fiber			25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

http://www.foodfortubies.org/videos/

Encourage tracking

CALORIEKING

myfitnesspal

esha

SuperTracker

Tips and tricks*

- May need to strain to avoid clogs
- Save time by cooking everything at once (meat, veggies, pasta in slow cooker)
- Oil helps thin formula
- Some foods that thicken:
  - Avocado, banana, blueberries, potatoes, pasta, non-cooked grains
- High powered blenders can cook foods → thickening
- Blend in large batches, store flat in freezer bags

*O'Gorman, Eric A. *Complete Tubefeeding*. CreateSpace Independent Publishing Platform, 2012. Print.

Formula as a base

- Ensures that protein, vitamins, and minerals are being (at least partially) provided
- Allows more freedom when designing recipes
- Less volume needed
- Provides some sodium

Total volume and free water

- Difficult to estimate final volume of each recipe
- Assume *at least* equal volume to calories
- Water flush before and after each bolus

Administration

- Bolus feeds via G-tube are best
  - Gravity
  - Syringe
- Baby food blend can go through a pump but **not recommended**
- Water flush before and after each feed
- Keep cold when traveling or at school
- https://www.youtube.com/watch?v=zrUFQsiPXmk

Vitamins and minerals

- Iron
- Calcium and vitamin D
- Sodium
  - 1 L Pedialyte = 1035 mg sodium
  - "Dash of salt"
  - Rx salt tabs (ex. DripDrop)

Commercial blenderized products

- Real Food Blends
  - http://realfoodblends.com/our-meals/
- Liquid Hope
  - http://functionalformularies.com/products/liquid-hope
- Nourish

Commercial blenderized products

Convenient	Insurance coverage questionable
Real ingredients, no added sugars or preservatives	Real Food Blends is not complete
Guaranteed nutrition	Use caution if giving Liquid Hope to children
Can be given via J-tube	
Can be given via feeding pump	

- Blenderized tube feeding is not so scary, and can have real GI benefits
- Can be nutritionally complete and safe
- Can be as easy or as complex as desired
- Special/elimination diets are not problematic
- Family must be on board, encourage open communication

Resources – nutrition tracking

- USDA MyPlate Supertracker
  - http://www.supertracker.usda.gov/
- Calorie King
  - www.calorieking.com or app available
- My Fitness Pal
  - www.myfitnesspal.com or app available

Resources - websites

- Food for Tubies
  - www.foodfortubies.com
- Feeding Tube Awareness Foundation
  - www.feedingtubeawareness.org
- The Oley Foundation
  - www.oley.org

Resources - written

- *Complete Tube Feeding* by Eric O'Gorman (2012)
- *Homemade Blended Formula Handbook* by Dunn and Morris (2007)
- "Blenderized Tube Feeding: Suggested Guidelines to Clinicians" by Arlene Escuro. *Practical Gastroenterology*, December 2014
- "The Registered Dietitian Nutritionist's Guide to Homemade Tube Feeding" by Cassandra Walia et al. *Journal of the Academy of Nutrition and Dietetics* 2016

Physiological Changes of Swallowing in the Pediatric Tracheostomized and Ventilator Dependent Populations

KATHERINE WHITE MA, CCC-SLP

Disclosures

I do not have any relevant or non-relevant financial disclosures.

Objectives

- Discuss the speech-language pathologist's (SLP) role in the multidisciplinary management of feeding affected by trach and vent dependence
- Demonstrate knowledge of anatomy and physiological changes with tracheostomy placement and speaking valve placement
- Discuss risks of feeding difficulties and treatment in this population

Multidisciplinary Team Management

What is the SLP's role?

"The overall objective of speech-language pathology services is to optimize the individuals' abilities to communicate and to swallow, thereby improving quality of life."

Aerodigestive Center Team

- ENT
- CRNP
- PA
- RN
- Respiratory
- Pulmonology
- SLP
- Frequent referrals to Feeding and Swallowing Center and outside
  - Includes OT, RD, behavioral support

Who needs a trach?

Congenital vs. Acquired

CONGENITAL	ACQUIRED
▪Craniofacial syndromes	▪Infection
▪Defects of the airway	▪Trauma
▪Lung issues	▪Stroke
▪Neuromuscular disorders	▪Ventilator support

Purposes of a Tracheostomy Tube

- Provide a patent, secure airway
- Delivery of O2
  - Mechanical ventilation
  - Trach collar O2
  - Room air
- Provide a pulmonary toilet

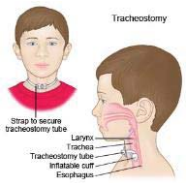
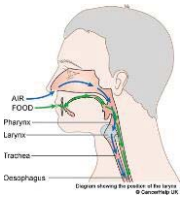


Image at: https://www.google.com/search?q=trach&tbm=isch&tbo=1#tbs=rlf:0&tbm=isch&cs=0&cd=1&safe=active&rlz=1C1GGRV_enUS732US732&q=trach+tube&imgrc=cJ4rZ5aaeWZQfyMM3A

Changes to Anatomy and Physiology

Basic Head and Neck Anatomy

- Nose
- Oral Cavity
- Pharynx
- Esophagus
- Larynx
- Trachea



Tracheostomy Tube

Image at: http://www.mayac.bo/tracheostomy-pediatric-collar/

Image at: http://img.medicalexpo.com/images_me/photo-g/79330-3002359.jpg

Changes and Results

CHANGE TO ANATOMY	RESULT
Bypass upper airway	Lack of smelling
Air delivered directly to lungs	Lack of taste
Minimal airflow to larynx	Pooling of secretions
Open system	Voicing weak or aphonic
	Decreased laryngeal sensation
	Lack the ability to cough
	Disrupted pressures during swallowing

Barriers to Feeding

PHYSIOLOGIC VS ACQUIRED

Physiologic

- Aspiration risk
  - Decreased airway protection
  - Changes in bolus propulsion pressures
- Preference for strong flavors
- Drooling

Figure 2: The Tracheostomy Tube

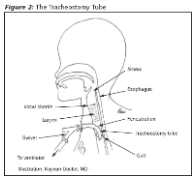


Illustration: Rayman Doctor, MD

Image at: http://www.aboutkids.com/articles/115769-emergency-management-of-the-technology-assisted-child

Acquired

- Oral aversion
- Texture sensitivity
- Delayed oral skills
- Lack of experience
- Suctioning trauma
  - oral and tracheal
- Decreased appetite

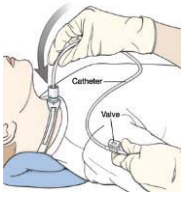


Image at: http://www.mouthbitary.org/articles/healthsheets/7022

Restoration of Voice, Swallowing and Beyond

Benefits of Speaking Valves

- Facilitates Rehabilitation
  - Phonation/Communication
  - Sensory
    - Taste
    - Smell
    - Tactile sensation
- Reduces cost of care
- Swallowing
- Improved gas exchange
- Strengthens respiratory muscles
- Expedite decannulation
- Balance
- GI motility

How a speaking valve works

- One way valve
- Hinged diaphragm (silicone) opens for inhalation
- During exhalation it is pushed closed, allowing the air to be pushed upward and out the nose and mouth
- Most of the air is directed upward

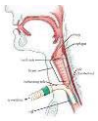


Image at: https://www.mda.org/quest/article/sorting-out-speech-services

Types of Valves

PASSY MUIR (PMV)

TRACOE (ADJUSTABLE VALVE)

Valve Use

ON VENTILATOR

Image at: http://www.passy-muir.com/vent_weaning

OFF VENTILATOR (OPEN TRACH)

Image at: http://www.passy-muir.com/babykids

Summary

- Anatomical and physiological disruptions to speech and swallowing
- Unique feeding barriers
- Crucial role of multidisciplinary team management
- Importance of early intervention

Thank you!

Questions??

Bibliography

American Speech-Language-Hearing Association. (2016). Scope of Practice in Speech-Language Pathology [Scope of Practice]. Available from www.asha.org/policy.

Johnson DC, Campbell SL and Rabkin JD. Tracheostomy tube manometry: evaluation of speaking valves, capping and need for downsizing. *The Clinical Respiratory Journal* 2009; 3: 8–14.

Ongkasuwan, J., Turk, C.L, Rappazzo, C.A. et al. The Effect of a Speaking Valve on Laryngeal Aspiration and Penetration in Children with Tracheotomies. *The Laryngoscope* 2014, Vol 124: 1469-1474.

Lichtman, S.W., Birnbaum, I. L., Sanfilippo, M.R. et al. Effect of a Tracheostomy Speaking Valve on Secretions, Arterial Oxygenation, and Olfaction. *Journal of Speech, Language and Hearing Research* 1995, Vol 38: 549-555.

Bibliography

Suiter, D.M, McCullough, G.H. & Pamela W. Powell. Effects of Cuff Deflation and One-Way Tracheostomy Speaking Valve Placement on Swallow Physiology. *Dysphagia* 2003, Vol 18 (4): 284-292.

Elpern, E.H., Okonek, M.B., Bacon, M. et al. Effect of the Passy-Muir Tracheostomy Speaking Valve on Pulmonary Aspiration in Adults. *Heart & Lung: The Journal of Acute and Critical Care* 2000, Vol 29 (4): 287-293.

Understanding Feeding Issues Associated with Orofacial Clefts and Craniofacial Anomalies

Matthew Ford MS CCC-SLP
Clinical Coordinator Cleft Craniofacial Center
Speech Language Pathologist

Children's Hospital of Pittsburgh | of UPMC

Incidence/Prevalence

- Most frequent congenital malformation in US(CDC-2008)
- 1 in **598** live births with overt orofacial cleft
- 40–60% will have associated malformations
- Associated with over 400 known syndromes(OMIN)

Children's Hospital of Pittsburgh | of UPMC

Cleft lip and palate

- **Can be complete or incomplete**
- **Typically non-syndromic**
- **May require pre-surgical orthopedic treatment in infancy**
- **Surgical interventions from infancy through skeletal maturity**

Children's Hospital of Pittsburgh | of UPMC

Overview: Cleft Protocol

- ✓ prenatal counseling
- ✓ airway and feeding
- ✓ birth: naso-alveolar molding and/or lip adhesion – *"convert all to incomplete clefts"*
- ✓ 3-6 mo: lip and primary nose repair
- ✓ 9-14 mo: one stage palatoplasty –pharyngoplasty: when able to evaluate speech and tolerate instrumentation
- ✓ touch-up before school or at skeletal maturity
- ✓ alveolar cleft repair: before eruption of lateral incisor
- ✓ orthagnathic surgery: distraction during growth or surgery at skeletal maturity
- ✓ Other procedures when needed including ENT interventions

Children's Hospital of Pittsburgh | of UPMC

Prenatal Diagnosis

- Approximately 70 – 75% of cleft lip +/- palate identified
- Opportunity for feeding education prior to delivery
- Prepare family with specialty nursers and clinic contact

Children's Hospital of Pittsburgh | of UPMC

Children's Hospital of Pittsburgh | of UPMC

Cleft types

- Unilateral
- Bilateral
- Complete
- Incomplete
- Lip +/- palate
- Submucous
- Rare Craniofacial

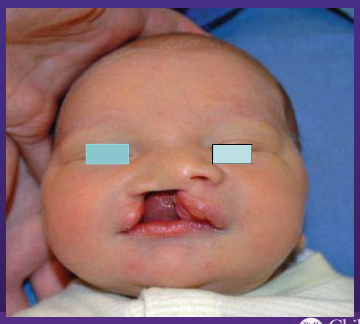
Children's Hospital of Pittsburgh | of UPMC

Right Incomplete Cleft Lip

Children's Hospital of Pittsburgh | of UPMC

Bilateral Incomplete Cleft Lip

Children's Hospital of Pittsburgh | of UPMC

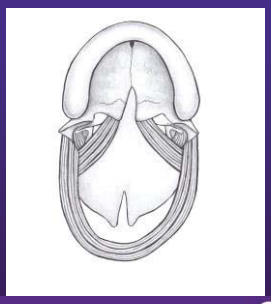


Children's Hospital of Pittsburgh | of UPMC

Children's Hospital of Pittsburgh | of UPMC

Children's Hospital of Pittsburgh | of UPMC
Children's Hospital of

Submucous Cleft Palate



SMCP

Examples

Children's Hospital of Pittsburgh | of UPMC

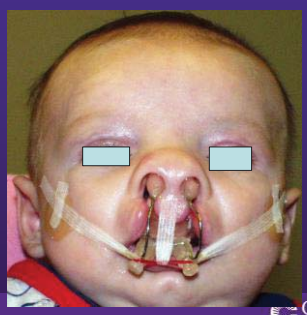
Craniofacial Cleft

Children's Hospital of Pittsburgh | of UPMC

Midline Cleft - Holoprosencephaly

Children's Hospital of Pittsburgh | of UPMC

Pre-Surgical Orthopedics
NAM-Nasoalveolar molding



Children's Hospital of Pittsburgh | of UPMC

Children's Hospital of Pittsburgh | of UPMC

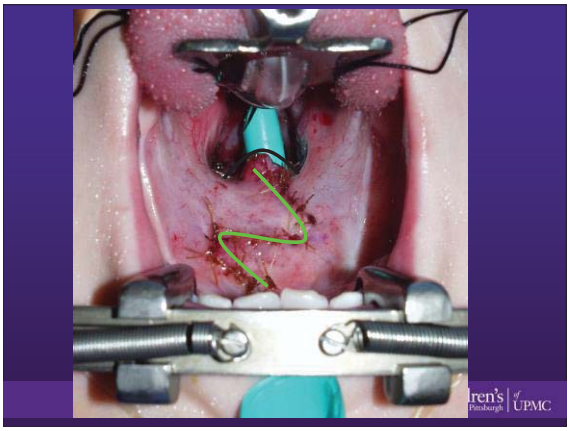
Cleft-Lip Adhesion

Children's Hospital of Pittsburgh | of UPMC

Children's
Hospital of Pittsburgh
of UPMC

Children's
Hospital of Pittsburgh
of UPMC

of UPMC

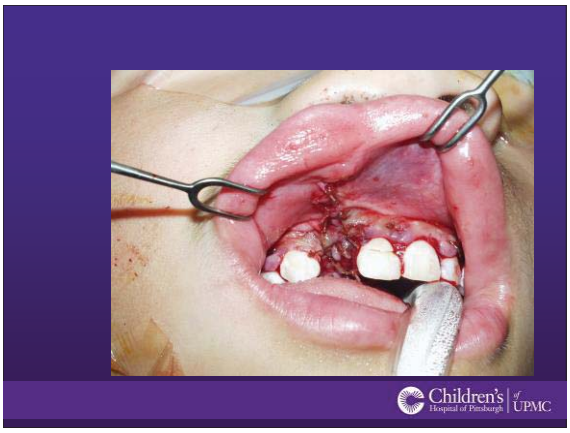


Alveolar Bone Graft-CLP Patients

- Mixed dentition – based on cleft site lateral incisor or canine
- Presurgical orthodontic preparation – Palate Expansion & Maxillary protraction
- Stabilize maxillary arch
- Provide tooth root support
- Allow for orthodontic tooth movement

Children's Hospital of Pittsburgh | of UPMC

Children's
Hospital of Pittsburgh
of
UPMC


Children's
Hospital of Pittsburgh
of
UPMC

Orthognathics

- Correct skeletal malocclusion
- Pre and post surgical orthondontia
- Speech changes – positive and negative

Children's Hospital of Pittsburgh | of UPMC

Children's Hospital of Pittsburgh | of UPMC

Secondary Surgery

- 60-75%
- "rule rather than exception"

Children's
Hospital of Pittsburgh
of UPMC

Children's
Hospital of Pittsburgh
of UPMC

Children's
Hospital of Pittsburgh
of UPMC

Neonatal Period

- Feeding optimization
- Specialized bottles, nipples and feeding systems – assist with flow
- Positioning - upright
- Caloric management
- Reflux management

Children's Hospital of Pittsburgh | of UPMC

Feeding and Swallowing

- Team evaluation and treatment of early feeding and swallowing issues
- Educate nurses, caretakers and parents regarding feeding recommendations including feeding position, appropriate nursers/nipples etc
- Recommend further diagnostic testing and interventions as indicated

Children's Hospital of Pittsburgh | of UPMC

Feeding a Cleft Lip Infant

- Minimal modifications needed
- Breast or bottle feeding is tolerated well
- Breast tissue or nipple fills void in lip
- If not succeeding check for Submucous cleft or wide maxillary alveolar cleft

Children's Hospital of Pittsburgh | of UPMC

Feeding a Cleft Palate Infant

- Positioning - upright
- Assistance with delivery of formula/breast milk flow
- Frequent burping

Children's Hospital of Pittsburgh | of UPMC

Specialty Nursers

Children's Hospital of Pittsburgh | of UPMC

MeadJohnoson Emfamil Cleft Nurser

- Cross cut nipple with soft squeezable bottle
- Pros: can help with extraction
- Cons: nipple can leak and frequent nipple irritation with ulceration of vomer

Children's Hospital of Pittsburgh | of UPMC

Vomerine ulceration

Children's Hospital of Pittsburgh | of UPMC

The Pigeon Bottle and Nipple System

- Includes semi-squeezable nurser with one way check valve
- Nipple is vented and Y-cut as well as multi-textured to allow rapid flow with minimal excursion
- Standard nipple ring and relatively normal appearing bottle make it a parent favorite

Children's Hospital of Pittsburgh | of UPMC

Pigeon Cleft Nurser

Children's Hospital of Pittsburgh | of UPMC

Haberman Cleft Feeder

- Utilizes a large nipple which is squeezed to provide formula delivery
- Nipple is straight cut
- Utilizes a one way flow valve to prevent back flow and air ingestion
- Most "special" appearing of the cleft nursers

Children's Hospital of Pittsburgh | of UPMC

Haberman Feeder/SpecialNeeds

- Description: One way valve, long nipple, no vacuum produced, three flow rates
- Pros: can adjust flow, silicone non-irritating nipple
- Cons: cost, cannot use thickened liquid, socially stigmatizing

Children's Hospital of Pittsburgh | of UPMC

Therapeutic Strategies

- Thickening -use cautiously
- Bottle and nipple
- Positioning (chin/jaw/cheek)
- Time limitations and schedule
- Frequent burping
- Oral stimulation
- Airway management
- GERD management

Children's Hospital of Pittsburgh | of UPMC

Orofacial Cleft Impact on Feeding and Swallowing

- Nasal regurgitation – most common feeding symptom associated w/cleft – until ABG in CLP
- Structural differences impact normal suckle, swallow respiration cycles – chewing & suction
- Interventions for correction of defects can result in temporary or long term feeding behavior changes – altered development
- Structural differences increase aspiration and FTT risk
- Post-operative feeding protocols

(Averdson & Brodsky 2002)

Children's Hospital of Pittsburgh | of UPMC

Mixed Dentition

Children's Hospital of

Children's Hospital of Pittsburgh | of UPMC

Class II Malocclusion

Children's Hospital of Pittsburgh | of UPMC

Class III Malocclusion

Children's Hospital of Pittsburgh | of UPMC

Oronasal Fistula

Children's Hospital of Pittsburgh | of UPMC

Preschool Age Problems

- Mastication-related to malocclusion or altered oral motor skills
- Nasal regurgitation – VPI, ONF & alveolar clefts
- Nasal airway obstruction – poor oral preparation & reduced swallow/respiratory coordination
- Anterior loss – reduced lip competence due to malocclusion or nasal airway obstruction

Children's Hospital of Pittsburgh | of UPMC

Cleft Related Airway Issues

Children's Hospital of Pittsburgh | of UPMC

Pierre Robin Sequence

Children's Hospital of Pittsburgh of UPMC

Micro-retrognathia

Glossoptosis

Respiratory obstruction

PRS: Protocol

- Positioning –prone
- GER prophylaxis
- Polysomnogram
- ETT – if unstable
- Multilevel airway evaluation
- Tongue-Lip Adhesion (TLA)
- Rapid mandibular distraction osteogenesis (DOG)
- Tracheostomy

Children's Hospital of Pittsburgh | of UPMC

Children's Hospital of Pittsburgh | of UPMC

Internal Mandibular Distraction

Children's Hospital of Pittsburgh | of UPMC

PRS Feeding

Children's Hospital of Pittsburgh | of UPMC

PRS Complex issues

- Primary feeding/swallowing issues closely related to airway obstruction from glossoptosis
- Glossoptosis obliterates vallecular space
- Obstruction leads to disorganization
- Higher rates and risk of aspiration
- Swallowing better after airway interventions
- Known esophageal motility issues
- Higher prevalence of GER
- Can lead to long term behavioral feeding problems
- Altered feeding development and potential aversions

Cladis et al 2014; Lefton-Greif & Averdson 2007; Dudkiewicz et al 2000; Marques et al 2009

Children's Hospital of Pittsburgh | of UPMC

Feeding and Swallowing PRS

- Overall safety of PO
- Feeding equipment and techniques
- Nutrition & medical support for FTT
- Prognosis for PO feeding for nutrition in short and long term with or without airway intervention
- MBS pre and post-op DOG if performed at any age
- Recommend G-tube if PO not reasonable in reasonable time period or if FTT persists

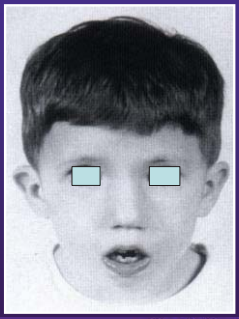
Children's Hospital of Pittsburgh | of UPMC

22Q Deletion Syndrome

Children's Hospital of Pittsburgh | of UPMC

22q11.2 deletion syndrome

- Velocardiofacial
- DiGeorge
- Conotruncal Anomaly
- Sphrintzen



Children's Hospital of Pittsburgh | of UPMC

22Q Deletion

- Most common condition associated with cleft palate - 8-10%
- 10-15% of VPI referrals to CCC
- 1/3000 births
- 30% with significant dysphagia requiring non-oral supplementation
- High prevalence of reduced volume of intake & food texture issues
- Autism spectrum & other behavioral dx common

(Eicher et al 2000 & 2001, Cuneo 2001)

Children's Hospital of Pittsburgh | of UPMC

22Q Deletion

- High prevalence of laryngeal web and laryngeal anomalies
- Oropharyngeal hypotonia/dysmotility
- Cardiac defects
- Growth disturbances
- Developmental delays - hypotonia
- Behavioral problems

Sphrintzen 2008, Miyamoto et al 2004, McDonald-Mcginn et al 2011

Children's Hospital of Pittsburgh | of UPMC

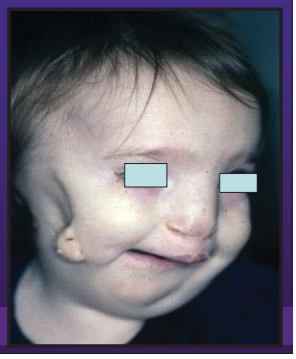
Craniofacial Microsomia OAV Spectrum

Children's Hospital of Pittsburgh | of UPMC

Hemifacial Microsomia - OAV

- Craniofacial microsomia
- 1st and 2nd branchial arch syndrome
- Oculo-auricular-vertebral spectrum(OAV)
- Goldenhar syndrome
- 1:3500-5000 births
- Type 1-3 mandibles
- Second most common craniofacial condition

(Stromland et al 2007, Converse et al 1973)



OAV Spectrum

- Facial clefting – lateral facial clefts and common cleft palate +/- lip
- Upper Airway obstruction from assymetrical retrognathia
- Tongue anomalies (palsies, cleft, ankyloglossia)
- Orofacial palsies
- TMJ anomalies
- Tracheoesophageal fistula & esophageal atresia
- Microtia and aural atresia
- Ophthalmologic anomalies

Children's Hospital of Pittsburgh | of UPMC

OAV Feeding

- Systematic Review of Feeding difficulties in Craniofacial Microsomia (Caron et al 2015)
  - -Feeding difficulties reported in 42 – 83% - lack of specificity
- 10/24 – Cohen et al 1995
- 12/18 – Stromland et al 2007 – most due to oral deformities and impairments
- 20/24 - Shokeir 1977

Children's Hospital of Pittsburgh | of UPMC

Craniofacial Dysostosis Syndromes

Children's Hospital of Pittsburgh | of UPMC

Craniosynostosis

- Prevalence: 3.1 to 4.8/10,000 live births
- Sex distribution: males > females except coronal
- Syndromic vs. non-syndromic – associated with > 100 known syndromes (OMIN)
- High prevalence of palatal clefts and anomalies

Children's Hospital of Pittsburgh | of UPMC

Craniofacial Dysostosis

- Syndromes with craniosynostosis
  - Familial forms of synostosis involving
    - Cranial base and Vault
    - Midface structures
    - Nasal airway – stenosis/atresia
    - Palatal structure and function

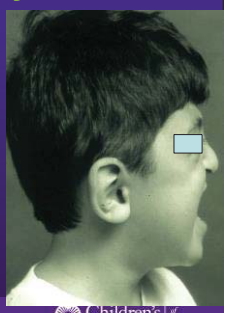
  **Well described (Gorlin & Cohen, 2001; Cohen, 1986)

Pfeiffer Syndrome

Children's Hospital of Pittsburgh | of UPMC

Syndromic Craniosynostosis

- Apert: FGFR2
- Crouzon: FGFR3
- Pfeiffer: FGFR2
- Saethre-Chotzen: TWIST1
- Muenke: FGFR3
- Carpenter: RAB23
- Antley-Bixler: POR
- Jackson-Weiss: FGFR2



Children's Hospital of Pittsburgh | of UPMC

Primary Functional Issues

- elevated intracranial pressure
  - multiple sutural fusion: 42%
  - single sutural fusion: 13%
- Vision: optic nerve atrophy, corneal exposure
- Cognitive function
- Airway integrity
- Feeding & swallowing

Children's Hospital of Pittsburgh | of UPMC

Secondary Functional Issues

- Speech and Language
- Malocclusion
- Feeding – long term
- Vision
- Hearing

***All can impact normal development of oral motor skills and feeding behaviors

Children's Hospital of Pittsburgh | of UPMC

Feeding in synostotic syndromes

- 30% rate of feeding difficulties in children with midfacial hypoplasia – Perkins et al 1997
- Prolonged feeding times, increased respiratory obstruction and decreased coordination of swallowing and respiration – Teichman & Walter 1994; Thompson et al 1994; Posnick 1994
- Apert syndrome – Pereira et al 2009
  - 7/13 w/aspiration & FTT
  - 10/13 required nutrition supplementation
  - 7/9 improvement of swallowing w/airway intervention

Children's Hospital of Pittsburgh | of UPMC

Malocclusion & Palate Anomalies

Children's Hospital of Pittsburgh | of UPMC

Preschool Feeding Issues

- FTT – Medical & Nutrition support
- Food Trapping – abnormal palatal vaults
- Poor Mastication – Malocclusion, lip incompetence & nasal obstruction
- Nasal Obstruction due to midface hypoplasia and nasal stenosis result in OSA, anterior loss and reduced swallow & respiratory coordination

Children's Hospital of Pittsburgh | of UPMC

Summary Recommendations

- Appropriate differential dx of problems
- Team management even with non-syndromic cases
- Early intervention
- Multidisciplinary interventions to maximize function at appropriate times

Children's Hospital of Pittsburgh | of UPMC

Addressing Food Selectivity in Children on the Autism Spectrum

Ann Condon Meyers RD, LDN, MS

I know what's on your mind!

Our roadmap for the next 45 minutes

- Basics of autism especially as they relate to toddlers and preschoolers
- Why feeding problems with autism
- How parents of an autistic child view the role of nutrition
- Special diets used in the treatment of autism
- How to evaluate nutritional status in young children with autism

Our objectives

- Understand how the behavioral and medical aspects of autism can affect the nutrition of toddlers and preschoolers
- Explore the relationship between autism and gastrointestinal function
- Describe common diets parents may use with their child on the spectrum
- Identify the role of nutrition in normal growth and development of children on the spectrum
- Separate typical toddler and preschooler feeding behavior from more serious food aversions

Why talk about autism today?

- Autism is now diagnosed at an earlier age, usually before age 5
- Therapies for ages 1 – 5 have been shown to make a difference in developmental outcomes
- This is also a critical time for developing the skills of eating as well as flavor preferences.
- Poor nutrition can hinder therapy and outcome as well as delay growth and brain development.
- Most parents of toddlers and preschoolers are in tune with early nutrition and feeding skills for this age group but some misconceptions may exist.

Autism 101

- Autism spectrum disorder (ASD) refers to a group of complex neurodevelopment disorders characterized by repetitive and characteristic patterns of behavior and difficulties with social communication and interaction. The symptoms are present from early childhood and affect daily functioning.

An historical perspective

- Autism (from the Greek word meaning self) was first described 100 years ago. It was a disorder to describe a condition in which people can not engage in social interaction. Originally it was thought to be a form of schizophrenia.
- 1943. Leo Kanner MD at Johns Hopkins University first described autism as a separate disorder.
- In the same decade, Hans Asperger, a German scientist and pediatrician identified patients with similar but distinct symptoms of withdrawn behavior.

Who's on the spectrum now?

- Google image – AutismSpeaks.org

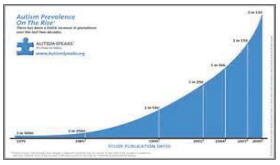
Within the spectrum…

- The Diagnostic and Statistical Manual of Mental Disorders (DSM-5, published in 2013) includes Asperger syndrome, childhood disintegrative disorder, and pervasive developmental disorders not otherwise specified (PDD-NOS) as part of ASD rather than as separate disorders.
- Genetics and environment both play a role in autism, according to the current research.

Stats:

- 1 in 68 children is on the autism spectrum
- More common in boys than girls
- Complex genetic abnormality – not completely understood yet
- Affects neurodevelopment in the brain
- Now diagnosed as early as the first year of life

Increase in the numbers



Toddlers and preschoolers on the spectrum

Signs of early autism

- No babbling or pointing by age 1
- No single words by age 16 months or two-word phrases by age 2
- No response to own name
- Loss of language or social skills previously acquired
- Poor eye contact
- Excessive lining up of toys or objects
- No smiling or social responsiveness

Ducks in a row…

- Google image

After age three or four indicators

- Impaired ability to make friends with peers
- Impaired ability to initiate or sustain a conversation with others
- Absence or impairment of imaginative and social play
- Repetitive or unusual use of language
- Abnormally intense or focused interest
- Inflexible adherence to specific routines or rituals

More feeding problems in children with autism?

- Feeding is a complicated human behavior dependent on a person's development status.
- Feeding involves every sensory system and children on the spectrum have difficulty with sensory processing.
- One study showed that 69% of children with ASD were unwilling to try new foods and another 46% had rituals surrounding their eating habits.

Medical conditions in autism which affect appetite

- Many children with ASD display gastrointestinal symptoms and increased gut permeability and a higher incidence of GERD
- Theory; a "leaky gut" leads to underlying GI distress. The incidence of GI symptoms is reported to be between 30 and 70% of all children with autism.
- Food allergies and intolerances are more common in ASD
- Does other sensory input "drown out" or suppress appetite? Does the child feel hunger?

Medications can affect appetite and weight gain

- Decreased appetite and resultant **weight loss** seen with many stimulants used to treat hyperactivity or inattention eg. Methylphenidate(Ritalin), atomoxetine (Straterra)
- **Weight gain** and increased appetite with risperidone (Risperdal) and aripiprazole (Abilify) used to treat disruptive and maladaptive behaviors
- Usually, these drugs are not used in children until about age 5. More commonly used in grade school children and teens.

Behavioral / developmental conditions which affect feeding

- The child may be responding to sensory aspects of food. For example strong flavors, smells, specific textures or even colors all influence food choices.
- Behavior problems are addressed using food. eg bribe for good behavior or just a desire for a peaceful family dinner.
- Strong food aversions are most likely reinforced unintentionally by caregivers and therapists.
- Eating is also a social skill – the child may not understand what is expected at mealtime.
- Limiting mealtimes to 30 min or less is one effective strategy to help the child focus on the task. Time limits and schedules help to limit the grazing which depresses hunger.

- Google image

Nutrition concerns in younger children with autism

- Selective eating which can lead to nutritional deficiencies
- Delayed feeding skills
- Intolerances / allergies
- GI disorders
- Unable to function well and participate in therapy sessions due to hunger or GI distress
- Pica – self stimulation versus iron deficiency. The most serious complication from pica at this age is GI obstruction.

Google image

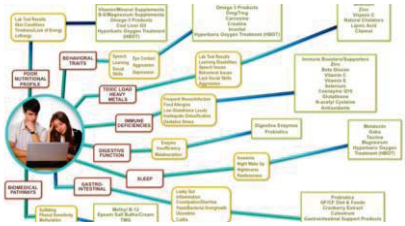
What are the categories of food selectivity?

- Picky eating – variable likes and dislikes
- Frequent food refusals
- Limited repertoire of foods
- Excessive intake of a few foods or liquids
- Selective intake of a food category such as carbohydrates
- Selective refusal of a food category such as animal protein

Complementary & Alternative Medicine (CAM): food as treatment

- Higher use in autism +26% compared to children without autism
- Use more likely in children with GI symptoms, behavior problems and seizure disorders
- Dietary intervention is the most common form of CAM in ASD

CAM - Information overload for parents



Research says following a healthy diet will improve symptoms?…

- No added sugar diet: 2% worse, 46% no change and 52% better (survey of parents)
- Other research: lower pesticides = more organic foods, some report children do better but no double blind placebo study yet
- Less "junk foods" = less artificial flavors, colors and preservatives. One recent study found artificial colors and sodium benzoate "caused" hyperactivity (included 153 3-year olds in the study)This was not the Feingold diet study.

Special diets used in autism

Food allergies and sensitivities

- Children with autism have more food allergies and food sensitivities
- Includes immediate mediated by IgE antibodies
- Or delayed mediated by non-IgE sensitivity
- Can involve the GI tract but also may trigger migraines

Elimination diets / elemental diets to address allergies / sensitivities

- Elimination of usually 6 foods: milk, egg, wheat, soy, peanuts / tree nuts, fish shellfish
- Elemental diet: no foods except an amino acid based formula such as Elecare or Neocate Junior.

FODMAP diets

- Elimination of all fermentable oligo-monosaccharides and polyols

Eliminate foods containing:

- fructose: fruit, high fructose corn syrup
- lactose: all dairy except hard cheeses and lactose free dairy products
- fructans: wheat, onion, garlic
- galactans: legumes
- polyols: sorbitol, cherries, avocados

Elimination of artificial dyes

- Foods that contain food dye
- Some families may also eliminate all food preservatives and additives as well.
- Started as The Feingold Diet (which avoided salicylates and dyes) which has since been disproven as treatment for hyperactivity

Gluten-free & casein free

- Requires education of families and a trial period to determine whether it is helpful. Usually 2 – 4 weeks
- Wheat (not gluten) and casein are already common food allergens. They are both proteins.
- Children with autism may be also be lactose (milk sugar) intolerant as well as milk protein intolerant
- Theory is: Peptides may bind to opioid-receptors in the brain – resulting in sleepiness, giddiness, inattention, aggression, self-abuse behavior.
- May also avoid soy; may only avoid wheat
- Must have a calcium and vitamin D supplement and may need B vitamins as well.
- Requires extra preparation and increase in food cost

Ketogenic diet or modified Adkins diet

- Adkins diet: all primary carbohydrate foods, including sugars, starches, fruits, and milk are restricted.
- The ketogenic diet is deficient in total protein, carbohydrates, and carnitine. It is extremely difficult to follow for many families. It is most often used to control seizure disorders that can not be well controlled using common anti-seizure medications. There is a ketogenic formula which can be used in place of foods. (Ketocal) Children may eat very small amounts of starches, meats, fruits and vegetables and large amounts of fats plus the formula or heavy cream as a drink.

Specific carbohydrate diet

- Restricts carbohydrates which change the intestinal flora. These food must be avoided:
- Cereal grains such as wheat, oats, rice
- Processed meats such as lunch meats and hot dogs
- Canned fruits and vegetables and most fruit juices
- Legumes: soy, chick peas, sprouts, mung, fava,
- Dairy: yogurt, milk processed cheese, ice cream
- Tubers: potatoes and yams
- Spices: curry, onion, garlic

Specific Carbohydrate Diet

- Avoid all carbohydrates and most sugars except the simple sugars in fruit.
- Not as much reliable research on this diet and autism compared to gluten and casein free. The diet usually improves the nutritional adequacy of the diet overall except for the B vitamins.
- Foods allowed are fresh fruits & vegetables, fresh meats and fish, fermented dairy, eggs and nuts.

Use of Probiotics

- Intestinal micro flora is altered in children with autism (compared to age-matched typical controls)
- Decrease in beneficial bacteria (eg. lactobacillus)
- Increase in pathogenic bacteria (eg. clostridium)

Other nutritional treatments

- Digestive enzymes administered to treat gut problems (gassy, bloating and constipation) are common in autism
- Anti-fungals (little research)
- Amino acids – lots of variation in blood work measuring amino acids within in children (with and without autism)
- Carnitine for children at risk due to limited meat or vegan diets – may actually be treating a mitochondrial disorder. May be used in conjunction with CoEnzyme Q10

Melatonin – not directly associated with poor feeding or appetite

- Used most often as a sleep aid
- Theory: sleep problems are correlated with poor gut function and not a direct consequence of autism
- Safe to use for long periods of time
- Not used much with toddlers and preschoolers even though this age group is the most sensitive to lack of sleep leading to a poor feeding session

What works using evidenced based practices?

Factors Affecting Dietary Intake/Nutrition Status in ASD & Suggested Nutrition Interventions

Factors Affecting Dietary Intake/ Nutritional Status in ASD	Gastrointestinal Symptoms/ Issues	Food Allergies/ Sensitivities	Nutrient Deficiencies Associated with ASD	Metabolic Abnormalities	General Inadequate Nutrient Intakes in ASD	Specific Deficiencies Due to Problem Eating Behaviors
Nutrients Affected	Multiple	Multiple	• Vitamin B6 (Pyridoxine) • Magnesium • Omega-3 Fatty acids (DHA/EPA)	• Folic Acid • Vitamin B12 • Glutathione	Iron, Zinc, Magnesium, Calcium, Vitamin D	Biotin, Vitamin K, Linolenic Acid, Choline
Suggested Nutrition/ Dietary Supplement Interventions (Under MD/RD Supervision)	Probiotics (GFCF not recommended at this time)	Work with MD/RD/ Certified Leap Therapist	Multivitamin Moderate amount of fish oil (DHA/EPA)	Multivitamin (Glutathione, DMG and TMG supplements not supported by literature)	Multivitamin Calcium supplement	Multivitamin

- Google image

DIY Nutrition Assessment

Where to start? Nutrition assessment prior to therapy

- Assess current intake and look for:

1. Does the child seem to enjoy eating?
2. What food is in the house?
3. What feeding skills are present?
4. What are family expectations for nutrition?
5. Who is present during meals / snacks?
6. Where and when do feedings take place?
7. How are feedings perceived by the family?
8. Are entire food groups missing?
9. Are foods ever used for behavior modification?

- Google image

What you need to know about assessing a child's diet

- Similar to other toddlers and preschoolers but more focus on appetite and enjoyment of food.
- Each child needs to receive a balanced diet which supports normal growth and development.
- A food intake diary is ideal if it is for 3 typical days.
- If family is not prepared to present this, then try for a typical day's intake including all foods, beverages and vitamin / mineral supplements.
- A **growth record is a must** in order to assess whether this child has been growing to their genetic potential.

How to analyze food records of toddlers and preschoolers.

- Be prepared for bites, sips and bits of foods. The typical toddler / preschooler will eat about 3 – 4 foods at a typical meal or snack. Each food is often no more than 1 tablespoon per year of age.
- Fluids should be about 4 – 6 ounces offered at a time but you may see much more if the child is not eating well and / or has developmentally delayed feeding skills.
- Look for missing food groups.

The following is a general guideline for intakes

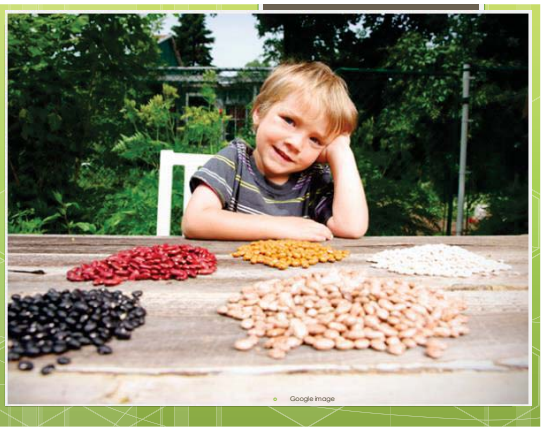
Individual nutrients at risk

Protein: Why do so many toddlers and preschoolers hate meat?!

- Chew, chew, chew…their jaws have 1/3 the strength of an adults
- Mouths can be dry as the desert – may prefer sauces - hummus and guacamole work well.
- Too large a portion - Toddlers only need 1 – 2 ounces of a complex protein food per meal. Preschoolers only need 1 ½ -2 ounces of protein per meal. Palm of child's hand for total amount of protein needed in a day.
- The most likely nutrient missing in this age group with ASD is iron.

Protein: complete vs incomplete

- Complete proteins contain all of the essential amino acids: beef, poultry, fish, pork, eggs, yogurt, cheese, soy milk, cow's milk, quinoa
- Incomplete proteins lack one or more to one of the essential amino acids: beans, peas, nuts, seeds, grains, vegetables. These con be combined in the diet to make a "complementary proteins" such as beans with corn or peanut butter with whole grain bread, or a vegetable lasagna.
- The different sources of protein don't have to be in the same meal.
- A LDN can analyze 3 day food record for all essential amino acids



- Google image

Carbohydrates

- Usually preferred foods for many toddlers and preschoolers– easier to chew and to digest.
- Many processed foods are high in carbohydrate. TV ads promote directly to children so children demand these foods most often.
- Easy to recognize, portable and present strong preferred flavors such as salty and sweet.
- Children usually choose low fiber carbs – high fiber carbs can be dry, harder to chew and have less flavor.

Fats in the diet of children with autism

- Not all fats in the diet are created equal:

Healthy choices are:

- Monounsaturated fats – liquid at room temperature: olive, peanut, soybean, canola oil plus avocados, olives and most nuts
- Polyunsaturated: fish and vegetable oils
- Omega-3 fatty acids also in seafood such as salmon, mackerel plus flaxseeds and walnuts. Small trials done.

Essential fatty acids

- Most of the US population (80%) have low levels of Omega 3 fatty acids
- But children with autism have the lowest levels of omega-3 fatty acids
- Best sources - small fish with low mercury levels and supplements:
- Omega – 3 FA: 20 – 60 mg/kg
- Omega – 6 FA: same dosage

Important vitamins for brain and nerve function:

- Calcium, iron and the B vitamins plus folic acid
- For example:
- Calcium is required for transmission of nerve impulses in the brain and aids in the release of neurotransmitters from neurons
- Iron transports O2 to the brain and is needed to produce the neurotransmitter dopamine

Vitamin and mineral supplements

- Large multi-center study done on children with autism and their diets. Nutrients most often lacking were potassium, calcium, vitamins D & K, iron and biotin.
- Of all of the nutrients, B6 with magnesium in high doses has been studied the most. There is a high incidence of B6 (pyridoxine) deficiency in children with autism. Magnesium may have an additive effect on levels of active B6.
- A pediatric multi-vitamin with iron and calcium such as Centrum Kids (contains milk wheat and soy). Rainbow Light Kids One multi-vitamin is milk, wheat, and soy free but has less iron. Neither has more than 10% of the RDA for calcium.
- Tums can be used as a source of calcium. One regular Tums is 500 mg of calcium which is 70 % of the RDA for ages 1-3 and 50% for ages 4 – 8. Kids Tums are 750 mg of calcium per tablet.

Water, water everywhere…

- Non-verbal children may not ask for water.
- They may be drinking too much milk or juice in stead of water (and are never hungry)
- Average requirement for fluid in ages 1 to 3 is: 5 cups per day (40 ounces) (fruits and vegetables are 90% water and they count in the total.
- Ages 4 – 5: 6 cups per day (48 ounces)
- Rule of thumb for dehydration – dark urine and dry eyes / dry mouth
- Children who are quiet and in climate controlled environments can do well with less hydration than the average requirement.

Time to call your friendly LDN

- When an entire food group is missing
- When growth is poor; that is: when length / height is not increasing at a smooth velocity or when weight is not meeting appropriate goals for age and medical diagnoses
- When BMI is below the 10th or above the 85th%tile
- When the family is giving multiple vitamins / supplements that you suspect may not be appropriate for age or size of child

References

- *Autism and nutrition: the role of the gut-brain axis.* Van De Sande MM, Van Buul, V.J, Brouns, F.J. Nutr Res Rev. 2014 Dec; 27(2): 199-214.
- *Autism Spectrum Disorder – Research Suggests Good Nutrition May Manage Symptoms*. Privett, D. Today's Dietitian. Vol 15, no1, 46 - 52.
- Eating for Autism. Strickland, E. Da Capo Press. 2099
-
- *Eating Habits of Children with Autism*. Williams, P.G., Dalrymple, N., Neal, J. Pediatric Nursing. 26 (3), 2000. 259 – 264
- *Food Selectivity in Autism Spectrum Disorders. A Systematic Review*. Marí-Bauset, S et al. J Child Neurol. Nov 2014. vol 29, no 11, 1554 – 1561
- *Food Selectivity, Mealtime Behavior Problems, Spousal Stress, and Family Food choices in Children with and without Autism Spectrum Disorder*. Curtin, C et al. J Autism Dev disord (2015) 45: 3308 – 3315
- *Multi-method assessment of feeding problems among children with autism spectrum disorders*. Sharp, W., Laquess, D. Lukens, C. Research in Autism Spectrum Disorders. vol 7 (2013) 56 – 65
- *Nutrition Management of Gastrointestinal Symptoms in Children with Autism Spectrum Disorder: Guideline from an Expert Panel*, Berry, Rashelle et al. J of the American Academy of Nutrition and Dietetics. Dec 2015. volume 115, no 5. 1919 – 1927

Acknowledgement

- Thanks to Stacey Zettle MS LDN, Children's Hospital Pediatric Gastroenterology Specialist for review of this presentation!

- Google image

What is the Feeding and Swallowing Center?

Feeding problems are complex and can develop for a variety of reasons (medical, anatomical/structural, psychosocial, developmental, behavioral, and/or experiential). The Feeding and Swallowing Center at Children's Hospital of Pittsburgh of UPMC incorporates an interdisciplinary approach for evaluating, treating, and providing ongoing support and follow-up care for infants and children (birth to 21) experiencing feeding and swallowing difficulties.

What is an interdisciplinary approach?

Based on a child's needs, the initial evaluation may include input from one or more of the following team members:

- Pediatrician
- Occupational Therapist
- Speech Pathologist
- Clinical Dietitian
- Nurse
- Behavioral Health Specialist

During the evaluation, the team will generate a patient and family centered treatment plan providing: family education, training and support. Recommendations are made to help family members/caregivers promote the safest most pleasurable feeding experience possible for the child.

Who can benefit from a visit to the center?

Children who experience one or more of the following may benefit from services provided through the Feeding and Swallowing Center:

- Limited or poor intake
- Food refusal/selectivity; picky eating
- Inadequate or slow weight gain
- Suspected or identified problems with airway protection and swallowing
- Choking or history of gagging
- Sensory problems
- Swallowing difficulties
- Chewing difficulties
- Oral sensitivity
- Lack of oral feeding experiences

Housing

For families being seen at Children's Hospital and who live greater than 40 miles from Pittsburgh, housing is available at the Ronald McDonald House. For more information please call 412-362-3400.

How do I schedule an appointment?

To schedule an appointment for an evaluation, please call **412-692-FEED (3333, select option 1)**

Our Location

Feeding and Swallowing evaluations are offered at this location:

Children's Hospital of Pittsburgh of UPMC
4401 Penn Ave.
Pittsburgh, PA 15224