NUTRITION

Nutrition, Case # 4

Written by Debra Best, M.D.

A healthy 4-month-old breast-fed child presents for a well-child examination. The parents want to know when he can begin solid foods and when he should be weaned from breast milk. How would you council them?

Definitions for Specific Terms:

Complementary foods- Any food or beverage other than breast milk or formula. Also referred to as "solids"

Review of Important Concepts:

Learning Objectives

- Know when complementary foods should be introduced.
- Learn how to what developmental milestones must occur for a baby to be ready for complementary foods.
- Describe the anticipatory guidance that is given to families about the introduction of complementary foods.
- Learn the recommendations for counseling patients about weaning from breast milk.

Clinical Reasoning

1. When can complementary foods be introduced?
   a. Solid foods should not be introduced before 4-6 months of age as this may lead to choking/aspiration, increased risk of atopy and increased risk of obesity.
   b. There is some difference of opinion within the American Academy of Pediatrics as to their recommendations for the timing of the introduction of complementary foods. The AAP Committee on Nutrition states that complementary foods can be introduced into a developmentally ready infant's diet between 4 and 6 months of age. The AAP Section on Breastfeeding recommends exclusive breastfeeding until 6 months of age. Both Sections agree that these complementary foods should be in addition to, and not in replacement of, breast milk or formula.
   c. The World Health Organization recommends exclusive breastfeeding until 6 months of age.
   d. There is little nutritional value of introduction of solids before 6 months of age which tends to replace the benefits of breast milk. Breastfeeding exclusively through 6 months of age confers significant benefits to the infant, including immune protection and decreased risk of obesity, SIDS and atopic diseases.
   e. There is no benefit to starting foods prior to 4 months of age. In fact, starting foods earlier than 4 months may be harmful. Infants may choke on foods if they aren't developmentally ready to swallow them. They may have an increased risk of obesity and atopic disease. They may also obtain less nutrition from breast milk or formula as solids may take the place of these

f. For infants at high risk of developing atopic disease (such as asthma, allergies or eczema), there is evidence that exclusive breastfeeding for at least 4 months of age decreases the incidence of eczema and cow's milk allergy in the first two years of life. There is not sufficient data currently to recommend delaying introduction of solids past 4-6 months of age to further decrease risk of atopic disease.
g. There is evidence that exclusive breastfeeding for at least 3 months protects against wheezing in early life
h. Delaying introduction of complementary foods beyond 6 months is not recommended because of increasing risk of energy, nutrient and vitamin deficiencies (specifically iron and zinc) and development of food aversion.

2. How can you tell a baby is developmentally ready for complementary foods?
   Around 4 to 6 months of age, babies become more interested in the environment around them. This includes becoming more interested in what other members of the family are eating. Infants should have obtained the following milestones prior to the introduction of complementary foods:
   a. Gross motor: Infants should be able to sit with support and have adequate head and neck control as evidenced by no head lag when pulled to a sitting position.
   b. Fine motor: Infants should be able to bring their hands and toys to their mouths.
   c. Oral-motor: Around this time, babies lose the tongue thrust reflex or extrusion reflex which allows baby to accept a spoonful of food when placed in the mouth. They are able to use their tongue to propel the food into the posterior oropharynx to enable swallowing.
   d. Behavioral: Infants should show signs of hunger by drooling, opening their mouths and leaning in when presented with food. They should be able to show signs of satiety as well, such as turning the head away or closing the mouth.

3. How would you educate a family to start these foods?
   a. While there is sparse evidence supporting a particular way to introduce solid food to babies, the American Academy of Pediatrics Committee on Nutrition recommends starting with a single grain iron fortified cereal or pureed meat. These foods are recommended because they provide infants with the nutrients that they are most likely to be deficient in, specifically iron and zinc. Rice cereal appears to be less likely to cause allergic reactions compared with other foods.
   b. Parents should mix a small amount of this cereal with breast milk or formula to about the consistency of applesauce. Parents should be advised to feed from a bowl with a spoon instead of putting the cereal in the bottle. Many families will put cereal in a bottle because they think it will help the baby sleep longer; studies have shown this does not make any difference in length of sleep. However, it can contribute the development of future obesity.
   c. Once the baby is accepting this food, the parents can introduce single ingredient pureed foods in 3 to 5 day intervals to observe for possible allergic reactions, such as wheezing, urticarial and vomiting.

4. Is juice recommended for babies?
   a. Juices are not recommended within the first six months of life. After this time, it is recommended to limit juice to 4 to 6 ounces daily and offer only 100% fruit juices. Juice should never be offered in a bottle, only in a cup. However, it must be stressed to parents that even 100% fruit juice is high in calories and sugar, which can contribute to many childhood health problems including obesity, diarrhea and early tooth decay/dental caries. Certain juices (pear, prune, apple) may be used sparingly to help aid in treating constipation.

b. Even beyond 6 months, juice is not generally recommended as this can replace healthy calories in the child's diet leading to vitamin deficiencies, anemia and malnutrition.

5. What do you recommend about weaning from breast milk?
   The 1997 policy statement on breastfeeding of the American Academy of Pediatrics recommends breastfeeding for at least the first year of life and as long thereafter as mother and child wish to continue. The World Health Organization recommends breastfeeding up to 2 years of age. If the child is weaned prior to one year of age, then he/she should be given cow's milk formula. If the child is weaned after one year of age, it is appropriate to wean to whole milk. Before advising against breastfeeding or recommending premature weaning, weigh the benefits of breastfeeding against the risks of not receiving human milk.

Suggestions for Learning Activities:

- Students can role play giving anticipatory guidance about these topics.
- Students can provide guidance about importance of breastfeeding, especially as it relates to obesity prevention.
- Students can visit a local retail baby supply store and familiarize themselves with the different stages of baby foods, cereals, etc.

Other Resources:

- http://brightfutures.aap.org/
- American Academy of Pediatrics. "The use and misuse of fruit juice in pediatrics". Pediatrics. May 2001;107(5):1210-1213.
- American Academy of Pediatrics, Section on Breastfeeding. "Breastfeeding and the use of human milk". Pediatrics. 2005; 115(2):496-506.
- Committee on Nutrition American Academy of Pediatrics. Complementary feeding. In: Pediatric Nutrition Handbook, 6th ed, Kleinman, RE (Ed), American Academy of Pediatrics, Elk Grove Village, IL 2009. p.113-143.
- Greer FR, Sicherer SH, Burks AW, et al. "Effects of early nutritional interventions on the development of atopic disease in infants and children: the role of maternal dietary restriction, breastfeeding, timing of introduction of complementary foods, and hydrolyzed formulas". Pediatrics 2008; 121:183.
- World Health Organization. Complementary feeding. http://www.who.int/nutrition/topics/complementary_feeding/en/index.html (Accessed on October 17, 2011).
- Zutavern A, Brockow I, Schaaf B, et al. "Timing of solid food introduction in relation to atopic dermatitis and atopic sensitization: results from a prospective birth cohort study". Pediatrics 2006; 117:401.

Nutrition,Case #5

Written by Debra Best, M.D.

A mother is concerned that her 5-day-old infant is not breast-feeding well. What historical or physical examination findings would help you investigate her concerns? What additional resources may be available to help support this mother?

Review of Important Concepts:

Learning Objectives

Students will know appropriate historical questions to ask related to an infant who is not breastfeeding well
Students will be able to perform a physical exam pertaining to this concern
Students will be able to provide additional resources to support mothers in breastfeeding

Physical Findings

What should you be looking for on physical exam?

Physical examination of the infant should include the following:

- Review of vitals:
  - The physician should look at the growth parameters noting birth weight, weight when discharged from the hospital, and the weight at that day's visit. Babies can lose up to 10% of their birth weight in the first few days of life. Babies should then gain about 20 grams per day until regaining their birth weight at approximately 10-14 days of life. Babies who have lost more than 10% of their birth weight should have a thorough nutritional and latch assessment to determine if problems with breastfeeding are contributing to their weight loss. The newly revised WHO growth charts should be used for breastfed infants. http://www.cdc.gov/growthcharts/who_charts.htm
  - Tachycardia may be a sign of late dehydration. Earlier signs of dehydration may include dry lips/mucous membranes, decreased urine output or "brick dust" in the diaper (reddish-brown uric acid crystals that form in the urine when a baby is dehydrated).
- Examination of the infant: A complete physical exam should be performed with particular attention to the following systems.
  - HEENT: Fontanelles should be open, soft and flat. A sunken fontanelle may indicate dehydration. Mucous membranes should be moist without dryness to the lips. Eyes should be examined for scleral icterus as an indication of elevated bilirubin levels which could contribute to a sleepy baby who does not feed well. Observe for anatomic variants such as small mandible size, ankyloglossia (tongue tie), cleft lip/ palate, which could also contribute to difficulties with feeding.
  - Cardiac: Tachycardia may be a sign of dehydration. A significant murmur may indicate an underlying cardiac problem which could lead to feeding problems. Sweating during feeds possible sign of cardiac pathology.
  - Skin: Skin turgor is a sign of hydration status as well. Observe for jaundice as a sign of elevated bilirubin level.
  - Neuro: Overall tone should be noted as infants with low tone may have difficulties with latching and sustaining a breastfeeding session.

Clinical Reasoning

1. What questions should you ask about birth history?
   a. Was the baby full term?
      - Late preterm babies (35-37 weeks) may have difficulty with breastfeeding.
      - Establishing breastfeeding in the late preterm infant is frequently more problematic than in the full-term infant. Because of their immaturity, late preterm infants may be sleepier, have less stamina and have more difficulty with latch, suck, and swallow than a full-term infant.
      - The sleepiness and inability to suck vigorously may be misinterpreted as sepsis, leading to unnecessary separation and treatment.
      - Given the known increased risk of medical problems of the late preterm as compared with the term infant, close observation and monitoring are required, especially in the first 12– 24 hours after birth when the risk of inadequate adaptation to extrauterine life is highest.
      - Each delivery service must determine where and how this can best be accomplished while supporting the mother-infant dyad and breastfeeding.
   b. Was it a normal vaginal delivery or cesarean section?
      - Mothers should expect their milk to come in within 2-5 days after delivery.
      - Delay in breastfeeding initiation is common after c-section due to hospital/OR protocols, delay in getting baby to mom's breast within one hour, positioning difficulties secondary to incision, and excessive drowsiness of baby secondary to peri-operative meds.
   c. Were there any complications (respiratory distress, infection, hypoglycemia, jaundice, etc)?
      - Babies with significant medical problems or difficulty transitioning in the early perinatal period may experience difficulties with feeding.
      - These babies may also be separated from the mother for periods of time for medical testing or treatment which can lead to difficulties in establishing breastfeeding.
      - These mothers should be provided with a breast pump in order to help establish their milk supply.
      - In addition, in these situations, the infants may be unable to breastfeed because of their illness or may ineffectively breastfeed.
   d. Any other problems that might cause lactation problems?
      - Other problems that may cause difficulty with breastfeeding include the following: low birth weight, multiple gestation, maternal history of breast surgery.

2. Any problems with breastfeeding while in the hospital?
   a. What questions should be asked in obtaining a nutritional assessment?
      - How often is the baby feeding? How long is the baby feeding on each breast?
      - Baby should be fed on demand in the neonatal period. There is neither a schedule nor a time requirement on each breast. Mothers should be fully emptying their breasts every 2-3 hours to maintain breast milk supply. Infants should feed at least 8 times in 24 hours. Mothers should be taught hand expression and how to use an electric breast pump. They should be reminded that baby's suckling is most effective for emptying the breast.
   b. Is the baby having any difficulties with latching?
      - Difficulty in latching is one of the most common reasons for difficulties with breastfeeding.
      - This could be secondary to the baby not being positioned at the breast correctly or not latching to the nipple/areola correctly. Latch for breastfeeding should NOT be focused on the nipple as the baby's mouth should be fully around the nipple and take in most of the areola.

- This can also occur if the baby has an anatomical abnormality (such as "tongue-tie" or cleft palate) or if the mother is engorged or has flat nipples.
- Babies with cleft palate are at increased risk of otitis media, so the protective effects of breast milk should be stressed.
- A full breastfeeding/latch evaluation should be done on each mother-baby dyad.
- If the baby is unable to latch on right away, expressed breast milk or pasteurized donor breast milk given by a cup or syringe is favorable to formula.

c. Is the mother having any problems with engorgement or sore nipples?
   - Engorgement can make it very difficult for an infant to latch at the breast. Sore nipples are a very common problem and may indicate that the baby is not latching correctly.
   - Proper latch should be evaluated and techniques to prevent engorgement should be taught to mom, i.e. properly and fully emptying the breast

d. How often is the baby urinating?
   Beginning in the first days of life, babies should have at least 2-3 wet diapers per day. At 5 days of life, the infant in this vignette should be having 6-8 voids in 24 hours. Once the maternal milk supply is established, infants are typically urinating with each feeding.

e. How many stools has the baby had in the past 24 hours and what color/consistency are they?
   - The initial stool that a baby passes is a thick, sticky, black substance known as meconium. As the baby feeds better, the stools change from this tar-like substance to the typical yellow, seedy stools of a breastfed infant. Knowing what the stools look like and how often they are occurring can help you understand how well a baby is feeding and if the milk supply is adequate. For breastfed infants, typically the transitional stools occur on day three with 3 to 4 yellow stools expected per day by day 5.
     BF babies generally stool more than formula fed infants.

f. Is the baby having any problems spitting up?
   Spitting up can be a normal part of infancy or a sign that there is an underlying problem such as pyloric stenosis or gastroesophageal reflux. This is particularly common in preterm infants where immaturity of the GE sphincter can lead to problems with reflux.

g. What are you looking for when observing a breastfeeding session?
   - Appropriate positioning at the breast
   - Infant should be held at the level of the mother's breast. Pillows may be required to get the baby to the appropriate level. The mother should be sitting comfortably with her back well-supported and avoid leaning forward to prevent the baby from falling off of the breast.
   - Adequate latching to the breast: It is a common misconception that breastfeeding is just on the nipple. For effective breastfeeding to occur, the baby's mouth should be open at least 90 degrees when latching to the breast to allow as much of the areola into the mouth as possible. Latching only on the tip of the nipple can cause significant problems with nipple soreness. Lips should be flanged outward (aka "fish lips") to prevent irritation to the mother's nipples. The nose and chin should just touch the breast. Mother's breasts should be examined with particular attention to determining if her milk has come in and the anatomic characteristics of the nipple.
   - Can use the LATCH assessment tool to help assess breastfeeding (Latch, Audible Swallowing, Type of nipple, Comfort (breast/nipple), Hold) http://www.cdph.ca.gov/programs/breastfeeding/Documents/MO-LatchBreastfeedingAssessment.pdf
   - Assist the mother in achieving a comfortable position and effective latch (attachment).
   - Observe infant for signs of effective positioning:

  - Is the infant well supported and placed at the level of the mother's breast (mother-led attachment)?
  - Is the infant well supported and placed between the mother's breasts (baby-led attachment)?
- Observe infant for signs of effective latch:
  - Wide opened mouth
  - Flared lips
  - Chin touching the breast
  - Asymmetric latch (more areola visible above the baby's mouth)
- Observe infant for signs of milk transfer:
  - Sustained rhythmic suckle/swallow/breathe pattern with periodic pauses
  - Audible swallowing
  - Relaxed arms and hands
  - Moist mouth
- Observe mother for signs of milk transfer:
  - Breast softening while feeding
  - Relaxation or drowsiness
  - Thirst
  - Uterine contractions or increased lochia flow during/after feeding
  - milk leaking from the opposite breast while feeding
  - nipple elongated but not pinched or abraded after feeding

h. How do you know a baby is feeding well?
   - If a baby is feeding well, you should observe jaw movement and hear an audible "cuh" sound as the infant swallows.
   - The infant will be content in between feeds.
   - Mother's breasts subjectively feel softer after feeds.
   - The infant has adequate weight gain of 20 grams per day and adequate urine and stool output.
i. Teach mothers to recognize and respond to early infant feeding cues and confirm that the baby is being fed at least 8 times in each 24 hours.
   - Early infant feeding cues include sucking movements and sounds, hand-to-mouth movements, rapid eye movements, soft cooing or sighing sounds and restlessness.
   - Crying is a late feeding cue and may interfere with effective breastfeeding.
j. What resources can you offer to a mother who is having difficulties with breastfeeding?
   - Lactation consultant: Some pediatric practices have lactation consultants on staff who are specially trained to work with lactating mothers and to troubleshoot breastfeeding problems. Independent lactation consultants are also typically available in the community. Many M.D.s are also certified lactation consultants.
   - Local mother's groups: These groups may be beneficial to mothers to be able to have the support of other mothers who are breastfeeding as well.
   - WIC offices: Many WIC offices have a lactation consultant on staff. In addition, mothers who are exclusively breastfeeding will receive a more comprehensive food package from WIC. WIC can provide these mothers with a free electric pump to use, if indicated.
   - La Leche League International: LLLI is an organization devoted to breastfeeding. There are local groups in all fifty states. They also have a website that provides answers to many common breastfeeding questions.

Suggestions for Learning Activities:

- Students can role play giving anticipatory guidance about these topics.
- Students can examine infants in a nursery or outpatient setting paying particular attention to the physical exam characteristics that signify adequate breastfeeding.
- Students can learn about and promote the WHO/Unicef Ten Steps to Successful Breastfeeding. (http://www.babyfriendlyusa.org/eng/10steps.html
- Students can accompany a lactation consultant either in the hospital or in outpatient practice to observe how to troubleshoot breastfeeding problems.
- Students should learn about the medically indicated reasons to supplement with formula. http://www.bfmed.org/Media/Files/Protocols/Protocol%203%20English%20Supplementation.pdf

Other Resources:

- http://brightfutures.aap.org/
- American Academy of Pediatrics, Section on Breastfeeding. "Breastfeeding and the use of human milk". Pediatrics. 2005; 115(2):496-506
- Chandran, L. et. Al. "Breastfeeding: The Essential Principles". Pediatrics in Review. 2006; 27:409-417.
- www.bfmed.org
- Protocols on: Engorgement, Supplementation, Infants with jaundice, Hypotonic infants, Infants with Cleft Palate, Breastfeeding the Late Preterm Infant, How to Create a Breastfeeding-Friendly Office
- www.wellstart.org
- Lactation Management Self-Study Modules (case based)
- www.aap.org/breastfeeding
- www.breastfeedingtraining.org
- www.babyfriendlyusa.org
- www.surgeongeneral.gov/topics/breastfeeding
- Surgeon general's call to action to support breastfeeding, 2011

Nutrition, Case #6

Written by Debra Best, M.D.

A healthy two-month-old infant is seen in your office for a routine visit. The mother asks about the need for vitamin and fluoride supplementation in her child. Discuss which supplements should be considered and at what age.

Review of Important Concepts:

Learning Objectives for the Students

- Know when fluoride supplementation should be introduced.
- Understand the recommendations for vitamin D supplementation in breastfed versus formula fed infants.
- Describe the recommendations for iron supplementation in breastfed versus formula fed infants.

Clinical Reasoning

1. When would you recommend fluoride supplementation?
    a. Fluoride supplementation is not indicated until after the eruption of primary teeth, which usually occurs at about 6 months of age. At that time, the pediatrician evaluates the need for fluoride supplementation based upon the child's risk of dental caries and total fluoride exposure. Risk factors for early childhood caries include:
        - Ethnicity, minority or low socioeconomic status
        - Bottle propping
        - Parents with less than a high school education
        - Limited or no dental insurance or access to dental care
        - Inadequate fluoride exposure (well water, etc)
        - Caries in a parent or sibling (especially in the past 12 months)
        - Children with special health care conditions
        - Low birth weight (less than 2500 grams)
        - Gingivitis
        - Chronic conditions that weaken enamel, promote gingivitis, or cause decreased saliva production
        - Poor nutritional/feeding habits
        - Poor oral hygiene
        - Total fluoride exposure is assessed by asking the family about their water source. City water is fortified with fluoride. Well water may or may not have fluoride present, so the water must be tested to determine the amount of fluoride. Even if a family has well water at home, all sources of water intake for the child should be discussed (ie grandparent's water supply, daycare, etc) as they child may be getting appropriate fluoride away from the home.
        - Generally, bottled water does NOT contain fluoride. It can be difficult to discern from bottled water versus bottled water with fluoride geared towards infants. It may be sold as "fluoridated nursery water". It is important to educate parents about the differences in bottled water.

2. Why is vitamin D recommended as a supplement?
   a. Adequate Vitamin D intake is necessary for the prevention of rickets, a disorder which can lead to softening and weakening of the bones. Vitamin D can be obtained through dietary supplementation and through direct cutaneous synthesis from exposure to sunlight. However, because of the risk of skin cancer, the AAP recommends sunscreen for infants older than 6 months and limited sun exposure for all which leads to reduced cutaneous vitamin D synthesis. In addition, breastmilk does not contain sufficient amounts of vitamin D.

   b. What are the AAP recommendations for vitamin D supplementation in exclusively or partially breastfeeding infants versus formula feeding infants?
      - Breast fed Infants
        For exclusively breastfed or partially breastfed infants: Breastmilk is not typically sufficient in vitamin D. Because of this, parents are encouraged to give their breastfed babies a vitamin D supplement which contains at least 400 IU of vitamin D3. Typically the vitamin is started once breastfeeding is fully established.
        If an infant is ingesting less than 30 ounces of formula per day, they should also be given a supplement with 400 IU vitamin D3.
      - Formula fed infants
        For formula fed infants: All formulas sold in the United States have at least 400 IU/L of vitamin D3.Because most formula-fed infants ingest nearly 1 L (approximately 30 ounces) of formula per day after the first month of life, they will achieve an adequate vitamin D intake each day.
        Supplementation should be continued until the infant is taking 1L per day of infant formula or is weaned after 12 months to vitamin D fortified whole milk.

3. Why is iron recommended as a supplement?
   a. Iron deficiency may result in cognitive and behavioral problems, some of which may be irreversible. Eighty percent of an infant's iron stores are obtained maternally during the third trimester. Infants born prematurely or to mothers with a history of diabetes, hypertension or anemia may have lower than normal iron stores. Full term infants typically have enough iron stores until 4 to 6 months of age.
   b. When and how should iron be introduced?
      - The recommendation for iron supplementation in exclusively breastfed infants is controversial. Breastmilk remains the ideal nutrition for infants for the first 6 months of life. In addition, iron in breastmilk is more bioavailable than that in iron-fortified formula. Because of this, most exclusively breastfed babies do not need any additional nutrient or iron supplementation until 6 months of age. By 6 months, infants should be introduced to iron fortified foods (cereal or meat) or an iron containing multivitamin. They should receive 1mg/kg per day of supplemental iron. If the infant was premature or born to a mother with a history of diabetes, hypertension or anemia, they may need supplementation by 4 months.
      - In partially breastfed infants who receive more than one-half of their daily feedings as breastmilk, they should also receive 1 mg/kg per day of supplemental iron if they are not receiving iron-containing complementary foods.
      - For formula-fed infants, their iron needs can be met by their formula which contains about 12 mg of iron per liter and the introduction of iron-containing complementary foods at 4 to 6 months of age.
      - Whole milk should not be introduced before 12 months of age.

- Complementary foods that are a good source of iron include iron-fortified single grains cereals (such as rice, oatmeal, barley) and pureed meats.

Suggestions for Learning Activities:

- Students can role play giving anticipatory guidance about this topic.
- Students can be asked to go to local pharmacy or retail baby supply store to look at different options of supplements that parents have to choose from.
- Students can be given scenarios after discussion to determine what supplements infants should be given.
- 4 month old infant solely breastfed (vitamin D)
- 7 month old infant in Hawaii on well water, breastfed, with solids of homemade fruits (Vitamin D, Fe, Fluoride).

Other Resources:

- http://brightfutures.aap.org/
- American Academy of Pediatrics, Section on Breastfeeding. "Breastfeeding and the use of human milk". Pediatrics. 2005; 115(2):496-506.
- Baker RD, et.al. American Academy of Pediatrics, Committee on Nutrition. "Diagnosis and Prevention of Iron Deficiency and Iron Deficiency Anemia in Infants and Children." Pediatrics. 2010; 126(5):1040-1050.
- Lewis CW, Milgrom P. Fluoride. Pediatr Rev. 2003; 24(10):327-336.
- Rozier, et. al. "Evidence-Based Clinical Recommendations on the Prescription of Dietary Fluoride Supplements for Caries Prevention." The Journal of the American Dental Association. 2010;141(12) 1480-1489.
- Wagner, et. al. American Academy of Pediatrics, Section on Breastfeeding and Committee on Nutrition. "Prevention of Rickets and Vitamin D Deficiency in Infants, Children, and Adolescents" Pediatrics. 2008; 122:1142-1152.

Nutrition, Case #7

Written by Angela Beeler, M.D.

A five-year-old boy is now at the 95th percentile for weight and 50th percentile for height whereas previously he had been at the 50th percentile for both height and weight. How would you counsel him and his family? Include the consequences of childhood obesity in your discussion.

Definition for Specific Terms:

Body Mass Index- A person's body weight divided by the square of the person's height (weight in kg / height in meters2). Used as a proxy for measurement of adiposity.

Obesity- In children is defined as a BMI >95th percentile for age and gender.

Overweight- In children in defined as BMI between the 85th and 95th % for age and gender.

Striae- Areas of linear skin thinning and erythema associated with rapid skin stretching.

Non-alcoholic fatty liver disease- Deposition of fat into the liver and elevation of liver enzymes, generally associated with being overweight. Typically benign but can lead to hepatic fibrosis and cirrhosis.

Review of Important Concepts:

Historical Points

- Children should be their thinnest from about 4-6 years of age as they tend to gain more height than weight during this time. It is normal for a child to look skinny and for parents to be able to count ribs in this age group. Many parents feel that their normal child is too thin or fail to recognize that their "normal" looking child is actually obese.
- Do the parents have any concerns about the child's weight? Many parents may have noticed the child's increasing waist but not length of pants. Families with parental obesity may show more concern about weight gain, or conversely may be more likely to try to normalize the excess weight.
- Dietary history should assess food choices at meals and snacks, fluid types and amounts, and portion sizes.
- Consider asking about: excess thirst/urination as a screen for Type 2 diabetes, night breathing difficulties as a screen for obstructive sleep apnea, limp as a screen for slipped capital femoral epiphysis, and signs and symptoms of depression.
- Ask about activity and screen time.

Physical Exam Findings

1. In children it is critical to graph height, weight and BMI to determine if the child is growing appropriately. Knowing the trend on the growth chart is more important than knowing the actual numbers. It is frequently difficult to identify a child who is overweight or mildly obese just by looking at the child.

2. Blood pressure should be measured and compared to norms for height percentiles.

3. Look for skin striae, acanthosis nigricans, hepatomegally.

Clinical Reasoning

1. What diseases can cause excess weight gain in children?
   a. Hypothyroidism, Cushing's Disease and Prader Willi syndrome can all cause excess weight – but will also cause decreased linear growth.
   b. In a child whose development is otherwise normal and linear growth is not delayed, it is unnecessary to screen for causes of obesity other than excess caloric intake.

2. Will this child "thin out" and lose the "baby fat"?
   Starting at about age 3 years there is a positive correlation between childhood obesity and adult obesity – meaning if you are overweight at 3 or older you are likely to be overweight as an adult. The older you become, the stronger the correlation.

3. What are the health consequences of childhood obesity?
   a. Obese children are more likely to suffer from depression and other mood disorders, have obstructive sleep apnea, develop insulin resistance or even Type 2 diabetes in childhood, and have non-alcoholic fatty liver disease.
   b. Obese patients can also have elevated LDL levels and the early stages of atherosclerosis which can persist into adulthood even if no longer obese as an adult.

4. What screening bloodwork might you do?
   None would be recommended in this child. Children over 10 years old, consider fasting lipids, glucose and liver enzymes.

5. What is the best way to treat obesity in children?
   Obesity in children, as with adults, is a complex and difficult condition to treat and should be considered a chronic condition. We can manage side effects but obtaining long term stable weight loss is difficult. The most effective programs engage the entire family in behavior change by having family meals, healthier food choices in the home, engaging in physical activity together and monitoring more frequently than once a year.

6. How much weight should this child lose?
   a. In children who are obese but still growing taller, the goal would be decreased weight velocity or weight maintenance to help them "grow into" their weight.
   b. If the child was significantly overweight or had complications, then gradual weight loss would be recommended.
   c. Adolescents who are no longer gaining height can work on gradual weight loss, up to 2 pounds per week if they are experiencing complications from their obesity.

Diagnosis:

Obesity:

a. Given the percentiles above, the child would have a weight of 53 pounds (24 kg), height of 43 inches (109 cm), and a BMI of 19.8 kg/m2. This places him greater than the 97th % on the CDC BMI charts for boys.
b. Given that he has maintained his linear growth at the 50th % it is unlikely that he has some other disease process causing his weight gain.

Suggestions for Learning Activities:

- Review how to plot height/weight on a growth chart and interpret the results. Review how to calculate BMI and graph that as well. Demonstrate the use of BMI "wheels", as well as, smart phone/internet apps.
- Practice taking a dietary history from a parent. What is a normal portion size for a 5 year old?
- Review the medical complications of obesity that can be seen in children and how they persist or progress in adulthood.
- Discuss any state or local initiatives related to childhood obesity in your area (school lunch changes, limits on sugary beverages/snacks in schools, etc).
- Review some simple tools for giving anticipatory guidance related to maintaining a healthy weight. For example 5-2-1-0: Each day get 5 servings of fruits and vegetables, 2 or fewer hours of screen time, 1 or more hours of physical activity, 0 servings of sugary beverages.

Other Resources:

- Expert Committee Recommendations on the Assessment, Prevention and
- Treatment of Child and Adolescent Overweight and Obesity – 2007: An Implementation Guide from the Childhood Obesity Action Network
- http://www.nichq.org/documents/coan-papers-and-publications/COANImplementationGuide62607FINAL.pdf
- Maine Center for Health "Keep Me Healthy" 5-2-1-0 Program: Keep ME Healthy
- CDC BMI calculators: Healthy Weight: Assessing Your Weight: Body Mass Index (BMI) |

Nutrition, Case #9

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The health conscious parents of a healthy, non-obese 15-month-old ask if they can switch her to nonfat milk, as they are concerned about obesity and heart disease. How would you counsel them?

Definitions for Specific Terms:

Full fat dairy- Dairy products which have not had fat removed from them during processing. Whole milk is a full fat dairy product and is 4% fat.

Non-fat dairy- Dairy product with the natural fat removed, or "skimmed." Skim milk is non-fat.

Reduced fat milk- Milk with only 2% fat

Low fat milk- Milk with only 1% fat

Review of Important Concepts:

1. The second year of life is one of rapid physical and neurologic growth needing myelination of brain cells, requiring relatively large amounts of calories per kg of body weight compared to adults.
2. Full fat dairy allows toddlers to get more calories in smaller volumes, important as they can be scattered and low volume eaters.
3. Dairy fat restriction could be considered for a child who is overweight or has a very strong family history of obesity as these would be risk factors for hyperlipidemia later in life.

Historical Points

- Ask the parents to elaborate on their concerns and review family history for significant obesity, heart disease or hyperlipidemia. Are there health consequences that the parents have seen which scare them?
- Take a thorough dietary history to evaluate for eating patterns and content. Toddlers can have "food jags" either of quantity or content
  - They will eat very small amounts of food for a time then eat large amounts, or eat one food excessively for a while then refuse to eat it.
  - Some will start to refuse certain food groups on a regular basis.
- Review developmental milestones
  - Toddlers become ambulatory and begin to burn more calories through activity (but less through growth) than in the first year.

Physical Exam Findings

1. Important to review the growth charts (weight, height, and head circumference) and which percentiles the child is following. She is not currently obese but has she been having rapid weight gain compared to length?

2. Basic neurologic exam looking for any developmental delay that might impact caloric needs. Children who are less active due to hypotonia or delayed gross motor skills may have lower caloric needs.

Clinical Reasoning

1. What are the caloric needs of a healthy toddler compared to those of an adult?
   An average weight 15 month old (10.6kg) requires about 870 calories per day, which is 82 kcal per kg. If a 70 kg adult ate 82 kcal/kg per day they would take in 5740 calories. So a toddler needs to take in relatively much more energy in a smaller stomach.

2. What is the nutritional difference between non-fat and whole milk? How does this affect a toddler's diet?
   Whole milk contains 4% milk fat and is 150 calories per 8oz. Non-fat milk is 85.5 calories per 8oz. Toddlers are recommended to get at least 16oz of milk per day – whole fat milk provides them over 100 extra calories, or more than 10% or their caloric needs for the day. Whole milk does have 5gm saturated fat per cup compared to 0.5gm in non-fat milk. In young children, obesity rather than dietary composition alone seems to be a stronger risk factor for atherosclerotic changes at a young age.

3. When should you check lipid levels on this child if the parents are worried about heart disease?
   a. There are no recommendations to routinely check children less than 2 years of age.
   b. If there was a strong family history of a genetically mediated hyperlipidemia syndrome with premature death then it might be reasonable to check a child this young.
   c. In general, obese children should be checked as they enter puberty.
   d. There is some evidence that lipid levels can be volatile and a single elevated number may not consistently remain elevated in an untreated child as it would in an adult.

Diagnosis:

Non-obese, healthy 15 month old.
Child should remain on whole fat dairy until 2 years of age to support caloric needs for growth and development.

Suggestions for Learning Activities:

- How might your counseling change if the toddler was at the 90th % for weight and 10th % for length? What if both parents were morbidly obese? Discuss that full fat dairy is not a hard and fast rule and there are times when it is reasonable to have a toddler on low fat dairy.
- Review growth charts for children 0-36 months showing that while growth slows compared to the first year of life it is still occurring at a much faster rate than later in childhood.
- Review gross motor milestones and activity level of toddlers.
- Review clinical reasoning questions above.
- Discuss dietary sources of fat: when it is recommended that 12-23 month old children not have a fat restricted diet that does not mean they should eat foods with lots of added fat (fried foods for example) but rather eat foods where natural fats have not been removed?

Other Resources:

- Pediatric Nutrition Handbook, American Academy of Pediatrics (Chapter 32 reviews issues of dietary fat in toddlers)
- Factors affecting the stability of blood lipid and lipoprotein levels from youth to adulthood: evidence from the Childhood Determinants of Adult Health Study. Archives of Pediatrics & Adolescent Medicine. 165(1):68-76, 2011 Jan.