Nutritional Assessments: Performing in Children

What is Nutritional Assessment in Children?
› Nutritional assessment refers to the use of a combination of factors—physical, biochemical, medical, psychological, and socioeconomic—to assess the risk for, or the existence of, nutritional problems in the patient
• What: With regard to diet, nutritional assessment includes determination of calorie intake and source (e.g., carbohydrate, protein, and/or fat), plus the adequacy of vitamin and mineral intake in relation to the patient’s needs
• How: Physical examination which includes hands, face, tongue, eyes, skin, hair, and blood sampling for laboratory testing are performed by the pediatrician and/or nurse clinician for analysis by a registered dietitian (RD). The RD may collect anthropometric measurements (e.g., height and weight) as well as diet history and ask the child and/or family members about lifestyle, culture, and eating habits. Skinfold measurements or bioelectrical impedance analysis may be used to determine body composition (e.g., body fat percentage). Standard precautions are followed when conducting the nutritional assessment
• Where: Nutritional assessment may be performed in the hospital in acutely ill or post-surgical patients, in a clinician’s office, in a school or day care center, or in a home care situation
Who: Parts of nutritional assessment may be performed by assistive personnel, but interpretation of the data should be performed by a trained professional such as an RD

What is the Desired Outcome of Nutritional Assessment in Children?
› The desired outcome of nutritional assessment in children is that the child will be assessed as growing and developing properly with no nutritional deficiencies, or that any deficiencies will be detected and treated

Why is Nutritional Assessment in Children Important?
› Proper nutrition is necessary for normal growth and development
› When the nutritional assessment identifies nutrition deficiencies or imbalances in an otherwise typical child, the child’s diet can be adjusted to correct for them
› Correcting the nutritional deficiencies of a child with severe chronic disease may result in improved outcomes
• Nutritional assessment, with appropriate nutritional intervention as needed, is particularly important in children with cancer to prevent treatment interruptions
• Vitamin and mineral deficiencies, if not discovered and treated, may lead to developmental problems and/or illness
› Nutrition assessment in school-aged children may help to identify those at risk for chronic diseases such as hypertension due to obesity

Facts and Figures
› In the U.S., fewer than 10% of children 4–8 years of age consume the recommended number of servings of fruits and vegetables established by the Dietary Guidelines for Americans; children who consume less than the recommended guidelines generally have
a higher body mass index (BMI) than children who consume the recommended amount (Miller et al., 2011)

› Children who are hospitalized, who are healing from illness, or who have wounds such as pressure ulcers (PrUs), require an increase in their daily consumption of protein to promote healing and spare muscle as an energy source. For children between 0 and 6 years an increase in protein intake of 3–4.5gm/kg is recommended, and for children 6 years and older the recommendation is an increase in protein of 2.5–3gm/kg (Ranade et al., 2011)

› The recommended fat intake of a child older than 2 years should be 20–30% of their diet. A child’s daily fiber requirement, which is a crucial nutrient and is often inadequate, is calculated by adding 5 g to the child’s age (Ranade et al., 2011)

› Investigators in Calgary, Canada surveyed a sample population at two hospitals and discovered that 75% of families referred to a pediatric dietitian viewed the referral as helpful with feeding strategies for the fussy child, providing healthy recipes, and determining appropriate portion sizes. Of the families who utilized a pediatric dietitian, 75% made changes to their children’s dietary habits and consumption (Watson-Jarvis et al., 2011)

› Fifty percent of the parents surveyed reported allowing their children to watch television while eating at least some of the time. This is linked to increased calorie consumption, because television inhibits a child’s ability to recognize satiety

› Fewer than 3% of the parents in this survey viewed their child as overweight or obese when in fact 15% qualified as overweight and 10% as obese

› Between 15 and 50% of children admitted to pediatric intensive care units (PICUs) in the U. S. demonstrate some degree of malnutrition. If malnutrition is pre-existing, children are at higher risk for nutritional deficiencies while in the PICU (American Academy of Pediatrics Committee on Nutrition, 2009)

› In general, premature infants with low birth weights who receive some human breast milk prior to age 6 months perform significantly better on mental and motor development tests at 6 months than those who do not receive human milk prior to age 6 months (Zulowsky, 2007)

› Children with cerebral palsy are at high risk for undernutrition due to feeding problems (e.g., oral motor dysfunction, dysphagia, gastroesophageal reflux disease), and those receiving gastrostomy feeding may be at increased risk for being overfed. Routine nutritional assessment is important in this patient population; but investigators who conducted a systematic review published in 2010 found a lack of evidence to support the validity of skinfold measurements or bioelectrical impedance analysis for measuring body composition in children with cerebral palsy (Rieken et al., 2010)

› Ongoing nutrition assessment by an RD is important for children with advanced chronic kidney disease because malnutrition has been detected in large numbers of these children. RDs can use conventional screening tools as well as computer-based calculations such as PeDiSMART to identify patients who are at risk, so that medical nutrition therapy can be implemented early (Apostolou et al., 2014)

› Children who are dependent on long-term home mechanical ventilation are at risk for malnutrition, including unintended under- or overnutrition and lower than desired protein intake, because of their unique nutritional requirements. A multifaceted home-based approach that includes bioelectrical impedance analysis and metabolic assessment may help to improve outcomes for this population (Martinez et al., 2015)

**What You Need to Know Before Performing the Nutritional Assessment of a Child**

› Children are born with the innate ability to regulate their food intake based on hunger and to determine their own satiety; follow normal growth and development patterns, as well as develop a lifestyle of healthy eating without the risk of becoming obese. However, children are often powerless over their own food choice (e.g., school lunch) and may be subjected to eating patterns imposed on them by adults (e.g., school teachers, caretakers)

› There is a strong correlation between a mother’s fruit and vegetable intake and that of her child(ren). Socioeconomic status also influences food choices with low socioeconomic income families often choosing or being able to afford foods that are high in calories and low in nutrients

› Due to constant growth and development, children have a higher metabolic rate than adults and require more total calories, protein and water per unit of body weight than adults

› In 1998, the U.S. National Institute of Health (NIH) mandated that any research to be endorsed by the NIH must include nutrition requirements of children 21 years and younger. As a result, it was discovered that children experience a high prevalence of skin wounds (e.g., PrUs, skin tears, friction shears). Populations at particular risk include children with spina bifida, cerebral palsy, scoliosis, myelodysplasia (i.e., a disorder in which the bone marrow does not produce normal blood cells), and children in traction or long leg casts

› The best way to determine if a child is meeting recommended nutritional requirements is to plot a child’s growth on an age-appropriate, standardized growth chart. The United States Centers for Disease Control and Prevention (CDC) recommends the clinicians use growth charts developed by the World Health Organization (WHO) to assess children from
birth to 2 years of age (http://www.cdc.gov/growthcharts/who_charts.htm) and the CDC growth charts to assess children 2 years and older (http://www.cdc.gov/growthcharts/). Height and weight are required measurements to plot development. In children who are unable to stand due to contractures or who have severe curvature of the spine, height can be estimated by measuring tibial length or knee height. However, measuring knee height requires that the child is able to place his/her feet flat against the bed; and therefore cannot be contracted. For children younger than age 3, head circumference is used instead of height.

- Constipation is a common problem in children due to an immature and developing digestive system. Therefore, a gradual increase in daily fiber and water consumption should be incorporated into a child’s diet to reduce the amount of gas and bloating. Pear juice or pear nectar is an effective and more desirable alternative in this population to prune juice.

- Many challenges (e.g., busy morning routines, a child’s fussiness, low income) exist to providing a nutrient-rich, healthy diet in children. However it is recommended that the parent(s) or primary caretaker(s) remain positive, calm, and pleasant and offer a variety of foods on a regular basis. Excessive parental control over a child’s food intake is a contributing factor in childhood obesity and other disordered eating.

- Asking a child’s parent(s) or primary caretaker(s) about food habits and allergies is an essential part of the nutritional history to identify children at risk for nutritional deficiencies. Subsets of children will have different areas of focus, including infants:
  - To determine if the infant is at nutritional risk, ask the parent(s)/primary caretaker(s) whether or not they have concerns about the child’s intake or nutrition status or if feeding the child is a pleasant experience. If the infant is formula fed, ask how the formula is prepared, how much is offered and how much is consumed with each feeding. If the infant is breastfed, ask how many times per day the infant is fed and how long each feeding session lasts. It is also important to ask the parent(s)/primary caretaker(s) about signs of distress during feeding such as gagging, choking, fatigue, arching or difficulty breathing.

- Toddlers experience a natural decline in appetite compared to infancy, therefore the parent(s)/primary caretaker(s) should be asked how many meals and snacks are offered daily and what each meal and snack consists of. A red flag should be raised if entire food groups are omitted (e.g., fruits, vegetables, dairy) or if a particular food (e.g., pizza) is predominant.

- School-aged children should eat at least three meals and 1–2 snacks per day. However, school-aged children who participate in school lunch programs may fall short of the recommendations.

- Adolescents are often influenced by peers and are therefore prone to dieting and dietary consumption that is unhealthy (e.g., consumption of sports and/or energy drinks and sodas, skipping meals, eating fast food). These dietary patterns place adolescents at risk for calcium, vitamin D, and iron deficiencies. Adolescent girls are further at risk for iron deficiency once menses begins.

- Children with special needs may not meet nutritional requirements through oral feeding alone due to delayed progression of feeding skills and may receive supplemental nutrition through feeding tubes. Therefore ask about what product is given, how much, over what time frame, and if any food is taken by mouth. Children with special needs or chronic illness (e.g., cystic fibrosis, Crohn’s disease) may also have food allergies or intolerances and food groups that are contraindicated (e.g., dairy, wheat/gluten, nuts).

- For children who are hospitalized, obtaining a weight measurement upon admission is crucial to calculating daily nutritional requirements before edema develops. Weight gain due to edema will falsely elevate a child’s daily nutritional requirements.

- Vitamin and mineral supplementation is generally not necessary for children as long as diet intake and growth are adequate. However, children with food allergies, those who routinely omit entire food groups, or those with chronic illness may require such supplementation. In addition, investigators increasingly point to the prevalence of vitamin D deficiency or insufficiency in children in the U.S. The American Academy of Pediatrics (AAP) and the Institute of Medicine (IOM) recommend vitamin D supplementation for (Whittington, 2013):
  - infants who are partially or exclusively breastfed
  - non-breastfed infants who consume < 1,000 mL/day of formula
  - children with or determined to be at high risk for vitamin D deficiency (e.g., due to inadequate consumption of milk and vitamin D-fortified foods).

- In developed countries, malnutrition in childhood is usually the result of chronic disease. Children at risk for poor nutrition include:
  - those who have recently immigrated from developing countries
  - those with malabsorptive states (e.g., cystic fibrosis, celiac disease, persistent diarrhea, cholestatic liver disease)
  - those with other disease states that interfere with food intake and metabolism (e.g., cerebral palsy, Crohn’s disease, ulcerative colitis, chronic kidney disease).
In patients with chronic kidney disease, malnutrition is usually caused partly by cachexia (also known as wasting), which occurs secondary to an increased release of cytokines.

- Anthropometric data can be misleading in children with chronic kidney disease because fluid overload can mask weight loss and a cachectic appearance.
- Maintaining good nutrition in children with kidney disease is a challenge; because of restrictions on protein intake, the necessity of keeping acid-base balance and electrolytes within the normal range, and the necessity of ensuring enough intake of calcium and phosphorus to maintain bone health.

Laboratory markers—including albumin, prealbumin, and transferrin levels; are often used in the assessment of nutritional status.

- A low albumin level is a marker for malnutrition; low albumin levels can indicate inflammation, and inflammation can result in poor appetite and increased catabolism, which can result in malnutrition.
  - Malnutrition due to anorexia nervosa does not, however, cause decreased serum albumin levels.
  - Conversely, children who are well nourished may have low albumin levels if infection is present.
- Albumin, prealbumin, and transferrin are not accurate measures of nutritional status when fluid overload, proteinuria, or infection is present.

Weight change in premature infants does not accurately indicate a change in lean body mass if dehydration or edema is present. A change in length is a better indicator of growth in premature infants.

- Premature infants are at risk for anemia from low dietary intake of iron, vitamin B12, vitamin E, and copper. Early postnatal anemia in these infants is usually due to loss of blood from frequent blood sampling.
- Laboratory tests can be used to assess nutritional status in premature infants, but should be used with caution.
  - Premature infants have lower concentrations of transferrin, albumin, and pre-albumin than term infants during the first three months of life.
  - Blood transfusions that are sometimes given to premature infants may mask the signs of hemolytic anemia.

Children 10–12 years of age can accurately report food intake using a food diary or similar instrument. The 24-hour recall method might be more suitable for adolescents, because they are less likely to complete the seven day diary.

Preliminary steps that should be performed before conducting the nutritional assessment of a child include the following:

- Review the facility/unit specific protocol for performing pediatric nutritional assessments, if available.
- Review the treating clinician’s orders regarding the nutritional assessment (e.g., any laboratory tests ordered).
- Review the manufacturer’s instructions for any equipment to be used (e.g., infant scale) and verify that the equipment is clean and in good working order.
- Review the child’s medical history/medical record for:
  - any allergies (e.g., to latex, medications, or other substances); use alternative materials, as appropriate.
  - any medical conditions that might interfere with adequate nutrition.

Gather supplies necessary for the nutritional assessment, which typically include the following:

- Nonsterile gloves, if indicated in facility/unit specific protocol; additional personal protective equipment (PPE; e.g., gown, face mask) are typically not necessary unless exposure to body fluids is anticipated.
- Scale appropriate to the child’s age and mobility status (e.g., infant scale, standing scale).
- Measuring tape.
- Calipers.
- Assessment form.

**How to Complete a Nutritional Assessment on a Child**

- Perform hand hygiene and don nonsterile gloves as necessary.
- Identify the patient according to facility protocol.
- Establish privacy by closing the door to the patient’s room and/or drawing the curtain surrounding the patient’s crib/bed.
- Introduce yourself to the patient, as age appropriate, and parent(s), if present; explain your clinical role; assess the coping ability of the patient/family and for knowledge deficits and anxiety regarding the nutritional assessment.
  - Determine if the patient requires special considerations regarding communication (e.g., due to illiteracy, language barriers, or deafness); make arrangements to meet these needs if they are present.
- Use a professional certified medical interpreter, either in person or via phone, when a language barrier exists.
- Explain the procedure and its purpose; answer any questions and provide emotional support as needed.
- Ask the child and/or parents about the child’s diet, eating habits, and food allergies. In some cases, the child or parent should be asked to keep a diet journal. If the child being assessed is
• an infant, ask whether the infant is formula fed or breastfed, how the formula is prepared if formula fed, how long the feeding lasts, how much is consumed during each feeding and the number of feedings per day. Also ask about episodes of vomiting and/or diarrhea
• a toddler, ask about the number of meals and snacks consumed each day, as well as the variety of foods being offered and consumed
• school-aged, ask about the variety of foods being offered and consumed, as well as the child’s participation in a school lunch program
• an adolescent, ask whether or not he/she is following a particular diet, consumes fast food, sodas, or sports drinks in place of healthier alternatives, or if the adolescent skips meals all together. If the adolescent is female, ask about the onset of menstruation
• a child with special needs, ask about the ability to feed him/herself, if able to consume food orally or if by feeding tube, any dietary restrictions due to chronic illness or disease
  › Measure the child’s height and weight and relate measurements to the standard values for his/her sex and age
  › Compare the current height and weight with the child’s previous height and weight to see if a normal amount of growth has occurred
  › If the child has contractures, a curved spine, or is unable to stand, use knee height calipers, if appropriate, or measure tibial length
  › Measure head circumference in children up to 3 years and compare to normal, age-specific values
  › Use calipers to measure subcutaneous fat, and arm circumference to estimate muscle wasting
  › Review the results of a physical examination to identify disease states that might cause poor nutrition and for signs and symptoms that might indicate vitamin, mineral, or other deficiency, such as the following:
    • Spoon-shaped, brittle, or ridged nails typically indicate iron deficiency
    • Night blindness (i.e., nyctalopia) may indicate vitamin A deficiency
    • Bow leg may indicate vitamin D deficiency
    • Edema may indicate protein deficiency
    • Dentition or large tonsils may affect intake, so examine the mouth and throat
  › Review the results of any blood work for determination of albumin, prealbumin, transferrin, hemoglobin, WBC count, and other values, if ordered
  › Discard used procedure materials and PPE; perform hand hygiene
  › Update the patient’s plan of care, as appropriate, and document the following information in the patient’s medical record:
    • Date and time of nutritional assessment
    • Patient assessment findings, including
      – child- and/or parent-reported diet and eating habits
      – height and weight and where these measurements fall on standardized growth charts
      – head circumference, if appropriate
      – skinfold thickness measurements
      – results of physical examination
    • Date and time the treating clinician was notified of any abnormalities, as applicable
    • Patient’s/family’s response to the nutritional assessment
    • Patient/family education, including topics presented, response to education provided/discussed, plan for follow-up education, and details regarding any barriers to communication and/or techniques that promoted successful communication

**Other Nutritional Interventions That May Be Necessary Before or After Procedure**
  › In infants, air displacement plethysmography (i.e., the determination of body composition by measuring the amount of air displaced in a sealed chamber), total body electroconductivity (i.e., the estimation of a person’s lean body mass by measuring the strength of that person’s electromagnetic field), dual X-ray absorptiometry (i.e., the determination of bone mineral density by exposing the person to two X-ray beams of different energy levels and subtracting soft tissue absorption) or bioelectrical impedance analysis (BIA: the estimation of body fat by measuring the resistance of electrical flow through the body) might be used to measure fat-free body mass and total body fat
  › Enteral feeding or other types of dietary supplements may be given if the child cannot consume adequate amounts of food by mouth
  › Patient may be tested for lactose intolerance or other food intolerance or allergy
  › Tests for pathological conditions affecting nutrient absorption, such as celiac disease or cystic fibrosis, may be performed
What to Expect After the Nutritional Assessment

› The child’s height and weight are appropriate for his or her age, no vitamin or trace element deficiencies are found, and the diet history indicates that he or she is consuming a normal, nutritious diet

› Alternately, any existing abnormalities in nutritional status will be identified and treated appropriately

Red Flags

› Children who show signs and symptoms of a specific nutrient deficiency should be referred to a clinician specialist for further evaluation

What Do I Need to Tell the Patient/Patient’s Family?

› Explain any identified nutritional problem, its cause, and its remedy to the patient and family

› Provide written material on good nutrition, as well as material on the disease state (if one is present) interfering with good nutrition

References
