NUTRITION SCREENING, ASSESSMENT AND INTERVENTION

Jamie Stang and Mary Story

Substantial rates of growth and development, combined with developmentally appropriate psychosocial changes, such as an increasing need for independence and a desire to make lifestyle choices that conform to peer ideals and differ from those of the family, place adolescents at risk for poor nutritional status. Because biological and psychosocial growth and development are dynamic throughout adolescence, it is important that teenagers be screened for adequacy of dietary intake and nutritional status each year. The Guidelines for Adolescent Preventive Services (GAPS) recommends that nutrition screening be included as a routine part of annual health guidance.[1] Common indicators of nutritional risk that should be considered during nutrition screening include overweight, underweight, hyperlipidemia, hypertension, iron deficiency anemia, food insecurity, eating disorders, substance use, and excessive intake of foods and beverages that have high fat or sugar contents. Pregnant females should also be assessed for adequacy of weight gain, compliance with prenatal vitamin-mineral supplement recommendations and appropriateness of macro- and micronutrient intakes. Adolescents who are found to be at nutritional risk during nutrition screening can benefit from a full nutrition assessment to determine appropriate dietary change recommendations. Table 1 provides an overview of medical, psychosocial, dietary and laboratory nutrition risk indicators that should be considered during the processes of nutrition screening and assessment.

Nutrition Screening

Nutrition screening should begin with an accurate measurement of height and weight, and calculation of BMI (body mass index). These data should be plotted on age and gender appropriate National Center for Health Statistics 2000 growth charts[2] to determine the appropriateness of weight for height and the presence of potential growth disorders. Table 2 illustrates indicators of weight for height status. Adolescents who are found to be < 5th percentile of weight for height or BMI for age and gender are classified as underweight and should be referred to a primary health care provider for evaluation of potential metabolic disorders, chronic health conditions, or eating disorders. Adolescents with a BMI ≥ 85th percentile but < 95th percentile are classified as at-risk for overweight.[3] They should be referred for a full medical evaluation to determine the presence or absence of obesity-related complications as illustrated in Figure 1.[4] Teenagers with a BMI ≥ 95th percentile are classified as overweight and should be referred for a complete medical evaluation to determine potential obesity-related complications. For adolescents who have completed biological growth and development as assessed using sexual maturation rating (SMR) in conjunction with chronological age (see Chapter 1), referral to a weight management program that can address the unique psychosocial and cognitive needs of adolescents and that follows the principles set forth in "Obesity Evaluation and Treatment: Expert Committee Recommendations"[3] may be appropriate. Additional information on assessment and treatment of overweight among adolescents can be found in Chapter 7.

TABLE 1
Elements of a Nutrition Screening and Assessment for Adolescents

	Medical and Psychosocial History	Growth and Development	Diet and Physical Activity	Routine Screenings and Laboratory Tests
Components of an Initial Nutrition Screening	Medical history Psychosocial history Socioeconomic status and history	Body Mass Index (BMI) Sexual Maturation Rating (SMR)	Meal and snacking patterns Nutrient and non-nutrient supplement use Food security Food allergies/ intolerances Special dietary practices Alcohol consumption Physical activity and competitive sports	Hemoglobin (females) Serum cholesterol or blood lipids Blood pressure
Indications for an In-depth Nutrition Assessment	Chronic disease Substance use Poverty and/or homelessness Depression or dysthymia Disordered eating Eating disorders Body image disorders Pregnancy or lactation	Underweight Overweight At-risk for overweight Delayed sexual maturation Short stature or stunting	Food insecurity Meal skipping Inadequate micronutrient intake Excessive intake of total or saturated fat Food allergy or intolerance Vegetarian diet Use of non-nutritional or herbal supplements Competition in competitive sports Chronic dieting Fasting Alcohol consumption	Hypertension Hyperlipidemia Iron deficiency anemia

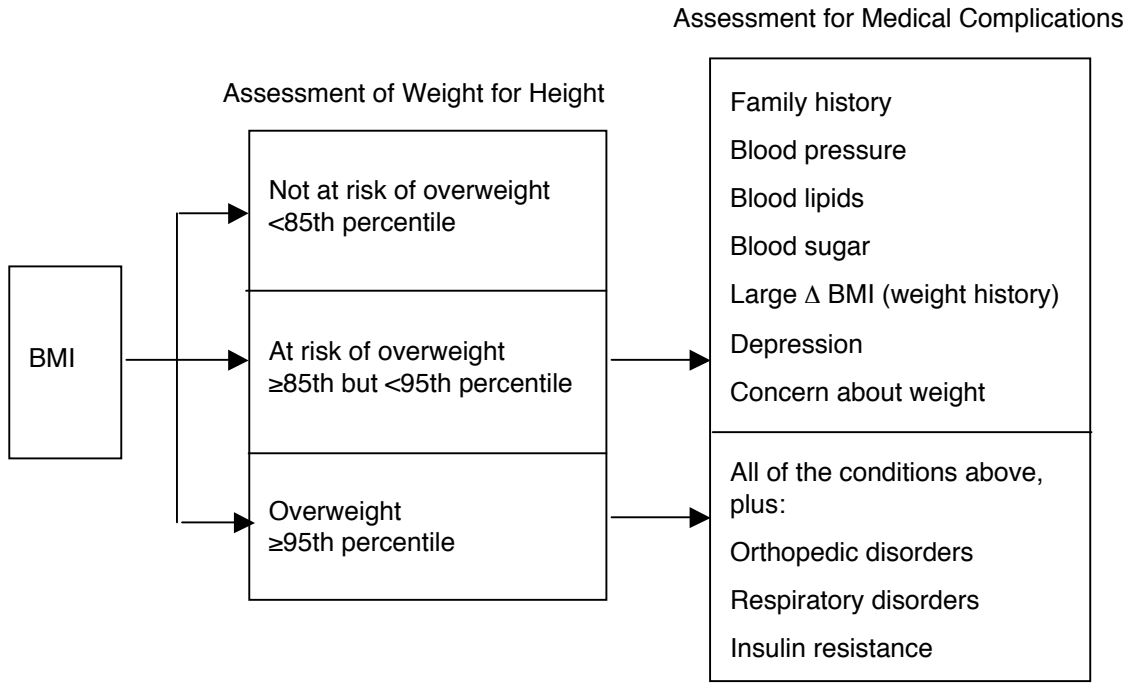
Source: Jamie Stang, Division of Epidemiology, University of Minnesota.

TABLE 2
Indicators of Height and Weight Status for Adolescents

Indicator	Anthropometric Variable	Cut-off Values
Stunting (low height-for-age)	Height-for-age	<3rd percentile
Thinness (low BMI-for-age)	BMI-for-age	<5th percentile
At risk for overweight	BMI-for-age	≥85th percentile, but <95th percentile
Overweight	BMI-for-age	≥95th percentile

Reprinted from Story M, Holt K, Sofka D, eds. Bright Futures in practice: nutrition. Arlington, VA: National Center for Education in Maternal and Child Health, 2000, Table 5, p. 115. Compiled from Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. World Health Organization Technical Report Series 854:1-452, World Health Organization; 1995; and Himes JH, Dietz WH. Guidelines for overweight in adolescent preventive services: recommendations from an Expert Committee. Am J Clin Nutr 1994;59:307-316.

FIGURE 1
Schematic Representation of Recommended Overweight Screening in Adolescence



Source: Adapted from Himes JH, Dietz WH. Guidelines for overweight in adolescent preventive services: recommendations from an Expert Committee. Am J Clin Nutr 1994;49:307-316.

Assessing Body Composition

Body composition assessment has important implications for health and fitness. In the adolescent, several factors affect the basis for estimating fat and lean tissues. Before growth is completed adolescents have higher body water and lower bone mineral contents resulting in a lower bone density.[5] Until recently, most skinfold equations for children were based on adult or elite adolescent athletes and extrapolated to children.[6] Adult formulas may overestimate body fatness by 3-6% and underestimate lean body weight. Slaughter and Lohman have validated a formula to be used with children and adolescents ages 8-18,[7] based on research that shows that chemical maturity does not occur until postpubescence is reached. Maturation differences in total body water and bone mass are significant and contribute to the need for different methods of evaluation of body composition based on maturation. As a result, Slaughter and Lohman recommend that a multi-component body composition model be used in evaluating body composition in children and youth.[7] The validated formulas use the triceps and subscapular skinfolds for assessment (see Table 3).

TABLE 3
Percent Body Fat Formulas (Ages 8-18)

Population	Formula
Prepubescent white males (SMR 1)	%BF= 1.21(SS) - .008(SS)^2 - 1.7
Prepubescent black males (SMR 1)	%BF= 1.21(SS) - .008(SS)^2 - 3.2
Pubescent white males (SMR 2-4)	%BF= 1.21(SS) - .008(SS)^2 - 3.4
Pubescent black males (SMR 2-4)	%BF= 1.21(SS) - .008(SS)^2 - 5.2
Postpubescent white males (SMR 5)	%BF= 1.21(SS) - .008(SS)^2 - 5.5
Postpubescent black males (SMR 5)	%BF= 1.21(SS) - .008(SS)^2 - 6.8
All females	%BF= 1.33(SS) - .013(SS)^2 - 2.5
For a sum of triceps and subscapular > 35mm	
All males	%BF= .783(SS) + 1.6
All females	%BF= .546(SS) + 9.7

SS= Sum of triceps and subscapular skinfolds

Source: Slaughter MH, Lohman TG, Boileau RA, Horswill CA, Stillman RJ, Van Loan MD, Bemben DA. Skinfold equations for estimation of body fatness in children and youth. Human Biology 1988;60(5):709-723.

Note: These formulas have not been validated on extremely obese youth or elite athletes.

Since body composition changes during periods of pubertal growth and maturation, care must be taken not to use body composition measurements for setting weight management or body composition goals during these periods of change. Serial measurements of body composition using the same method would be helpful in showing change in body fat over time.

Other methods for assessing body composition include hydrostatic weighing, bioelectrical impedance (BEI), and dual energy X-ray absorptiometry (DXA). But limited standards are available for assessing body composition in young children and adolescents using these methods.

- **Hydrostatic weighing** is often considered the gold standard in determining body composition. Body fat is determined by the body's water displacement. It also requires the ability to determine residual lung volume. This method is expensive and non-portable but is accurate if done correctly.

- **Bioelectric impedance (BEI)**: BEI is less costly than hydrostatic weighing and is based on the principle that fat is an insulator of electric current. The impedance machine measures the impedance of the electric current through the body. The higher the body fat the higher the impedance and therefore the higher the body fat. But BEI is highly dependent on hydration status; if dehydrated the impedance is lower and therefore gives an artificial low body fat. Also, if an individual has eaten in the last two hours, the thermogenic effect of food may alter the impedance. Since pre-pubertal and early puberty adolescents have a higher percentage of body water and equations used in BEI are based on adult standards, this method is unreliable for adolescents.

- **Dual energy X-ray absorptiometry (DXA)**: Like hydrostatic weighing, DXA is expensive and because it is an x-ray, produces small amounts of radiation. It has the ability to measure all body fat and can be very accurate. Standards for younger adolescents are limited although research in this area is currently ongoing.

It is usually not appropriate for an evaluation of SMR to be done during nutrition screening (see Chapter 1). Information on the SMR of the teen should be reviewed as part of the medical history prior to nutrition screening when possible. If data on the SMR of the adolescent are not available, the teen can be asked general questions in an effort to estimate SMR. Photos that depict developmental stages can be viewed or the teen can be asked to describe past and current linear growth and weight changes. Females can be asked about the age of menarche to estimate gynecological age.[*] These pieces of information, combined with an adequate understanding of pubertal growth and development, can assist health professionals in determining the potential for future growth and development and approximate SMR.

Nutrition screening should always include a brief assessment of the adequacy of usual dietary intake. Food frequency questionnaires (FFQs), 24-hour recalls, and food records or diaries are suitable methods for use with adolescents; however not all methods are suitable for use in a single dietary screening session. Table 4 lists the advantages and disadvantages of each of these dietary assessment methods. Short dietary assessment questionnaires that focus on specific eating behaviors, such as consumption of savory snacks, fast foods and high-sugar beverages, are appropriate for use during the initial nutrition screening. Such questionnaires, often known as "screeners," are suitable for adolescents with limited cognitive skills or limited comprehension of the English language. They can be completed rapidly and are useful for determining the need for more extensive dietary assessment and nutrition counseling.

Adolescents who consume diets that consist of frequent intakes of foods and beverages high in fat and/or sugar, who eat at fast food restaurants more than two times per week, who frequently skip meals, and who engage in chronic fasting or dieting should be counseled on ways to improve dietary intake. Dietary counseling should focus on substitutions for commonly consumed foods that are not nutrient-dense and on the concepts of dietary variety and moderation. Concrete examples of appropriate food substitutions and hands on practice with determining appropriate serving sizes should be included in nutrition education efforts.

[*] Gynecological age = chronological age (yr) – age at menarche (yr)

TABLE 4
Strengths and Limitations of Various Dietary Assessment Methods Used in Clinical Settings

	Strengths	Limitations	Applications
24-Hour Recall	Does not require literacy Relatively low respondent burden Data may be directly entered into a dietary analysis program May be conducted in-person or over the telephone	Dependent on respondent's memory Relies on self-reported information Requires skilled staff Time consuming Single recall does not represent usual intake	Appropriate for most people as it does not require literacy Useful for the assessment of intake of a variety of nutrients and assessment of meal patterning and food group intake Useful counseling tool
Food Frequency	Quick, easy and affordable May assess current as well as past diet In a clinical setting, may be useful as a screening tool	Does not provide valid estimates of absolute intake of individuals Can't assess meal patterning May not be appropriate for some population groups	Does not provide valid estimates of absolute intake for individuals, thus of limited usefulness in clinical settings May be useful as a screening tool, however, further development research is needed
Food Record	Does not rely on memory Food portions may be measured at the time of consumption Multiple days of records provide valid measure of intake for most nutrients	Recording foods eaten may influence what is eaten Requires literacy Relies on self-reported information Requires skilled staff Time consuming	Appropriate for literate and motivated population groups Useful for the assessment of intake of a variety of nutrients and assessment of meal patterning and food group intake Useful counseling tool
Diet History	Able to assess usual intake in a single interview Appropriate for most people	Relies on memory Time consuming (1 to 1-1/2 hours) Requires skilled interviewer	Appropriate for most people as it does not require literacy Useful for assessing intake of nutrients, meal patterning and food group intake Useful counseling tool

Source: Adapted from Story M, Stang J. Nutrition assessment of pregnant adolescents. In: Story M, Stang J. eds. Nutrition and the pregnant adolescent: a practical reference guide. Minneapolis, MN: Center for Leadership, Education and Training in Maternal and Child Nutrition, Division of Epidemiology, University of Minnesota, 2000. http://www.epi.umn.edu/let/pubs/nmpa.shtm

Nutrition Assessment

Indicators of nutrition risk that may necessitate more extensive nutrition assessment are listed in Table 5. Adolescents who meet the criteria for one or more indicators of nutritional risk should be considered candidates for in-depth medical assessment and nutrition counseling. All pregnant females should also be considered appropriate for in-depth nutrition assessment and counseling.

TABLE 5
Key Indicators of Nutrition Risk for Adolescents

FOOD CHOICES		
Indicators of Nutrition Risk	**Relevance**	**Criteria for Further Screening and Assessment**
Consumes fewer than 2 servings fruit or fruit juice per day. Consumes fewer than 3 servings of vegetables per day.	Fruits and vegetables provide dietary fiber and several vitamins (such as A and C) and minerals. Low intake of fruits and vegetables is associated with an increased risk of many types of cancer. In females of childbearing age, low intake of folic acid is associated with an increased risk of giving birth to an infant with neural tube defects.	Assess the adolescent who is consuming less than 1 serving of fruit or fruit juice per day. Assess the adolescent who is consuming fewer than 2 servings of vegetables per day.
Consumes fewer than 6 servings of bread, cereal, pasta, rice or other grains per day.	Grain products provide complex carbohydrates, dietary fiber, vitamins, and minerals. Low intake of dietary fiber is associated with constipation and an increased risk of colon cancer.	Assess the adolescent who is consuming fewer than 3 servings of bread, cereal, pasta, rice, or other grains per day.
Consumes fewer than 3 servings of dairy products per day.	Dairy products are a good source of protein, vitamins and calcium and other minerals. Low intake of dairy products may reduce peak bone mass and contribute to later risk of osteoporosis.	Assess the adolescent who is consuming fewer than 2 servings of dairy products per day. Assess the adolescent who has milk allergy or is lactose intolerant. Assess the adolescent who is consuming more than 20 oz of soft drinks per day.
Consumes fewer than 2 servings of meat or meat alternatives (e.g., beans, eggs, nuts, seeds) per day.	Protein-rich foods (e.g., meats, beans, dairy products) are good sources of B vitamins, iron, and zinc. Low intake of protein-rich foods may impair growth and increase the risk of iron-deficiency anemia and of delayed growth and sexual maturation. Low intake of meat or meat alternatives may indicate inadequate availability of these foods at home. Special attention should be paid to teens who follow a vegetarian diet.	Assess the adolescent who is consuming less than 2 servings of meat or meat alternatives per day or if following a vegan diet.
Has excessive intake of dietary fat.	Excessive intake of total fat contributes to the risk of cardiovascular diseases and obesity and is associated with some cancers.	Assess if teen has family history of premature cardiovascular disease. Assess the adolescent who has a body mass index (BMI) greater than or equal to the 85th percentile.
FOOD RESOURCES		
Indicators of Nutrition Risk	**Relevance**	**Criteria for Further Screening and Assessment**
Has inadequate financial resources to buy food, insufficient access to food, or lack of access to cooking facilities.	Poverty can result in hunger and compromised food quality and nutrition status. Inadequate dietary intake interferes with learning.	Assess the adolescent who is from a family with low income, is homeless, or is a runaway.

EATING BEHAVIORS		
Indicators of Nutrition Risk	**Relevance**	**Criteria for Further Screening and Assessment**
Exhibits poor appetite.	A poor appetite may indicate depression, emotional stress, chronic disease or eating disorder.	Assess if BMI is less than the 15th percentile or if weight loss has occurred. Assess if irregular menses or amenorrhea has occurred for 3 months or more. Assess for organic and psychiatric disease.
Consumes food from fast-food restaurants 3 or more times per week.	Excessive consumption of convenience foods and foods from fast-food restaurants is associated with high fat, calorie, and sodium intakes, as well as low intake of certain vitamins and minerals.	Assess the adolescent who is at-risk for overweight/obese or who has diabetes mellitus, hyperlipidemia, or other conditions requiring reduction in dietary fat.
Skips breakfast, lunch, or dinner/supper 3 or more times per week.	Meal skipping is associated with a low intake of energy and essential nutrients, and, if it is a regular practice, could compromise growth and sexual development. Repeatedly skipping meals decreases the nutritional adequacy of the diet.	Assess the adolescent to ensure that meal skipping is not due to inadequate food resources or unhealthy weight loss practices.
Adolescent consumes a vegetarian diet.	Vegetarian diets can provide adequate nutrients and energy to support growth and development if well planned. Vegan diets may lack calcium, iron, vitamins D and B-12. Adolescents who have eating disorders may adopt low fat vegetarian diets.	Assess the adolescent who consumes fewer than 2 servings of meat alternatives per day. Assess the adolescent who consumes fewer than 3 servings of dairy products per day. Assess the adolescent for eating disorder and adequacy of energy intake who follows a low fat vegetarian diet and experiences weight loss.
PHYSICAL ACTIVITY		
Indicators of Nutrition Risk	**Relevance**	**Criteria for Further Screening and Assessment**
Is physically inactive: engages in physical activity fewer than 5 days per week.	Lack of regular physical activity is associated with overweight, fatigue and poor muscle tone in the short term and a greater risk of heart disease in the long term. Regular physical activity reduces the risk of cardiovascular disease, hypertension, colon cancer, and type 2 diabetes mellitus. Weight-bearing physical activity is essential for normal skeletal development during adolescence. Regular physical activity is necessary for maintaining normal muscle strength, joint structure, and joint function; contributes to psychological health and well-being; and facilitates weight reduction and weight maintenance throughout life.	Assess how much time the adolescent spends watching television/ videotapes and playing computer games. Assess the adolescent's definition of physical activity.
Engages in excessive physical activity.	Excessive physical activity (nearly every day or more than once a day) can be unhealthy and associated with menstrual irregularity, excessive weight loss, and malnutrition.	Assess the adolescent for eating disorders.

WEIGHT AND BODY IMAGE		
Indicators of Nutrition Risk	**Relevance**	**Criteria for Further Screening and Assessment**
Practices unhealthy eating behaviors (e.g., chronic dieting, vomiting, and using laxatives, diuretics, or diet pills to lose weight).	Chronic dieting is associated with many health concerns (fatigue, impaired growth and sexual maturation, irritability, poor concentration, impulse to binge) and can lead to eating disorders. Frequent dieting in combination with purging is often associated with other health-compromising behaviors (substance use, suicidal behaviors). Purging is associated with serious medical complications.	Assess the adolescent for eating disorders. Assess for organic and psychiatric disease. Screen for distortion in body image and dysfunctional eating behavior, especially if adolescent desires weight loss, but BMI is less than the 85th percentile.
Is excessively concerned about body size or shape.	Eating disorders are associated with significant health and psychological morbidity. Eighty-five percent of all cases of eating disorders begin during adolescence. The earlier adolescents are treated, the better their long-term prognosis.	Assess the adolescent for distorted body image and dysfunctional eating behaviors, especially if adolescent wants to lose weight but BMI is less than the 85th percentile.
Exhibits significant weight change in past 6 months.	Significant weight change during the past 6 months may indicate stress, depression, organic disease, or an eating disorder.	Assess the adolescent to determine the cause of weight loss or weight gain (limited or too much access to food, poor appetite, meal skipping, eating disorder).
GROWTH		
Indicators of Nutrition Risk	**Relevance**	**Criteria for Further Screening and Assessment**
Has BMI less than the 5th percentile.	Thinness may indicate an eating disorder or poor nutrition.	Assess the adolescent for eating disorders. Assess for organic and psychiatric disease. Assess for inadequate food resources.
Has BMI greater than the 95th percentile.	Obesity is associated with elevated cholesterol levels and elevated blood pressure. Obesity is an independent risk factor for cardiovascular disease and type 2 diabetes mellitus in adults. Overweight adolescents are more likely to be overweight adults and are at increased risk for health problems as adults.	Assess the adolescent who is overweight or at risk for becoming overweight (on the basis of present weight, weight gain patterns, family weight history).
MEDICAL CONDITIONS		
Indicators of Nutrition Risk	**Relevance**	**Criteria for Further Screening and Assessment**
Has chronic diseases or conditions.	Medical conditions (diabetes mellitus, spina bifida, renal disease, hypertension, pregnancy, HIV/AIDS) have significant nutritional implications.	Assess adolescent's compliance with therapeutic dietary recommendations. Refer to dietitian if appropriate.
Has hyperlipidemia.	Hyperlipidemia is a major cause of atherosclerosis and cardiovascular disease in adults.	Refer adolescent to a dietitian for cardiovascular nutrition assessment.
Has iron-deficiency anemia.	Iron deficiency causes developmental delays, behavioral disturbances, and increased lead absorption.	Screen adolescents if they have low iron intake, history of iron-deficiency anemia, limited access to food due to poverty or neglect, special health care needs, or extensive menstrual or other blood losses. Screen annually.

MEDICAL CONDITIONS (continued)		
Indicators of Nutrition Risk	**Relevance**	**Criteria for Further Screening and Assessment**
Has dental caries.	Eating habits have a direct impact on oral health. Calcium and vitamin D are vital for strong bones and teeth, and vitamin C is necessary for healthy gums. Frequent consumption of carbohydrate-rich foods (e.g., lollipops, soda) that stay in the mouth longer may cause dental caries. Fluoride in water used for drinking and cooking as well as in toothpaste reduces the prevalence of dental caries.	Assess the adolescent's consumption of snacks and beverages that contain sugar, and assess snacking patterns. Assess the adolescent's access to fluoride (e.g., fluoridated water, fluoride tablets).
Is pregnant.	Pregnancy increases the need for most nutrients.	Refer the adolescent to a dietitian for further assessment, education, and counseling as appropriate.
Is taking prescribed medication.	Many medications interact with nutrients and can compromise nutrition status.	Assess potential interactions of prescription drugs (e.g., asthma medications, antibiotics) with nutrients.
Is using nutritional supplement.	Vitamin and mineral preparations can be healthy additions to dietary intake, especially if pregnant, lactating, or has history of anemia; frequent use or high doses can have serious side effects. Those using other "nutritional supplements" for "bulking up" may be at risk for experimentation with anabolic steroids.	Inquire about type and dosage of supplement; rule out anabolic steroid use. Screen for nutrient-nutrient or drug-nutrient interactions.
LIFESTYLE		
Indicators of Nutrition Risk	**Relevance**	**Criteria for Further Screening and Assessment**
Engages in heavy alcohol, tobacco, and other drugs.	Alcohol, tobacco, and other drug use can adversely affect nutrient intake and nutrition status.	Assess the adolescent further for inadequate dietary intake of energy and nutrients.
Uses dietary supplements.	Dietary supplements (e.g., vitamin and mineral preparations) can be healthy additions to a diet, especially for pregnant and lactating women and for those with a history of iron-deficiency anemia; however frequent use or high doses can have serious side effects. Adolescents who use supplements to "bulk up" may be tempted to experiment with anabolic steroids. Herbal supplements for weight loss can cause tachyardia and other side effects. They may also interact with over the counter prescription medications.	Assess the adolescent for the type of supplements used and dosages. Assess the adolescent for use of anabolic steroids and megadoses of other supplements.

Source: Adapted from Story M, Holt K, Sofka D, eds. Bright Futures in practice: Nutrition. Arlington, VA: National Center for Education in Maternal and Child Health; 2000 (Appendix D, p. 243-255).

Critical factors to be assessed to determine the need for an extensive nutrition assessment include:

- Acute or chronic conditions, genetic or congenital disorders, or metabolic disorders that affect nutrient needs.
- Physical disabilities that affect the ability to feed oneself.
- Past or current nutritional deficiencies such as iron deficiency anemia.
- Sexual maturation rating (see Chapter 1); for females, age at menarche, gynecological age, presence of heavy menstrual bleeding, and current or past pregnancy history.
- Personal and family history of chronic diseases such as cardiovascular disease, hypertension, hyperlipidemia, diabetes, and cancer.
- Personal and family history of obesity, eating disorders, depression, dysthymia, alcoholism, substance use, and physical, sexual or mental abuse or neglect.
- Presence of hearing, speech, language, or learning disorders, deficiencies of sight, and English as a second language.
- Frequency of use and dose of prescription and non-prescription medications, "nutritional" supplements, diet pills, laxatives, herbs and other botanical products, vitamin-mineral supplements, and anabolic steroids.
- Socioeconomic status indicators such as homelessness, adequate cooking and food storage facilities, sufficient daily food supply, participation in food assistance programs, and access to medical, mental health, and dental care.

A complete nutrition assessment should include a survey of the all available medical, psychosocial and laboratory data. Detailed information on general dietary intake and adequacy, as well as information specific to the identified health risk, should be obtained through rigorous dietary assessment. For example, an underweight teen should be assessed for level of physical activity, history of metabolic disorders, and criteria for body image or eating disorders as well as adequacy of energy, carbohydrate, protein, fat, iron, zinc and B-vitamin intakes, whereas a teen with hyperlipidemia would need to be assessed for weight-for-height status, physical activity level and adequacy of energy, fat, carbohydrate and cholesterol intakes.

Choosing the best dietary assessment method for use in nutrition assessment is very important. Factors that should be considered when choosing the dietary assessment method(s) to use include the length of the appointment, cognitive ability of the client, fluency in English, and availability of dietary analysis software. The utilization of multiple methods is recommended whenever practical. The combination of a 24-hour recall with either a food frequency questionnaire (FFQ) or food record/diary can provide knowledge about consistency of diets with national dietary guidelines as well as sufficiency of energy and specific nutrient intakes.

Many health professionals prefer the 24-hour recall method because it can be completed relatively quickly, does not rely on memory as extensively as the FFQ and can be used to assess adequacy of energy and macronutrient intakes. A 24-hour recall requires remembering foods and beverages consumed during the past 24 hours. Some teens find it easier to remember the most recent food or beverage consumed, working backward through the past 24 hours period while others find it easiest to begin recalling from the previous day. Daily schedules can be used to enhance memory. When working with teens, prompts such as waking up, going to bed, traveling to and from school, and time spent at work are often very effective at enhancing memory of food intake. An example of a 24-hour recall is shown in Figure 2. If the 24-hour recall is used, questions about how dietary intake over the past 24 hours might differ from usual dietary intake should be asked. Ideally, multiple 24-hour recalls that include weekend and weekday meals should be used.

FIGURE 2
Example of 24-Hour Recall

24 Hour Food Recall

NAME_____ DATE _____

AGE_____

"I would like to know what you've eaten within the past 24 hours. Please tell me everything you ate or drank, including meals, snacks, beverages, candy and alcohol? Why don't you start with the last thing you've had to eat or drink today and we'll go backwards."

				Dairy Products	Meat or Substitute	Fruits	Vegetables	Grains	Fats, Oils, Sweets
Time	Place	Food or Beverage	Amount	**This Side For Office Use**					
Recommended servings/day for adolescents				3-4	3	2-4	3-5	6-11	2
Is this a typical day?_____									
Total Number of Servings									

Nutrients diet may be lacking in:_____

Nutrients diet may be excessive in:_____

Adapted from Story M, Stang J. eds. Nutrition and the pregnant adolescent: a practical reference guide. Minneapolis, MN: Center for Leadership, Education and Training in Maternal and Child Nutrition, Division of Epidemiology, University of Minnesota; 2000 (Appendix C1, p. 236). http://www.epi.umn.edu/let/pubs/nmpa.shtm

Adolescents who are interested in assessing their dietary intake can enter dietary data into a variety of diet assessment programs available through the internet (USDA website).

Food frequency questionnaires ask a person to recall what they have eaten over a specified period of time (usually a week or a month). While the FFQ can determine the core diet of a teenager, it cannot accurately estimate average energy or nutrient intakes. There are a number of standardized FFQs available for use by adolescents, including the Youth/Adolescent Food Frequency Questionnaire (YAQ), a 131-item food frequency questionnaire that was specifically developed for children and adolescents.[8] In clinical settings the processing of a standardized FFQ within the timeframe of a typical appointment may not be practical. In this instance, a FFQ can be mailed and the teen can be instructed to complete it prior to an appointment, or a shorter, brief FFQ can be utilized. A sample brief FFQ for adolescents is shown in Figure 3.

Food records or diaries are often used with teens because they do not necessitate memory. A potential disadvantage of this method is that the process of recording foods may alter dietary behaviors during the recording period. An additional drawback is that information is self-reported and is subject to over- or underestimation. Adolescents must be thoroughly instructed on how to complete a food record, with particular attention given to estimation of portion sizes. Some teenagers may be disinclined to complete a food record because they feel they have poor handwriting or spelling skills. Tape recorders can be used to verbally gather dietary information in such instances, however the audiotapes must be transcribed in order for the diet to be assessed. A sample food record is shown in Figure 4.

FIGURE 3
Sample Food Frequency Questionnaire for Adolescents

Food Frequency Form

How often do you eat the following foods? (Put an "X" on the line.)

	More than once/day	Once/day	2-3 times/week	Seldom	Never
Milk					
Cheese, yogurt					
Ice cream					
Meat, fish, poultry					
Eggs					
Peanut butter, nuts					
Dry beans, peas, tofu, soy					
Citrus fruits, juice (i.e., orange, grapefruit, tomato)					
Dark green leafy or deep orange vegetables (i.e., collards, broccoli, carrots, squash, sweet potatoes)					
Other fruits, vegetables, potatoes					
Bread, cereals, rice, pasta					
Sweets (cakes, donuts, pies, cookies, candy)					
Salty snacks: potato chips, corn chips, tortilla chips, pretzels, etc.					
Soda pop, Kool-Aid					
Alcohol (beer, wine, etc.)					
Coffee, tea					
Vitamins, herbs, other supplements					
Fast foods					

Reprinted with permission from Story M, Stang J. eds. Nutrition and the pregnant adolescent: a practical reference guide. Minneapolis, MN: Center for Leadership, Education and Training in Maternal and Child Nutrition, Division of Epidemiology, University of Minnesota; 2000 (Appendix C2, p. 237). http://www.epi.umn.edu/let/pubs/nmpa.shtm

FIGURE 4
Daily Food Record for Adolescents

DAILY FOOD RECORD

DAY NUMBER

Time	Food or Beverage	Amount Eaten	Place Eaten	Who You Ate With

DAILY FOOD RECORD

INSTRUCTIONS

1. Record EVERYTHING you eat and drink, even water, for seven days. Record your beverage, meal or snack IMMEDIATELY after it is eaten.
2. Complete the Time, Amount Eaten, Place Eaten, and Who You Ate With sections for each beverage, meal or snack.
3. Write CLEARLY, but do not worry too much about spelling.
4. Use a SEPARATE LINE for each food or beverage.
5. Leave 1 or 2 BLANK LINES after each meal or snack.
6. Start EACH NEW DAY on a NEW PAGE.
7. If more space is needed for one day, continue on a blank piece of paper, and be sure to include Time, Amount Eaten, Place Eaten, and Who You Ate With.

PLEASE REMEMBER:

1. Record BRAND NAMES of food, if known.
2. Record EXACT AMOUNTS. Write down measurements like cup, teaspoon, ounce, or inches.
3. Record HOW the food was PREPARED. Example: fried chicken, broiled fish, baked ham, breaded tenderloin, etc.
4. For foods prepared with fat, LIST THE FAT used if known. Example: fried in vegetable oil (Wesson brand).
5. Record NAMES OF RESTAURANTS in the Food or Beverage column if you eat out.
6. DESCRIBE all foods, beverages, condiments, spreads, etc. with as much detail as possible. Example: chicken thigh, skin not eaten; caffeine-free Coke; Kraft low calorie French dressing.
7. LIST INGREDIENTS for sandwiches and mixed dishes like tacos, spaghetti, and casseroles.
8. Don't forget FOODS USED AT THE TABLE. Example: baked potato with 1 tablespoon butter; iced tea with one packet of Nutra-Sweet. Record each food on a separate line.
9. Describe all VITAMINS, MINERALS, and other SUPPLEMENTS taken.

Reprinted with permission from Story M, Stang J. eds. Nutrition and the pregnant adolescent: a practical reference guide. Minneapolis, MN: Center for Leadership, Education and Training in Maternal and Child Nutrition, Division of Epidemiology, University of Minnesota; 2000 (Appendix C3, p. 238). http://www.epi.umn.edu/let/pubs/nmpa.shtm

For adolescents with low literacy skills, learning disabilities, or those who are not fluent in English, food pictures, models, and packages can be used to determine food intake. Adolescents can be presented with a stack of food packages, photos or food models that depict commonly consumed foods. These items can be sorted into foods that were consumed during the past week and those that were not. Adolescents can verbally report the frequency of consumption of each food item that has been consumed in the past week. The teen should be asked to describe the types and quantities of any foods that were consumed that were not included in the set of photos, packages or food models in order to collect comprehensive dietary intake.

It is essential to accurately estimate portion sizes of foods and beverages consumed when administering a 24-hour recall. Food models, cups or glasses, food wrappers or containers, and other props can aid adolescents in determining serving sizes. Nutrition information is available from most fast food restaurants and can be used to approximate portion sizes of fast foods. To assure comprehensiveness of a 24-hour recall, a list or pictures of foods commonly consumed by teens can be utilized at the end of the recall to assist in recollecting any unreported items such as condiments, candy or beverages. When the recall is complete, the teen should be asked how typical the 24-hour recall is of their usual eating habits. Any dissimilarity between reported intake and typical intake should be recorded and taken into consideration when determining dietary adequacy.

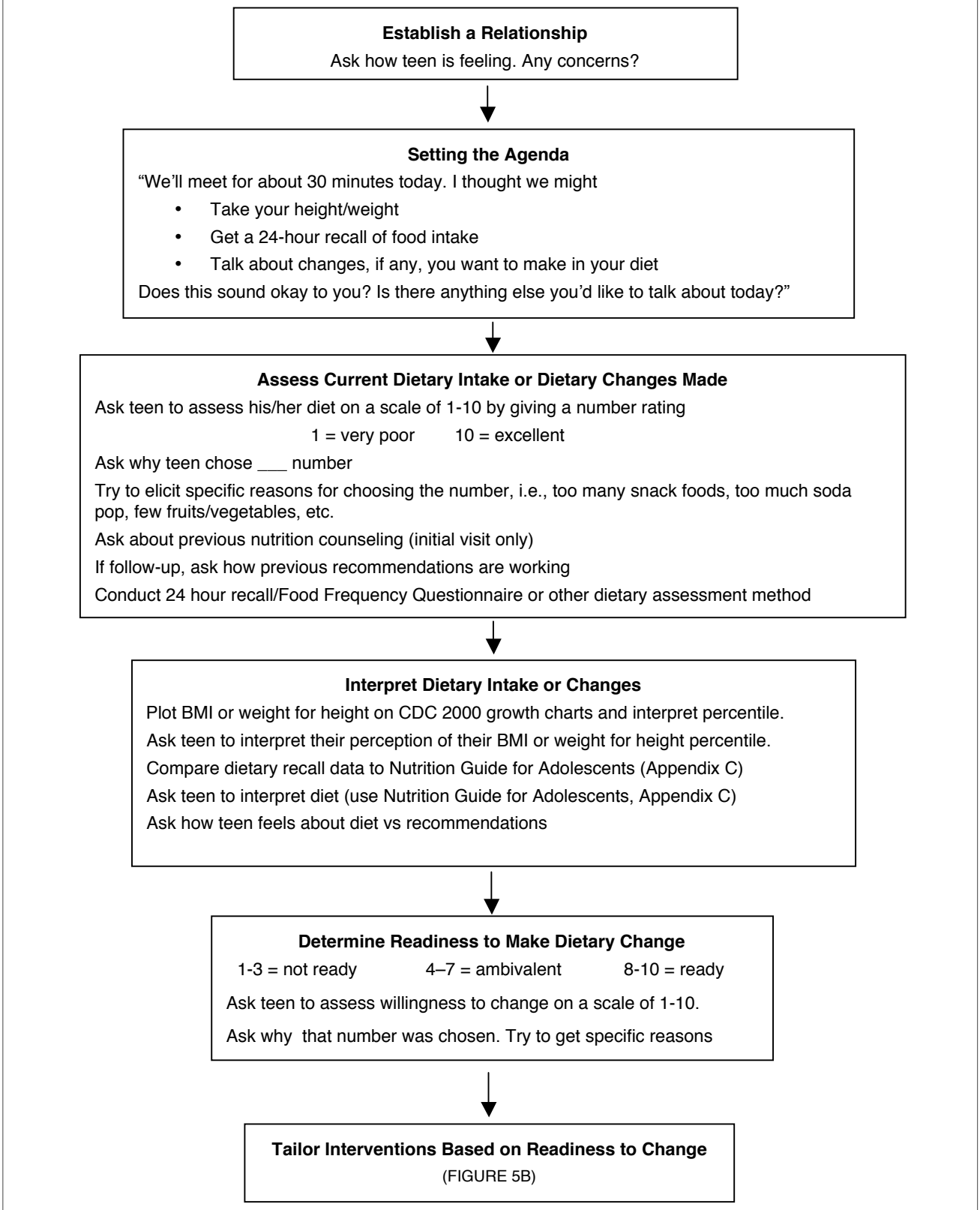
Dietary assessment data should be analyzed using a nutrient analysis program to determine adequacy of macro- and micronutrient intakes as well as intakes of other dietary components such as sodium and cholesterol. The results of the assessment are a useful counseling tool. Adolescents should be allowed to view their dietary assessment results alongside recommended dietary intakes and should be asked to report any potential areas of improvement that they identify. For example, "Here are the nutrition results from the diet that you reported eating yesterday. The numbers listed here are what you ate while the numbers listed in parentheses are what are recommended for a person of your age and gender. Tell me how you think your diet compares to recommended intakes?" Allowing the adolescent to assess their own dietary adequacy empowers them, builds rapport, and increases the likelihood that they will be motivated to make dietary changes.

ASSESSING MOTIVATION TO MAKE BEHAVIOR CHANGE

Adolescents should be directly involved in identifying priority areas for behavior change. Allowing teens to review the results of their dietary assessment alongside current dietary recommendations is an excellent way to get them involved. Targeted questions about how the results of their dietary assessment differ from recommended intakes and the use of an interactive nutrition evaluation form can help to guide the adolescent in determining areas for behavior change. If the teen does not identify specific areas where behavior change could be beneficial, it is appropriate to offer a prepared list of areas of common concern among teens and some suggestions for priority areas.

Once one or two behaviors have been chosen as areas for behavior change, the teen's motivation to make these changes should be assessed. Teens can be asked to rate their perceived motivation for making each selected behavior change on a scale of 0-10 with 0 representing not willing to change and 10 representing very willing to change (see Figure 5). Once they have chosen a number, they should be asked why they chose the number they did, and not a higher number, such as 9 or 10. This permits teens to identify possible barriers to behavior change. Once all potential barriers to change have been explored, adolescents can be asked why they did not pick a lower number such as 0 or 1. This allows adolescents to bring forth self-motivating statements that can be used during nutrition education and counseling. This process should be repeated for each area of behavior change that the teenager expresses interest in pursuing. Nutrition education and counseling efforts can then be modified to the level of perceived ability to change for each adolescent (see Chapter 6).

FIGURE 5
Adolescent Willingness to Change



Source: Adapted from Berg-Smith SM, Stevens VJ, Brown KM, et al. A brief motivational intervention to improve dietary adherence in adolescents. Health Education Research: Theory and Practice 1999;14(3):399-410.

FIGURE 5B
Tailored Intervention Stages

Stage 1. Teen is Not Ready to Make Dietary Change

Practitioner Goal: To increase teen's knowledge of need for good nutrition and to educate/motivate.

- Ask what would be needed to increase teen's willingness to make dietary changes.
- Ask how you could help teen to become ready to change.
- Reinforce your respect for teen even if teen chooses not to make changes.
- Offer advice such as "I would recommend you increase your vegetable intake. However it's your choice. If you decide at some time that you might want to eat more vegetables, then I will be glad to help you. In the meantime, may I call you periodically just to see how you're doing?"
- Ask open ended questions.
- Offer advice (with permission) and emphasize choice and personal responsibility.

Stage 2. Teen is Ambivalent About Dietary Change

Practitioner Goal: To motivate and empower teen and to understand factors related to ambivalence.

- Explore hesitancy. Ask about likes and dislikes in current diet or request a list of pros and cons of making dietary change
- Ask about "healthy eating" habits or pros of making change first to set positive tone. Then ask cons of unhealthy habits
- Ask what teen feels the next step should be
- Offer to maintain contact periodically to check on teen's progress.

Stage 3. Teen is Ready to Make Dietary Change

Practitioner Goal: To help teen develop a plan and to define and negotiate specific strategies

- Ask what teen thinks needs to be changed
- Ask for specific ideas or methods.
- Help set small, realistic goals for 1-2 changes and make suggestions on how to measure change.
- Choose rewards for achieving goals.
- Make a follow-up appointment to monitor progress

Source: Adapted from Berg-Smith SM, Stevens VJ, Brown KM, et al. A brief motivational intervention to improve dietary adherence in adolescents. Health Education Research: Theory and Practice 1999;14(3):399-410.

CONCLUSION

All adolescents should be offered annual nutrition screening to determine the presence or absence of nutrition risk factors. Annual preventive nutrition guidance should also be offered to all adolescents. Teens who screen positive for nutritional risk factors should be offered in-depth nutrition assessment to determine particular nutrition-related behaviors that should be addressed through nutrition education and counseling. The assessment of motivation to make dietary behavior changes should be an integral part of the comprehensive dietary assessment and should be used to tailor nutrition education and counseling efforts for each individual adolescent.

REFERENCES

1. American Medical Association. Guidelines for adolescent preventive services. Chicago: American Medical Association, Department of Adolescent Health; 1992.
2. Centers for Disease Control and Prevention. Growth Charts. http://www.cdc.gov/growthcharts. Accessed 8/27/04.
3. Barlow SE, Dietz WH. Obesity evaluation and treatment: Expert Committee recommendations. Maternal and Child Health Bureau, Health Resources and Services Administration, Department of Health and Human Services. Pediatrics 1998;102(3):E29.
4. Himes J, Dietz W. Guidelines for overweight in adolescent preventive services: Recommendations from an expert committee. Am J Clin Nutr 1994;59(2):307-316.
5. Nelson-Steen S, Bernhardt DT. Nutrition and weight control. In: Sullivan JA, Anderson SJ, eds. Care of the young athlete. American Academy of Pediatrics and American Academy of Orthopaedic Surgeons; 2000.
6. Lohman TKG. Assessment of body composition in children. Pediatr Exerc Sci 1989;1:19-30.
7. Slaughter MH, Lohman TG, Boileau RA, Horswill CA, Stillman RJ, Van Loan MD, et al. Skinfold equations for estimation of body fatness in children and youth. Hum Biol 1988;60(5):709-723.
8. Rockett HR, Brieitenbach M, Frazier L, Witschi J, Wolf AM, Field AE, et al. Validation of a Youth/Adolescent Food Frequency Questionnaire. Prev Med 1997;26:808-816.