PART 1

Nutrition Assessment and Support

CHAPTER 1

Nutrition Assessment

The Nutrition Care Process

The Nutrition Care Process (NCP), developed by the Academy of Nutrition and Dietetics (the Academy), is a systematic approach to providing high-quality nutrition care, which provides dietetic professionals with a framework for critical thinking, problem-solving, and decision-making to address nutrition-related problems.[1] The NCP was designed to improve the consistency and quality of nutrition care and the predictability of nutrition care outcomes. Dietetic professionals, including registered dietitians (RD) and registered dietitian nutritionists (RDN), use the NCP in diverse venues to provide nutrition services and document the process.

The NCP consists of four steps: Nutrition Assessment, Nutrition Diagnosis, Nutrition Intervention, and Nutrition Monitoring and Evaluation. The NCP culminates in documentation of the process, often referred to as being in the ADIME format. A feature in this book is a highlight box called "ADIME At-A-Glance," which includes common aspects of each NCP step for a specific condition or disease state.

Nutrition assessment of the patient, client, or resident is the first step in effective nutrition care to identify and diagnose nutrition risks and plan appropriate interventions. It consists of a comprehensive assessment of nutrition status and includes five assessment domains. The following are examples of data collected within each domain but are not all-inclusive:

1. Anthropometric measurements: height, weight; body mass index (BMI); weight history; growth pattern indices/percentile ranks; and body measures, including fat, muscle, and bone components and growth
2. Biochemical data, medical tests, and procedures
3. Nutrition-focused physical findings: findings from a nutrition-focused physical examination (NFPE), interview, or the health

record including muscle and subcutaneous fat, oral health, suck/swallow/breathe ability, appetite, and affect

4. Client history: personal, medical and health (patient/client/family), and social histories
5. Food/Nutrition-related history: including food and nutrient intake, diet history, medication and complementary/alternative medicine, food and nutrition knowledge, beliefs and behaviors, physical activity and exercise, and food availability

Nutrition diagnosis is the second step in the NCP. After assessment, the patient's nutrition-related problems and needs are determined, which form the nutrition diagnosis. The nutrition diagnosis, in turn, is expressed and documented in a specific format: problem, etiology, and signs and symptoms (PES). **BOXES 1.1** and **1.2** illustrate and provide an example for the PES format.

BOX 1.1 Nutrition Diagnosis: Problem/Etiology/Signs

The problem (P) describes alterations in patient nutritional status:

- A diagnostic label (qualifier) is an adjective that describes the physiologic response (e.g., altered, impaired, risk of).

The etiology (E) refers to cause(s) or contributors(s) to the problem:

- It is linked to the problem by the term "related to" (RT).

The signs/symptoms (S) are clusters of subjective and objective factors that provide evidence that a problem exists:

- They also quantify the problem and describe severity.
- Linked to (E) by the term "as evidenced by" (AEB).

BOX 1.2 Writing the Nutrition Diagnosis (ND) Statement

Example for the ND Statement Format (**P**)roblem/(**E**)tiology/(**S**)igns/symptoms: Excessive energy intake (**P**) related to frequent consumption of large portions of high-fat meals (**E**), as evidenced by:

1. Daily caloric intake exceeding estimated energy intake by 500 kcal (**S**)
2. 12 lb weight gain during past 18 months (**S**)

The nutrition diagnostic terms are classified according to the following three domains and subclasses:

1. Intake: caloric energy balance, oral or nutrition support intake, fluid intake, bioactive substances intake, nutrient intake
2. Clinical: functional, biochemical weight, malnutrition disorders
3. Behavioral/environmental: knowledge and beliefs, physical activity and function, food safety, and access

Nutrition intervention is the third step in the NCP. The interventions are planned to positively change a nutrition-related behavior, environmental condition, or aspect of health status for the patient/client. The interventions should address the problems identified in the nutrition assessment that have been formulated into the nutrition diagnosis. The intervention typically targets the etiology of the nutrition diagnosis/problem identified in the PES statement. Less frequently, the nutrition intervention is directed at the signs and symptoms to minimize their impact.[1] The intervention step includes two interrelated components: planning and implementation. Planning involves prioritization of the nutrition diagnoses as to each problem's severity or importance, and the use of evidence-based interventions and practice guidelines to establish patient-focused expected outcomes for each nutrition diagnosis. Implementation of the nutrition intervention is the action phase that includes carrying out and communicating the plan of care to the patient/client, caregivers, and other members of the healthcare team; continuing data collection; and revising the nutrition intervention strategy, based on the patient/client response. The nutrition intervention terminology is organized into five domains:

1. Food and/or nutrient delivery
2. Nutrition education
3. Nutrition counseling
4. Coordination of nutrition care by a nutrition professional
5. Population-based nutrition action

The final step in the NCP is monitoring and evaluation. This is a critical component of the NCP because it identifies important measures of patient/client outcomes relevant to the nutrition diagnosis and intervention and describes how best to measure and evaluate these outcomes. During this step, the patient's status is re-examined by gathering new data (monitoring) and assessing to see how it compares with previous status, expected outcomes, and established standards (evaluation). This fourth step helps to determine whether the patient/client is meeting the nutrition intervention goals or desired outcomes. The domains and terminologies used in monitoring/evaluation are the same as those used in nutrition assessment, except for client history (there is no client history domain in this step because there are no nutrition care outcomes associated with client history).

ADIME 1.1 ADIME At-A-Glance: Nutrition Diagnoses for Malnutrition

Severe: Chronic Illness or Condition

- Chronic Disease/Condition-related Malnutrition (may have severe protein-calorie malnutrition) RT increased energy expenditure because of catabolic illness AEB estimated energy intake ≤75% over 2 months, severe pectoralis and deltoid muscle loss (shoulder square in appearance), malignancies

Severe: Acute Illness or Injury

- Acute Disease/Condition-related Malnutrition (may have severe protein-calorie malnutrition) RT alteration in gastrointestinal tract structure AEB weight loss of >5% in 1 month, severe quadricep wasting (severe depression of muscle on thigh, prominent femur bone), major gastrointestinal surgery

Severe: Social or Environmental (Starvation-related)

- Starvation-related Malnutrition (may have severe protein-calorie malnutrition) RT disordered eating pattern AEB intake of ≤50% of estimated energy needs for ≥1 month, severe deltoid muscle loss (prominent acromion protrusion), anorexia nervosa

Anthropometric Assessment

There are several anthropometric measurements that are useful in the clinical setting. Measurements of body weight, height, and composition can be used by the clinician when evaluating nutritional status.

Estimating Height

An estimation of height is necessary for patients who are confined to bed or a wheelchair, have curvature of the spine or contractures, or are otherwise unable to stand for an actual height measurement.[2]

Demi-Span

- This measurement is particularly useful in the clinical setting because it requires no special equipment. It is also helpful to use with patients who have lower limb dysfunction.
- Using the left arm, if possible, measure the distance from the tip of the middle finger to the middle of the sternal notch.
- Make sure the patient's arm is horizontal and in line with the shoulders.
- Height (in cm) is calculated using the following formulas:

$$\text{Females: Height in cm} = (1.35 \times \text{demi-span in cm}) + 60.1$$
$$\text{Males: Height in cm} = (1.40 \times \text{demi-span in cm}) + 57.8$$

Knee Height

- Knee height is measured using a sliding broad-blade caliper (available commercially at http://www.weighandmeasure.com/).
- Patient should be in the supine position, and the left leg is preferable for measurement.
- With both the knee and ankle at 90-degree angles, place one blade of the caliper under the heel of the foot and the other on the anterior surface of the thigh.
- The shaft of the caliper is held parallel to the long axis of the lower leg, and pressure is applied to compress the tissue.
- Height (in cm) is calculated using the following formulas:

$$\text{Females: Height in cm} = 84.88 - (0.24 \times \text{age in years}) + (1.83 \times \text{knee height in cm})$$

$$\text{Males: Height in cm} = 64.19 - (0.04 \times \text{age in years}) + (2.02 \times \text{knee height in cm})$$

Evaluating Body Weight

Ideal Body Weight

Body weight relative to height is a frequently used measurement to determine risk of morbidity and mortality.[3] Although there is limited published research on their validity, many ideal body weight (IBW) equations and height/weight tables are used to assess an individual's nutrition status by comparing actual body weight with IBW standards in various settings. One common method frequently used in the United States is the Hamwi method, shown below:

Females: IBW = 100 lb for 5 ft + 5 lb for each inch >60 in
Males: IBW = 106 lb for 5 ft + 6 lb for each inch >60 in

For light- or small-framed individuals, the IBW, using this method, can be reduced by 10%, and for heavy- or large-framed individuals, the IBW can be increased by 10%. See the following sections for determining frame size.

Frame Size Adjustment

To adjust for differences in body build (muscularity, bone thickness, and body proportions), it is necessary to determine an individual's frame size when calculating IBW.[4] Frame size can be estimated by two methods. Measuring wrist circumference is easy and straightforward. Measuring elbow breadth is more complex, but tends to provide a more accurate estimate of frame size. Both methods use the measurements in relation to the patient's height.

Wrist Circumference

- Measure the wrist circumference just distal to the styloid process at the wrist crease of the left hand, in inches, using a tape measure. Compare the measurement with the values in **TABLE 1.1**.

Elbow Breadth

- Subject should stand, if possible, and extend the arm forward so that it is horizontal and parallel to the ground.
- Turn palm so that it is facing up and bend elbow so that the forearm is at a 90-degree angle to the ground.
- Measure the distance between the two prominent bones on either side of the elbow (the epicondyles of the humerus). This measurement can be taken with a ruler or tape measure, but using commercially available calipers is preferable.
- Compare the measurement with the values in **TABLE 1.2**.

TABLE 1.1 Estimating Frame Size Using Wrist Circumference

Female Wrist Measurements			
	Height <5'2"	**Height 5'2"–5'5"**	**Height >5'5"**
Small	<5.5"	<6.0"	<6.25"
Medium	5.5"–5.75"	6.0"–6.25"	6.26"–6.5"
Large	>5.75"	>6.25"	>6.5"
Male Wrist Measurements			
		Height >5'5"	
	Small	5.5"–6.6"	
	Medium	6.5"–7.5"	
	Large	>7.5"	

Data from U.S. National Library of Medicine (NLM), "Calculating body frame size," accessed June 24, 2019, http://www.nlm.nih.gov/medlineplus/ency/imagepages/17182.htm.

TABLE 1.2 Estimating Frame Size Using Elbow Breadth

Female Elbow Measurements	
Medium Frame	
If elbow breadth is less than those in the table for a specific height, subject is small framed, and if elbow breadth is greater, subject is large framed.	
Height	**Elbow Breadth**
4'10"–4'11"	2¼"–2½"
5'0"–5'3"	2¼"–2½"
5'4"–5'7"	2⅜"–2⅝"
5'8"–5'11"	2⅜"–2⅝"
6'0"–6'4"	2½"–2¾"
Male Elbow Measurements	
Medium Frame	
If elbow breadth is less than those in the table for a specific height, subject is small framed, and if elbow breadth is greater, subject is large framed.	

(*continues*)

TABLE 1.2 Estimating Frame Size Using Elbow Breadth (*continued*)

Height	Elbow Breadth
5'2"–5'3"	2½"–2⅞"
5'4"–5'7"	2⅝"–2⅞"
5'8"–5'11"	2¾"–3"
6'0"–6'3"	2¾"–3⅛"
6'4"–6'7"	2⅞"–3¼"

Data from Deman, F.J., and Ney, D.M., *Applications in Medical Nutrition Therapy*, 2nd ed., (Upper Saddle River, NJ: Merrill-Prenctice Hall, 1996).

TABLE 1.3 Amputation Adjustments for Estimating Ideal Body Weight

Percentage Body Weight Contributed by Body Part	
Hand	0.7%
Forearm and hand (below elbow)	2.3%
Entire arm	5.0%
Foot	1.5%
Lower leg and foot (below knee)	5.9%
Entire leg	16.0%

Data from Linda Kautz Osterkamp, "Current perspective on assessment of human body proportions of relevance to amputees," *Journal of the American Dietetic Association* 95, no. 2 (1995): 215–218.

Amputation Adjustment

For patients with amputations, estimation of IBW should be adjusted with the following equation using the factors in **TABLE 1.3**

$$\frac{100 - \%\text{ amputation}}{100} \times \text{IBW for original height}$$

Spinal Cord Injury Adjustment

For patients with spinal cord injuries, estimation of IBW should be adjusted as follows:

- Paraplegia: subtract 5% to 10% from IBW
- Quadriplegia: subtract 10% to 15% from IBW

Interpretation of Body Weight Data

Percentage of Ideal Body Weight

$$\%\text{IBW} = \frac{\text{current body weight (CBW)}}{\text{IBW}} \times 100$$

Percentage of Usual Body Weight (UBW)

$$\%\text{ usual body weight (UBW)} = \frac{\text{CBW}}{\text{UBW}} \times 100$$

TABLE 1.4 shows how to evaluate % IBW and % UBW data.

Percentage of Weight Change

This calculation is useful in assessing variations from the patient's usual weight, especially in the elderly population where unintentional weight loss is associated with increased morbidity and mortality.[5,6] Once percentage of weight change has been calculated, use **TABLE 1.5** to assess the significance of any weight changes.

$$\%\text{ Weight Change} = \frac{\text{UBW} - \text{CBW}}{\text{UBW}} \times 100$$

TABLE 1.4 Interpreting % IBW and % UBW

% IBW	% UBW	Nutritional Risk
>120	—	Obesity
110–120	—	Overweight
90–109	—	Not at risk
80–89	85–95	Mild
70–79	75–84	Moderate
<70	<75	Severe

TABLE 1.5 Interpreting Unintentional Weight Changes

Time Frame	Significant Weight Loss	Severe Weight Loss
1 wk	1%–2%	>2%
1 mo	5%	>5%
3 mo	7.5%	>7.5%
6 mo	10%	>10%

Data from Academy of Nutrition and Dietetics, "Nutrition Care Manual," accessed June 24, 2019. https://www.nutritioncaremanual.org.

Assessment of Overweight and Obesity

Body Mass Index

BMI, or Quetelet's index, is a direct calculation based on height and weight, regardless of gender, and can be used to assess the severity of obesity. BMI does have limitations, and factors such as age, sex, ethnicity, and muscle mass can influence the relationship between BMI and body fat. In addition, the presence of edema should be considered when interpreting BMI results.[7] See **TABLE 1.6** for classifications of overweight and obesity based on BMI.

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m}^2\text{)}} \quad \text{or} \quad \text{BMI} = \frac{\text{weight (lb)}}{\text{height (in}^2\text{)}} \times 703$$

Waist Circumference and Waist-to-Hip Ratio

The presence of excess fat in the abdomen, out of proportion with total body fat, is an independent predictor of risk factors and morbidity.[7] Two methods for measuring abdominal fat are waist circumference and the waist-to-hip ratio (WHR). Both methods have been used to show increased risk for diabetes, coronary artery disease, and hypertension for those individuals with excess abdominal fat. Some studies suggest that waist circumference is a better predictor of disease risk than WHR, whereas other studies suggest that WHR is a stronger indicator.[7,8] Regardless of which method the clinician uses, measuring abdominal fat can help identify risk level for several chronic diseases (**TABLES 1.6** and **1.7**).

TABLE 1.6 Classification of Overweight and Obesity by BMI, Waist Circumference, and Associated Disease Risk

BMI (kg/m^2)	Weight Status	Obesity Class	Disease Risk[a] Relative to Normal Weight and Waist Circumference	
			Men ≤40" Women ≤35"	Men >40" Women >35"
<18.5	Underweight		—	—
18.5–24.9	Normal		—	—
25.0–29.9	Overweight		Increased	High
30.0–34.9	Obesity	I	High	Very high
35.0–39.9	Obesity	II	Very high	Very high
>40.0	Extreme obesity	III	Extremely high	Extremely high

[a]Disease Risk for type 2 diabetes, hypertension, and cardiovascular disease.

Data from (i) "Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report," National Institutes of Health, accessed June 24, 2019, http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=obesity, and (ii) "About Adult BMI," Centers for Disease Control and Prevention, Division of Nutrition, Physical Activity, and Obesity, accessed June 24, 2019, https://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html.

TABLE 1.7 Waist-to-Hip Ratio

Male	Female	Health Risk
≤0.95	≤0.80	Low risk
0.96–1.0	0.81–0.85	Moderate Risk
≥1.0	≥0.85	High risk

Data from Salim Yusuf, et al., "Obesity and the Risk of Myocardial Infarction in 27,000 Participants from 52 Countries: A Case-Control Study," *Lancet* 366 (2005): 1640–1650.

Estimating Nutrient Requirements

Energy Requirements—Noncritical Care

Many prediction equations and formulas are available for estimating resting metabolic rate (RMR). The Mifflin–St. Jeor (MSJE) and Harris–Benedict (HBE) equations are two widely used formulas for estimating energy expenditure in the noncritically ill population. According to the Academy's Evidence Analysis Library (EAL), the MSJE performed better than the HBE when predicting RMR in both nonobese and obese, noncritically ill populations.[9] Once RMR has been calculated, the total energy expenditure (TEE) would need to be estimated using a combination of activity and stress factors. Stress factors are used for hospitalized patients in a hypermetabolic state owing to disease, infection, or trauma. The clinician's judgment should be used to determine the appropriate activity and/or stress factor to estimate TEE. See **TABLE 1.8** for activity and stress factors.

Mifflin–St. Jeor Equation (MSJE)

$$\text{Females: REE} = 10W + 6.25H - 5A - 161$$
$$\text{Males: REE} = 10W + 6.25H - 5A + 5$$

where, REE, *resting energy expenditure*; W, *actual weight in kilograms*; H, *height in centimeters*; A, *age in years.*

TABLE 1.8 Activity and Stress Factors for Determining Total Energy Expenditure

Condition	Factor
Activity Factors	
Confined to bed	1.2
Ambulatory	1.3
Stress Factors	
Burns	
≤20% BSA	1.5
20%–40% BSA	1.8
>40% BSA (use max. of 60% TBSA)	1.8–2.0
Infection	
Mild	1.2
Moderate	1.4
Severe	1.8

Starvation	0.85
Surgery	
Minor	1.1
Major	1.2
Trauma	
Skeletal	1.2
Blunt	1.35
Closed head injury	1.4

TBSA, total body surface area.

Harris–Benedict Equation (HBE)

$$\text{Females: BEE} = 655.1 + 9.6W + 1.9H - 4.7A$$
$$\text{Males: BEE} = 66.5 + 13.8W + 5.0H - 6.8A$$

where, W, *weight in kilograms (use of actual vs. ideal vs. adjusted body weight is determined by the clinician*);* H, *height in centimeters;* A, *age in years.*

Kilocalories per Kilogram

A fast and easy method for estimating energy needs is using kilocalories per kilogram of body weight, with the reference weight as actual or IBW, based on the clinician's judgment (**TABLE 1.9**).

Energy Requirements—Critical Care

The Academy's EAL recommends that if indirect calorimetry is not available to determine energy requirements for critically ill patients, the Penn State University equations have the best prediction accuracy.[11] For *nonobese*, ventilator-dependent, critically ill patients, and for *obese*, ventilator-dependent, critically ill patients <60 years of age, the EAL recommends using the Penn State equation [PSU(2003b)]. For *obese*,

*The EAL does report that the HBE was most accurate when used with the actual body weight.[10]

ventilator-dependent, critically ill patients >60 years of age, the Modified Penn State equation [PSU(2010)] has better accuracy.

Penn State Equation [PSU(2003b)]

(Use with nonobese and with obese <60 years of age)

$$\text{RMR} = \text{Mifflin}\ (0.96) + V_E\ (31) + T_{max}\ (167) - 6{,}212$$

Modified Penn State Equation [PSU(2010)]

(Use with obese >60 years of age)

$$\text{RMR} = \text{Mifflin}\ (0.71) + V_E\ (64) + T_{max}\ (85) - 3{,}085$$

where, V_E, *expired minute ventilation*; T_{max}, *maximum body temperature in previous 24 hours in degrees Celsius.*

Determining energy requirements for non–ventilator-dependent, critically ill patients is dependent on protocol at each facility and clinician judgment. One method in use is the MSJE modified by a factor of 1.25, although accuracy rates for this equation are only around 50%.[11]

$$\text{RMR} = \text{MSJE} \times 1.25$$

Recommendations by the American Society for Parenteral and Enteral Nutrition (ASPEN) and the Society for Critical Care Medicine (SCCM)

TABLE 1.9 Energy Requirements Based on Kilocalories per Kilogram of Body Weight

Condition	Energy Requirement (kcal/kg)
Normal	25–30
Obese, critically ill (BMI > 30)	11–14 (actual body weight) or 22–25 (ideal body weight)
Stress	
Mild	30–35
Moderate to severe	35–45

Data from (i) Sylvia Escott-Stump, *Nutrition and Diagnosis-Related Care*, 8th ed., (Philadelphia, PA: Wolters Kluwer, 2015), and (ii) Stephen A. McClave, et al., "Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient: Society of Critical Care Medicine and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.)," *Journal of Parenteral and Enteral Nutrition* 33, no. 33 (2009): 277–316.

for kcal/kg energy requirements for the obese, critically ill patient can be found in **TABLE 1.9**.

Protein Requirements

TABLE 1.10 contains protein recommendations for patients with several general conditions. Disease-specific protein requirements can be found in respective chapters.

Fluid Requirements

Methods for estimating fluid requirements for the normal person are typically based on kilocalorie intake (energy method), body weight, fluid balance, or body surface area (BSA). The energy method uses 1 mL/kcal for adults and 1.5 mL/kg for infants. The fluid balance method, which requires the measurement of urine output, is urine output plus 500 mL per day. The BSA method uses 1,500 mL/m^2/day × BSA (see Table 3.7 for calculating BSA).[6] **TABLE 1.11** shows additional methods for estimating fluid requirements based on body weight. Fluid requirements will also depend

TABLE 1.10 Daily Protein Requirements for Hospitalized Patients

Condition	Protein Requirement (g/kg)
Normal–maintenance	0.8–1.0
Metabolic stress	
Mild	1.2–1.5
Moderate to severe	1.5–2.0
Obese, critically ill	2.0 (when using hypocaloric feeding)
Pressure ulcers	1.2–1.5 (stage 1, 2) 1.5–2.0 (stage 3, 4)
Protein repletion	1.2–2.0
Severe trauma, burns	1.5–2.0

Data from (i) Sylvia Escott-Stump, *Nutrition and Diagnosis-Related Care*, 8th ed., (Philadelphia, PA: Wolters Kluwer, 2015), and (ii) Stephen A. McClave, et al., "Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient: Society of Critical Care Medicine and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.)," *Journal of Parenteral and Enteral Nutrition* 33, no. 33 (2009): 277–316, and (iii) European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance, "Prevention and Treatment of Pressure Ulcers/Injuries: Quick-Reference Guide," ed., E. Haesler, EPUAP/NPIA/PPPIA: 2019, page 18.

TABLE 1.11 Estimating Fluid Requirements Based on Body Weight

Method 1 (Adults)	
Body Weight	**Fluid Requirement**
Average adult: 18–54 years	30–35 mL/kg
Older: 55–65 years	30 mL/kg
Elderly: >65 years	25 mL/kg
Method 2 (Commonly Used in Pediatric Populations)	
Body Weight	**Fluid Requirement**
1–10 kg	100 mL/kg
11–20 kg	1,000 mL + 50 mL/kg each kg > 10 kg
>20 kg	1,500 mL + 20 mL/kg each kg > 20 kg

Data from Academy of Nutrition and Dietetics. "Nutrition Care Manual." Accessed June 24, 2019. https://www.nutritioncaremanual.org.

on the medical condition of the patient, with additional or restricted fluids required in certain situations. The individual disease chapters may list fluid requirements for specific conditions.

Biochemical Data

The purpose of collecting laboratory data for nutrition assessment is to determine status inside the body. Blood and urine samples can be used to directly measure a nutrient or metabolite that is affected by the nutrient. Each test is associated with a distinctive sensitivity and specificity. Sensitivity indicates the degree to which the assay for a particular constituent is accurate in determining the amount of that constituent in a sample. Specificity refers to how specific the test is in reflecting a particular function or diagnosis, for example, how specific blood urea nitrogen is for assessing renal function.

Basic concepts in the interpretation of laboratory data include the following: No single test is diagnostic on its own; repeated draws are more valid; there can be diurnal variation for some tests; and some constituents can be affected by other superimposed conditions, diseases, and medications.

Protein Status

Protein status, both visceral protein and somatic protein compartments, were historically an important aspect of nutrition assessment in various settings, including acute care. The three major hepatic proteins used to assess visceral protein are albumin, transferrin, and prealbumin (**TABLE 1.12**). However, these hepatic proteins also reflect the physiologic response to injury, stress, infection, surgery, and trauma.[6] They are negative acute-phase proteins, in that their levels decrease during the physiologic

TABLE 1.12 Visceral Protein Parameters

Protein	Normal Range	Implications and Considerations
Albumin	3.5–5.0 g/dL	Low when visceral protein is depleted; 17–20 d; low in liver disease, malabsorption syndromes, protein-losing nephropathies, ascites, burns, overhydration, inflammation; elevated in dehydration
Fibronectin	220–400 mg/dL	Low when protein is depleted; half-life 15 hr; low in inflammation, injury; affected by coagulation factors
Prealbumin	15–36 mg/dL	Low when visceral protein is depleted; half-life 1.9 d; low in liver disease, burns, inflammation; elevated in nephrotic syndrome, chronic kidney disease, pregnancy, Hodgkin lymphoma
Retinol-binding protein	3–6 mg/dL	Low when visceral protein is depleted; half-life 12 hr; low in chronic pancreatitis or carcinoma, cystic fibrosis, intestinal malabsorption, chronic liver diseases, vitamin A deficiency; elevated in renal failure
Transferrin	188–341 mg/dL	Low when visceral protein is depleted (only if iron status is normal); half-life 8–10 d; low in chronic infection, malignancy; elevated in late pregnancy, use of oral contraceptives, viral hepatitis

Data from Kathleen Pagana, *Mosby's Manual of Diagnostic and Laboratory Tests*, 5th ed., (St. Louis, MO: Elsevier-Mosby, 2014).

response to stress when the liver reprioritizes protein synthesis from visceral proteins to acute-phase reactant proteins. Systemic inflammation, a hallmark of the stress response, not only reduces albumin synthesis but can also increase its degradation and promote transcapillary leakage of albumin.[12] In light of this, markers of protein status, such as albumin and prealbumin, have little value in assessment or monitoring of nutritional status in the acute-care setting. Instead, they can be used in conjunction with positive acute-phase protein lab values, such as C-reactive protein (CRP), to identify patients who might be at nutritional risk because of acute or chronic health conditions that contribute to inflammation. In addition, hypoalbuminemia has been studied extensively among subsets of patients, such as those with burns, pressure ulcers, severe sepsis, cancer, renal disease, and surgical patients, as an important predictor of morbidity and mortality.[13–16] The use of multifactorial prognostic indices may be useful in some situations to predict nutrition risk (see **TABLE 1.13**).

TABLE 1.13 Formulas for Assessment of Nutrition Risk

Risk Assessment	Formula	Interpretation
Nutrition Risk Index	(1.519 × albumin) + (41.7 × % IBW)	>100, no risk 97.5–100, mild risk 83.5–97.5, moderate risk <83.5, severe risk
Prognostic Nutrition Index	158 – 16.6 (albumin) – 0.78 (triceps skin fold in mm) – 0.2 (transferrin) – 5.8 (delayed skin hypersensitivity)	<40, normal ≥40, compromised
Prognostic Inflammatory and Nutritional Index	$\frac{\text{C-reactive protein} \times \text{alpha 1-acid-glycoprotein}}{\text{prealbumin} \times \text{albumin}}$	≤1, no risk 1–10, low risk 11–20, moderate risk 21–30, severe risk

Total lymphocyte count (TLC) reflects visceral protein status; although because of its association with immune system function, it will not be accurate under some circumstances (**TABLE 1.14**).

Another parameter for assessment of visceral protein status is nitrogen balance, although it more properly reflects total body protein (**TABLE 1.15**). Adults are normally in nitrogen balance, in that dietary protein (source of

TABLE 1.14 Total Lymphocyte Count and Visceral Protein Status

Formula: TLC = % of lymphocytes × No. of WBCs (10^3)	
Interpretation (Values in cells/mL^3)	
Normal	>1,500
Mild degree of depletion	1,200–1,500
Moderate degree of depletion	800–1,199
Severe degree of depletion	<800
Affected by Injury, viral infection, radiation therapy, surgery, chemotherapy, and other immunosuppressive medications.	

Note: TLC may not be a reliable indicator of malnutrition in the elderly.

WBCs, white blood cells.

Data from Academy of Nutrition and Dietetics, "Nutrition Care Manual," accessed June 24, 2019, https://www.nutritioncaremanual.org, and (ii)Kathleen Pagana, *Mosby's Manual of Diagnostic and Laboratory Tests*, 5th ed., (St. Louis, MO: Elsevier-Mosby, 2014).

TABLE 1.15 The Use of Nitrogen Balance in Assessment of Total Body Protein

1. Monitor dietary intake of protein (PRO) for 24 hr.
2. Convert dietary protein intake to nitrogen intake:

$$\text{Nitrogen} = \frac{\text{PRO intake}}{6.25\text{ g nitrogen}}$$

3. Collect 24-hr urine; obtain urinary urea nitrogen (UUN).
4. Nitrogen Balance = nitrogen intake – (UUN + 3[a]).
5. Interpretation: Adults are normally in nitrogen balance (0); pregnant women and children (growth states) are in positive balance; negative balance may suggest malnutrition.

[a]Insensible losses.

nitrogen) is used for protein synthesis. When protein degradation exceeds synthesis, a person is in negative nitrogen balance, which occurs in malnutrition. Children and pregnant women are in positive nitrogen balance, because protein synthesis exceeds degradation during phases of growth.

The somatic protein compartment is assessed using both anthropometric and biochemical measurements, the latter through the use of creatinine excretion and nitrogen balance. Creatinine is a catabolic product of creatine phosphate, a compound needed in muscular contraction. It is excreted at a constant daily rate proportional to muscle mass. Kidney disorders and high intake of meat products can raise levels. **TABLE 1.16** provides the formula for calculating creatinine height index and standards for comparison to determine protein depletion severity.

Biochemical assessment also includes review of hematologic parameters, as they may be indicators of nutritionally related anemia (**TABLE 1.17**). Several of these parameters can also be expected to be affected by compromised visceral protein status.

TABLE 1.16 Calculation and Interpretation of Creatinine Height Index

24-Hour Urine Collection; Meat-Free Diet (Ideally); Compare Creatinine with Standard for Height/Gender

$$\%\ \text{CHI} = \frac{\text{24 urinary creatinine} \times 100}{\text{expected 24-hr urinary excretion (mg)}}$$

Interpret: 60%–80%, mild depletion
40%–59%, moderate depletion
<40%, severe depletion

Affected by: Renal dysfunction, advanced age, stress, trauma, sepsis, strenuous exercise, use of corticosteroids

24-Hour Urinary Creatinine Excretion in Adults

Males: 23 mg/kg/IBW		Females: 18 mg/kg/IBW	
Height (cm)	**Creatinine (mg)**	**Height (cm)**	**Creatinine (mg)**
157.5	1,288	147.3	830
160.0	1,325	149.9	851

162.6	1,359	152.4	875
165.1	1,386	154.9	900
167.6	1,426	157.5	925
170.2	1,467	160.0	949
172.7	1,513	162.6	977
175.3	1,555	165.1	1,006
177.8	1,596	167.6	1,044
180.3	1,642	170.2	1,076
182.9	1,691	172.7	1,109
185.4	1,739	175.3	1,141
188.0	1,785	177.8	1,174
190.5	1,831	180.3	1,206
193.0	1,891	182.9	1,240

CHI, creatine height index.

Data from George L. Blackburn, et al., "Nutritional and Metabolic Assessment of the Hospitalized Patient," *Journal of Parenteral and Enteral Nutrition* 1, no. 1 (1977): 11–12.

TABLE 1.17 Hematologic Parameters Related to Anemia

Constituent	Normal Range	Implications and Considerations
Erythrocyte protoporphyrin	<5 µg/dL RBCs	High in later stages of iron-deficiency anemia
Ferritin	Males: 18.0–350 ng/mL Females: 15–49 years: 12.0–156 ng/mL >49 years: 18.0–204 ng/mL	Low in early deficiency state in the presence of depleted iron stores
Folate, RBC content	95 ng/mL	Low in later stages of folate-deficiency anemia
Folate, serum	1.9 ng/mL	Low as folate-deficiency progresses

(*continues*)

TABLE 1.17 Hematologic Parameters Related to Anemia (*continued*)

Constituent	Normal Range	Implications and Considerations
Hematocrit	Males: 41%–50% Females: 35%–46%	Low in anemia; represents percentage of RBCs in total blood volume
Hemoglobin	Males: 14.0–17.2 g/dL Females: 12.0–15.6 g/dL	Low in anemia; represents total amount of hemoglobin in RBCs
Mean corpuscular hemoglobin concentration	32–36 g/dL	Low in iron-deficiency anemia (hypochromic); normal in B_{12} and folate deficiency (normochromic); represents hemoglobin (pigmentation) contained in an average RBC
RBC count	Male: 4.4–5.8 × 10^6 µL Female: 3.9–5.2 × 10^6 µL	Low in anemia; the number of RBCs in sample
Transferrin	188–341 mg/dL	High in iron-deficiency anemia as transport of iron increases
Vitamin B_{12}	200–800 pg/mL	Low in B_{12} deficiency

RBC, red blood cell.
Data from Kathleen Pagana, *Mosby's Manual of Diagnostic and Laboratory Tests*, 5th ed., (St. Louis, MO: Elsevier-Mosby, 2014).

Nutrition-Focused Physical Examination

Physical assessment is a vital part of the nutrition assessment of a patient. The goal is to identify signs and symptoms that may be associated with specific nutrient deficiencies and compromised nutritional status or malnutrition.

In 2010, an etiology-based approach to the diagnosis of adult malnutrition in the clinical setting was developed by an international committee.[17] Adult malnutrition is now described in the context of acute illness or injury, chronic diseases or conditions, and starvation-related malnutrition.

Six characteristics were identified as vital in the detection and diagnosis of malnutrition: insufficient energy intake, weight loss, loss of subcutaneous body fat, loss of muscle mass, fluid, accumulation that may mask weight loss, and diminished functional status. As no single parameter is definitive for adult malnutrition, two or more of the six characteristics are recommended for diagnosis (**TABLE 1.18**).

The NFPE is conducted to help identify malnutrition by determining fat loss, muscle loss, and presence of edema (**TABLE 1.19**), as well as to identify possible nutrient deficiencies (**TABLE 1.20**).

The Subjective Global Assessment (SGA) is another nutrition assessment tool that has been found to be highly predictive of nutrition-associated complications.[18] The SGA uses patient assessment data such as weight, intake, functional status, disease state, symptoms, metabolic stress, and physical examination to assess and monitor risk for malnutrition and to evaluate effects of interventions. An online, Scored Patient-Generated SGA is available for health professionals to utilize at http://pt-global.org.

Patient History

A comprehensive nutrition assessment includes many aspects of the patient's history. The main types of history include health or medical, medications, personal, and food and nutrition. Sources for the historical information include the medical record, the patient, and significant others.

The health or medical history identifies factors that affect nutrient needs or nutrition education needs or that place the client at risk for poor nutrition status. One important component is the nutritional relevance of the current diagnosis (**TABLE 1.21**). The diagnosis may present a specific level of risk based on the potential to adversely affect nutritional status. In addition to the disease's potential to alter nutritional status, the degree of risk posed to an individual patient depends on several factors, including its duration and severity, the presence of other physiologic stressors, and the individual (genetics, age, and nutritional status). Some diseases are nutritionally relevant because of the likelihood of the need for nutrition intervention.

The medication history identifies substances that can affect nutrient needs or alter nutritional status. This includes prescribed medications,

TABLE 1.18 Determining Adult Malnutrition

Context of Malnutrition	Chronic Illness		Acute Illness or Injury		Social/Environmental Circumstances	
Degree of Malnutrition	**Malnutrition of Moderate Degree**	**Severe Protein-Calorie Malnutrition**	**Malnutrition of Moderate Degree**	**Severe Protein-Calorie Malnutrition**	**Malnutrition of Moderate Degree**	**Severe Protein-Calorie Malnutrition**
Energy intake: Compare recent intake with estimated energy needs and report inadequate intake as a percentage of estimated needs over time.	<75% of estimated energy requirement for ≥1 mo	≤75% of estimated energy requirement for ≥1 mo	<75% of estimated energy requirement for >7 d	≤50% of estimated energy requirement for ≥5 d	<75% of estimated energy requirement for ≥3 mo	≤50% of estimated energy requirement for ≥1 mo
Weight loss: Evaluate weight in light of other clinical findings including hydration. Report weight change over time as a percentage of weight lost from baseline.	5% in 1 mo 7.5% in 3 mo 10% in 6 mo 20% in 12 mo	>5% in 1 mo >7.5% in 3 mo >10% in 6 mo >20% in 12 mo	1–2% in 1 wk 5% in 1 mo 7.5% in 3 mo	>2% in 1 wk >5% in 1 mo >7.5% in 3 mo	5% in 1 mo 7.5% in 3 mo 10% in 6 mo 20% in 12 mo	>5% in 1 mo >7.5% in 3 mo >10% in 6 mo >20% in 12 mo

Body fat: Loss of subcutaneous fat (orbital, triceps, fat overlying ribs).	Mild depletion	Severe depletion	Mild depletion	Moderate depletion	Mild depletion	Severe depletion
Muscle mass: Loss of muscle (temples, clavicles, shoulders, scapula, thigh, calf).	Mild depletion	Severe depletion	Mild depletion	Moderate depletion	Mild depletion	Severe depletion
Fluid accumulation: General or local fluid accumulation (extremities, ascites, or vulva/scrotal edema).	Mild	Severe	Mild	Moderate to severe	Mild	Severe
Functional status: Based on standards supplied by manufacturer of dynamometer.	Not applicable	Measurably reduced	Not applicable	Not recommended in intensive care setting	Not applicable	Measurably reduced

Reprinted by permission from Jane V. White, et al., "Consensus Statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (Undernutrition)," *Journal of Parenteral and Enteral Nutrition* 112, no. 5 (2012): 730–738, © 2013 by Elsevier, available at: http://www.iamtouchpoint.com/pages/home.aspx.

TABLE 1.19 Nutrition-Focused Physical Examination: Malnutrition Assessment

Fat Area	Normal	Mild to Moderate	Severe
Orbital region—surrounding the eye (fluid retention may mask loss)	Slightly bulged fat pads	Slightly darker circles; somewhat hallow look	Dark circles; hallow look; depression; loose skin
Upper arm region—triceps/biceps	Large space between fingers when pinching	Some depth pinch but not ample; fingers almost touch	Very little space between folds, fingers touch
Thoracic and lumbar region—ribs, lower back, midaxillary line	Chest is full; ribs do not show; slight to no protrusion of the iliac crest	Ribs apparent; depressions between them less pronounced; iliac crest somewhat prominent	Depression between the ribs very apparent; iliac crest very prominent
Muscle Area	**Normal**	**Mild to Moderate**	**Severe**
Temple region—temporalis muscle	Can see/feel well-defined muscle	Slight depression	Hollow; scooping depression
Clavicle and acromion bone region—deltoid muscle	Rounded curves at arm/shoulder/neck	Acromion process may slightly protrude	Shoulder to arm joint looks square; bones prominent; acromion protrusion very prominent
Clavicle bone region—pectoralis major, deltoid, trapezius muscles	Not visible in male; visible but not prominent in female	Visible in male; some protrusion in female	Protruding, prominent bone

Scapular bone region—trapezius, supraspinatus, infraspinatus muscles	Bones not prominent; no significant depressions	Mild depression or bone may show slightly	Prominent, visible bones; depressions between ribs/scapula or shoulder/spine
Dorsal hand—interosseous muscle	Muscle bulges could be flat in some well-nourished people	Slightly depressed	Depressed area between thumb–forefinger
Patellar region—quadriceps muscle	Muscles protrude; bones not prominent	Knee cap less prominent; more rounded	Bones prominent; little sign of muscle around knee
Anterior thigh region—quadriceps muscles	Well rounded; no depressions	Mild depression on inner thigh	Depression/line on thigh; obviously thin
Posterior calf region—gastrocnemius muscle	Well-developed bulb of muscle	Not well developed	Thin; minimal to no muscle definition
Edema	Normal	Mild to Moderate	Severe
Edema—rule out other causes of edema; patient at dry weight	No sign of fluid accumulation	Mild to moderate pitting; slight swelling of the extremity; indentation subsides quickly (0–30s)	Deep to very deep pitting; depression lasts a short to moderate time (31–60s); extremity looks swollen (3–4+)

Adapted with permission from TouchPoint Support Services. Atlanta, GA. Available at: http://www.iamtouchpoint.com/pages/home.aspx.

TABLE 1.20 Nutrition-Focused Physical Examination: Nutrient Deficiency Assessment

	Observed Conditions		
Body System	**Healthy**	**Abnormal**	**Implications**
Hair	Normal distribution, shiny	Thin, dull, dry, brittle, corkscrew hairs	Chemotherapy, protein or biotin deficit, vitamin C deficiency
Eyes	Bright, clear, pink conjunctiva	Sunken, dull, pale, dry conjunctiva, photophobia, xerosis	Deficiency of: Vitamin A, zinc, riboflavin
Lips	Moist, good color	Swollen, dry, red, cracked	Deficiency of riboflavin, pyridoxine, niacin
Gums	Pink, firm	Sore, spongy, red, swollen, bleed easily	Vitamin C deficiency
Tongue	Pink, presence of papillae	Purple, white or gray coating, smooth, slick	Deficiency of riboflavin, pyridoxine, folic acid, niacin, vitamin B_{12}, iron
Teeth	Clean, intact, all present	Dentures, missing teeth, loss of tooth enamel	Calcium deficiency, poor diet
Neck	No swelling	Presence of nodule(s), goiter	Excess or deficiency of iodine
Skin	Smooth, slightly moist, good color	Pale, dry, scaly, bruises easily, pressure ulcers, dermatitis	Deficiency of iron, vitamins A or C, zinc, essential fatty acid, protein; excess of niacin

Legs	Well-developed, firm musculature, no joint or bone pain	Calf tenderness, flaccid muscles, pain, edema, rickets, bone or joint pain	Deficiency of protein; vitamins A, C, or D; calcium
Abdomen	No swelling or pain	Mildly edematous, diarrhea, ascites	Deficiency of protein, niacin, zinc
Hands/nails	Smooth	Brittle nails, atrophied fine muscles, spoon-shaped nails	Deficiency of protein, iron
Musculoskeletal, adipose	Normal bone, muscle, and fat development	Calf tenderness, loss of subcutaneous fat, emaciated appearance, pain, decreased grip strength, hollow cheeks, fractures, osteoporosis	Deficiency of protein, thiamin, vitamin C; energy or fluid deficit
Neurologic	Normal reflexes	CVA, limited reflexes, disorientation, paralysis, convulsions, dementia	Deficiency of thiamin, niacin, vitamins B_6 or B_{12}, folic acid, iodine, phosphorus, calcium, magnesium

CVA, cerebrovascular accident.
Data from Sylvia Escott-Stump, *Nutrition and Diagnosis-Related Care*, 8th ed., (Philadelphia, PA: Wolters Kluwer, 2015).

over-the-counter (OTC) medications, and dietary supplements (see Appendix B). Personal history includes several aspects of psychosocial and lifestyle patterns that may affect nutrient needs, influence food choices, or limit therapy options. The food and nutrition history identifies food

TABLE 1.21 Nutritionally Relevant Conditions

AIDS-HIV	Dehydration	Multiple sclerosis
Alcohol and/or drug abuse	Diabetes	Nephrotic syndrome
Cachexia	Dysphagia	Neutropenia
Cancer	Eating disorders	Obesity
Celiac disease	Gastrointestinal bleeding	Pancreatitis
Cerebrovascular accident	Hepatic encephalopathy	Parkinson disease
Chronic obstructive pulmonary disease	Hepatitis	Peritonitis
Cirrhosis	Hypertension	Pressure ulcers
Coronary heart disease (MI)	Inflammatory bowel disease	Renal failure
Crohn's disease	Malabsorption	Sepsis
	Malnutrition	Tuberculosis

MI, myocardial infarction.

Data from Academy of Nutrition and Dietetics, Evidence Analysis Library, "Energy Expenditure: Evidence Analysis: Estimating RMR with Prediction Equations," last modified 2006, http://www.eatrightpro.org/resources/research/evidence-based-resources/evidence-analysis-library.

consumption patterns, specific nutrient intake and imbalances, reasons for potential nutrition problems, and dietary factors important for shaping the nutrition care plan. **TABLE 1.22** lists general information for all categories of history in addition to specific information to collect from the patient or the medical record.

Food and Nutrition History

A comprehensive food and nutrition history (diet history) is generally not possible with most patients in the acute care setting, although components of the history are vital in nutrition assessment. In other practice settings, it is both possible and desirable to collect detailed information of this type. The goal of a food and nutrition history is to identify nutrient intake and imbalances, the reasons for potential food and nutrition problems, and all dietary factors important in generating the nutrition diagnosis and subsequent intervention. The following types of data are needed: Food

TABLE 1.22 Patient History Categories

History Category	Specific Information
Health/Medical	
Current health status and diagnoses	Date of first diagnosis Previous education on diagnosis
Previous medical history and health status	Specific family members affected by nutritionally relevant disease and onset age
Family history	Recent diagnostic procedures requiring NPO status
Surgical history	Difficulty chewing (state of dentition) or swallowing Chronic gastrointestinal problems (diarrhea, constipation, nausea, vomiting)
Medications	
Prescription medications	Use of multiple medications
OTC medications	Duration of medication use
Dietary supplements (nutrient, herbal, essential nutrients)	Frequency of use (chronic or as needed) Changes in sense of smell or taste related to medications
Illegal drugs	Previous education on potential interactions
Personal	
Age	Income
Gender	Use of or eligibility for government programs
Cultural/ethnic identity	Communication barriers
Occupation/economic status	Cognitive function
Role in family	Smoking
Educational level	Ability to perform daily functions
Motivational level	Person responsible for grocery shopping, meal preparation Access to transportation Recent loss of spouse

(*continues*)

TABLE 1.22 Patient History Categories (*continued*)

History Category	Specific Information
Food and Nutrition/Diet	
Food intake	Food intolerances or allergies
Eating habits and patterns	Appetite (current and prior to admission) Weight history (recent weight loss in particular) Physical handicaps affecting food preparation or intake Typical daily intake (types and amounts of foods and beverages consumed) Meal pattern Religious dietary restrictions
Lifestyle patterns	Ethnic dietary habits Alcohol consumption Frequency of dining out; types Exercise, physical activity (type and frequency) Attitude regarding diet and health Previous diet instruction (location, year, topic) Interest in diet instruction or outpatient counseling Stage of change/readiness to learn

OTC, over the counter.

intake, eating habits and patterns, and lifestyle patterns related to nutrition and health. If it is likely the patient will require bedside instruction, and depending on the diagnosis, more detailed information about the patient's food intake may need to be collected.

Of the various methods for obtaining a patient's food intake, the most practical in the acute or extended care settings are the typical daily intake (TDI) (**TABLE 1.23**) and simplified food frequency (FF) (**TABLE 1.24**). In the TDI, the patient is asked what he or she typically eats on a daily basis. In contrast to a 24-hour food recall, in which the patient recounts his or her intake beginning with the last meal eaten, the TDI begins with the

TABLE 1.23 Typical Daily Intake Form

Meal Timing	Food Item	Amount	Where Eaten
Sample Form			

TABLE 1.24 Food Frequency Form

Food Item/Group	Amount/Day	Amount/Week
Milk or other dairy products (yogurt, cheese)		
Meat, poultry, eggs		
Fish		
Nuts, legumes, and legume products		
Fruits		
Vegetables		
Starches (breads, cereals, grains)		
Fats, added (oils, margarine, salad dressing)		
Snack foods (chips, pretzels, crackers)		
Desserts/sweets		
Dining out		
Fast food		
Restaurant dining		
Beverages		
Alcohol		
Coffee, tea		
Carbonated beverages		
Fruit juices		

first meal of the day. To avoid a judgmental approach, it is best not to label meals as breakfast, lunch, and dinner, but rather based on time of day. For example, you could ask, "What is the first thing you would eat or drink when you get up in the morning?"

TABLE 1.25 Evaluation of Dietary Intake

Group	Servings/Day	Recommended	Adequate/Excess
Dairy			
Protein			
Fruit			
Vegetable			
Starch			
Fat/sweets			
Overall Diet Adequacy: ___ yes ___ no			
Specific Nutrients:			
Deficit of: ___ kcals ___ PRO ___ fiber ___ Vit A ___Vit C ___ Fe ___ Ca ___ Other			
Excess of: ___ kcals ___ Fat ___ SFA ___ Chol ___ Sugar ___ Alcohol ___ Na			
Other: ______________________			
Summary:			
PRO, protein; Fe, iron; Ca, calcium; SFA, saturated fatty acid; Chol, cholesterol; NA, sodium			

A simplified FF is not as detailed as a comprehensive FF questionnaire but is advantageous for two reasons. The first advantage is that the simplified FF is a quick method for determining whether the patient avoids any major category of food, and the second is that it will provide a crosscheck of the TDI. After collecting the food intake information, it is compared with an appropriate standard, such as the Dietary Guidelines for Americans or the Dietary Reference Intakes. A simplified evaluation form of general aspects of diet can also be used (**TABLE 1.25**).

References

1. Academy of Nutrition and Dietetics. "Nutrition Terminology Reference Manual (eNCPT): Dietetics Language for Nutrition Care." Accessed June 24, 2019. http://ncpt.webauthor.com.
2. RxKinetics. "Estimating height in bedridden patients." Accessed June 24, 2019. http://www.rxkinetics.com/height_estimate.html.

3. Shah, Bhumika, Kathryn Sucher, and Clarie B. Hollenbeck. "Comparison of Ideal Body Weight Equations and Published Height-Weight Tables with Body Mass Index Tables for Healthy Adults in the United States." *Nutrition in Clinical Practice* 21 (2006): 312–319.
4. Government of the United States. "Calculating body frame size." US National Library of Medicine (NLM). Accessed June 24, 2019. http://www.nlm.nih.gov/medlineplus/ency/imagepages/17182.htm.
5. Gaddey, Heidi, and Kathryn Holder. "Unintentional Weight Loss in Older Adults." *American Family Physician* 89, no. 9 (2014): 718–722.
6. Academy of Nutrition and Dietetics. "Nutrition Care Manual." Accessed June 24, 2019. https://www.nutritioncaremanual.org.
7. Government of the United States. "Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report." National Institutes of Health. Accessed June 24, 2019. http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=obesity.
8. Singh, Rohit, M. Prakash, Radhika Dubey, Kaushik Roy, Atul Kotwal, and Ajoy Mahen. "Body Composition Parameters as Correlates of Coronary Artery Disease." *The Indian Journal of Medical Research* 138, no. 6 (2013): 1016–1019.
9. Academy of Nutrition and Dietetics, Evidence Analysis Library. "Energy Expenditure: Evidence Analysis: Estimating RMR with Prediction quations." Accessed June 24, 2019. http://www.eatrightpro.org/resources/research/evidence-based-resources/evidence-analysis-library.
10. Academy of Nutrition and Dietetics, Evidence Analysis Library. "Energy Expenditure: Evidence Analysis: Harris-Benedict." Accessed June 24, 2019. http://www.eatrightpro.org/resources/research/evidence-based-resources/evidence-analysis-library.
11. Academy of Nutrition and Dietetics, Evidence Analysis Library. "Critical Illness: Critical Illness Guidelines: Determination of Resting Metabolic Rate." Accessed June 24, 2019. http://www.eatrightpro.org/resources/research/evidence-based-resources/evidence-analysis-library.
12. Huckleberry, Yvonne. "Nutritional Support and the Surgical Patient." *American Journal of Health System Pharmacy* 61, no.7 (2004): 671–682.
13. Aguayo-Becerra, Olivia Alejandra, Carlos Torres-Garibay, Michel Dassaejv Macías-Amezcua, Clotilde Fuentes-Orozco, Mariana de Guadalupe Chávez-Tostado, Elizabeth Andalón-Dueñas, Arturo Espinosa Partida, Andrea Del Socorro Álvarez-Villaseñor, Ana Olivia Cortés-Flores, and Alejandro González-Ojeda. "Serum Albumin Level as a Risk Factor for Mortality in Burn Patients." *Clinics (Sao Paulo, Brazil)* 6, no. 7 (2013): 940–945.
14. Matthew Y. Lin, Wendy Y. Liu, Amy M. Tolan, Armen Aboulian, Beverley A. Petrie, Bruce E. Stabile. "Preoperative Serum Albumin but not Prealbumin Is an Excellent Predictor of Postoperative Complications and Mortality

in Patients with Gastrointestinal Cancer." *The American Surgeon* 77, no. 10 (2011): 1286–1289.

15. Peralta, R. "Hypoalbuminemia" Accessed June 24, 2019. http://emedicine.medscape.com/article/166724-overview#a6.
16. Eljaiek, Roberto, and Marc-Jacques Dubois. "Hypoalbuminemia in the First 24 Hours of Admission with Organ Dysfunction in Burned Patients." *Burns* 39, no. 1 (2012): 113–118.
17. White, Jane V., Peggi Guenter, Gordon Jensen, Ainsley Malone, and Marsha Schofield. "Consensus Statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (undernutrition)." *Journal of the Academy of Nutrition and Diet* 112, no. 5 (2012): 275–283, 730–738.
18. Jeejeebhoy, Khursheed. "Subjective Global Assessment: A Highly Reliable Nutritional Assessment Tool." Accessed June 24, 2019. http://subjectiveglobalassessment.com/.