MANUAL OF CLINICAL NUTRITION MANAGEMENT

MORRISON
HEALTHCARE FOOD SERVICES

MANUAL OF CLINICAL NUTRITION MANAGEMENT

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STATEMENT ON NUTRITIONAL ADEQUACY

The Dietary Reference Intakes (DRIs) of the Food and Nutrition Board of the Institute of Medicine, National Academy of Sciences, are used as the standard for determining the nutritional adequacy of the regular and modified diets outlined in this manual. The DRIs consist of four reference intakes:

- Recommended Daily Allowances (RDA), a reference to be used as a goal for the individual
- Tolerable Upper Intake Level (UL), which is given to assist in advising individuals what levels of intake may result in adverse effects if habitually exceeded
- Estimated Average Requirement (EAR), the intake level at which the data indicate that the needs for 50% of individuals consuming this intake will not be met
- Adequate Intake (AI), a level judged by the experts developing the reference intakes to meet the needs of all individuals in a group but which is based on fewer data and substantially more judgment than used in establishing an EAR and subsequently the RDA

An AI is given when the RDA cannot be set. Both of these reference intakes are to be used as goals to plan and assess diets for healthy individuals (1). The DRIs do not cover special needs for nutrients due to various disease conditions. Reference values that are appropriate for both assessing population intakes and planning diets have not been established and are being addressed by a Subcommittee of the DRI activity on Interpretation and Uses of the DRIs. Until these values are established, the DRIs, as now recommended, will be used as the reference values (1).

The sample menus throughout this manual have been planned to provide the recommended DRIs for men, 31 to 50 years of age, unless indicated otherwise, and have been analyzed by a nutrient analysis software program. For specific values, refer to the following tables of recommended DRIs from the National Academy of Sciences, Food and Nutrition Board. However, it is acknowledged that nutrient requirements vary widely. The dietitian can establish an adequate intake on an individual basis.

Reference

1. Yates AA, Schlicker SA, Suitor CW. Dietary Reference Intakes: The new basis for recommendations for calcium and related nutrients, B vitamins, and choline. *J Am Diet Assoc*. 1998;98:699-706.

FOOD AND NUTRITION BOARD, INSTITUTE OF MEDICINE – NATIONAL ACADEMY OF SCIENCES
DIETARY REFERENCE INTAKES: RECOMMENDED LEVELS FOR INDIVIDUAL INTAKE[a]

Life-stage group	Calcium (mg/d)	Phosphorus (mg/d)	Magnesium (mg/d)	Vitamin D[bc] (µg/d)	Fluoride (mg/d)	Thiamin (mg/d)	Riboflavin (mg/d)	Niacin[d] (mg/d)	Vitamin B-6 (mg/d)	Folate[e] (µg/d)	Vitamin B-12 (µg/d)	Pantothenic Acid (mg/d)	Biotin (µg/d)	Choline[f] (mg/d)
Infants														
0 – 6 mo	210*	100*	30*	5*	0.01*	0.2*	0.3*	2*	0.1*	65*	0.4*	1.7*	5*	125*
7 – 12 mo	270*	275*	75*	5*	0.5*	0.3*	0.4*	4*	0.3*	80*	0.5*	1.8*	6*	150*
Children														
1 – 3 y	500*	**460**	**80**	5*	0.7*	**0.5**	**0.5**	**6**	**0.5**	**150**	**0.9**	2*	8*	200*
4 – 8 y	800*	**500**	**130**	5*	1*	**0.6**	**0.6**	**8**	**0.6**	**200**	**1.2**	3*	12*	250*
Males														
9 – 13 y	1,300*	**1,250**	**240**	5*	2*	**0.9**	**0.9**	**12**	**1.0**	**300**	**1.8**	4*	20*	375*
14 – 18 y	1,300*	**1,250**	**410**	5*	3*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	25*	550*
19 – 30 y	1,000*	**700**	**400**	5*	4*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	30*	550*
31 – 50 y	1,000*	**700**	**420**	5*	4*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	30*	550*
51 – 70 y	1,200*	**700**	**420**	10*	4*	**1.2**	**1.3**	**16**	**1.7**	**400**	**2.4**[g]	5*	30*	550*
> 70 y	1,200*	**700**	**420**	15*	4*	**1.2**	**1.3**	**16**	**1.7**	**400**	**2.4**[g]	5*	30*	550*
Females														
9 – 13 y	1,300*	**1,250**	**240**	5*	2*	**0.9**	**0.9**	**12**	**1.0**	**300**	**1.8**	4*	20*	375*
14 – 18 y	1,300*	**1,250**	**360**	5*	3*	**1.0**	**1.0**	**14**	**1.2**	**400**[h]	**2.4**	5*	25*	400*
19 – 30 y	1,000*	**700**	**310**	5*	3*	**1.1**	**1.1**	**14**	**1.3**	**400**[h]	**2.4**	5*	30*	425*
31 – 50 y	1,000*	**700**	**320**	5*	3*	**1.1**	**1.1**	**14**	**1.3**	**400**[h]	**2.4**	5*	30*	425*
51 – 70 y	1,200*	**700**	**320**	10*	3*	**1.1**	**1.1**	**14**	**1.5**	**400**	**2.4**[g]	5*	30*	425*
> 70 y	1,200*	**700**	**320**	15*	3*	**1.1**	**1.1**	**14**	**1.5**	**400**	**2.4**[g]	5*	30*	425*
Pregnancy														
≤ 18 y	1,300*	**1,250**	**400**	5*	3*	**1.4**	**1.4**	**18**	**1.9**	**600**[i]	**2.6**	6*	30*	450*
19 – 30 y	1,000*	**700**	**350**	5*	3*	**1.4**	**1.4**	**18**	**1.9**	**600**[i]	**2.6**	6*	30*	450*
31 – 50 y	1,000	**700**	**360**	5*	3*	**1.4**	**1.4**	**18**	**1.9**	**600**[i]	**2.6**	6*	30*	450*
Lactation														
≤ 18 y	1,300*	**1,250**	**360**	5*	3*	**1.5**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*
19 – 30 y	1,000*	**700**	**310**	5*	3*	**1.5**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*
31 – 50 y	1,000*	**700**	**320**	5*	3*	**1.5**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*

[a] Recommended Dietary Allowances (RDAs) are presented in **bold type** and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). RDAs and AIs may both be used as goals for individual intake. RDAs are set to meet the needs of almost all (97% to 98%) individuals in a group. For healthy breast-fed infants, the AI is the mean intake. The AI for other life-stage and gender groups is believed to cover needs of all individuals in the group, but lack of data or uncertainty in the data prevent being able to specify with confidence the percentage of persons covered by this intake. Source: The National Academy of Sciences. ©1998.

[b] As cholecalciferol. 1 µg cholecalciferol = 40 IU vitamin D.

[c] In the absence of adequate exposure to sunlight.

[d] As niacin equivalents (NE). 1 mg niacin = 60 mg tryptophan; 0 to 6 mo = preformed niacin (not NE).

[e] As dietary folate equivalent (DFE). 1 DFE = 1 µg food folate = 0.6 µg folic acid (from fortified food or supplement) consumed with food = 0.5 µg synthetic (supplemental) folic acid taken on an empty stomach.

[f] Although AIs have been set for choline, there are few data to assess whether a dietary supply of choline is needed at all stages of the life cycle, and it may be that the choline requirement can be met by endogenous synthesis at some of these stages.

[g] Because 10% to 30% of older people may malabsorb food-bound vitamin B-12, it is advisable for those older than 50 years to meet their RDA mainly by consuming foods fortified with vitamin B-12 or a supplement containing vitamin B-12.

[h] In view of evidence linking folate intake with neural tube defects in the fetus, it is recommended that all women capable of becoming pregnant consume 400 synthetic folic acid from fortified foods and/.or supplements in addition to intake of food folate from a varied diet.

[i] It is assumed that women will continue consuming 400 µg folic acid until their pregnancy is confirmed and they enter prenatal care, which ordinarily occurs after the end of the periconceptional period – the critical time for formation of the neural tube.

FOOD AND NUTRITION BOARD, NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL
RECOMMENDED DIETARY ALLOWANCES,[a] REVISED 1989 (Abridged)
Designated for the maintenance of good nutrition of practically all healthy people in the United States

Category	Age (years) or Condition	Weight (kg)	Weight (lb)	Height (cm)	Height (in)	Protein (g)	Vitamin A (µg RE)[c]	Vitamin K (µg)	Iron (mg)	Zinc (mg)	Iodine (µg)
Infants	0.0-0.5	6	13	60	24	13	375	5	6	5	40
	0.5-1.0	9	20	71	28	14	375	10	10	5	50
Children	1-3	13	29	90	35	16	400	15	10	10	70
	4-6	20	44	112	44	24	500	20	10	10	90
	7-10	28	62	132	52	28	700	30	10	10	120
Males	11-14	45	99	157	62	45	1,000	45	12	15	150
	15-18	66	145	176	69	59	1,000	65	12	15	150
	19-24	72	160	177	70	58	1,000	70	10	15	150
	25-50	79	174	176	70	63	1,000	80	10	15	150
	51+	77	170	173	68	63	1,000	80	10	15	150
Females	11-14	46	101	157	62	46	800	45	15	12	150
	15-18	55	120	163	64	44	800	55	15	12	150
	19-24	58	128	164	65	46	800	60	15	12	150
	25-50	63	138	163	64	50	800	65	15	12	150
	51+	65	143	160	63	50	800	65	10	12	150
Pregnant						60	800	65	30	15	175
Lactating	1st 6 months					65	1,300	65	15	19	200
	2nd 6 months					62	1,200	65	15	16	200

Note: This table does not include nutrients for which Dietary Reference Intakes have recently been established (see *Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride* [1997] and *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12}, Pantothenic Acid, and Choline* [1998]).

[a]The allowances, expressed as average daily intakes over time, are intended to provide for individual variations among most normal persons as they live in the United States under usual environmental stresses. Diets should be based on a variety of common foods in order to provide other nutrients for which human requirements have been less well defined.
[b] Weights and heights of Reference Adults are actual medians for the U.S. population of the designated age, as reported by NHANES II. The median weights and heights of those under 19 years of age are taken from Hamill et al. (1979). The use of these figures does not imply that the height-to-weight ratios are ideal.
[c] Retinol equivalents. 1 retinol equivalent = 1µg retinol or 6 µg ß-carotene.
[d] a-Tocopherol equivalents. 1 mg d-a tocopherol = 1 a-TB.

FOOD AND NUTRITION BOARD, INSTITUTE OF MEDICINE – NATIONAL ACADEMY OF SCIENCES
DIETARY REFERENCE INTAKES: RECOMMENDED LEVELS FOR INDIVIDUAL INTAKE[1]

Life-stage group	Vitamin C (mg)	Vitamin E (mg/d)[d]	Selenium (µg)	Life-stage group	Vitamin C (mg)	Vitamin E (mg/d)[d]	Selenium (µg)
Infants				Females			
0 – 6 mo	40 (AI)[e]	4 (AI)[e]	15 (AI)[e]	9 – 13 y	45	11	40
7 – 12 mo	50 (AI)[e]	6 (AI)[e]	20 (AI)[e]	14 – 18 y	65	15	55
Children				19 – 30 y	75	15	55
1 – 3 y	15	6	20	31 – 50 y	75	15	55
4 – 8 y	25	7	30	51 – 70 y	75	15	55
Males				> 70 y	75	15	55
9 – 13 y	45	11	40	Pregnancy			
14 – 18 y	75	15	55	≤ 18 y	80	15	60
19 – 30 y	90	15	55	19 – 50 y	85	15	60
31 – 50 y	90	15	55	Lactation			
51 – 70 y	90	15	55	≤ 18 y	115	19	70
> 70 y	90	15	55	19 – 50 y	120	19	70

[d] a-Tocopherol equivalents. 1 mg d-a tocopherol = 1 a-TB
[e] AI = Adequate Intake

Reference

[1] Food and Nutrition Board, Institute of Medicine - National Academy of Sciences. Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium and Cartenoids. Available at: http://www.nap.edu/readingroom/books/dri_vitaminc/summary.pdf on 4/24/00.

Dietary Reference Intakes: Tolerable Upper Intake Levels (UL[a]) for Certain Nutrients and Food Components
Food and Nutrition Board, Institute of Medicine-National Academy of Sciences

Life-Stage Group	Calcium (g/day)	Phosphorus (g/day)	Magnesium (mg/day)[b]	Vitamin D (µg/day)	Fluoride (mg/day)	Niacin (mg/day)[c]	Vitamin B_6 (mg/day)	Synthetic Folic Acid (µg/day)[c]	Choline (g/day)	Vitamin C (mg/day)[c1]	Vitamin E (mg/d)[bc1]	Selenium (mg/d)[1]
0-6 months	ND[d]	ND	ND	25	0.7	ND	ND	ND	ND	ND	ND	45
7-12 months	ND	ND	ND	25	0.9	ND	ND	ND	ND	ND	ND	60
1-3 years	2.5	3	65	50	1.3	10	30	300	1.0	400	200	90
4-8 years	2.5	3	110	50	2.2	15	40	400	1.0	650	300	150
9-13 years	2.5	4	350	50	10	20	60	600	2.0	1,200	600	280
14-18 years	2.5	4	350	50	10	30	80	800	3.0	1,800	800	400
19-70 years	2.5	4	350	50	10	35	100	1,000	3.5	2,000	1,00	400
> 70 years	2.5	3	350	50	10	35	100	1,000	3.5	2,000	1,000	400
Pregnancy												
≤ 18 years	2.5	3.5	350	50	10	30	80	800	3.0	1,800	800	400
19-50 years	2.5	3.5	350	50	10	35	100	1,000	3.5	2,000	1,000	400
Lactation												
≤ 18 years	2.5	4	350	50	10	30	80	800	3.0	1,800	800	400
19-50 years	2.5	4	350	50	10	35	100	1,000	3.5	2,000	1,000	400

[a] The UL for magnesium represents intake from a pharmacological agent only and does not include intake from food and water.
[b] The ULs for niacin and synthetic folic acid apply to forms obtained from supplements, fortified foods, or a combination of the two.
[c] ND: Not determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.
[d] a-Tocopherol equivalents. 1 mg d-a tocopherol = 1 a-TB.

Reference
[1] Food and Nutrition Board, Institute of Medicine - National Academy of Sciences. Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium and Cartenoids. Available at: http://www.nap.edu/readingroom/books/dri_vitaminc/summary.pdf on 4/24/00.

VITAMINS AND MINERALS AS SUPPLEMENTS AND THERAPEUTIC AGENTS STATEMENT OF THE AMERICAN DIETETIC ASSOCIATION (ADA)

'It is the position of The American Dietetic Association that the best nutritional strategy for promoting optimal health and reducing the risk of chronic disease is to obtain adequate nutrients from a wide variety of foods. Vitamin and mineral supplementation is appropriate when well-accepted, peer-reviewed, scientific evidence shows safety and effectiveness (1).'

Recommendations regarding supplementation and the therapeutic use of vitamins and minerals for treating specific conditions may be found in the corresponding sections of this manual.

Under the Dietary Supplement Health and Education Act of 1994, manufacturers must adhere to restrictions regarding the types of claims that are allowed on product labels. Statements regarding the efficacy of specific products in the treatment or prevention of particular conditions are prohibited. A claim statement is allowed if the

> "statement claims a benefit related to a classical nutrient deficiency disease and discloses the prevalence of such disease in the United States, describes the role of a nutrient or dietary ingredient intended to affect the structure or function in humans, characterizes the documented mechanism by which a nutrient or dietary ingredient acts to maintain such structure or function, or describes general well-being from consumption of a nutrient or dietary ingredient (1)."

The manufacturer must specify that the claims are truthful and not misleading. The following statement must also accompany any claims: "This statement has not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease (1)". In addition, all supplements must have the identity and strength of contents listed on the label, and meet appropriate specifications for quality, purity and composition (2).

References

1. Position of The American Dietetic Association: vitamin and mineral supplementation. *J Am Diet Assoc.* 1996;96:73.
2. Dietary Supplement Health and Education Act of 1994. Pub No. 103-417, 108 stat 4325.

DIETARY GUIDANCE FOR THE HEALTHY UNITED STATES POPULATION

Title and Organization

		Health Organization	Federal Government Agencies					Other Scientific Groups	
		Healthy Start… Food to Grow On (1)	Nutrition and Your Health: Dietary Guidelines for Americans (2) and Food Guide Pyramid (3)	Food, Nutrition and the Prevention of Cancer: a Global Perspective (4)	The Surgeon General's Report on Nutrition and Health (5)	The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (6)	Report of the Expert Panel on Blood Cholesterol Levels in Children and Adolescents (7)	Diet and Health: Implications for Reducing Chronic Disease Risk (8)	Recommended Dietary Allowances (9) Dietary Reference Intakes (10)
Type of Guidance (General or Specific)		Healthy Children	General	Cancer	General	Heart Disease	Heart Disease	General	General
Maintain Reasonable Body Weight		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fats (%kcal)	Total-Limit or Reduce	<30%	<30%	To <30%	Yes	<30%	<30%	<30%	<30%
Fats (%kcal)	Saturated-Reduce	<10%	≤10%	*	Yes	<10%	<10%	<10%	<10%
Fats (%kcal)	Polyunsaturated-Limit or Reduce	*	*	*	*	<10%	<10%	≤10%	≤10%
Cholesterol-Limit or Reduce		<300 mg/day	<300 mg/day	*	Yes	<300 mg/day	<300 mg/day	<300 mg/day	<300 mg/day
Carbohydrates	Complex-Increase	Eat more foods high in complex carbohydrates	Eat more foods high in complex carbohydrates	≥7 servings grains and legumes and ≥5 servings fruits and vegetables/day	Eat more foods high in complex carbohydrates	*	*	≥55% of calories with ≤6 servings grains and legumes and ≥5 servings of fruits and vegetables/day	Yes
Carbohydrates	Fiber-Increase	Eat more foods with fiber	Eat more foods with fiber	*	Eat more foods with fiber	*	*		Eat fiber containing foods
Carbohydrates	Refined Sugar-Limit or Reduce	Yes	Yes	Yes	Yes, especially children	*	*	Do not increase	Yes
Sodium-Limit or Reduce		Yes	Yes	2,400 mg sodium or ≤6 g salt/day	Yes	2,300 mg sodium/day	*	2,400 mg sodium or ≤6 g salt/day	Minimum of 0.5 g/day
Alcohol-in Moderation if at all		*	No more than 1 drink/day for women and 2 drinks/ day for men	Not recommended. If consumed, limit to 1 ounce/day	Yes	Yes	*	Not recommended. If consumed, limit to 1 ounce/day	*

References

1. Food Marketing Institute, American Dietetic Association, American Association of Pediatrics. *Healthy Start… Food to Grow on*. Washington, DC: Food Marketing Institute; 1991.
2. *Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2000.* Available at: www.ars.usda.gov/dgac/dgacguidexp.pdf on February 15, 2000.
3. *The Food Guide Pyramid. A Guide to Daily Food Choices.* Washington, DC: US Department of Agriculture, Human Nutrition Information Services; 1992. Home and Garden Bulletin No. 252.
4. *Food, Nutrition and the Prevention of Cancer: A Global Perspective*. Washington, DC: American Institute for Cancer Research; 1997.
5. *The Surgeon General's Report on Nutrition and Health.* Washington, DC: US Departments of Agriculture and Health and Human Services; 1988. DHHS (PHS) Publ. 88-50210.
6. The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Arch Intern Med.* 1997; 157: 2413-2444.
7. *Report of the Expert Panel on Blood Cholesterol Levels in Children and Adolescents.* Bethesda, MD: US Departments of Health and Human Services and Public Health Service, National Institutes of Health, National Heart, Lung, and Blood Institute, American Academy of Pediatrics; 1991.
8. Committee on Diet and Health. *Diet and Health: Implications for Reducing Chronic Disease Risk*. Washington, DC: National Academy Press; 1989.
9. Food and Nutrition Board. *Recommended Dietary Allowances.* 10th ed. Washington, DC: National Academy Press; 1989.
10. Yates AA, Schlicker SA, Suitor CW. Dietary Reference Intakes: The new basis for recommendations for calcium and related nutrients, B vitamins, and choline. *J Am Diet Assoc.* 1998; 98: 699-706.

REGULAR DIET- ADULT

Description
The diet includes a wide variety of foods to meet nutritional requirements and individual preferences of healthy adults. It is used to promote health and reduce the risks of developing major, chronic, or nutrition-related disease.

Indications
The diet is served when specific dietary modifications are not required.

Nutritional Adequacy
The diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in *Statement on Nutritional Adequacy* in Section IA.

How to Order the Diet
Order as “Regular Diet,” indicating any special instructions.

Planning the Diet
The *Dietary Guidelines* (1) and portion sizes from the *Food Guide Pyramid* (2) are used as the basis for planning the menu. Since the *Dietary Guidelines* are for healthy Americans, modifications may be required in health care settings that treat ill patients. While patients are hospitalized, the main goal is to encourage food intake, which frequently requires “comfort foods,” such as soup, sandwiches, and other foods the patient is accustomed to. With that consideration, the number of servings of foods from each food group may differ from the *Food Guide Pyramid* recommendations. However, the meal will still be planned to meet the DRI whenever possible.

Dietary Guidelines for Americans (1)

- Aim for a healthy weight.
- Be physically active each day.
- Let the Pyramid guide your food choices.
- Eat a variety of grains daily, especially whole grains.
- Eat a variety of fruits and vegetables daily.
- Keep food safe to eat.
- Choose a diet that is low in saturated fat and cholesterol and moderate in total fat.
- Choose beverages and foods that limit your intake of sugars.
- Choose and prepare foods with less salt.
- If you drink alcoholic beverages, do so in moderation.

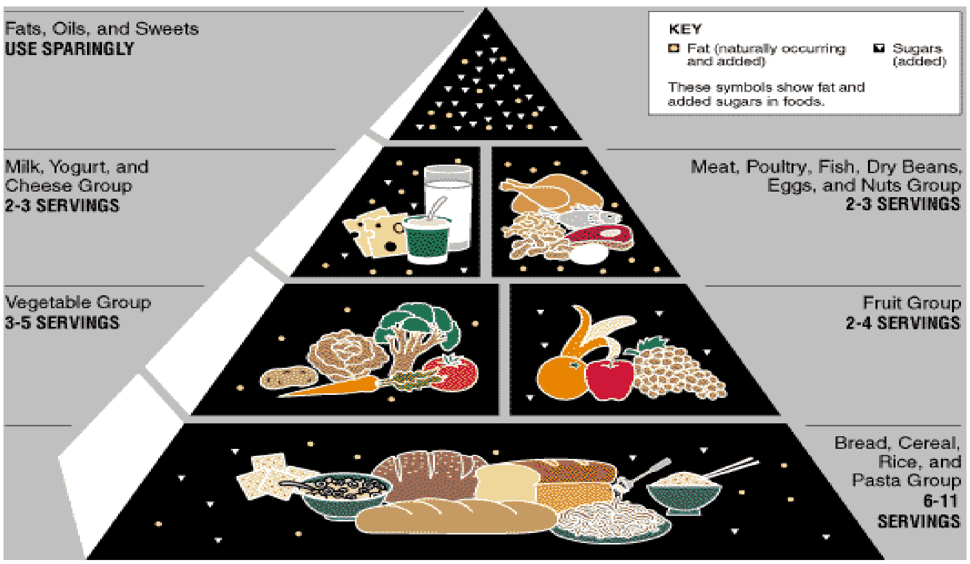
FOOD GUIDE FOR AMERICANS (2)

Food Group	Recommended Daily	Serving Size
Bread, Cereal, Rice, and Pasta	6-11 servings Include several whole-grain products daily.	1 slice of bread 2 large or 4 small crackers 1/2 cup cooked cereal, rice, or pasta 1 ounce ready-to-eat cereal 1 small roll, muffin, or biscuit 1/2 English muffin, bagel, hamburger bun, or large roll
Vegetables Dark green and deep yellow Starchy: peas, corn and potatoes Legumes: beans	3-5 servings Consume dark-green leafy and deep-yellow vegetables several times a	1 cup of raw leafy vegetables: spinach, lettuce 1/2 cup of other vegetables, cooked or chopped raw 3/4 cup of vegetable juice
Fruits Citrus, melon, berries Other fruits	2-4 servings Consume citrus fruits, melon, and regularly.	Medium-size orange, apple, or banana 1/2 cup of chopped, cooked, or canned fruit 3/4 cup of 100% fruit juice
Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts	2-3 servings Choose fish, dry beans, peas, poultry without skin, and lean meat.	2-3 ounces of cooked fish, poultry, or lean meat 1 cup cooked beans 1 egg

Food Guide For Americans (cont.)

Food Group	Recommended Daily	Serving Size
Milk, Yogurt, and Cheese	2-3 servings Choose skim milk and nonfat yogurt. Choose part-skim and lowfat cheeses.	1 cup of milk or yogurt 1 1/2 ounces of natural cheese (mozzarella, Swiss, cheddar) 2 ounces of processed cheese (American)
Fats, Oils, and Sweets	Use sparingly	

THE FOOD GUIDE PYRAMID



SAMPLE MENU

Breakfast	**Noon**	**Evening**
Orange Juice	Honey Glazed Chicken	Braised Beef and Noodles
Cream of Wheat	Rice Pilaf	Seasoned Green Beans
Scrambled Egg	Steamed Broccoli with Carrots	Sliced Tomato Salad
Biscuit	Orange Mousse	French Dressing
Margarine	Whole-wheat Roll	Peach halves
Jelly	Margarine	Dinner Roll
Milk	Frosted Banana Cake	Margarine
Coffee	Milk	Iced tea
Sugar	Tea	Sugar
Creamer	Sugar	

References

1. *Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2000.* Available at: www.ars.usda.gov/dgac/dgacguidexp.pdf on February 15, 2000.
2. *The Food Guide Pyramid. A Guide to Daily Food Choices* Washington, DC: US Department of Agriculture, Human Nutrition Information Services; 1992. Home and Garden Bulletin No. 252.

HIGH-PROTEIN, HIGH-CALORIE DIET

Description

Additional foods and supplements are added to meals or between meals to increase protein and energy intake.

Indications

A high-protein, high-calorie diet is served when protein and energy requirements are increased by stress, protein loss (protein losing enteropathy, nephrotic syndrome), and catabolism. This diet may be indicated in patients with:

- protein-energy malnutrition
- failure to thrive
- cancer
- burns
- cystic fibrosis
- human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS)
- chronic gastrointestinal diseases

This diet may also be indicated in preparation for surgery. An increase in energy is required to promote the efficient utilization of proteins for anabolism.

Nutritional Adequacy

Since no dietary constituents are eliminated, this diet is as adequate in nutrients as the Regular Diet.

How to Order the Diet

Order as "High-Protein, High-Calorie Diet." The dietitian determines a target level of protein and energy to meet individual needs based on guidelines as stated in Estimation of Energy Requirements and Estimation of Protein Requirements in Section II.

Planning the Diet

The diet is planned as a Regular Diet with addition of between-meal supplements that increase energy intake by at least 500 kcal and protein intake by 25 g for adults. Examples of high-protein, high-energy supplements are milk shakes, eggnogs, puddings, custards, and commercial supplements.

For children, the diet generally should provide 120% to 150% of the Dietary Reference Intakes (DRIs) for energy and protein. The actual amounts of energy and protein provided will depend on the child's or adolescent's age, height, weight, medical status, and nutrition goals.

IMMUNOCOMPROMISED DIET (Neutropenic Diet)

Description
The Immunocompromised Diet eliminates certain foods in order to serve a diet requiring a lower level of bacteria than is present in a typical hospital diet. Foods from the Regular Diet are served with the exception of raw fruits and vegetables, meat cooked less than well done, cured meats, yogurt, aged cheese and prepared salads.

Indications
Data suggest that taking measures to reduce the introduction of potentially pathogenic organisms into the gastrointestinal tract may be warranted for patients with severe immunodeficiency diseases, with bone marrow failure, or following intensive chemotherapy for malignancy (1).

When the white blood cell count is below 500 cells/mm^3, it is appropriate to make efforts to reduce the bacteria in the diet (2). As the white blood count reaches or exceeds this level, a less strict diet can be considered.

Nutritional Adequacy
The Immunocompromised Diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA.

How to Order the Diet **For CMC, CIR and University facilities, CLICK HERE.**
Order as "Immunocompromised Diet" or "Neutropenic Diet."

Planning the Diet
The diet does not differ significantly from the Regular Diet except it eliminates foods that are higher in pathogenic organisms. Although raw fruits and vegetables are eliminated, the Fred Hutchinson Cancer Research Center (3) allows raw fruits and vegetables (including peel) if they have been washed under "running water," except raw vegetable sprouts.

There is little evidence in the literature to support the "Immunocompromised Diet." The diet outlined below is the consensus of staff members of individual hospitals, not a consensus from the literature.

Foods to Exclude
Vegetables: all raw vegetables; prepared salads (2,4-6)
Fruits: all raw fruits; prepared salads (2,4-6)
Meats, poultry, fish, eggs: raw or undercooked products; cured, smoked or pickled meats, such as bacon, sausage, luncheon meats, and lox; shellfish (2-4,6)
Milk, yogurt, cheese: raw milk/milk products, yogurt, aged cheese, such as Brie, Camembert, blue, sharp cheddar, and feta (2-4,6)
Fats, oils: refrigerated cheese-based salad dressing, such as blue cheese, that is not shelf stable (2-4,6)

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NUTRITION MANAGEMENT DURING PREGNANCY AND LACTATION

Description
Diets for pregnant and lactating women include additional servings of food from the Regular Diet to meet the increased requirement for nutrients during pregnancy and lactation.

Nutritional Adequacy
The food patterns given will meet the Dietary Reference Intakes (DRIs) for pregnancy and lactation as outlined in the *Statement on Nutritional Adequacy* in Section IA, except for iron during the second and third trimesters of pregnancy. Factors that may increase nutritional requirements above the estimated demands of pregnancy include poor nutritional status; young maternal age; multiple pregnancy; closely spaced births; breast-feeding one or more children during pregnancy; continued high level of physical activity; certain disease states; and use of cigarettes, alcohol, and legal or illegal drugs. Dietary intake of iron, folate, zinc, protein, and calcium should be carefully assessed for adequacy (1). Supplementation is justified when evidence suggests inadequate intake of specific nutrients that increase the risk of an adverse effect on the mother, fetus, or pregnancy outcome. Vegetarians who exclude all animal products need 2 mg of vitamin B_{12} daily (1).

How to Order the Diet
Order as "Regular Diet—Pregnancy" or "Regular Diet—Lactation." Any special instructions should be indicated in the diet order.

Planning the Diet

Daily Food Group Guidelines (2)
<u>No. of Servings</u>

Food Group	**Pregnant**	**Lactating**
Grains, Breads, Cereals	9	6-11
Fruits	3	2-4
Vegetables	4	3-5
Low-Fat Meat, Fish, Eggs, Poultry	2 or more (5-7 oz)	2 or more (7-8 oz)
Low-Fat Milk, Yogurt, Cheese	3-4	4-5
Fats, Sweets	As needed to provide energy	

Specific Nutrient Requirements During Pregnancy
Energy: The National Academy of Sciences, Food and Nutrition Board (FNB) has stated that a range of optimal weight gain depends on the weight of the mother at the beginning of pregnancy (1). The optimum weight gain for a woman of normal prepregnancy weight, for her height, carrying a single fetus is 25 to 35 lb. The pattern of weight gain is of greater significance than the absolute weight gain. The desired pattern of weight gain is approximately 3 to 8 lb in the first trimester and about 1 lb per week during the last two trimesters.

Body mass index (BMI), defined as weight/height^2, is a better indicator of maternal nutritional status than is weight alone. (See Body Mass Index in Section II) To identify the weight for height categories and appropriate weight gain, use the following table (1)

Table IA-1: Evaluation of Weight Gain After the First Trimester of Pregnancy

BMI	**Recommended Rate of Weight Gain**	**Intervention Suggested**	**Overall Weight Gain**
<19.8 (underweight)	1.1 lb/wk	<2 lb/mo	28-40 lb
19.8-26.0 (normal weight)	1 lb/wk	<2 lb/mo >6.5 lb/mo	25-30 lb
>26.0 to 29.0 (overweight)	0.66 lb/wk	>3.5 lb/wk <1 lb/wk	15-25 lb
>29.0 (obese)	Individualized	<l lb/wk >2.5 lb/wk	At least 15 lb

Women with a height under 62 inches should strive for weight gains at the lower end of the range (2). For twins, a woman should gain 35 to 45 pounds; for triplets, 45 to 55 pounds (2).

On the average, each successive birth contributes an additional two pounds above that normally gained with age. However, women with high gestational weight gains may surpass this average (1).

Energy: FNB has recommended an intake of 300 kcal/day in addition to normal energy needs, which may be estimated by using the Harris-Benedict equation (3). This normally results in a total of approximately 2,200 to 2,500 kcal/day for the average size pregnant woman, or about 15% over her usual intake.

Protein: FNB recommends 50 g of protein per day for the reference nonpregnant woman with an additional 10 g/day throughout pregnancy (3). Protein utilization depends on energy intake. Therefore, adequate energy intake is important so that protein may be spared.

Vitamins and minerals: Routine supplementation is recommended only if the usual dietary intake of a nutrient is likely to be inadequate to produce essential compounds for body function or there may be adverse effects on the health of the mother, fetus, or newborn. Research has shown iron to be the only known nutrient for which requirements cannot be met reasonably through diet alone (1).

Iron: So that a woman meets the required additional 30 mg of ferrous iron per day during pregnancy, a low-dose supplement is recommended during the last two trimesters (1,3). An iron supplement containing 150 mg of ferrous sulfate, 300 mg of ferrous gluconate, or 100 mg of ferrous fumarate can provide this additional need. Iron deficiency anemia is the most common anemia during pregnancy. If the maternal iron stores are low, 60 to 120 mg may be recommended (3) in addition to a multiple vitamin supplement containing 15 mg of zinc and 2 mg of copper. If the laboratory values indicate macrocytic anemia, vitamin B_{12} and folate levels should be assessed (1).

Folate: The DRI for folate for women 19 to 50 years of age is 400 μg/day. This level of folate is to be consumed through synthetic folic acid from fortified food or supplements or both, in addition to intake of folate from a varied diet (4). Studies have documented that women taking folic acid at the time of conception are less likely to give birth to a child with neural tube defects (5-8). It also has been reported that women taking multivitamins containing folic acid 1 to 2 months before conception have a reduced risk of having a child with orofacial clefts (9).

Calcium: A daily intake of 1,000 mg is recommended for pregnant and lactating women (10) older than 19 years of age.

Sodium: Sodium is required during pregnancy for the expanding maternal tissue and fluid compartments and to provide fetal needs. Routine sodium restriction is not recommended (3).

Vitamin A: High doses of vitamin A during pregnancy have resulted in children with birth defects of the head, heart, brain, or spinal cord. The Food Drug Administration (FDA) and the Institute of Medicine recommend that vitamin A intake be limited to a DRI of 5,000 IU during pregnancy (10-12). In addition, pregnant women should limit their intake of liver and fortified cereals. The FDA recommends that women of childbearing age choose fortified foods that contain vitamin A in the form of beta carotene rather than preformed vitamin A whenever possible. A high intake of fruits and vegetables rich in beta carotene and other carotenoids is not a concern (11).

Fluids: Adequate fluid intake is extremely important. It is recommended that pregnant women drink 2 to 3 qt a day (13).

Fiber: Ingestion of fiber is important to speed digestion and help prevent constipation and hemorrhoids.

Other Substances

Alcohol: The consumption of alcohol during pregnancy may result in fetal alcohol syndrome (FAS). Studies suggest that even light to moderate drinking may cause neurologic abnormalities not detectable at birth. Since a safe level has not been determined, it is recommended that pregnant women abstain from alcohol (14).

Caffeine: Studies on caffeine consumption are inconclusive. Some studies have found no adverse effects as a result of caffeine consumption, while others noted an increase in stillbirths, spontaneous abortions, and malformations in pregnant women who consumed high levels of caffeine. Until further evidence provides guidelines for setting a specific limit on caffeine intake, it is recommended to limit caffeine consumption during pregnancy (2, 15, 16).

Olestra: Studies of the fat substitute olestra conclude that pregnant or breast-feeding women should not consume products containing olestra. Olestra has been shown to cause gastrointestinal distress and diarrhea, which may lead to the loss of the necessary fat-soluble vitamins A, D, E, and K (17).

Sugar substitutes: In general, sugar substitutes should be consumed in moderation during pregnancy. Research continues to indicate that aspartame is safe during pregnancy. There is limited evidence that saccharin can pass through the placenta, so avoidance of saccharin is recommended. Acesulfame K crosses the placenta, but it has shown no adverse effect on the fetus and is considered safe (18).

Risk Factors During Pregnancy

Women should be evaluated for factors that may put them at risk while they are pregnant. If any of the following risks are identified, appropriate medical and nutritional monitoring should be provided throughout the pregnancy.

Risk factors at the onset of pregnancy

- Adolescence: younger than 15 years at time of conception or less than 3 years of age since onset of menses
- Older than 35 years of age
- Three or more pregnancies within 2 years
- History of poor obstetric or fetal performance
- Economic deprivation
- Unusual dietary practices
- Heavy smoker (>10 cigarettes per day)
- Excessive alcohol intake
- Drug addiction
- Chronic systemic disease
- Prepregnancy BMI under 19.8 or over 29.0
- Multiple gestation

Risk factors during pregnancy

- Hemoglobin level below 11 g/dL; or hematocrit below 32%
- Inadequate weight gain: Below 1 lb/month for very overweight women
  Below 2 lb/month for normal or slightly overweight women
  Below 4 lb/month for women with multiple gestation and underweight women
- Excessive weight gain (more than 2 lb/week after first trimester), possibly associated with fluid retention
- Serum folate level below 3 mg/dL
- Serum albumin level below 2.5 g/dL
- Total serum protein level below 5.5 g/dL
- Vitamin B_{12} level below 80 pg/mL

Special Considerations for the Adolescent

In a pregnant adolescent, the combination of the growing adolescent and the growing fetus presents an increase in nutritional needs and places the mother at nutritional risk. The increased needs include:

Protein: Young teens aged 11 to 14 years may need up to 1.7 g/kg of protein and those 15 to 18 years of age may need 1.5 g/kg (14).

Energy: Evaluate teens individually according to age and prepregnancy weight. Consider energy requirements for normal growth of the teenager plus the additional weight gain needed for pregnancy. For some adolescents, the general recommended additional 300 kcal/day may be adequate when added to the adolescent's current energy need. Usually, pregnant adolescents should consume at least 2000 kcal/day.

Calcium: 1,300 mg day (10).

Gastrointestinal Discomfort

Nausea and vomiting: The most common complaint during the first 3 months of pregnancy is nausea or morning sickness. The current trend in dealing with nausea is a recommendation for consuming lemonade and potato chips rather than just ginger ale and saltines; it is also important to minimize exposure to strong odors (18). Other suggestions to provide dietary relief are as follows (13,14):

- Eat small, frequent meals and snacks
- Select low-fat, protein foods and easily digested carbohydrate foods
- Eat dry crackers before rising in the morning
- Avoid spicy foods and gas-forming fruits and vegetables

- Drink fluids between meals
- Avoid drinks with caffeine or alcohol

Pregnancy-Induced Hypertension (13,14)
Hypertension, proteinuria, and edema characterize pregnancy-induced hypertension (PIH), also called preeclampsia. Preeclampsia occurs more often in primigravid women and in women over 35 years old.

PIH is also associated with marked changes in renal function that may lead to excessive extracellular fluid retention. When PIH is accompanied by convulsions, it is called eclampsia. Preeclampsia usually occurs after the 20th week of conception. It is more common among adolescents, underweight women who fail to gain weight properly, and low-income populations, and when there are multiple fetuses.

There is no evidence of a nutritional basis for the disease, but a well-balanced diet is advisable. Adequate calcium, protein, energy, and potassium are necessary. Sodium intake should not be excessive but should not be less than 2 g/day. Diuretics should be avoided unless given under strict medical supervision.

Specific Nutrient Requirements During Lactation
Energy: It is assumed that 3 kg of fat stored by the woman during pregnancy is available during the first 3 postpartum months. The average energy costs of lactation are an additional 500 kcal/day (5) in the first 6 months and 400 kcal/day in the second 6 months (3). However, the energy content of the diet should be adjusted based on the woman's milk production and rate of weight loss. Excessive restriction of energy may compromise milk production. Consumption of less than 1,800 kcal/day may result in a decrease in milk production.

Protein: An additional 15 g of protein over the DRI is required during lactation (1).

Fluids: Intake of 2 to 3 qt of fluid daily is encouraged to compensate for the volume of milk produced.

Alcohol: Discourage consumption of alcohol unless permitted by the physician.

Caffeine: Limit consumption to two 5-oz cups of coffee (<200 mg) daily (13).

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NUTRITION AND THE OLDER ADULT

Aging is a process that occurs throughout life. Its impact, however, is often ignored until adulthood. Progressive changes in body composition, sensory perception, functional status and physiologic functioning occur at all ages. The rate of change is strongly influenced by the genetic background and life experiences of the individual (1-3).

Older adults display wide individual variations in aging processes and thus in nutritional needs and concerns. Maximizing and maintaining adult potential becomes the major health care objective. The nutritional care goal is to provide education and support to achieve this objective as decreases in metabolic needs, declining activity levels, illness, infirmity, economic hardship, loss of social support systems, and other variables mandate adjustments in food intake.

Each older adult should be viewed as a unique individual. Chronological age and functional capacity do not directly correlate. Diversity increases with age (4). Provision of quality nutritional care requires the regular, systematic, longitudinal assessment of each older individual as well as a nutritional care plan based on specific needs identified. The least restrictive regimen possible should be implemented.

Dietary Considerations for the Older Adult

Although the DRIs are the same for all people over 51 years of age, there are special considerations for the elderly defined as 65 to 74 years old, the moderately old defined as 74 to 84 years old, and the very old defined as more than 85 years old.

Taste and smell dysfunction tends to begin at around 60 years of age and becomes more severe in persons over 70 (5). Two thirds of persons over 75 years of age are edentulous. More sweet flavorings or salty foods may be required to satisfy the appetite of elderly individuals.

Energy and Nutrient Considerations

Basal metabolic rate (BMR) decreases 2% with each decade of life; lean body mass declines 6% with each decade and is usually replaced with fat. As BMR decreases with advancing age and physical activity is reduced, energy needs decrease. The DRI recommends an average reduction of 600 kcal/day for men and 300 kcal/day for women after 51 years of age (4). Meeting the nutritional needs of the older adult is challenging because although caloric needs decrease, protein, vitamins and minerals remain the same or increase. The average daily calorie intake for persons over 51 years of age is 2300 calories for men and 1900 calories for women. Health problems arise when the caloric intake is less than 1500 kcal per day (6).

In 1989, the Food and Nutrition Board concluded that protein should be 0.8 g/kg daily for adults of all ages (4). However, recent studies recommend protein be increased to 1 g/kg daily (7-10) or 12% to 14% of total energy intake for the elderly.

Metabolic and physical changes that affect the status of vitamin B_6, B_{12}, and folic acid may alter behavior and general health, whereas adequate intake of these nutrients prevents some decline in cognitive function associated with aging (11). Deficiencies of these nutrients, along with inadequate intake of vitamin C and riboflavin, may result in poor memory (11). Immune function affected by nutritional status may be improved by an increased intake or supplementation of protein, vitamins B_6 and E, and zinc.

Vitamin D levels may be reduced in the elderly even with adequate exposure to the sunlight, and deficiency may be exacerbated by homebound status, use of sun block, poor dietary intake, decreased capabilities to synthesize cholecalciferol in the skin, and decreased number of gastrointestinal receptors (6,14,15). Supplementation of vitamin D and calcium may reduce the incidence of hip fractures and may increase bone density (9,16).

Dehydration is a major problem for the elderly. Water intake needs are the same for the young and the old, but the elderly are prone to inadequate water intake. Frequently, diseases will reduce the ability to recognize thirst, create an inability to express thirst, or decrease access to water (9,17). Even healthy elderly persons appear to have reduced thirst in response to fluid deprivation. Fear of incontinence and difficulty making trips to the toilet, due to arthritic pain or other immobility, may also interfere with adequate fluid consumption (9). The elderly should be encouraged to ingest about 2 L of fluid per day or 30 cc/kg body weight.

Contributors to Poor Nutritional Status in the Elderly

A variety of factors may contribute to poor nutritional status as individuals age (18-22). Table IA-2 lists some of the factors frequently identified as potential causes of malnutrition. These must be kept in mind when evaluating nutritional status and when developing a care plan to prevent, delay, or correct problems identified. For some conditions, cure is not possible but ameliorative or palliative nutritional interventions are often indicated (21,22). Improvement in the quality of life will frequently ensue.

Table IA-2: Contributors to Malnutrition in Older Adults (18-22)

Nutritional	Psychological
Alcohol/addictive substances	Bereavement
Decreased appetite	Change in body habits
Drug-nutrient interactions (prescription and over-the-counter drugs)	Confusion
	Depression
Inappropriate food intake	Fear
Increased nutrient requirements	Withdrawal
Overly restrictive dietary prescriptions	
Physical	**Social**
Acute/chronic disease	Fixed income/poverty
Changes in body composition	Ignorance
Changes in organ system structure/function	Isolation
Changes in sensory perception	Limited food procurement, preparation, storage
Dependence/disability	Capability
Infirmity/immobility	Reliance on economic assistance programs
Poor dentition/ill-fitting dentures	

Other Dietary Considerations

- Minimize dietary restrictions to encourage better food intake.
- Encourage adequate intake of foods high in fiber. Include foods that can be easily chewed and not cause gastrointestinal discomfort.
- Hyponatruria is often seen in the hospitalized patient. Sodium-restricted diets should be used with caution in the elderly.
- The hospitalized elderly patient frequently has a low level of albumin. Response to medical nutrition therapy to improve the albumin level is longer in the older individual.
- Failure to thrive is a growing problem in the aging population. Depression, use of many medications, underlying medical illnesses, and other factors should be addressed to correct this condition.

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MECHANICAL SOFT (DENTAL SOFT) DIET

Description
The diet is a modification of the Regular Diet for the edentulous patient who has difficulty in chewing or swallowing, for the patient who has undergone temporomandibular joint (TMJ) surgery, or for the patient who is advancing in his or her dysphagia rehabilitation. For the greatest variety of foods, all foods that are easily masticated are included in the diet.

Indications
The Mechanical Soft Diet is indicated for the patient who has difficulty in chewing or swallowing.

Nutritional Adequacy
The diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA.

How to Order the Diet **For CHS facilities, CLICK HERE.**
Order as "Mechanical Soft Diet," "Dental Soft Diet," or "Dysphagia Advanced Diet." Any specific instructions should be indicated in the diet order.

"Non-chewing Diet" or "TMJ Diet" needs to be indicated to identify this variation of the Mechanical Soft Diet. For the patient progressing in dysphagia rehabilitation, any additional needs such as thickened liquids should be specified in the diet order.

Planning the Diet
The menu selection and the individual patient tolerances should be considered when planning a Mechanical Soft Diet.

SAMPLE MENU

Breakfast	Noon	Evening
Orange Juice	Honey Glazed Chicken, Chopped	Braised Beef (chopped) & Noodles
Cream of Wheat	Baked Potato With Margarine	Seasoned Green Beans
Scrambled Egg	Soft Cooked Broccoli	Peach Halves
Biscuit	Orange Mousse	Dinner Roll
Margarine	Dinner Roll	Margarine
Jelly	Margarine	Soft Cookie
Milk	Frosted Banana Cake	Iced Tea
Coffee	Milk	Sugar
Sugar	Tea	
Creamer	Sugar	

FOOD GUIDE

FOOD GROUP	RECOMMENDED	MAY CAUSE DISTRESS
Beverages	All	None
Breads and Crackers	Soft breads, rolls Plain crackers softened in soup or beverage Pancakes; plain muffins Biscuits	Breads with nuts Breads with thick crusts Breads with raisins if not tolerated Hard crackers
Cereals and Grains	Cooked cereals Well-moistened dry cereals Pasta; noodles; rice	Cereals with raisins or nuts Granola-type cereals
Vegetables and Potatoes	Potatoes: baked, boiled, mashed Vegetable juices All tender soft-cooked vegetables	Raw or cooked vegetables with tough skins or seeds; fried vegetables; raw vegetables
Fruits and Juices	Fruit juices Ripe banana, melon, peeled peaches, pear, strawberries, seedless grapes Applesauce Any cooked or frozen fruit Citrus sections Stewed prunes; other tender stewed dried fruit Canned peaches, pears, apricots, pineapple, fruit cocktail	Fruit with tough skin if not tolerated (eg, raw apple, dried fruit)
Meat, Fish, Poultry, Cheese, Eggs, Legumes	Tender meat, fish, or poultry Soft cheese Chopped or ground meats, poultry Soft casseroles Meat, fish, or egg salads Hard cooked or scrambled eggs Peanut butter; liverwurst	Tough fibrous meats (eg, sausage casings) Fried egg
Fats	All	
Soups	Most soups	Soups with tough meats or vegetables
Desserts	Cake; tender cookies Ice cream; sherbet; gelatin; custard; pudding Pie: cream, custard, pumpkin, soft fruit pies Flavored yogurt	Desserts containing nuts, coarse dried fruit, or tough fruit Desserts baked to a hard consistency
Sugar and Sweets	Soft candy Jelly; smooth jams	Candy containing tough fruits or nuts, hard candy

Diet following temporomandibular joint surgery: Foods such as breads, crackers, and cookies should be broken up into small pieces before eating so as to avoid biting down or opening the mouth wide. Foods that may not be tolerated include: toast, meats not ground, snack chips, foods containing coconut, corn.

PUREED DIET

Description
The diet is soft in texture and mechanically nonirritating. Foods prepared on the Pureed Diet follow the standards of the Morrison *Classic Puree* program (In *Recipe Implementation and Resource Guide*. Smyrna, Ga; Morrison Management Specialists; 1998): smooth and thickened.

Indications
The Pureed Diet is used for patients with problems in chewing and swallowing or esophageal inflammation or varices.

Nutritional Adequacy
The diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA.

How to Order the Diet **For CMC, CIR, University facilities, CLICK HERE.**
Order as "Pureed Diet." For the patient in dysphagia rehabilitation, order the diet "Dysphagia Pureed" and the liquid consistency specified. Include any other special instructions. See Full Liquid Blenderized Diet in Section IA for patients who require feedings to be given through a syringe or straw.

Planning the Diet

Foods Included	
Beverages and Milk	As desired. For dysphagic patients, thickened per diet order
Breads and Crackers	Doughnuts, pancakes, waffles, French toast, bread prepared in a slurry; regular soft bread and crackers may be used for patients if swallowing ability permits
Cereals and Grains	All cooked cereals; strained oatmeal; milk-soaked or well-moistened dry cereal if swallowing ability permits
Vegetables and Potatoes	Mashed white or sweet potatoes; pureed, mashed, and/or strained thickened vegetables; tomato and vegetable juices
Fruits and Juices	Applesauce; pureed thickened fruits; fruit juices
Meats, Fish, Poultry, Cheese	Pureed or strained meats, poultry, fish; cheese sauce; eggs
Fats	Butter, margarine, cream, gravy, mayonnaise
Soups	All smooth cream or broth-base soups with pureed ingredients
Desserts	Custard, pudding, ice cream, sherbet, gelatin*, fruit whips; cakes, cobblers, and pies pureed to a smooth and moist consistency; soft cookies and plain cakes such as vanilla wafers or sugar cookies prepared in a slurry. Regular versions of these foods if swallowing ability permits
Sugar and Sweets	Sugar, jelly, honey, syrup

**For patients with dysphagia, serve only if tolerated. May need to add thickener before gelling.*

SAMPLE MENU

Breakfast	**Noon**	**Evening**
Orange Juice	*Classic Puree* Chicken	*Classic Puree* Beef & Noodles
Cream of Wheat	Mashed Potatoes with gravy	*Classic Puree* Green Beans
Scrambled Egg	*Classic Puree* Carrots	Tomato Juice
Biscuit with Slurry	*Classic Puree* Rosy Pears	*Classic Puree* Peaches
Milk	Dinner Roll with Slurry	Dinner Roll with Slurry
Coffee	Ice Cream	Milk
Sugar	Tea	
Creamer	Sugar	

NUTRITION MANAGEMENT OF FLUID INTAKE

Description
Adequate fluid intake is necessary to maintain optimum hydration or to correct a state of dehydration or overhydration. The amount of fluid required to maintain the optimum hydration level varies with the medical condition of the patient.

Indications
In the healthy individual, normal sensations of thirst promote the consumption of adequate fluid and the maintenance of optimum hydration. However, some patients may not recognize thirst, may not be able to communicate thirst, or may not freely consume liquids. Risk factors for dehydration include any of the following:

- unconscious; semiconscious and confused state
- severe depression
- tranquilizer or sedative use
- enteral feeding
- must be fed or require assistance with feeding
- diarrhea
- poor appetite
- immobility
- diuretic use
- frequent laxative use
- perspiration (in hot weather where air conditioning is unavailable)
- increased respiratory rate
- salivation decreased by medications or radiation therapy
- fever
- fistulous drainage
- high output ileostomy
- vomiting
- severe burns
- polyuria (eg, glycosuria, ketonuria)
- high renal solute load (eg, High-Protein Diet)
- denuded body surface
- hyperpnea

Nutritional Adequacy
See statement pertaining to diet order.

How to Order the Diet
The patient's usual diet can be amended as follows: ________________ diet, force fluids to _________ cc/day, or ________________________ diet, restrict fluids to _________ cc/day. Order should include amount of fluid to be given by Food and Nutrition Services with meals and snacks and amount of fluid to be given by nursing (ie, with medications or between meals).

Planning the Diet
When the dietitian calculates the intake of fluids, foods that are liquid at room temperature should be counted by cubic centimeters. Such foods include water, carbonated beverages, coffee and tea, gelatin, milk, water ices and popsicles, soups, supplements, eggnog, ice cream and sherbet, and milk shakes.

Fluid is usually ordered in the form of cubic centimeters (cc) (1 mL = 1 cc). This can be converted to cups or ounces as follows:

30 cc = 1 fl oz
120 cc = 4 fl oz or ½ cup
180 cc = 6 fl oz or ¾ cup
240 cc = 8 fl oz or 1 cup
960 cc = 32 fl oz or 1 qt

FLUID CONTENT OF THE REGULAR DIET - Sample (Container Size and Menus May Vary)	
Breakfast	
Juice (4 oz)	120 cc
Milk (8 oz)	240 cc
Coffee (6 oz)	180 cc
Noon	
Soup (6 oz)	180 cc
Tea (8 oz)	240 cc
Evening	
Milk (8 oz)	240 cc
Tea (8 oz)	240 cc
Subtotal for Three Meals	1440 cc
Other Fluids/Water	560 cc
TOTAL	**2000 cc**

Treatment and Prevention of Fluid Deficit
An appropriate assessment is made by the physician to determine if water depletion alone (dehydration) or the more common sodium/water (volume) depletion is present. Treatment is accomplished by increasing oral intake of fluid and electrolytes as needed. Patients with more severe cases and those who are unable to take fluids by mouth are treated by appropriate intravenous fluid replacement. (Note: Internal sequestering, also known as third spacing, may create a deficit of water in some compartments, although total body water is unaltered. Replacement water requirements may be greatly increased in peritonitis, pancreatitis, enteritis, ileus, or portal vein thrombosis.)

An evaluation of fluid requirements should be made on an individual basis. A precise intake and output record is necessary to determine and meet fluid requirements. The magnitude of factors determining water loss precludes the setting of a general rule for estimating minimal water requirements.

General guidelines for calculating fluid needs are:

1. Pediatrics (1,2,3,4)

Weight (kg)	Fluid Requirement (cc/kg/day)
First 10 kg	100
11-20 kg	1000 + 50 cc for each kg above 10 kg
>20.0	1500 + 20 cc for each kg >20 kg

2. Patients >5 kg*

Method 1(5)

Weight (kg)	Fluid Requirement (cc/kg/day)
First 10 kg of body weight	100
Second 10 kg of body weight	50

****In obese patients, ideal weight for height is used***

Method 2 (6,7)
Children over 20 kg: 1500 cc/day + 20 cc/kg above 20 kg
Active young adults with large muscle mass: 40 cc/kg per day
Adults between 18 to 55 years: 35 cc/kg per day
For persons 55 to 65 years old with no major cardiac or renal diseases: 30 cc/kg actual weight per day
For persons >65 years old: 25 cc/kg
For residents of long-term care facilities, minimum 1,500 cc to 2,000 cc daily.
Patients with pressure ulcers: 30 to 35 cc/kg of body weight (10)
Patients with congestive heart failure: 20 to 25 cc/kg of body weight
RDA: 1 cc/kcal (1,11)

3. Calculating fluid deficit (6)
   Calculated Water Deficit = (% TBW) × (BW) × [1 − (Na Predicted/Na Measured)]
   where TBW = total body water
   % TBW, normal adult male = 60
   % TBW, lean adult male = 70
   % TBW, obese adult male = 50
   % TBW, normal adult female = 50
   % TBW, lean adult female = 60
   % TBW, obese adult female = 42
   BW = actual body weight in kilograms
   Na Predicted = constant average serum sodium of 140 mEq/L
   Na Measured = patient's actual measured serum sodium

4. Increase an additional 12% or 150 cc/day for each degree Celsius over 37.8°C.

5. One bed change due to perspiration represents approximately 1 L of fluid lost (12).

6. Patients receiving mechanical ventilation or other source of humidified oxygen can absorb up to an additional 1000 cc of fluid daily, whereas unhumidified oxygen therapy can result in a net loss of fluid (12).

7. Patients treated on air-fluidized beds may become dehydrated easily due to evaporative water loss. Evaporative loss can increase two to four times the normal amount. Fluid loss has also been correlated to the bed temperature. If it is low (86°F), fluid loss is similar to that on a conventional bed (480 cc/m^2/24 h). However, when the bed temperature is high (94°F), fluid loss may increase up to 80 percent (938 cc/m^2/24 h) in a 70-kg person (13). (Bed temperatures are adjustable and usually set between 88 and 93°F.)

8. Minimal fluid requirements:
   2000 to 3000 cc/day intake is necessary to yield approximately 1000 to 1500 cc/day in urine output.

Assessment of Fluid Status
The clinical assessment of total body water (TBW) is generally inaccurate. More than 10% of TBW may be lost before evidence of hypovolemia appears. The thirst mechanism is activated when the decrease in TBW reaches approximately 2%. Serial assessment of body weight is probably the most reliable parameter, especially because water makes up such a large proportion of total body weight (12). Along with serial assessment, the following physical alterations can be assessed to help determine hydration status (14,15).

Volume deficit
- Decreased moisture in the oral cavity
- Decreased skin and tongue turgor (elasticity); skin may remain slightly elevated after being pinched
- Flattened neck and peripheral veins in supine position
- Decreased urinary output (<30 cc/h without renal failure)
- Acute weight loss (>1 lb /day)

Volume excess
- Clinical apparent edema is usually not present until 12 to 15 L of fluid has accumulated
- 1 L fluid = 1 kg weight
- Pitting edema, especially in dependent parts of the body (eg, feet, ankles, and sacrum)
- Distended peripheral and neck veins
- Symptoms of congestive heart failure or pulmonary edema
- Central venous pressure > 11 cm H_20

Laboratory values used to evaluate fluid status include serum electrolytes; serum osmolality; hematocrit; blood, urea nitrogen (BUN); and urine specific gravity. Serum sodium is the best indicator of intracellular fluid disorders. The hematocrit reflects the proportion of blood plasma to red blood cells. Fluid loss causes hemoconcentration and serum osmolality; fluid gain causes hemodilution and decreases serum osmolality. A rise in BUN level frequently reflects a fluid deficit state and a fluid deficit causes urine to be concentrated (specific gravity >1.030); a fluid excess dilutes urine (specific gravity <1.010) (12).

Aging increases the risk for dehydration based on the physical and psychological changes. The elderly often lack the ability to recognize thirst, have aged kidneys that may have a decreased ability to concentrate urine, fear urinary incontinence and thus do not drink sufficient fluids, have acute or chronic illnesses that alter fluid and electrolyte balance (16), and have a decrease in total body water from 60% to 45%.

Refer to the following section for further information:
Section IB: *Enteral Nutrition* for discussion of calculation of free water in tube feeding.

Fluid Restriction

In congestive heart failure, ascites, end-stage renal disease, and other disorders, patients retain fluid. A fluid restriction is often useful in the management of these conditions.

See Section III: Clinical Nutrition Management

- **CONGESTIVE HEART FAILURE**
- **END-STAGE RENAL DISEASE**

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VEGETARIAN DIETS

Description
A Vegetarian Diet is a variation of the Regular Diet in which certain or all foods of animal origin are excluded. A wide spectrum of dietary practices are considered vegetarian.

Ovolactovegetarian: Milk and milk products as well as eggs are the only animal products included.

Lactovegetarian: Milk and milk products are the only foods of animal origin included.

Ovovegetarian: Eggs are the only animal product included.

Total vegetarian (vegan): The diet consists of foods of plant origin only.

Indications
Vegetarian diets are adapted for a variety of health, ecological, economical, philosophical, and ethical reasons (1). Many epidemiologic data suggest a positive relationship between vegetarian lifestyles and risk reduction for several chronic degenerative diseases such as obesity, coronary artery disease, hypertension, diabetes mellitus, and some types of cancer. However, this relationship likely is due to lifestyle factors in addition to diet (1).

Nutritional Adequacy
Vegetarian diets are healthful and nutritionally adequate when appropriately planned (1). The diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA. Nutrients that are often of concern are vitamins B_{12} and D, calcium, iron, zinc, and linolenic acid. All vegan children should have a reliable source of vitamin B_{12}, and if sun exposure is limited, vitamin D supplements or fortified foods should be emphasized (1-4). Pregnant and lactating vegans should receive, respectively, supplements of 2.0 mg and 2.6 mg of vitamin B_{12} daily, and if sun exposure is limited, should have their diet supplemented with 10 mg of vitamin D (1).

How to Order the Diet
Order as “Regular Diet—Vegetarian.” The patient’s particular dietary constraints will be considered.

Planning the Diet
A Vegetarian Diet can be made adequate by careful planning and by giving attention to the following guidelines:

- Keep to a minimum the intake of foods with low-nutrient density, such as sweets and fatty foods.
- Choose a variety of foods, including fruits, vegetables, whole grains, legumes, nuts, seeds, and, if desired, dairy products and eggs.
- Choose whole or unrefined grain products whenever possible, instead of refined products.
- If milk products are consumed, use lower fat versions.
- Include a regular source of vitamin B_{12}, along with a source of vitamin D if sun exposure is limited.

Protein: Although vegetarian diets usually meet or exceed requirements for protein, they typically provide less protein than nonvegetarian diets.

The body’s need for essential amino acids can be met by consumption of animal or plant sources of protein. Although plant foods contain less of the essential amino acids than do equivalent quantities of animal foods, a plant-based diet can provide adequate amounts of amino acids when a varied diet is consumed on a daily basis. A mixture of different proteins from unrefined grains, legumes, seeds, nuts, and vegetables will complement each other in their amino acid profiles so that deficits in one are made up by the others.

Different types of protein that complement each other should be eaten over the course of the day. However, since after absorption, amino acids from exogenous and endogenous sources combine in the body’s protein pool, it is not necessary that complementation of amino acid profiles be precise and present in the same meal (1).

Vitamin B_{12}: A vegan should supplement his or her diet with vitamin B_{12} by using a cobalamin supplement or by selecting fortified foods such as fortified soy milk or breakfast cereals, to ensure an adequate intake of the active form of the nutrient. Although the requirement for vitamin B_{12} is minute, vegetarians must include a reliable source of vitamin B_{12} in their diets or be at risk of eventually developing a deficiency. Supplements are advised for all older vegetarians because absorption of vitamin B_{12} becomes less efficient as the body ages (1). Also, breast-fed vegan infants should receive a source of vitamin B_{12} if the mother's diet is not supplemented (1).

Calcium: Calcium intake of ovolactovegetarians is comparable or higher than that of nonvegetarians. However, vegans' intake of calcium is generally lower than that of either ovolactovegetarians or omnivores. It should be noted that vegans may have lower calcium needs than nonvegetarians because diets that are low in total protein and have more alkaline have been shown to have a calcium-sparing effect. If vegans do not meet calcium requirements from food, dietary supplements are recommended (1).

Vitamin D: Reliance on sunlight alone, particularly in northern climates or in cultures where most of the body is concealed in clothing, may not provide all of the vitamin D needed. A vitamin D supplement may be necessary for persons who do not ingest vitamin D-fortified milk products or cereals or do not obtain 5 to 15 minutes of exposure to sunlight daily (5), especially for dark-skinned individuals (1,5).

Energy: Vegan diets tend to be high in bulk, making it more challenging for them to meet energy needs, especially for infants, children, and adolescents. Frequent meals, snacks, and eating foods higher in fat can help vegetarian children meet energy needs (1).

Iron: The non-heme iron found in plant foods is more sensitive than heme iron to both inhibitors and enhancers of iron absorption (1). Western vegetarians have a relatively high intake of iron from plant foods, such as dark-green leafy vegetables, iron-fortified cereals, and whole grains. Although vegetarian diets are higher in total iron than nonvegetarian diets, iron stores are lower because iron from plant foods are poorly absorbed. However, the frequency of anemia is not any higher in the vegetarian population than in the nonvegetarian population. Vegetarians' higher vitamin C intake may improve their iron absorption.

Zinc: Vegetarians should strive to meet or exceed the DRI for zinc due to the low bioavailability of zinc from plant sources and because the effects of marginal zinc status are poorly understood.

Linolenic Acid: Diets that do not include fish or eggs lack the long chain n-3 fatty acid docosasahexaenoic acid (DHA). It is recommended that vegetarians include good sources of linolenic acid in their diets, such as walnuts, canola oil, and linseed oil.

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FOOD SOURCES OF NUTRIENTS

Iron	Milligrams per Serving
Breads, cereals and grains	
Whole wheat bread, 1 slice	0.9
White bread, 1 slice	0.7
Bran flakes, 1 c	11.0
Cream of wheat, ½ c cooked	5.5
Oatmeal, instant, 1 packet	6.3
Wheat germ, 2 tbsp	1.2
Vegetables (½ c cooked)	
Beet greens	1.4
Sea vegetables	18.1-42.0
Swiss chard	1.9
Tomato juice, 1 c	1.3
Turnip greens	1.5
Legumes (½ c cooked)	
Baked beans, vegetarian	0.74
Black beans	1.8
Garbanzo beans	3.4
Kidney beans	1.5
Lentils	3.2
Lima beans	2.2
Navy beans	2.5
Soy foods (½ c cooked)	
Soybeans	4.4
Tempeh	1.8
Tofu	6.6
Soy milk, 1 c	1.8
Nuts/seeds (2 tbsp)	
Cashews	1.0
Pumpkin seeds	2.5
Tahini	1.2
Sunflower seeds	1.2
Other foods	
Blackstrap molasses, 1 tbsp	3.3

Zinc	
Breads, grains, and cereals	
Bran flakes, 1 c	5.0
Wheat germ, 2 tbsp	2.3
Legumes (½ c cooked)	
Adzuki beans	2.0
Chickpeas	1.3
Lima beans	1.0
Lentils	1.2
Soy foods (½ c cooked)	
Soybeans	1.0
Tempeh	1.5
Tofu	1.0
Textured vegetable protein	1.4
Vegetables (½ c cooked)	
Corn	0.9
Peas	1.0
Sea vegetables	1.1-2.0
Dairy foods	
Cow's milk, 1 c	1.0
Cheddar cheese, 1 oz	0.9
Yogurt, 1 c	1.8

Calcium	Milligrams per Serving
Legumes (1 c cooked)	
Chickpeas	78
Great northern beans	121
Navy beans	128
Pinto beans	82
Black beans	103
Vegetarian baked beans	128
Soy foods	
Soybeans, 1 c cooked	175
Tofu, ½ c	120-350
Tempeh, ½ c	77
Textured vegetable protein, ½ c	85
Soy milk, 1 c	84
Soy milk, fortified, 1 c	250-300
Soy nuts, ½ c	252
Nuts and seeds (2 tbsp)	
Almonds	50
Almond butter	86
Vegetables (½ c cooked)	
Bok choy	79
Broccoli	89
Collard greens	178
Kale	90
Mustard greens	75
Turnip greens	125
Fruits	
Dried figs, 5	258
Calcium-fortified orange juice, 1 c	300
Other foods	
Blackstrap molasses, 1 tbsp	187
Cow's milk, 1 c	300
Yogurt, 1 c	275-400

Vitamin D	Micrograms per Serving
Fortified, ready-to-eat cereals, ¾ c	1.0-2.5
Fortified soy milk or other nondairy milk, 1 c	1.0-2.5

Vitamin B_{12}	
Ready-to-eat breakfast cereals, ¾ c	1.5-6.0
Meat analogs (1 burger or 1 serving according to package)	2.0-7.0
Fortified soy milk or other nondairy milk, 8 oz	0.2-5.0
Nutritional yeast (Red Star Vegetarian Support Formula, formerly T6635[a]) 1 tbsp	4.0

Linolenic acid	
Flax seed, 2 Tbsp	4.3
Walnuts, 1 oz	1.9
Walnut oil, 1 Tbsp	1.5
Canola oil, 1 Tbsp	1.6
Linseed oil, 1 Tbsp	7.6
Soybean oil, 1 Tbsp	0.9
Soybeans, ½ c cooked	0.5
Tofu, ½ c	0.4

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KOSHER GUIDELINES

Description

Kosher is a Hebrew word that means "fit" or "wholesome." Kosher dietary laws define foods and combinations of foods that are allowed or forbidden. The collective term for the Jewish laws and customs relating to the types of foods permitted for consumption and their preparation is *kashruth.* The observance of kosher dietary laws varies according to the traditions of the individual and interpretations of the dietary laws.

In a nonkosher food service facility, observance of dietary laws usually involves service of commercially prepared kosher dinners on disposable plastic ware for the patient following a strict kosher diet. For patients not following a strict kosher diet or if the patient so wishes, the foods usually prepared by the Food and Nutrition Services Department can be served, as long as milk and milk products are separated from meat and meat products and certain forbidden foods are excluded (see the following list).

The strict observance of the kashruth by the kosher food service requires separate sets of equipment, dishes, and silverware, as well as kosher food suppliers for many items. Dairy foods are stored and prepared separately from meat and meat products.

Indications

Kosher diets may be ordered for individuals of the Jewish faith if they so desire.

Nutritional Adequacy

The diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA.

How to Order the Diet

Order as "Kosher Diet." Any additional dietary modifications that may be warranted should be stated in the diet prescription (eg, "Kosher Diet, Sugar in Moderation").

Guidelines for Food Selection:

1. Kosher meats and poultry may come only from animals that have cloven hooves, chew their cud, and are slaughtered according to the humane and specific guidelines prescribed by the Jewish dietary laws. In addition, kosher meats undergo a process called koshering, in which blood is extracted by soaking in salt or broiling on a regular grill. (Pan grilling is not acceptable.)
2. Foods are classified as dairy, meat, or pareve. Meals are classified either as dairy or meat. Meat and meat products are not to be combined with any dairy products in recipe, food preparation, or service. Pareve foods may be served at dairy or meat meals.
3. The strict observance of the Kashruth requires separate sets of equipment, dishes, and silverware for dairy or meat meals. In a kosher kitchen, dairy foods are stored and prepared separately from meat and meat products.
4. In a nonkosher food service facility, observance of dietary laws usually involves service of commercially prepared kosher dinners on disposable plastic ware for the patient following a strict kosher diet. For patients not following a strict kosher diet or if the patient so wishes, the usual foods prepared by the dietary department can be served, as long as milk and milk products are separated from meat and meat products and certain forbidden foods are excluded.
5. Processed foods: No product should be considered kosher unless so certified by a reliable rabbinic authority whose name of insignia appears on the sealed package. The insignia, U which is the copyrighted symbol of the Union of Orthodox Jewish Congregations of America, indicates that the product is certified as to its kosher nature. Packages marked with other symbols may be suitable for certain but not all kosher diets. It is important that a kosher food package remains sealed when presented to the user. The package should be opened only under these circumstances: by the user, in the user's presence, or by someone authorized by the religious authorities to open the food package.
6. Nonkosher foods may be used if considered essential in the treatment of an ill person. However, a rabbi should be consulted before waiving dietary restrictions.

FOOD GUIDE

	FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
Dairy	Milk Products	All foods containing milk or white sauces Note: Foods containing milk derivatives such as sodium caseinate and lactose are considered dairy	
Meat	Meat	Only meat from an animal that chews its cud and has split hooves	Pork and pork products
		Beef: chuck, brisket, plate, shank, rib up to and including 12th rib Broiled liver	Beef: loin, flank, round
		Veal/lamb: shoulder, rack, shank, breast	Veal: loin, leg
	Fowl	Most domesticated fowl are by tradition considered to be kosher: chicken, turkey, domestic duck	Wild fowl that is hunted
Pareve	Breads, Cereals, and Grains	All except listed in Foods Excluded column	Bread made with lard or animal shortening. Note: Breads and cereals containing any dairy products are classified as dairy
	Eggs	Eggs from domestic fowl	Eggs containing blood spots
	Fish and Seafood	Fish having *both* fins and scales: halibut, flounder, cod, tuna, haddock, pollack, turbot, salmon, trout, whitefish, herring, etc.	Catfish, eel, marlin, sailfish, shark, sturgeon, swordfish, shellfish
	Vegetables and Fruit	All, prepared with pareve and allowed Ingredients	
	Fats	Pure vegetable oil Margarine made with vegetable shortening and without milk	Lard or animal shortening Margarine with added milk Butter
	Sweets	Imitation sour cream or whipped topping with pareve certification	
	Beverages	Sugar, jam, jelly, syrup Candy without milk	
		Coffee, tea, carbonated beverages Alcoholic beverages Nondairy creamer with pareve certification	
		Those made with milk or milk products are considered to be a part of the dairy group	
Other	Desserts	Desserts made without milk or animal products are considered to be pareve	Desserts made with lard or animal shortening Monoglycerides and diglycerides and emulsifiers may be from animal fats

CLEAR LIQUID DIET

Description
The Clear Liquid Diet is designed to provide fluids without stimulating extensive digestive processes, to relieve thirst and to provide oral feedings that may promote return to a normal ingestion of food. The diet as served will yield approximately 700 to 1,000 kcal when calorie-containing clear liquids are served between meals.

Indications
The Clear Liquid Diet is indicated for the following:

- short-term use whenever an acute illness or surgery causes an intolerance for foods
- to temporarily restrict undigested material in the gastrointestinal tract

Nutritional Adequacy
The diet is inadequate in all food nutrients and provides only fluids, energy, and some vitamin C. Low-residue food supplements are desirable if the diet is for prolonged use.

How to Order the Diet
Order as "Clear Liquid Diet." Variations of this standard diet should be specifically ordered; specify the exclusion of certain foods or specify a diet limited to certain foods.

A diet order specifying the number of meals or days of liquids or the diet progressions, as tolerated, will ensure that this nutritionally inadequate diet is advanced or evaluated.

FOOD GUIDE

FOODS ALLOWED	FOODS EXCLUDED
Carbonated beverages, regular and decaffeinated coffee and tea, fruit-flavored soft drinks Clear flavored gelatin, fruit ices, Popsicles Cranberry, apple, and grape juices Lightly seasoned clear broth or consomme (fat-free) Sugar, honey, syrup	All other foods or fluids except water

SAMPLE MENU
(600 kcal)

Breakfast	Noon	Evening
Cranberry Juice	Beef Broth	Chicken Broth
Flavored Gelatin	Grape Juice	Apple Juice
Coffee or Tea	Flavored Gelatin	Water Ice
Sugar	Coffee or Tea	Coffee or Tea
	Sugar	Sugar

CLEAR LIQUIDS BETWEEN MEALS AS DESIRED

FULL LIQUID DIET

Description
The Full Liquid Diet consists of foods that are liquid at body temperature, including gels and frozen liquids. The diet provides nourishment that is easy to consume and digest with very little stimulation to the gastrointestinal tract.

Indications
The Full Liquid Diet may be indicated following oral surgery or plastic surgery of the face or neck area in the presence of chewing or swallowing dysfunction for acutely ill patients.

The Full Liquid Diet has been traditionally used as a postoperative transitional diet. The diet is intended for short-term use only; therefore, attempts are not usually made to increase the variety of foods offered to provide for the total adequacy of nutrients.

Contraindications
Due to the liberal use of milk and foods made with milk, the diet is high in lactose. A temporary lactose intolerance may occur in some patients following surgery. Symptoms of lactose intolerance upon ingestion of a Full Liquid Diet may result, and the diet should be modified for the patient. (See Lactose-Controlled Diet in Section IH.)

Nutritional Adequacy
The diet as served meets the Dietary Reference Intakes (DRIs) for ascorbic acid, vitamin D, vitamin B_{12}, calcium, phosphorus, and riboflavin. It may not meet the protein and caloric requirements of the individual. The diet as served will provide approximately 1,200 kcal and 40 g of protein. When between-meal nourishment is added, the intake is increased to 1,500 to 1,800 kcal and 65 g of protein. Protein and caloric intake can be increased through the use of additional full liquid foods at meals and between meals. The diet can be nutritionally adequate when supplements are offered and consumed in sufficient amounts.

How to Order the Diet
Order as "Full Liquid Diet." Variations in this standard diet should be specifically ordered (eg, the exclusion of certain foods or a diet limited to certain foods). A diet order specifying the duration of the diet or the diet progression, as tolerated, will ensure that this nutritionally inadequate diet is advanced or evaluated.

FOOD GUIDE

FOODS ALLOWED	FOODS EXCLUDED
Carbonated beverages, regular and decaffeinated coffee and tea, soft drinks, cocoa	All solid foods
Cooked refined cereal, farina, cream of rice, or strained cereal	
Custard, plain gelatin, ice cream, sherbet, pudding, yogurt, all without nuts; fruit or preserves	
Eggnog,* milk shake, and other milk drinks	
Butter, margarine, cream	
Fruit and vegetable juices (including one serving of citrus fruit juice daily)	
Broth, bouillon, consomme, strained cream soup	
Honey, sugar, syrup	

*Made from pasteurized eggs only or commercial product

SAMPLE MENU

Breakfast	Noon	Evening
Orange Juice	Strained Cream of Chicken Soup	Strained Cream of Celery Soup
Cream of Wheat	Grape Juice	Apple Juice
Milk	Vanilla Ice Cream	Custard
Coffee or Tea	Milk	Milk
Sugar	Coffee or Tea	Coffee or Tea
	Sugar	Sugar

FULL LIQUIDS BETWEEN MEALS AS DESIRED

FULL LIQUID BLENDERIZED DIET

Description

The Full Liquid Blenderized diet consists of a variety of liquids, as well as semisolid foods that have been thinned to a consistency that can be consumed through a straw, fed by syringe, or sipped from a cup. The diet also includes foods that, if eaten by spoon, will turn to a liquid consistency in the mouth. The method of feeding will determine the desired viscosity of the liquid.

Indications

The objective of the diet is to provide oral nourishment in a form that requires no mastication. This diet is indicated for the following:

- patients following oral surgery or plastic surgery of the face or neck area in the presence of chewing or swallowing dysfunction (eg, a wired jaw or intermaxillary fixation surgery)
- acutely ill patients with oral esophageal disorders, neuromuscular disabilities, advanced carcinoma of the oral cavity, facial or neck trauma
- patients who have received radiation therapy and find eating difficult

Nutritional Adequacy

The Full Liquid Blenderized Diet can meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA, if the proper amount and variety of food is consumed by the patient. Because some patients experience palatability problems or may have difficulty consuming an adequate volume of liquids, liquid supplements may be necessary to meet their nutrient and fluid needs.

How to Order the Diet **For CHS CLICK HERE**

Order as "Full Liquid Blenderized Diet" or "Wired Jaw." These terms will distinguish this diet from the Full Liquid Diet, which is lower in energy and nutrients. The dietitian determines the amount and type of food or supplements to be served, based on patient acceptance, nutrient needs, and change in condition.

FOOD GUIDE

NOTE: The foods listed below vary greatly in caloric and nutrient density. It may be necessary to encourage certain foods, depending on the nutritional goals for the individual.

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
Beverages and Milk	Milk, eggnog, milk shake, milk drinks All beverages: coffee, tea, etc. Yogurt without seeds or fruit (may need to be thinned for straw or syringe feeding)	All other
Bread and Cereals	Cereal gruels of farina, cream of rice, grits Cereal gruels are equal parts whole milk with cereal Strained oatmeal or cream of wheat *Note: iron-fortified cereals are recommended*	All other
Vegetables	Mashed white potato, thinned with soup or broth Vegetable juices Vegetables purees, thinned with soups	All other
Fruits	Fruit juices Pureed fruits thinned with fruit juice Juices may need to be strained to remove excess pulp for straw or syringe feeding *Note: Citrus juices may not be well tolerated by all surgical patients*	All other
Meats, Poultry, Fish, Cheese, Eggs	Pureed meats and poultry (baby strained), thinned with broth	All other
Fats	Margarine, butter Nondairy creamers, half-and-half	
Soups	Broth, strained cream soups	All other
Desserts	Ice cream, sherbet, plain gelatin, custards, puddings, fruit ices Popsicle (may need to be liquefied or melted for straw or syringe feeding).	All other
Sugar and Sweets	Sugar, syrup Hard candy if tolerated	All other
Miscellaneous	Salt, pepper, herbs Lemon juice, other condiments and seasonings as tolerated	All other

NUTRITION MANAGEMENT OF DYSPHAGIA

For specific Dysphagia Diet Management guidelines at CMC, CIR, University and other CHS facilities, as appropriate, CLICK HERE.

Description

The consistency of the diet is modified according to the patient's tolerance as determined by results of the clinical examination, the therapeutic goals for nutrition, and the patient's retraining in swallowing. Pureed food and liquids are thickened to the consistency that the patient can swallow.

Characteristics of foods, such their uniform consistency and their capacity to form a bolus in the mouth, influence the ease with which the food can be chewed and swallowed.

Indications

Patients with dysphagia, which involves difficulty in moving the food from the front to the back of the mouth or in channeling the food into the esophagus, or both. Dysphagia may be due to weak or uncoordinated muscles of the mouth and/or throat or to motor and sensory defects impeding chewing or swallowing, or both.

Nutritional Adequacy

Dysphagia diets can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA. However, enteral feedings may be necessary to supplement oral intake until a sufficient quantity of food can be consumed. A record of food intake, including fluid intake, and enteral feeding delivered is necessary at all stages of dysphagia therapy. When oral intake approaches the patient's caloric and protein requirements, weaning from the enteral feeding should begin.

The method of feeding should be evaluated for the patient receiving enteral nutrition as the primary source of nutrition. One study of patients experiencing hemiplegic stroke documented better outcomes with percutaneous endoscopic gastrostomy (PEG) tube feeding than the traditional nasogastric (NG) feeding (1). Problems associated with the NG feeding include aspiration pneumonia following tube displacement or removal of the tube. Patients in the study who received PEG feeding gained weight, had minimum time on tube feedings, and had shorter hospitalizations (1). In contrast, patients on the NG lost weight, missed an average of 22% of their prescribed feedings, and experienced longer hospitalizations.

How to Order the Diet

If dysphagia is suspected, a swallowing evaluation should be performed. This may include any of the following: a bedside evaluation, indirect or fiberoptic laryngoscopy, fiberoptic endoscopic evaluation of swallowing (FEES), and a videofluoroscopic swallow study (also known as a modified barium swallow). The latter is the preferred diagnostic tool for dysphagia because it determines any structural and functional problems that may occur with varied food and liquid consistencies and will rule out inappropriate diet consistencies. The dietitian and the speech pathologist should use the results from both the evaluation and a chewing-swallowing challenge to choose appropriate foods and beverages for the patient.

Before a patient is fed orally, a diet order specifying the patient can eat must be obtained from the physician. The dietitian and the speech pathologist must coordinate efforts to determine the appropriate consistency of foods and liquids for the patient both before feedings begin and with subsequent feedings. The consistency of foods and liquids should be altered as the patient progresses.

The type of dysphagia the patient experiences will determine the level of the diet required. Diet orders should include the level of diet, for example, Dysphagia Pureed, Dysphagia Mechanically Altered, Dysphagia Advanced, or Regular Diet and the liquid consistency desired (eg, nectar-like, honey-like, or spoon-thick). *With each progression of the diet, both the level of diet and the liquid consistency need to be specified in the nutrition prescription.* The four levels include (2-4):

- Dysphagia Pureed (Level 1): Foods are thick and smooth, and have a moist pudding-like consistency without pulp or small food particles. They cling together, are easy to swallow, and require a minimum amount of manipulation in the mouth. Puree foods are prepared and thickened according to the Morrison *Classic Puree* program (5). Sticky foods or foods that require a bolus formation or controlled manipulation of the mouth (eg, melted cheese and peanut butter) are omitted. The diet is nonirritating and low in fiber. Generally all thin liquids are omitted or thickened. Food and fluid intake should be monitored. (Refer to Pureed Diet in Section IA for specific foods allowed.)

- Dysphagia Mechanically Altered (Level 2): Foods are moist, soft, and simple to chew, and easily form a cohesive bolus. The diet is intended to provide a transition from puree to easy-to-chew foods. Moistened ground meats, vegetables cooked to a soft mashable texture, soft-cooked or canned fruits, and bananas are included. The diet is similar to a mechanical soft diet but is specific in foods to be excluded. Some naturally thickened beverages such as juice nectar and milk shakes may be tolerated. More frequent feedings may be beneficial. Food and fluid intake should be monitored.
- Dysphagia Advanced (Level 3): Same foods as in the Mechanical Soft Diet. (See Mechanical Soft Diet in Section IA.) Meats are soft and in bite-size pieces. Regular liquids can be used as tolerated.
- Regular Diet (Level 4): Patients can chew and swallow regular food and liquids safely. This diet is the same as the Regular Diet. (See Regular Diet in Section IA.)

Planning the Diet

General considerations: Dietary considerations will vary with each patient. The importance of individual food consistencies cannot be overemphasized. For example, dysphagic patients with an obstruction may be able to take liquids safely; other patients may aspirate liquids and require thickened liquids and a puree consistency. It may be necessary to avoid foods that change consistency in the mouth (eg, gelatin or ice cream).

- One of the most important considerations of food texture is cohesiveness, or ability to stay together. Patients often can chew through foods but are not able to press them into a bolus unless they are either naturally or artificially cohesive. For patients who cannot swallow a smooth pureed food, a higher texture (more viscous) food is desired in order to rehabilitate muscles. The larger surface area provides stimulation to the nerve and muscle groups that assist the swallowing process.
- Do not combine textures in the same bolus, such as dry cereal with milk or chunky vegetable soup in broth. Do not use fluids to wash down the bolus. It may be appropriate to alternate liquid and solids. Present foods and fluids separately, checking for complete swallows after each mouthful.
- Use gravies on all ground meat.
- Plain gelatins, rice, and cottage cheese are difficult for some dysphagic patients to handle. Add whipped topping to gelatin to increase cohesiveness; use rice in casseroles with a soup base; include only pureed small-curd cottage cheese.
- Milk does not cause mucous formation but it can aggravate thickening of mucus in some people, which can reduce the patient's ability to manage secretions. Creamy fruited yogurt or lactose-free supplements may be used if milk is not tolerated.

Liquids: The dysphagic patient frequently has difficulty with thin liquids, which are not easily channeled to the back of the mouth. It is necessary to introduce thickened liquids initially and progress to thinner liquids as proficiency is gained in swallowing. Thin liquids will frequently require adding a thickening agent, such as Thicken Right®, in order for the patient to be able to swallow without choking or drooling. Most thickeners require 1 tbsp of thickening product per 4 fl oz to bring liquids to a nectar-like thickness stage, 1 tbsp + 1 tsp per 4 fl oz for a honey-like thickness, and 1½ to 2 tbsp per 4 fl oz for a spoon-thick consistency. See the Thickening Chart in the Morrison *Classic Puree Manual* (5) for exact directions. Prepackaged thickened beverages are a good choice to ensure the proper consistency.

Examples of thin liquids are gelatin, juices, coffee, tea, soda, milk, popsicles, eggnog, juice from canned fruit, and broth. Examples of liquids with a nectar-like consistency are V-8 vegetable juice, tomato juice, prune juice, shakes, strained thick cream soup, 1.5 to 2.0 kcal/cc supplements, and nectar.

Water is the most difficult thin liquid to control. Water should be flavored (as in coffee, tea, punch, or broth) and thickened. To ensure hydration from water, thicken with a digestible thickening agent, such as a commercial starch thickener (eg, Thicken Right®). Gum-based thickeners should not be used, as they may compromise fluid availability.

See Section III: Clinical Nutrition Management
DYSPHAGIA
RELATIONSHIP OF DYSPHAGIA TO THE NORMAL SWALLOW

References

1. Norton B, Homer-Ward M, Donnelley M, et al. A randomised prospective comparison of percutaneous endoscopic gastrostomy and nasogastric tube feeding after acute dysphagic stroke. *Br Med J.* 1996; 312:13-16.
2. Nutrition Management of Dysphagia. *Manual of Clinical Dietetics.* Chicago, Ill: American Dietetic Association; 1996.
3. Womack P. Dysphagia texture and HACCP guidelines. *The Consultant Dietitian.* 1996; 20:1-3.
4. *National Dysphagia Diet.* Chicago, Ill: The American Dietetic Association (pending 2000 publication).
5. *Recipe Implementation and Resource Guide.* Smyrna, Ga: Morrison Management Specialists; 1998.

FOOD GUIDE

Dysphagia Pureed: See Pureed Diet, Section IA

Dysphagia Mechanically Altered (Level 2)

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
Beverages and Milk	Milk, milk shakes and eggnog, yogurt with pureed fruit, pudding	
Cereals and Grains	Refined cooked cereal, mashed potatoes with gravy, pasta products, slurried bread, blended soups	Dry cereals, breads, crackers, thin cooked cereal, potato (except mashed)
Vegetables and Potatoes	Soft cooked or mashed vegetables May include any cooked vegetables without hull or stringy fibers	Cooked peas, corn; raw vegetables
Fruits and Juices	Nectars, sliced or chopped canned fruits (no grapes, cherries, or apricots with skin), finely chopped and mashed ripe peach or banana, fruits, cranberry sauce	Fruit cocktail, fresh fruits except ripe peach or banana
Meats, Fish, Poultry, Cheese	Moist, ground meat or ground meat casseroles, melted cheese in casseroles, cottage cheese, custard	All other meats, hard cheese Fried or boiled egg
Desserts	Custard, pudding, ice cream, sherbet. Flavored gelatin if tolerated; gelatin can be thickened the same as liquids before gelling	

Dysphagia Mechanical Soft (Level 3): See Mechanical Soft Diet, Section IA

DUMPING SYNDROME DIET

Description
The diet is modified to prevent the rapid introduction of a hyperosmolar solution into the proximal jejunum (“dumping”). Several dietary strategies may be employed, including altered macronutrient composition, size and timing of meals and avoidance of certain food constituents. The diet limits beverages and liquids at meals, limits the intake of simple carbohydrates, and is high in protein and moderate in fat.

Indications
The dumping syndrome is a complication that may result from:

- the reduced storage capacity of the stomach following gastrectomy
- any procedure that interferes with the pyloric sphincter or compromises the reservoir function of the stomach.

The “dumping syndrome” occurs in response to the presence of undigested food in the jejunum. When this occurs, plasma fluids shift into the intestine area to equalize osmotic pressure, causing a drop in blood volume. Symptoms vary among individuals and may consist of the following: abdominal bloating, nausea, cramps, diarrhea, weakness, diaphoresis and tachycardia. In most cases, symptoms appear within 15 to 30 minutes after a meal. The secretion of gastrointestinal hormones has also been implicated in causing hypotension and palpitations (1,2). Some postgastrectomy patients experience “late postprandial dumping syndrome” characterized by hypoglycemia 1 to 2 hours after a meal.

Contraindications
One of the strategies sometimes employed, an increased intake of fat, is contraindicated in conditions such as malabsorption of fat.

Nutritional Adequacy
The diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA. The adequacy of the diet depends on the extent of the surgery and the individual’s food tolerance. After gastric surgery some patients experience malabsorption, which may be specific for macro- or micronutrients. Vitamin and mineral supplementation may be necessary, depending on the extent of surgery and whether the dumping syndrome symptoms persist (1).

How to Order the Diet
Order as “Dumping Syndrome Diet.” One or more features of the diet may be individually ordered, eg, Sugar in Moderation Diet, 120 cc fluid ½-1 hour before or after meals, 5-6 small meals, Lactose-Controlled Diet, Low-Fiber Diet, or other strategies listed under Planning the Diet.

Planning the Diet
1. Simple carbohydrate (lactose, sucrose, and dextrose) consumption is kept to a minimum to prevent the formation of a hypertonic solution and the subsequent osmotic symptoms, as well as to prevent late hypoglycemia. (See Sugar in Moderation Diet in Section IC.) Complex carbohydrates may be included.
2. Taking liquids with meals is thought to hasten gastrointestinal transit. Consume adequate amounts of liquid throughout the day in small amounts at a time (3). Carbonated beverages and milk are not recommended in the initial stages of the diet.
3. Smaller, more frequent feedings (5-6 per day) are recommended to accommodate the reduced storage capacity of the stomach and to provide adequate nourishment.
4. Lactose, especially in milk or ice cream, may be poorly tolerated due to rapid transit time, so should be avoided. Cheese and yogurt are better tolerated. A Lactose-Controlled Diet may be beneficial. (See Lactose-Controlled Diet in Section IH.)
5. Proteins and fats are increased as necessary to meet energy requirements. An increased fat intake also delays gastric emptying. A moderate fat intake (30-40% of kcal) and high protein intake (20% of kcal) are recommended (3).
6. Lie down and avoiding activity for an hour after meals may lessen symptoms (3).
7. If adequate caloric intake cannot be provided due to steatorrhea, use medium chain triglyceride products. (See Medium Chain Triglycerides in Section IC.)
8. Pectin may be utilized in the diet regimen to slow gastric emptying time (2,3).

References

1. *Manual of Clinical Dietetics*. 5th ed. Chicago, IL: American Dietetic Association; 1996: 411-416.
2. Shils ME, Olson JA, Shike M, eds. *Modern Nutrition in Health and Disease*. 8th ed. Philadelphia, Pa: Lea & Febriger; 1994: 588, 1033.
3. Beyer PL. Medical *Nutrition Therapy for Upper Gastrointestinal Tract Disorders*. In: Mahan KL, Escott-Stump S, ed. *Krause's Food, Nutrition and Diet Therapy*. 10th ed. Philadelphia: WB Saunders; 2000. p. 666-694.

SPECIALIZED NUTRITION SUPPORT

The provision of nutritional support via enteral (gastrointestinal) or parenteral (intravenous) routes may help maintain nutritional status in patients unable to take in adequate nutrients by mouth during the recovery from illness. The modality of nutrition support selected should permit the delivery of required nutrients utilizing the safest, most cost-effective route for the patient. The following section is a brief outline of nutritional management using these two modalities of nutritional support. For more detailed information, the clinician is directed to the referred literature.

Indications[1]
Specialized nutrition support may be indicated for malnourished* patients and patients who are not eating sufficient amounts to meet estimated nutrient requirements after a period of ≥ 7 days. Hypermetabolic, critically ill patients may require support therapy before 7 days to prevent 'autocannibalism' of patients.

Contraindications
Specialized nutrition support is usually not indicated for malnourished patients who are eating adequate amounts to meet estimated nutrient requirements, normally nourished patients when it is anticipated that adequate oral intake will be resumed within 7 days, and patients whose prognosis does not warrant aggressive nutritional care.

* *Refer to Section II for guidelines to develop criteria to identify a patient who either is or may become malnourished.*

References
1. Adapted from ASPEN Board of Directors. Guidelines for the use of parenteral and enteral nutrition in adult and pediatric patients. *JPEN.* 1993;17(4):1SA-11SA.

ENTERAL NUTRITION SUPPORT

Definition
Enteral nutrition support is the provision of nutrients via the gastrointestinal (GI) tract, either orally or by tube, in amounts to maintain or replete nutritional reserves of the patient.[1] This section will pertain to nutrition support via enteral tube feeding.

Indications (1-3)
Enteral nutrition support via tube feeding should be considered for those patients who are unable to ingest adequate amounts of nutrients orally and who have an adequately functioning GI tract. The advantages of enteral feeding versus parenteral feeding may include

- significantly lower cost to the patient,
- maintenance of GI mucosal integrity and prevention of bacterial translocation,
- avoidance of complications associated with parenteral feedings (sepsis, pneumothorax, catheter embolism, etc).

Contraindications (1-3*)*
Enteral nutrition support should usually be avoided in patients who do not have an adequately functioning GI tract. Specific conditions may include

- intractable vomiting,
- severe diarrhea,
- ileus,
- high-output enterocutaneous fistula (>500 cc/d),
- conditions warranting total bowel rest (acute pancreatitis, severe inflammatory bowel disease, etc),
- upper GI hemorrhage,
- short bowel syndrome (<100 cm small bowel remaining),
- intestinal obstruction (depending on location),
- hypovolemic or septic shock,
- prognosis that does not warrant aggressive nutritional support.

Nutritional Adequacy
Enteral feedings can be nutritionally adequate if an appropriate formula is selected with consideration of each patient's individual estimated requirements. Tube feedings may be used as the sole source of nutrients or to supplement inadequate oral nutrition.

How to Order the Diet **For CHS facilities, CLICK HERE.**
The physician or the dietitian determines that a tube feeding is indicated. The route and type of formula to be used are then determined. The selection of tube feeding formula type and goal rate can be facilitated by a dietitian. A nutrient intake study may be beneficial to verify that the patient's total nutrient intake (oral and tube feeding) is adequate.

The order specifies:

- the product: specify by name or as the "Standard Tube Feeding" according to hospital protocol.
- volume, rate, timing: specify volume/rate to be given initially, as well as the progression and goal volume/rate.*
- administration and monitoring: follow facility's standard procedures or individualize orders and include the administration of extra water to flush the tube and/or meet fluid requirements.

See Section III: Clinical Nutrition Management
ENTERAL NUTRITION

Routes of Access of Enteral Tube Feeding

Orogastric	Feeding tube is inserted through the mouth with the tip resting in the stomach.
Nasogastric	Feeding tube is inserted through the nose with the tip resting in the stomach
Nasoduodenal	Feeding tube is inserted through the nose with the tip resting in the duodenum.
Nasojejunal	Feeding tube is inserted through the nose with the tip resting in the jejunum.
Esophagostomy	Feeding tube is inserted through a surgical opening in the neck and passed through the esophagus with the tip resting in the stomach.
Gastrostomy	Feeding tube is inserted through the abdominal wall into the stomach via percutaneous endoscopic guidance (PEG) or surgical placement (surgical gastrostomy).
Jejunostomy	Feeding tube is inserted through the abdominal wall into the jejunum via percutaneous endoscopic guidance (PEJ) or surgical placement (surgical jejunostomy).

*At standard dilution of 1 kcal/cc, the volume will be roughly equal to the calories desired

Enteral Formula Categories

Polymeric Formulas

Polymeric formulas require breakdown in the small bowel to dipeptides and tripeptides, free amino acids, and simple sugars, and therefore require adequate digestive and absorptive capability. There are two basic types of polymeric formulas:

- Synthetic formulas are generally used for standard tube feedings. Caloric content generally ranges from 1.0 kcal/cc to 2.0 kcal/cc. They are composed of protein (12-20% of kcal), carbohydrate (45-60% of kcal) and fat (25-40% of kcals) in high-molecular (intact) form and usually have a low osmolality (300-500 mOsm/kg H_20). Formulas are usually lactose-free and may or may not contain fiber.

- Blenderized formulas are a blenderized mixture of meats, fruits, vegetables, nonfat dry milk solids, and added vitamins and minerals. They are available as lactose-free and lactose-containing formulas. Some have a moderate to high viscosity, therefore requiring administration via a larger-bore feeding tube, and moderate osmolality.

Oligomeric and Monomeric

These formulas consist of one or more predigested macronutrients. Protein is present either as free amino acids (monomeric) or as amino acids with di- or tri-peptides (oligomeric). Carbohydrate sources consist of oligosaccharides and/or sucrose. Fat sources usually include medium chain triglycerides (MCT) oil and/or long-chain triglycerides (LCT) (soy or safflower) oils. These formulas are low-residue, are usually lactose-free, and are hyperosmolar. They are strictly indicated for patients with compromised GI function. Formulas with predigested nutrients should not be used for patients with normal digestion and absorption, as they are unnecessary and the cost of these formulas is significantly higher than standard intact nutrient formulas. Animal studies have shown that free amino acid (monomeric) based enteral formulas, when compared with polymeric formulas, are associated with increased intestinal atrophy, bacterial overgrowth and, systemic translocation in times of metabolic stress (4-7).

Modular Components

These are individually packaged macronutrients (protein, carbohydrate, fat) that may be combined in varying amounts to meet the patient's individual needs. Modular components may also be added as needed to premixed formulas to enhance the intake of one or more macronutrients.

Disease and Condition Specific Formulas

Several disease-specific formulas are currently on the market. These formulas have been altered in one or more nutrients in an attempt to optimize nutritional support without exacerbating the metabolic disturbances normally associated with various disease states. Although standard enteral formulas are appropriate for most patients, specialty products may offer advantages in some patients. Adequate data from clinical trials establishing the efficacy of disease-specific formulas are lacking; therefore; the potential benefit of these formulas to the patient is based primarily on theory. These formulas are more expensive than standard enteral formulas and should be carefully evaluated in light of the potential benefit for the individual patient before recommending them for use.

- Renal disease: Currently there are two basic categories of formulations on the market designed to minimize accumulation of nitrogenous compounds, electrolytes, and fluids in patients with renal insufficiency:

  - ❖ Modified non essential amino acids (NEAA): essential amino acid (EAA) ratios: Formulas are designed to be adequate in kcalories and restricted in protein, with a majority of the protein source in the form of EAA. Theoretically, these formulas force the body to recycle endogenously produced ammonia and urea nitrogen for protein synthesis. Additionally, these formulas 1) contain extra histidine, which is conditionally essential in renal failure, 2) are low in minerals/electrolytes, and 3) do not meet the RDAs. These solutions have limited uses, as they are not intended for patients receiving hemo- or peritoneal dialysis and are intended for short-term use only (8). The 1993 ASPEN guidelines (1) state, "On the basis of current evidence, providing specialized nutrition support to acute renal failure patients should be accomplished with an intake containing a balanced mixture of both essential and nonessential amino acids. Solutions with only essential amino acids are not recommended, except possibly under unusual conditions (eg, to decrease net urea synthesis), and then only for short periods, with monitoring of serum ammonia levels."

- ❖ Formulas with intact proteins: Formulas are either low or moderate in protein content with standard NEAA: EAA ratios. Formulas moderate in protein content are intended primarily for dialysis patients, while formulas low in protein may benefit patients for whom dialysis is not indicated or needs to be delayed for a short period of time. These formulas are moderately restricted in fluid and will meet the Dietary Reference Intakes (DRI) except for select vitamins, minerals, and electrolytes normally restricted in renal insufficiency (potassium, sodium, phosphorus, magnesium, etc).

- Immunocompromised state: Formulas contain nutrients that, in pharmacological amounts, are believed to benefit the immune system in times of metabolic stress (9-11). The following nutrients and the theories behind the development of the specialty formulas containing these nutrients are as follows:

  - ❖ Arginine: Requirement may be increased during stress due to greater utilization of the urea cycle. Arginine possesses hormonal secretory activities (growth hormone, insulin-like growth factor, catacholamines). Arginine has been shown to enhance T-cell proliferation after injury (12) and promote collagen formation in wound healing (13,14).
  - ❖ Fatty acids: Eicosapentanoic acid (EPA) and docosahexanoic acid (DHA) of the omega-3 fatty acid family (the parent being linolenic acid), which can be obtained from fish oils, are precursors of the 3-series prostanoids and 5-series leukotrienes. These substances are less immunosuppressive than the 2- and 4-series eicosanoids formed from omega-6 fatty acids (the parent being linoleic acid). Furthermore, omega-3 fatty acids inhibit formation of the eicosanoids produced from the omega-6 fatty acids and may be beneficial during times of metabolic stress.
  - ❖ Nucleotides: Serve as precursors to RNA and DNA synthesis and may improve immune response by influencing T lymphocyte activity (15,16).

- Hepatic disease: Formulas contain protein of a high branched-chain amino acid (BCAA) to aromatic amino acid ratio. They are designed to correct abnormal amino acid profiles associated with hepatic encephalopathy, as BCAA are metabolized independently of liver function. Effectiveness in correcting malnutrition may be due to increased nitrogen intake without aggravation of encephalopathy**.** Therefore, these formulas may be beneficial in malnourished patients with liver failure who have a history of encephalopathy and in whom potentially intolerable amounts of nitrogen intake are required to match losses. Cirrhotic patients without a history of encephalopathy usually tolerate standard enteral formulas. Hepatic formulas are not nutritionally complete and their use is not clearly correlated with an overall improvement in clinical outcome. These formulas may not meet the RDAs for selected nutrients.

- Stress: When the patient is stressed, the main objectives are to 1) support nutrient losses during the hypermetabolic response and, 2) enhance immune system. Stress formulas enriched with BCAA (44-50%), have low calorie:nitrogen ratios (80:1), which are believed to better support the increased muscle proteolysis associated with metabolic stress. In some clinical trials, BCAA-enriched formulas have produced greater nitrogen retention (17,18) and higher levels of serum proteins (17) in stressed patients, but did not clearly affect morbidity or mortality rates. These formulas, in moderate amounts, usually meet the RDAs for all nutrients. Some stress formulas have also been enriched with glutamine. Although glutamine is the most abundant amino acid in the body, it is not considered essential in diets of healthy individuals. However, in critically ill patients, supplemental glutamine is suspected to, among other functions, protect intestinal mucosal integrity and improve protein nutriture by increasing protein synthesis (19) and decreasing protein breakdown (20). Instability of glutamine in aqueous solutions has precluded its addition to most enteral and parenteral products used in the clinical setting.

- Pulmonary disease: Formulas are designed to be low in carbohydrate and high in fat in order to blunt CO_2 production in pulmonary compromised patients. Although a few studies have shown decreased CO_2 levels in hypercapnic patients receiving these formulas (21,22), more data demonstrating the effectiveness of these formulas are needed. Caution must be exercised to not overfeed, even with this specialized formula. The high lipid content of these formulas may cause delayed gastric emptying. These formulas tend to contain intact nutrients and are usually low in fluid and nutritionally complete in moderate amounts.

- Hyperglycemia: Formulas are designed to be low in carbohydrate and high in fat, and contain fiber to attenuate the blood glucose response. It has been shown that lower carbohydrate formulations, when compared with standard formulations, have a glucose-lowering effect in some patients with glucose intolerance; however, the responses of individual patients are variable (23). Fiber in tube feeding has not been proven to significantly lower blood glucose levels.

Water/Fluid Requirements
Fluid requirements can usually be met by providing at least 1 cc/kcal or 30 cc/kg body weight. Fluid requirements may be reduced in some medical conditions, such as congestive heart failure, renal failure, ascites, syndrome of inappropriate antidiuretic hormone (SIADH), and malignant hypertension. Conditions that may increase fluid requirements include fever, burns, diarrhea, vomiting, high output fistulas and ostomies, and ventilatory support.

Methods to Determine Fluid Requirements

- 1500 cc/m^2
- 1500 cc for 1st 20 kg, then 20 cc/kg > 20 kg
- 30-35 cc/kg (average net)
- 30-35 cc/kg age 18-64 yr
- 30 cc/kg: age 55-65 yr
- 25 cc/kg: age> 65 yr
- RDA: 1 cc/kcal
- 1 cc/kcal + 100 cc/g N_2 consumed

Approximate Free Water* Content of Nutritional Formulas

Formula	**cc H_2O/cc Formula**	**cc H_20/ kcal**
1.0 kcal/cc	0.84	0.84
1.0 kcal/cc w/fiber	0.83	0.83
1.5 kcal/cc	0.78	0.52
2.0 kcal/cc	0.71	0.36

*Free water delivered in tube feeding = cc formula delivered x cc H_2O/cc formula.

Considerations for Formula Selection
There are a variety of enteral nutrition products on the market, many of which have only subtle differences in composition.

Caloric density: A caloric density of 1 kcal/cc is considered standard. Additional free water is usually necessary to meet fluid requirements. Higher concentrations may be indicated when fluid must be restricted or when feeding volumes sufficient to meet caloric requirements cannot be tolerated.

Osmolality: Products are available at isotonic osmolalities (300 mOsm/kg), moderate osmolalities, and high osmolalities. The main contributors to osmolality are sugars, free amino acids, and electrolytes. High carbohydrate, amino acid or peptide-based formulas have a moderate to high osmolality.

Protein: Protein sources are intact proteins, peptides, or amino acids. Generally, protein makes up 9% to 24% of total calories. High nitrogen formulas may not be well tolerated in certain renal or hepatic disorders. High nitrogen concentrations can result in higher renal solute load and predispose, the elderly patient to dehydration. One (1) g of nitrogen requires 40-60 cc of water for excretion. An average nonprotein kcal/N ratio of 150:1 (ranging from 80:1 to 150:1) has been suggested to meet needs of moderately to severely stressed patients (24).

Fat: Fat sources are long-chain triglycerides (LCT) and medium-chain triglycerides (MCT). The fat content usually ranges from 3% to 35% of calories for amino acid/peptide-based formulas and 25-55% for standard formulas. Fats do not contribute significantly to osmolality. Inclusion of MCT may be beneficial when there is fat malabsorption or maldigestion, since MCT does not require pancreatic lipase for absorption, and intraluminal hydrolysis is more rapid and complete than with LCT (23). MCT do not supply essential fatty acids. MCT may cause complications for cirrhotic patients with limited ability to oxidize MCT. The administration of MCT along with LCT increases the total intestinal absorption of both fats, compared with the absorption when one or the other is administered alone.

Carbohydrate: Carbohydrate is the most easily digested and absorbed nutrient. Enzyme digestion is very efficient as surface digestion is not rate limiting (except lactose). The transport process is the slowest part of carbohydrate metabolism. Carbohydrate sources are monosaccharides, oligosaccharides, or lactose. The carbohydrate content of formulas may range from 35% to 90%. Longer carbohydrate molecules exert less osmotic pressure, taste less sweet, and require more digestion than shorter ones. Glucose polymers are better absorbed than free glucose and enhance absorption of calcium, zinc, and magnesium in the jejunum. Use of hypertonic formulas has been associated with diarrhea in some patients. Nausea, vomiting, and diarrhea may occur with the use of lactose-containing formulas in patients with lactose intolerance.

Lactose: Lactose is present in milk-based and some blenderized formulas. Note: Most commercial formulas are lactose free.

Residue: Milk-based and other formulas with intact nutrients are generally low residue. Blenderized and fiber-supplemented formulas leave a moderate to high residue.

Fiber: Products containing fiber are available. These products may be beneficial for some patients to maintain normal bowel function and/or to help control diarrhea (25,26) or constipation (28). Soy polysaccharide in formulas consists of both soluble and insoluble fiber. Dietary fiber has been shown to increase fecal wet weight (29) and stool frequency (29-31). Short-chain fatty acids from the breakdown of soluble fiber have been shown to stimulate mucosal growth in the small bowel and colon (32), which may be beneficial in protecting against mucosal atrophy in times of metabolic stress. Fortified products contain 5-14 g fiber/per liter.

Sodium and Potassium: Select formula according to the patient's nutrition prescription and laboratory profile.

Renal Solute Load: The main contributors to renal solute load are protein, sodium, potassium, and chloride. High renal solute load in sensitive patients can result in clinical dehydration.

Safety: Formulas blenderized in the facility are discouraged. They carry a greater risk of infection, require careful handling, tend to clog tubes, and need a high volume to meet nutrient needs.

Nutritional Completeness: Formulas vary as to the volume needed to provide 100% of the RDA.

Viscosity: Blenderized, high-fiber, and high-density formulas should not be administered through tubes smaller than a 10 French unless a pump is used. Formulas may flow through an 8 French tube when a pump is used.

Vitamin K: For patients receiving anticoagulant therapy, prothrombin time may be affected by variations in the level of vitamin K intake. Selecting an enteral product low in vitamin K or simply ensuring a consistent daily level of vitamin K intake may be beneficial for these patients.

Cost: Amino acid/peptide-based formulas are usually more expensive than synthetic formulas containing intact nutrients.

Form: Ready-to-use liquid or powder.

Enteral Feeding Administration

Formula Delivery: Pump-Assisted Infusions

Continuous feedings require that the enteral formula be administered at a slow rate over a 24-hour period. Continuous feedings are indicated for unstable critically ill patients or other patients unable to tolerate high-volume feedings. Feedings may be initiated at full strength in the stomach or at an isotonic strength in the small bowel, at a low rate (10-50 cc/hr), and gradually increased as tolerated in increments of 10-25 cc/hr to the goal rate. Ideally, strength and volume should not be increased simultaneously.

Cyclic feedings are administered over an 8-20-hour period of time. This method of tube feeding is most beneficial for patients who are progressing from complete tube feeding support to oral feedings (as discontinuation of feedings during the day may help to stimulate appetite), and in ambulatory home care patients who are unable to tolerate intermittent or bolus feedings (allows freedom from the administration set). Since cyclic feedings usually require a high infusion rate, they may in turn cause formula intolerance. This can be avoided in most cases by a gradual transitioning of the patient from continuous feeds to a cyclic feeding schedule.

Formula Delivery Not Requiring Pump

Bolus feeding method involves delivery of up to 400 cc of formula via feeding tube over a 5-10-minute period several times a day to meet estimated requirements. This method is restricted to gastric feedings and is contraindicated in patients with a high risk of aspiration.

Intermittent/gravity-flow feeding involves delivery of up to 400 cc formula via feeding tube over 30-minute periods several times daily as needed to meet estimated nutritional needs. This method is indicated for gastric feedings only since the small bowel does not tolerate large volumes of formula at one time. This type of feeding is contraindicated in patients with a high risk of aspiration.

Enteral Feeding Formula and Equipment Maintenance

Formula

- Bring to room temperature prior to feeding.
- Hang time should be kept to less than 8 hours or as specified by manufacturer, unless ready-to-hang prefilled containers are used (which may hang up to 24 hours at room temperature). Any formula remaining in container after hang time has expired should be discarded.
- Opened, unused formula should be kept refrigerated for no longer than the manufacturer's specifications (usually 24 to 48 hours).

Enteral Delivery Set

- Irrigate tube every 4 hours with warm water to ensure patency.
- To reduce bacterial contamination, flush water through the bag and tube every 8 hours prior to adding new formula.
- Avoid putting food and beverages into the tube (juice, milk, soda, etc).
- Flush tube with water prior to and immediately after administration of medicines to avoid clogging the tube.
- To reduce risk of infection and contamination, feeding bag and tubing should be changed every 24 hours.

Patient Monitoring

Clinical

- Patients with nasoenteric tubes require mouth and nose care every 8 hours to prevent parotitis and skin breakdown around the nose.
- Assess bowel sounds every 8 hours.
- Check placement of nasoenteric tube every 4-8 hours.
- Check residuals in nasogastric-or gastrostomy-fed patients prior to each intermittent or bolus feeding using a 50-60 cc syringe. Residuals should be checked before bolus feedings or during continuous pump feedings, intermittently and/or when other signs of feeding intolerance (abdominal distention, vomiting, etc) are present. A residual volume of greater than 200 cc obtained from a nasogastric suctioning, or greater than 100 cc from a gastrostomy tube, should alert the clinician to possible intolerance (33). A single occurrence of a high residual without other signs of feeding intolerance should not result in cessation of the tube feeding, as this can result in patients not meeting their nutritional requirements. Patients with high residuals may benefit from medications that stimulate gastric motility. Patients with consistently high residuals must be evaluated to rule out any medical problems (eg, ileus, bowel impaction) that may cause an intolerance to the feeding. Feeding tubes <10 French may be unreliable in determining residuals.
- Maintain head of bed at 30°-45° angle to reduce risk of aspiration when feeding. If bolus feeding, keep head of bed in this position for 30-60 minutes after feeding.
- Watch for signs of aspiration, nausea, vomiting, abdominal cramping, diarrhea, dehydration, stool impaction, ileus.
- Weigh patient weekly.
- Maintain records of intake, output, and bowel movements.

Metabolic/Labs

- Sodium, potassium, chloride, CO_2, blood urea nitrogen (BUN), creatinine, and glucose daily until stable, then biweekly to weekly.
- Albumin, liver function tests, calcium, magnesium, and phosphorus baseline and at least weekly until stable, then monthly.
- CBC baseline, then as needed.
- 24-hour urine for urine urea nitrogen (or total urea nitrogen) once goal rate/strength of tube feeding attained, then weekly until stable.
- Prealbumin baseline, then biweekly to weekly during visceral protein repletion.

Medications via Enteral Feeding Tubes

Feeding tubes should be irrigated with water prior to and immediately after administration of medications. Since crushed medications may lead to clogged tubes, liquid forms of medication should be used when possible. Many oral medicines formulated for slow release may be surrounded by an enteric coating and should not be crushed and administered through the feeding tube. Temporary cessation of feeding may be indicated prior to and/or after administration of certain enteral medications (eg, phenytoin), due to food-drug interactions.

Transitional Feedings: Enteral to Oral

Depending on the swallowing function of the patient, oral intake should begin with liquids and advance to soft foods as tolerated. When oral intake reaches 500 calories or more, tube feedings may be proportionately tapered. Often switching the patient from a continuous tube feeding to night tube feeding only or discontinuing tube feeding 1-2 hours before meals will stimulate appetite and speed transition to adequate oral intake. When oral intake consistently meets or exceeds 60% of the patient's energy requirements and 100% fluid requirements before discontinuation of tube feedings should be considered (3).

See Section III: Clinical Nutrition Management
ENTERAL NUTRITION COMPLICATIONS

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PARENTERAL NUTRITION SUPPORT

Total parenteral nutrition (TPN), also known as central parenteral nutrition (CPN), and historically known as intravenous hyperalimentation (IVH), is the delivery of nutrients via a central venous access (subclavian or internal jugular vein). TPN permits the delivery of hyperosmolar nutrient solutions for long-term nutrition support. Supplementation via a peripheral vein is defined as peripheral parenteral nutrition (PPN) and is a temporary access for the administration of dilute nutrient solutions. (See section entitled "Peripheral Parenteral Nutrition (PPN)").

Indications (1-3)
Total parenteral nutrition (TPN) is indicated for patients who are unable to take adequate nutrients via the enteral route (eg, patients who have a nonfunctional or severely compromised gastrointestinal tract). Specifically, conditions may include

- severe malabsorption,
  - massive bowel resection ($\geq$ 70% resected)
  - severe diarrhea
- intractable vomiting,
- moderate to severe pancreatitis,
- ileus,
- complete intestinal obstruction,
- enterocutaneous fistula,
- severe inflammatory bowel disease (IBD),
- malnourished patient undergoing high-dose chemotherapy, radiation, bone marrow transplantation.

Contraindications (1-3)
TPN is not indicated for patients

- with a fully functional and accessible GI tract,
- inability to obtain venous access,
- whose prognosis does not warrant aggressive nutritional support,
- whose sole dependence on TPN is expected to be less than 5 days,
- when the risks of TPN exceed the potential benefit to the patient.

Nutrient Sources of PN Solutions
Carbohydrate in the intravenous form is available as a monohydrous dextrose. Stock solutions range from 5% to 70% concentration of dextrose in water. Each gram of dextrose yields 3.4 Calories. Dextrose solutions in the TPN mixture usually range from 10% to 35% final concentration. The ability of the body to oxidize glucose is in the range of 2-5 mg/kg BW/min (4). Provision of carbohydrate in excess of this range may result in overfeeding and can lead to increased CO_2 production, minute ventilation, and respiratory quotion (RQ) > 1.0 (5). This may be hazardous for the pulmonary-compromised patient (6,7). Overfeeding of dextrose can also lead to fatty liver (steatosis) (8) and unnecessary hyperglycemia (9).

Protein is available in the intravenous form as crystalline L-amino acids. Stock solutions vary from 3% to 15% amino acids (AA). Commercial AA formulas usually contain 40-50% EAA, 50-60% NEAA. The calorie content of intravenous amino acids is 4 kcal/gram. Most patients require 1.0-2.5 g protein/kg BW/day to meet nitrogen losses (10-12). Exceptions may include patients with hepatic or renal failure who may not tolerate large doses of protein. (See "Specialized Amino Acid Solutions".) Balanced protein solutions (normal NEAA:EAA ratios) contain 16% nitrogen (1 g protein = 0.625 g nitrogen). Protein breakdown for energy seems to be inherent in metabolically stressed patients. It is difficult to determine exact non-protein calorie to nitrogen ratios for protein repletion in stressed patients; however, it is generally recommended to provide 80-150 calories for every gram of nitrogen (10). In the unstressed, stable patient, calorie to nitrogen ratios of 150:1 to 350:1 are recommended (13,14).

Fat in the intravenous form is available as long-chain triglycerides (LCT) derived from either soybean oil or as a combination of soybean and safflower oils. Lipid sources are emulsified with egg yolk phospholipid; therefore, use may be contraindicated in patients with known egg allergies. Lipids provide 9 kcal/gram and have been shown to be nitrogen sparing when provided with dextrose in PN solutions (15,16). Current stock solutions are available as 10% concentration (1.1 kcal/cc), 20% concentration (2.0 kcal/cc), and 30% concentration (3.0 kcal/cc). Intravenous lipids are isotonic, and therefore contribute minimally to osmolarity of PN solutions. Lipids provide an important source of essential fatty acids (EFA). Two to four percent of energy needs should be supplied as linoleic acid or 25-

100 mg/kg EFA daily. A minimum of 500 cc of 10% lipid stock solution or 200 cc of 20% stock solution given two to three times a week is sufficient to prevent EFA deficiency (17).

Providing a portion of the nonprotein calories as lipid in PN solutions without overfeeding in total calories has been shown to reduce insulin requirements in hyperglycemic patients (15) and may blunt excessive CO_2 production, which has been associated with infusion of high carbohydrate solutions (9). Recent evidence has indicated, however, that excessive rates of LCT infusions may have a detrimental effect on immune function by interfering with the reticulo-endothelial system (RES) (18,19,20). Therefore, it is currently recommended that lipids be infused continuously over a 24-hour period (18,19) and at 25-40% of calories or less, or no more than 1 g/kg BW/day (10,18). Exceeding 60% of the nonprotein calories as fat has resulted in fat overload syndrome (21). Lipids should be used cautiously in patients with hypertriglyceridemia (>250 mg/dL).

Specialized Amino Acid Solutions: Use of these formulas is intended for special disease states in which conventional amino acid solutions may not be well tolerated (eg, renal failure, hepatic failure). The contribution of these formulas to improve overall clinical outcome is debatable. Since the cost of these formulas is usually much higher than conventional amino acid solutions, the clinician should evaluate the cost in light of potential benefit to the patient before recommending them for use. In 1993 ASPEN published guidelines for nutrition support in specific disease states (22). These guidelines serve as a basis for the following discussion of use of specialized or "designer" formulas:

- Liver disease: High BCAA/low aromatic AA solutions are designed to correct abnormal amino acid profiles associated with hepatic encephalopathy, as BCAA are metabolized independently of liver function. The 1993 ASPEN guidelines (22) state, "Most patients with liver disease that do not have hepatic encephalopathy can tolerate a protein source with standard amino acids. When, in spite of conventional medical therapy with lactulose and/or neomycin, the presence of hepatic encephalopathy makes it impossible to provide adequate protein to a patient with liver disease, an enteral or parenteral product containing a liver-specific amino acid mixture should be used."

- Critical illness: High branched-chain amino acids solutions have been designed for use in the septic or trauma patient to support the increased muscle proteolysis associated with metabolic stress. " Branched-chain amino acids have not been shown to favorably influence clinical outcome in critically ill patients" (22).

- Renal disease: Solutions containing only essential amino acids are designed to help blunt BUN elevations in patients with severe renal insufficiency. Theoretically, providing only small amounts of EAA (approximately 0.6 g/kg BW/day) as the protein source in nutrition support regimens will promote reutilization of endogenously produced urea nitrogen for protein synthesis. These solutions have limited uses, as they are not intended for patients receiving hemo- or peritoneal dialysis and are intended for short-term use only (23). The 1993 ASPEN guidelines (22) state, "On the basis of current evidence, providing specialized nutrition support to acute renal failure patients should be accomplished with an intake containing a balanced mixture of both essential and nonessential amino acids. Solutions with only essential amino acids are not recommended, except possibly under unusual conditions (eg, to decrease net urea synthesis), and then only for short periods, with monitoring of serum ammonia levels."

PARENTERAL VITAMINS, TRACE ELEMENTS, AND ELECTROLYTES FOR ADULTS

Vitamins, minerals, and trace elements are essential for normal cell metabolism and repair and must be included in TPN solutions on a daily basis. The following amounts are recommended daily (24-26):

Vitamins		**Trace Elements**	
A (IU)	3300	Zinc (mg) *	2.5-4.0
D (IU)	200	Copper (mg) ❖	0.5-1.5
E (IU)	10	Chromium (mcg)	10-15
Ascorbic acid (mg)	100	Manganese (mcg) ❖	150-800
Folacin (mcg)	400		
Niacin (mg)	40	**Electrolytes**	
Riboflavin (mg)	3.6	Na	80-100 mEq
Thiamine (mg)	3.0	K	80-100 mEq
Pyridoxine (mg)	4.0		
Cyanocobalamin (mcg)	5.0	Ca @	15-25 mEq or .2-.3 mEq/kg
Pantothenic acid (mg)	15.0		
Biotin (mcg)	60.0	Phos @	15-20 mM or .3-.6 mmol/kg
		Mg #	20-30 mEq or 0.25-0.35 mEq/kg
		Cl	same as sodium

*In patients with intestinal losses via ostomies, diarrhea, etc, add 12.2 mg/L for small intestinal fluid loss and 17.1 mg/L for stool or ileostomy output.

❖ Cu and Mn are excreted via the biliary tract; therefore, these elements may need to be decreased or eliminated from the parenteral nutrition solution for patients with cholestatic liver disease.

@ Limitations exist in which amounts can be placed in PN solutions. Ca and P can form a precipitate if they are not compounded properly or if excessive amounts are added to the solution. The pH, temperature, and type of AA solution also affect compatibility. Special consideration is required for a 3-in-1 solution because of the higher pH and destabilizing effect of lipid emulsion. Limits are:

2-in-1 solution - 10m Eq/L of Ca and 12 mM/L of P (27)
3-in-1 solution - 8m Eq/L of Ca and 20 mM/L of P (28)

#Mg, like Ca, is divalent and can destabilize the lipid emulsion. In a 2-in-1 solution, 20 mEq/L of Mg is usually compatible; however, in a 3-in-1 solution, no more than a total of 20 mEq/L of Ca and Mg is recommended. (27,28)

Vitamin K

Supplementation in amounts of 1 mg/day or 10 mg/week is considered essential in parenterally fed adult patients (exceptions may include patients receiving anticoagulants.) Vitamin K may be administered in the PN solution or via intramuscular (IM) injection (29).

Molybdenum (Mb) and Selenium (Se)

Although Mb and Se are believed to be essential in humans, the exact daily requirements for parenteral Mb and Se have not been established. For adults, providing Mb at 20-120 mcg/day and Se at 40-80 mcg/day has been practiced (30).

Iron

Iron replacement therapy is not commonly utilized during short-term nutrition support but may be indicated when there is a preexisting iron deficiency or when acute blood loss is significant. Oral administration of iron, if possible, is the preferred method of supplementation. Intramuscular (IM) injection and infusion of iron through a separate peripheral line are other methods for iron replacement. Although it is not routine practice, iron (as iron dextran) has been added to conventional parenteral nutrition solutions for long-term TPN patients; maintenance doses of approximately 1.0 mg/day have been utilized (31,32). Addition of iron to total nutrient admixtures is not recommended because of compatibility problems (33).

Total Nutrient Admixtures (TNA)(33)

TNA parenteral solutions, also known as '3 in one' or 'all in one' solutions, are composed of a mixture of amino acids, dextrose, lipids, vitamins, trace elements, and electrolytes in one container. This method of delivery of nutrients differs from the conventional method of providing TPN, in which lipids were given from a separate container and "piggybacked in" with the amino acid-dextrose solution.

Total nutrient admixtures have helped decrease the cost of TPN solutions because of an overall decrease in daily administrative and equipment costs associated with TPN preparation and a decrease in nursing time (34,35). Use of TNA may also help prevent excessive dextrose administration in critically ill patients. Also, lipids are administered over a 24-hour period, which may promote better patient tolerance.

Disadvantages of total nutrient admixtures include a better growth medium for bacteria than the conventional system. Also, most particulate matter cannot be visually inspected. Because TNAs contain lipids, a larger in-line filter of the 1.2 micron size (versus the 0.22 micron size for conventional solutions) must be used, which is sufficient for trapping solution particulates, precipitates, and *Candida albicans* but does not protect against infusing contaminates such as *S. epidermis, E. coli*, and bacterial endotoxins.

Monitoring Hospitalized Patients on TPN (36,37) **For CHS facilities, CLICK HERE.**

Metabolic	
Blood glucose	every 6 hours until stable, then twice a week
Electrolytes	daily until stable, then two to three times a week
BUN/Cr	baseline, then two to three times a week
Ca*	baseline, then weekly
Phos	baseline, then two to three times a week
Mg	baseline, then two to three times a week
Total bilirubin	baseline, then weekly
LFT	baseline, then weekly
Fluids (I/O)	every 8 hours or daily
Nutritional	
Weight	daily until stable, then twice a week
Albumin	baseline, then as needed
Transferrin	baseline, then as needed
Prealbumin	baseline, then as needed
Nitrogen balance	weekly until stable
Clinical	
Temperature	every 8 hours
Pulse	every 8 hours
Blood pressure	every 8 hours
Respiratory rate	every 8 hours

* Half of total calcium is protein bound; therefore, during hypoalbuminemia, true calcium status may not be represented by measuring serum calcium levels. There is a 0.8 mg/dL decline in total concentration of serum calcium for each 1.0 mg/dL decrease in albumin concentration below 4.0 g/dL. Corrected serum calcium can be estimated by the following formula: Ca++(mg/dL) = measured serum Ca++(mg/dL) + 0.8 x [4 - alb (g/dL)] (38).

See Section III: Clinical Nutrition Management
PARENTERAL NUTRITION:
COMPLICATIONS OF TPN METABOLIC
CALCULATING TOTAL PARENTERAL NUTRITION

Transitional Feeding

Parenteral to Enteral

When the patient is transitioned from parenteral support to enteral support, the tube feeding should be initiated at full strength at 10-50 cc/hr. As the rate of tube feeding is increased, the rate of TPN is decreased proportionately. In general, the transition of TPN to TF is accomplished in 3-7 days, depending on the patient's tolerance.

Cyclic TPN

Cyclic TPN is the infusion of TPN over a limited amount of time (usually 12-18-hour periods). Cyclic TPN is indicated for patients who are metabolically stable and for patients requiring long-term TPN, such as home TPN patients. The advantages of cyclic TPN include feedings that more closely resemble physiological (discontinuous) feedings, which may reduce hepatic toxicity associated with continuous feedings, and improved quality of life as the patient is free from TPN equipment during the day.

Peripheral Parenteral Nutrition (PPN)

Peripheral parenteral nutrition is a solution of protein, calories, vitamins, trace elements, and electrolytes that is administered via the peripheral vein. PPN is indicated for use as a temporary measure (<2 weeks) of nutrition support in malnourished patients in whom central PN access has not yet been or cannot be obtained (1). PPN does not meet the total needs of most patients. Because of the inability of peripheral veins to tolerate soluntions of > 900 mOsm/L, nutrients must be limited in PPN. Dextrose may be provided in 5-10% final concentration, amino acids in 3.0-5.0% final concentration. Lipids are isotonic, and therefore contribute minimally to the osmolarity of the PPN solution. Lipids may also help protect the veins from irritation associated with PPN solutions of dextrose and amino acids. The maximum volume of PPN usually tolerated is 3 L/day (125cc/hr).

RECOMMENDED DAILY INTRAVENOUS NUTRIENTS OF THE PEDIATRIC PATIENT (39-41)

Age	Energy kcal/kg	Protein (g/kg)	Fat (g/kg)	Fluids
Very low birth weight (<1,500 g)	80-120	2.5-3.0	2-3	Initiate 90-100 cc/kg on day 1-2, advance to 120-140 cc/kg by the end of the first week of life. Advance to 130-150 cc/kg by the second week of life. In clinical practice 150-180 cc/kg are often administered, depending on birthweight (1,2).
0-12 mo	90-110	2.0-3.0	3	100-120 cc/kg
1-8 yr	70-100	1.5-2.5	3	70-100 cc/kg
8-15 yr	30-70	1-1.5	2-3	30-70 cc/kg

Carbohydrates (42)

- Preterm infants begin with D_5W final concentration glucose infusion rate of 5-6 mg/kg/min. Advance carbohydrate in 1-2 mg/kg/min increments daily or by 1-3%, as tolerated, depending on fluid intake. Extremely low birthweight (ELBW <100 grams) or small for gestational age (SGA) infants may require more gradual advancement in carbohydrate because of persistent problems with hyperglycemia.
- Full-term infants begin with $D_{10}W$ final concentration and glucose infusion rate of 7-9 mg/kg/min. Advance carbohydrate in 2-4 mg/kg/min increments daily or by 2.5-5% as tolerated, depending on fluid intake.
- High incidence of hyperglycemia occurs within the first 24-48 hours of life in preterm infants and may occur up to the first 2 weeks of life in ELBW or SGA infants.

Protein (42)

- Pediatric amino acid preparations contain a balanced mixture of essential and nonessential amino acids with increased amounts of tyrosine and taurine.
- Premature infant: Begin 0.25-0.5 g/kg/d and advance by 0.5 g/kg as tolerated, until the goal is reached. In actual clinical practice, most preterm infants greater than 1.0 kg tolerate initial doses of 1.0 g/kg with daily advancements of 1.0 g/kg/day.
- Full-term infant: Begin at 1.0 g/kg/d and increase 0.5-1.0 g/kg/d as tolerated, until the desired goal is reached.
- Intakes > 3-3.5 g/kg/d may result in increased ammonia, lethargy, decreased responsiveness, and increased metabolic acidosis.

Fat (42,43)

- Low birthweight and SGA infants are highly susceptible to essential fatty acid deficiency.
- Lipids displace bilirubin from the protein carrier albumin; delay advancement of intravenous lipids in infants with an elevated bilirubin until bilirubin levels approach normal limits.
- Fat should be administered over 20-24 hours.
- Preterm weighing <1000 g: Begin at 0.5 g/kg/d and increase by 0.5 g/kg/d to maximum 2.5 g/kg/d.
  Preterm >1000 g and term: Begin 0.5 g/kg/d and increase by 0.5 g/kg/d to maximum 3.0-3.5 g/kg/d. Maximum rate of infusion is 150 mg/kg/hr. In actual clinical practice, most preterm infants > 1000 g and term infants tolerate initial doses of 1.0 g/kg with advancement of 1.0 g/kg/day.

Lipids should be used cautiously and monitored closely in infants with hyperbilirubinemia, pulmonary hypertension, or sepsis. The essential fatty acid dose of 0.5-1 g/kg/d is safe, even for infants with significant pulmonary disease, sepsis, or hyperbilirubinemia. As soon as clinically feasible, lipids should be gradually advanced by 0.5 g/kg/d to a goal of 2-3 g/kg in order to optimize the provision of the infant's caloric needs.

RECOMMENDED DAILY NUTRIENT NEEDS OF PEDIATRIC PATIENT REQUIRING PARENTERAL NUTRITION

Recommended Intakes for Vitamins (39,44,45)

Nutrient	Full-Term infants / Children	Preterm Infants
Thiamin (B_1)	1.2 mg/day	0.35 mg/kg
Riboflavin (B_2)	1.4 mg/day	0.15 mg/kg
Niacin	17 mg/day	6.8 mg/kg
Pyridoxine (B_6)	1.0 mg/day	0.18 mg/kg
Ascorbic acid (C)	80 mg/day	25 mg/kg
Vitamin A	700 mcg/day	500 mcg/kg
Vitamin D	400 IU/day	160 IU/kg
Vitamin E	7.0 IU/day	2.8 IU/kg
Pantothenate	5 mg/day	2.0 mg/kg
Folate	140 mcg/day	56 mcg/kg
Vitamin B_{12}	1.0 mcg /day	0.3 mcg/kg
Vitamin K	200 mcg/day	80 mcg/kg
Biotin	20 mcg/day	6.0 mcg/kg

Adapted from Greene HL, et al. *Am J Clin Nutr* 48:1324-1342; 1988.

Recommended Intakes of Electrolytes (39,44)*

Electrolyte	Low Birthweight (mEq/kg)	Full Term Infants to Adolescents (mEq/kg)
Sodium	2 - 4	2 -4
Potassium	2 - 3	2 - 3
Chloride	2 - 3	2 - 3
Calcium	50-60 mg/dL 3.5-4.5 mEq/kg	3-3.6 mEq/kg (< 1 year) 1-2 mEq/kg (> 1 year) ✧
Phosphorus	1.0-1.5 mM/kg	1.0 mM/kg (child) 0.5-1.0 mM/kg (adolescent)
Magnesium	0.25-0.5 mEq/kg	0.25-0.5 mEq/kg

* - These will need to be adjusted according to the tolerance of the individual patient and particular disease state.
✧ - Requirements are less with advancing age; few data are available.

Recommended Intakes for Trace Elements (44,45)*

Element (mcg/kg/day)	Infants: Preterm	Infants: Full-Term	Children
Zinc	400	250 (<3 mo) 100 (<3 mo)	50
Copper *	20	20	20
Chromium ✧	0.20	0.20	0.20
Manganese @	1.0	1.0	1.0
Selenium #	2.0	2.0	2.0
Molybdenum #	0.25	0.25	0.25

* Except for Zinc, inclusion of these elements may not be required when TPN is given less than 4 weeks or when TPN is only supplemental to enteral nutrition. Adapted from Greene, HL, et al. *Am J Clin Nutr*. 1988; 48:1324-1342.
✧ Omit in patients with obstructive jaundice.
@ Omit in patients with renal insufficiency.
# Decrease or omit in patients with renal dysfunction.

Iron (Fe)

Parenteral iron supplementation should be considered for infants and children on long-term TPN who have not received blood transfusions. Supplementation may be delayed until 3-4 months of age in full-term infants with normal iron stores (44).

Addition of iron to the parenteral nutrition solution is controversial because of the interaction of iron with antioxidant activity and the risk of gram-negative septicemia and anaphylaxis. Diluted iron dextran has been used parenterally to support iron requirements in children. Parenteral requirements have been estimated at approximately 100 mcg Fe/kg for the full-term infant and 200 mcg Fe/kg for the preterm infant (39). For preterm infants, supplements are generally not necessary before the second month or prior to reaching a weight of 2000 g. Serum iron and transferrin levels should be monitored closely and the dose of iron adjusted accordingly.

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MEDICAL NUTRITION THERAPY FOR DIABETES MELLITUS

For CHS facilities specific diets, you may also choose one of the following:
DIABETES IN CHILDREN, UNMEASURED DIABETIC DIET, REACTIVE HYPOGLYCEMIA

Description
The goal of medical nutrition therapy for diabetes mellitus is to improve metabolic control (glucose and lipids), provide appropriate energy, and improve overall health through optimal nutrition. The meal plan incorporates consistent carbohydrate intake, appropriate fat modifications, and consistent timing of meals and snacks.

Indications
Diabetes is diagnosed and classified based on results of the appropriate tests. The Expert Committee on Diagnosis and Classification of Diabetes Mellitus has established criteria for interpretation of test values. See Section II: Diagnosis Criteria for Diabetes Mellitus. The type of diabetes and the individual needs of the patient with diabetes determine the nutrition strategy employed.

The overall goal of medical nutrition therapy is to assist people with diabetes in making changes in nutrition and exercise habits, which would lead to improved metabolic control. Additional goals are as follows (1):
- Maintain blood glucose as near to normal as possible to prevent hyperglycemia and/or hypoglycemia.
- Prevent or delay the development of the long-term cardiovascular, renal, retinal, and neurologic complications associated with diabetes mellitus.
- Achieve optimal lipid levels.
- Attain and maintain reasonable body weight.
- Contribute to normal outcomes of pregnancies for women with preexisting diabetes and gestational diabetes.
- Provide adequate nutrition for increased needs during pregnancy and lactation.
- Maintain normal growth and development rates in children and adolescents with diabetes.

Glycemic Control for People With Diabetes* (2)

Biochemical index	Normal	Goal	Additional action suggested
Average preprandial glucose (mg/dL)†	<110	80-120	<80 >140
Average bedtime glucose (mg/dL)†	<120	100-140	<100 >160
HbA_{1c} (%)	<6	<7	>8

*The values shown in this table are by necessity generalized to the entire population of individuals with diabetes. Patients with comorbid diseases, the very young and older adults, and others with unusual conditions or circumstances may warrant different treatment goals. These values are for nonpregnant adults. Additional action suggested depends on individual patient circumstances. Such actions may include enhanced diabetes self-management education, comanagement with a diabetes team, referral to an endocrinologist, change in pharmacologic therapy, initiation of or increase in SMBG, or more frequent contact with the patient. Hemoglobin A_{1c} (HbA_{1c}) is referenced to a nondiabetic person of 4.0%-6.0% (mean, 5.0%; SD, 0.5%).
†Measurement of capillary blood glucose.

Nutritional Adequacy
The nutrition prescription can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the ***Statement on Nutritional Adequacy*** in Section IA.

How to Order the Diet
The physician may specify one of the following:
- Consistent carbohydrate meal plan: The meal plan incorporates consistent carbohydrates (±15 g of carbohydrate per meal or snack), appropriate fat modifications, and consistent timing of meals and snacks, not specific calorie levels. The meal plan provides 1,500 to 1,800 kcal a day through meals and snacks, with approximately 50% of the energy from carbohydrate, 20% from protein, and 30% from fat (3). Evening (HS) snack will be sent automatically with this order. This diet will be the house standard meal plan for people with diabetes.
- Nutrition prescription per registered dietitian (RD) recommendations: The dietitian plans an individualized diet, taking into account the patient's energy and protein needs, fat restrictions, food preferences, and eating habits. Snacks are planned for patients taking insulin or are served according to facility protocols. Meal plans based on exchange diets or carbohydrate counting may be used with this order.

Individualization of the meal pattern is emphasized, rather than a specific standard macronutrient distribution. Fat content of the diet is manipulated according to the blood glucose, lipid, and body weight goals desired. Protein, carbohydrate, and mineral content of the diet may be manipulated to achieve individual metabolic and clinical goals.

- Regular diet: This may be considered as an option for patients with increased needs for energy and protein because of other medical conditions, such as pressure ulcers, cancer, burns, or sepsis. Blood glucose levels can be kept in the patient's goal range with sliding scale insulin, if necessary.

Note: "No concentrated sweets" is not recommended since it conveys the impression that simply avoiding sweets will in itself promote good control of blood glucose.

See Section III: Clinical Nutrition Management
DIABETES MELLITUS
DIABETES: CONSIDERATIONS FOR SICK DAYS
DIABETES: GASTROINTESTINAL COMPLICATIONS
DIABETES: ORAL GLUCOSE-LOWWERING MEDICATIONS AND INSULIN
DIABETES: CONSIDERATIONS FOR EXERCISE
DIABETES: FAT REPLACERS AND ARTIFICIAL SWEETENERS

Timing of Food Intake: Type 1 Diabetes (Ketosis Prone)

Timing and consistency of food: Individual needs should dictate the time at which meals and snacks are taken, how much time elapses between insulin injection and food intake, and the number of meals and snacks eaten each day. Diet history, lifestyle, physical activity, and insulin regimen, as well as results of blood glucose monitoring, are all considerations. Day-to-day consistency of food consumption is a crucial element of management for individuals taking injections of insulin.

It is recommended that individuals receiving insulin therapy eat at consistent times synchronized with the action time of the insulin preparation used and with blood glucose results, and that insulin doses be adjusted for the amount of food usually eaten or required (3). This decision should be based on review of blood glucose records and discussion with the patient's physician.

Intensified insulin therapy (multiple daily injections or insulin pump therapy): The goal of intensified insulin therapy is to bring the blood glucose levels as close to the normal range as is feasible for the individual. Insulin infusion pumps mimic the normal physiologic insulin delivery and allow flexibility in meal size and timing. If the patient is taking three or more injections of short-acting insulin daily as a supplement to an intermediate acting insulin (NPH or lente) or a long-acting insulin (ultralente), greater flexibility in meal intake may be allowed by adjusting the dose of the short-acting insulin. Carbohydrate counting, at an advanced level, can greatly increase flexibility in meal planning (4,5). Potential problems associated with intensified insulin therapy include hypoglycemia and weight gain due to more positive energy balance (6,7).

Adjustments for exercise: Because physical activity may vary considerably from day to day, adjustments in energy intake and insulin dosage may be required to avoid hypoglycemia in individuals with type 1 diabetes. Several strategies may be used to avert hypoglycemia during or after exercise. When exercise is planned, insulin dose should be adjusted to prevent hypoglycemia. If exercise is not planned, a carbohydrate supplement should be consumed (8).

Timing of Food Intake: Type 2 Diabetes (Non-Ketosis Prone)

Timing and consistency of food: Regular timing of meals from day to day is not crucial but is more important if the individual is taking exogenous insulin. Smaller, more frequent meals that require less endogenous insulin may assist in achieving blood glucose control (9).

Oral glucose-lowering medications (GLMs): Hypoglycemia is less common with GLMs than with insulin. However, skipping meals or decreasing food intake can result in hypoglycemia. Regularity of meals in relation to ingestion of GLMs is desirable.

Adjustments for exercise: Supplemental food before and during exercise is not needed to prevent hypoglycemia and is not recommended, except under conditions of strenuous, prolonged exercise, such as endurance sports. For individuals taking sulfonylureas, there is a slightly increased risk of hypoglycemia during exercise, and supplemental energy intake may be required in some cases. The need may be determined by glucose self-monitoring. Individuals with type 2 diabetes who use insulin should also monitor their blood glucose levels closely during and after exercise. Several strategies may be used to avert hypoglycemia during or after vigorous, prolonged, or nonhabitual exercise. These involve the consumption of supplemental carbohydrate-containing foods before, during, and after exercise, as well as adjustment of insulin dosage and timing (7).

Section III: Clinical Nutrition Management
DIABETES: ORAL GLUCOSE-LOWERING MEDICATIONS AND INSULIN
DIABETES: CONSIDERATIONS FOR EXERCISE

Protein
Protein intake for individuals with diabetes is the same as that for the general population. This translates into approximately 10% to 20% of daily energy intake from protein, which can be derived from both animal and vegetable sources (1).

With the onset of overt nephropathy, lower intakes of protein may need to be considered. However, at this time, the consensus is to prescribe a protein intake of approximately the adult Recommended Dietary Allowance (RDA) of 0.8 g/kg/day (approximately 10% of daily energy intake) (1).

Fat
Since dietary protein contributes 10% to 20% of total energy, 80% to 90% of energy remains to be distributed between dietary fat and carbohydrates. Less than 10% of energy should be from saturated fats, and less than 10% of energy should be from polyunsaturated fats, leaving 60% to 70% of total energy from monounsaturated fats and carbohydrates. The distribution of energy from fat and carbohydrate should be individualized based on the patient's nutrition assessment and treatment goals (1).

The recommended energy fraction from fat depends on the patient's lipid levels and treatment goals for glucose, lipids, and weight. People who are at a healthy weight and have normal lipid levels should follow the guidelines recommended by the National Cholesterol Education Program (NCEP). The NCEP recommends that all individuals over 2 years of age limit fat to less than 30% of total energy, with saturated fat restricted to less than 10% of total energy; polyunsaturated fat, less than 10%; and monounsaturated fat, in the range of 10% to 15% of energy (2).

Type 2 diabetes is associated with a twofold to fourfold excess risk of coronary heart disease (CHD). The most common pattern of dyslipidemia in type 2 patients with diabetes is elevated triglyceride levels and decreased HDL cholesterol levels. The concentration of LDL cholesterol in type 2 patients with diabetes is similar to nondiabetic individuals (10). For patients with dyslipidemia, use the following guidelines:

Category of Risk Based on Lipoprotein Levels in Adults With Diabetes (10)

Risk	**LDL cholesterol** (mg/dL)	**HDL cholesterol** (mg/dL)*	**Triglyceride** (mg/dL)
High	> 130	<35	> 400
Borderline	100-129	35-45	200-399
Low	<100	>45	<200

*For women, the HDL cholesterol values should be increased by 10 mg/dL

Because of the frequent changes in glycemic control in patients with diabetes and their effects on levels of lipoprotein; levels of low-density lipoprotein (LDL), high-density lipoprotein (HDL), and total cholesterol; and triglyceride should be measured every year in adult patients (10). The following outlines strategies to treat dyslipidemias in patients with diabetes.

Problem	Goal/Treatment Strategy
Elevated LDL cholesterol (1,11,12)	Goal: decrease serum LDL NCEP Step II diet (≤30% kcal from fat <7% kcal from saturated fat <200 mg cholesterol per day)

Elevated triglycerides, very low-density lipoprotein (triglycerides <1,000 mg/dL measured when blood glucose is in fair or good control) (1,11,12)	Goal: decrease triglycerides 30%-40% kcal from fat <10% kcal from saturated fat >10% kcal from MUFA* <50% kcal from carbohydrate
Extremely elevated triglycerides (triglycerides >1,000 mg/dL) (1)	Goal: decrease triglycerides <10% kcal from fat <10% kcal from saturated fat > 10% kcal from MUFA* <50% kcal from carbohydrate

**MUFA indicates monounsaturated fat.*

Pharmacologic therapy should be initiated after behavioral interventions are used. However, it is suggested that diabetic subjects with clinical coronary heart disease (CHD) and an LDL cholesterol level greater than 100 mg/dL after medical nutrition therapy and glucose interventions be treated with pharmacologic agents. For patients with diabetes without preexisting CHD, the recommendations for starting pharmacologic therapy are 1) an LDL cholesterol level of greater than 130 mg/dL and 2) a goal of less than 100 mg/dL for LDL cholesterol. These recommendations are based not only on the high incidence of CHD in patients with diabetes but also on their higher fatality rate once they have CHD (10).

Carbohydrate and Sweeteners

The energy fraction from carbohydrate will vary and should be based on the individual's eating habits and glucose and lipid goals. For most of the past century, it has been a widely held belief that people with diabetes should avoid simple sugars and should replace them with starches. This belief appears to be based on the assumption that sugars are more rapidly digested and absorbed than are starches and thereby aggravate hyperglycemia to a greater degree. There is little scientific evidence that supports this assumption. Although various starches do have different glycemic responses, from a clinical perspective, the dietitian should place first priority on the total amount of carbohydrate the client consumes rather than the source of the carbohydrate (1).

Section III: Clinical Nutrition Management
DIABETES: FAT REPLACERS AND ARTIFICIAL SWEETENERS

Fiber

Recommendations for people with diabetes are the same as for the general population as related to fiber consumption and a healthy diet. Daily consumption of a diet containing 20 to 35 g of dietary fiber from both soluble and insoluble fibers from a wide variety of food sources is recommended (1).

Sodium

Recommendations for people with diabetes are the same as for the general population as related to sodium in the diet. Some health authorities recommend no more than 3,000 mg of sodium for the general population, whereas other authorities recommend no more than 2,400 mg/day. For people with mild to moderate hypertension less than 2,400 mg/day of sodium is recommended. For people with hypertension and nephropathy, less than 2,000 mg/day of sodium is recommended (1).

Alcohol

The same precautions regarding the use of alcohol that apply to the general population also apply to people with diabetes. The *Dietary Guidelines for Americans* recommends no more than two drinks per day for men and no more than one drink per day for women.

The effect of alcohol on blood glucose levels is dependent not only on the amount of alcohol ingested but also on the relationship to food intake. If used in moderation and with food, blood glucose levels are not affected by the ingestion of alcohol when diabetes is well controlled. For individuals using insulin, two or fewer alcoholic beverages can get ingested with and in addition to the regular meal plan. Food should not be omitted because of the possibility of alcohol-induced hypoglycemia. When kilocalories from alcohol need to be calculated as a part of the total energy intake, alcohol should be substituted for fat exchanges or fat calories (1).

Treatment of Hypoglycemia

When the blood glucose level is 70 mg/dL or below, treat with low-fat carbohydrate foods or glucose tablets. For mild to moderate hypoglycemic reactions, the following items, which contain about 15 g of carbohydrate, may be given (4[pp176-177],13[pp86-87]). These food items are used because they are readily available and/or easy to carry when away from home, not because they are fast-acting (14):

4-6 oz fruit juice
4-6 oz regular soda
3-4 glucose tablets (4 grams glucose each)
2 tbsp raisins
5-6 Lifesavers candy
1 tbsp honey or Karo syrup
4 tsp or 4 packets of granulated sugar

Retest the patient's blood glucose level 15 to 20 minutes after ingestion of the food. If the patient's blood glucose level is still low, give 15 more grams of carbohydrate and retest in 15 minutes.

Carbohydrate Replacement for Missed or Delayed Meals

Missed meals**:** When illness or diagnostic tests prevent a diabetic individual from taking the usual diet, systematic replacement of carbohydrate is appropriate. The carbohydrate value of the foods in the missed meal can be replaced with easily consumed liquids or soft foods as tolerated. Usually a missed meal may be satisfactorily replaced by 50 g of carbohydrate taken by mouth. The consumption of 50 g of carbohydrate every 3 to 4 hours has been recommended. Another suggested plan is to try to replace, in the 3-hour period following the meal, enough food to bring the intake of carbohydrate and energy to at least half that in the prescribed feeding. If the patient is incapable of taking food by mouth, it may be necessary to give dextrose intravenously (7[pp28,62]).

Delayed meals: When the meal is to be delayed and the blood glucose level is normal, carbohydrate should be given. Usually 15 g of carbohydrate (1 fruit or bread exchange) each 30 to 45 minutes until the meal is served, or 15 to 30 g of carbohydrate for a 1- or 2-hour delay, protects the patient from hypoglycemia.

Carbohydrate Content of Foods

Foods selected from the list below can be used as substitutes for foods of similar carbohydrate content in the missed meal or during illness.

15 Grams of Carbohydrate

Apple juice	½ cup	Jelly beans	9
Applesauce, sweetened	¼ cup	Jelly, jam	1 tbsp
Applesauce, unsweetened	½ cup	Lifesavers candy	5-6
Cooked cereal	½ cup	Orange juice	½ cup
Cranberry juice	1/3 cup	Pineapple juice	½ cup
Cream soup, made with water	1 cup	Popsicle bar (3 oz)	1
Custard	½ cup	Regular soda	½ cup
Gelatin	½ cup	Sherbet	¼ cup
Grape juice	1/3 cup	Sugar, granulated	4 tsp
Ice cream	½ cup	Syrup	1 tbsp

12 Grams of Carbohydrate

Milk (whole, reduced-fat, skim)	1 cup
Eggnog	½ cup
Plain yogurt	1 cup

Note: Patients who experience hypoglycemia and are being treated with acarbose (Precose) should be treated with glucose.

See Section III: Clinical Nutrition Management
DIABETES: CONSIDERATIONS FOR SICK DAYS

Diabetes Nutrition Management: Meal Planning Approaches (4)
Familiarity with the variety of meal planning approaches available can help dietitians more effectively teach patients how to reach nutrition-related goals. The type of approach selected should depend on the goals for metabolic outcomes, and the patient's nutrition needs, literacy, motivation, and lifestyle. Approaches that can be used for teaching meal planning include:

Basic nutrition guidelines	These guidelines provide the patient with an understanding of the basic principles of nutrition and guidance in selecting an adequately balanced diet for optimal health, eg, *Dietary Guidelines for Americans, Food Guide Pyramid, Guide to Good Eating.*
Basic diabetes guidelines	These guidelines provide the patient with an understanding of the connection between food intake and metabolic outcomes. They give the patient direction in making appropriate food choices for managing diabetes, eg, *First Step in Diabetes Meal Planning, Healthy Food Choices (Guidelines), Single-Topic Diabetes Resources* (ADA/ADA).
Menu approaches to meal planning	These approaches provide simple examples to assist patients with meal planning, eg, *ADA Month of Meals Cookbooks*, individualized menus.
Exchange lists for meal planning	These approaches give the patient structure, in that they are calorie-controlled, involve the use of a meal plan, and require understanding of the exchange concept, eg, *Exchange Lists for Meal Planning*, High-Carbohydrate, High-Fiber (HCF).
Counting approaches	These approaches provide structure, in that specific rules are clearly identified. They allow optimal flexibility with food choices and meal planning, eg, carbohydrate counting, calorie counting point system, fat gram counting.

Body Weight Issues and Energy Needs in Type 2 Diabetes
"Recent nutrition recommendations encourage setting goals for a reasonable body weight, defined as weight that the patient and the health care team acknowledge as being achievable and maintainable.

Calories should be prescribed to achieve and maintain a reasonable body weight. Baseline energy needs depend on height, weight, the need for weight loss or gain, and usual activity/exercise patterns. During childhood, adolescence, and pregnancy and lactation, the body requires additional energy (6[pp96-97]).

One method for calculating energy needs for obese diabetic individuals is to use the adjusted body weight for calculations, rather than the desirable body weight. See Section II: Adjustment of Calculated Body Weight for Obese Patients. Body mass index may be used to identify healthy weight ranges and to estimate the desirable body weight. See Section IC: Calorie-Controlled Diet for Weight Management; and Section II: Body Mass Index, and Estimation of Energy Requirements."

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MEDICAL NUTRITION THERAPY FOR GESTATIONAL DIABETES MELLITUS

For CHS facilities, Jovanovic Guidelines, CLICK HERE.

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy (1). The definition applies regardless of whether insulin is used for treatment or the condition persists after pregnancy. It does not exclude the possibility that the glucose intolerance may have antedated the pregnancy (2).

All pregnant women should have a screening glucose load between the 24th and 28th week of pregnancy consisting of 50 g of oral glucose given without regard to time of the last meal or time of day. A value of greater than 140 mg/dL is recommended as a threshold to indicate the need for a full diagnostic glucose tolerance test. Diagnosis of GDM is based on the results of the 100-g oral glucose tolerance test during pregnancy interpreted according to the diagnostic criteria of O'Sullivan and Mahan, as modified by Carpenter and Coustan for current glucose assay techniques. A definitive diagnosis requires that two or more of the venous plasma glucose concentrations be met or exceed the following values: fasting, 105 mg/dL; 1 hour, 190 mg/dL; 2 hours, 165 mg/dl; 3 hours, 145 mg/dL (1-3). (See Section II: Diagnostic Criteria for Diabetes Mellitus.)

Approaches

A nutrition regimen is often used to treat GDM (1,2). Specific therapeutic goals may vary among physicians. Many, however, will initiate insulin therapy if dietary management does not consistently maintain the fasting plasma glucose level at less than or equal to 105 mg/dL and/or the 2-hour postprandial plasma glucose level at less than or equal to 120 mg/dL (1-4).

Use of sulfonylureas (oral hypoglycemic agents) is contraindicated in pregnancy (1,2).

The prevention of ketosis may require multiple daily insulin injections and distribution of dietary carbohydrate into small frequent meals (three meals, three or four snacks). Insulin requirements normally increase as the pregnancy proceeds, and the insulin regimen needs to be continually adjusted throughout the pregnancy. Blood glucose monitoring by the patient is an essential part of this process (1,2).

The heightened insulin requirement will plummet within hours of delivery. Metabolic control during labor, delivery, and the postpartum period should be managed by frequent determinations of blood glucose levels and adjustments to the insulin.

Monitoring

Self-monitoring of blood glucose is essential for management of diabetes during pregnancy. Urine is also tested for ketones on a routine basis; monitoring of urine glucose levels is not appropriate in GDM. Monitoring schedules for patients with preexisting diabetes are discussed in references 1, 2, and 4.

Blood Glucose Goals in Diabetic Pregnancy (1,2,4)

Fasting	60-90 mg/dL
Premeal	60-105 mg/dL
1 h postprandial	100-120 mg/dL
2 h-6h postprandial	60-120 mg/dL

Follow-up

The American Diabetes Association recommends a follow-up evaluation of each woman diagnosed with gestational diabetes (1,2), as there is evidence that these women may be prone to developing type 2 diabetes later in life. It is prudent to provide nutrition counseling and guidance to these women after the birth of their children.

Dietary Recommendations (GDM and Type 1 Diabetes)

Meal planning strategies are designed to provide adequate energy and protein to support favorable outcome of the pregnancy. Energy intake to achieve appropriate weight gain may be estimated based on the percent of desirable body weight before the pregnancy (1,2). Pregravid body mass index may be used to estimate a goal for weight gain in the pregnancy (1,3). The dietitian should endeavor to assist the patient in formulating realistic plans to achieve glycemic control and take adequate nutrition (4). If fasting blood glucose and/or post-breakfast blood glucose levels are difficult to control, many clinicians restrict carbohydrate intake to 30 g at breakfast.

Table IC-1: Recommended Daily Energy Intake (2)

Prepregnancy Weight Status	Kcal/kg/day	Kcal/lb/day
Desirable body weight	30	13.6
>120% desirable body weight	24	10.9
<90% desirable body weight	36-40	16.3-18.2

Table IC-2: Recommended Total Weight Gain Ranges for Pregnant Women Based on Prepregnancy Body Mass Index (BMI) (3)

Prepregnancy Weight Classification	Body Mass Index (kg/m^2)	Recommended Total Gain [kg (lb)]
Low BMI	<19.8	12.5-18 (28-40)
Normal BMI	19.8-25.9	11.5-16 (25-35)
High BMI	26-29	7.0-11.5 (15-25)
Obese	>29	At least 7.0 (at least 15)

For multiple fetuses the following weight gain is appropriate:

Twin pregnancy	15.9-20.5 kg (35-45 lb)
Triplet pregnancy	20.5-11.3 kg (45-55 lb)

Frequent small meals may help minimize blood glucose fluctuations and avoid ketosis. The American Diabetes Association has proposed that three to four snacks containing 5% to 10% of total daily caloric intake may be beneficial (2). Use of nutrient-dense foods should be emphasized; concentrated sweets should be taken in moderation when blood glucose levels are near target ranges (5).

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DIETARY MANAGEMENT WITH THE EXCHANGE SYSTEM

This system is used in the calculation of calorie controlled and Diabetic Diets. Various exchange groups within the system can also be used in the calculation of Fat Controlled Diets.

Each list shows the kinds and amounts of foods to use for one exchange. Exchanges are based upon roughly equivalent carbohydrate, protein, and fat content. Exchanges have been defined in household measures. For food service portioning, they may be further defined by utensils, or multiples or fractions of the standard portion.

The lists here are intended to be a reference for initial planning of diets, menu writing and carbohydrate counting. Additional foods/recipes can be translated into exchanges and/or grams of carbohydrates through evaluation of macronutrient content.

LIST	Carbohydrate (grams)	Protein (grams)	Fat (grams)	Calories
Carbohydrate Group				
Starch	15	3	1 or less	80
Fruit	15	-	-	60
Milk				
Skim and Low fat	12	8	0-3	90
Reduced-fat	12	8	5	120
Whole	12	8	8	150
Other carbohydrates	15	varies	varies	varies
Vegetables	5	2	-	25
Meat and Meat Substitutes Group				
Very lean	-	7	0-1	35
Lean	-	7	3	55
Medium fat	-	7	5	75
High fat	-	7	8	100
Fat Group	-	-	5	45

Exchange lists are adapted from the 1995 edition *Exchange Lists for Meal Planning* by the American Diabetes Association and The American Dietetic Association.

STARCH LIST

Each item in this list contains approximately 15 grams of carbohydrates, 3 grams of protein, 0-1 gram of fat, and 80 Calories.

Bread	Amount	Starchy Vegetables	Amount
Bagel	1/2 (1 oz)	Baked beans	1/3 cup
Bread, reduced-calorie	2 slices (1 1/2 oz)	Corn	1/2 cup
Bread, white, whole-wheat, pumpernickel, rye	1 slice (1 oz)	Corn on cob, medium	1 (5 oz)
Bread sticks, crisp, 4 in long x 1/2 in	2 (2/3 oz)	Mixed vegetables with corn, peas or pasta	1 cup
English muffin	1/2	Peas, green	1/2 cup
Hot dog or hamburger bun	1/2 (1 oz)	Plantain	1/2 cup
Pita, 6 in across	1/2	Potato, baked or boiled	1 small (3 oz)
Roll, plain, small	1 (1 oz)	Potato, mashed	1/2 cup
Raisin bread, unfrosted	1 slice (1 oz)	Squash, winter (acorn, butternut)	1 cup
Tortilla, corn, 6 in across	1	Yam, sweet potato, plain	1/2 cup
Tortilla, flour, 6 in across	1		
Waffle, 4 1/2 in square, reduced-fat	1		

Cereal and Grains	Amount
Bran cereals	1/2 cup
Bulgur	1/2 cup
Cereals	1/2 cup
Cereals, unsweetened, ready-to-eat	3/4 cup
Cornmeal (dry)	3 tbsp
Couscous	1/3 cup
Flour (dry)	3 tbsp
Granola, low-fat	1/4 cup
Grape-Nuts	1/4 cup
Grits	1/2 cup
Kasha	1/2 cup
Millet	1/4 cup
Muesli	1/4 cup
Oats	1/2 cup
Pasta	1/2 cup
Puffed cereal	1 1/2 cup
Rice milk	1/2 cup
Rice, white or brown	1/3 cup
Shredded wheat	1/2 cup
Sugar-frosted cereal	1/2 cup
Wheat germ	3 tbsp

Crackers and Snacks	Amount
Animal crackers	8
Graham crackers, 2 1/2 in square	3
Matzoth	3/4 oz.
Melba toast	4 slices
Oyster crackers	24
Popcorn (popped, no fat added or low-fat microwave)	3 cups
Pretzels	3/4 oz
Rice cakes, 4 in across	2
Saltine-type crackers, unsalted tops	6
Snack chips, fat-free (tortilla, potato)	15-20 (3/4 oz)
Whole-wheat crackers, no fat added	2-5 (3/4 oz)

Starchy Foods Prepared With Fat

(Count as 1 starch exchange, plus 1 fat exchange.)

Biscuit, 2 1/2 in. across	1
Chow mein noodles	1/2 cup
Corn bread, 2 in cube	1 (2 oz)
Crackers, round butter type	6
Croutons	1 cup
French-fried potatoes	16-25 (3 oz)
Granola	1/4 cup
Muffin, small	1 (1 1/2 oz)
Pancake, 4 in across	2
Popcorn, microwave	3 cups
Sandwich crackers, cheese or peanut butter filling	3
Stuffing, bread (prepared)	1/3 cup
Taco shell, 6 in across	2
Waffle, 4 1/2 in square	1
Whole-wheat crackers, fat added	4-6 (1 oz)

Beans, Peas, and Lentils

(Count as 1 starch exchange, plus 1 very lean meat exchange.)

Beans and peas (garbanzo, pinto, kidney, white, split, black-eyed)	1/2 cup
Lima beans	2/3 cup
Lentils (cooked)	1/2 cup
Miso⊗	3 tbsp

⊗=400 mg or more of sodium per serving.

FRUIT LIST

Each item on this list contains about 15 grams of carbohydrate, and 60 Calories**.**

Fruit	**Amount**	**Fruit** (con't)	**Amount**
Apple, unpeeled, small	1 (4 oz)	Pears, canned	1/2 cup
Applesauce, unsweetened	1/2 cup	Pineapple, fresh	3/4 cup
Apples, dried	4 rings	Pineapple, canned	1/2 cup
Apricots, fresh	4 whole (5 1/2 oz)	Plums, small	2 (5 oz)
Apricots, dried	8 halves	Plums, canned	1/2 cup
Apricots, canned	1/2 cup	Prunes, dried	3
Banana, small	1 (4 oz)	Raisins	2 tbsp
Blackberries	3/4 cup	Raspberries	1 cup
Blueberries	3/4 cup	Strawberries	1 1/4 cup whole berries
Cantaloupe, small	1/3 melon (11 oz) or 1 cup cubes	Tangerines, small	2 (8 oz)
Cherries, sweet, fresh	12 (3 oz)	Watermelon	1 slice (13 1/2 oz) or 1 1/4 cup cubes
Cherries, sweet, canned	1/2 cup		
Dates	3		
Figs, fresh	1 1/2 large or 2 medium (3 1/2 oz)	**Fruit Juice**	
Figs, dried	1 1/2	Apple juice/cider	1/2 cup
Fruit cocktail	1/2 cup	Cranberry juice cocktail	1/3 cup
Grapefruit, large	1/2 (11 oz)	Cranberry juice cocktail, reduced-calorie	1 cup
Grapefruit sections, canned	3/4 cup	Fruit juice blends, 100% juice	1/3 cup
Grapes, small	17 (3 oz)	Grape juice	1/3 cup
Honeydew melon	1 slice (10 oz) or 1 cup cubes	Grapefruit juice	1/2 cup
Kiwi	1 (3 1/2 oz)	Orange juice	1/2 cup
Mandarin oranges, canned	3/4 cup	Pineapple juice	1/2 cup
Mango, small	1/2 fruit (5 1/2 oz) or 1/2 cup	Prune juice	1/3 cup
Nectarine, small	1 (5 oz)		
Orange, small	1 (6 1/2 oz)		
Papaya	1/2 fruit (8 oz) or 1 cup cubes		
Peach, medium, fresh	1 (6 oz)		
Peaches, canned	½ cup		
Pear, large, fresh	1/2 (4 oz)		

MILK LIST

Each item has 12 grams carbohydrate and 8 grams of protein.

Skim and Low-fat	**Amount**	**Whole Milk**	**Amount**
(90 calories, 0-3 grams fat per exchange)		(150 calories, 8 grams fat per exchange)	
Skim milk	1 cup	Whole milk	1 cup
1/2% milk	1 cup	Evaporated whole milk	1/2 cup
Low-fat milk	1 cup	Goat's milk	1 cup
Nonfat or low-fat buttermilk	1 cup	Kefir	1 cup
Evaporated skim milk	½ cup		
Nonfat dry milk	1/3 cup dry		
Plain nonfat yogurt	¾ cup		
Plain nonfat or low-fat fruit-flavored yogurt sweetened with asparatame or with a nonnutritive sweetener	1 cup		
Reduced-fat			
(120 calories, 5 grams per exchange)			
2 % milk	1 cup		
Plain low-fat yogurt	¾ cup		
Sweet acidophilus milk	1 cup		

OTHER CARBOHYDRATES LIST

Each item in this list contains 15 grams of carbohydrates.

Food	Serving Size	Exchanges Per Serving
Angel food cake, unfrosted	1/12th cake	2 carbohydrates
Brownie, small, unfrosted	2 in square	1 carbohydrate, 1 fat
Cake, unfrosted	2 in square	1 carbohydrate, 1 fat
Cake, frosted	2 in square	2 carbohydrates, 1 fat
Cookie, fat-free	2 small	1 carbohydrate
Cookie or sandwich cookie with creme filling	2 small	1 carbohydrate, 1 fat
Cupcake, frosted	1 small	2 carbohydrates, 1 fat
Cranberry sauce, jellied	1/4 cup	2 carbohydrates
Doughnut, plain cake	1 medium (1 1/2 oz)	1 1/2 carbohydrate, 2 fats
Doughnut, glazed	3 3/4 in across (2 oz)	2 carbohydrates, 2 fats
Fruit juice bars, frozen, 100% juice	1 bar (3 oz)	1 carbohydrate
Fruit snack, chewy (pureed fruit concentrate)	1 roll (3/4 oz)	1 carbohydrate
Fruit spreads, 100% fruit	1 tbsp	1 carbohydrate
Gelatin, regular	1/2 cup	1 carbohydrate
Gingersnaps	3	1 carbohydrate
Granola bar	1 bar	1 carbohydrate, 1 fat
Granola bar, fat-free	1 bar	2 carbohydrates
Honey	1 tbsp	1 carbohydrate
Hummus	1/3 cup	1 carbohydrate, 1 fat
Ice cream	1/2 cup	1 carbohydrate, 2 fats
Ice cream, light	1/2 cup	1 carbohydrate, 1 fat
Ice cream, fat-free, no sugar added	1/2 cup	1 carbohydrate
Jam or jelly, regular	1 tbsp	1 carbohydrate
Milk, chocolate, whole	1 cup	2 carbohydrates, 1 fat
Pie, fruit, 2 crusts	1/6 pie	3 carbohydrates, 2 fats
Pie, pumpkin or custard	1/8 pie	2 carbohydrates, 2 fats
Potato chips	12-18 (1 oz)	1 carbohydrate, 2 fats
Pudding, regular (made with low-fat milk)	1/2 cup	2 carbohydrates
Pudding, sugar-free (made with low-fat milk)	1/2 cup	1 carbohydrate
Salad dressing, fat-free⊗	1/4 cup	1 carbohydrate
Sherbet, sorbet	1/2 cup	2 carbohydrates
Spaghetti or pasta sauce, canned	1/2 cup	1 carbohydrate, 1 fat
Sugar	1 tbsp	1 1/2 carbohydrates
Sweet roll or Danish	1 (2 1/2 oz)	2 1/2 carbohydrates, 2 fats
Syrup, light	2 tbsp	1 carbohydrate
Syrup, regular	1 tbsp	1 carbohydrate
Syrup, regular	1/4 cup	4 carbohydrates
Tortilla chips	6-12 (1 oz)	1 carbohydrate, 2 fats
Yogurt, frozen, low-fat, fat-free	1/3 cup	1 carbohydrate, 0-1 fat
Yogurt, frozen, fat-free, no sugar added	1/2 cup	1 carbohydrate
Yogurt, frozen, low-fat with fruit	1 cup	3 carbohydrates, 0-1 fat
Vanilla wafers	5	1 carbohydrate, 1 fat

⊗=400 mg or more sodium per exchange

VEGETABLE LIST

Each serving on this list contains about 5 grams of carbohydrate, 2 grams of protein, and 25 Calories. Each exchange is ½ cup portion cooked or 1 cup raw.

Artichoke
Artichoke hearts
Asparagus
Beans (green, wax, Italian)
Bean sprouts
Beets
Broccoli
Brussel sprouts
Cabbage
Carrots
Cauliflower
Celery
Cucumber
Eggplant
Green onions or scallions
Greens (collard, kale, mustard, turnip)
Kohlrabi
Leeks
Mixed vegetables (without corn, peas, or pasta)
Mushrooms
Okra
Onions
Pea pods
Peppers (all varieties)
Radishes
Salad greens (endive, escarole, lettuce, romaine, spinach)
Sauerkraut⊗
Spinach
Summer squash
Tomato
Tomatoes, canned
Tomato sauce⊗
Tomato/vegetable juice⊗
Turnips
Water chestnuts
Watercress
Zucchini

⊗ = 400 mg or more sodium per exchange.

MEAT LIST

Each serving of meat and meat substitutes on this list contains about 7 grams of protein.

Very Lean Meat and Substitutes	Amount
(35 Calories, 0-1 gram fat per exchange)	
Poultry**:** Chicken or turkey (white meat, no skin), Cornish hen (no skin)	1 oz
Fish: Fresh or frozen cod, flounder, haddock, halibut, trout; tuna fresh or canned in water	1 oz
Shellfish: Clams, crab, lobster, scallops, shrimp, imitation shellfish	1 oz
Game: Duck or pheasant (no skin),venison, buffalo, ostrich	1 oz
Cheese with 1 gram or less fat per ounce:	
Nonfat or low-fat cottage cheese	1/4 cup
Fat-free cheese	1 oz
Other: Processed sandwiches meats with 1 gram or less fat per ounce, such as deli thin, shaved meats, chipped beef⊗, turkey ham	1 oz
Egg whites	2 oz
Egg substitutes, plain	1/4 cup
Hot dogs with 1 gram or less fat per ounce⊗	1 oz
Kidney (high in cholesterol)	1 oz
Sausage with 1 gram or less fat per ounce	1 oz

Very Lean Meat and Substitutes (cont.)	Amount
Count as one very lean meat and one starch exchange.	
Dried beans, peas, lentils (cooked)	1/2 cup

⊗ = 400 mg or more sodium per exchange

Lean Meats and Substitutes	Amount
(55 Calories, 3 grams fat per exchange)	
Beef: USDA Select or Choice grades of lean beef trimmed of fat, such as round, sirloin, and flank steak; tenderloin; roast (rib, chuck, rump); steak (T-bone, porterhouse, cubed), ground round	1 oz
Pork: Lean pork, such as fresh ham; canned, cured, or boiled ham; Canadian bacon⊗; tenderloin, center loin chop	1 oz
Lamb: Roast, chop, leg	1 oz
Veal: Lean chop, roast	1 oz
Poultry: Chicken, turkey (dark meat, no skin), chicken white meat (with skin), domestic duck or goose (well-drained of fat, no skin)	1 oz
Fish:	
Herring (uncreamed or smoked)	1 oz
Oysters	6 medium
Salmon (fresh or canned), catfish	1 oz
Sardines (canned)	2 medium
Tuna (canned in oil, drained)	1 oz
Game: Goose (no skin), rabbit	1 oz
Cheese:	
4.5%-fat cottage cheese	1/4 cup
Grated Parmesan	2 tbsp
Cheeses with 3 grams or less fat per ounce	1 oz
Other:	
Hot dog with 3 grams or less fat per ounce	1 1/2 oz
Processed sandwich meat with 3 grams or less fat per ounce, such as turkey pastrami or Kielbasa	1 oz
Liver, heart (high in cholesterol)	1 oz

Medium-Fat Meat and Substitutes

(75 Calories, 5 grams of fat per exchange)

Medium-Fat Meat and Substitutes	Amount
Beef: Most beef products fall into this category (ground beef, meatloaf, corned beef, short ribs, Prime grades of meat trimmed of fat, such as prime rib)	1 oz
Pork: Top loin, chop, Boston butt, cutlet	1 oz
Lamb: Rib roast, ground	1 oz
Veal: Cutlet	1 oz
Poultry: Chicken dark meat (with skin), ground chicken, fried chicken (with skin)	1 oz

Medium-Fat Meat and Substitutes (cont.)	Amount
Fish: Any fried fish product	1 oz
Cheese: With 5 grams or less fat per ounce	
Feta	1 oz
Mozzarella	1 oz
Ricotta	1/4 cup (2 oz)
Other:	
Egg (high in cholesterol, limit to 3 a week)	1
Sausage with 5 grams or less fat per ounce	1 oz
Soy milk	1 cup
Tempeh	4 oz or 1/2 cup
Tofu	4 oz or 1/2 cup

High-Fat Meat

(100 Calories and 8 grams of fat per exchange)

Remember these items are high in saturated fat, cholesterol, and calories and may raise *blood* cholesterol levels if eaten on a regular basis.

High-Fat Meat	Amount
Pork: Spareribs, ground pork, pork sausage	1 oz
Cheese: All regular cheeses, such as American⊗, cheddar, Monterey Jack, swiss	1 oz
Other: Processed sandwich meats with 8 grams or less fat per ounce, such as bologna, pimento loaf, salami	1 oz
Sausage, such as bratwurst, Italian, Knockwurst, Polish, smoked	1 oz
Hot dog (turkey or chicken)⊗	1 (10/lb)
Bacon	3 slices (20 slices/lb)
Peanut butter (contains unsaturated fat) (Count as one high-fat meat plus one fat exchange.)	2 tbsp
Hot dog (beef, pork, or combination)⊗ (Count as one high-fat meat plus two fat exchanges.)	1 (10/lb)

NOTE: When dining out, inquire about the cut of meat served. Select meats that are NOT prime cuts, since they are high in fat and calories.

⊗ = 400 mg or more sodium per exchange

FAT LIST

Each serving on the fat list contains about 5 grams of fat, and 45 Calories.

Monounsaturated Fats	Amount
Avocado, medium	1/8 (1 oz)
Oil (canola, olive, peanut)	1 tsp
Olives: ripe (black)	8 large
green, stuffed⊗	10 large
Nuts	
almonds, cashews	6 nuts
mixed (50% peanuts)	6 nuts
peanuts	10 nuts
pecans	4 halves
Peanut butter, smooth or crunchy	2 tsp
Sesame seeds	1 tbsp
Tahini paste	2 tsp

Saturated Fats*	Amount
Bacon, cooked	1 slice (20 slices/lb.)
Bacon, grease	1 tsp
Butter: stick	1 tsp
whipped	2 tsp
reduced-fat	1 tbsp
Chitterlings, boiled	2 tbsp (1/2 oz)
Coconut, sweetened, shredded	2 tbsp
Cream cheese: regular	1 tbsp (1 oz)
reduced-fat	
Fatback or salt pork*	1 tsp
Shortening or lard	2 tbsp
Sour cream: regular	3 tbsp
reduced-fat	

*Use a piece 1 in. x 1/4 in. if you plan to eat the fatback cooked with vegetables. Use a piece 2 in. x 1/2 in. when eating only the vegetables with the fatback removed.

Polyunsaturated Fats	
Margarine: stick, tub, or squeeze	1 tsp
lower-fat (30% to 50% vegetable oil)	1 tbsp
Mayonnaise: regular	1 tsp
reduced-fat	1 tbsp
Nuts, walnuts, English	4 halves
Oil (corn, safflower, soybean)	1 tsp
Salad dressing: regular	1 tbsp
reduced-fat	2 tbsp
Miracle Whip Salad Dressing®:regular	2 tsp
reduced-fat	1 tbsp
Seeds: pumpkin, sunflower	1 tbsp

⊗ = 400 mg or more sodium per exchange.

FREE FOODS

A free food is any food or drink that contains less than 20 calories or less than 5 grams of carbohydrates per serving. Food with serving sizes should be limited to 3 servings per day. Foods listed without a serving size can be eaten as often as desired.

Fat-free or Reduced-fat Foods	Amount
Cream cheese, fat-free	1 tbsp
Creamers, nondairy, liquid	1 tbsp
Creamers, nondairy, powdered	2 tsp
Mayonnaise, fat-free	1 tbsp
Mayonnaise. reduced-fat	1 tsp
Margarine, fat-free	4 tbsp
Margarine, reduced-fat	1 tsp
Miracle Whip®, nonfat	1 tbsp
Miracle Whip®, reduced-fat	1 tsp
Nonstick cooking spray	
Salad dressing, fat-free	1 tbsp
Salad dressing, fat-free, Italian	2 tbsp
Salsa	¼ cup
Sour cream, fat-free, reduced fat	1 tbsp
Whipped topping, regular or light	2 tbsp

Sugar-free or Low-sugar Foods	
Candy, hard, sugar-free	1 candy
Gelatin dessert, sugar-free	
Gelatin, unflavored	
Gum, sugar-free	
Jam or jelly, low-sugar or light	2 tsp
Sugar substitutes*	
Syrup, sugar-free	2 tbsp

*Sugar substitutes, alternatives, or replacements that are approved by the Food and Drug Administration (FDA) are safe to use. Common brand names include:

- Equal® (aspartame)
- Sprinkle® (saccharin)
- Sweet One® (acesulfame K)
- Sweet-10® (saccharin)
- Sugar-Twin® (saccharin)
- Sweet' n Low® (saccharin)

Drinks	Amount
Bouillon, broth, consomme⊗	
Bouillon or broth, low-sodium	
Carbonated or mineral water	
Cocoa powder, unsweetened	1 tbsp
Coffee	
Club soda	
Diet soft drinks, sugar-free	
Tea	
Tonic water, sugar-free	

Condiments	
Catsup	1 tbsp
Horseradish	
Lemon juice	
Lime juice	
Mustard	
Pickles, dill⊗	1 1/2 large
Soy sauce, regular or light⊗	
Taco sauce	1 tbsp
Vinegar	

Seasonings

Be careful with seasonings that contain sodium or are salts, such as garlic or celery salt, and lemon pepper.

Flavoring extract
Garlic
Herbs, fresh or dried
Pimento
Spices
Tabasco®or hot pepper sauce
Wine, used in cooking
Worcestershire

⊗ = 400 mg or more of sodium per choice.

SAMPLE EXCHANGE PATTERNS FOR CALCULATED DIETS

1200 kcal

	CHO	=	Starch	+	Fruit	+	Milk	Meat	Vegetable	Fat
Breakfast	3		1		1		1	1		1
Snack										
Lunch	2		1		1			2	1	
Snack										
Supper	3		2		1			2	1	
Snack	2		1				1			
Totals:	10		5		3		2	5	1	1

1500 kcal

	CHO	=	Starch	+	Fruit	+	Milk	Meat	Vegetable	Fat
Breakfast	4		2		1		1	1		1
Snack										
Lunch	3		2		1			2	1	1
Snack										
Supper	3		2		1			2	1	1
Snack	3		1		1		1			
Totals:	13		7		4		2	5	2	3

1800 kcal

	CHO	=	Starch	+	Fruit	+	Milk	Meat	Vegetable	Fat
Breakfast	5		2		2		1	1		1
Snack										
Lunch	4		3		1			2	1	1
Snack										
Supper	4		3		1			2	1	1
Snack	2		1				1	1		
Totals:	15		9		4		2	6	2	3

2000 kcal

	CHO	=	Starch	+	Fruit	+	Milk	Meat	Vegetable	Fat
Breakfast	6		3		2		1	1		1
Snack										
Lunch	5		3		2			2	1	2
Snack										
Supper	5		3		1		1	2	1	1
Snack	2		1		1			1		
Totals:	18		10		6		2	6	2	4

2200 kcal

	CHO	=	Starch	+	Fruit	+	Milk	Meat	Vegetable	Fat
Breakfast	6		3		2		1	1		1
Snack										
Lunch	5		3		2			2	1	2
Snack	2		1				1			
Supper	5		3		1		1	3	1	1
Snack	2		1		1			1		1
Totals:	20		11		6		3	7	2	5

SUGAR IN MODERATION DIET

Description
The diet restricts foods high in added sugar and fat. "Added sugar" is defined as that added to sweeten food at the table or added by the manufacturer, and is chiefly sucrose or corn syrup.

Indications
This is a less restricted diet for people trying to lose weight. It is also used in conjunction with the "Dumping Syndrome Diet." (See Section IB: Dumping Syndrome.) This diet is not meant for people with type 1 diabetes or type 2 diabetes.

Nutritional Adequacy
The diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA.

How to Order the Diet
Order as "Sugar in Moderation Diet".

Planning the Diet
Exclude the following foods.

FOOD GROUP	FOODS EXCLUDED
Beverages and Milk	Regular carbonated beverages; fruit ades; sugar-sweetened soft drinks; sugar-sweetened iced tea; chocolate milk; milkshake; eggnog; sweetened yogurt; cocoa (sweetened)
Breads and Crackers	Sweet rolls or breads; doughnuts
Cereals and Grains	Sugar-coated cereals; granola-type cereals; presweetened cooked cereals
Meat, Fish, Poultry, Cheese, Eggs, Legumes	Glazed meats
Vegetables and Potatoes	Candied or glazed vegetables; sweet pickled vegetables
Fruits and Juices	Sweetened fruits or juices; candied or glazed fruits
Desserts	Cakes, pies, cookies, pastries, sherbets, puddings, gelatin desserts (regularly sweetened), ice cream
Sugar and Sweets	Candy, chewing gum, sugar, honey, jam, jelly, marmalade, syrup, molasses
Miscellaneous	Sweet relishes

CALORIE-CONTROLLED DIET FOR WEIGHT MANAGEMENT

Description

For the Calorie-Controlled Diet for Weight Management, the Regular Diet is modified by reducing energy intake below what is necessary for maintenance of body weight. Intake of essential protein, vitamins, and minerals is maintained by limiting the amount of fat and sugar in the diet and by substituting foods lower in energy for foods of similar nutrient content that are higher in energy.

Indications

Weight reduction is desirable in patients not only as obesity relates to increased mortality but also because weight loss reduces risk factors for disease. Thus, weight loss may help not only control diseases worsened by obesity but also decrease the likelihood of developing these diseases. Strong and consistent clinical evidence supports weight loss in persons who are overweight or obese and who have hypertension, hyperlipidemia, or type 2 diabetes mellitus. In overweight and obese persons, weight loss is recommended to

- lower blood pressure in patients with hypertension
- lower total cholesterol, low-density lipoprotein cholesterol (LDL-C), and triglyceride levels in patients with hyperlipidemia
- lower blood glucose levels in patients with type 2 diabetes mellitus (2,3)

Fat is lost when the body is in a state of negative energy balance due to a reduced energy intake or increased energy output through muscle work or both. A reduction in energy intake is an important modality for the treatment of obesity or lesser degrees of overweight.

The discussion below will pertain to indications for the treatment of obesity and overweight. Body mass index (BMI) defined as weight (kg)/height (m^2) is the best determinant of weight status and health risk (1,2). For optimal health, a BMI goal of 19 to 25 is recommended, based on evidence that this range is associated with minimal risk of disease. Table IC-3 outlines the health risks associated with the BMI level.

Table IC-3: Weight Classification by BMI, Waist Circumference, and Associated Health Risks

			Health Risk Relative to Waist Circumference	
Weight	**BMI**	**Risk Class**	**Men ≤102 cm (≤40 inches) Women ≤88 cm (≤35 inches)**	**Men >102 cm (>40 inches) Women >88 cm (>35 inches)**
Underweight	<18.5	--	--	--
Normal	18.5-24.9	0	--	Increased
Overweight	25.0-29.9	0	Increased	High
Obesity	30.0-34.9	I	High	Very high
	35.0-39.9	II	Very high	Very high
Extreme obesity	≥40	III	Extremely high	Extremely high

Source: National Heart, Lung, and Blood Institute Obesity Education Initiative Expert Panel. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. Available at: http://www.nhlbi.nih.gov/nhlbi/htm. Accessed June 24, 1998.

Prophylactic: In the noncatabolic patient newly confined to bed rest or in the patient whose condition imposes limitations on physical activity, the requirement for energy decreases. This may be due to a lower level of physical activity as well as to a decreased metabolic rate, the consequence of diminished muscle mass. The diet may be limited in energy to prevent unwanted weight gain.

The overweight child: The greatest hazards of obesity to the child may be psychological and social (4). The extent to which childhood obesity is directly related to physical health risks is not exactly clear. However, the risk of the obese child becoming an obese adult increases with the degree and duration of obesity (5). Presently, there is insufficient information to predict which overweight children will spontaneously lose the excess fat, which will do so with some treatment, and which will always be overweight. When obesity is established by young adulthood, there is an increased risk of developing cardiovascular disease at an early age (6).

Professionals working with children are faced with the dilemma of deciding when some form of intervention is appropriate for the overweight child. The dietitian must consider whether the consequences of failed intervention could be worse than the stigma of being overweight (most treatment regimens have low success rates, between 10% and 30%), and whether the overweight would resolve itself if left unattended. Most fat infants do not become fat children, but 78.1% of obese adolescent males and 66.1% of obese adolescent females will be obese adults (7).

Contraindications
Weight reduction is not recommended for the following:

- pregnant women because energy restriction during pregnancy sufficient to produce weight loss can be dangerous (10)
- patients with unstable mental or medical conditions
- patients with anorexia nervosa or a past history of the disorder
- terminally ill patients (8)
- children whose statural growth and central nervous system development could be impaired by a prolonged catabolic state; growth of the child's lean mass should be supported, and the child's adipose mass should be held constant (9).

Since osteoporosis and cholelithiasis can be aggravated by weight loss, the risks and benefits of weight reduction need to be evaluated on a case-by-case basis.

See Section III: Clinical Nutrition Management
CONGESTIVE HEART FAILURE
GASTROESOPHAGEAL REFLUX (GERD)
HYPERTENSION
HYPERTRIGLYCERIDEMIA
HYPOGLYCEMIA
OBESITY AND WEIGHT MANAGEMENT

Nutritional Adequacy
The precise level at which energy intake is insufficient to allow for the consumption of an adequate diet is difficult to define without taking into consideration the age and sex of the individual and the corresponding Dietary Reference Intakes (DRIs). However, 1,200 kcal/day for women and 1,400 kcal/day for men have been cited (8,11) as acceptable levels. At levels below these recommendations, it becomes increasingly difficult to obtain all the protective nutrients in adequate amounts.

How to Order the Diet
The physician may specify one of the following:

- "Weight Reduction Diet": The dietitian determines an appropriate weight loss goal and energy level.
- "____kcal Diet": The dietitian plans an individualized meal plan within the energy prescription.
- Restriction of sodium, fat, cholesterol, or other restriction: If a restriction is required, it should be prescribed along with the diet order.

Initiation of a weight reduction diet usually is not recommended in a hospital setting. If weight reduction is desired, it may be more appropriate to order a low-fat, low-cholesterol diet, which naturally limits energy from fat and will promote selection of lower-energy foods.

Moderate energy restriction is recommended. When combined with exercise and behavioral therapy, individualized meal plans of 1,200 to 1,500 kcal/day for women and 1,400 to 2,000 kcal/day for men can promote retention of lean body mass while facilitating weight reduction. To increase long-term compliance and avoid unnecessarily large energy deficits that require major dietary changes, a modest (500-kcal) energy deficit can be established. When setting goals of weight loss with patients, the dietitian should establish a realistic and practical target, such as a decrease of 2 BMI units (8).

Successful weight reduction requires a commitment to behavioral change and family support as well as attention to activity patterns. A prescription of moderate physical activity can promote maintenance of lean body mass and, in addition to the energy restriction, further contribute to the energy deficit needed for weight loss.

Pharmacologic agents are a useful adjunct to, but not a substitute for, necessary changes in eating and physical activity. The effectiveness of any pharmacologic intervention depends on its use with appropriate dietary intervention, increased physical activity, and lifestyle change (2,8). A BMI of 30 or more with no comorbid conditions or BMI exceeding 27 with comorbid conditions should be one criterion for use of medications in the treatment of obesity. Other criteria include failure to manage weight with more conservative behavioral methods, number and severity of associated comorbidities, absence of contraindications such as depression or ischemic heart disease, and need for short-term weight loss to reduce operative risk (1). A weight loss of 10% of initial weight can be expected, with regain of weight after drug withdrawal. Long-term treatment with drugs is still controversial (1).

Planning the Diet

The dietitian should plan a calorie-controlled diet to meet the individual needs and lifestyle of the client. Suggestions to reduce daily energy intake include the following:

- Reduce intake of foods with high-caloric density (eg, alcohol and fat). Follow the Dietary Guidelines of less than 30% energy from fat, 10% to 20% from protein, 50% to 60% from carbohydrates.
- Reduce the total amount of food consumed by decreasing portions and frequency of consumption. Employ behavior modification techniques to improve the client's control over the food selection process and the act of eating.
- Establish self-management training techniques that will enhance the satiety of meals but reduce the energy intake. For example, encourage eating more slowly so the patient’s brain can register that the stomach is full, or recommend eating ample amounts of low-caloric density vegetables (eg, salads with small amounts of salad dressing or fat-free dressing) to provide chewing satisfaction and fill the stomach.

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MEDICAL NUTRITION THERAPY FOR HYPERLIPIDEMIA

Description

The general dietary approach to the treatment of hyperlipidemia is a progressive reduction in total fat, saturated fatty acids, and cholesterol, coordinated in a plan to obtain/maintain reasonable body weight. The diet follows the recommendations of the National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP II) of the National Institutes of Health (NIH) and the American Heart Association (AHA) (1).

Indications

Medical nutrition therapy (MNT) is recommended as the first line treatment for hyperlipidemia. The outcome of MNT intervention is to reduce the risk of coronary heart disease (CHD).

Nutritional Adequacy

The diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section 1A.

The National Institutes of Health maintain that the Step 1 and Step 2 diets are consistent with good nutrition and aim to achieve healthy eating patterns (1). A diet low in saturated fat, cholesterol and total fat is recommended for all healthy persons 2 years of age and older.

How to Order the Diet **For CHS facilities, CLICK HERE**

Specify all that apply:

- Step 1 Diet or Step 2 Diet. The Step 1 Diet is ordered initially. The Step 2 Diet is used if the response to the Step 1 Diet is insufficient. The dietitian will determine the specific approaches to be used to implement the Step 1 and Step 2 goals.
- Further reduction in total fat intake may be implemented. This depends on the dietitian's assessment and patient's compliance.
- If required, sodium control or other dietary modification should be specifically ordered.
- If weight reduction is desired, the dietitian should set the weight loss goal with the patient and determine the appropriate weight loss regimen.

Planning the Diet

Table IC- 4. Medical Nutrition Therapy for Hyperlipidemia (1)

	Recommended Intake		
Nutrient	**Step 1 Diet**	**Current U.S. Diet***	**Step 2 Diet**
Total fat	<30% of total calories	34%	<30% of total calories
Saturated fatty acids	8-10% of total calories	12%	<7% of total calories
Polyunsaturated fatty acids	≤10% of total calories	7%	≤10% of total calories
Monounsaturated fatty acids	≤15% of total calories	12.5%	≤15% of total calories
Carbohydrates	≥55% of total calories	50%	≥55% or more of total calories
Protein	10-20% of total calories	15%	10-20% of total calories
Cholesterol	<300 mg/day	270-350 mg/day	<200 mg/day
Total calories	To achieve and maintain reasonable weight		To achieve and maintain reasonable weight

***** Data obtained from the Third National Health and Nutrition Survey, Phase I (2).

Step 1 and Step 2 Diets: The recommended diets are presented in two steps: Step 1 and Step 2 (Refer to Table 1). The selection of the Step 1 or Step 2 diet is based on the patient's serum low-density lipoprotein (LDL) level, high-density lipoprotein (HDL) level, total cholesterol, risk factors associated with coronary heart disease (CHD) or presence of CHD. The Step 1 Diet calls for reducing sources of saturated fatty acids and cholesterol in the diet. For many patients this can be achieved without a radical alteration in dietary habits. The Step 2 Diet is recommended for persons with CHD and calls for further reductions of saturated fatty acids and cholesterol; neither of these is an essential nutrient, and can be reduced to very low intakes without harm. The primary objective of medical nutrition therapy (MNT) is to sufficiently reduce the intake of saturated fatty acids and cholesterol to lower low-density-lipoprotein (LDL)-cholesterol, while at the same time providing a nutritious and palatable diet.

Total Fat and Saturated Fatty Acids**:** Elevated LDL and total cholesterol is a direct risk factor for coronary heart disease (CHD). The reduction of dietary saturated fat directly decreases clearance of LDL and very low-density lipoprotein (VLDL) remnants (1). The recommendations for total fat and saturated fatty acids are based on the percentage of the patient's total daily caloric intake. (The average daily energy intake for women is approximately 1,800 Calories, for men approximately 2,400 Calories.) Reduction of total fat facilitates a decrease in saturated fatty acids and may also help in weight reduction in overweight patients. Much evidence suggests that even a small reduction in saturated fat intake can significantly reduce CHD incidence. Sources of saturated fatty acids include butter, lard, vegetable shortening, baked and pastry products, fat in meat and poultry, whole dairy products, palm oil, palm kernel oil, and cocoa butter.

Polyunsaturated Fatty Acids (PUFA): There are two major categories of PUFAs: omega-6 and omega-3 fatty acids. Linoleic acid is the primary omega-6 fatty acid and predominates in the American diet. The American Heart Association (AHA) recommends less than 10% of total fat calories come from polyunsaturated fatty acids. The new World Health Organization guidelines set a range of 4% to 10% for polyunsaturated fatty acid intake (3). Studies have demonstrated that intakes of greater than 10% is associated with decreasing HDL- level, a known risk factor for CHD (3). Sources of omega-6 fatty acids include corn oil, safflower oil, sunflower oil, soybean oil, nuts, and seeds.

Some studies have demonstrated that omega-3 fatty acids may reduce mortality in patients with preexisting CHD (4). Current studies show that the benefits from omega-3 fatty acids come from the fat content in fish. Omega-3 fatty acids lower blood levels of triglyceride and VLDL and therefore does have a role in the treatment of lipoprotein disorders characterized by severe hypertriglyceridemia (5). In studies where people who ate fish oil also ate less saturated fat, their LDL levels went down. But in studies where saturated fat intake remained constant while fish oil increased, LDL levels either did not change or increased (4,6). Currently fish oil or fish oil capsules are not recommended in the treatment of hypercholesterolemia (4). Sources of omega-3 fatty acids include cold water fish, tofu, soybean and canola oils, and nuts.

Monounsaturated Fatty Acids (MUFA): Oleic acid is the primary MUFA, and recent evidence indicates that oleic acid may cause as great a decrease in LDL-cholesterol levels as linoleic acid when substituted for saturated fatty acids in the diet. Substitution of monounsaturated fat for saturated fat lowers LDL without decreasing HDL (7). Sources of monounsaturated fatty acids include canola, olive, peanut oils and avocados.

Carbohydrates: It is recommended that complex carbohydrates make up the majority of digestible carbohydrates. When fat intake is reduced and nutrient replacement is required to maintain caloric balance, the replacement should be with complex carbohydrates. Recommended sources include whole grains, legumes, fruits, vegetables and low fat dairy.

Protein: Protein recommendations largely depend on caloric intake, as well as the carbohydrate intake. A recent meta-analysis has illustrated that substituting soy protein for animal protein lowers LDL-cholesterol and serum triglycerides[7,8,9]. Sources of soy protein include soy-milk, soybeans, tofu, and alphafa sprouts.

Cholesterol: Dietary cholesterol is found only in animal products, especially those foods that are high in saturated fatty acids (eg, meats and whole dairy products). There is some evidence that dietary cholesterol enhances the serum cholesterol-raising action of saturated fatty acids (1).

Total Calories**:** Maintaining a balance between calorie and energy expenditure is a goal of MNT. Some patients with high LDL-cholesterol levels are sensitive to caloric intake. Weight reduction and attainment of reasonable body weight will completely correct their elevated LDL-cholesterol concentrations. In many people, weight reduction will also reduce plasma triglycerides, as well as raise HDL-cholesterol levels.

Fiber: A high intake of total dietary fiber (eg, 20-35 g/day) is recommended for adults. Increasing intake of foods rich in soluble fiber has been correlated with decreasing serum cholesterol (10,11). Fiber found in oats, barley, and pectin-rich fruits and vegetables provides adjunctive lipid-lowering benefits beyond those achieved through the reduction of total and saturated fat alone [11]. Choosing both types of fiber in a ratio of about 1 part soluble to 3 parts insoluble fiber is recommended by the AHA.

Antioxidants: Recent studies suggest that oxidation of LDL in the artery wall increases its atherogenicity from free radical damage. Vitamins with antioxidant properties (eg, vitamins C, E, and beta-carotene) help to prevent atherosclerosis. Evidence for a protective effect is strongest for vitamin E (7,12,13).

Homocysteine: Homocysteine, an amino acid in the blood, appears to cause oxidation of LDL cholesterol (7). There is rapidly accumulating evidence that elevated blood levels of homocysteine increase the risk of vascular disease. An increase in blood total homocysteine (tHcy) levels of 5 mmol/L elevates the risk of CAD as much as an increase in total cholesterol of 20 mg/dL (7). A number of factors have been identified that influence blood homocysteine levels. Factors include deficiencies of folate, B-6, B-12, age, gender, menopausal status, renal function, and certain medications. Folate is required for the conversion of homocysteine to methionine, an amino acid. An inverse relationship has been found between serum folate and tHcy levels (14,15,16). Presently folic acid supplementation has not been studied to assess the impact folate has on reducing homocysteine levels. Currently a diet rich in folate is recommended, encouraging the consumption of enriched grains, legumes, fruits and vegetables.

Alcohol: Alcohol does not affect LDL-cholesterol concentrations, but it does increase serum triglyceride concen-centrations and HDL-cholesterol levels in many individuals. The mechanism for the rise in HDL-cholesterol is not known, nor is it known whether the higher level of HDL affords any protection against CHD. Individuals reporting moderate amounts of alcohol intake (approximately one to three drinks daily) have a 40% to 50% reduction in coronary artery disease risk compared with individuals who are abstinent. Excessive consumption of alcohol is associated with increased CHD (17). The NCEP report and AHA does not specifically recommend the use of alcohol for the prevention of CHD (1).

Trans Fatty Acids**:** Trans fatty acids are created through hydrogenation, a process involved when vegetable oils are heated in the presence of metal catalysts to produce vegetable shortening and margarine. Trans fatty acids have shown to increase LDL-cholesterol and decrease HDL-cholesterol. Because saturated fats increase LDL, but do not decrease HDL levels, trans fatty acids can produce a greater increase in the ratio of LDL to HDL cholesterol. It is estimated that 5-6% of the fat in the American diet is compromised of trans fatty acids (7). Sources of trans fatty acids include hardened vegetable fat, stick margarine, shortening and baked products made with these fats. Public concern has been raised about the use of margarine and whether other options, including butter might be a better choice. The AHA Nutrition Committee recommends margarine as a preferable substitute for butter. Soft margarine with no more than 2 grams saturated fat per tablespoon and with liquid oil as the first ingredient is recommended in place of stick margarine.

Phytochemicals: Phytochemicals are nutritive substances found in plants. Nuts, whole grains, fruits and vegetables contain a variety of phytochemicals. Epidemiological studies are showing the relationship between the intake of phytochemicals, primarily plant sterols, flavonoids, and plant sulfur compounds and coronary heart disease. Plant sterols found in rice bran have shown to decrease cholesterol levels (9). Flavonoids found in tea, onions, soy and wine have demonstrated antioxidant properties. Plant sulfur substances found in garlic, onions, and leeks have shown to decrease serum cholesterol (18). Studies are difficult to interpret because food sources containing phytochemicals have multiple compounds, and distinguishing a specific cause and effect to atherosclerotic process has been limited. Several studies are currently ongoing to assess the relationship of phytochemicals to CHD.

20% Fat Diet

Reducing intake of total fat to 20% or less of total calories, along with progressive reductions in saturated fatty acids and cholesterol, has been proven to help stop and/or reverse the progression of heart disease. When this approach is taken, care must be taken to maintain adequate intakes of certain nutrients (eg, iron, calcium, and some B-vitamins). A 20% Fat Diet has shown favorable outcomes for some patients with established CHD or other atherosclerotic diseases (19).

The principles of the 20% Fat Diet (see Food Guide), which consists primarily of fruits, vegetables, grains, lean chicken and fish, legumes, nonfat dairy products, oil-based salad dressings (eg, olive oil), and egg whites, are

- 20% or less of calories from fat (poly- and monounsaturated),
- 60-65% carbohydrate (mainly from complex sources),
- 15-20% protein,
- approximately 100 mg cholesterol,
- high in fiber,
- no restriction in calories.

Foods to avoid or restrict with the 20% Fat Diet include

- foods high in saturated fat (eg, all red meat, fried foods),
- high and low-fat dairy products (eg, whole and reduced fat milk, yogurt, butter, cheese, egg yolks, cream)
- alcohol.

SAMPLE MENU

Breakfast	Noon	Evening
Plain oatmeal	Turkey breast (2 oz)/wheat bread	Baked chicken (3 oz)
Wheat toast with margarine (1 tsp)	Lettuce, tomato, mustard	Baked potato with margarine (1 tsp)
1/2 grapefruit	Tossed salad	Fresh broccoli
Fresh fruit juice	Fresh fruit	Fruit salad
Nonfat milk	Nonfat milk	Decaffeinated iced tea

See Section 1C: Calorie-Controlled Diet for Weight Management
See Section III: Clinical Nutrition Management
HYPERLIPIDEMIA
HYPERTRIGLYCERIDEMIA

INDICATIONS FOR MEDICAL NUTRITION THERAPY FOR HYPERLIPIDEMIA

Cardiovascular Risk (1)
Increased blood cholesterol levels or, more specifically, increased levels of LDL-cholesterol are related to increased risk for CHD. Coronary risk rises progressively with an increase in cholesterol, particularly when cholesterol levels rise above 200 mg/dL. Patients with established CHD are at high risk for subsequent myocardial infarction or CHD death--5 to 7 times higher than without established CHD.

There is also substantial evidence that lowering total and LDL-cholesterol levels (often combined with drug interventions) will decrease the incidence of CHD in both primary and secondary prevention settings (eg, patients with and without evidence of CHD, respectively).

Clinical trials of relatively short-term duration support the projection that for individuals with serum cholesterol levels initially in the 250 to 300 mg/dL range, each 1% reduction in serum cholesterol level yields approximately a 2% reduction in CHD rates. Epidemiological studies suggest that the reduction in CHD rates achievable by a long-term cholesterol-lowering regimen amounts to as much as 3% for each 1% reduction in serum cholesterol. Thus, it is reasonable to estimate that the 10%-to-15% reduction in serum cholesterol level resulting from MNT should reduce CHD risk by 20%-to-30%.

Patient-Centered vs. Population Approaches (1)
Patient Centered Approach: A clinical or patient-based approach seeks to identify individuals at high risk who will benefit from intensive intervention efforts. Criteria define the candidates for medical intervention and provide guidelines on how to detect, set goals for, treat, and monitor these patients over time. The patient-centered approach is discussed in this chapter.

Population Approach: The population or public health approach attempts to lower blood cholesterol levels in the whole population by promoting changes in dietary habits and physical activity levels. The AHA and the NIH take the position that a generalized reduction in cholesterol levels in Americans should decrease the prevalence of CHD. It is widely assumed that the eating habits of Americans are primarily responsible for cholesterol levels above the desirable range. For this reason, the AHA and the NIH recommend that the population at large adopt an eating pattern designed to maintain plasma cholesterol near the desirable range.

The patient-centered and population approaches are complimentary, and together represent a coordinated strategy aimed at reducing cholesterol levels and coronary risk.

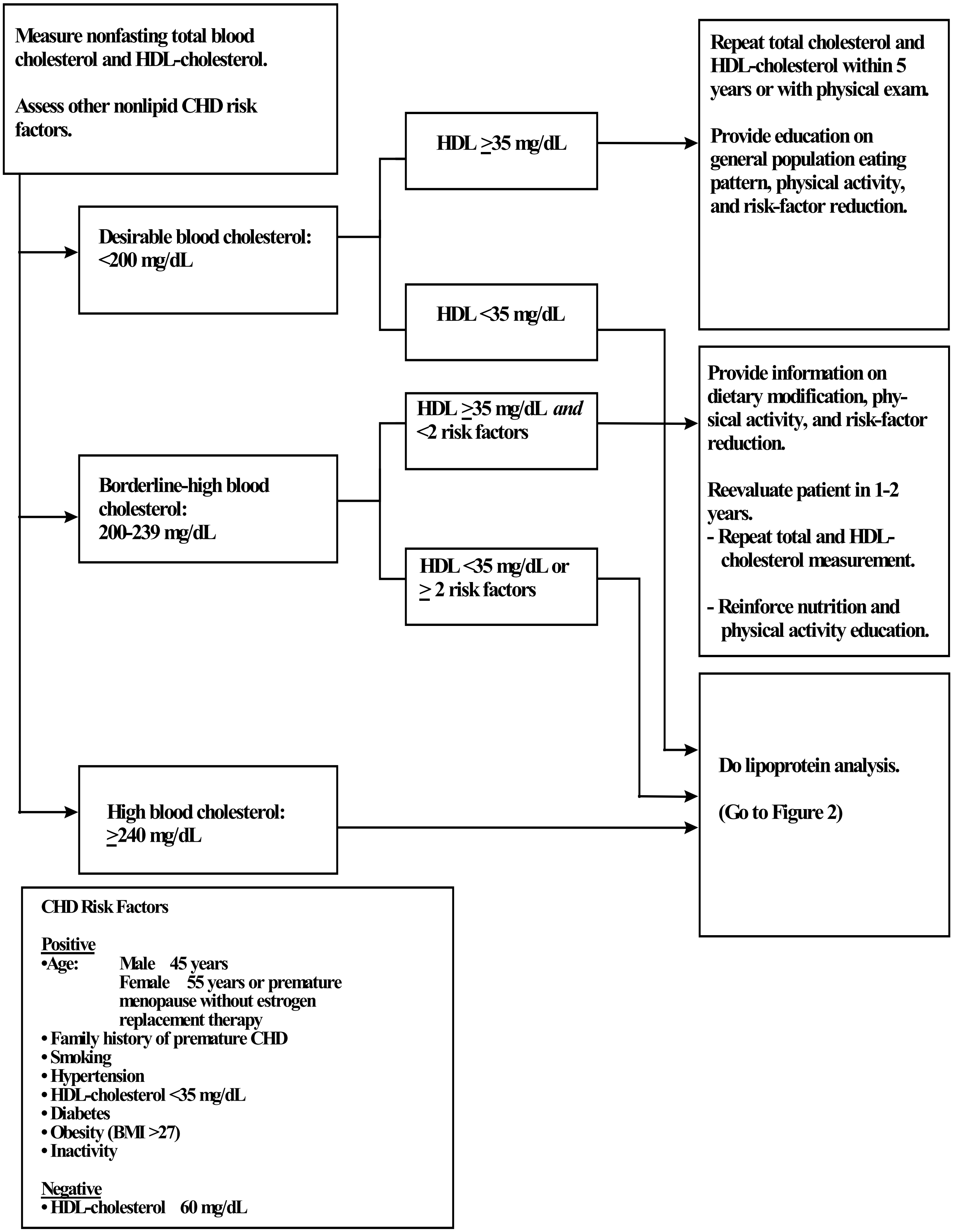
Special Groups
Severe Primary and Secondary Lipid Disorders: Patients with severe primary hyperlipidemia (eg, familial hyperlipidemia) deserve maximal MNT, eg, the Step 2, 20% Fat, or 10% Fat Diet. However, some of these patients will not respond adequately to diet and will require drug therapy in addition to MNT (1).

Elderly High-Risk Patients: MNT for elderly high-risk patients must carefully consider the adequacy of nutrient intake and the interest of the individual undertaking the change, as well as general clinical status and health. The Step 1 Diet is recommended for most elderly patients with high cholesterol levels; however, intensive MNT (eg, the Step 2, 0% or 10% Fat Diet) is not advisable except under special circumstance (20).

Pregnant Women with Preexisting Lipid Disorders: Elevations in blood cholesterol and triglycerides may occur during pregnancy, with maximal levels in the third trimester, and return to normal after delivery. Generally, the MNT previously prescribed for preexisting lipid disorder should be continued during pregnancy. If MNT is very restrictive, careful consideration should be given to ensure adequate nutrient intake. Drug therapy should be discontinued during pregnancy, since the effect of lipid-lowering drugs on the fetus has not been carefully studied (20).

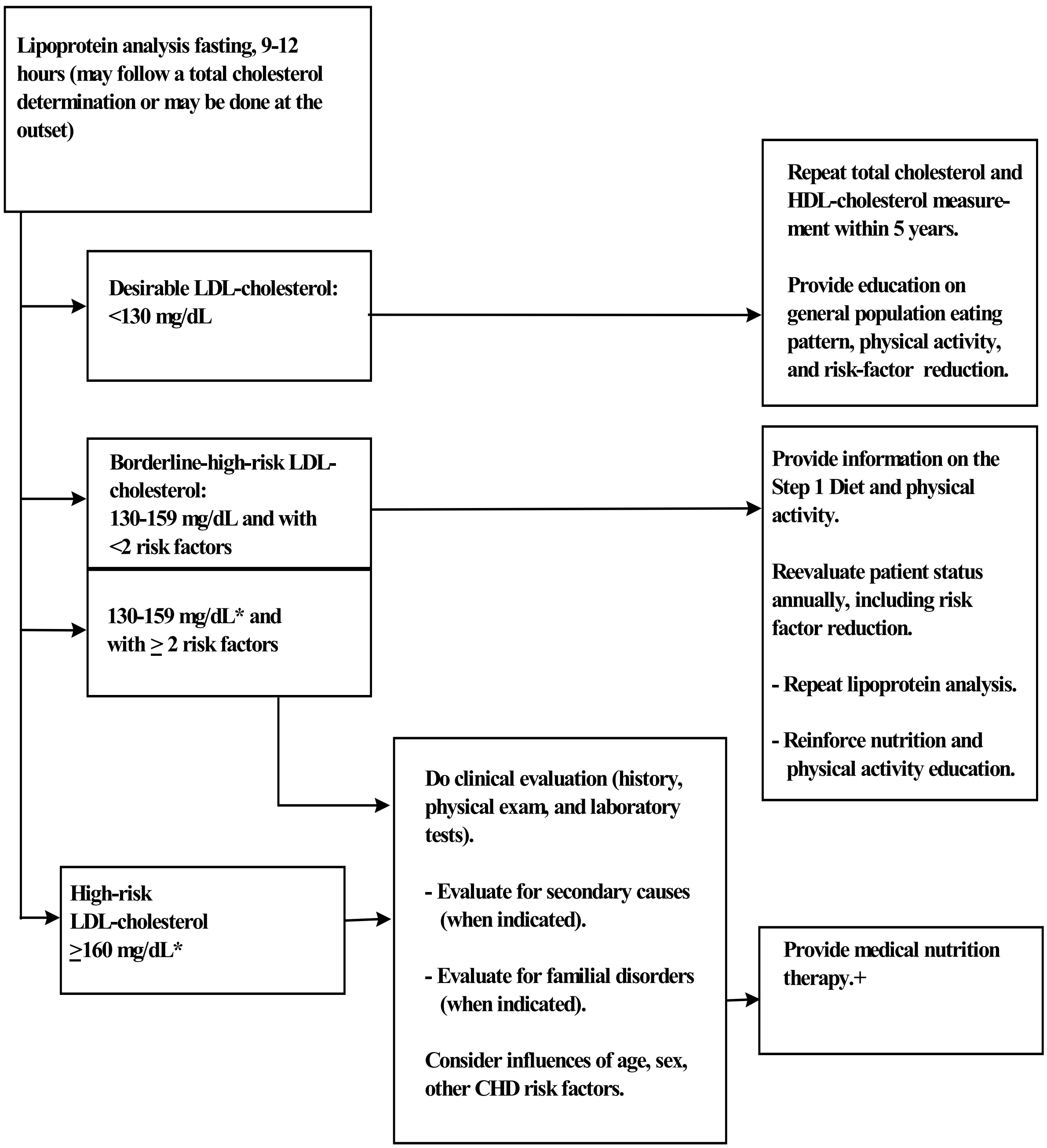
Children and Adolescents: *The Report of the Expert Panel on Blood Cholesterol Levels in Children and Adolescents* from the National Cholesterol Education Program concludes that atherosclerosis and its forerunners begin in youth. The panel recommends that children follow the same dietary guidelines as adults. Initial screening should be performed on children and adolescents ages 2 to 19 having a family history of high blood cholesterol or incidence of cardiovascular disease before age 55. In addition, those children with other risk factors for heart disease (eg, high blood pressure, obesity, diabetes, and physical inactivity) should be screened. The Step 1 Diet is recommended for youths with LDL-cholesterol level greater than 110 mg/dL. Drug therapy is considered as a means of treatment only when LDL-cholesterol is greater than 190 mg/dL or LDL-cholesterol remains greater than 160 mg/dL and a positive family history of premature CVD or two or more CVD risk factors are present (21,22).

Figure 1. **Primary Prevention in Adults Without Evidence of CHD: Initial Classification Based on Total Cholesterol and HDL-Cholesterol** (1)



Hyperlipidemia

Figure 2. **Primary Prevention in Adults Without Evidence of CHD: Subsequent Classification Based on LDL-Cholesterol** (1)



* On the basis of the average of two determinations. If the first two LDL-cholesterol tests differ by more than 30 mg/dL, a third test should be obtained within 1-8 weeks and the average value of the three tests used.

\+ For protocol, refer to Hyperlipidemia, in: Inman-Felton A, Smith K, Johnson E, eds, *Medical Nutrition Therapy Across the Continuum of Care*. Chicago, Ill: The American Dietetic Association; 1998.

More intensive nutrition interventions (eg, the 20 % and 10% Fat Diets) may be considered with or without drug therapy. Criteria that define candidates for this intensive dietary approach have not been established, and are largely determined by the patient and the dietitian's assessment. Factors to consider include the hospital setting, the general clinical status and health of the patient (eg, existing CHD), and the patient's motivation. A minimum of 6 months of MNT is indicated before consideration of drug therapy. The lipid profile in patients who have had an acute myocardial infarction may take four to six weeks after the event to stabilize; thus treatment decisions should not be based on cholesterol levels obtained in the immediate post-infarction period.

Because LDL-cholesterol offers more precise risk assessment and is the primary target of interventions, treatment decisions are primarily based on LDL-cholesterol levels. (Refer to Table IC-5.)

Table IC-5. Medical Nutrition Therapy (1)

	Initiation Level	*LDL-Cholesterol Goal*
Without CHD and with < 2 Risk Factors	≥ 160 mg/dL	< 160 mg/dL
Without CHD and with ≥ 2 Risk Factors	≥ 130 mg/dL	< 130 mg/dL
With CHD	> 100 mg/dL	≤ 100 mg/dL

Drug Treatment

	Consideration Level	*LDL-Cholesterol Goal*
Without CHD and with < 2 risk factors	≥ 190 mg/dL*	< 160 mg/dL
Without CHD and with ≥ 2 risk factors	≥ 160 mg/dL	< 130 mg/dL
With CHD	≥ 130 mg/dL+	≤ 100 mg/dL

* In men under 35 years of age and premenopausal women with LDL-cholesterol levels 190-219 mg/dL, drug therapy should be delayed except in high-risk patients (i.e., those with diabetes).

\+ In CHD patients with LDL-cholesterol levels 100-129 mg/dL, the physician should exercise clinical judgment in deciding whether to initiate drug treatment.

Expected Response to Medical Nutrition Therapy

The degree of reduction of LDL-cholesterol levels achieved by MNT depends on dietary habits before starting therapy, degree of compliance, and inherent biological responsiveness. In general, patients with high cholesterol levels experience greater absolute reductions in LDL-cholesterol levels than do those with low cholesterol levels. Research suggests that switching from the typical American diet to the Step 1 Diet could reduce total cholesterol levels on average by 5-7%. Progressing to a Step 2 Diet may yield a further reduction of 3-7% in total cholesterol levels. Patients who undergo intensive medical nutrition therapy (eg, diets with 20% or less fat from total calories) may experience a reduction of up to 40% (19). Limited data suggest that women may have a slightly smaller response than men. Most of the decrease in total blood cholesterol occurs in the LDL fraction (1).

Adherence to the prescribed diet is facilitated by monitoring the patient's response. The Step 1 Diet should be measured at 4-6 weeks and at 3 months. This should allow the patient sufficient time to adopt new eating habits and respond to dietary change. The response can be judged from the change in the total cholesterol and/or LDL-cholesterol level. If the response is satisfactory (eg, cholesterol goals are achieved), long-term monitoring may begin. If the desired response is not obtained in spite of good diet adherence, the patient should progress to the Step 2 Diet, measured after 3-4 weeks and 3 months. Consultation with a registered dietitian is recommended for assessment of the patient's adherence and response to the Step 2 Diet. More intensive MNT (eg, 20% or 10% Fat Diets) may be initiated, depending on the patient's needs (1). Although HDL-cholesterol levels are now being considered among the major risk factors for CHD, the main target goals of MNT are to decrease LDL-cholesterol to levels below the cut points for initiating therapy (See Table IC-5).

High-Density Lipoproteins

Epidemiological studies have shown that low HDL-cholesterol levels are a significant risk factor for CHD, independent of LDL-cholesterol and other risk factors. A reduced serum level of HDL-cholesterol is defined as a concentration below 35 mg/dL. Research indicates that for every 1 mg/dL decrease in HDL-cholesterol, the risk of CHD is increased by 2-3% (23). Likewise, higher HDL-cholesterol levels appear to afford a degree of protection against CHD. This conversely warrants calling a high level (≥ 60 mg/dL) a negative risk factor. Measurement of HDL-cholesterol occurs with the lipoprotein analyses of primary prevention in adults *without* evidence of CHD. For secondary prevention in adults *with* evidence of CHD, lipoprotein analysis is required in all patients and classification is based on only LDL-cholesterol. Appropriate advice in treatment includes smoking cessation, weight reduction, and increased physical activity. Avoidance of certain drugs that reduce HDL-cholesterol, such as beta-adrenergic blocking agents (beta-blockers), anabolic steroids, and progestational agents, should also be considered (1).

Physical Activity and Weight Management

Research has shown that excess body fat, or obesity, is a major risk factor for CHD and also contributes to the development of other risk factors, such as diabetes and hypertension. Weight management plays a vital role in achieving and maintaining good health while enhancing the quality of life. Proper nutrition and physical activity are key factors that influence weight control.

An important adjunct to long-term change in eating habits and lifestyle is an increase in physical activity. There is evidence that regular exercise alone reduces CHD mortality by increasing HDL-cholesterol levels, and in some patients lowering LDL-cholesterol levels. The exercise should emphasize aerobic activity, such as brisk walking, jogging, swimming, bicycling, and tennis. Improvements in cardiovascular fitness result from exercising 3-5 times a week at moderate intensity for 30-45 minutes (17). Vigorous, high-intensity exercise must be carried out with caution in high-risk persons and only with the advice of a physician and under the supervision of trained personnel (24).

SELF-MANAGEMENT TRAINING FOR THE PATIENT WITH HYPERLIPIDEMIA

Once the patient's clinical status, motivation, comprehension, and environmental support are assessed, the dietitian should set goals with the patient and provide self-management training to fit his or her needs. The following outlines several approaches that may be considered to help the patient limit his/her fat intake.

Foods to Choose vs. Foods to Decrease Consumption of

The Step 1 Diet calls for the reduction of the major and obvious sources of saturated fatty acids and cholesterol in the diet. The objective of the Step 1 Diet is a saturated fat intake of less than 10% of calories. It is usually difficult for the average person to estimate when this target is being met. Therefore, a realistic approach is to provide specific recommendations about diet change, such as reducing meat portions, as well as food substitutions. It is usually necessary to implement the specific goals in a graduated fashion, rather than all at once (1).

Food Lists

Food lists from the NHLBI outline the number of servings from each of several food groups. In order to increase adherence, it is important to individualize these by taking a patient's food preferences into consideration and jointly set goals for changes in eating habits.

Grams of Fat

This method involves counting the grams of fat and saturated fat consumed each day (eg, to reach the diet goals of the Step 2 Diet, 20% Fat Diet, and 10% Fat Diet). Food selections should be made so that the number of grams of fat and saturated fat does not go over the goals set. Food labels and supplemental references can be used to calculate the grams of fat in a dietary recall that can be compared to the goal.

Exchange List for Meal Planning

The *Exchange Lists* of the American Diabetes Association and The American Dietetic Association are a tool that be used to quantify the amount of fat in the diet, through the designation of foods as fat exchanges, and the identification of other foods that include fat and fat exchanges. The *Exchange Lists* also identifies very lean and lean meats and mono- and polyunsaturated fats. Diets at various fat and calorie levels can be calculated using the macronutrient values for the various exchange lists. For the patient who has already been instructed in the exchange system, the dietitian may wish to continue to use this system with the following considerations:

- For the non-diabetic patient and patients who do not need to limit simple carbohydrates, additional sugar-containing foods may be allowed. These may be incorporated into the diet as carbohydrate exchanges.
- Special attention should be made to limit eggs, meat/fish/poultry, and fats according to the NHLBI guidelines and the recommendations for the 20% and 10% Fat Diets. (See Food Guide, this section.)
- Diabetics and other clients would be advised to modify their existing diet patterns to reduce saturated fat by following these recommendations. Certain foods in the meat, fat, and milk exchange lists are to be avoided or limited. In the Step 1 Diet, foods on the high-fat meat list, the saturated fats list and the low fat/whole milk lists are to be avoided. In the Step 2 Diet, the medium fat meat list may also need to be avoided. Among the meat exchange list, the 20% Fat Diet includes only foods from the very lean meat list. The 10% Fat Diet is vegetarian, and thus excludes all meats (including chicken and fish). Egg whites, nonfat cheeses, and legumes

are the only items allowed from the very lean meat list in the 10% Fat Diet. In the fat exchange list, this diet also excludes all items listed under saturated fats and certain unsaturated fats. Only nonfat dairy products, including fat free milk, nonfat yogurt, nonfat cheeses, and nonfat sour cream are permitted in all the diets discussed in this section.

- Fat-containing foods on the starch list can be identified as foods that need to be fat modified.
- As a behavioral strategy, establish the number of fat exchanges to be part of the daily meal choices. Refer to the *Exchange Lists* and count toward the fat tally: (1) servings from the fat list, (2) fat exchanges included in fat-containing foods on the bread/starch list, (3) each ounce of high-fat meat as 1 fat exchange, (4) each serving of whole milk as 2 fat exchanges, and each serving of low-fat milk as 1 fat exchange.

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FOOD GUIDE - Step 1 and Step 2 Diets

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
Beverages	Carbonated beverages, soft drinks, coffee, tea, cocoa mixes	
Breads, cereals, grain products	Most breads, cereals, pasta, rice, dried peas, beans, and potatoes. Low-fat crackers: Rye Crisp, Saltines,* bread sticks, fat-free crackers,* melba toast, English muffins, bagels, pita bread	Commercial baked goods: croissants, cheese breads, doughnuts, muffins, biscuits, butter- type rolls, quick breads, granola-type cereals, snack crackers like cheese crackers, potato chips, egg noodles, creamed potatoes/pasta
Vegetables & fruits	All fresh, canned, or dried fruits and vegetables	Vegetables prepared in butter, cream, or other sauces
Meat, fish, poultry ***Step 1 & Step 2 Diets*:** Limit to 5-6 oz a day. ***20% Fat Diet:*** 3 to 4 oz. a day	Chicken & turkey: remove the skin and any visible fat. Fish & shellfish Veal & wild game Beef, pork & lamb: use lean cuts only. Beef: extra lean ground beef, sirloin tip, ground steak, and rump roast. Pork: center-cut ham,* loin chops and tenderloin Luncheon meats at least 95% fat-free	Poultry: goose, domestic duck Fatty cuts of meat Fried fish Beef: corned beef brisket,* regular ground beef, short ribs Pork: spareribs, ground pork Processed meats: bacon,* bologna.* salami,* sausage,* hot dogs* Organ meats: liver, gizzard, brains, heart & kidney (limit to once a month.)
Eggs	Egg whites, cholesterol-free egg substitute Reduced cholesterol eggs or egg substitutes	Egg yolks**.** **Step 1 Diet**, limit to 3 per week, **Step 2 Diet**, limit to 1 a week
Milk & dairy products	Fat-free or 1% fat milk and buttermilk, low-fat or nonfat yogurt, fruited or frozen (1% or less milk fat)	Whole milk (4%), regular, evaporated, condensed; cream, half & half, reduced fat milk, imitation milk products, nondairy creamers, whipped toppings, eggnog, whole milk yogurt, milkshakes
	Low-fat cheese: any cheese labeled 2-6 grams of fat per oz, part-skim mozzarella cheese, cottage cheese (1% or 2%), part-skim ricotta cheese Fat-free cream cheese and sour cream (**20% Fat Diet:** nonfat cheeses only)	All natural cheeses (eg, bleu, brie, feta, muenster, Roquefort, camembert, cheddar, Swiss, American, cream cheese, sour cream) Low-fat or "light" cream cheese or sour cream

***High in salt. Individuals limiting their salt intake should avoid these foods.**

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
Fats & oils ***Step 1 & Step 2 Diets*****:** Limit to 6-8 tsp or portions a day, including fat used in cooked products. ***20% Fat Diet*****:** Limit to 4 servings per day.	Unsaturated vegetable oils: canola, safflower, sunflower, corn, peanut, olive, soybean. Margarine in which the first ingredient is "liquid" oil. Diet margarine. Nonfat butter substitutes. Nonstick spray. Nonfat or fat-free salad dressing or mayonnaise. •Olives* (5 large) •Nuts (1 oz = 3 tsp fat) •Avocado (1/8 med) •Mayonnaise-type dressing (2 tsp) •Salad dressing (1 Tbsp) •Peanut butter (2 Tbsp =3 tsp of allowed fat)	Saturated fats & oils: butter, coconut oil, cocoa butter, palm kernal oil, lard, or bacon fat. Margarine or shortenings in which the first ingredient is a partially hydrogenated oil or animal fat. Dressings made with egg yolk, bleu cheese, or sour cream. Coconut, chocolate, commercial dips. **Foods with hidden fat:** • Biscuit* (2”) 1 tsp of fat • Cornbread* (2” cube) 1 tsp of fat • Muffin (small) 1 tsp of fat • Pancakes (2) 1 tsp of fat • Stuffing/dressing (1/2 cup) 1 tsp of fat • Cake (3” square) 1 tsp of fat • Fruit pie (1” wedge) 1 tsp of fat • Cookies (2-2”) 1 tsp of fat These foods are acceptable if prepared homemade with oil or “liquid” margarine. Count the “hidden” fat in these foods toward the daily fat allowances.
Soups	Broth type made with allowed ingredients	Cream soups. Condensed cream soups*
Sugar & sweets *20% Fat Diet***:** Avoid all but fat-free products, syrups, and hard candy.	"Fat-free" frozen desserts, cakes, and cookies; angel food cake; sherbet, sorbet, gelatin; occasionally ice milk Low-fat yogurt Syrups: chocolate (made with cocoa), strawberry, etc Cookies: graham crackers, gingersnaps, animal crackers, fig bars, vanilla wafers Pudding made with fat free milk Hard candy	Commercial baked goods: pies, cakes, cookies, doughnuts, pastries; ice cream, brownies, fudge topping, milk chocolate candy

***High in salt. Individuals limiting their salt intake should avoid these foods.**

10% Fat Diet

This intensive medical nutrition therapy is designed for people with established coronary heart disease, and follows guidelines from programs developed by Dean Ornish, MD (Reversing Heart Disease Program), and Robert Pritikin (New Pritikin Program).

Successful outcomes from this diet (eg, reduction of total and LDL-cholesterol) are largely dependent upon patient motivation and compliance. Studies have documented that a very low-fat diet with 10% or less fat, together with lifestyle changes (eg, stress management, psychosocial support, smoking cessation, and exercise), results in decreased progression and possibly regression of cardiac disease.

The primary focus of the 10% Fat Diet is not to limit the amount of food eaten, but to change the type(s) of food consumed. Similar to Dr. Dean Ornish's Reversal Diet (also known as the Life Choice Diet), the 10% Fat Diet is a low-fat vegetarian diet that allows frequent snacking between meals (1). Approximately 20-25 grams of fat a day are permitted, depending on the individual's frame size, gender, and exercise level.

Principles of the 10% Fat Diet (2-6)**,** which consists primarily of fruits, vegetables, grains, legumes, nonfat dairy products, and egg whites, are

- 10% or less of calories from fat (primarily poly- and monounsaturated),
- no foods high in saturated fat (eg, all meats, high-fat dairy products),
- 70-75% carbohydrate (mainly from complex sources),
- 15-20% protein,
- 5 milligrams cholesterol a day,
- high in fiber,
- no restriction on calories.

Foods to avoid or severely restrict with the 10% Fat Diet include

- all meats,
- all oils and oil-containing products,
  - high fat and reduced fat dairy products (eg, whole and reduced fat milk, yogurt, butter, cheese, egg yolks, cream)
  - sugar and simple carbohydrates (eg, honey, molasses, corn syrup, fructose, sucrose),
  - avocados and olives,
  - nuts and seeds,
  - alcohol,
  - caffeine and other stimulants,
  - limit of 2 non-fat dairy servings/day

SAMPLE MENU

Breakfast	**Noon**	**Evening**
Waffles	Vegetable soup	Pasta with marinara sauce
Nonfat yogurt	Tossed green salad with/fat-free dressing	Black-eyed pea salad
Fresh cantaloupe		Mixed greens
Orange juice	Wheat bread	Dinner roll
	Fresh fruit	Peaches

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FAT-CONTROLLED DIET
(50 Grams)

Description
Omitting and/or limiting fat-containing foods restricts the total amount of fat in the diet. The type of fat is not considered .

Indications
A fat-controlled diet is indicated for individuals who are unable to properly digest, metabolize, and absorb fat. Common diseases of the hepatobiliary tract, pancreas, intestinal mucosa, and lymphatic system impair fat digestion, metabolism, and absorption (1-5). A low fat-diet may also be useful in the treatment of patients with gastroesophageal reflux (4,6).

Contraindications
In pancreatic insufficiency, enzyme preparations remain the primary treatment for steatorrhea. As normal a diet as possible is encouraged to increase the likelihood that a nutritionally adequate diet will be consumed (5,7,8). The diet should restrict fat only to the individual's tolerance level.

The treatment of choice for gallstones at the present time, where indicated, is surgery. There is no reason in the postoperative period to restrict or modify fat intake in any way.

Nutritional Adequacy
The Fat-Controlled Diet can be planned to meet the Dietary Reference Intakes (DRIs) for all nutrients as outlined in the *Statement on Nutritional Adequacy* in Section 1A. Vitamin E intake will be lower than in a regular diet. However, the requirement for vitamin E is proportional to the intake of polyunsaturated fatty acids, which will also be reduced in a Fat-Controlled Diet.

Ordering the Diet
- Order as "Low-Fat Diet" or "50-Gram-Fat Diet" can be ordered (this is sufficiently restricted for many indications).
- Other levels of fat restriction can be specified, eg, 25-35-g-fat diet.
- If a cholesterol restriction is desired, the diet ordered should be "Step I Diet." See Section IC: Medical Nutrition Therapy for Hyperlipidemia.

FOOD GUIDE

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
Beverages and Milk	Coffee, tea, carbonated drinks Fat-free milk or buttermilk, evaporated skim, nonfat dry milk, skim or low-fat yogurt	Whole, reduced fat, evaporated, condensed, or chocolate milk, yogurt made from whole milk, cocoa mixes
Breads, Cereals and Grains	Whole-grain or enriched breads, dinner rolls, cereals and grains, pasta, plain crackers	Quick breads such as muffins, biscuits, rich or sweet rolls, doughnuts, pancakes, waffles, party crackers, potato chips, granola unless calculated into diet
Meat, Fish, Poultry, Cheese, Eggs (average 3-5 g fat/oz) (limit intake to 5 oz/day)	Lean meat (trimmed of visible fat), fish, and fowl (without skin). The following are equal to 1oz meat: 1 egg, 1/4 cup tuna, salmon (water-packed), or cottage cheese. The following low-fat cheeses are allowed (one serving per day): 1oz low fat or fat free milk cheeses (sapsago, mozzarella, farmer's) or 1/4 cup 1% cottage or ricotta cheese	Fried or fatty meats, such as luncheon meats, cured and processed meats, other cheeses

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
Vegetables	Any prepared without fat.	Vegetables in cream sauces or gravies, fried vegetables including potatoes
Fruits and Juices	All	None
Fats (limit intake to 5 tsp/day; use no more than 2 servings/meal) (Average: 1 tsp fat = 5 g fat)	Butter, margarine, vegetable oil, crisp bacon (1 strip = 1 tsp fat)	Cream, avocado, nuts, coconut, olives, peanut butter
Soup	Any soups made with fat free milk or fat free broth	Commercially canned soups, cream soups, soups containing fat or whole milk
Desserts	Fruit, sherbet, sorbet, fat-free frozen desserts, gelatin, angel food/sponge cake, low fat cookies (gingersnaps, vanilla wafers), fat-free cakes, puddings made with fat free milk, meringues	Ice milk, ice cream, pie, cake, cookies, pastries, any desserts made with shortening, chocolate, cream, nuts, or fat
Sweets	Sugar, jelly, honey, syrups with no fats, molasses, plain marshmallows, hard candy	Any containing chocolate, nuts, cream, coconut, butter-flavored or fudge syrup
Miscellaneous	Vinegar, low-calorie or fat-free dressings, cocoa or carob powder, herbs and spices, salt, pepper, Butter Buds®	Chocolate, coconut, gravy

SAMPLE MENU

Breakfast	**Noon**	**Evening**
Orange juice	Honey glazed chicken (skinless)	Lean beef tips and noodles
Cream of wheat	Baked potato/margarine	Seasoned green beans
Scrambled egg	Steamed broccoli	Sliced tomato salad
Wheat toast	Fruited gelatin	Fat-free French dressing
Margarine	Dinner roll	Peach halves
Jelly	Margarine	Dinner roll
Fat free milk	Sherbet	Margarine
Coffee	Fat free milk	Iced tea
Sugar	Tea	Sugar
	Sugar	

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MEDIUM-CHAIN TRIGLYCERIDES (MCT)

Description
Commercial medium-chain triglycerides (MCT) are composed of 8-10 carbon fatty acids synthesized from palm kernel and coconut oils (1). MCT provide 8.3 kcal per gram and 116 kcal per tablespoon (2).

Indications
MCT are indicated in conditions where long-chain triglycerides (LCT) are not well tolerated. MCT are commonly used in fat-controlled diets to provide increased calories and improve the palatability of a reduced-fat diet See Fat-Controlled Diet. The following properties of MCT may make it useful in disorders where LCT are problematic:

- Absorption can occur despite pancreatic lipase deficiency (2).
- Bile salts or micelles are not required for dispersion in water and subsequent absorption (2).
- Transport across the intestinal mucosa occurs more readily than with LCT (2).
- MCT are not dependent upon chylomicrons for transit and consequently do not require lipoprotein lipase for oxidation (2).
- Transport does not occur through the lymphatic system. MCT travel directly to the liver via the portal vein, as free fatty acids bound to albumin (2).
- MCT hydrolyzes to fatty acids more quickly (2) and oxidizes more rapidly and efficiently than LCT (1).

MCT may be adjunctive to a fat-controlled diet in the following conditions:

- Pancreatic insufficiency (1)
- Cystic fibrosis (1)
- Intestinal resection (1)
- Hepatobiliary disease (1)
- Lymphangiectasia (2)
- Chyluria (2)
- Chylous ascites (2)
- Chylothorax (2)
- Secondary carnitine deficiency syndromes (3)
- Whipple's disease (4)
- Hyperchylomicronemia (4)

MCT may be therapeutically incorporated into the ketogenic diet, which is used to control epileptic seizures (see Ketogenic Diet) and may also be used in adjunct with antineoplastic treatment for pediatrics (5).

Contraindications
Under normal physiologic conditions, MCT are ketogenic. Therefore, MCT are contraindicated in persons who are prone to diabetic ketoacidosis (2).

In cirrhosis, MCT accumulate in the blood, resulting in a condition that presents with symptoms similar to hepatic encephalopathy, including hyperlactacidemia, hyperammonemia, hyperventilation, and altered EKG findings (2).

Nutritional Adequacy
MCT are used in conjunction with specific diets, such as fat-controlled or ketogenic diets. Nutritional adequacy will depend on the prescribed diet.

How to Order the Diet
MCT are generally ordered in conjunction with a fat-controlled diet. The order should specify the number of mL or g MCT to be added to the diet. For example: "____ g Fat-Controlled Diet plus ____ mL(g) MCT"

Planning the Diet
- MCT are available as MCT oil or in formulas containing MCT.
- MCT should be introduced slowly to avoid the abdominal distention and pain, nausea, vomiting, and diarrhea associated with rapid infusion or high dose (2).

- MCT in divided doses of no more than 15-20 mL (3-4 tsp) at a time are generally well tolerated (2). Patients should initially receive no more than 20-30 mL per day, increasing by 5-10 mL per day as tolerated until the MCT goal is met.
- To incorporate MCT into the diet, the following are suggested (2):
  - Add 1 tsp MCT oil to 4 oz fat free milk, carbonated beverages, juices, or flavored drinks. If patient is prescribed a ketogenic diet, use sugar-free beverages and follow fluid restrictions.
  - Substitute an equal amount of MCT oil for other fats when cooking and baking.
  - Prepare salad dressings with MCT oil.

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FIBER-RESTRICTED DIETS
(Low-Residue/Low-Fiber)

Description
The Low-Residue/Low-Fiber Diet restricts dietary fiber provides less than 10 grams a day. Foods that have been defined in qualitative terms as having tough fibers are also eliminated. Animal products, refined grain products, and selected fruits and vegetables are included.

Indications
- To prevent the formation of an obstructing bolus when the intestinal lumen is narrowed,
- To delay intestinal transit time in conditions of diarrhea,
- To reduce (not eliminate) the residue in the colon pre- and postoperatively,
- To allow the bowel to rest during acute exacerbation of inflammatory bowel disease, acute phases of diverticulitis, or regional enteritis (Crohn's disease).

The diet is intended for short-term use. The goal of nutrition therapy is to establish a tolerance to a wider variety of foods and to make a transition to a regular diet.

Contraindications
A fiber-restricted diet is contraindicated when a soft stool is desired, as in individuals with diverticulosis. A low-residue/low-fiber intake may aggravate the symptoms of irritable bowel or constipation. In these cases, a high-fiber intake is recommended. (See Section 1D: High-Fiber Diet.)

Where a diet soft in texture is desired, as in the case of a patient with esophageal narrowing, a mechanical soft diet may be ordered.

Nutritional Adequacy
The Low-Residue or Low-Fiber Diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section 1A. At least one serving of citrus fruit juice is recommended for daily vitamin C.

How to Order the Diet
Order as "Low-Residue Diet" or "Low-Fiber Diet." Milk and other lactose-containing foods will not be restricted unless ordered. Milk is fiber-free and a medium-residue food; therefore, it is not necessary to eliminate it. However, for individuals with inflammatory bowel disease and a lactose deficiency, a low-fiber, low-lactose dietary restriction is appropriate.

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Planning the Diet

	Est. Fiber per serving (g)	Low-Residue Diet < 10 g Dietary Fiber/Day
Meat, Fish, Poultry, Eggs	0.0	Not restricted
Milk, and products containing milk	0.0	Not restricted (unless specified)
Breads and Cereals White or refined bread and cereal products and baked goods	0.5	Not restricted
Fruits and Vegetables		
Legumes, nuts, seeds		Omitted
Vegetables and fruits with hulls, skins, seeds		Omitted
Other fruits and vegetables including vegetable soups and desserts made from allowed fruits and vegetables	< 2.0*	3-6 servings
Fruit juices	0.0	Not restricted

**The 2 g per serving guideline for vegetables is arbitrary, and intended only to assist dietitians in the meal planning process.*

SAMPLE MENU (less than 10 g fiber)

Breakfast	Noon	Evening
Orange juice	Chicken rice soup	Baked chicken with gravy
Grits	Roast beef sandwich on white bread	Whipped potatoes
Soft-Cooked egg	Mayonnaise	Green beans
White toast	Tomato juice	Dinner roll
Margarine	Orange sherbet	Margarine
Grape jelly	Coffee and tea	Canned peaches
Milk	Sugar	Milk
Coffee		Tea
Sugar		Sugar

FOOD GUIDE-LOW-RESIDUE DIET

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
Beverages and Milk	All (See below for fruit and vegetable juices.)	Milk is avoided when lactose intolerance is present.
Breads and Starches, Pasta, Rice	All breads and crackers made from white flour Graham crackers Corn and flour tortillas Cornbread Pasta, noodles, white rice	Whole-wheat, rye, pumpernickel or bran breads, crackers, muffins Buckwheat pancakes Rye wafers Breads and crackers containing fruit, nuts, or seeds Brown rice; barley

FOOD GUIDE LOW-RESIDUE DIET (cont.)

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
Breakfast Cereals	Farina, cream of rice, grits, oatmeal Ready-to-eat cereals from corn, rice, or white flour	Wheatena, rolled wheat, and other whole-grain cooked cereals Ready-to-eat whole-grain, oat and bran cereals including bran flakes, granola, Grape-Nuts, oat bran, 100% bran, puffed wheat, shredded wheat, wheat bran, wheat flakes, wheat germ
Desserts	Fruit and vegetable pies without skins or seeds, eg, apple, pumpkin, banana, All others except those excluded	Cakes, pies, cookies, pudding containing dried fruit, fruit with skins or seeds, coconut, nuts, or seeds
Fats	Bacon, butter, cream, cream substitutes, margarine, mayonnaise, oils, shortening, salad dressing, sour cream	Nuts, seeds
Fruit Juices	All	
Fruits	Banana, applesauce Canned: peeled apricots, Royal Anne cherries, peeled citrus sections, peaches, pears, peeled plums, fruit mix without grapes, pineapple	All fresh fruits except banana and soft fresh fruit from which the peel and seeds have been removed
Meat, Fish, Poultry, Cheese, Eggs	All	None
Legumes	None	All legumes: chickpeas, lima beans, black-eyed peas, kidney beans, pinto beans, etc Peanut butter Baked beans
Soup	Meat, rice, noodle soups Soups made from allowed vegetables	Minestrone soup Bean, pea, and lentil soups
Sugar and Sweets	All except those containing foods excluded Cranberry sauce, seedless	Candy containing fruits, nuts, or coconut Jam, marmalade, relishes containing seeds, or skins
Vegetables and Vegetables Juices	Mushrooms (raw or cooked) Tomato/vegetable juice Tomato sauce Cooked asparagus, beets, carrots, spinach, green and wax beans, zucchini, white potatoes without skins	Broccoli Corn Mixed vegetables Skin of potato Succotash (also see legumes) Most raw vegetables
Miscellaneous	Catsup, spices, herbs, seasonings	Pickles

HIGH-FIBER DIET

Description

The diet emphasizes the consumption of a variety of foods of plant origin, particularly those high in dietary fiber. The amount and type of fiber provided should be determined by the nutritional objectives for each specific disease state, as outlined below. Studies show that the average Western diet provides 14 to 15 g of dietary fiber per day (1). For adults, recommendations are 20 to 35 g of dietary fiber per day (1). The optimal diet recommended by most professional health organizations is a diet low in fat and saturated fat, high in complex carbohydrates, and that includes frequent consumption of vegetables, fruits, and whole grains.

General Information

Crude fiber is the amount of plant material that remains after treatment with acid or alkali solvents. It is predominantly a measure of the cellulose content of a food and, as such, significantly underestimates the total dietary fiber found in plant food. Many older food composition tables report only crude fiber (2).

Dietary fiber (roughage or fiber) is the portion of a plant food that resists digestion by enzymes in the human gastrointestinal tract. The reported amount of dietary fiber in a plant food varies with the method being used in analysis (2). Dietary fiber is divided into two categories: water-soluble and water-insoluble. Plant foods contain both types of fiber in varying amounts.

Water-soluble fiber includes pectins, gums, mucilages, and some hemicelluloses. These fibers have been found to delay gastric emptying, intestinal transit, and glucose absorption, and to decrease serum cholesterol concentration (1). The majority of soluble fibers are fermented by intestinal bacteria, to become short-chain fatty acids, hydrogen, carbon dioxide, and methane (3). Apples, citrus fruits, strawberries, carrots, barley, legumes, and oat bran are the primary food sources of water-soluble fiber.

Water-insoluble fiber includes lignin, cellulose, and some hemicelluloses. These fibers have been found to accelerate intestinal transit, slow starch hydrolysis, delay glucose absorption, and increase fecal bulk (2). Insoluble fibers (particularly lignin) are less likely to be fermented by intestinal bacteria. Whole-wheat flour, wheat bran, other whole grains, vegetables, and fruits with edible seeds are the primary sources of water-insoluble fiber (2).

The effect of food preparation techniques on fiber is not fully understood. Freezing and blanching appear to have little effect on dietary fiber in vegetables (4). Cooking or mechanically altering the texture of plant foods will not decrease fiber content. On the contrary, cooking of food may actually increase the apparent fiber content of the food because of browning reaction products that are analyzed as lignin (2). Heat treatment of food may increase the solubility of β-glucan found in soluble fibers, leading to increased production of the gel-like, viscous material that may be partially responsible for the cholesterol-reducing property of oat products (5).

Indications

Dietary fiber is particularly effective in the prevention and treatment of the following gastrointestinal disorders.

Constipation: Constipation is frequently prevented or treated with the consumption of dietary fiber. Insoluble fiber, particularly wheat bran, accelerates intestinal transit, increases fecal bulk through water absorption, and reduces intracolonic pressure (1). Large particles of coarsely ground bran appear to stimulate laxation more than do finely ground particles. The fermentation of soluble fiber results in sloughed-off bacteria, which increases fecal bulk (6) and the production of short-chain fatty acids that are hypothesized to stimulate bowel function (3). Intake of a variety of high-fiber foods is encouraged. Other factors that influence fecal elimination and that should be considered when a dietitian is planning treatment include fluid intake, exercise, stress, and relaxation.

Diverticulosis: Diverticular disease of the colon is thought to occur secondary to increased intracolonic pressure caused by hard, dry fecal material and the increased effort necessary to eliminate this type of stool. Well-controlled experimental studies confirming the benefits of a high-fiber diet in the prevention and treatment of diverticular disease are relatively few, with less than conclusive results. One study found that 90% of diverticular patients remained symptom-free after 5 years on a high-fiber diet (7). This result may be explained by the fact that a high-fiber diet promotes the formation of soft, large stools that are defecated more easily, resulting in lower colonic pressure and less straining during elimination. A high-fiber diet has been recommended in the absence of acute inflammation (8).

To increase stool bulk, studies suggest increasing the consumption of whole-grain breads, cereals, and brans. In cases of diverticulosis, a common practice has been to provide a high intake of fiber but to exclude hulls of nuts and corn and seeds because they may get trapped in one of the diverticula. However, there have been no control studies to demonstrate that skins and seeds are harmful (7).

Irritable bowel syndrome: Irritable bowel syndrome (IBS) is characterized by intestinal dysfunction of at least 3 months' duration, during which time diarrhea, diarrhea alternating with constipation, and chronic constipation may be experienced in the absence of any underlying disease states (7). Abdominal pain, the passage of mucus, and pain alleviation following defecation may also be indicative of IBS (9). In patients with a strong family history of allergy and hypersensitivity to certain foods, a trial of food elimination and challenge may be justified (7). A normal diet with emphasis on high-fiber intake (20 to 30 g/day) is recommended to relieve the constricting pressure and to promote normal bowel motility (7). Additional fiber in the form of bulk laxatives (eg, Metamucil®) may also be necessary.

Hypercholesterolemia: An increase in the intake of foods rich in soluble fibers has been associated with decreasing serum cholesterol and low-density lipoprotein LDL-cholesterol (10-13). Fiber found in oats, barley, and pectin-rich fruits and vegetables provides adjunctive lipid-lowering benefits beyond those achieved through reduction of total and saturated fat alone (1,14).

Diabetes: The American Dietetic Association has determined that the consumption of soluble fiber has little effect on glycemic control in diabetes. However, for general health benefit, the daily consumption of 20 to 35 g of dietary fiber is encouraged (15).

Cancer: People who eat a greater amount of fruits and vegetables have about one half the risk of cancer and a lower mortality from cancer (16). There is convincing evidence that diets high in vegetables and fruits decrease the risk of cancers of the colon, rectum, lung, stomach, mouth, pharynx, and esophagus and probably protect against cancers of the breast, bladder, larynx, and pancreas (10,17,18).

Contraindications

Diverticulitis: A high-fiber diet is contraindicated when inflammation has caused the narrowing or blockage of the intestinal lumen or during acute diverticulitis (7,8).

Infants and children: The American Academy of Pediatrics does not encourage the addition of high-fiber foods to the diets of infants younger than 1 year old. High-fiber foods are filling but contain few calories, potentially causing reduced energy intakes in infants whose stomach capacities are naturally small. It is recommended that children over 2 years of age increase their fiber intake to an amount equal to or greater than their age plus 5 g/day (1).

Phytobezoar formation: Phytobezoars are masses of vegetable matter that become trapped in the stomach. Individuals who experience a loss of normal pyloric function with decreased gastric acidity, such as in diabetic gastroparesis, or those who have undergone surgical procedures for stomach cancer or peptic ulcer disease may be susceptible. These individuals should be advised to avoid the following foods implicated in phytobezoar formation: apples, berries, brussels sprouts, coconuts, figs, green beans, oranges, persimmons, and potato peels (7,19).

Nutritional Adequacy

The diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA.

How to Order the Diet

Order as "High-Fiber Diet."

Planning the Diet

- Promote food intake patterns consistent with the Food Guide Pyramid that encourage a wide variety of plant foods to achieve fiber intakes. Emphasize fruits, vegetables, and whole-grain breads and cereals.

- Foods made from whole-grain flours are substituted for those made with refined flours and starches.

- People who experience difficulty in chewing fruits and vegetables may increase fiber in the diet by consuming one or more servings daily of a high-fiber cereal, such as bran, substituting whole-wheat bread for white bread, and consuming soft or cooked fruits and vegetables.

- If unprocessed bran is consumed, it must be served thoroughly moistened and mixed with food and be incorporated gradually into the diet. One tablespoon of bran contains 4.5 g of dietary fiber. To incorporate bran into the diet, begin with 1 tsp a day and gradually increase in divided doses, as tolerated, to 4 to 6 tbsp a day (7). Three tablespoons of bran, consumed daily in divided doses, is adequate to promote normal bowel functioning.

- High-fiber foods should be added to the diet gradually. An increase in fiber consumption may initially generate bloating and flatulence. Patients should be advised that these conditions may occur but will generally subside as the digestive system adjusts to increased fiber consumption.

- Fiber gathers water in the colon, hence its stool-bulking property. For this reason, a high-fiber diet should also include a liberal intake of fluids, of at least 64 oz of extra fluid per day (7). Consuming increased amounts of fiber without increasing fluid consumption can lead to the formation of hard, dry stools that are difficult to eliminate.

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FOOD GUIDE HIGH-FIBER DIET

This list is not meant to be all-inclusive. Only the foods highest and lowest in fiber in each category are listed in the categories Higher-Fiber and Lower-Fiber Foods, respectively.

FOOD GROUP	Emphasize HIGHER-FIBER FOODS	Minimize LOWER-FIBER FOODS
Beverages and Milk		Beverages and milk
Breads and Crackers	100% whole-wheat bread, rolls, muffins Whole-wheat crackers Bran muffins Pumpernickel and rye bread	White bread and rolls Saltine and other refined crackers
Cereals and Grains	100% and 40% bran cereal, whole-wheat and oat cereals, including puffed wheat, shredded wheat, granola,* Grape-Nuts, oatmeal,* oat bran,* rolled wheat, and Wheatena Brown rice, barley	Cereals from refined wheat flours, corn, or rice, including farina, grits, cream of rice, cornflakes, puffed rice, and crisp rice White rice, pasta, noodles
Desserts	Desserts made from whole-grain flour, nuts, fruits, coconut, or vegetables	Cake, cookies, and pastry made from white flour Ice cream, sherbet Cream or custard pies Pudding, custard Gelatin
Fats	Peanuts,* tree nuts, seeds	Butter, margarine, oils, mayonnaise, salad dressings, gravy
Fruits	All except juices	Juices
Meat, Fish, Poultry, Cheese, Eggs, Legumes	Chili and other entrees containing legumes* Peanut butter*	Meat, fish, poultry, eggs, cheese
Soups	Vegetable and other legume* soups	Broth, meat, rice, noodle soups
Sugars and Sweets	Candy made primarily from coconut, raisins, or other fruit or nuts	Hard, chocolate, or caramel candy; honey, jam, jelly, molasses, sugar, syrup
Vegetables and Potatoes	All, especially broccoli, corn, greens, legumes,* peas,* sweet potatoes, winter squash	

*Foods containing soluble fibers.

SAMPLE MENU (23 g fiber)

Breakfast	Noon	Evening	Snack
Fresh orange 40% bran cereal Soft cooked egg Whole wheat toast Margarine Jelly Milk Coffee	Split pea soup Roast beef sandwich on whole-wheat bread with lettuce and tomato Relish plate Apricot halves Coffee or tea	Cranberry relish Roast turkey Sweet potatoes Broccoli Tossed salad with dressing Whole wheat bread Margarine Fresh apple Coffee or tea	Milk Grapes

DIETARY FIBER CONTENT OF FOODS

Food Group	<1 g	1-1.9 g	2-2.9 g	3-3.9 g	4-4.9 g	5-5.9 g	>6 g
Breads	Bagel (½) Dinner roll French bread Hamburger/hot dog roll (½) Hard roll Italian bread Pancake (1) Graham crackers (2) White bread	Whole-wheat pita bread (5 inches) Raisin Rye Tortilla	Pumpernickel Bran muffin			Rye wafers (3)	
Cereals (3/4 cup cooked; 1 oz dry, unless noted)	Puffed rice Puffed wheat Rice Krispies	Oatmeal Cornflakes Granola Grits	Grape-Nuts Shredded Wheat Wheat Chex	Cheerios Raisin bran Wheat germ Wheaties	Unprocessed bran 40% bran flakes Oat bran Ralston cereal		All-Bran Bran Buds
Pasta, rice	Macaroni Spaghetti Egg noodles Rice, white	Rice, brown					
Vegetables and legumes (½ cup cooked unless noted)	Cabbage, raw Bean sprouts Celery, raw Cucumber, raw Green pepper Lettuce, raw Mushrooms, raw	Asparagus Brussels sprouts Cabbage Carrots, raw Cauliflower Green beans Summer squash Tomatoes, raw Turnips Zucchini squash	Broccoli Carrots Corn Mixed vegetables Okra Potato, no skin Spinach	Baked beans Sweet potato	Baked potato, no skin Kidney beans Lima beans Peas Winter squash	Chickpeas Pinto beans	Lentils
Fruits, canned (unless noted)	Grapefruit, raw Grapes, raw Pineapple Plums Watermelon Fruit juices (including nectars)	Applesauce Apple slices Apricots Cantaloupe Cherries, raw or cooked Cherries, raw Fruit cocktail Peaches Pineapple, raw Prunes (3) Raisins, dried (2 tbsp) Strawberries, raw	Banana Nectarine Papaya Pears	Apple, raw Dates (5) Mango Orange, raw	Pear, raw Raspberries, raw		
Miscellaneous	Olives	Filberts Popcorn Walnuts	Almonds Avocado Fruit pie Peanuts Peanut butter				

Source: Pennington J. *Bowes and Church's Food Values of Portions Commonly Used.* 17th ed. Philadelphia, Pa: JB Lippincott; 1998.

Dietary Fiber Content of Common Foods

	Grams
Beverages and Milk	
Milk, white, nonfat or low-fat (8 oz)	0.0
Buttermilk	0.0
Coffee, tea	0.0
Bread	
Bagel (1 whole)	1.6
Bran muffin (1 average size)	2.5
Biscuit	0.5
Cornbread	1.0
Dinner roll (1)	0.9
Doughnut	0.7
French bread (1 slice)	0.8
Hamburger/hot dog roll (½)	0.6
Hard roll (1 white)	0.9
Italian bread (1 slice)	0.9
Pancakes	1.0
Pita bread (5 inches)	1.0
Pumpernickel bread (1 slice)	2.1
Raisin bread (1 slice)	1.1
Rye bread (1 slice)	1.9
Taco shell (1)	1.3
Tortilla, flour	1.2
White bread (1 slice)	0.6
Whole-wheat bread (1 slice)	1.9
Crackers	
Graham	0.25
Rye wafers (3)	5.7
Saltines (2)	0.1
Triscuits (7)	4.0
Wheat Thins (24)	1.0
Snacks	
Corn chips (1 oz)	1.4
Popcorn (1 cup)	1.0
Potato chips (1 oz)	1.0
Pretzels (1 oz)	0.9
Cereals and Grains	
(Cooked cereal 3/4 cup unless noted)	
Cream of rice	1.0
Farina	2.4
Grits	1.5
Oatmeal	3.0
Ralston	4.6
Dry, Ready-to-Eat Cereal	
(1 oz unless noted)	
All-Bran	10.0
Bran Buds (1/3 cup)	12.0
Bran, unprocessed (1 tbsp)	4.6
40% bran flakes	4.0

	Grams
Cheerios	3.0
Cornflakes	1.1
Granola (1/3 cup)	1.8
Grape-Nuts	2.5
Oat bran (1/3 cup)	4.8
Puffed rice (1 cup; 14 g)	0.1
Puffed wheat (1 cup; 14 g)	0.5
Raisin bran	4.0
Rice Krispies	0.5
Shredded wheat	2.8
Wheaties	3.0
Wheat germ (1/4 cup)	3.8
Pasta, Rice, etc (½ cup cooked)	
Barley	3.0
Macaroni; spaghetti	0.9
Rice, white	0.5
Rice, brown	1.7
Desserts	
Cake, plain, iced (1/12 of 9 inches)	0.5
Carrot cake (1/12 of 9 inches)	1.4
Coffee cake (1/6 of 16 oz)	0.8
Cookies (1 oz)	0.5
Gelatin dessert	0.0
Ice cream (½ cup)	0.0
Pie, fruit (1/8 of 9-inch pie)	2.0
Pudding	0.0
Yogurt (8 oz) plain or fruit	0.0
Fats and Nuts	
Avocado (1/4)	2.1
Butter; margarine (1 tsp)	0.0
Cream, dairy and nondairy, all types	0.0
Mayonnaise; smooth salad dressing (1 tbsp)	0.0
Oil; shortening (1 tbsp)	0.0
Olives (5 medium)	0.5
Tartar sauce; thousand island dressing (1 tbsp)	0.0
Nuts (1 oz)	
Almonds, roasted	3.0
Filberts	1.7
Peanuts, roasted and salted	2.3
Peanut butter, chunky (2 tbsp)	2.0
Walnuts (1 oz)	1.4
Fruits and Juices	
(½ cup portion unless noted)	
Apple, raw with peel (2½-inch diameter)	3.7
Apple, canned, sliced	1.7

	Grams
Applesauce, canned	1.0
Apricots, canned (3 halves)	1.4
Banana (1 medium)	2.7
Cantaloupe (1/4 melon)	1.3
Cherries, sweet (10)	1.6
Cherries, canned	1.9
Dates, dried (5)	3.1
Fig, dried (3)	6.8
Fruit cocktail	1.2
Grapefruit (½)	1.4
Grapefruit sections, canned	0.5
Grapes, European (10)	0.8
Honeydew melon	0.5
Mandarin oranges	0.9
Mango (1 medium)	3.7
Nectarine (1 medium)	2.2
Orange (1 small)	3.1
Papaya (½ medium)	2.5
Peaches, canned (2 halves)	1.6
Peach, raw (1 medium)	1.7
Pear, canned (2 halves)	2.0
Pear, raw (2½ per pound)	4.0
Pineapple, canned	1.0
Pineapple, raw	1.8
Plums, raw, 1 medium	1.0
Plums, canned (3)	0.9
Prunes (3)	1.8
Raisins (2 tbsp)	1.6
Raspberries, raw	4.2
Strawberries, raw	1.6
Tangerine	1.9
Watermelon	0.4
Fruit Juices (½ cup)	
Apple	0.0
Apricot nectar	0.8
Cranberry	0.0
Grapefruit; orange	0.0
Grape	0.0
Pineapple	0.0
Prune	1.3
Meat, Fish, Poultry, Cheese, Eggs	0.0
Sugar and Sweets	
Jam; preserves (1 tbsp)	0.7
Jelly (1 tbsp)	0.0
Sugars; honey; syrups	0.0
Cranberry sauce (1/4 cup)	0.7

Dietary Fiber Content of Common Foods (continued)

	Grams
Soups (½ cup)	
Bean with bacon	7.0
Beef barley	2.0
Beef noodle	1.0
Celery, cream of	1.0
Cheddar cheese	1.0
Chicken gumbo	1.0
Chicken noodle	1.0
Chicken rice	0.0
Chicken vegetable	2.0
Clam chowder, Manhattan	2.0
Clam chowder, New England	1.0
Corn chowder	2.0
Minestrone	4.0
Mushroom, cream of	1.0
Pea, green	2.5
Pea, split	5.0
Potato, cream of	1.0
Tomato	2.0
Turkey noodle	1.0
Vegetable	2.0
Vegetable beef	2.0
Vegetables (½ cup portion cooked or raw unless noted)	
Asparagus	1.4
Baked beans (1/3 cup)	3.0
Bean sprouts	0.6
Beans, green, fresh-cut	2.0
Beans, green, cut	1.3
Beans, kidney	4.9
Beans, lima, baby	4.9
Beans, navy	6.7
Beets	1.4
Broccoli, raw (1 spear)	1.3
Broccoli, spears	2.8
Broccoli, chopped	2.3
Brussels sprouts	2.0
Cabbage, cooked	1.7
Cabbage, raw	0.8
Carrots, cooked	2.6
Carrots, raw (1 medium)	2.2
Cauliflower, cooked	1.7
Cauliflower, raw	1.3
Celery, raw (1 stalk)	0.7
Chard	1.7
Chickpeas (garbanzo beans)	5.3
Collard greens	2.4
Coleslaw	0.9
Corn kernels	2.3
Cowpeas (black-eyed peas)	3.7
Cucumber, raw	0.4

	Grams
Green pepper	0.9
Kale	1.3
Lentils	7.8
Lettuce, iceberg (shredded)	0.5
Mixed vegetables	2.5
Mushrooms, raw	0.4
Mushrooms, canned	1.9
Okra	2.2
Onions, raw, chopped	1.4
Peas, green, frozen	4.4
Pinto beans	5.5
Potato, baked, with skin	4.6
Potato, boiled (140 g)	2.3
Potato, french fried (20)	1.6
Potato, mashed	1.9
Radishes	0.7
Sauerkraut	2.9
Spinach	2.8
Spinach, raw	0.8
Squash, summer	1.3
Squash, winter	4.5
Squash, zucchini	1.8
Sweet potatoes, mashed	3.0
Tomato, raw (1medium)	1.4
Tomato juice	0.7
Tomato sauce	1.7
Turnips	1.6
Turnip greens	2.5
Miscellaneous	
Ketchup (1 tbsp)	0.2
Mustard (1 tsp)	0.1
Pickle, dill (1 medium)	0.3
Pickle, sweet (4 slices)	0.5
Pickle relish, sweet (1tbsp)	0.5

Source: Pennington J. *Bowes and Church's Food Values of Portions Commonly Used.* 17th ed. Philadelphia, Pa: JB Lippincott; 1998.

GASTROINTESTINAL SOFT DIET

For CMC, CIR, University facilities, CLICK HERE.

Description

The Gastrointestinal Soft Diet limits most raw, highly seasoned, and fried foods. The diet contains only moderate amounts of fiber.

Indications

This diet is used as a transitional diet for patients who have undergone surgery that irritates or causes major discomfort to the gastrointestinal tract.

Contraindications

The diet does not necessarily limit fat or the size of meals and may be counterproductive in patients with gastro-esophageal reflux (see Section III: Gastroesophageal Reflux).

The diet is low in fiber and may be contraindicated in disorders, such as diverticulosis, requiring a liberal fiber intake. See Section 1D: Fiber-Restricted Diets and High-Fiber Diet.

The diet may inappropriately limit mealtime variety and thereby limit enjoyment and oral intake.

Nutritional Adequacy

The diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section 1A.

How to Order the Diet

Order as "Gastrointestinal (GI) Soft Diet." If between-meal feedings are required, they should be specifically ordered.

SAMPLE MENU

Breakfast	**Noon**	**Evening**
Orange juice	Roast beef	Cream of tomato soup
Oatmeal	Whipped potatoes	Baked chicken
Scrambled egg	Cooked carrots	Steamed rice
Toast	Plain roll	Green beans
Margarine	Margarine	Plain roll
Jelly	Sugar cookies	Margarine
Milk	Iced Tea	Sliced peaches
Coffee		Milk

FOOD GUIDE-GASTROINTESTINAL SOFT DIET

Since the food tolerances of patients with gastrointestinal disorders and symptoms can vary considerably, attention should be given to individual food tolerances.

FOOD GROUP	FOOD ALLOWED	FOODS EXCLUDED
Beverages and Milk	Milk and milk drinks Cereal beverages Carbonated beverages Coffee, tea	Alcohol
Breads and Crackers	White, seedless rye, fine whole-wheat bread Plain crackers Graham crackers	Coarse whole-grain breads Breads with seeds, nuts, or raisins Highly seasoned crackers
Cereals and Grains	Cooked and dry cereals unless listed as excluded Plain spaghetti, macaroni, noodles, rice	Bran cereals Cereals with raisins Brown or wild rice
Desserts	Plain cake, cookies, pudding, custard, ice cream, sherbet, gelatin, fruit whips	Pastries, pies, desserts containing nuts, coconut, dried fruits, fruit with seeds or tough skins
Fats	Butter Cream; cream sauce Bacon Margarine Mayonnaise; mild salad dressing	Fried foods Gravy Nuts Olives Spicy salad dressings
Fruits and Juices	All fruit juices Avocado Banana Grapefruit and orange sections without membrane Baked peeled apple; applesauce Canned: apricots, cherries, peaches, pears, pineapple Peeled ripe peaches or pears	Raw fruit not listed as allowed Dried fruits Fruits with edible seeds or tough skins
Meat, Fish, Poultry, Cheese, Eggs, Legumes	Meat, fish, or poultry, not fried Plain cheeses Eggs, except fried Smooth peanut butter	Fried meat, fish, or poultry Highly seasoned cold cuts or sausage Fried eggs
Soup	Cream soups made from foods allowed; meat, rice, noodle soups	Vegetable soups unless made from foods allowed
Sugar and Sweets	Sugar, syrup, honey, clear jelly; plain, sugar candy in moderation	Jam, marmalade, and candies that contain tough skins, seeds or nuts
Vegetables and Potatoes	Tomato juice Cooked asparagus, beets, carrots, green or wax beans, green peas, mushrooms, potatoes, spinach, summer squash, sweet potatoes, tomatoes, winter squash	Raw vegetables All other cooked vegetables Deep-fried vegetables
Miscellaneous	Salt, allspice, cinnamon, paprika, herbs, flavoring extracts, ketchup	Red, black, white pepper; horseradish, mustard, pickles, popcorn, potato chips

NUTRITION MANAGEMENT OF THE FULL-TERM INFANT

For CHS facilities, CLICK HERE.

Growth and nutrient needs during the first year of life exceed those at any other stage of the life cycle. However, since the organ systems are not fully developed in infancy, special considerations should be given to when and how foods are introduced. While supplying sufficient nutrients to promote growth and maintenance, it is important for the infant's diet to not exceed the requirements or capabilities of the infant's digestive or excretory systems. The optimal feeding regimen is to start with breast-feeding and introduce age-appropriate foods at 4 to 6 months while breast-feeding continues (1,2).

Breast-feeding

Breast-feeding is the optimal way to provide food for the health, growth, and development of the infant. In addition to its unique nutrient composition, it offers immunologic and psychosocial benefits that are not provided by any other feeding substance. Human milk is unique in that it provides docosahexaenoic acid (DHA), a long-chain fatty acid that is essential for infant brain and eye development (3,4). Lactoferrin, an iron-binding protein found in whey of human milk, has been observed to inhibit the growth of certain iron-dependent bacteria in the gastrointestinal tract (5). Infants who are breast-fed usually have fewer gastrointestinal and nongastrointestinal infections, including otitis media, pneumonia, bacteremia, diarrhea, and meningitis. They have fewer food allergies and a reduced risk of certain chronic diseases throughout life (eg, type 1 diabetes, lymphoma, and Crohn's disease) (6-9).

Infants nursed by a vegan mother may be at risk for vitamin B_{12} deficiency. The dietary vitamin B_{12} intake of the mother should be assessed to determine adequacy. Vegan mothers should be instructed to supplement their diets with foods fortified with vitamin B_{12} (10).

Contraindications for Breast-Feeding

Infants with certain inborn metabolism errors, such as phenyalamine, maple syrup urine disease, or galactosemia should not be breastfed (11).

Breast-feeding is contraindicated for women who:

- use addictive drugs, such as cocaine, marijuana, and phencyclidine (PCP)
- drink more than a minimal amount of alcohol
- receive certain therapeutic or diagnostic agents, such as radiation or chemotherapy (12,13)
- are infected with the human immunodeficiency virus (HIV) (11)

Women should not breast-feed when they are receiving certain therapeutic medications. Not only is toxicity to the infant a concern, but research has indicated that some medications affect the infant's metabolism. In addition, some agents (eg, bromocriptine) decrease milk production. Whereas most medications are considered compatible with breast-feeding, there are substances for which the risk of toxicity to the infant is considered to be greater than the benefit to the mother. The most frequently used of these medications to be aware of include (12):

- amphetamine
- bromocriptine
- cyclophosphamide
- cyclosporine
- doxorubicin
- ergotamine
- lithium
- methotrexate
- nicotine
- phenindione

Formula Feeding

The use of commercially prepared infant formula is an acceptable alternative to breast-feeding. These formulas are designed to approximate the composition of human milk as closely as possible. Most commercial infant formulas are composed of milk proteins or soy protein isolate.

Milk-based formulas are generally appropriate for use with the healthy full-term infant. Standard formulas have a 60:40 whey-to-casein ratio, which is desirable in a formula; they provide 20 kcal/oz. Breast milk yields an 80:20 whey: casein ratio with about the same number of calories. Soy-based formulas are often used from birth to prevent allergic disease in infants with a strong family history of allergies (14).

As long as the commercially prepared infant formula with iron is delivered in the appropriate volumes for a term infant, it is not necessary to supplement with additional vitamins or iron. The American Academy of Pediatrics recommends that formula-fed infants be given an iron-fortified cereal or supplemented with iron by 6 months of age. When food is introduced during the second 6 months of life, the combination of food and formula will meet the infant's nutrient requirements (15). Fluoride supplementation may be required if powdered or concentrated formula is used and if the community water supply contains less than 0.3 ppm of fluoride. Fluoride should not be supplemented before 6 months of age (16).

Therapeutic or specialized formulas are indicated for use with premature infants, as well as infants with cow's milk allergy or intolerance, intact protein allergy, or generalized malabsorption. Premature-infant formulas are modified in terms of their energy, macronutrient, and micronutrient content in order to meet the specialized physiologic and gastrointestinal needs of these infants. Premature infants should be discharged home on premature-infant formula and remain on it until 12 months of age. Human milk fortifiers (HMFs) are specially designed to be added to expressed breast milk for the premature infant. HMFs provide protein, energy, calcium, phosphorus, and other minerals needed for rapid growth and normal bone mineralization in the premature infant. Hydrolysate formulas are indicated for the nutrition management of infants with allergies to intact protein from either cow's milk or soy. These hydrolyzed formulas, some of which also contain part of the fat as medium chain triglycerides, may also be used for infants with generalized malabsorption of both protein and fat (eg, short gut syndrome and cystic fibrosis). Fat-modified formulas are indicated for nutrition management of infants with steatorrhea due to their limited bile salt pool, such as those with biliary atresia or other forms of malabsorption or intolerance. Medical formulas for various disorders of inborn errors of metabolism are also available from the major formula manufacturers for disorders such as phenylketonuria and maple syrup urine disease.

Water

If the infant consumes an adequate amount of breast milk, formula, or both, the infant will have an adequate intake of water.

Cow's Milk

Cow's milk should not be introduced until a child is 1 year of age. The nutrient composition of cow's milk varies substantially from that of human milk. Feedings with cow's milk causes a markedly high renal solute load due to its protein and sodium content, and infants are not generally able to concentrate urine well. The ingestion of cow's milk increases the risk for gastrointestinal blood loss and allergic reactions. Whole milk can be introduced after the first year and continued through the second year. After the second year, reduced-fat milk can be served (17-19).

Table IE-1: Nutrient Comparison of Breast Milk, Formula, and Cow's Milk

Products per 100 cc	Energy (kcal)	Protein (g)	Calcium (mg)	Phosphorus (mg)	Iron (mg)	Sodium (mg)
Breast milk	70	1.0	32	14	0.3	8
Milk-based formula (20 kcal/oz)	67	1.5	42-51	28-39	1.2	15-20
Soy-based formula (20 kcal/oz)	67	1.8-2.1	60-71	42-51	1.2	20-30
Whole cow's milk (homogenized)	64	4.9	120	95	Trace	51

Introduction of Solid Food

There is no nutritional need to introduce solid food to infants during the first 4 to 6 months of age. The infant's individual growth and development pattern is the best indicator of when to introduce semisolid and solid foods. Generally, an infant will double his birth weight and be able to sit upright without support by the time semisolid foods are introduced. By 4 to 5 months, the infant has the ability to swallow nonliquid foods. If solids are introduced before this time, these foods may displace breast milk or formula and the infant may receive inadequate energy and nutrient needs.

No specific schedule of introduction of food other than breast milk or formula must be followed, but certain recommendations exist:

- Iron-fortified infant cereal is commonly suggested as the first food offered. Start with a few spoonfuls of a single-grain, iron-fortified infant cereal such as rice, once or twice a day.
- Introduce single-ingredient foods, one at a time, so that the offending food can be identified if an adverse reaction occurs.
- Vegetables might be accepted more readily if introduced before fruits, since fruits taste sweeter.
- Allow at least 3 days between the introduction of each new food.
- Begin with small amounts of foods, offering seconds as necessary.
- Avoid early introduction of the following common allergens: egg white, cow's milk, citrus, wheat, chocolate, fish, shellfish, tree nuts, and nut butters (eg, no peanut butter until 18 to 24 months of age) because susceptible infants with a family history of allergies may experience allergic reactions.
- Take care to avoid spoilage of home-prepared foods and jars of food once they are opened. Do not feed infants directly from the jar, as saliva added to the jar causes faster spoilage.
- Select appropriate solid foods that require minimal chewing. Foods such as hot dogs, peanuts, grapes, berries, raw carrots and sliced apples, raisins, potato or corn chips, popcorn, seeds, round, hard candies, and gum may cause choking and aspiration in infants and children.

Table IE-2: Infant Feeding Guidelines

	Age (months)					
Food	**0-2**	**2-4**	**4-6**	**6-8**	**9-10**	**11-12**
Human milk/ formula (oz)	18-28	25-32	27-45	24-32	24-32	24-32
Iron-fortified cereal (tbsp)			4-8	4-6	4-6	4-6
Zwieback, dry toast				1	1	1-2
Vegetable, plain, strained (tbsp)				3-4	6-8	7-8 (soft, cooked, chopped)
Fruit, plain strained (tbsp)				3-4	6-8	8 (soft, chopped)
Meat, plain, strained (tbsp)				1-2	4-6	4-5 (ground or chopped)
Egg yolk (tbsp)					1	1
Fruit juice (oz)				2-4	4	4
Potato, rice, noodles (tbsp)						8

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INFANT FORMULA COMPARISON CHART

NUTRIENT CONTENT OF INFANT FORMULAS (per 100 cc)

FORMULA	INDICATIONS	CAL./ oz.	CHO	PROTEIN	FAT	ADDITIONAL INFORMATION	CARBOHYDRATE g	CARBOHYDRATE % of Kcal	PROTEIN g	PROTEIN % of Kcal	FAT g	FAT % of Kcal	MINERALS mg(mEq) Na	K	Cl	P	Ca	Fe	OSM mOsm/ KgH_2O	RSL mOsm
COW'S MILK-BASED																				
BREAST MILK	Most preferred for normal infant feeding	20	Lactose	Lactalbumin 65% Casein 35%	High in oleic; low in volatile fatty acids.	Average values for range of 15 days to 15 mos. post partum. Note: compositional variations due to stage of lactation may be a consideration when breast milk is provided to premature or high risk infants with increased nutritional needs.	7.0 (4.9-9.5)	42	1.0 (.7-2.0)	6	3.9 (1.3-8.3)	52	8 (0.8)	53 (1.3)	42 (1.2)	14	32	.3	300	7.5
ENFAMIL (Mead-Johnson)	Normal infant feeding	20	Lactose	Whey, Non-fat milk (60/40)	Coconut oil 55% Soy oil 45%	Other uses: sick infants with nutritional problems. Lactalbumin; casein ratio close to breast milk.	7	41	1.6	9	3.6	50 (.8)	18	63 (0.8)	43 (1.1)	32	47	0.3 1.25*	300	13.4
SIMILAC (Ross)	Normal infant feeding.	20	Lactose	Non-fat milk	Coconut oil 53% Soy oil 47%	Other uses: sick infants without nutritional problems.	7.2	43	1.5	9	3.6	48 (0.8)	19	73 (1.8)	43 (12)	38	49 (1.2)*	.15	300	9.6
SIMILAC PM 60/40 (Ross)	Lower Na & K levels; preferred for decreased renal function.	20	Lactose	Demineralized whey, calcium & sodium caseinate (60/40)	Coconut oil Corn oil	Preferred for renal patients due to lower phosphorus content and 2:1 Ca to P ratio; Low RSL; Lactalbumin; casein ratio close to breast milk.	6.9	41	1.6	9	3.8	50 (.70)	16.0 (1.5)	58.0 (1.1)	40.0	19	38	.15	280	9.6
SMA (Wyeth)	Normal infant feeding. Low Na & K	20	Lactose	Demineralized whey, non-fat milk (60/40)	Oleo Coconut oil Soybean oil Oleic	Other uses: sick infants without nutritional problems; infants with CHF; lactalbumin: casein ratio close to breast milk; Low RSL.	7.2	43	1.5	9	3.6	48 (.65)	15	56 (1.4)	37 (1.0)	28	42 (1.2)*	.15	300	9.1
SIMILAC 27 (Ross)	Compensation for limited volume intake	27	Lactose	Non-fat milk	Soy oil Coconut oil	Other uses: failure to thrive; cardiac patients	9.6	42	2.5	11	4.8	47 (1.4)	31	120 (3.1)	74 (2.1)	64	82	0.2	430	16.4
SMA 27 (Wyeth)	Compensation for limited volume intake	27	Lactose	Non-fat milk & demineralized whey	Oleo Coconut oil Oleic Soy oil	Other uses: failure to thrive; cardiac patients	9.7	43	2.0	9	4.9	48 (.9)	20	76 (1.9)	51 (1.4)	38	57	0.2 (1.6)*	416	12.3
COW'S MILK, WHOLE	Not recommended for infants <12 month of age	19	Lactose	Casein 81% Lactalbumin 19%	Butterfat	Introduction into infant's diet depends on intake of solids. Avoid skim milk before 2 years of age.	4.9	28	3.5	19	3.5	51 (2.2)	51	154 (3.9)	106.5 (3.0)	90.9	137	.05	290	23.0
SOY-BASED FORMULAS																				
ISOMIL (Ross)	Allergy to cow's milk; lactose or galactose intolerance	20	Corn syrup Sucrose	Soy protein isolate L-methionine	Soy oil Coconut oil	Other uses: recovery stage after mild/moderate diarrhea.	6.8	40	1.8	11	3.7	49 (1.3)	30	73 (1.9)	42 (1.2)	51	70.0	1.2	240	11.6
ISOMIL SF (Ross)	Allergy to cow's milk; sucrose, lactose, or galactose intolerance	20	POLYCOSE Glucose Polymers	Soy protein Isolate L-methionine	Soy oil Coconut oil	Other uses: recovery stage after mild/moderate diarrhea; galactosemia	6.8	40	1.8	11	3.7	49 (1.3)	30	73 (1.9)	42 (1.2)	51	71	1.2	180	11.6
NURSOY (Wyeth)	Allergy to cow's milk, lactose or galactose intolerance	20	Sucrose	Soy protein Isolate	Oleo Coconut oil Soy oil	Other uses: recovery stage after mild/moderate diarrhea	6.9	40	2.1	12	3.6	48 (0.9)	20	70 (1.8)	38 (1.1)	42	60	1.1	296	12.2
PROSOBEE (Mead Johnson)	Allergy to cow's milk; sucrose, lactose or galactose intolerance	20	Corn syrup solids	Soy protein isolate & L-methionine	Coconut oil 55% Soy oil 45%	Other uses: recovery stage after mild/moderate diarrhea; galactosemia.	6.8	40	2.0	12	3.6	48 (1.2)	24	82 (2.1)	56 (1.5)	50	64	1.3	200	17.8

INFANT FORMULA COMPARISON CHART

NUTRIENT CONTENT OF INFANT FORMULAS (per 100 cc)

FORMULA	INDICATIONS	CAL./ oz.	CHO	PROTEIN	FAT	ADDITIONAL INFORMATION	CARBOHYDRATE g	CARBOHYDRATE % of Kcal	PROTEIN g	PROTEIN % of Kcal	FAT g	FAT % of Kcal	MINERALS mg(mEq) Na	K	Cl	P	Ca	Fe	OSM mOsm/ KgH_2O	RSL mOsm
PREMATURE FORMULAS																				
ENFAMIL PREMATURE (Mead-Johnson)	For the premature and low-birth weight infant less than 2000 gm	20- 24	Corn syrup solids 60% lactose 40%	Whey protein concentrate, Non-fat milk (60/40)	Soy oil 40% MCT oil 40% Coconut oil 20%	High protein (whey:casein 60/40), readily digestible fat & CHO, appropriate Ca, P & other minerals for rapid growth.	7.4	44	2.0	11	3.4	45	26 (1.1)	70 (1.8)	69 (1.9)	67	134	.2 (1.25)*	244	17.60
SIMILAC SPECIAL CARE 24 (Ross)	Compensation for limited volume intake	24	Lactose POLYCOSE Glucose Polymers	Non-fat milk, Whey	MCT oil Coconut oil Soy oil	Ready-feed not available commercially. Other uses: recovery from an extended illness-induced period of malnutrition, failure to thrive.	8.5	42	2.2	11	4.4	47	35.0 (1.5)	104 (2.7)	66 (1.9)	73	146	0.3 (1.5)*	300	14.9
SPECIAL FORTIFIERS OF HUMAN MILK FOR PREEMIES																				
SIMILAC NATURAL CARE (Ross)	To extend volume and nutrients of breast milk for premature infants	24	Lactose, POLYCOSE Glucose Polymers	Non-fat milk, Whey	MCT oil Soy oil Coconut oil	Mix 1:1 ratio product with breast milk.	8.5	42	2	11	4.4	47	35 (1.5)	104 (2.7)	66 (1.9)	85	171	0.3	300	14.9
ENFAMIL HUMAN MILK (Mead Johnson)	To fortify breast milk to meet the needs of low birth-weight infants (under 1500 gm)	24	Corn syrup solids, Lactose	Whey protein concentrate, Na caseinate	From Caseinate	Add 4 packets to 100 cc breast milk. Provides 24 cal/oz. when mixed with milk. Available in powder only.	0.7	77	0.1	20	.01	2.5 per 0.96 oz. powdered packet	1.8	3.9	4.4	11	23	NA	120	1.6
SPECIAL FORMULAS																				
LOFENALAC (Mead Johnson)	Phenylketonuria	20	Corn syrup (S.C.) solids, modified tapioca starch	Hydrolyzed casein (most Phe removed) L-tyrosine L-tryptophan L-histidine L-methionine	Corn oil	When serum phenylalanine has reached acceptable levels (2-10 mg/100 cc) breast milk or infant formula should be added to meet growth requirements.	8.8	52	2.2	13	2.7	36	32.0 (1.4)	66.3 (1.7)	46.1 (1.3)	46.8	62.0	1.3	356	13.2
NUTRAMIGEN (Mead Johnson)	Intact protein intolerance; galactosemia	20	Corn syrup solids, mod-ified corn starch	Hydrolyzed casein + added amino acids	Corn oil Soy oil	Other uses: lactose deficiency; recovery stage after mild/moderate diarrhea, soy intolerance.	9.1	54	1.9	11	2.6	35	32 (1.4)	73 (1.9)	58 (1.6)	43	64	1.3	320	12.5
PORTAGEN (Mead Johnson	Fat malabsorption	20	Corn syrup solids, Sucrose	Sodium caseinate (Intact protein)	MCT oil 86% Corn oil 11% Soy lecithin 3%	Minimal lactose content (<.15%) Fat malabsorption, incl: decreased pancreatic lipase, decreased bile salt production, defect in fat trans-portation, defect in fat absorption.	7.7	46	2.3	14	3.1	40	33 (1.4)	83 (2.1)	58 (1.6)	48	64	1.3	320	20.0
PREGESTIMIL (Mead Johnson)	Malabsorption, intractable diarrhea	20	Corn syrup solids, modified cornstarch, dextrose	Hydrolyzed casein, L-tryptophan L-cysteine L-tyrosine	Corn oil 20% MCT oil 60% Safflower oil 20%	Malabsorption due to short gut syndrome, cystic fibrosis, celiac, malnutrition. Other uses: intact protein intoler-ence, sensitivity to hyperosmolar solutions, recovery stage after prolonged diarrhea. Less palatable than Nutramigen.	7.0	41	1.9	11	3.8	48	26 (1.4)	73 (1.9)	58 (1.6)	42	63	1.3	320	12.5
PRODUCT 3232A (Mead Johnson)	Disaccharidase deficiency, intractable diarrhea	20 w/ 6.2% CHO added	Dependent on CHO used in preparation	Casein hydrolysate	MCT oil Corn oil	CHO of choice to be added in step wise progression. Note: If no oral CHO is tolerated, adequate glucose must be provided I.V.	9.1			1.9	2.8		2.9 (1.3)	74 (1.9)	60.0		1.3			varies with CHO

INFANT FORMULA COMPARISON CHART

NUTRIENT CONTENT OF INFANT FORMULAS (per 100 cc)

FORMULA	INDICATIONS	CAL./ oz.	CHO	PROTEIN	FAT	ADDITIONAL INFORMATION	CARBOHYDRATE g	CARBOHYDRATE % of Kcal	PROTEIN g	PROTEIN % of Kcal	FAT g	FAT % of Kcal	MINERALS mg(mEq) Na	K	Cl	P	Ca	Fe	OSM mOsm/ KgH_2O	RSL mOsm
RCF (Ross)	CHO intolerance	20 w/7% CHO added	Dependent on CHO used in preparation	Soy protein isolate L-methionine	Soy oil 50% Coconut oil 50%	CHO of choice to be added in step wise progression. Note: If no oral CHO is tolerated, adequate glucose must be provided I.V.	6.8	0	2.0	20	3.6	80	29 (1.2)	73 (1.9)	42 (1.2)	50	70	0.2	varies with CHO	
ALIMENTUM (Ross)	Malabsorption, short gut, intractable diarrhea	20	Sucrose, modified tapioca starch	Casein hydrolysate, cysteine, tyrosine tryptophan	MCT oil 50% Safflower oil Soy oil	Available in liquid only; therefore, cannot concentrate product.	6.9	41	1.9	11	3.7	48	30 (1.3)	80 (2.1)	54 (1.5)	51	71	1.2	370	12.3
PEDIASURE (Ross)	Children with elevated calorie and nutrient needs	28	Corn syrup solids, sucrose	Low-lactose whey, Protein & Na caseinate	High-oleic Safflower oil Soy oil MCT oil	Other uses: recovering from trauma, severe illness, surgery.	11	44	3.0	12	5.0	44	38 (1.7)	131 (3.4)	101 (2.9)	80	97	1.2	310	19.9
OTHER SOLUTIONS																				
REHYDRALYTE	Severe diarrhea	3	Glucose			Isotonic; also contains citrate.	2.5	100					172.0 (7.5)	78.0 (2.0)	177.5 (5.0)			305	13.0	
5% GLUCOSE	Initial enteral feeding after NPO if I.V. is source of electrolytes	6	Glucose			276 mOsm/Kg H_2O														
10% GLUCOSE	Initial enteral feeding after NPO if I.V. is source of electrolytes	12	Glucose			Hypertonic (552 mOsm/Kg H_2O)														
PEDIALYTE (Ross)	Severe diarrhea	3	Glucose			Also contains citrate	2.5	100					103.5 (4.5)	78.2 (2.0)	124.1 (3.5)					
RESOL (Wyeth)	Mild to moderate dehydration	2.5	Glucose			Also contains magnesium and citrate.	2.0	100					115 (5.0)	78.2 (2.0)	177.3 (5)	.50.40				

NUTRITION MANAGEMENT OF THE TODDLER AND PRESCHOOL CHILD

For CHS facilities, CLICK HERE.

Description

The Regular Diet for the Toddler (1 to 3 years of age) and the Preschool Child (4 to 5 years of age) includes a wide variety of foods to promote optimal growth and development. The diet consists of foods of different textures, tastes, and colors provided throughout the day. Snacks are required to meet the nutrient needs, since the toddler and preschooler have small stomach capacities.

Indications

The diet is served when specific dietary modifications are not therapeutically required.

Nutritional Adequacy

The diet can be planned to meet the Dietary Reference Intakes (DRIs) for the specific age as outlined in the *Statement on Nutritional Adequacy* in Section IA. Actual nutrient requirements may vary widely among children of the same age, depending on the rate of growth and stage of development. Nutrients that may be of suboptimal intake at this age are protein and iron because children often refuse to eat an adequate quantity of protein sources. Adequate vitamin A intake may also be of concern because children often dislike vegetables. Most healthy children who eat a variety of foods do not need a vitamin and mineral supplement. However, supplementation may need to be discussed with the caregivers if dietary intake appears to be inadequate or sporadic (1,2).

How to Order the Diet

Order as "Pediatric Regular Diet" or "Regular Diet for Age ______." The age of the patient will be taken into consideration in implementing the diet order. Any specific instructions should be indicated.

Planning the Diet

Energy needs vary with the growth rate, body size, and physical activity of the child. The average energy requirement at this age is 1,300 to 1,700 kcal/day (3). For children 1 to 3 years old, 102 kcal/day and for children 4 to 5 years, 90 kcal/day can be used to estimate specific needs. Carbohydrates are the main source of energy.

The recommended protein intake is 16 g/day (or 1.2 g/kg) for 1- to 3-year-olds and 24 g/day (or 1.2 g/kg) for 4- or 5-year-olds (3). Adequate protein intake may be difficult to obtain if chewing skills are limited or milk intake is inadequate. Cheese, peanut butter, and yogurt may be considered to help promote adequate protein intake.

The toddler and preschool child have distinct developmental and nutrition needs. After the first year of life, a time of rapid growth and development, the growth rate slows, but there is a steady increase in body size. Along with the decrease in growth rate, the appetite decreases. However, there is an increased need for protein and many vitamins and minerals (3,4).

The toddler and preschool child is striving for independence. Self-feeding is important, although the child may not physically be able to handle feeding utensils or have good hand-eye coordination. At this age, food likes and dislikes become prominent, and food acquires a greater social significance.

Beginning at 2 years of age, recommendations from the *Dietary Guidelines* and *Food Guide Pyramid* should be applied for healthy children (5,6). See Table IE-3.

Table IE-3: Food Pyramid Groups and Recommended Portion Sizes

Food Group	Daily Servings	Portion Size 1-3 years	Portion Size 4-5 years
Grains, Breads, Cereals	*>6 servings*		
	Bread	¼ - ½ slice	¾ -1 slice
	Dry cereal	¼ - 1/3 cup	½ cup
	Cooked cereal, noodles, rice	¼ - 1/3 cup	1/3 - ½ cup
	Crackers	2-3	4-6
Fruits	*≥2 servings*		
	Fresh fruit	½ small	½ -1 small
	Cooked, canned, or raw, (chopped)	1/3 cup	½ cup
	Juice	¼- ½ cup	½ cup
Vegetables	*≥3 servings*		
	Cooked, canned, or raw, (chopped)	¼ cup	½ cup
		¼-½ piece	½-1 piece
	Whole	¼ cup	½ cup
	Juice		
Milk	*3-4 servings*		
	Milk	½ cup	¾ cup
	Yogurt	½ oz (2-4 tbsp)	¾ oz (4-6 tbsp)
	Cheese		
Meat	*2 servings*		
	Egg	1	1
	Cooked meat	1-3 tbsp	3-5 tbsp
	Dried beans, peas	1-3 tbsp	2-4 tbsp
Fat	*3-4 servings*		
	Margarine; butter; oil	1 tsp	1 tsp

Children should be supervised during meals and snacks. A child who is choking may not be able to make noise or to attract attention. Foods that may cause choking include hot dogs, chunks of meat, nuts, peanut butter, raw apples, jelly beans, hard candy, gum drops, popcorn, raw carrots, raisins, grapes, berries, and potato or corn chips. By changing the form of some of these items, these foods are less likely to cause choking, such as serving peanut butter with jelly, not by the spoonful, or cutting hot dogs or grapes in small pieces (2).

References

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6. *Food Guide Pyramid*: *A Guide to Daily Food Choices.* Washington, DC: US Dept of Agriculture, Human Nutrition Information Service; 1992. Home and Garden Bulletin No. 252.

NUTRITION MANAGEMENT OF THE SCHOOL-AGE CHILD

For CHS facilities, CLICK HERE.

Description

The Regular Diet for the School-Age Child (6-11 years of age) includes a wide variety of foods to promote optimal growth and development. Nutrition during this stage should supply adequate nutrients to encourage fitness, and ensure the growth demands of adolescence. Foods are provided based on the *Food Guide Pyramid*, and the National Cholesterol Education Program. Three meals a day are recommended, with one to three planned snacks.

Indications

The diet is served when specific dietary modifications are not therapeutically required.

Nutritional Adequacy

The Regular Diet for the School-Age Child is adequate to meet the Dietary Reference Intakes (DRIs) for the specific age as outlined in the *Statement on Nutritional Adequacy* in Section IA, provided that a variety of foods is consumed. Energy and protein requirements vary with the child's age, growth rate, and physical activity.

How to Order the Diet

Order as "Pediatric Regular Diet" or "Regular Diet for Age ______." The age of the patient will be taken into consideration in implementing the diet order. Any specific instructions should be indicated.

Planning the Diet

Energy needs vary with the growth rate, body size, and physical activity of the child. The average energy requirement at this age is 2,000 kcal/day (1). Carbohydrates are the main source of energy. The recommended protein intake is 24 g/day (or 1.2 g/kg) for 6-year-olds, 28 g/day (or 1.0 g/kg) for 7- to 10-year-olds and 45 g/day (or 1.0 g/kg or 11-year-olds (1).

The DRI for calcium is 500 mg until age 8 years, and then it increases to 1,300 mg at age 9 (2). The requirement for calcium increases with the growth of lean body mass and the skeleton.

At this age, appetite naturally increases. However, between the ages of 8 and 11 years some children (primarily girls), may be at risk for developing eating disorders due to an overemphasis on body image and low intake (3).

Recommendations from the *Dietary Guidelines*, *Food Guide Pyramid*, National Cholesterol Education Program, and the American Academy of Pediatrics should be applied for healthy children. These include limiting fat to no more than 30% of total calories, limiting saturated fat to less than 10% of total calories, and limiting dietary cholesterol to less than 300 mg/day (4-6). Fiber recommendations from the American Health Foundation for children in the 5- to 11-year-old range are the child's age plus a minimum of 5 g/day up to a maximum of 10 g/day (7).

Table IE-4: Food Pyramid Groups and Recommended Portion Sizes (8)

Food Group	Daily Servings	Portion Size
Grains, Breads, Cereals	*>6 servings*	
	Bread	1 slice
	Dry cereal	1 oz or ¾ cup
	Cooked cereal	½ cup
	Noodles	4-6
	Rice	
	Crackers	
Fruits	*≥2 servings*	
	Fresh fruit	1 whole medium
	Cooked, canned, or raw, (chopped)	½ cup
	Juice	½ cup
Vegetables	*≥3 servings*	
	Cooked, canned, or raw, (chopped)	½ cup
	Juice	¾ cup
Milk	*3 servings*	
	Milk	1 cup
	Yogurt	1 oz
	Cheese	
Meat	*2-3 servings (5-6 oz)*	
	Egg	1
	Cooked meat	2-3 oz
	Dried beans, peas	½ cup
	Peanut butter	2 tbsp
Fats, Sweets		As needed to provide energy

See Section III: Clinical Nutrition Management
OBESITY AND WEIGHT MANAGEMENT

References

1. Food and Nutrition Board. *Recommended Dietary Allowances*. 10th ed. Washington, DC: National Academy Press; 1989.
2. Institute of Medicine, Food and Nutrition Board. *Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride.* Washington, DC: National Academy Press; 1997.
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8. *Food Guide Pyramid*. Washington, DC: US Dept of Agriculture, Human Nutrition Information Service; 1992. Home and Garden Bulletin No. 252.

NUTRITION MANAGEMENT OF THE ADOLESCENT

For CHS facilities, CLICK HERE.

Description

The Regular Diet for the Adolescent (11 to 19 years of age) includes a wide variety of foods to promote normal growth and development during puberty and to maintain a good nutritional status for health and disease prevention after the physiological growth has occurred. Foods are provided based on the *Dietary Guidelines for Americans*, the *Food Guide Pyramid*, the American Heart Association, the American Cancer Association, and the National Cholesterol Education Program (1-3).

Indications

The diet is served when specific dietary modifications are not therapeutically required.

Nutritional Adequacy

The Diet for the Adolescent is adequate to meet the Dietary Reference Intakes (DRIs) for the specific age as outlined in the *Statement on Nutritional Adequacy* in Section IA, provided that a variety of foods is consumed. Energy and protein requirements vary with the adolescent's age, sex, stage of growth, and physical activity. Special attention may be required to ensure adequate intake of iron, zinc, and calcium.

How to Order the Diet

Order as "Regular Diet" or "Regular Diet for Age ______." The age of the patient will be taken into consideration in implementing the diet order. Any specific instructions should be indicated.

Planning the Diet

Energy needs vary with the sex, stage of growth, and physical activity of the adolescent. An initial estimate for energy that relates more closely to physiological age can be obtained by calculating kilocalories divided by height in centimeters (4). This is determined by dividing the DRI for energy for the child's age and sex by the reference height (Table 1E-5) and then multiplying kilocalories per centimeter by the adolescent's height (5). If the height is unavailable or cannot be measured accurately, the DRI for the kilocalories per day may be used (5). Therefore, periodic adjustments in energy intake may be necessary to maintain an appropriate weight for height.

As shown in Table IE-5, females have the highest energy needs during early adolescence (ages 11 to 14) and males have the highest energy needs during later adolescence (ages 15 to 19).

Protein needs for adolescents also relate more to the physiological age than chronological age. The DRI for total protein intake ranges from 44 to 59 g/day (5). Like energy needs, protein requirements can be determined based on the reference height for each age category (see Table IE-5).

Table IE-5: Recommended Energy and Protein Intake for Adolescents

Age (years)	Reference Height (cm)	Average Energy Allowance (kcal)	Average Protein Allowance (g)	Energy Needs (kcal/cm)	Energy Needs (kcal/kg)	Protein Needs (g /cm)	Protein Needs (g/kg)
Males							
11-14	157	2,500	45	15.9	55	0.29	1.0
15-18	176	3,000	59	17.0	40	0.33	0.9
Females							
11-14	157	2,200	46	14.0	47	0.29	1.0
15-18	163	2,200	44	13.5	40	0.27	0.8

Source: Food and Nutrition Board. *Recommended Dietary Allowances*. 10th ed. Washington, DC: National Academy Press; 1989.

Girls generally begin puberty around 10 to 12 years of age and boys begin between 11 and 13 years of age. Likewise, girls usually have a peak height velocity around age 12 and boys around age 14. Young men often achieve an adult height greater than young women do because boys grow prepubertally 2 years more than girls do and have a longer period of growth once puberty starts. Girls generally stop growth at 16 years of age and boys at 18 years of age.

During puberty, body composition changes. Boys double their lean body mass between 10 and 17 years of age and maintain about 12% body fat by late puberty. Girls gain more fat during puberty and usually have 23% body fat by late puberty.

Vitamins and mineral needs increase as the adolescent grows. Calcium, iron, and zinc are particularly important for growth, and dietary intake is frequently inadequate. Careful food selection is required to meet the DRIs. Accepting changes that will improve nutrient intake seems to be most successful when the change is related to physical development, appearance, and sports performance.

The DRI for calcium is 1,300 mg for both sexes between the ages of 9 and 18 years (6). The accelerated skeletal and muscular development during adolescence makes this stage of life a critical time for bone growth and deposition of calcium.

The DRI for iron 11- to 18-year-olds is 12 mg/day for males and 15 mg/day for females (5). The need for iron increases during puberty with the increase in muscle mass and blood volume.

The RDA for zinc for males and females 11 to 18 years is 15 mg/day and 12 mg/day, respectively (5). Zinc is especially important during adolescence because of its role in growth and sexual maturation.

Recommendations from the *Dietary Guidelines*, *Food Guide Pyramid*, the American Heart Association, the American Cancer Association, and the National Cholesterol Education Program should be applied for healthy adolescents. Refer to the Regular Diet-Adult in Section IA for recommendations and guidelines.

See Section IA: Regular Diet in Pregnancy and Lactation
See Section III: Clinical Nutrition Management
OBESITY AND WEIGHT MANAGEMENT

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KETOGENIC DIET

For CHS facilities, CLICK HERE.

Description
The ketogenic diet is designed to establish and maintain ketosis. The diet is very high in fat and severely restricted in carbohydrates. This is done by calculating the diet to provide 3 to 4 grams of fat for each 1 gram of protein and carbohydrate combined, thus converting the fuel burned by the body from carbohydrate to fat. A physician prescribes the ratio of 3:1 or 4:1 as appropriate for each individual patient. The diet is calculated to meet the specific needs of each individual for calories and protein, and provides little to no carbohydrate depending on protein requirements. Even with the high fat content of the diet, weight is usually maintained with very little gain. This is possible because calories are calculated to meet only 75% of the individual's Dietary Reference Intake (DRI) for energy. The foundation of the diet is either heavy whipping cream or MCT oil. The diet using whipping cream is described below.

Indications
The diet serves as an adjunct to anti-convulsant medications in controlling intractable seizures. It is used in cases of resistance to medications or drug toxicity (1,2). Sustained ketosis appears to be important in modifying the convulsive threshold (1,3). The diet seems to be most effective in children 18 months to 10 years of age (4), although it can be used with older children and adults with varying degrees of success. The diet is administered to those who have myoclonic absence (drop) and atonic seizures, which are difficult to control with medications. It may also benefit children with generalized tonic-clonic (grand mal) seizures and seizures of the Lennox-Gestault Syndrome. The ketogenic diet can be used for all types of seizures, especially if medication therapy is not effective (5).

The diet requires a trial period of 2 to 3 months during which effectiveness is assessed and the diet is adjusted to maintain strong ketosis. Once it is determined that the diet is effective on controlling seizure activity, a commitment of 1 to 2 years is required after which weaning is done gradually. Because of the extreme dietary regimens involved in this diet, the Johns Hopkins Pediatric Epilepsy Center recommends use of the ketogenic diet for those individuals who have more than 2 seizures a week despite treatment with at least 2 different anticonvulsant medications (6).

Nutritional Adequacy
The ketogenic diet is inadequate in vitamin B-complex vitamins, folate, iron, calcium, and zinc. The diet must be supplemented with vitamins, iron and calcium in forms that are sugar-free.

How to Order the Diet
Order as "Ketogenic Diet." A nutrition consult by a registered dietitian must accompany the diet order, as the diet has to be precisely calculated. All medications must be carbohydrate free, as well as toothpaste. The diet must be initiated in a hospitalized setting under close supervision.

Planning the Diet
A gram scale and a copy of the Epilepsy Diet Treatment book (6) are paramount in administering this diet effectively.

Calculation (5)

1. Sample patient: age and weight

Age	5
Height	43 inches
Weight in kilograms	18.46 (40.6 lb)
Ideal weight	18.46 (50th percentile)

Ketogenic Ratio (fat calories:nonfat calories ratio)

Up to 2 years	3:1
2 years to 12 years	4:1
Over 12 years	3:1

A 4:1 Ketogenic diet is prescribed for the patient, which at 50th percentile matches the ideal weight for his age and size.

2. Calories per kilogram: Calculate the ideal body weight for the child's height using the NCHS growth charts. Determine the number of calories per kilogram based on the child's age and ideal weight from the following chart (7). Additional adjustments for caloric needs will need to be individualized based on patient's activity level.

Up to 1 year	80 kcal/kg
12 - 18 months	75 kcal/kg
18 months - 3 years	70 kcal/kg
4 - 6 years	65 kcal/kg
7 - 8 years	60 kcal/kg
9 - 10 years	55 kcal/kg
11 - 14 years	40 kcal/kg or less

3. Total calories: Determine the total number of kcal in the diet by multiplying the child's ideal weight by the number of calories required per kilogram.

   The patient, age 5 and weighing 18.46 kg, needs a total of 65 x 18.46 or 1,200 kcal per day.

4. Dietary unit composition: Dietary units are the building blocks of the ketogenic diet. A 4:1 diet has dietary units made up of 4 gm of fat to each 1 gm of protein plus carbohydrates. Because fat has 9 calories/g (9 x 4 = 36), and protein and carbohydrates each have 4 kcal/g (4 x 1 = 4), a dietary unit at a 4:1 diet ratio has 36 + 4 = 40 kcal. The caloric value and breakdown of dietary units vary with the ketogenic ratio.

Ratio	**Fat Calories**	**Carbohydrates plus Protein Calories**	**Calories per Dietary Unit**
2:1	2 g x 9 kcal/g = 18	1 g x 4 kcal/g = 4	18 + 4 = 22
3:1	3 g x 9 kcal/g = 27	1 g x 4 kcal/g = 4	27 + 4 = 31
4:1	4 g x 9 kcal/g = 36	1 g x 4 kcal/g = 4	36 + 4 = 40
5:1	5 g x 9 kcal/g = 45	1 g x 4 kcal/g = 4	45 + 4 = 49

   The patient's dietary units will be made up of 40 calories each because he is on a 4:1 ratio.

5. Dietary unit quantity: Divide the total calories allotted by the number of calories in each dietary unit to determine the number of dietary units to be allowed daily.

   Each of the patient's dietary units on a 4:1 ratio contains 40 calories, is allowed a total of 1200 kcal/day, so he receives 1200/40 = 30 dietary units per day.

6. Fat allowance: Multiply the number of dietary units' times the units of fat in the prescribed ketogenic ratio to determine the number of fat grams permitted daily.

   On his 4:1 diet, with 30 dietary units per day, the patient will have 30 x 4 or 120 g of fat per day.

7. Protein and carbohydrate allowance: Multiply the number of dietary units times the number of protein plus carbohydrate in the prescribed ketogenic ratio, usually one, to determine the combined daily protein plus carbohydrate allotment.

   On his 4:1 diet, the patient will have 30 x 1 or 30 g of protein and carbohydrate per diet.

8. Protein allowance: To maintain health, a 5-year-old child should eat a minimum of 1 g of protein for every kilogram of weight and/or meet the DRI for protein for age.

   At 18.56 kg, the patient should eat 18.5 g of protein per day out of his total protein and carbohydrate allotment of 30 g.

9. Carbohydrate allowance: Determine the grams of carbohydrate allotted by subtracting the protein allotment from the total protein plus carbohydrate allotment. Carbohydrates are the diet's filler and are always determined last.

   The patient's carbohydrate allotment is 30 - 18.5 = 11.5 gm carbohydrate daily.

10. Meal Order: Divide the daily fat, protein and carbohydrate allotments into 3 equal meals. It is essential that the proper ratio of fat to protein plus carbohydrate be maintained at each meal.

    The patient's diet order reads:

	Daily	**Per Meal**
Protein	18.5 g	6.2 g
Fat	120 g	40 g
Carbohydrate	11.5 g	3.8 g
Kcal	1,200	400

11. Liquids: Multiply the child's ideal weight by 65 to determine the daily cubic centimeter allotment of liquid. As few as 60cc/kg but as many as 70cc may be adequate, depending on the child's activity level and the climate in which they live. Liquid intake should be spaced throughout the day with no more than 120 - 150 cc being given at any one time. Liquids should be non-caloric such as water, herbal or decaffeinated tea or decaffeinated sugar-free diet soda. Sugar free soda should be limited to no more than 1 calorie per day. In hot climates, the cream may be excluded from the fluid allotment. The liquid allotment may also be set equal to the number of calories in the diet.

    The patient, who lives in New York and gets 1200 kcal per day on the diet, is allowed 1200 cc of fluid per day, including his allotted cream.

12. Every child on the ketogenic diet should take a daily dose of a sugar-free vitamin/mineral supplement. For infants or children who have difficulty chewing, 600 to 650 mg of oral calcium, in a sugar-free form, such as calcium gluconate or calcium carbonate or calcium magnesium liquid and a sugarless multi-vitamin with iron, such as Poly-Vi-Sol® liquid or drops can be used. A sugar free multivitamin mineral Chew Tab is a better choice for children over 1 year of age that can chew.

Introducing The Ketogenic Diet
The diet must be introduced in the hospitalized care setting. Initially "ketogenic eggnog" is given after the initial two-day fast or when the ketones have reached the 160 level (4+).

To introduce to children, a ketogenic eggnog is provided a sample full meal recipe follows. The child should receive 1/3 of the child's full meal recipe first meal, 2/3's of the full meal recipe the second meal, and progress to the full recipe by the third meal.

Calculating The Ketogenic Eggnog

Step 1: Calculate the recipe based on 1/3 of the child's total allotted calories. Select an amount of cream that contains close but not equal to the amount of total allotted fat.

	Weight	**Protein**	**Fat**	**Carbohydrate**
Cream	97 g	1.9 g	34.9 g	2.9 g
Egg				
Should be		6.2 g	40.0 g	3.8 g

Step 2: Subtract the carbohydrate in the cream used from the total allotted carbohydrate: 3.8 g - 2.9 g = 0.9 g.

Step 3: Add the remaining amount of carbohydrate to the total allotted protein: 6.2 g + 0.9 g = 7.1 g.

Step 4: Subtract the protein used in the cream from the sum in Step 3. 7.1 g - 1.9 g = 5.2 g.

Step 5: Using the food values chart (8), give the amount of egg that contains 5.2 g of protein.

Recipe for 1 Full Meal

	Weight	Protein	Fat	Carbohydrate
Cream	97 g	1.9 g	34.9 g	2.9 g
Egg	43 g	5.2 g	5.2 g	-----
Actual total		**7.1 g**	**40.1 g**	**2.9 g**
Should be		6.2 g	40.0 g	3.8 g

In the ketogenic eggnog, the carbohydrate will be lower than the allotment and the protein will be higher than the allotment. The amount of fat should always be within a close proximity to the allotment. On occasion, depending on different ketogenic ratios used, small amounts of oil may be needed.

The 4:1 ketogenic ratio may be double-checked by adding the grams of protein and carbohydrate in the meal and multiplying by four [4]. The sum should be the amount of fat in the meal, in this case, 40.0 g. Since (7.1 g + 2.9 g) x 4 = 40.0 g, the ratio is correct.

When the full quantity is reached, real food may be served or the child may be given eggnog again.

The Ketogenic Eggnog Recipe

Ketogenic eggnog is the only meal that does not need to be eaten all at once. This way the child sipping eggnog will not be under as much pressure as when he/she is faced with a plate of unfamiliar food. At home, the parents can prepare more appetizing, familiar meals. However, it is important that parents be given enough training in preparing solid food meals so they will be able to do it comfortably at home. Ingredients required for the ketogenic eggnog are:

Heavy Cream
Egg
Vanilla Extract
Saccharin (optional)

The patient's first meal of eggnog will be 1/3 of the full meal recipe:

32 g	Heavy Cream
14 g	Egg
up to 5 drops	Vanilla
up to ¼ grain	Saccharin
46 cc	Total

The patient's second meal of eggnog will be 2/3 of the full meal recipe:

64 g	Heavy Cream
28 g	Egg
up to 5 drops	Vanilla
up to ¼ grain	Saccharin
92 cc	Total

The patient's third meal of eggnog will be the full meal recipe.

92 g	Heavy Cream
14 g	Egg
up to 5 drops	Vanilla
up to ¼ grain	Saccharin
140 cc	Total

Regular meals are provided to the patient usually by the third meal and/or prior to discharge.

Calculating Meal Plans
When calculating the meal plan, divide the total protein, fat and carbohydrate allotted for the day by three and provide 1/3 of the allotment per meal. For example:

	Weight	Protein	Fat	Carbohydrate
Cream	65 g	1.3 g	23.4 g	1.9 g
Fruit	19 g	0.2 g	--	1.9 g
Meat	20 g	4.7 g	3.3 g	--
Fat	18 g	--	13.3 g	--
Actual Total	**6.2 g**	**40.0 g**	**3.8 g**	
Should Be	6.2 g	40.0 g	3.8 g	

Calculate the whipping cream first. Heavy whipping cream (36%) should take up no more than half of the carbohydrate allotment in the meal.

The patient is allowed a total of 3.8 g carbohydrates per meal. Referring to the food value charts (9), to use half of this allotment of cream, he should eat 65 g of 36% cream, which contains 1.9 g carbohydrates.

Calculate the rest of the carbohydrate (fruits or vegetables) by subtracting the carbohydrate contained in the cream from the total carbohydrate allotment.

Referring to the food value charts, the patient can eat the remaining 1.9 g carbohydrates as 19 g of 10% fruits. [The percent equals the percent of carbohydrate in the fruit (7).]

10% Carbohydrate Fruits	15% Carbohydrate Fruits
Applesauce	Apple
Cantaloupe	Apricot
Grapefruit	Blackberries
Tangerine	Blueberries
Honeydew	Figs
Orange	Nectarine
Papaya	Pear
Peach	Pineapple
Strawberries	Plums (Damson)
Watermelon	Raspberries (black)
	Raspberries (red)
	Grapes
	Mango

Calculate the remaining protein (meat/fish/poultry, cheese or egg) by subtracting the protein in the cream and vegetable from the total protein allotment. The 65 g of 36% cream and the 19 g of 10% fruits contain a total of 1.5 g of protein.

The patient is allowed 6.2 gm of protein per meal, so he can eat 4.7 g of protein from meat, fish or poultry. Referring to the food value charts (9), this calculates to be 20 g of meat, fish or poultry.

Calculate the amount of fat to be allowed in the meal by subtracting the fat in the cream and protein from the total fat allotment.

The patient has to eat 40 g of fat with each meal. The cream and meat contain 26.7 g of fat, leaving 13.3 g of fat to be mixed with his meal.

Butter, margarine or mayonnaise are more frequently used because of their palatability. However, they contain only 74% Fat. Therefore, the remaining grams of fat are divided by 0.74. 13.3/.74 = 17.9 or 18 g of butter, margarine or mayonnaise

Oil is not included but can be used. Oil would raise the average up higher but is not used as often as butter, margarine or mayonnaise.

Other Considerations

Because the diet may induce hypoglycemia, blood glucose levels need to be monitored during the fasting period (3). All IV's must be glucose free. If the blood sugar drops at or below 25-mg % with symptoms of hypoglycemia, administer 15 to 30 cc (1.8 to 3.75 g carbohydrate) of orange juice. Monitor closely and administer more juice if necessary, but be aware that too much carbohydrate will delay ketosis. (See reference 5 for complete hypoglycemia plan.) Another alternative is to administer 1 oz. Pulmocare® plus 5-cc corn/safflower oil. This provides a 4.3:1 ratio and 1.25 g carbohydrate in 30 cc, therefore, treating the hypoglycemia but not interrupting ketosis (7).

Food Guide

All foods must be weighed precisely on a gram scale. *Bowes & Church's Food Values of Portions Commonly Used* (9) is a useful reference for meal planning.

The following foods and products are eliminated from the diet because they contain an appreciable amount of carbohydrates.

Foods to Avoid

Bread	Ice cream, commercial	Peas
Cake	Jam	Pies
Candy	sugar sweetened	Jelly Preserves
Carbonated beverages,	Ketchup	Potatoes
Cereals, sugar coated	Marmalade	Puddings
Chewing gum	Medicines containing sugar	Rice
Cookies	Molasses	Rolls
Cough drops or cough	Muffins	Sherbet
syrups that contain sugar	Pancakes	Sugar
Crackers	Pastries	Syrup
Honey		Toothpaste
		Waffles

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SODIUM-CONTROLLED DIET

Description
The Sodium-Controlled Diet limits the sodium intake to a prescribed level determined by the requirements of the specific disease state. Foods and condiments high in sodium are eliminated or restricted.

The average American adult consumes to 4 to 5 grams of sodium per day (1). The minimum daily sodium requirement for healthy adults is estimated to be 500 mg (1). The National Research Council recommends that the daily intake of sodium be limited to 2,400 mg or less. This recommendation provides guidelines for menu planning and offers direction for persons who desire to make healthful alternatives.

Indications
The Sodium-Controlled Diet is used in the treatment of conditions characterized by edema, including the following:

- cirrhosis of the liver with ascites
- congestive heart failure
- essential hypertension
- renal disease

Under normal physiologic conditions, the body responds to an increase in sodium consumption with an increase in sodium excretion, generally eliminating the excess within 24 hours (1). However, certain diseases or conditions impair the body's ability to maintain a normal sodium and water balance, necessitating a reduction in sodium intake.

Cirrhosis of the liver with ascites: Ascites, an accumulation of nutrient-rich fluid in the peritoneal cavity, often occurs as a result of hepatic cirrhosis. A small percentage of patients with this condition will lose weight and reduce their fluid volume by adhering to a sodium-controlled diet (3). Almost 90% of patients will respond to combination therapy consisting of a sodium-controlled diet and diuretics, whereas the other approximately 10% are resistant to the combination therapy and require further medical intervention (4). Although fluid restrictions often accompany sodium-controlled diets, the efficacy of this practice in the treatment of ascites has been challenged. Fluid restriction may not be necessary until the serum sodium level drops below 120 mEq/L (3). The treatment goal in ascites is to achieve a negative sodium balance and a weight loss of 0.5 kg/day (3). Sodium-controlled diets that provide 500 to 2,000 mg sodium per day, depending on the patient's fluid volume, are recommended (2).

Congestive heart failure: In congestive heart failure, the kidneys respond to a decrease in systemic blood flow by increasing the absorption of sodium and fluids, leading to edema and worsening heart failure. To promote diuresis, a sodium-controlled diet accompanied by diuretic use is the preferred method of treatment (2). A 2,000-mg sodium diet is as restrictive as necessary for patients to respond to diuretic therapy. Some research suggests that a sodium restriction of 3,000 mg or less is adequate to control mild to moderate congestive heart failure (5).

Hypertension: Sodium-sensitive individuals have an impaired ability to excrete large concentrations of sodium, leading to an increase in serum sodium levels, hypervolemia, and hypertension. Between 20% and 50% of individuals with hypertension, particularly the elderly and those of African descent, respond to an increase in sodium consumption with an increase in blood pressure (2). The Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure recommends that Stage 1 hypertension (formerly called mild hypertension) be treated with a 2,300-mg (100-mmol) or less sodium-controlled diet accompanied by other lifestyle modifications, such as weight loss (6). Large studies have shown that a 2,300-mg/day reduction in sodium intake is associated with a 5- to 10-mm Hg decrease in blood pressure (6). If within 3 to 6 months an acceptable reduction in blood pressure has not been achieved with lifestyle modifications, pharmacologic treatment will generally be initiated (6). Sodium-controlled diets also enhance the effectiveness of diuretic therapy (1) and may help individuals remain normotensive after pharmacologic therapy (7).

If a thiazide or loop diuretic is prescribed and the patient need not restrict potassium intake, a diet containing increased amounts of potassium may be necessary to avoid hypokalemia (6). (See Nutrition Management of Potassium Intake later in this section.)

Renal disease: See Section IG: Medical Nutrition Therapy for Renal Disease.

Contraindications

Under normal conditions, a dietary sodium restriction alone should not cause sodium depletion. However, a sodium-controlled diet is contraindicated in the presence of the following:

- conditions that promote sodium depletion (profuse perspiration, vomiting, and diarrhea)
- impairment of the normal mechanisms of sodium conservation (colectomy and ileostomy in the postoperative period)
- conditions that conserve sodium as a normal physiologic adjustment (pregnancy)

A sodium restriction may also be contraindicated in lithium carbonate therapy. The kidney does not always discriminate between sodium and lithium. Therefore, with a low sodium intake, the kidney may conserve both sodium and lithium, causing an elevation in serum lithium level and the potential for lithium toxicity (2).

Nutritional Adequacy

Sodium-controlled diets can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA.

How to Order the Diet **For CHS facilities, CLICK HERE.**

- Order the diet in terms of sodium, not salt.
- Order the amount of sodium that should not be exceeded in the diet.
- The following outlines the levels of sodium-controlled diets:

mg Na	mEq Na
500	22
1,000	43
2,000	87
3,000	130
4,000	174

- The dietitian may allow certain higher sodium foods to be added to the patient's diet if the patient's sodium intake falls below the prescribed range due to low energy intake.

Note: Diets containing less than 2,000 mg of sodium per day are difficult to sustain outside of the hospital environment for reasons of palatability and convenience.

Planning the Diet

Salt substitutes: Salt substitutes will not be offered unless a physician, standing order, or an organization's policy designates its use. Salt substitutes may contain potassium chloride, which could be contraindicated under certain conditions. Some salt substitutes also contain varying amounts of sodium.

Sodium in medications*:* Patients on a sodium-restricted diet should be made aware of certain over-the-counter medications that contain high quantities of sodium (eg, seltzers and some antacids) and should consult their physician if the medication is used regularly

See Section III: Clinical Nutrition Management
CONGESTIVE HEART FAILURE
CORTICOSTEROID THERAPY
HYPERTENSION
NEPHROTIC SYNDROME

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NO ADDED SALT DIET
(4,000 mg sodium)

FOODS EXCLUDED

Bacon*
Barbecue sauce*
Buttermilk, cultured (limit to 1 cup/day)
Ketchup (limit to 1 tbsp/day)
Cheese, processed
Chili sauce
Commercially canned, frozen or convenience products (unless <600 mg of sodium for entree and 350 mg of sodium for single food items)
Corned beef*
Fish, salty or smoked (eg, anchovies, salted cod, herring, sardines)
Frankfurters*
Ham*
Meat extracts
Meat, luncheon*
Meat, smoked, cured, canned, or pickled
Meat tenderizers
Olives
Party spreads and dips
Salted potato chips, corn chips
Salt pork
Salted bouillon cubes
Salted crackers
Salted nuts
Soups, regular, canned, frozen, or dehydrated
Sauerkraut or pickled vegetables
Sausage*
Spices and herbs with salt such as garlic salt, celery salt, onion salt, and lemon pepper
Soy sauce
Tuna canned in oil (tuna can be used if rinsed)

*May be calculated into the diet. Select only one serving daily from the entire list.

Note: Foods with a sodium content greater than 350 mg per serving should be calculated into the diet.

FOOD GUIDE — 3,000-MG SODIUM DIET

FOOD GROUP	FOOD ALLOWED	FOOD EXCLUDED
Beverages	Milk Low-sodium carbonated beverages Coffee; tea	
Breads, Cereals, Grain Products	Enriched white, wheat, rye and pumpernickel bread Hard rolls; dinner rolls Muffins; cornbread Waffles; pancakes Most dry and hot cereals Crackers and breadsticks with unsalted tops Tortilla Enriched unsalted rice; barley; and noodles, spaghetti, macaroni, and other pastas Unsalted tortilla chips, pretzels, potato chips, or popcorn Homemade bread stuffing	Breads, rolls, and crackers with salted tops Commercially prepared rice and pasta mixes Salty snack foods
Vegetables	All fresh and frozen vegetables Canned, drained vegetables White and sweet potatoes Squash Tomato paste; low-sodium tomato sauce and tomato paste	Sauerkraut, pickled vegetables, and others prepared in brine Vegetables seasoned with ham, bacon, or salt pork Commercially prepared potato mixes Regular tomato sauce and puree
Fruits and Juices	All fruits and fruits juices Low-sodium or salt-free vegetable juices	Regular vegetable juices
Milk	Milk; buttermilk (limit to 1 cup/day); chocolate milk Yogurt; frozen yogurt	
Meats and Meat Substitutes	Any fresh or frozen beef, lamb, pork, and poultry Fish and most shellfish; canned tuna or salmon, rinsed Eggs and egg substitutes Low-sodium cheese as desired Regular peanut butter (3 times weekly) Dried peas and beans Frozen dinners (<600 mg sodium)	Any smoked, cured, salted, koshered, or canned fish, poultry, or meat, including bacon, chipped beef, cold cuts, ham, hot dogs, sausage, sardines, anchovies, marinated herring, and pickled meats Frozen breaded meats Pickled eggs
	Limit to 1 serving a day: Regular cottage cheese or ricotta (½ cup); Swiss or mozzarella cheese (1 oz)	Processed cheese; cheese spreads and sauces
Fats	Butter or margarine Vegetable oils Salad dressings in limited amounts Light, sour, and heavy cream Unsalted nuts	Bacon, salad dressings containing bacon fat, bacon bits, and salt pork Snack dips made with instant soup mixes or processed cheese Salted nuts Olives Canned gravy and mixes

FOOD GROUP	FOOD ALLOWED	FOOD EXCLUDED
Soups	Homemade broth Soups without added salt and made with allowed vegetables Reduced-sodium canned soups and broths	Regular canned or dehydrated soups
Desserts and Sweets	All	None
Miscellaneous	Limit added salt to ¼ tsp/day used at the table or in cooking Use a salt substitute with physician's approval Pepper; herbs; spices Vinegar Ketchup (1 tbsp); mustard (1 tbsp) Lemon or lime juice Hot pepper sauce; low-sodium soy sauce (1 tsp); Worcestershire sauce (1 tsp) Salsa (¼ cup)	Any seasoning made with salt, including garlic salt, celery salt, onion salt, and seasoned salt; sea salt; rock salt; kosher salt Meat tenderizers Monosodium glutamate Regular soy sauce; teriyaki sauce; barbecue sauce Most flavored vinegars Cooking wine

SAMPLE MENU

Breakfast	Noon	Evening
Orange Juice	Honey Glazed Chicken	Unsalted Beef Tips & Noodles
Unsalted Cream of Wheat	Steamed Rice	Seasoned Green Beans
Unsalted Scrambled Egg	Steamed Broccoli	Sliced Tomato Salad
Wheat Toast	Fruited Gelatin	French Dressing
Margarine, Jelly	Dinner Roll	Dinner Roll
Milk (1 cup)	Margarine	Margarine
Coffee	Frosted Banana Cake	Peach Halves
Sugar, Creamer	Milk (1 cup)	Iced Tea
	Tea, Sugar	Sugar

FOOD GUIDE — 2,400-MG SODIUM, LOW-FAT DIET

Research has found that a diet rich in fruits, vegetables, and low-fat dairy foods and reduced saturated and total fat can substantially lower blood pressure (1). The following food guide combines these recommendations with the sodium guideline for treatment of hypertension (≤2,400 mg of sodium) from the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (2,3). The number of recommended servings in the fruit and vegetable groups may be unrealistic in the hospital setting because of the high fiber content. However, incorporating the low-fat component into the diet and encouraging an increase in intake of fruits and vegetables in this setting will start the self-management training process with the patient.

FOOD GROUP	FOOD ALLOWED	FOOD EXCLUDED
Beverages	Low-sodium carbonated beverages Coffee; tea Limit caffeine to less than 300 mg/day	
Breads, Cereals, Grain Products	Hot cereal without salt Puffed rice, puffed wheat, shredded wheat, and low-sodium dry cereals Low-sodium crackers Tortilla Enriched unsalted rice, barley, noodles, spaghetti, macaroni, and other pastas Unsalted tortilla chips, pretzels, potato chips, or popcorn *Limit to 6 servings per day:* Enriched white, wheat, rye, and pumpernickel bread; hard rolls and dinner rolls; low-fat muffins; pancakes; most dry and instant hot cereals; crackers and breadsticks with unsalted tops; homemade bread stuffing	Breads, rolls, and crackers with salted tops; cornbread Frozen waffles Commercially prepared rice, pasta mixes, and bread stuffing Salty snack foods
Vegetables	*Eat 4 or 5 servings per day. In the hospital setting, this quantity may be unrealistic, as patients cannot handle this amount of fiber.* All fresh and frozen vegetables Canned, drained, and rinsed vegetables White or sweet potatoes Squash Unsalted tomato paste; low-sodium tomato sauce	Sauerkraut, pickled vegetables, and others prepared in brine Vegetables seasoned with ham, bacon, or salt pork Regular tomato sauce, puree, and paste Commercially prepared potato mixes
Fruits and Juices	*Eat 4 or 5 servings per day. In the hospital setting, this quantity may be unrealistic, as patients cannot handle this amount of fiber.* All fruits and fruits juices Low-sodium, salt-free vegetable juices	Regular vegetable juices Fruits processed with salt or sodium-containing compounds
Milk	*Eat 3 servings per day:* Low-fat or nonfat milk; chocolate milk Low-fat yogurt; frozen yogurt	Buttermilk, whole, or reduced-fat milk

FOOD GROUP	FOOD ALLOWED	FOOD EXCLUDED
Meats And Meat Substitutes	*Limit to 5-6 oz/day* Any fresh or frozen lean beef, lamb, pork, and poultry Fish and most shellfish; canned tuna or salmon, rinsed Egg substitutes Low-sodium, low-fat cheese Dried peas and beans Frozen dinners (<600 mg sodium) *Limit to 1 serving per day*: Regular cottage cheese or ricotta (½ cup); Swiss or mozzarella cheese (1 oz)	Any smoked, cured, salted, koshered, or canned fish, poultry, or meat, including bacon, chipped beef, cold cuts, ham, hot dogs, sausage, sardines, anchovies, marinated herring, imitation seafood, and pickled meats Fatty meat Peanut butter Frozen breaded meats Pickled eggs Processed cheese; cheese spreads and sauces
Fats	*Limit to 6 tsp or portions per day:* Unsaturated vegetable oils: canola, safflower, sunflower, corn, peanut, olive, soybean Margarine in which the first ingredient is "liquid oil"; diet margarine Unsalted nuts (1 oz counts as 1 serving of fat) *Limit to 1 serving per day:* Regular or fat-free salad dressings or mayonnaise (1 tbsp); fat-free cream cheese *Note: fat-free dressings and cream cheese do not count as a fat, but are limited because of sodium content.*	Butter, bacon, salad dressings containing bacon fat, bacon bits, and salt pork Snack dips made with instant soup mixes or processed cheese Tartar sauce Salted nuts Olives Canned gravy and mixes
Soups	Homemade broth Soups without added salt and made with allowed vegetables Reduced-sodium canned soups and broths	Regular canned or dehydrated regular soups
Desserts and Sweets	Sherbet Flavored gelatin Angel food cake Jam; jelly Syrup Hard candy *Limit to 1 serving per day (because of sodium content):* Fat-free frozen desserts, cakes, and cookies	Commercial baked goods: pies, cakes, cookies, doughnuts, pastries, brownies, cheesecake Ice cream; fudge topping Instant pudding mix
Miscellaneous	Salt substitute with physician's approval Pepper; herbs; spices Vinegar Ketchup (1 tsp/day); mustard (1 tsp/day) Lemon or lime juice Hot pepper sauce; Worcestershire sauce (1 tsp/day) Low-sodium condiments Salsa (¼ cup)	Any seasoning made with salt, including garlic salt, celery salt, onion salt, and seasoned salt; sea salt; rock salt; kosher salt Meat tenderizers Monosodium glutamate Relish Regular soy sauce, chili sauce, steak sauce, teriyaki sauce, barbecue sauce Most flavored vinegars Cooking wine

SAMPLE MENU

Breakfast	Noon	Evening
Orange Juice	Honey Glazed Chicken	Unsalted Beef Tips & Noodles
Stewed Prunes	Steamed Rice	Seasoned Green Beans
Unsalted Cream of Wheat	Steamed Broccoli	Seasoned Carrots
Unsalted Scrambled Egg	Tossed Salad with Fat-Free Dressing	Sliced Tomato Salad
Wheat Toast	Dinner Roll	Dinner Roll
Margarine, Jelly	Margarine	Margarine
Nonfat Milk (1 cup)	Fresh Banana	Peach Halves
Coffee	Nonfat Milk (1 cup)	Iced Tea
Sugar, Creamer	Tea, Sugar	Sugar

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3. Hypertension protocol. In: Inman-Felton A, Smith KG, Johnson EQ, eds. *Medical Nutrition Therapy Across the Continuum of Care.* Chicago, Ill: American Dietetic Association; 1998.

FOOD GUIDE — 2,000-MG SODIUM DIET

FOOD GROUP	FOOD ALLOWED	FOOD EXCLUDED
Beverages	Coffee; tea Low-sodium carbonated beverages	
Breads, Cereals, Grain Products	Hot cereal without salt Puffed rice, puffed wheat, shredded wheat, and low-sodium dry cereals Low-sodium crackers Tortilla Enriched unsalted rice; barley; and noodles, spaghetti, macaroni, and other pastas Unsalted tortilla chips, pretzels, potato chips, or popcorn *Limit to 6 servings per day:* Enriched white, wheat, rye and pumpernickel bread; hard rolls and dinner rolls; muffins; pancakes; most dry and instant hot cereals; crackers and breadsticks with unsalted tops; homemade bread stuffing	Breads, rolls, and crackers with salted tops Cornbread Frozen waffles Commercially prepared rice or pasta mixes or bread stuffing Salty snack foods
Vegetables	All fresh and frozen vegetables Canned, drained, and rinsed vegetables White or sweet potatoes Squash Unsalted tomato paste; low-sodium tomato sauce	Sauerkraut, pickled vegetables, and others prepared in brine Vegetables seasoned with ham, bacon, or salt pork Regular tomato sauce, puree, and paste Commercially prepared potato mixes
Fruits and Juices	All fruits and fruits juices Low-sodium, salt-free vegetable juices	Regular vegetable juices Fruits processed with salt or sodium-containing compounds
Milk	*Limit to 2 servings per day:* Milk; chocolate milk; yogurt; frozen yogurt	Buttermilk
Meats and Meat Substitutes	Any fresh or frozen beef, lamb, pork, and poultry Fish and most shellfish; canned tuna or salmon, rinsed Eggs and egg substitutes Low-sodium cheese Regular peanut butter (3 times/week) Dried peas and beans Frozen dinners (<600 mg sodium) *Limit to 1 serving per day*: Regular cottage cheese or ricotta (½ cup); Swiss or mozzarella cheese (1 oz)	Any smoked, cured, salted, koshered, or canned fish, poultry, or meat, including bacon, chipped beef, cold cuts, ham, hot dogs, sausage, sardines, anchovies, marinated herring, imitation seafood, and pickled meats Frozen breaded meats Pickled eggs Processed cheese; cheese spreads and sauces
Fats	Butter or margarine Vegetable oils Unsalted nuts *Limit to 1 serving per day:* Regular or fat-free salad dressings or mayonnaise (1 tbsp); fat-free cream cheese *Note: fat-free dressings and cream cheese do not count as a fat, but are limited because of sodium content.*	Bacon, salad dressings containing bacon fat, bacon bits, and salt pork Snack dips made with instant soup mixes or processed cheese Tartar sauce Salted nuts Canned gravy and mixes Olives
Soups	No-added-salt broths and soups made with allowed vegetables; reduced-sodium canned soups and broths	Regular canned or dehydrated regular soups

FOOD GROUP	FOOD ALLOWED	FOOD EXCLUDED
Desserts and Sweets	Ice cream, sherbet, flavored gelatin, jam, jelly, syrup *Limit to 1 serving per day:* Pie (1/8 of 9-inch), homemade, noninstant or low-sodium pudding or custard (½ c), cookies (2), cake (1/16 of 9-inch)	Cheesecake or instant pudding mixes
Miscellaneous	Salt substitute with physician's approval Pepper; herbs; spices Vinegar Ketchup (1 tsp/day); mustard (1 tsp/day) Lemon or lime juice Hot pepper sauce; Worcestershire (1 tsp/day) Low-sodium condiments Salsa (¼ cup)	Any seasoning made with salt, including garlic salt, celery salt, onion salt, and seasoned salt; kosher salt Meat tenderizers Monosodium glutamate Relish Soy sauce, chili sauce, steak sauce, teriyaki sauce, barbecue sauce Most flavored vinegar Cooking wine

SAMPLE MENU

Breakfast	Noon	Evening
Orange Juice	Honey Glazed Chicken	Unsalted Beef Tips & Noodles
Unsalted Cream of Wheat	Steamed Rice	Seasoned Green Beans
Unsalted Scrambled Egg	Steamed Broccoli	Sliced Tomato Salad
Wheat Toast	Fruited Gelatin	French Dressing
Margarine, Jelly	Dinner Roll	Dinner Roll
Milk (1 cup)	Margarine	Margarine
Coffee	Frosted Banana Cake	Peach Halves
Sugar, Creamer	Milk (1 cup)	Iced Tea
	Tea, Sugar	Sugar

FOOD GUIDE — 1,000-MG SODIUM DIET

FOOD GROUP	FOOD ALLOWED	FOOD EXCLUDED
Beverages	Coffee; tea Low-sodium carbonated beverages	Gatorade
Breads, Cereals, Grain Products	Hot cereal without salt Puffed rice, puffed wheat, shredded wheat, and low-sodium dry cereals Low-sodium bread Low-sodium crackers, melba toast, and matzo Tortilla Enriched unsalted rice, barley, and pastas Unsalted tortilla chips, pretzels, potato chips, or popcorn *Limit to 2 servings per day:* Enriched white, wheat, rye, and pumpernickel bread or breadsticks; hard rolls and dinner rolls; homemade bread stuffing	Breads, rolls, and crackers with salted or unsalted tops Quick breads; biscuits; cornbread; muffins Frozen waffles; pancakes Regular dry cereal; instant hot cereals Self-rising flour Commercially prepared rice or pasta mixes Potato chips; salty snack foods
Vegetables	All fresh, unsalted frozen vegetables Low-sodium canned vegetables White or sweet potatoes Squash Unsalted tomato paste	Regular canned vegetables, sauerkraut, pickled vegetables, and others prepared in brine Vegetables seasoned with ham, bacon, or salt pork Tomato sauce, puree, and regular paste Commercially prepared potato mixes Frozen peas, lima beans, and mixed vegetables All frozen vegetables in sauce
Fruits and Juices	All fruits and fruits juices Low-sodium, salt-free vegetable juices	Regular vegetable juices Fruits processed with salt or sodium compounds, eg, some dried fruits
Milk	*Limit to 2 servings per day* Milk Yogurt	Malted milk; milk shake; buttermilk; chocolate milk
Meats and Meat Substitutes	Any fresh or frozen beef, lamb, pork, and poultry Fish and most shellfish; low-sodium canned tuna or salmon Eggs Low-sodium cheese, cottage cheese, and ricotta cheese Low-sodium peanut butter Dried peas and beans	Any smoked, cured, salted, koshered, or canned meat, fish, poultry including bacon, chipped beef, cold cuts, ham, hot dogs, sausage, sardines, anchovies, marinated herring, and pickled meats Frozen breaded meats Egg substitutes; pickled eggs Regular hard and processed cheese; cottage cheese; cheese spreads and sauces Regular peanut butter Frozen dinners
Fats	Unsalted butter or margarine Vegetable oils Low-sodium salad dressing; low-sodium mayonnaise Nondairy creamer (≤1 oz/day) Unsalted nuts Low-sodium cream cheese	Bacon, bacon bits, and salt pork; regular salad dressings; snack dips made with instant soup mixes or processed cheese; canned gravies and mixes; tartar sauce, salted nuts; olives

FOOD GROUP	FOOD ALLOWED	FOOD EXCLUDED
Soups	No-added-salt broths and soups made with allowed vegetables Low-sodium canned soups and broths Low-sodium cream soups made with milk allowance	Regular canned or dehydrated regular soups
Desserts and Sweets	Ice cream Low-sodium pudding Frozen yogurt (count as part of milk allowance) Fruit ice Gelatins and sherbet (not to exceed ½ cup/day) Jam; jelly Syrup	Instant puddings Commercial cake, cookie, and brownie mixes Cheesecake
Miscellaneous	Salt substitute with physician's approval Pepper; herbs; spices Vinegar Low-sodium condiments (ketchup, mustard) Lemon or lime juice Hot pepper sauce Fresh ground horseradish Salsa (¼ cup)	Any seasoning made with salt, including garlic salt, celery salt, onion salt, and seasoned salt; kosher salt Meat tenderizers Monosodium glutamate Worcestershire sauce; regular and low-sodium soy sauce; chili sauce, teriyaki sauce; barbecue sauce Most flavored vinegars Regular condiments Commercial salsa Cooking wine

SAMPLE MENU

Breakfast	Noon	Evening
Orange Juice	Honey Glazed Chicken	Unsalted Beef Tips & Noodles
Unsalted Cream of Wheat	Steamed Rice	Unsalted Green Beans
Unsalted Scrambled Egg	Steamed Broccoli	Sliced Tomato Salad
Melba Toast	Fruited Gelatin	Dinner Roll
Margarine, Jelly	Dinner Roll	Unsalted Margarine
Milk (1 cup)	Unsalted Margarine	Peach Halves
Coffee	Fresh Banana	Iced Tea
Sugar, Creamer	Milk (1 cup)	Sugar
	Tea, Sugar	

FOOD GUIDE — 500-MG SODIUM DIET

Follow the same guidelines as the 1,000-mg diet but include these additional restrictions:

- Use distilled water, not regular tap water.
- Use only unsalted breads, cereals, and crackers.
- Exclude the following vegetables: beets, carrots, all greens (kale, spinach, mustard, and chard), celery, white turnips, rutabagas, and peas.
- Exclude gelatin and sherbet.

NUTRITION MANAGEMENT OF POTASSIUM INTAKE

Description
The medical condition and nutritional requirements of the patient influence whether the dietary intake of potassium is adequate. The amount of potassium in the diet may need to be either increased or decreased, depending on the patient's condition.

Indications
A diet with an increased potassium content is prescribed to retain body potassium stores in the following:

- patients whose long-term use of potassium-losing diuretics, combined with a marginal potassium intake, contributes to potassium depletion
- patients who have increased urinary and gastrointestinal potassium losses resulting from certain diseases or conditions, eg, edema associated with certain cardiac or hepatic disorders, dehydration, the diuretic stage of nephritis

A potassium-supplemented diet may be used in conjunction with pharmaceutical potassium supplements, or alone, in individuals with a mild potassium depletion who are not able to tolerate potassium supplements. However, without supplements, it may be difficult for a patient to consistently increase dietary potassium intake over his or her usual level of intake.

A diet restricting potassium intake is usually required for patients with hyperkalemia, which commonly is caused by renal disease or certain medications. See Medical Nutrition Therapy for Renal Disease in Section IG. For patients requiring a Simplified Renal Diet, refer to Simplified Renal Diet in Section IG.

Nutritional Adequacy
Increased potassium intake: The diet is planned as a Regular Diet with an increase in foods that are high in potassium. The diet is planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA.

Decreased potassium intake: See Dietary Management with the Renal Choice System in Section IG.

How to Order the Diet
To increase potassium intake: Order the diet as "Regular Diet with high potassium foods." If a specific potassium level is desired, specify the level in grams.

Individual potassium intake varies. To determine the patient's current potassium intake, the physician should order a nutrition consult, including a diet recall of the patient's intake of potassium. From this evaluation, the dietitian can make appropriate recommendations for the patient to increase potassium intake.

To decrease potassium intake: See Dietary Management with Renal Choice System and Simplified Renal Diet in Section IG.

Planning the Diet
To increase potassium intake, refer to the Table IF-1: Potassium Content of Common Foods.

See Section IG: Modification of Protein
MEDICAL NUTRITION THERAPY FOR RENAL DISEASE

TABLE IF-1: POTASSIUM CONTENT OF COMMON FOODS

FOOD ITEM	SERVING SIZE	POTASSIUM (mg)
Dairy Products		
Cheese, American	1 oz	101
Cheese, Cheddar	1 oz	127
Ice Cream	¾ cup	192
Milk	1 cup	422
Yogurt, Fruited	1 cup	441
Dried Beans and Peas		
Great Northern Beans	½ cup	344
Lima Beans	½ cup	369
Pinto Beans	½ cup	397
Peas	½ cup	216
Fruits		
Apricots, Dried	5	241
Banana	½ medium	226
Cantaloupe	1 cup of pieces	494
Dates	¼ cup	290
Grapefruit	½ small	156
Honeydew Melon	1 cup of pieces	461
Orange Juice	½ cup	236
Orange	1 small, 2½-inch diameter	237
Prune Juice	½ cup	353
Strawberries	¾ cup	185
Watermelon	1 cup	185
Vegetables		
Broccoli	½ cup	227
Brussels Sprouts	½ cup	247
Mushrooms, Cooked	½ cup	278
Potato, Baked in Skin	1-2 1/3 × 4 ¾ inches	609
Potato, Mashed With Margarine	½ cup	244
Spinach	½ cup	419
Sweet Potatoes	½ cup	348
Tomato, Fresh	2 slices	109
Tomato Sauce	¼ cup	226
Breads and Cereals		
Bran Buds	1/3 cup	421
Bran Flakes	½ cup	123
Oatmeal, Cooked	½ cup	200
Raisin Bran	1¼ oz (1 box)	184
Wheat Germ	1 tbsp	134
Whole Wheat Bread	1 slice	26
Meats, Fish, Poultry		
Beef; Chicken	1 oz	79 (average)
Tuna	¼ cup	89
Nuts		
Peanut Butter	2 tbsp	91
Peanuts, Dry Roasted	1 oz	230
Pecans	1 oz	105

Source: USDA Handbook No. 8. Washington, DC: US Dept of Agriculture; 1986.

NUTRITION MANAGEMENT OF PHOSPHORUS INTAKE

Description
Phosphorus intake is limited to the prescribed level.

Indications
Hyperphosphatemia can lead to secondary hyperparathyroidism, resulting in bone disease. To prevent hyperphosphatemia, a phosphorus-restricted diet may be adjunctive to the use of agents that bind phosphorus in the gastrointestinal tract for individuals with chronic renal failure. Generally, phosphorus is restricted to 600 to 1,200 mg/day. However, when a simultaneous restriction of protein is ordered, such as in renal disease, the phosphorus level is generally lowered enough to be within the desired range. With a glomerular filtration of 25 mL/min, phosphate binding substances alone are usually sufficient to control the serum phosphorus level. See Diet in Renal Disease in Section IG.

Nutritional Adequacy
If the phosphorus level is restricted to a level below 800 mg, the Dietary Reference Intakes (DRIs) for phosphorus will not be met. If milk products are restricted in order to achieve this level of phosphorus, the DRI for calcium, vitamin D, and riboflavin may not be met; calcium supplementation may be indicated. See Medical Nutrition Therapy for Renal Disease in Section IG for a discussion of nutritional adequacy for patients with renal disease.

How to Order the Diet
Specify the desired intake of phosphorus in milligrams and any other restrictions, eg, ________ Diet, ___ mg phosphorus.

Planning the Diet
Generally, the phosphorus restriction can be met by:

- limiting the intake of foods containing milk
- eliminating legumes, nuts, chocolate, and cola from the diet
- substituting refined grains for whole grains

Refer to Table IF-2: Phosphorus Content of Common Foods, for additional foods that may warrant restriction.

See Section IG: Moderation of Protein
MEDICAL NUTRITION THERAPY FOR RENAL DISEASE

TABLE IF-2: PHOSPHOROUS CONTENT OF COMMON FOODS

FOOD ITEM	SERVING SIZE	PHOSPHORUS (mg)
Dairy Products		
Cheese, American	1 oz	112
Cheese, Cheddar	1 oz	143
Cheese, Cottage	½ cup	69
Ice Cream	¾ cup	101
Milk	1 cup	250
Yogurt, Fruited	1 cup	271
Dried Beans and Peas		
Great Northern Beans	½ cup	145
Lima Beans	½ cup	100
Pinto Beans	½ cup	136
Peas	½ cup	94
Breads and Cereals		
Bran Buds	1/3 cup	218
Bran Flakes	½ cup	96
Oatmeal, Cooked	½ cup	122
Raisin Bran	1 ¼ oz (1 box)	132
Wheat Germ	1 tbsp	162
Whole Wheat Bread	1 slice	64
Meats, Fish, Poultry		
Beef; Chicken	1 oz	65 (average)
Egg	1	90
Tuna	¼ cup	53
Nuts		
Peanut Butter	2 tbsp	103
Peanuts, Dry Roasted	1 oz	100
Pecans	1 oz	86
Miscellaneous		
Cola	12 oz	45
Chocolate	1 oz	40

Source: USDA Handbook No. 8. Washington, DC: US Dept of Agriculture; 1986.

NUTRITION MANAGEMENT OF CALCIUM INTAKE

Description
The medical condition and nutritional requirements of the patient influence whether the dietary intake of calcium is adequate. The amount of calcium in the diet may need to be either increased or decreased, depending on the patient's condition.

Indications
Calcium restriction may be indicated for the following:

- to control hypercalciuria
- in conjunction with overall treatment for urolithiasis

An adequate intake of calcium has been associated with a reduced risk of osteoporosis. The Dietary Reference Intakes (DRIs) includes the amount of calcium needed to reduce the risk of osteoporosis (1). However, it is difficult for many women to consume these levels without supplementation.

Nutritional Adequacy
Calcium-Restricted Diet: The diet is inadequate in calcium, vitamin D, and riboflavin.

Calcium-Enhanced Diet: The diet meets the DRIs as stated in the *Statement on Nutritional Adequacy* in Section IA.

How to Order the Diet
To decrease calcium in the diet: Specify the desired level of calcium intake in milligrams. Include any other necessary restrictions. Order ______Diet, _____ mg calcium.

To increase calcium in the diet above the DRI: Specify the desired level of calcium in milligrams. The DRI for calcium for males and females is as follows (1):

Age (years)	**Calcium (mg/day)**
9-18	1,300
19-50	1,000
≥51	1,200

Planning the Diet
To restrict calcium: Eliminate milk and all milk products.

To encourage increase in calcium intake: Refer to Table IF-3: Calcium Content of Common Foods, for additional foods to encourage eating. If supplementation is required, recommend supplements with calcium carbonate, since this form contains the best absorbed calcium. Read the supplement's label to determine the actual amount of calcium, which usually is referred to as elemental calcium (2).

Adequate intake or synthesis of vitamin D is critical to ensure adequate absorption of calcium. The DRI for vitamin D for men and women is as follows (1):

Age (years)	**Vitamin D (IU)**
19-50	200
51-70	400
≥71	600

Although vitamin D is synthesized in the skin from exposure to sunlight, studies have shown that older adults usually do not have adequate exposure to sunlight to synthesize the necessary vitamin D. This problem is compounded by increased use of sunscreens with high sun protection factors and an inefficiency of the skin to manufacture vitamin D as adults age. For adults over 50 years of age and younger adults who spend little time outside, it may be advised to take a daily multivitamin with vitamin D (which typically contains 400 IU of vitamin D) (3-5).

TABLE IF-3: CALCIUM CONTENT OF COMMON FOODS

FOOD ITEM	SERVING SIZE	CALCIUM (mg)
Milk and Dairy Products		
Cheese		
American	1 oz	174
Cheddar	1 oz	204
Cottage, Creamed	1 oz	68
Mozzarella, Part Nonfat	1 oz	183
Parmesan Cheese	1 tbsp	70
Swiss	1 oz	272
Hot Cocoa	1 cup	106-300
Ice Cream	½ cup	88
Ice Milk	½ cup	102
Milk, Whole, Nonfat, Chocolate	1 cup	287-300
Pudding	½ cup	125-187
Sherbet	½ cup	52
Yogurt, Fat-Free	8 oz	314
Yogurt, Frozen	4 oz	105
Yogurt, Fruit-Flavored	8 oz	415
Yogurt, Plain	8 oz	415
Fish		
Sardines, Canned With Bones	1 oz	101
Salmon, Canned With bones	1 oz	74

Fruits and Vegetables: See Section IA: Normal Nutrition Vegetarian Diet – Food Sources of Nutrients.

Source: USDA Handbook No. 8. Washington DC: US Dept of Agriculture; 1986.

References

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PROTEIN-CONTROLLED DIET

Description
Adjustment of the amount and type of protein characterizes the Protein-Controlled Diet. Energy and protein are provided to attempt maintenance of nitrogen balance and support liver regeneration.

Indications
The diet is used in the treatment of hepatic disorders, including the following:

- hepatitis
- biliary cirrhosis
- alcoholic liver disease
- hepatic cirrhosis

Liver disease causes numerous metabolic problems that can affect all major nutrients and the assessment parameters commonly used to evaluate nutritional status of the patient with hepatic disease. The classic signs of liver disease are anorexia, weight loss, and nausea with marked deficiencies in energy, protein, vitamins, and minerals (1,2).

Although malnutrition does not correlate with the type of liver disease, therapeutic modifications vary according to the type and severity of hepatic insufficiency. Generally, fatty liver requires little to no nutrition intervention, while cirrhosis necessitates major changes in the patient's food intake. A major goal of medical nutrition therapy in liver disease is to prevent and treat hepatic encephalopathy (1).

Hepatic disease can profoundly affect the nutritional status of the patient because of its effects on carbohydrate, fat, protein, vitamin, and mineral metabolism. Metabolic disorders of the following are commonly seen in the clinical setting of patients with hepatic insufficiency:

- Carbohydrates: Adverse effects can include hypoglycemia or hyperglycemia. Hypoglycemia is most frequently seen in acute hepatitis or fulminant liver disease, probably due to impaired gluconeogenesis (1,3). Hyperglycemia is commonly observed secondary to counteracting catabolic hormones and insulin resistance when superimposed by acute stress and injury (1).

- Fats: Malabsorption may occur because of inadequate production of bile salts. This may lead to steatorrhea, which could lead to deficiencies in fat-soluble vitamin and calcium levels. Researchers have found an increase in serum lipids, reflecting lipolysis (1,3).

- Protein: The effect of hepatic injury on protein metabolism is more dramatic than is carbohydrate or fat metabolism. There is a decrease in synthesis of serum albumin, the transportation of proteins, and the clotting factors (1,3). The ability of the liver to synthesize urea decreases, which results in an accumulation of ammonia and a decrease in serum urea level. This derangement in metabolism elevates the serum aromatic amino acids (AAAs) (phenylalanine, tryptophan, and tyrosine) and methionine and decreases the serum branched-chain amino acids (BCAAs) (valine, isoleucine, and leucine). The only enzymes that metabolize AAAs are located in the hepatocytes. In hepatic insufficiency, there is a decrease in hepatic oxidation of AAAs, leading to an increase in circulation of AAAs in the plasma. In contrast, BCAAs are metabolized primarily by the skeletal muscle. There is an increase in BCAA oxidation in the peripheral tissue during stress, causing a drop in plasma circulation (1).

- Vitamins and minerals: Hepatic injury results in decreased absorption, transport, and storage and may alter the metabolism of vitamins and minerals. Cirrhotic livers have been reported to store decreased levels of thiamine; folate; riboflavin; niacin; pantothenic acid; vitamins B_6, B_{12}, and A; zinc; and cobalt (1,4). In chronic liver disease, the hydroxylation of dietary and endogenous vitamin D to the active form (25-hydroxy derivative) is impaired and may lead to a deficiency state with concomitant osteomalacia. Although there are possibilities of vitamin and mineral deficiencies, supplementation should be administered only when a specific nutrient deficiency is identified. Supplementation should be monitored. Vitamin K deficiency may be induced from malabsorption with steatorrhea, dietary deficiency, impaired hepatic storage, and/or decreased production of gut flora due to intake of antibiotics. If vitamin K deficiency occurs, the rate at which prothrombin is converted to thrombin is affected, thus hampering the coagulation process and producing inadequate clotting factors (1). Intravenous or intramuscular vitamin K often is given for 3 days to rule out hypopothrombinemia due to deficiency (4).

Nutritional Adequacy
Diets containing less than 50 g of protein may be inadequate in thiamin, riboflavin, calcium, niacin, phosphorus, and iron based on the *Statement on Nutritional Adequacy* in Section IA. Supplementation may be indicated but should be assessed on an individual basis.

How to Order the Diet
The diet order should specify the grams of protein required from food. Base the grams of protein ordered on the patient's estimated desirable weight or adjusted weight. To calculate weight, see Section II (Adjustment of Calculated Body Weight for Obese Patients, or Weight for Height Calculation-5' Rule). If a special formula is requested, the amount should be specified. Specify any restriction such as sodium, fluid, or other nutrients.

Planning the Diet
The table below outlines the recommended nutrient prescription according to type of hepatic disease (1,5-7).

Type of Hepatic Disease	**Nutrient Prescription**
Fatty liver/steatosis	Abstinence from ethanol Weight reduction, if attributable to obesity Reduced energy and dextrose intake, especially if patient is receiving total parenteral nutrition (TPN)
Hepatitis (acute/chronic/alcoholic)	Energy: 30-40 kcal/kg Protein: 1.0-1.5 g/kg Fat: Not restricted
Cirrhosis (uncomplicated)	Energy: 30-40 kcal/kg Protein: 1.0-1.5 g/kg
Cirrhosis (complicated)	Energy: 40-50 kcal/kg (with malnutrition); 30-40 kcal/kg (with cholestasis) Protein: 1.0-1.8 g/kg (with malnutrition); 1.0-1.5 g/kg (with cholestasis)
Esophageal varices	Liberal diet consistency, normal consistency is encouraged as tolerated
Ascites	Sodium restriction: 2 g/day with diuretics Fluid restriction: Use clinical judgment Fat-soluble vitamin supplement up to 100% RDA may be necessary in cholestatic cirrhosis
Hepatic encephalopathy	Energy: 25-40 kcal/kg Protein: 0.5-1.2 g/kg. Start at 0.5 g/kg per day and progress by +10 g/day as tolerated. Do not give products enriched with glutamine.
Type of Hepatic Disease (con't)	**Nutrient Prescription**
Hepatic coma	Use tube-feeding Protein: Start at 0.5g/kg per day and progress by +10 g/day as tolerated. Do not give products enriched with glutamine.
Steatorrhea >10 g/day	Fat: 40 g/day (long-chain triglycerides) Supplement with medium-chain triglycerides to provide additional energy

Meal size and frequency: Some patients require small portions and frequent feedings because ascites limits the capacity for gastric expansion. Studies have shown that the metabolic profile after an overnight fast in patients with cirrhosis is similar to normal individuals undergoing prolonged starvation without any associated stress. Cirrhosis can be considered a disease of accelerated starvation with early recruitment of alternative fuels. A small-scale study showed patients with cirrhosis who received an evening snack to supply energy during sleeping hours were able to maintain a greater positive nitrogen balance than did other patients who were fed less frequently (2).

Commercial supplements: Supplementation with enteral formulas is often necessary to increase the patient's intake. Modular products of carbohydrates and fat can increase energy intake without increasing protein intake. The usefulness of special products containing BCAAs is controversial, and these products generally have a higher cost.

SAMPLE MENU
(50 g of protein)

Breakfast	Noon	Evening
Orange Juice (½ c)	Garden Green Salad (1 oz) with	Cranberry Juice Cocktail (½ cup)
Oatmeal (½ c)	Dressing (1 tbsp)	Oven Fried Chicken (2 oz)
Toast (2 slices)	Roast Beef Sandwich	Buttered Rice (½ c)
Margarine (2 tsp)	Roast Beef, Shaved (1 oz)	Seasoned Green Beans (½ c)
Jelly (1 tbsp)	Bread (2 slices)	Dinner Roll (1)
Milk (½ c)	Mayonnaise (2 tbsp)	Margarine (2 tsp)
Sugar	Sliced Tomato (1 oz)	Sliced Peaches (½ c)
Coffee; Tea	Fresh Fruit Salad (½ c)	Lemonade
Nondairy Creamer	Fruit Punch	
Snack	**Snack**	**Snack**
Hard Candy (6 pieces)	Fruit Ice (3 oz)	Banana (1)
Jelly Beans (1 oz)		Dry Cereal (¾ oz)
		Milk (½ c)

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PROTEIN-BASED EXCHANGES

Exchange	Protein (g)
Meat and Meat Substitutes	7
Milk	4
Starch/Bread	2.5
Vegetables	2
Fruit	Negligible
Low-Protein Products	0.2
Sweets	Negligible
Fats	Negligible

Meat and Meat Substitutes (7 g protein)	**Portion**	**Variances in Portion or Protein Content (0.2 g) Noted**
Egg	1 large	1 medium egg = 5.7 g
Cheese, Natural Hard or Semisoft	1 oz	
Cheese, Processed (eg, American)	1 oz	6.6 g
Cottage Cheese	¼ cup	
Meat, Fish, Poultry, Lean Portion Cooked	1 oz	
Meat, Ground or Flaked	¼ cup (1 oz)	
Legumes, Cooked:	½ cup	
Black Beans		7.6 g
Garbanzo Beans		7.3 g
Kidney Beans		6.7 g
Lentils		8.9 g
Lima Beans		7.3 g
Pinto Beans		7.0 g
Black-Eyed Peas (Cow Peas)		5.7 g
Peanut Butter	2 tbsp	7.9 g
Milk (4 g protein)		
Cream, Half-and-Half	½ cup	3.6 g
Cream, Light	½ cup	3.3 g
Cream, Heavy Whipping	¾ cup	3.7 g
Cream, Heavy, Fluid	¾ cup	3.6 g
Cream Cheese	2 tbsp	2.1 g
Milk, Whole, Low-Fat, Nonfat, or Chocolate	½ cup	
Yogurt, Fruited	½ cup	4.5 g
Yogurt, Plain, Low-Fat, Vanilla	1/3 cup	
Custard	1/3 cup	
Pudding	½ cup	
Starch/Bread (2.5 g protein)		
Bread, white, rye, whole wheat	1 slice	
Biscuit	1	Approx. 1-oz biscuit = 2.0 g
Cereal, Cooked		
Cream of Rice	6 oz	1.6 g
Farina	6 oz	2.6 g
Grits	6 oz	2.7 g
Maltex	4 oz	2.9 g
Oatmeal	4 oz	3.0 g
Ralston	4 oz	2.8 g
Rolled Wheat	4 oz	2.5 g
Wheatena	4 oz	2.8 g

Protein-Based Exchanges (continued)

Starch/Bread (cont.)	Portion	Variances in Portion or Protein Content (0.2 g) Noted
Cereal, Ready-to-Eat		
40% Bran Flakes	1 oz	3.6 g
Corn Flakes	1 box (¾ oz)	1.7 g
Crisp Rice	1 box (5/8 oz)	1.2 g
Puffed Rice	½ oz	0.9 g
Puffed Wheat	½ oz	2.1 g
Shredded Wheat	1 oz	3.1 g
Crackers		
Graham	4 squares	2.3 g
Saltines	6	3.0 g
Muffin, Corn	1	Approx. 1½ oz = 2.8 g
Pasta, Rice, Noodles, Cooked	½ cup	
Ice Cream	½ cup	2.4 g
Ice Milk	½ cup	2.6 g
Starchy Vegetables (2.5 g protein)		
Corn	½ cup	
Peas, Green	¼ cup	½ cup = 4.1 g
Potato, Baked	1 (5 oz)	3.2 g
Potatoes, French Fried, 2-3½ Inches Long	10	3.2 g
Potato, Mashed	½ cup	2 g
Potato, Peeled and Boiled	1 small (5 oz)	
Sweet Potato or Yam, Canned	½ cup	
Winter Squash	½ cup	1.5 g
Other Vegetables (2 g protein)		
All Others, Cooked, Except Those in *Starch/Bread* and *Meat and Meat Substitutes* Groups	½ cup	
Fruits (Negligible Protein)		
All		
Low-Protein Products (each exchange contains 0.2 g protein)		
Low-Protein Bread	1 slice (1½ oz)	
Low-Protein Rusks	2 slices	
Low-Protein Macaroni or Noodles	½ cup, cooked (¼ cup dry)	
Low-Protein Gelatin	½ cup, prepared (negligible protein)	
Low-Protein Cookies	2	

Sweets (negligible protein)
Candy: Hard Candy, Lollipops, Jelly Beans, Gum Drops, Marshmallows
Carbonated Beverages
Lemonade; Limeade
Noncarbonated Soft Drinks
Jam; Jelly
Popsicles; Fruit Ice, Italian Ice
Sugar; Syrup; Honey

Fats (negligible protein)
Butter or Margarine
Oil or Shortening
Mayonnaise
Salad Dressing (except sour cream based or cream cheese)
Nondairy Creamer
Gravy (meat drippings with fat, thickened with cornstarch)

MEDICAL NUTRITION THERAPY FOR RENAL DISEASE

For CMC, CIR, University facilities, CLICK HERE.

For Kidney/Cardiac Transplant Diet Guidelines, CLICK HERE.

Description
Based on individual needs, the diet is controlled in one or more constituents: protein, sodium, potassium, total fluid, or phosphorus. The diet may also be modified to provide adequate amount of energy, vitamins, and minerals.

Indications
Conservative Dietary Management
The goals for conservative dietary management are to minimize uremic toxicity, prevent wasting and malnutrition, and slow the progression of renal insufficiency. Typically, chronic renal failure progresses until treatment by dialysis or transplantation is required. The primary challenge in managing the uremia of kidney failure is to reduce the amount of nitrogenous waste that must be excreted by the kidney and yet maintain a positive nitrogen balance. Nitrogenous wastes are reduced by restricting protein intake and by providing at least sixty percent (for predialysis) or fifty percent (for hemo- or peritoneal dialysis) of the total protein as high biological value so that there is less excess nitrogen to be removed (1,2) Adequate energy (>35 kcal/kg of ideal body weight, or IBW) is recommended to reduce protein degradation (3).

Hemodialysis
Hemodialysis uses an artificial kidney (hemodialyzer) to cleanse the blood. This process can return the body to a more normal state by removing excess fluid and waste products. It does not replace the endocrine functions of the kidney. The average treatment lasts 3 to 5 hours and is usually required three times a week. Treatment is based on adequate urea clearance to equal a urea reduction rate (URR) of 65 or a KT/V (clearance of the dialyzer × time/volume) of 1.2. (URR is the percentage of change in blood urea nitrogen (BUN) in a single dialysis treatment. BUN_1 - BUN_2/100.)

Peritoneal Dialysis
This type of dialysis involves the removal of waste products and water within the peritoneal cavity, using the peritoneal membrane as a filter. In peritoneal dialysis, the dialysis solution (dialysate) is instilled through the peritoneal catheter into the peritoneal cavity or peritoneum. The many blood vessels and capillaries throughout the peritoneum are separated from the peritoneal cavity by a layer of mesothelium. Passive movement from the peritoneal capillaries into the dialysate removes the uremic toxins. The high osmolality of the dialysate due to the high dextrose concentration results in the removal of extracellular fluid. There are two major types of peritoneal dialysis (intermittent peritoneal dialysis also is available; however, it is not used as a standard treatment):

- Continuous ambulatory peritoneal dialysis (CAPD), whereby a continuous presence of a dialysate in the peritoneal cavity is interrupted intermittently for drainage and instillation of fresh dialysate. The exchanges are usually done four times a day, with only a 30- to 35-minute interruption of daily activity for each exchange. The dialysate is allowed to dwell in the peritoneal cavity for 3.5 to 4 hours during the day and about 8 to 10 hours at night.

- Continuous cyclic peritoneal dialysis (CCPD), which allows for more daytime freedom by decreasing the catheter connections to two a day. A cycler machine is used to deliver three or four exchanges each night, lasting 2½ to 3 hours each. Approximately 2 L of dialysate is left in the peritoneal cavity during the day. The residual fluid remains in the abdomen for 12 to 15 hours and is drained when the patient begins the nightly routine again.

Alternative Dialytic Treatments

- Continuous arteriovenous hemofiltration (CAVH) and continuous venovenous hemofiltration (CVVH) utilize a polysulfane membrane to remove some of the solutes. No dialysis is used. When CAVH is used, protein requirements should be estimated in a range of 1.5-1.8 g/kg per day (3,4).

Transplantation
A transplant offers a relatively favorable long-term outlook and adds several productive years for some individuals with end-stage renal disease (ESRD), especially young children. A functioning transplanted kidney performs the excretory and regulatory functions of a normal kidney. Successful transplantation frees the patient from the time-consuming demands of dialysis and a strict dietary regimen.

Nutritional Adequacy

Because individual diets in renal disease may vary widely as to the nutrients controlled, a general statement on nutritional adequacy is not given. Refer to statements for each constituent in the respective sections:

- Section IF: Nutrition Management of Potassium Intake
  Sodium-Controlled Diets
  Nutrition Management of Phosphorus Intake
- Section IG: Protein-Controlled Diet

See Section III: Clinical Nutrition Management
END-STAGE RENAL DISEASE

How to Order the Diet

Refer to the "How To Order the Diet" instructions for each of the components required in the respective chapters (See Nutritional Adequacy on the preceding page. Also refer to Nutrition Management of Fluid Intake in Section IA.

Planning the Diet

Energy

The energy intake should be adequate to maintain or achieve an IBW. The energy level of the diet determines whether the diet will produce positive or negative nitrogen balance. Unless there are sufficient calories from carbohydrate and fat, protein will be used for energy production. As a source of energy, complex carbohydrates providing extra fiber are stressed whenever possible, since constipation is a frequent problem in uremic patients. Energy intake greater than 35 kcal/kg is recommended to provide adequate energy when body mass index (BMI) is 20 kg/m^2 to 27 kg/m^2.

In peritoneal dialysis, glucose is absorbed from the dialysate. Dietary energy may need to be decreased to prevent excess weight gain and obesity. An average weight gain of 5 kg/year has been reported. Glucose absorption varies in each patient due to individual peritoneal permeability. Some patients undergoing CAPD or CCPD have been shown to absorb more than 800 kcal/day from the dialysate, depending on which exchange concentrations are used. See Determination of Glucose Absorption During CAPD later in this section.

Protein

Controversy still remains as to when to implement protein restriction and at what level. Evidence from the Modification of Diet in Renal Disease Trial (MDRD) indicates that protein restriction can slow progression of chronic renal failure (CRF). Recommendations for dietary protein in progressive renal failure are 0.8 g/kg per day, sixty percent high biological value (HBV), along with sufficient energy in the patient with no symptoms of uremia and glomerular filtration rate (GFR) greater than or equal to 55mL/min. When the GFR is 25 to 55 mL/min, the use of 0.6 g/kg per day of protein, 60% HBV has been found to be beneficial in terms of reducing or eliminating uremic symptoms and slowing the loss of renal function (1,3).

Hemodialysis: The protein recommendation for patients undergoing hemodialysis three times a week is 1.0 to 1.5 g/kg of IBW. Some researchers recommend an additional 0.2 g/kg per day as protein or essential amino acids (3,5,6). In a single hemodialysis treatment in a nonfasting patient, 6 to 10 g of free amino acids and 3 to 4 g of peptides are lost. About 30% to 40% of the amino acids lost during hemodialysis are essential. Therefore, HBV protein should represent at least half of the total protein content of the diet. Reuse of dialyzers may increase amino acid losses, depending on the composition of the dialyzer.

Peritoneal dialysis: In peritoneal dialysis, the patient's requirement for protein is increased. When used for long-term management of patients with ESRD, peritoneal dialysis has been associated with progressive wasting and malnutrition. Several factors contribute to this wasting, including anorexia (caused by inadequate dialysis, superimposed additional and secondary illnesses, discomfort, fullness, or severe dietary restriction); losses to dialysate of protein, amino acids, and vitamins; and peritonitis leading to catabolism. (During episodes of peritonitis, there are increased protein losses, which continue several days to 1 week after the clinical signs of peritonitis subside. Some researchers believe this loss may continue for even longer periods.) Protein and albumin losses with the dialysate vary from patient to patient but are fairly consistent within an individual. Of the protein lost, 66% to 80% is albumin. Protein losses in patients undergoing CCPD approximate those in patients receiving CAPD. A minimum protein intake of 1.2 to 1.5 g/kg of IBW per day has been suggested for clinically stable patients undergoing CAPD.

Sodium and Fluid

Hemodialysis: The allowance for the hemodialysis patient can vary from 2 to 3 g of sodium per day and depends largely on urine output. The more urine the patient produces, the more sodium the patient may eliminate via the urine. Under steady-state conditions, urinary output usually provides a good guide for the fluid intake. Urine volume (in 24 hours) plus 1000 cc for insensible water losses through the lungs and skin should allow for a fluid weight gain of 1 or 2 lb/day.

Peritoneal dialysis: Sodium balance and blood pressure can be well controlled with CAPD or CCPD. As much as 5,700 mg/day of sodium can be removed with CAPD. The patient must be aware of the symptoms of hypotension and methods for avoiding it. For sodium requirements, each patient must be individually evaluated for parameters such as weight (dry weight versus fluid weight), blood pressure (hypo- or hypertension), shortness of breath, and edema. Most patients do well with little or no restriction of sodium (3 to 4 g/day). However, sodium may need to be restricted 2 to 4 g/day in patients who use few high-dextrose exchanges to control fluid weight gains.

Fluid generally is not restricted for patients on CAPD or CCPD, but patients should know how to monitor their weight and blood pressure. Adjustments in fluid balance can be made by altering the quantity or strength of hypertonic solutions. Patients must take their own blood pressure readings and weigh themselves regularly to determine the concentration of exchanges necessary to maintain fluid balance.

Potassium

Renal patients who have urine outputs of at least 1,000 mL/day usually do not develop hyperkalemia, even without dietary limitation. Generally, patients undergoing maintenance hemodialysis manage to achieve serum potassium levels between 3.5 and 6.0 mEq/L with diets containing 40 mg/kg of IBW. Patients on CAPD or CCPD may not need potassium restrictions; however, the potassium ingested should be distributed throughout the day, not consumed all at one time.

Phosphorus

Hemodialysis: Phosphorus is routinely restricted in patients undergoing hemodialysis. Hyperphosphatemia usually develops when the GFR falls below 25 mL/min. Hyperphosphatemia is harmful because it contributes to secondary hyperparathyroidism. Control of serum phosphorus is usually not possible by diet alone. Calcium carbonate ($CaCO_3$) or calcium acetate is the medication of choice for phosphate control. Phosphate binders are given at mealtimes to bind the phosphate from food. The prescribed amount should be individualized according to the amount of phosphate present in a meal. The general dietary recommendation is less than or equal to 8-17 mg/kg of IBW (1,7). Approximately 50% of phosphorus (PO_4) ingested is absorbed. One gram of $CaCO_3$ binds roughly 40 to 60 mg of PO_4, 1 g of calcium acetate binds 39 mg PO_4, and $CaCO_3$ contains 40% elemental calcium, when calcium acetate is composed of 25% elemental calcium. As a standard, calcium acetate contains 167 mg of elemental calcium in each tablet and $CaCO_3$ contains 500mg. If PO_4 is greater than 6 mg or the Ca/PO_4 product is greater than 70 mg, then an aluminum-containing binder may be considered provided the patient does not have an elevated aluminum level. Binders containing aluminum hydroxide are used for a limited time due to the possible toxicity.

Peritoneal dialysis: Phosphorus may need some restriction, but considering the high protein needs of most patients, it is difficult to restrict phosphorus to 15 mg/g of protein. Phosphate binders are still required by most patients to maintain reasonable serum phosphorus levels.

Calcium

Calcium supplementation frequently is prescribed. Intestinal absorption of calcium is impaired in uremia due to the lack of the active form of vitamin D. Also, diets prescribed for patients with ESRD tend to be low in calcium because of the restriction of dairy products. Calcium supplements containing 1 to 2 g of elemental calcium per day may be given. The general dietary recommendation depends on the serum level. These supplements are taken between meals, and are not to be confused with those used to bind phosphorus. An activated form of vitamin D (calcitriol) can also be used to enhance calcium absorption.

Magnesium

The kidney is the organ primarily responsible for the normal maintenance of serum magnesium. Most patients with uremia should avoid the use of laxatives, enemas, or phosphate binders containing magnesium. Hypermagnesemia may occur when the tap water used to prepare the dialysate contains excess magnesium. The dialysate should not contain more than 0.5 to 1.0 mEq/L of magnesium. Excess magnesium accumulates largely in bone, where it is deleterious to bone metabolism. Symptoms include muscle weakness, hypotension, electrocardiographic change, sedation, and confusion. Magnesium may be decreased in dialysate and used as a phosphate binder along with $CaCO_3$.

Guidelines for Vitamin and Trace Mineral Supplementation in Renal Failure

Vitamins: Studies do not support routine supplementation of fat-soluble vitamins other than vitamin D for patients consuming well-balanced, adequate diets. Supplementation with 1,25 dihydroxycholecalciferol, the active form of vitamin D in the presence of $CaCO_3$, must be individualized and its effects on calcium levels frequently monitored (6). Vitamin K may be considered for the patient who has been receiving antibiotic therapy. Water-soluble vitamins, especially vitamin C, folate, and pyridoxine are recommended, as deficiencies may occur secondary to poor appetite, altered metabolism, uremia, removal by dialysis, and restricted diet. Each patient should be evaluated and treated with vitamins according to individual need.

Trace minerals: Patients with CRF experience alterations in trace mineral metabolism; serum or tissue levels or both can be high or low. Trace minerals should be supplemented or restricted only after appropriate biochemical assessments have been made.

NUTRITION REQUIREMENTS FOR ADULTS WITH RENAL DISEASE BASED ON TYPE OF THERAPY (7,8)

THERAPY/ DIAGNOSIS	ENERGY	PROTEIN	FLUID	SODIUM	POTASSIUM	PHOSPHORUS
Impaired renal function (ARF, predialysis, renaal insufficiency)	35 kcal/kg* 40-50 kcal/kg (for repletion) 20-30 kcal/kg (obesity)	0.6-0.8 g/kg >60% HBV 1.0 g/kg (anabolism) 1.5 g/kg with CAVH	As needed	2-3 g/day, variable based on input/losses	2 g/day variable, usually as needed to cover losses with diuretics	10-12 mg/g protein or ≤ 10 mg/kg/day
Hemodialysis	30-35 kcal/kg	1.2-1.4 g/kg > 50% HBV	Urine output + 1000 cc	2-3 g/day	2-3 g/day Adjust to serum levels	12-15 mg/g protein or ≤ 17 mg/kg IBW/day
Intermittent peritoneal dialysis (IPD)	25-35 kcal/kg (40-50 kcal/kg for repletion)	1.2-1.5 g/kg > 50% HBV 1.5g/kg (for repletion)	Urine output + 1000 cc	2-3 g/day	2-3 g/day	12-15 mg/g protein or ≤ 17 mg/kg IBW/day
Continuous ambulatory peritoneal dialysis (CAPD)	≥ 35 kcal/kg (include dialysate kcals) (40-50 kcal/kg for repletion) 20-25 kg/kcal for weight loss	1.2-1.5 g/kg > 50% HBV 1.5 g/kg (for repletion)	Minimum of 2000 cc day + urine output	2-4 g/day	3-4 g/day Adjust to serum levels	12-15 mg/g protein or ≤ 17 mg/kg IBW/day
Diabetic on hemodialysis, IPD, or CAPD	35 kcal/kg (40-50 kcal/kg for repletion)	1.2-1.4 g/kg	Same as above. Monitor thirst, blood sugar, and weight changes.	Same as above.	Same as above. Increased blood sugar may cause increased potassium.	12-15 mg/g protein or ≤ 17 mg/kg IBW/day

*To calculate above requirements use ideal body weight (IBW) (5) or base calculation on standard (eg, weight for height tables by frame size as used in MDRD study) (2). Use usual weight if recent weight change. Adjust weight for obesity or amputation.

NUTRIENT AND FLUID RECOMMENDATIONS FOR THE PEDIATRIC PATIENT WITH RENAL INSUFFICIENCY

PROTEIN REQUIREMENTS (g/kg)				
Age	**Predialysis**	**Hemodialysis**	**Peritoneal Dialysis**	**Transplant[a]**
0-6 mo	2.2	3.3	2.5	3
7-12 mo	1.6	2.4	2.5-4	3
1-3 yr	1.2	1.8	2.0-2.5	2-3
4-6 yr	1.2	>1.8	2.0-2.5	2-3
7-10 yr	1.0	>1.5	2.0-2.5	2-3
11-18 yr	0.9	>1.3-1.5	1.5	2

Source: Wilkins K. *Suggested Guidelines for Nutrition Care of Renal Patients*. Chicago, Ill: The American Dietetic Association; 1992.
[a]Initially, DRI after approximately 3 months.

ENERGY, SODIUM, POTASSIUM, CALCIUM, PHOSPHORUS, AND FLUID REQUIREMENTS (predialysis, hemodialysis, peritoneal dialysis)						
Age	**Energy[a]** (kcal/kg)	**Sodium[b]**	**Potassium[c]** (Meq/kg)	**Calcium (mg/day)**	**Phosphorus (mg/day)**	**Fluid[d]**
0-6 mo	≥108	Generally unrestricted	1-3	400	Use low content formula	Insensible + urinary output + ultrafiltration
7-12 mo	≥98	Generally unrestricted	1-3	600	Use low content formula	Insensible + urinary output
1-3 yr	102	Generally unrestricted	1-3	800	600-800 when serum levels are elevated	Insensible + urinary output
4-6 yr	90	Generally unrestricted	1-3	800	600-800 when serum levels are elevated	Insensible + urinary output
7-10 yr	70	Generally unrestricted	1-3	800	600-800 when serum levels are elevated	Insensible + urinary output
11-14 yr	47 (female) 55 (male)	Generally unrestricted	1-3	1,200	600-800 when serum levels are elevated	Insensible + urinary output
15-18 yr	40 (female) 45 (male)	Generally unrestricted	1-3	1,200	600-800 when serum levels elevated	Insensible + urinary output

Note: Multivitamin preparations and vitamin D metabolites, zinc, iron, or copper are prescribed as needed at all ages. For transplant recipients, energy requirements are the same, sodium requirements are in the upper range, potassium is unrestricted, and calcium and phosphorus are supplemented as needed. Fluids usually are not restricted after transplantation.

[a]Use ideal weight for height and length.
[b]1-3 mEq/kg if edema or hypertension is present.
[c]If needed, usually not until GFR is <10% of normal.
[d]For predialysis, unrestricted unless needed. If restricted, replace insensible + urinary output.

DETERMINATION OF GLUCOSE ABSORPTION DURING CAPD

Energy requirements and nutrient intake calculations for patients receiving continuous ambulatory peritoneal dialysis (CAPD) treatment should take into account carbohydrate absorption from the dialysate.

Formula

1. Glucose present per liter of dialysate (X)
   1.50% Dialysate = 1.3 g/dL
   2.50% Dialysate = 2.2 g/dL
   4.25% Dialysate = 3.8 g/dL

2. Glucose absorbed from each liter of exchange (Y)
   Y = 11.3 (X) – 10.9
   X = Concentration of Glucose (g/dL) in Solution (from 1 above)

   If the patient is using a combination of solutions, find the average concentration used and substitute for (X) in the formula 1 above. The average glucose concentration equals the sum of concentrations divided by the number of liters.

   Kilocalories Absorbed From Dialysate per Day = Grams of Glucose Absorbed per Day × 3.4 kcal/g

   Example: Patient uses *two exchanges (2 L each) of 2.5% dialysate* and *two exchanges (2 L each) of 4.25% dialysate* per day.

   2.50% Dialysate = 2.2 g/dL × 4 L = 8.8 g/dL
   4.25% Dialysate = 3.8 g/dL × 4 L = 15.2 g/dL
   Total 8 L = 24.0 g/dL

   Divide by number of liters to get average concentration per liter:

   24 g/dL ÷ 8L = 3.0 g/dL

   Glucose Absorbed per Liter of Dialysate = 11.3 (3.00 g/dL) – 10.9 = 23 g
   23 g/L × 8L = 184 g Glucose
   184 g × 3.4 kcal/g = 625.6 kcal/day Absorbed From Dialysate

Resources:

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DIETARY MANAGEMENT WITH THE RENAL CHOICE SYSTEM

This system is used in the calculation of the Renal Diet. Foods are divided into groups according to nutrient content and contain roughly equivalent protein, sodium, potassium, and phosphorus content. To differentiate the renal system from the exchange system used for diabetes, the decision was made to use the word *choice* rather than *exchange* when referring to specific foods. Choices have been defined in household measures. For food service portioning, they may be further defined by utensils, or multiples or fractions of the standard portion. The lists here are intended to be a reference for initial planning of diets and menu writing. Additional foods and recipes can be translated into choices through evaluation of micronutrient content.

The following information and Renal and Renal Diabetic Choice Lists are reprinted with permission from The American Dietetic Association, "National Renal Diet: Professional Guide," "Healthy Food Guide for Hemodialysis," and "Healthy Food Guide for Diabetes and Hemodialysis," 1993.

Choice List	Protein (g)	CHO (g)	Sodium (mg/mEq)	Potassium (mg/mEq)	Phosphorus (mg/mEq)	Energy (kcal)
Milk	4	12 (8)[a]	80/3	185/5	110/7	120 (100)[a]
Nondairy	0.5	12	40/2	80/2	30/2	140
Meat	7	—	25/1	100/2	65/4	65
Vegetables	1	5	15/0	0-350/0-9	20/1	25
Starches	2	18 (15)[a]	80/5	35/1	35/2	90 (80)[a]
Fruits	0.5	17 (15)[a]	0	0-350/0-9	15/1	70 (60)[a]
Fats	0	—	55/3	10/.25	5/0	45
High Calorie	0	25 (15)[a]	15/0	20/.5	5/0	100 (60)[a]
Salt Choices	—	—	250/11	—	—	—

[a]Values represent diabetic renal exchanges that differ from renal exchanges. CHO indicates carbohydrate.

Food Choice Lists

The food choice lists are presented in a logical sequence of meal planning beginning with Milk and Meat choices, because the quantity and quality of protein are top priorities in renal diets. Moreover, these high-quality protein foods contain large amounts of phosphorus, and phosphorus restriction is a major goal for all renal patients regardless of treatment modality. The following descriptions of the food groups provide rationales for the inclusion or exclusion of certain foods and explain how serving sizes were established.

Milk choices: Due to the large amount of phosphorus and potassium in milk and milk products, portion sizes are 0.5 cup or equivalent to 4 g of protein. Milk products that are high in refined carbohydrate are excluded from the diabetes renal lists; consequently, the average kilocalorie value is lower in those lists.

Nondairy Milk Substitute choices: These nondairy items are much lower in phosphorus, potassium, and protein than are regular dairy products. Therefore, they can be used easily in renal diets to substitute for milk and to provide sufficient energy.

Meat choices: Each serving on this list is equal to about 7 g of protein, 4 g of fat, and 65 kcal. Meat choices that contain 250 mg or more of sodium are footnoted to indicate that they are also a Salt choice.

Starch choices: This group contains all breads, cereals, pastas, crackers, and selected desserts. Dried beans and legumes do not appear on this list because they contain large quantities of potassium, phosphorus, and nonessential amino acids. In addition, bran and whole-grain items are significantly limited because of their high phosphorus content. With these modifications, the average protein content of the starch group is 2 g per serving.

Average Potassium Values of Vegetable and Fruit Choices

	Average (mg) per Serving	Range (mg)
Low potassium	70	1-100
Medium potassium	150	101-200
High potassium	270	201-300
Very high potassium	—	301-350

Vegetable choices: The average protein content of this group is 1 g. The portion size is 0.5 cup, and the vegetables on the list are divided into low-, medium-, and high-potassium groups.

Fruit choices: To facilitate accurate calculation of low-protein diets, 0.5 g of protein is assigned to the fruit group. For dialysis diets, in which protein intake is not as closely controlled, the dietitian should decide whether to use this value in calculating the meal plan. Fruits are divided by potassium level for dialysis diets as just described. The kilocalorie level assigned to fruits for the diabetes renal lists is lower because sweetened fruits are excluded from the lists.

Fat choices: Seeds and nuts are omitted from this list because they contain low-quality protein, phosphorus, and potassium.

High-Calorie choices: This list includes refined carbohydrates and low-protein products, which provide energy without adding protein. These foods can be used to meet high-calorie needs without exceeding optimal levels of protein and electrolytes, or as concentrated sources of energy for patients with poor appetites. High-Calorie choices contain approximately 100 kcal in the nondiabetes renal lists and 60 kcal (15 g of carbohydrates) in the diabetes renal lists.

Salt choices: The calculation figures are presented with assumption that salt is not added in the preparation of food. Some patients require a specific amount of sodium, which cannot be provided unless their meal plans include some salt or salt-containing foods. Salt choices, equal to 250 mg of sodium per serving, can be calculated into the diet to arrive at the optimal sodium level for each patient.

Beverage choices: For patients undergoing hemodialysis and for some patients undergoing peritoneal dialysis, fluid intake must be restricted. Because some beverages contain large amounts of potassium, phosphorus, or both, the amounts allowed should be calculated into the daily meal plan.

DETERMINING THE DIET PRESCRIPTION

Before determining a patient's diet prescription and calculating his or her meal plan, a complete nutrition assessment should be performed, with special attention to the following factors:

1. Medical history.
2. Physician's orders.
3. Treatment modality (pre-end-stage renal disease [ESRD], hemodialysis, or peritoneal dialysis). Nutrition management of the renal patient depends on the method of treatment as well as on medical and nutritional status. A comparison of treatment methods and primary concerns in each is summarized in the table below.
4. Presence of other chronic diseases, which may affect the nutritional status. As a result, the diet prescription also will be affected.

Comparison of Treatments and Major Concerns for Pre-ESRD, Hemodialysis, and Peritoneal Dialysis Patients[a]

	Pre-ESRD	Hemodialysis	CAPD or CCPD
Treatment	Diet and medications	Diet and medications; Hemodialysis	Diet and medications; peritoneal dialysis
Modality	None	Dialysis using vascular access for waste product and fluid removal	Dialysis using peritoneal membrane for waste product and fluid removal
Duration	Indefinite	3-5 hr 2-3 days/wk	3-5 exchanges 7 days/wk
Concerns	Glomerular hyperfiltration; rise in BUN; bone disease	Amino acid loss; interdialytic electrolyte and fluid changes	Protein loss into dialysate; glucose absorption from dialysate
	Hypertension; glycemic control in diabetes	Bone disease; hypertension	Bone disease; weight gain; hyperlipidemia; glycemic control in diabetes

[a]CAPD indicates continuous ambulatory peritoneal dialysis; CCPD, continuous cyclic peritoneal dialysis; and BUN, blood (serum) urea nitrogen.

PROCEDURE FOR CALCULATING RENAL DIETS

1. Establish the diet prescription (nutrient goals) based on the general recommendations for renal patients (from The American Dietetic Association's "National Renal Diet: Professional Guide", 1993 and the nutrition assessment.
2. Obtain a recall of the patient's usual eating patterns.
3. Determine the amount of HBV protein to be provided. At least two-thirds of total protein intake should be from high-quality protein.
4. Using the calculation figures, determine the number of Milk and Meat choices needed to meet the HBV protein requirement.
5. Divide the remaining protein allowance among Fruit, Vegetable, Starch, and Nondairy Milk Substitute choices.
6. Provide for the remainder of the energy requirements with Fat and High-Calorie choices.
7. Total each nutrient and adjust the diet to meet the previously established nutrient goals.
8. Add Salt choices, if necessary to meet the diet prescription for sodium. (This may be calculated into a regular salted item.)
9. Incorporate Beverage choices based on individual preferences and diet parameters.
10. Formulate a meal plan based, as much as possible, on the patient's usual intake and preferences.
11. Provide a sample menu based on the food choices and the patient's usual eating pattern.

Note: Because of other, more important parameters of the diet, percentages of energy contributed by carbohydrates and fats may differ from those recommended for people with diabetes and good kidney function.

HEALTHY FOOD GUIDE FOR KIDNEY DISEASE

MILK CHOICES

1 choice = 4 g protein
= 120 kcal
= 80 mg sodium
= 185 mg potassium
= 110 mg phosphorus

1 choice = 0.5 g protein
= 140 kcal
= 40 mg sodium
= 80 mg potassium
= 30 mg phosphorus

Milk Choices	Amount
Milk (nonfat, low-fat, whole)	½ cup
Lo Pro	1 cup
Buttermilk, cultured	½ cup
Chocolate milk	½ cup
Light cream or half-and-half	½ cup
Ice milk or ice cream	½ cup
Yogurt, plain or fruited-flavored	½ cup
Evaporated milk	¼ cup
Sweetened condensed milk	¼ cup
Cream cheese	3 tbsp
Sour cream	4 tbsp
Sherbet	1 cup

Nondairy Milk Substitutes	Amount
Dessert, nondairy frozen	½ cup
Dessert topping, nondairy frozen	½ cup
Liquid nondairy creamer, polyunsaturated	½ cup

MEAT CHOICES

1 choice = 7 g protein
= 65 kcal
= 25 mg sodium
= 100 mg potassium
= 65 mg phosphorus

Prepared without added salt

Meat	Amount
Beef	1 oz
Round, sirloin, flank, cubed, T-bone and porterhouse steak; Tenderloin, rib, chuck, and rump Roast; ground beef or ground chuck	
Pork	1 oz
Fresh ham; tenderloin; Chops; loin roast; cutlets	
Lamb	1 oz
Chops; leg; roasts	
Veal	1 oz
Chops; roasts; cutlets	
Poultry	1 oz
Chicken; turkey; Cornish Hen; domestic duck and goose	
Fish	
Fresh and frozen fish	1 oz
Lobster; scallops; shrimp; clams	1 oz
Crab; oysters	1½ oz
Canned tuna; canned salmon (canned without salt)	1 oz
Sardines (canned without salt)[a]	1 oz
Wild game	1 oz
Venison; rabbit; squirrel; Pheasant; duck; goose	
Egg	
Whole	1 large
Egg white or yolk	2 large
Low-cholesterol egg product	¼ cup
Chitterlings	2 oz
Organ meats [a]	1 oz

Prepared with added salt

Meat	Amount
Beef	1 oz
Deli-style roast beef[b]	
Pork	1 oz
Boiled or deli-style ham[b]	
Poultry	1 oz
Deli-style chicken or turkey[b]	
Fish	
Canned tuna, canned salmon[b]	1 oz
Sardines[a,b]	1 oz
Cheese	
Cottage[b]	¼ cup

Meat/Protein Sources to Avoid:

- Bacon
- Black beans, black-eyed peas, great northern beans, lentils, lima beans, navy beans, pinto beans, red kidney beans, soybeans, split peas, turtle beans
- Frankfurters; bratwurst; Polish sausage
- Luncheon meats, including bologna, braunschweiger, liverwurst, picnic loaf, summer sausage, and salami
- Nuts and nut butters
- All cheeses except cottage cheese

[a]High phosphorus.
[b]High sodium — each serving counts as *1 Meat choice* and *1 Salt choice.*

STARCH CHOICES

1 choice = 2 g protein
= 90 kcal
= 80 mg sodium
= 35 mg potassium
= 35 mg phosphorus

Breads and Rolls	Amount
Bread (French, Italian, raisin, Light rye, sourdough, white)	1 slice (1 oz)
Bagel	½ small
Bun, hamburger or hot dog type	½
Danish pastry or sweet roll, no nuts	½ small
Dinner roll or hard roll	1 small
Doughnut	1 small
English muffin	½
Muffin, no nuts, bran, or whole wheat	1 small (1 oz)
Pancake [a,b]	1 small (1 oz)
Pita or "pocket" bread	½ 6-inch diameter
Tortilla, corn	2 6-inch diameter
Tortilla, flour	1 6-inch diameter
Waffle [a,b]	1 small (1 oz)

Crackers and Snacks

Crackers: saltines, round butter	4 crackers
Graham crackers	3 squares
Melba toast	3 oblong
RyKrisp [a]	3 crackers
Popcorn, plain	1½ cup popped
Tortilla chips	¾ oz, 9 chips
Pretzels, sticks or rings [a]	¾ oz 10 sticks
Pretzels, sticks or rings, unsalted	¾ oz, 10 sticks

Cereals and Grains	Amount
Prepared without added salt	
Cereals, ready-to-eat, most brands [a]	¾ cup
Puffed rice	1½ cup
Puffed wheat	1 cup
Cereals, cooked	
Cream of Rice or Wheat, Farina, Malt-O-Meal	½ cup
Oat bran or oatmeal, Ralston	1/3 cup
Cornmeal, cooked	¾ cup
Grits, cooked	½ cup
Flour, all-purpose	2½ tbsp
Pasta (noodles, macaroni, spaghetti), cooked	½ cup
Pasta made with egg (egg noodles), cooked	1/3 cup
Rice, white or brown, cooked	½ cup

Desserts

Cake, angel food	1 oz
Cake	2 × 2-in square or 1½ oz
Sandwich cookie [a,b]	4 cookies
Shortbread cookie	4 cookies
Sugar cookie	4 cookies
Sugar wafer	4 cookies
Vanilla wafer	10 cookies
Sweetened gelatin	½ cup
Fruit pie	1/8 pie

Starches to Avoid

- Bran cereal or muffins; Grape-Nuts cereal; granola cereal or bars
- Boxed, frozen, or canned meals; entrees; or side dishes
- Black beans, black-eyed peas, great northern beans, lentils, lima beans, navy beans, pinto beans, red kidney beans, soybeans, split peas, turtle beans
- Pumpernickel, dark rye, whole wheat, or oatmeal bread
- Whole wheat cereals
- Whole wheat crackers

[a]High sodium — each serving counts as *1 Starch choice* and *1 Salt choice.*
[b]High phosphorus.

VEGETABLE CHOICES

1 choice = 1 g protein
= 25 kcal
= 15 mg sodium
= 20 mg phosphorus

Prepared or canned without added salt unless otherwise indicated

Vegetables	Amount
Low Potassium (0-100 mg)	
Alfalfa sprouts	1 cup
Bamboo shoots, canned	½ cup
Beans, green or wax	½ cup
Bean sprouts	½ cup
Cabbage, raw	½ cup
Chinese cabbage, raw	½ cup
Chard, raw	½ cup
Cucumber, peeled	½ cup
Endive	½ cup
Escarole	½ cup
Lettuce, all varieties	1 cup
Pepper, green, sweet	½ cup
Water chestnuts, canned	½ cup
Watercress	½ cup
Medium potassium (101-200 mg)	
Artichoke	½ cup
Broccoli	½ cup
Cabbage, cooked	½ cup
Carrots, raw	1 small
Cauliflower	½ cup
Celery, raw	1 stalk
Collards	½ cup
Corn[a]	½ cup or 1 small ear
Eggplant	½ cup
Kale	½ cup
Mushrooms, canned[a]	½ cup
Mushrooms, fresh raw	½ cup
Mustard greens	½ cup
Onions	½ cup
Peas, green[a]	½ cup
Radishes	½ cup
Sauerkraut[b]	½ cup
Snow peas[a]	½ cup
Spinach, raw	½ cup
Squash, summer	½ cup
Turnip greens	½ cup
Turnips	

Vegetables	Amount
High potassium (201-350 mg)	
Asparagus[a]	5 spears
Avocado	¼ whole
Beets	½ cup
Brussels sprouts[a]	½ cup
Celery, cooked	½ cup
Kohlrabi	½ cup
Mushrooms, fresh cooked[a]	½ cup
Okra[a]	½ cup
Parsnips[a]	½ cup
Pepper, chili	½ cup
Potato, boiled or mashed	½ cup
Pumpkin	½ cup
Rutabagas[a]	½ cup
Tomato	1 medium
Tomato juice, unsalted	½ cup
Tomato juice, canned with salt[c]	½ cup
Tomato puree	2 tbsp
Tomato sauce	¼ cup
Vegetable juice cocktail, unsalted	½ cup
Vegetable juice cocktail, canned with salt[c]	½ cup
Bamboo shoots, fresh cooked[d]	½ cup
Beet greens[d]	¼ cup
Chard, cooked[d]	½ cup
Chinese cabbage, cooked[d]	½ cup
Potato, baked[d]	½ medium
Potato, hashed brown[d]	½ cup
Potato chips[d]	1 oz, 14 chips
Spinach, cooked[d,e]	½ cup
Sweet potato[d,e]	½ cup
Tomato paste[d]	2 tbsp
Winter squash[d]	¼ cup

Prepared or Canned With Salt

Vegetables canned with salt (use serving size listed above)[e]

[a]High phosphorus.
[b]High sodium — each serving counts as *1 Vegetable choice* and *3 Salt choices.*
[c]High sodium — each serving counts as *1 Vegetable choice* and *2 Salt choices.*
[d]Very high potassium.
[e]High sodium — each serving counts as *1 Vegetable choice* and *1 Salt choice.*

FRUIT CHOICES

1 choice = 0.5 g protein
= 70 kcal
= 15 mg phosphorus

Fruit	Amount	Fruit	Amount
Low potassium (0-100 mg)		*High potassium (201-350 mg)*	
Apple sauce	½ cup	Apricots, canned or fresh	2 halves
Blueberries	½ cup	Apricots, dried	5
Cranberries	1 cup	Cantaloupe	1/8 small
Cranberry juice cocktail	1 cup	Dates	¼ cup
Grape juice	½ cup	Figs, dried	2 whole
Lemon	½	Honeydew melon	1/8 small
Papaya nectar	½ cup	Kiwifruit	½ medium
Peach nectar	½ cup	Nectarine	1 small, 2-inch diameter
Pears, canned	½ cup	Orange juice	½ cup
Pear nectar	½ cup	Orange	1 small, 2½-inch diameter
Medium potassium (101-200 mg)		Pear, fresh	1 medium
Apple	1 small, 2½-inch diameter	Banana[a]	½ medium
Apple juice	½ cup	Prune juice[a]	½ cup
Apricot nectar	½ cup	Prunes, dried or canned[a]	5
Blackberries	½ cup		
Cherries, sour or sweet	½ cup		
Figs, canned	½ cup		
Fruit cocktail	½ cup		
Grapes	15 small		
Grapefruit	½ small		
Grapefruit juice	½ cup		
Gooseberries	½ cup		
Lemon juice	½ cup		
Mango	½ cup		
Papaya	½ cup		
Peach, canned	½ cup		
Peach, fresh	1 small, 2-inch diameter		
Pineapple, canned or fresh	½ cup		
Plums, canned or fresh	1 medium		
Raisins	2 tbsp		
Raspberries	½ cup		
Rhubarb	½ cup		
Strawberries	½ cup		
Tangerine	1 medium, 2 ½-inch diameter		
Watermelon	1 cup		

[a]Very high potassium.

FAT CHOICES

1 choice = 45 kcal
= 55 mg sodium
= 10 mg potassium
= 5 mg phosphorus

Unsaturated Fats	Amount	Saturated Fats	Amount
Margarine	1 tsp	Butter	1 tsp
Reduced-calorie margarine	1 tbsp	Coconut	2 tbsp
Mayonnaise	1 tsp	Powdered coffee whitener	1 tbsp
Low-calorie mayonnaise	1 tbsp	Solid shortening	1 tsp
Oil (safflower, sunflower, corn, Soybean, olive, peanut, canola)	1 tsp		
Salad dressing (mayonnaise-type)	2 tsp		
Salad dressing (oil-type)	1 tbsp		

Fat Choices (con't)

Unsaturated Fats (con't)	Amount
Low-calorie salad dressing (mayonnaise-type)	2 tbsp
Low-calorie salad dressing (oil-type)[b]	2 tbsp
Tartar sauce	1½ tsp

[b]High sodium — each serving counts as *1 Fat choice* and *1 Salt choice.*

HIGH-CALORIE CHOICES

1 choice = trace protein
=100 kcal
= 15 g sodium
= 20 mg potassium
= 5 mg phosphorus

Beverages	Amount
Carbonated beverages (fruit flavors, root beer, colas, or pepper-type) [a]	1 cup
Kool-Aid	1 cup
Limeade	1 cup
Lemonade	1 cup
Fruit-flavored drink	1 cup
Tang	1 cup
Wine[b]	½ cup

Frozen Desserts

Fruit ice	½ cup
Juice bar (3 oz)	1 bar
Popsicle (3 oz)	1 bar
Sorbet	½ cup

The following foods are high in poor-quality protein and/or phosphorus. They should be used only when advised by the dietitian.
Beer[b]
Chocolate
Nuts and nut butters
[a]High phosphorus.
[b]Check with your physician before using alcohol.

Candies and Sweets	Amount
Butter mints	14
Candy corn	20 or 1 oz
Chewy fruit snacks	1 pouch
Cranberry sauce or relish	¼ cup
Fruit chews	4
Fruit Roll Ups	2
Gumdrops	15 small
Hard candy	4 pieces
Honey	2 tbsp
Jam or jelly	2 tbsp
Jelly beans	10
LifeSavers or cough drops	12
Marmalade	2 tbsp
Marshmallows	5 large
Sugar, brown or white	2 tbsp
Sugar, powdered	3 tbsp
Syrup	2 tbsp

SALT CHOICES

1 choice = 250 mg sodium

Salt Choices	Amount
Salt	1/8 tsp
Seasoned salts (eg, onion, garlic)	1/8 tsp
Accent	¼ tsp
Barbecue sauce	2 tbsp
Bouillon	1/3 cup
Catsup	1½ tbsp
Chili sauce	1½ tbsp
Dill pickle	1/6 of large or ½ oz
Mustard	4 tsp
Olives, green	2 medium or 1/3 oz
Olives, black	3 large or 1 oz
Soy sauce	¾ tsp
Light soy sauce	1 tsp
Steak sauce	2½ tsp
Sweet pickle relish	2½ tbsp
Taco sauce	2 tbsp
Tamari sauce	¾ tsp
Teriyaki sauce	1¼ tsp
Worcestershire sauce	1 tbsp

HEALTHY FOOD GUIDE FOR DIABETES AND KIDNEY DISEASE

MILK CHOICES

Milk Choices		Nondairy Milk Substitutes	
1 choice	= 4 g protein	1 choice	= 0.5 g protein
	= 8 g carbohydrate		= 12 g carbohydrate
	= 100 kcal		= 140 kcal
	= 80 mg sodium		= 40 mg sodium
	= 185 mg potassium		= 80 mg potassium
	= 110 mg phosphorus		= 30 mg phosphorus

Milk Choices	Amount
Milk (nonfat, low-fat, whole)	½ cup
Lo Pro	1 cup
Buttermilk, cultured	½ cup
Chocolate milk	½ cup
Light cream or half-and-half	½ cup
Ice milk or ice cream	½ cup
Yogurt, plain or fruit-flavored	½ cup
Evaporated milk	¼ cup
Cream cheese	3 tbsp
Sour cream	4 tbsp

Nondairy Milk Substitutes	Amount
Dessert, nondairy frozen	½ cup
Dessert topping, nondairy frozen	½ cup
Liquid nondairy creamer, Polyunsaturated	½ cup

MEAT CHOICES

1 choice = 7 g protein
= 65 kcal
= 25 mg sodium
= 100 mg potassium
= 65 mg phosphorus

Prepared without added salt

Meat	Amount
Beef	1 oz
Round, sirloin, flank, cubed, T-bone and porterhouse steak; tenderloin, rib, chuck, and rump roast; ground beef or ground chuck	
Pork	1 oz
Fresh ham; tenderloin, Chops; loin roast; cutlets	
Lamb	1 oz
Chops; leg; roasts	
Veal	1 oz
Chops; roasts; cutlets	
Poultry	1 oz
Chicken; turkey; Cornish Hen; domestic duck and goose	
Fish	
Fresh and frozen fish	1 oz
Lobster; scallops; shrimp; clams	1 oz
Crab; oysters	1½ oz
Canned tuna, canned salmon (canned without salt)	1 oz
Sardines (canned without salt) [a]	1 oz
Wild game	1 oz
Venison; rabbit; squirrel; Pheasant; duck; goose	
Egg	
Whole	1 large
Egg white or yolk	2 large
Low-cholesterol egg product	¼ cup
Chitterlings	2 oz
Organ meats[a]	1 oz

Meat	Amount
Beef	1 oz
Deli-style roast beef[b]	
Pork	1 oz
Boiled or deli-style ham[b]	
Poultry	1 oz
Deli-style chicken or turkey[b]	
Fish	
Canned tuna; canned salmon[b]	1 oz
Sardines[a,b]	1 oz
Cheese	
Cottage[b]	¼ cup

Meat/Protein Sources to Avoid:

- Bacon
- Black beans, black-eyed peas, great northern beans,
- lentils, lima beans, navy beans, pinto beans, red kidney beans, soybeans, split peas, turtle beans
- Frankfurters; bratwurst; Polish sausage
- Luncheon meats, including bologna, braunschweiger, liverwurst, picnic loaf, summer sausage, and salami
- Nuts and nut butters
- All cheeses except cottage cheese

[a]High phosphorus.
[b]High sodium — each serving counts as *1 Meat choice* and *1 Salt choice.*

STARCH CHOICES

1 choice = 2 g protein
= 15 g carbohydrate
= 80 kcal
= 80 mg sodium
= 35 mg potassium
= 35 mg phosphorus

Breads and Rolls	Amount
Prepared without added salt	
Bread (French, Italian, raisin, light rye, sourdough, white)	1 slice (1 oz)
Bagel	½ small
Bun, hamburger or hot dog type	½
Dinner roll or hard roll	1 small
English muffin	½
Muffin, no nuts, bran, or whole wheat	½ small (1 oz)
Pancake[a,b]	1 small (1 oz)
Pita or "pocket" bread	½ 6-inch diameter
Tortilla, corn	2 6-inch diameter
Tortilla, flour	1 6-inch diameter
Waffle[a,b]	1 small (1 oz)

Cereals and Grains	Amount
Cereals, ready-to-eat, most brands[a]	¾ cup
Puffed rice	2 cups
Puffed wheat	1 cup
Cereals, cooked	
Cream of Rice or Wheat, Farina, Malt-O-Meal	½ cup
Oat bran or oatmeal, Ralston	1/3 cup
Cornmeal, cooked	¾ cup
Grits, cooked	½ cup
Flour, all-purpose	2½ tbsp
Pasta (noodles, macaroni, spaghetti), cooked	½ cup
Pasta made with egg (egg noodles), cooked	1/3 cup
Rice, white or brown, cooked	½ cup

Crackers and Snacks

Crackers: saltines, round butter	4 crackers
Graham crackers	3 squares
Melba toast	3 oblong
RyKrisp[a]	3 crackers
Popcorn, plain	1½ cup popped
Potato chips	1 oz, 14 chips
Tortilla chips	¾ oz, 9 chips
Pretzels, sticks or rings[a]	¾ oz 10 sticks
Pretzels, sticks or rings, unsalted	¾ oz, 10 sticks

Desserts

Cake, angel food	1 oz
Shortbread cookie	3 cookies
Sugar cookie	3 cookies
Sugar wafer	2 cookies
Vanilla wafer	5 cookies
Sweetened gelatin	½ cup

Starches to Avoid

- Bran cereal or muffins; Grape-Nuts cereal; granola cereal or bars
- Boxed, frozen, or canned meals; entrees; or side dishes
- Black beans, black-eyed peas, great northern beans, lentils, lima beans, navy beans, pinto beans, red kidney beans, soybeans, split peas, turtle beans
- Pumpernickel, dark rye, whole wheat, or oatmeal bread
- Whole wheat cereals
- Whole wheat crackers

[a]High sodium — each serving counts as *1 Starch choice* and *1 Salt choice.*
[b]High phosphorus.

VEGETABLE CHOICES

1 choice = 1 g protein
= 25 kcal
= 5 g carbohydrates
= 15 mg sodium
= 20 mg phosphorus

Prepared or canned without added salt unless otherwise indicated

Vegetables	Amount
Low Potassium (0-100 mg)	
Alfalfa sprouts	1 cup
Bamboo shoots, canned	½ cup
Beans, green or wax	½ cup
Bean sprouts	½ cup
Cabbage, raw	½ cup
Chinese cabbage, raw	½ cup
Chard, raw	½ cup
Cucumber, peeled	½ cup
Endive	½ cup
Escarole	½ cup
Lettuce, all varieties	1 cup
Pepper, green, sweet	½ cup
Water chestnuts, canned	½ cup
Watercress	½ cup
Medium potassium (101-200 mg)	
Artichoke	½ cup
Broccoli	½ cup
Cabbage, cooked	½ cup
Carrots, raw	1 small
Cauliflower	½ cup
Celery, raw	1 stalk
Collards	½ cup
Corn [a]	½ cup or 1 small ear
Eggplant	½ cup
Kale	½ cup
Mushrooms, canned [a]	½ cup
Mushrooms, fresh raw	½ cup
Mustard greens	½ cup
Onions	½ cup
Peas, green [a]	½ cup
Radishes	½ cup
Sauerkraut[b]	½ cup
Snow peas [a]	½ cup
Spinach, raw	½ cup
Squash, summer	½ cup
Turnip greens	½ cup
Turnips	½ cup
High potassium (201-350 mg)	
Asparagus [a]	5 spears
Avocado	¼ whole
Beets	½ cup
Brussels sprouts [a]	½ cup
Celery, cooked	½ cup
Kohlrabi	½ cup
Mushrooms, fresh cooked [a]	½ cup
Okra [a]	½ cup
Parsnips [a]	½ cup
Pepper, chili	½ cup
Potato, boiled or mashed	½ cup
Pumpkin	½ cup
Rutabagas [a]	½ cup
Tomato	1 medium
Tomato juice, unsalted	½ cup
Tomato juice, canned with salt[c]	½ cup
Tomato puree	2 tbsp
Tomato sauce	¼ cup
Vegetable juice cocktail, unsalted	½ cup
Vegetable juice cocktail, with salt[c]	½ cup
Bamboo shoots, fresh cooked[d]	½ cup
Beet greens[d]	¼ cup
Chard, cooked[d]	½ cup
Chinese cabbage, cooked[d]	½ cup
Potato, baked[d]	½ medium
Potato, hashed brown[d]	½ cup
Potato chips[d]	1 oz, 14 chips
Spinach, cooked[d,e]	½ cup
Sweet potato[d,e]	½ cup
Tomato paste[d]	2 tbsp
Winter squash[d]	¼ cup

Prepared or Canned With Salt

Vegetables canned with salt (use serving size listed above)[e]

[a]High phosphorus.
[b]High sodium — each serving counts as *1 Vegetable choice* and *3 Salt choices.*
[c]High sodium — each serving counts as *1 Vegetable choice* and *2 Salt choices.*
[d]Very high potassium.
[e]High sodium — each serving counts as *1 Vegetable choice* and *1 Salt choice.*

FRUIT CHOICES

1 choice = 0.5 g protein
= 15 g carbohydrate
= 60 kcal
= 15 mg phosphorus

Fruit	Amount	Fruit	Amount
Low potassium (0-100 mg)			
Apple sauce	½ cup	Apricots, canned or fresh	2 halves
Blueberries	½ cup	Apricots, dried	5
Cranberries	1 cup	Cantaloupe	1/8 small
Cranberry juice cocktail	1 cup	Dates	¼ cup
Grape juice	½ cup	Figs, dried	2 whole
Lemon	½	Honeydew melon	1/8 small
Papaya nectar	½ cup	Kiwifruit	½ medium
Peach nectar	½ cup	Nectarine	1 small, 2-inch diameter
Pears, canned	½ cup		
Pear nectar	½ cup	Orange juice	½ cup
Medium potassium (101-200 mg)		Orange	1 small, 2½-inch diameter
Apple	1 small, 2½-inch diameter		
Apple juice	½ cup	Pear, fresh	1 medium
Apricot nectar	½ cup	Banana[a]	½ medium
Blackberries	½ cup	Prune juice[a]	½ cup
Cherries, sour or sweet	½ cup		
Figs, canned	½ cup		
Fruit cocktail	½ cup		
Grapes	15 small		
Grapefruit	½ small		
Grapefruit juice	½ cup		
Gooseberries	½ cup		
Lemon juice	½ cup		
Mango	½ cup		
Papaya	½ cup		
Peach, canned	½ cup		
Peach, fresh	1 small, 2-inch diameter		
Pineapple, canned or fresh	½ cup		
Plums, canned or fresh	1 medium		
Raisins	2 tbsp		
Raspberries	½ cup		
Rhubarb	½ cup		
Strawberries	½ cup		
Tangerine	1 medium, 2½-inch diameter		
Watermelon	1 cup		

FAT CHOICES

1 choice = 45 kcal
= 55 mg sodium
= 10 mg potassium
= 5 mg phosphorus

Unsaturated Fats	Amount	Saturated Fats	Amount
Margarine	1 tsp	Butter	1 tsp
Reduced-calorie margarine	1 tbsp	Coconut	2 tbsp
Mayonnaise	1 tsp	Powdered coffee whitener	1 tbsp
Low-calorie mayonnaise	1 tbsp	Solid shortening	1 tsp
Oil (safflower, sunflower, corn, Soybean, olive, peanut, canola)	1 tsp		
Salad dressing (mayonnaise-type)	2 tsp		
Salad dressing (oil-type)	1 tbsp		
Low-calorie salad dressing (mayonnaise-type)	2 tbsp		

Unsaturated Fats	Amount
Low-calorie salad dressing (oil-type) [b]	2 tbsp
Tartar sauce	1½ tsp

[b]High sodium — each serving counts as *1 Fat choice* and *1 Salt choice.*

HIGH-CALORIE CHOICES

1 choice = trace protein
= 15 g carbohydrate
= 60 kcal
= 15 mg sodium
= 20 mg potassium
= 5 mg phosphorus

Beverages	Amount
Carbonated beverages (fruit flavors, root beer, colas, or pepper-type) [a]	½ cup
Kool-Aid	½ cup
Limeade	½ cup
Lemonade	½ cup
Cranberry juice cocktail (low-calorie)	½ cup
Tang	½ cup
Fruit-flavored drink	½ cup
Wine[b]	¼ cup

Frozen Desserts	Amount
Fruit ice	¼ cup
Juice bar (3 oz)	1 bar
Popsicle (3 oz)	1 bar
Sorbet	¼ cup

The following foods are high in poor-quality protein and/or phosphorus. They should be used only when advised by the dietitian.

Beer[b]
Chocolate
Nuts and nut butters

[a]High phosphorus.
[b]Check with your physician before using alcohol.

Candies and Sweets	Amount
Butter mints	8
Candy corn	12
Chewy fruit snacks	½ pouch
Cranberry sauce or relish	2 tbsp
Fruit chews	3
Fruit Roll Ups	1
Gumdrops	9 small
Hard candy	3 pieces
Honey	1 tbsp
Jam or jelly	1 tbsp
Jelly beans	6
LifeSavers or cough drops	8
Marmalade	1 tbsp
Marshmallows	3 large
Sugar, brown or white	4 tsp
Sugar, powdered	2 tbsp
Syrup	1 tbsp

SALT CHOICES

1 choice = 250 mg sodium

Salt Choice	Amount
Salt	1/8 tsp
Seasoned salts (eg, onion, garlic)	1/8 tsp
Accent	¼ tsp
Barbecue sauce	2 tbsp
Bouillon	1/3 cup
Catsup	1½ tbsp
Chili sauce	1½ tbsp
Dill pickle	1/6 large or ½ oz
Mustard	4 tsp
Olives, green	2 medium or 1/3 oz
Olives, black	3 large or 1 oz
Soy sauce	¾ tsp
Light soy sauce	1 tsp
Steak sauce	2½ tsp
Taco sauce	2 tbsp
Tamari sauce	¾ tsp
Teriyaki sauce	1¼ tsp
Worcestershire sauce	1 tbsp

MEAL PATTERNS USING RENAL CHOICES (SAMPLE)

Food Choices	# of Choices	B	L	D	HS
Milk	1	1			
Nondairy					
Meat	6	1	3	2	
Starch	6	2	2	2	
Vegetable					
Low K	1		1		
Medium K	1		1		
High K	1			1	
Fruit					
Low K	1	1			
Medium K	1			1	
High K	1		1		
Fat	4				
High-Calorie					
Beverage					
Salt	3		2	1	

Total Calories 1515

Pro 63 g Na 2025 mg K 2025 mg P 840 mg

Fruit Choices	# of Choices	B	L	D	HS
Milk	1	1			
Nondairy					
Meat	7	2	3	2	
Starch	8	3	2	3	
Vegetable	3				
Low K	1		1		
Medium K	1		1		
High K	1			1	
Fruit	3				
Low K	1	1			
Medium K	2		1	1	
High K					
Fat	6	2	2	2	
High-Calorie					
Beverage					
Salt	3	1	1	1	

Total Calories 1850

Pro 74 g Na 2020 mg K 2085 mg P 980 mg

Food Choices	# of Choices	B	L	D	HS
Milk	1	1			
Nondairy					
Meat	8	2	3	3	
Starch	9	3	3	3	
Vegetable					
Low K	1		1		
Medium K	2		1	1	
High K					
Fruit					
Low K	1	1			
Medium K	1		1		
High K	1			1	
Fat	6	2	2	2	
High-Calorie					
Beverage					
Salt	3	1	1	1	

Total Calories 2005

Pro 83 g Na 2125 mg K 2220 mg P 1080 mg

Fruit Choices	# of Choices	B	L	D	HS
Milk	1	1			
Nondairy					
Meat	8	2	3	3	
Starch	11	4	3	4	
Vegetable					
Low K	1	1			
Medium K	1		1		
High K	1			1	
Fruit					
Low K	1	1			
Medium K	1			1	
High K	1		1		
Fat	7	2	2	3	
High-Calorie					
Beverage					
Salt	2		1	1	

Total Calories 2205

Pro 87 g Na 2090 mg K 2420 mg P 1135 mg

SIMPLIFIED RENAL DIET

Description
The Simplified Renal Diet mildly restricts sodium, potassium, phosphorus, and fluid intake.

Indications
- patients in predialysis stage
- patients receiving hemodialysis and having difficulty adhering to the Renal Diet

Nutritional Adequacy
The diet is inadequate in calcium according to the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA.

How to Order the Diet
The diet should be ordered "No Added Salt Diet (NAS) ______ cc fluid restriction, Simplified Renal Diet." For patients who require a renal-diabetic restriction, order "Consistent Carbohydrate, NAS Diet with ______ cc fluid restriction, Simplified Renal Diet."

Planning the Diet

Guidelines for the Simplified Renal Diet follow:

1. Limit milk and milk products to ½ cup/day.
2. Limit foods high in potassium to one serving per day. Such foods include cantaloupe and honeydew, potatoes, prunes, oranges, orange juice, prune juice, dried beans and peas, nuts and peanut butter, chocolate, bananas, apricots, and tomatoes. (The renal choice list may be used for guidelines of a serving.)
3. Eliminate salt substitutes and light salt.
4. If phosphorus restriction is required, limit bran cereal, whole wheat bread, nuts, and dried beans to one serving per day.
5. For protein requirements, provide 6 oz of meat or meat entree per day. Offer an egg for breakfast at least every other day.

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GLUTEN-FREE DIET

Description
The Gluten-Free Diet eliminates foods prepared with wheat, rye, barley, and oats and their derivatives, such as, spelt, semolina, kamut, triticale, quinoa, buckwheat, amaranth, and teff (1). The clinical diet is based on grains, chemicals, and natural or artificial ingredients found to be toxic for patients with the conditions of celiac disease and dermatitis herpetiformis (1). The elimination of oats from a gluten-free diet has been controversial for more than 40 years. Although there is some evidence that oats may be safe for people with celiac disease (2,3), a 5-year follow-up study on the same patient population is under way to ascertain any long-term effects of oats in the diet of persons with celiac disease (2,4). Until proved safe, the diet included in this manual will recommend the elimination of oats from the diet. Refer to the Gluten Sensitive Enteropathy medical nutrition therapy protocol (MNT) for specific MNT intervention strategies (5).

Indications
The Gluten-Restricted, Gliadin-Free Diet is the primary means of treatment of celiac disease, also called gluten-sensitive enteropathy, nontropical sprue, or celiac sprue. This diet has also been found to help control most cases of dermatitis herpetiformis associated with gluten-sensitive enteropathy. Tropical sprue, a similar diarrheal disease, is not responsive to the diet.

Celiac disease is an inheritable disease linked to genetically transmitted histocompatibility cell antigens (6). In persons with this genetic potential, an inflammatory condition occurs in the small intestine with the ingestion of foods containing a source of gliadin (a fraction of gluten protein found in wheat) and prolamin (the equivalent toxic protein fraction found in barley, rye, and oats). The jejunum and ileum are the primary areas affected, with the proximal bowel the most severely involved. This inflammatory reaction results in a decrease in the amount of surface area available for nutrient, fluid, and electrolyte absorption. The extent of loss of intestinal absorptive surface area generally dictates whether an individual will develop symptoms (7). Symptoms include diarrhea, steatorrhea, anorexia, weight loss, malnutrition, general wasting, abdominal bloating and pain, menstrual irregularities in women, and in children the failure to thrive. Other people may develop anemia related to fatigue and have no symptoms of the gastrointestinal tract. Such individuals are likely to have the disease limited to the proximal small bowel, where iron is normally absorbed, with the remainder of the bowel adequate for nutrient and fluid absorption. Symptoms of dermatitis herpetiformis include a blistering, burning, itchy rash on the extensor surfaces of the body (8-11).

The etiology of celiac disease is not determined. It most commonly occurs in the first 2 years of life, usually appearing after the introduction of foods containing gluten, or at around 30 to 40 years of age. However, it can begin anytime (4,10). Celiac disease is more common among people of European descent and individuals with type 1 diabetes (6,9,11,12). Although all individuals with the disease do not have a family history of celiac disease, they usually have a history of disorders that are related to celiac disease through the immune system. Examples include dermatitis herpetiformis, Down's syndrome, selective IgA deficiency, epilepsy, hypothyroidism, scleroderma, type 1 diabetes, systemic lupus erythematosus, Sjogren's syndrome, Graves' disease, Addison's disease, myasthenia gravis, autoimmune chronic active hepatitis, and Wegener's granulomatosis (6-8).

Marked differences in individual sensitivity to gluten have been observed, varying from dramatic deterioration following ingestion of small amounts of gluten, to symptoms occurring only after a high gluten intake for several months (5). Endomysial and antigliadin antibodies may be used to screen for celiac disease. Diagnosis of this disorder is made by a small-bowel biopsy, which determines active disease, and by clinical response to the Gluten-Free Diet (6,9,12,13).

Celiac disease is a chronic disease that is controlled by diet. Patients see a response to symptoms after 3 to 6 days on a gluten-free diet, with full improvement of intestinal mucosa within 6 months (6). Gluten intolerance in childhood persists into adulthood. An asymptomatic state depends on lifelong maintenance of the Gluten-Free Diet. Patients should be cautioned against ingesting gluten once they start to gain weight and to feel better. The ingestion of gluten damages the mucosa and causes recurrent symptoms, although several weeks may lapse before the patient observes symptoms. An assessment of dietary adherence is critical in determining whether the recurrent symptoms are related to gluten-sensitivity or to an unrelated problem.

Decreased bone density is a concern in persons with celiac disease. In children, an early diagnosis and strict adherence to the Gluten-Free Diet for over 12 months allows the child to reach normal bone mineralization density (14). In adults, decreased bone density is a serious problem. Calcium malabsorption in celiac disease occurs from reduction in vitamin D-regulated proteins located in the enterocytes of the villi that are essential for calcium absorption, not because of the absence of vitamin D receptors (16). If calcium is not absorbed due to the damage to the small intestine that celiac disease causes, bone mineralization density is decreased. As the aging process begins, bone is lost at a predictable rate. For individuals not at the optimal bone mass, the fracture threshold is reached at a younger age. It is recommended that adults with celiac disease have a bone density test performed by a physician or at an osteoporosis clinic (2,13).

Contraindications
One form of celiac disease, refractory sprue, does not respond to the Gluten-Free Diet or responds only temporarily. Many of these patients respond to prednisone (9).

Nutritional Adequacy
The diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA. In severe cases, supplementation may be required. Anemia may be treated accordingly with folate, iron, or vitamin B_{12}. Electrolytes and fluids are required in patients with dehydration from severe diarrhea. Vitamin K may be prescribed in the presence of purpura, bleeding, or prolonged prothrombin time. Calcium and vitamin D supplementation may be necessary to correct osteomalacia. Vitamins A and D may be necessary to replenish stores deleted by steatorrhea. A gluten-free, multivitamin-mineral supplement containing the DRIs is recommended daily for patients who continue to have malabsorption (2,9,11,12,15).

How to Order the Diet
Order as "Gluten-Free Diet."

Planning the Diet
Eliminate all foods containing wheat, rye, oats, barley, and their derivatives. In addition, evaluate the patient for lactose intolerance, which sometimes appears secondary to celiac disease. If the patient is lactose intolerant, see the discussion of the Lactose-Controlled Diet later in this section. Usually lactose intolerance will normalize within weeks to months of a gluten-free diet. Other nutrient recommendations include the following (2,15):

- Protein intake: 1 to 2 g protein/kg of body weight for adults. Use proteins with high biological value.
- Energy intake: 35 to 40 kcal/kg of body weight for adults. Adults may use simple carbohydrates, such as flavored gelatins, fruit juices, simple cornstarch pudding, and fruit. Infants may tolerate banana powder.
- Evaluate the need for a medium-chain triglyceride supplement, especially in adults.

The food label on all prepared items should be screened. Some hidden sources of gluten include hydrolyzed vegetable protein, flavorings, malt flavoring, brown rice syrup, modified food starch, vegetable gum, soy sauce, monoglycerides and diglycerides in dry products, maltodextrin, emulsifiers, distilled vinegar, and alcohol-based extracts (eg, vanilla). Some additional components that contain gluten and are often overlooked are broth, breading, croutons, pasta, stuffing, flours, sauces, coating mixes, marinades, thickeners, roux, soup base, self-basting poultry, imitation seafood, and imitation bacon (2,13,16).

Some medications also contain gluten. All prescribed and over-the-counter medications should be examined by a knowledgeable pharmacist or physician (13,16).

Ingredients used as part of packaging are not required to be listed on the label. Gum wrappers are dusted with flour to prevent the gum from sticking. The flour isn't listed as an ingredient because it is part of the packaging. Likewise, hidden sources may come in how food is prepared. Food that is prepared on a grill or in a fryer with wheat-breaded items, can pass some of the gluten onto other foods.

There are several reasons it is advised to have complete avoidance of oat products. One is the increased risk of developing a malignancy, especially intestinal lymphoma, among persons with celiac disease who do not adhere to a gluten-free diet. Another is a concern about the purity of commercial oats and oat products. Oats may be contaminated with wheat while being harvested or processed, hence causing intestinal problems in some patients (2,5,17).

FOOD GUIDE

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
Beverages	Brewed coffee (regular and decaffeinated); tea Instant and freeze-dried Sanka®, Maxwell House®, and Brim® coffee Carbonated beverages except root beer Artificially flavored fruit drinks Wine; rum	Some herbal teas Other instant coffees Cocoa mixes Root beer Beer[a], ale, whiskey, and other distilled spirits made from cereal grains[a]
Breads, Cereals, Grain Products	Specially prepared breads, crackers, cakes, cookies, pasta, and other products made with these flours and starches: cornflower, cornstarch, cornmeal, potato starch, rice flour, soy flour, soybean starch, tapioca, arrowroot starch Pure corn tortillas Potato chips made only of potato; corn chips made only of corn Popcorn Rice cakes Hominy grits Rice; rice noodles Cornmeal Corn or rice cereals containing malt flavoring derived from corn; cream of rice; puffed rice	Breaded foods Breads, crackers, muffins, pizza crust, and other products made from barley, oat, rye, or wheat flour Bran or wheat germ Commercial "gluten" bread Commercially prepared mixes for buckwheat pancakes or cornbread Cracker crumbs Pretzels, chips, and other snack foods, except those allowed Pasta and noodles made from barley, oat, rye, or wheat flour Communion wafers
Vegetables	All plain, fresh, frozen, or canned, except those excluded	Commercially prepared vegetables and salads Any prepared with sauces Canned baked beans
Fruits and Juices	Fresh, frozen, canned, or dried fruit All fruit juices	Prepared fruits with excluded flours or grains (eg, some pie fillings, thickened fruits)
Milk	Milk	Cereal beverages such as Ovaltine and Postum Commercial chocolate milk; malted milk; instant milk mixes
Meat and Meat Substitutes	Pure meat, fish, poultry, eggs, bacon, and ham Pure cottage cheese, natural hard, and semisoft cheese Peanut butter, soybeans, dried beans, and other legumes Tofu Cold cuts, frankfurters, or sausage without fillers[a]	Breaded meat, fish, or poultry Canned or frozen meat dishes, stews, chili Patties, loaves, and croquettes made with bread crumbs or flour Prepared meats such as cold cuts, frankfurters, sausages, and some hamburgers Processed cheese, cheese food, and spreads Textured or hydrolyzed vegetable protein products (TVP, HVP) Self-basting turkey with HVP added Any cheese product containing oat gum as an ingredient Imitation crab containing wheat, starch, and other unacceptable fillers Frozen individual fish (may be dusted with flour); tuna canned with hydrolyzed protein

FOOD GROUP	FOODS ALLOWED	FOODS EXCLUDED
Fats	Butter; margarine; lard; cream; shortening; oils Mayonnaise made with allowed vinegar Nuts Olives Gravies and sauces made with allowed thickening agents Salad dressings if they do not contain a gluten stabilizer and are made with allowed vinegar Cream cheese	Some commercial salad dressings (consult label) Cream sauce thickened with flour Nondairy cream substitute Commercially prepared gravy and sauce
Soups	Homemade broths; vegetable or cream soups made with allowed ingredients	Commercially prepared soups, bouillon, or broth with hydrolyzed vegetable protein (HVP)[a] Soups containing barley, pasta, noodles, and HVP
Desserts and Sweets	Cakes, cookies, or pastries made from allowed flours or starches and cereal-free baking powder Custard Cornstarch, rice, and tapioca puddings Junket Gelatin desserts Ice cream with a few simple ingredients (usually brands that are expensive) Sorbet, frozen yogurt, and sherbet (check labels) Coconut Marshmallows Hard candy Commercial and homemade candies free from excluded grains Sugar; honey; corn syrup; maple syrup; jam; jelly; molasses	Ice cream containing stabilizers Commercially made puddings Cookies, cakes, pies, pastry, and so on, unless specially prepared Doughnuts Bread pudding Products made with brown rice syrup prepared with barley malt enzyme Flavored syrups Chocolate and other candy containing excluded ingredients Desserts with malt and malt flavoring or natural flavoring Chocolate-covered nuts that may have been rolled in wheat flour
Miscellaneous	Salt; monosodium glutamate; tamari; spices; herbs; flavoring extracts; dry mustard Dry yeast Pure cocoa and chocolate Cider Wine or rice vinegar Pickles; olives	Soy sauce[a]; commercial catsup[a]; chili sauce[a]; barbecue sauce; Worcestershire sauce; horseradish; seasoning mixes Cake yeast; baking powder Chewing gum[a]

[a]Check product label and contact manufacturer to clarify questionable ingredients, especially the source of “flavoring” used in meat and poultry products.

SAMPLE MENU

Breakfast	**Noon**	**Evening**
Orange Juice	Baked Chicken	Braised Beef Tips
Cream of Rice	Steamed Rice	Whipped Potatoes
Soft-Cooked Egg	Steamed Broccoli With Carrots	Green Beans
Gluten-Free Bread	Gluten-Free Bread	Sliced Tomato Salad
Margarine; Jelly	Margarine	Peach Halves
Milk	Pineapple Chunks	Gluten-Free Bread
Coffee	Milk	Margarine
Sugar; Creamer	Iced Tea; Sugar	Iced Tea; Sugar

Substitutions for Wheat Flour

Most patients find special cookbooks helpful. Recipes can be modified by the following substitutions:

For baking, 1 cup wheat flour may be replaced by:
1 cup corn flour (finely milled)
1 scant cup fine cornmeal
¾ cup coarse cornmeal
5/8 cup (10 tbsp) potato starch flour
7/8 cup (14 tbsp) rice flour (white or brown)
1 cup soy flour, plus ¼ cup potato starch flour
½ cup soy flour, plus ½ cup potato starch flour

For thickening, 1 tbsp of wheat flour may be replaced by:
1½ teaspoons of cornstarch, potato starch, rice, flour, arrowroot starch, or gelatin
2 teaspoons of quick-cooking tapioca
1 tbsp rice flour (white or brown)

Support Groups

Gluten Intolerance Group
P.O. Box 23053
Seattle, WA 98102-0353
206/325-6890

Publishes quarterly newsletter and fact sheet on celiac sprue
Cookbooks and other diet instruction materials available
Affiliate groups located throughout the country

American Celiac Society
58 Muscano Court
West Orange, NJ 07054
201/325-8837

Provides information sheets on gluten intolerance and milk intolerance
Offers referrals to other resource groups

Celiac-Sprue Association
P.O. Box 31700
Omaha, NE 68131-0700
402/558-0600

Suppliers of Low-Protein and Gluten-Free Products

Dietary Specialties, Inc.
P.O. Box 227
Rochester, NY 14601
800/544-0099

dp line (Dietetic Paygel): low-protein baking mix; wheat starch; low-protein bread; cookies
Aproten pasta
Rusks
Prono gelled dessert mix
Well-Planned Pastas
(Sauces: tomato flavor, lemon herb, garlic herb, chocolate)

Ener-G Foods, Inc.
P.O. Box 84487
Seattle, WA 98124-5787
800/331-5222

Low-protein bread mix; gluten-free white or brown rice bread; buns; muffins; pizza shells; coffee cake; doughnuts, cookies; spaghetti, macaroni; rusks

Kingsmill Foods Co., Ltd.
1399 Kennedy Road, Unit 17
Scarborough, Ontario, Canada M1P2L6

Low-protein gelatin
Cookies
Low-protein Unimix, all-purpose baking mix

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TYRAMINE-RESTRICTED DIET

Description
Foods containing tyramine and other vascoconstrictive amines are eliminated from the Tyramine-Restricted Diet.

Indications
The Tyramine-Restricted Diet is indicated when patients are receiving monoamine oxidase inhibitors (MAOIs). These drugs treat anxiety and depression by inhibiting the inactivation of neurotransmitters. Therapy with MAOIs is used to prevent the catabolism of dietary tyramine, which normally is metabolized in the gastrointestinal tract. The result is an increased concentration of tyramine in the body, causing the release of norepinephrine and an elevation of mood. Increase amounts of tyramine, however, can cause an excess amount of norepinephrine to be released, which may result in a hypertensive crisis. This is characterized by severe headaches, palpitation, neck stiffness or soreness, nausea or vomiting, sweating, fever, and visual disturbances.

Many foods normally contain small amounts of tyramine and other vasopressor amines. Large amounts have been reported only in aged, fermented, pickled, smoked, or bacterially contaminated products. When fresh foods are stored, especially meat, poultry, fish, and related items such as pâté, gravy, and soup stock, fermentation occurs and the tyramine content of the food increases. Since heat does not destroy tyramine, all foods should be fresh, fresh frozen, or canned and should be handled, prepared, stored, and served in ways that maximize freshness.

The consequences of tyramine intake are dose-related. Therefore, reactions can be prevented without total abstinence from tyramine-containing foods. A rational approach to diet compliance could best be achieved by emphasizing the most crucial items to avoid.

Caffeine does not contain tyramine, but excessive amounts may precipitate hypertensive crisis. Therefore, foods containing caffeine should be ingested with caution.

Nutritional Adequacy
The diet, a variation of the Regular Diet, can be planned to meet the DRIs as outlined in the *Statement on Nutritional Adequacy* in Section IA.

How to Order the Diet
Order as "____________________ Diet, Tyramine Restricted."

Planning the Diet
Guidelines for dietary counseling in MAOI use include the following:

1. Begin nutrition counseling before drug therapy.
2. Monitor patient compliance.
3. Recommend preparation and consumption of only fresh foods.
4. Continue the diet 4 weeks beyond drug therapy.

Resynthesis of monoamine oxidase occurs slowly, and food interactions may occur up to 3 weeks after withdrawal of some MAOI drugs. Prudent practice is to start the tyramine-restricted diet when the drug therapy is begun and to continue the diet for 4 weeks after the drug regimen is withdrawn.

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FOOD GUIDE

FOODS EXCLUDED

Beverages	Wine; beer; champagne (regular, alcohol-free, or reduced alcohol) Caffeine-containing beverages (eg, coffee, tea, or soft drinks) should be limited to two 8-oz servings per day
Milk	Cheese or cheese products except cottage cheese and cream
Meats	Aged, cured, smoked, pickled, or salted meats and fish Liver; pate Hot dogs; sausage; salami; pepperoni; bacon
Vegetables	Sauerkraut Pickled vegetables such as pickles; chili pepper Board beans
Fruits	Avocado
Miscellaneous	Soy sauce; teriyaki sauce; black bean sauce Meat tenderizers Bleu cheese, ranch, or other cheese-containing salad dressings Brewer's yeast Olives Chocolate

Note: Patients should be reminded to consult their physician or pharmacist before taking new medications, especially cold tablets, decongestants, most allergy and asthma medications, hypertensive medications, diet pills, and sleeping pills.

MONOAMINE OXIDASE INHIBITOR (MAOI) DRUGS CURRENTLY PRODUCED		
GENERIC NAME	**TRADEMARK & MANUFACTURER**	**GENERAL USE**
Tranylcypromine sulfate	Parnate *SmithKline Beecham Pharmaceuticals*	Antidepressant
Phenelzine sulfate	Nardil *Parke-Davis*	Antidepressant
Isocarboxazid	Marplan *Roche*	Antidepressant
Furazolidone	Furoxone *Roberts Pharmaceutical Corporation*	Antimicrobial
Procarbazine hydrochloride	Matulane *Roche*	Anticancer

LACTOSE-CONTROLLED DIET

Description
The Lactose-Controlled Diet limits intake of milk and milk products to the amount tolerated by the individual. Refer to Lactose Maldigestion medical nutrition therapy protocol for medical nutrition intervention strategies (1).

Indications
The Lactose-Controlled Diet is indicated in patients who are lactose intolerant; they are deficient in the enzyme lactase and are unable to tolerate ingested lactose. Lactose maldigestion occurs when digestion of lactose is reduced as a result of low activity of the enzyme lactase, as determined by the breath hydrogen test (2). Interpretation of the terms used to describe lactose maldigestion varies. For example, lactose intolerance refers to the gastrointestinal symptoms resulting from consumption of too much lactose relative to the body's ability to break it down by the intestinal enzyme lactase (1). Lactose maldigestion or its symptoms (lactose intolerance) should not be confused with a milk allergy, which is an allergy to milk proteins, not lactose. Lactose maldigestion is present in 70% of the world's adults and 20% to 25% of the US population. It is most prevalent among African-Americans, Asians, Hispanics, Native Americans, and people of Jewish descent. Lactose not hydrolyzed by lactase in the small intestine passes into the large intestine, where it is broken down by bacteria. The products of bacterial degradation can irritate the mucosa and raise the osmolality of the intestinal contents, causing a net secretion of fluid. Symptoms include bloating, abdominal pain, flatulence, and diarrhea, usually within 30 minutes after ingestion of lactose-containing foods.

Lactose maldigestion is not a disease, but a normal physiologic pattern (3). Primary lactase deficiency is the most common type and occurs as a normal physiological process in which lactase production in the brush border of the small intestine is reduced (3). Lactase deficiency may be secondary (secondary lactase deficiency) to significant protein-energy malnutrition, acquired immunodeficiency syndrome (AIDS), or iron deficiency anemia. Secondary lactase deficiency has also been observed following the use of antibiotics and anti-inflammatory drugs for arthritis. A transient secondary lactase deficiency may occur following viral gastroenteritis. It has been observed following surgical resection of the stomach or small bowel when there is a decrease in the absorptive area, following radiation therapy to the gastric or pelvic area, and after prolonged disuse of the gastrointestinal tract (eg, with total parenteral nutrition). However, the lactase activity may return to normal in the latter conditions over time. In children, it is typically secondary to infections or other conditions, such as diarrhea, AIDS, or giardiasis. Lactose intolerance may also be secondary to conditions that produce intestinal damage, such as celiac sprue, regional enteritis, Crohn's disease, and gluten-sensitive enteropathy.

Treatment is aimed at the underlying disorder in order to restore the patient's tolerance to lactose and to eliminate lactose restrictions. Evidence suggests that people with medically confirmed lactase maldigestion can include the recommended number of servings of milk and other dairy foods in their diet, which may actually improve their tolerance to lactose (1-3).

In feeding malnourished hospitalized patients and other patients with lactose intolerance, intolerance to 12 g of lactose can be clinically relevant. The following are used to determine the presence of lactose intolerance:

- *A diet history* can reveal symptoms of lactose intolerance following ingestion of lactose. Relief of symptoms following trial of a reduced lactose intake also indicates lactose intolerance.
- *A breath hydrogen analysis test* is the gold standard, or method of choice, to diagnose lactose maldigestion, especially in children. An increase in breath hydrogen concentration, generally 10 to 20 ppm above baseline, warrants a diagnosis of lactose maldigestion.
- *A lactose tolerance test* gives an oral dose of lactose equivalent to the amount of 1 quart of milk (50 g). In the presence of lactose intolerance, the blood glucose level increases less than 25 mg/dL of serum above the fasting level, and gastrointestinal symptoms may appear.
- *A biopsy* of the intestinal mucosa to determine lactase activity.

Congenital lactose intolerance is a rare condition. It is commonly diagnosed during the newborn period by intestinal biopsy and enzyme assay. Congenital lactose intolerance can cause life-threatening diarrhea and dehydration in the newborn. A lactose-free formula is indicated as soon as the diagnosis is made.

Nutritional Adequacy

The Low-Lactose Diet can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA. Adequate calcium can be obtained through the inclusion of dairy products, including cheese, yogurt, and milk or lactose-hydrolyzed milk.

When dairy products are limited, adequate intake of calcium, phosphorus, vitamins A and D, and riboflavin may be difficult to obtain. Because of the increased importance of calcium and its relationship to various diseases (eg, osteoporosis, hypertension) maintaining calcium intake of 1,000 to 1,300 mg/day for adults is a primary goal (4). Vitamin D fortified milk is the most dependable source of vitamin D. A vitamin D supplement may be indicated if exposure to sunlight is not ensured and if other foods fortified with vitamin D are not included in the diet.

How to Order the Diet **For C C, i ersit CIR CLICK HERE**

To order Lactose Restricted Diets at CMC, CIR, University Hospital, order as Low Lactose or Lactose Free Diet.

Planning the Diet

The important consideration is how much lactose can be tolerated without developing intestinal symptoms.

Between 80% and 100% of people with lactase deficiency experience the symptoms described if they drink 1 quart of milk a day. Research indicates that most people with low levels of lactase can comfortably ingest at least 1 cup (8 oz) of milk (12 g of lactose) with a meal and even 2 cups of milk in a day (5,6). One study has found that people with lactose maldigestion can consume 1,500 mg of calcium per day if the dairy products are distributed between the three meals and provided partially in the form of yogurt and cheese (2 cups of milk, 2 oz of cheese, and 8 oz of yogurt) (7). Tolerance to milk products is greater when they are consumed with other foods and spaced throughout the day. Whole milk is better tolerated than lower fat milk, and chocolate milk is better tolerated than unflavored milk (8,9). Generally, cheeses and ice cream are better tolerated than milk because of its lower lactose content. Adults with lactose intolerance can usually tolerate the amounts of milk in many prepared foods, such as breads, luncheon meats, and creamed foods, if these foods are given at intervals throughout the day.

Milk contributes a number of important nutrients to the diet, and dairy products are a major source of calcium, protein, and riboflavin. The maximum amount of milk products that can be taken without adverse effects should be included in the diet of persons with lactose maldigestion. Tolerance to lactose can be improved by gradually increasing intake of lactose-containing foods such as dairy products (3).

Commercial lactase enzyme preparations (eg, Lactaid® and Dairy Ease®) will hydrolyze 70% to 90% of the lactose in milk depending on the amount added. Lactose-reduced milks (reduced-fat, nonfat, calcium-fortified, and chocolate) with 70% to 100% of their lactose hydrolyzed are available. Lactose-reduced cottage cheese, pasteurized processed cheese, and some ice creams are available in some markets. Lactaid® caplets and Dairy Ease® tablets, which can be taken before ingestion of milk or milk products, are also available. Products made from soy, eg, tofu, calcium and vitamin fortified soy milk, tofu-based ice cream substitutes, and pasta entrees, are also available.

The following ingredients contain lactose and can be identified on the product's food label: (dry) milk solids/curds, casein, whey (solids), and lactose.

Other compounds that may appear on the food label but do not contain lactose are calcium compounds, kosher foods marked "pareve" or "parve," lactate, and lactic acid.

LACTOSE CONTENT OF MILK PRODUCTS

10-15 g	1-6 g	<1 g[a]
Milk, fluid, 1 cup	Pudding, ½ cup Ice Cream, ½ cup Ice Milk, ½ cup	Processed American Cheese, 1 oz Cream cheese, 1 oz
Yogurt[b], 1 cup	Sherbet, ½ cup Processed Cheese Spread, 1 oz Cottage Cheese, ½ cup Lactaid® and Dairy Ease® Milk (<100% reduced), 1 cup	Natural Hard and Semisoft Cheeses, 1 oz Half-and-Half, 1 tbsp Sour Cream, 1 tbsp

[a]These foods are processed with small amounts of milk, milk products, milk solids, or lactose and can be considered to have minimal to undetectable amounts of lactose.

[b]Only yogurt with active cultures is well tolerated by persons with a lactase deficiency. Yogurt with active cultures is labeled "live and active culture."

FOOD GUIDE — LACTOSE-CONTROLLED

FOOD GROUPS	FOODS THAT MAY CAUSE DISTRESS
Beverages and Milk	Milk (including acidophilus milk) and milk products except yogurt[a]; however, 4 -8 oz of milk can usually be tolerated with meals several times per day Mocha mix
Fruits and Juices	None
Vegetables	Any prepared with milk or cheese Instant mashed potatoes containing lactose Creamed, scalloped, or commercial products containing milk
Breads and Cereals	Instant Cream of Wheat; high-protein cereals; cereals with milk
Meat, Fish, Poultry, Cheese	Meats and meat substitutes in cream sauce Cold cuts, luncheon meats, sausage, processed meats that contain milk, nonfat milk solids or lactose filler Cottage cheese; processed cheese spread (Hard, aged cheeses, eg, bleu, brick, Camembert, cheddar, Colby, Edam, provolone, and Swiss, and processed cheeses, eg, American, Swiss are low in lactose and usually do not present a problem.)
Fats	Cream; half-and-half; whipping cream Gravies made with milk
Soups	Cream soups; chowder; commercially prepared soups that contain milk or milk products
Desserts	Ice cream Pudding, custard, and other desserts containing milk or milk products
Sugar and Sweets	Candy containing milk or cocoa Butterscotch candies, caramels, chocolate

[a]Only yogurt with active cultures is well tolerated by persons with a lactase deficiency. Yogurt with active cultures is labeled "live and active culture."

SAMPLE MENU

Breakfast	Noon	Evening
Orange Juice	Honey Glazed Chicken	Braised Beef & Noodles
Oatmeal	Baked Potato With Margarine	Seasoned Green Beans
Hard-Cooked Egg	Steamed Broccoli	Sliced Tomato Salad
Biscuit	Fruited Gelatin	French Dressing
Margarine; Jelly	Dinner Roll	Peach Halves
Coffee	Margarine	Dinner Roll
Sugar; Nondairy creamer	Frosted Banana Cake	Fruited Yogurt
Milk (½ cup if tolerated) or	Milk (½ cup if tolerated)	Margarine
Lactose-Reduced Milk	Tea; Sugar	Tea; Sugar

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NUTRITION MANAGEMENT OF FOOD HYPERSENSITIVITIES

Description
This diet eliminates the offending food or foods that cause an adverse reaction. Generally, the diet is the Regular Diet with the omission of the offending food. Each individual's sensitivity to the food determines the degree to which the particular food must be omitted.

Indications
Food hypersensitivity is an immune response, generally from IgE, to food components. The reaction results from an antigen of food source (usually protein) and may occur immediately (1 minute to 2 hours) or as a delayed reaction (2 to 48 hours) (1). Allergic tendencies are inherited, but not necessarily to a specific antigen. Foods most commonly reported to cause allergic reactions in children are cow's milk, chicken eggs, peanuts, soy, and fish; in adults, the most common are tree nuts, peanuts, fish, shellfish and wheat (2, 3, 4). The most common reactions to food allergies are gastrointestinal (eg, diarrhea, nausea, vomiting, cramping, and abdominal distention and pain), skin-related, and respiratory responses as well as systemic anaphylaxis with shock.

No simple test can be used to accurately diagnose the presence of a true food hypersensitivity. Unidentified or misdiagnosed food hypersensitivities can cause fatal reactions, result in inappropriate treatments, and threaten nutritional status. For the diagnosis of hypersensitivity, the following measures should be taken: a food reaction history, a physical examination, a 1- to 2-week diary recording foods eaten and symptoms, biochemical testing, immunologic testing, eg, skin tests such as, radioallergosorbent test (RAST) and the enzyme-linked immunosorbent assay (ELISA), a trial elimination diet for 2 weeks or until symptoms are clear, and a food challenge (2,5,6).

The history, used to identify the suspected food, should include detailed descriptions of symptoms, amount of food ingested, time of intake, and time of onset of symptoms.

A trial elimination diet removes all suspected foods and reintroduces them one at a time; if the symptoms are reduced by 50% or more while the patient is on the diet, that food is suspected (5). The food challenge is made after symptoms are cleared. Although challenges can be open, single-blind, or double-blind, the double-blind, placebo-controlled food challenge (8) is the preferred method for diagnosis of food hypersensitivity. Foods are provided in a pure form, and challenged one at a time, one per day. After the trial elimination diet and food challenge, the patient's diet should be altered eliminating the response-related food for 6 to 8 weeks (5). These foods are challenged again, and if the patient does not react to them, the foods are returned to the diet on an occasional basis.

Nutritional Adequacy
The trial elimination diet is intended to be short term because of its nutrient inadequacies. Most eliminations that involve a single food can be planned to meet the Dietary Reference Intakes (DRIs) as outlined in the *Statement on Nutritional Adequacy* in Section IA. However, diets that eliminate cow's milk may be low in calcium, vitamin D, and riboflavin. If children must eliminate cow's milk, the diet may also be low in protein and vitamin A. Diets that restrict or eliminate eggs, meats, and fish may be deficient in protein. Grain-free diets may be deficient in B vitamins, iron, energy, and carbohydrates. Citrus-free diets may be deficient in vitamin C and folic acid. Diets that eliminate multiple foods can be deficient in certain nutrients and should be evaluated, so that appropriate alternatives are recommended to supply nutrients that are lacking. No food group should be completely eliminated on a permanent basis unless absolutely necessary.

How to Order the Diet
Order as "______-Free Diet" (specify food to eliminate).

Planning the Diet
The basic diet should be the appropriate diet for the patient's age. Only foods confirmed by the food challenge should continue to be restricted. It is important to personalize the patient's diet based on food preferences.

Labels and recipes should be carefully read to avoid ingestion of the food that causes a reaction. Teaching the patient to read food labels, make appropriate substitutions, and purchase foods free of the suspected allergen, is the most helpful component to the self-management training. Often this training will require more than one session. Patients should be encouraged to contact food manufacturers with questions about ingredients. The Food Allergy

Network (FAN) has a Grocery Manufacturer's Directory and small, pocket-laminated cards listing food terminology.

These resources are available for purchase directly from FAN (10400 Eaton Place, Suite 107, Fairfax, VA 22030, 703/691-3179, Fax, 703/691-2713, email: fan@world web.net) (5).

The following section lists ingredients and terms found on food labels, which indicate the presence of specific food allergens.

Corn-Free Diet

Ingredients to avoid:

- Baking powder
- Corn, all types
- Corn flour
- Corn grits
- Corn malt
- Corn meal
- Corn starch
- Corn sugar; corn sweeteners
- Corn syrups
- Dextrin; dextrose
- Equal® sugar substitute
- Fructose
- Glucose
- Hominy
- Lactic acid
- Maize
- Maltodextrin
- Modified food starch
- Popcorn
- Sorbitol
- Vegetable gum; vegetable starch

Egg-Free Diet

Ingredients to avoid:

- Albumin
- Apovitellin
- Cholesterol-free egg substitute
- Egg
- Egg powder
- Egg whites, all forms
- Globulin
- Livetin
- Mayonnaise
- Meringue
- Ovalbumin
- Ovoglobulin
- Ovomucin
- Ovomucoid
- Ovovitellin
- Simplesse

Milk-Free Diet

Ingredients to avoid:

- Artificial butter flavor; butter-flavored oil
- Butter, butter solids
- Buttermilk
- Casein; caseinates (ammonium, calcium, magnesium, potassium, sodium)
- Cheese, all types; cheese flavor; cheese sauce; cottage cheese; cream cheese
- Cream; sour cream; whipped cream
- Curds
- Custard
- Ghee
- Goat's milk
- Half-and-half
- Hydrolysates (casein, milk, protein, whey, whey protein)
- Ice cream
- Lactalbumin; lactalbumin phosphate; lactoglobulin
- Lactate solids
- Lactose
- Lactulose
- Malted milk
- Milk: whole, low-fat, reduced fat, and nonfat
- Milk chocolate
- Milk derivative; milk powder; milk protein; milk solids; milk solid pastes
- Nonfat milk solids; nonfat dry milk
- Nougat
- Pudding
- Rennet casein
- Simplesse
- Sour milk solids
- Sweetened condensed milk
- Whey: curd, lactose-free, demineralized, sweet dairy; whey protein concentrate; whey solids
- Yogurt; frozen yogurt; yogurt powder

Note: The designation "pareve" on food labels indicates that the product does not contain milk.

Peanut-Free Diet:
Ingredients to avoid:

- Beer nuts
- Cold pressed or extruded peanut oil
- Ground nuts
- Mixed nuts
- Nuts; flavored nuts
- Peanuts
- Peanut butter; peanut butter chips
- Peanut flour
- Peanut syrup

Soy-Free Diet
Ingredients to avoid:

- Eda-Mame (soybeans in pods)
- Hydrolyzed soy protein
- Kinnoko flour
- Kyodofu (freeze-dried tofu)
- Miso; soy miso
- Modified food starch
- Natta
- Okara (soy pulp)
- Shoyu sauce
- Soy albumin
- Soy concentrate
- Soy flour; soybean flour
- Soy milk; soybean milk
- Soy nuts
- Soy protein; soy protein isolate
- Soy sauce
- Soy sprouts
- Soybean granules
- Supro
- Tamari
- Tempeh
- Tofu
- Yakidofu

Wheat-Free Diet
Ingredients to avoid:

- All-purpose flour, enriched flour
- Bran
- Bread; bread crumbs
- Bulgur
- Cake flour
- Cereal extract
- Couscous
- Crackers; cracker meal
- Durum; durum flour; durum wheat
- Farina
- Flour, wheat, bran, graham
- Food starch
- Gluten; high-gluten flour
- Graham flour
- Malt; malt extract
- Noodles
- Pasta
- Pastry flour
- Semolina
- Spelt
- Wheat; wheat bran; wheat flour
- Wheat germ
- Wheat gluten
- Wheat malt
- Wheat starch
- Whole-wheat berries

Note: Alternatives to wheat flour include rice flour, potato flour, rye flour, oat flour, barley flour, and buckwheat flour. See Gluten-Restricted, Gliadin-Free Diet earlier in this section for flour substitution recipes.

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BODY WEIGHT EVALUATION

Whenever possible, a patient should be weighed on a beam scale with nondetachable weights. The patient should be weighed while fasting, after voiding and without drainage bags and dressings. If it is not possible to remove drainage bags and dressings, weigh them separately to deduct their weight.

Interpretation

Of the three means of evaluating body weight, the "percent usual weight" and the "percent of recent weight change" correlate best with ultimate morbidity and mortality in individual patients. This is largely a result of the fact that many patients have a usual weight that is above their "ideal" weight for height. For the most complete picture, the dietitian may wish to evaluate the patient from the standpoint of all three parameters. For the dehydrated or edematous patient, the measured weight must be intuitively increased or decreased, respectively, before evaluation according to the methods below.

1. Percent Ideal Body Weight (IBW) (1):

$$\% \text{ IBW} = \frac{\text{Actual Weight}}{\text{IBW}} \times 100$$

1. Percent Usual Body Weight (UBW) (1):

$$\% \text{ UBW} = \frac{\text{Actual Weight}}{\text{Usual Weight}} \times 100$$

1. Percent Recent Weight Change (1):

$$\% \text{ Recent Weight Change} = \frac{(\text{Usual Weight} - \text{Actual Weight})}{\text{Usual Weight}} \times 100$$

Onset of Weight Loss	Significant Weight Loss	Severe Weight Loss
1 week	1%-2%	>2%
1 month	5%	>5%
3 months	7.5%	>7.5%
6 months	10%	>10%

Nutritional Parameters for Defining Protein Energy Malnutrition

Code	Weight for Height	Triceps Skinfold (Percentile)	Serum Albumin (g/dL)	Serum Prealbumin (mg/dL)	Other
260 Kwashiorkor	<90% standard	>50th	<3.0		• Easily pluckable hair • Peripheral edema • Delayed wound healing
261 Marasmus	<80% standard	<5th	>3.0		
262 Other Severe PEM	Weight loss >10% in 6 months % UBW <74% % IBW <69%	<30th	<2.1	<7.0	
263.0 Moderate PEM	Weight loss 10% in 6 months % UBW <75%-84% % IBW <70%-79%	30–39th	2.1–2.7	7.0–12.0	
263.1 Mild PEM	% UBW 85%-95% % IBW 80%-90%	40–50th	2.8–3.5	11.0–15.0	

Source: *International Classification of Diseases, Clinical Modification (ICD-9-CM)*. 9th ed. Ann Arbor, Mich: National Center for Health Statistics; 1997.

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STATURE DETERMINATION

Method 1: Height
Height should be taken with the subject in stocking feet and standing against a vertical measuring board. (For patients with severe curvature of the spine, other measurements of stature may be more accurate.)

Procedure: Have the subject stand erect with weight equally distributed on both feet and the heels together and touching the vertical board. Where possible the head, shoulder blades, buttocks, and heels should all touch the vertical board. Arms should be hanging free at the sides with palms facing the thighs. Subject should look straight ahead, take a deep breath, and hold position while the horizontal headboard is brought down firmly on top to the head. Measure to the nearest 0.1 cm.

Method 2: Arm Span
Measurement of arm span is roughly equal to height. The span measurement remains constant despite decreasing height with age and is an acceptable alternative method for establishing height.

Procedure: Position the subject with his or her feet against a flat surface, usually a wall. Fully extend the subject's upper extremities (including hands) at shoulder level with palms facing forward. Place a tape measure against the wall to measure the distance between the tip of one middle finger to the tip of the other middle finger (exclude fingernails). Arm span must be done supine between birth and three years of age.

Note: Measurement of arm span may be difficult in elderly persons due to an inability to adequately stretch out their arms, and chest measurements may be altered by lung disease or osteoporosis. Arm span may be used in the elderly to estimate maximum stature at maturity before occurrence of age-related bone loss.

Method 3: Knee Height
Knee height provides a method to measure stature of persons who cannot stand upright. Unlike overall height, knee height changes little with age. The measurement is highly correlated with stature.

The following formulas are used to compute stature from knee height:

Estimation of Stature From Knee Height			**Factor***
White male	6-18 years	2.22 (Knee Height) + 40.54	±8.42 cm
	18-60 years	1.88 (Knee Height) + 71.85	±7.94 cm
	60-80 years	2.08 (Knee Height) + 59.01	±15.68 cm
Black male	6-18 years	2.18 (Knee Height) + 39.60	±9.16 cm
	18-60 years	1.79 (Knee Height) + 73.42	±7.2 cm
	60-80 years	1.37 (Knee Height) + 95.79	±16.8 cm
White female	6-18 years	2.15 (Knee Height) + 43.21	±7.8 cm
	18-60 years	1.87 (Knee Height) + 70.25 – (0.06 age)	±7.2 cm
	60-80 years	1.91 (Knee Height) + 75 – (0.17 age)	±17.64 cm
Black female	6-18 years	2.02 (Knee Height) + 46.59	±8.78 cm
	18-60 years	1.86 (Knee Height) + 68.10 – (0.06 age)	±7.6 cm
	60-80 years	1.96 (Knee Height) + 58.72	±16.5 cm

*The stature of an individual will have a 95% chance of falling within the boundaries represented by the formula with the appropriate correction factor.

Adapted from: Chumlea W, Guo S, Steinbaugh M. Prediction of stature from knee height for black and with adults and children with application to mobility-impaired or handicapped person. *J Am Diet Assoc.* 1994;94:1385-1388. From: Grant A, DeHoog S. *Nutrition Assessment Support and Management.* Seattle, Wash: DeHoog/Grant; 1999. Reprinted by permission.

Procedure: The knee length measurement is made with a sliding, broad-blade caliper similar to the apparatus used to measure the length of infants. (Apparatus and user's guide available from Medical Express, 5150 SW Griffith Dr, Beaverton, OR 97005; 800/633-3676. Less expensive calipers are available from Ross Laboratories, Columbus, OH 43216.)

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BODY MASS INDEX (BMI)

	Weight (lb)																				
Height	**100**	**105**	**110**	**115**	**120**	**125**	**130**	**135**	**140**	**145**	**150**	**155**	**160**	**165**	**170**	**175**	**180**	**185**	**190**	**195**	**200**	**205**
5’0”	20	21	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
5’1”	19	20	21	22	23	24	25	26	26	27	28	29	30	31	32	33	34	35	36	37	38	39
5’2”	18	19	20	21	22	23	24	25	26	27	27	28	29	30	31	32	33	34	35	36	37	37
5’3”	18	19	19	20	21	22	23	24	25	26	27	27	28	29	30	31	32	33	34	35	35	36
5’4”	17	18	19	20	21	21	22	23	24	25	26	27	27	28	29	30	31	32	33	33	34	35
5’5”	17	17	18	19	20	21	22	22	23	24	25	26	27	27	28	29	30	31	32	32	33	34
5’6”	16	17	18	19	19	20	21	22	23	23	24	25	26	27	27	28	29	30	31	31	32	33
5’7”	16	16	17	18	19	20	20	21	22	23	23	24	25	26	27	27	28	29	30	31	31	32
5’8”	15	16	17	17	18	19	20	21	21	22	23	24	24	25	26	27	27	28	29	30	30	31
5’9”	15	16	16	17	18	18	19	20	21	21	22	23	24	24	25	26	27	27	28	29	30	30
5’10”	14	15	16	17	17	18	19	19	20	21	22	22	23	24	24	25	26	27	27	28	29	29
5’11”	14	15	15	16	17	17	18	19	20	20	21	22	22	23	24	24	25	26	26	27	28	29
6’0”	14	14	15	16	16	17	18	18	19	20	20	21	22	22	23	24	24	25	26	26	27	28
6’1”	13	14	15	15	16	16	17	18	18	19	20	20	21	22	22	23	24	24	25	26	26	27
6’2”	13	13	14	15	15	16	17	17	18	19	19	20	21	21	22	22	23	24	24	25	26	26
6’3”	12	13	14	14	15	16	16	17	17	18	19	19	20	21	21	22	22	23	24	24	25	26
6’4”	12	13	13	14	15	15	16	16	17	18	18	19	19	20	21	21	22	23	23	24	24	25

The BMI score means the following:	Underweight	Below 18.5
	Normal	18.5-24.9
	Overweight	25.0-29.9
	Obesity	30.0-39.9
	Extreme obesity	$\geq$40

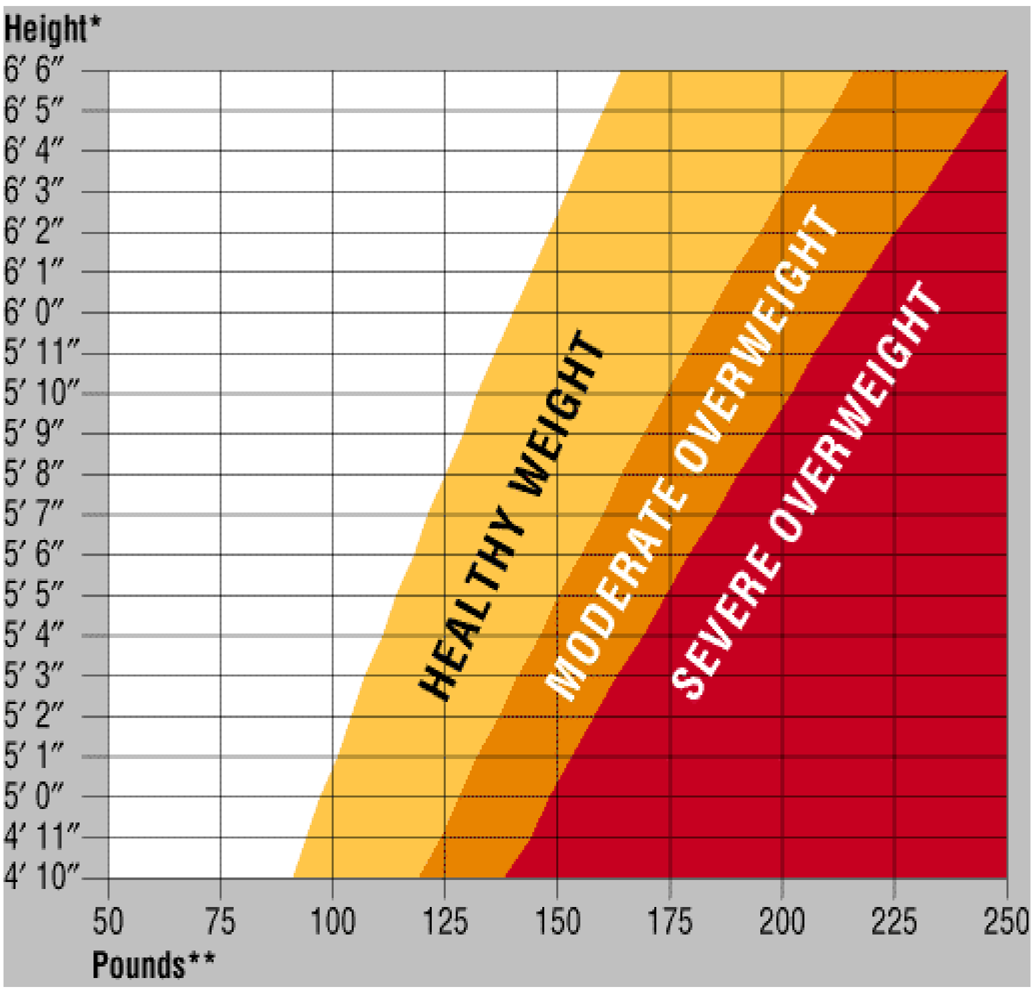
Source: National Heart, Lung, and Blood Institute Obesity Education Initiative. Expert Panel. Clinical guidelines on the identification, evaluation and treatment of overweight and obesity in adults. Available at: http://www.nhlbi.nih.gov. Accessed November 8, 1999.

WEIGHT FOR HEIGHT CALCULATION – 5' FT RULE

Frame Size	Females	Males
Medium	Allow 100 lb for first 5 ft of height plus 5 lb for each additional inch. Subtract 2.5 lb for each inch less than 5 ft.	Allow 106 lb for first 5 ft of height plus 6 lb for each additional inch. Subtract 2.5 lb for each inch under 5 ft.
Small	Subtract 10%	Subtract 10%
Large	Add 10%	Add 10%

Source: *Nutrition and Your Health: Dietary Guidelines for Americans.* 3rd ed. Washington, DC: US Depts of Agriculture and Health and Human Services; 1990. Home and Garden Bulletin No. 232.

HEALTHY WEIGHT CHART



* Without Shoes
**Without Clothes

Source: *Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2000*. Available at: http://www.ars.usda.gov/dgac/dgacguideexp.pdf. Accessed February 23, 2000.

SUGGESTED WEIGHTS FOR ADULTS

The following table provides the numerical healthy weight ranges outlined under the "Healthy Weight Chart."

Height (without shoes)	Weight in pounds (without clothes)
5'0"	97-128
5'1"	101-132
5'2"	104-137
5'3"	107-141
5'4"	111-146
5'5"	114-150
5'6"	118-155
5'7"	121-160
5'8"	125-164
5'9"	129-169
5'10"	132-174
5'11"	136-179
6'0"	140-184
6'1"	144-189
6'2"	148-195
6'3"	152-200
6'4"	156-205
6'5"	160-211
6'6"	164-216

Note: The higher weights in the ranges generally apply to men, who tend to have more muscle and bone; the lower weights more often apply to women, who have less muscle and bone.

Source: *Nutrition and Your Health: Dietary Guidelines for Americans*. 3rd ed. Washington, DC: US Departments of Agriculture and Health and Human Services; 1990. Home and Garden Bulletin No. 232.

AVERAGE HEIGHT AND WEIGHT FOR PERSONS AGED 65 YEARS AND OLDER

MEN

Height (in)	Ages 65-69	Ages 70-74	Ages 75-79	Ages 80-84	Ages 85-89	Ages 90-94
61	128-156	125-153	123-151			
62	130-158	127-155	125-153	122-148		
63	131-161	129-157	127-155	122-150	120-146	
64	134-164	131-161	129-157	124-152	122-148	
65	136-166	134-164	130-160	127-155	125-153	117-143
66	139-169	137-167	133-163	130-158	128-156	120-146
67	140-172	140-170	136-166	132-162	130-160	122-150
68	143-175	142-174	139-169	135-165	133-163	126-154
69	147-179	146-178	142-174	139-169	137-167	130-158
70	150-184	148-182	146-178	143-175	140-172	134-164
71	155-189	152-186	149-183	148-180	144-176	139-169
72	159-195	156-190	154-188	153-187	148-182	
73	164-200	160-196	158-192			

WOMEN

Height (in)	Ages 65-69	Ages 70-74	Ages 75-79	Ages 80-84	Ages 85-89	Ages 90-94
58	120-146	112-138	111-135			
59	121-147	114-140	112-136	100-122	99-121	
60	122-148	116-142	113-139	106-130	102-124	
61	123-151	118-144	115-144	109-133	104-128	
62	125-153	121-147	118-144	112-136	108-132	107-131
63	127-155	123-151	121-147	115-141	112-136	107-131
64	130-158	126-154	123-151	119-145	115-141	108-132
65	132-162	130-158	126-154	122-150	120-146	112-136
66	136-166	132-162	128-157	126-154	124-152	116-142
67	140-170	136-166	131-161	130-158	128-156	
68	143-175	140-170				
69	148-180	144-176				

DETERMINATION OF FRAME SIZE

Method 1: Wrist Measurement

$$\text{Frame Size } (r \text{ values}) = \frac{\text{Height (cm)}}{\text{Wrist Circumference (cm)}}$$

r values Females	Males	Interpretation	Method
>11.0	>10.4	Small frame	1. Measure individual height in centimeters (cm)
10.1-11	9.6-10.4	Medium frame	2. Measure the smallest part of the individual's wrist in centimeters.
<10.1	<9.6	Large frame	3. Divide the height by the wrist circumference to derive *r* value for frame size. Look at table to the left to interpret frame size of individual.

Method 2: Elbow Breadth (1,2)

Frame size is influenced by soft tissue and fat but elbow breadth is a good index of skeletal or frame size and is less affected by fat than wrist circumference. It is also closely associated with lean body mass. Elbow breadth is the distance between the epicondyles of the humerus and should be measured with either sliding or spreading calipers. To measure:

1. Extend one arm in front of the body and bend the forearm upward at a 90° angle. Keep the fingers straight and turn the inside of the wrist toward the body.
2. Place the thumb and index finger of the other hand on the two prominent bones (epicondyles of the humerus) on the right side of the elbow. For greatest accuracy, use sliding calipers. (Sliding calipers can be obtained from Lafayette Instrument, PO Box 5729, 3700 Sagamore Pkwy N, Lafayette, IN 47903; telephone: 800/428-7545; fax: 765-423-4111; e-mail: rehab@licmef.com.)
3. Place the blades of the sliding caliper (blades pointing up) or the tips of the spreading caliper on the epicondyles. Exert firm pressure to compress the soft tissues and record in the measurement to the nearest 0.1 cm.
4. Frisancho developed a frame index based on elbow, breadth, height, and age. "Frame Index 2" was derived using data from the National Health and Nutrition Examination Survey III (NHANES) and accounts for age-related changes to height and weight. Plug the value into the following formula:

   Frame Index 2 = Elbow Breadth (mm) divided by Height (cm) $\times$ 100
5. Use the table below to identify frame size for age.

Frame Size Based on Stature and Age

	Men			Women		
Age (yr)	**Small**	**Medium**	**Large**	**Small**	**Medium**	**Large**
18-25	<38.4	38.4-41.6	>41.6	< 35.2	35.2-38.6	>38.6
25-30	<38.6	38.6-41.8	>41.8	<35.7	35.7-38.7	>38.7
30-35	<38.6	38.6-42.1	>42.1	<35.7	35.7-39.0	>39.0
35-40	<39.1	39.1-42.4	>42.4	<36.2	36.2-39.8	>39.8
40-45	<39.3	39.3-42.5	>42.5	<36.7	36.7-40.2	>40.2
45-50	<39.6	39.6-43.0	>43.0	<36.7	37.2-40.7	>40.7
50-55	<39.9	39.9-43.3	>43.3	<37.2	37.2-41.6	>41.6
55-60	<40.2	40.2-43.8	>43.8	<37.8	37.8-41.9	>41.9
60-65	<40.2	40.2-43.6	>43.6	<38.2	38.2-41.8	>41.8
65-70	<40.2	40.2-43.6	>43.6	<38.2	38.2-41.8	>41.8
70-75	<40.2	40.2-43.6	>43.6	<38.2	38.2-41.8	>41.8

Adapted from: Frisancho AR. *Anthropometric Standards for the Assessment of Growth and Nutritional Status.* Ann Arbor, Mich: University of Michigan Press; 1990. In: Grant A, DeHoog S. *Nutrition Assessment Support and Management*. 5th ed. Seattle, Wash: Grant/DeHoog; 1999. Reprinted by permission.

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ADJUSTMENT OF CALCULATED BODY WEIGHT FOR OBESE PATIENTS

An adjusted body weight is used in the basal energy expenditure (BEE) calculation for the patient who is more than 125% of his or her ideal body weight (IBW). The basal energy expenditure calculation assumes a certain metabolic rate for tissue. As the obese person has a greater percentage of body fat, which is much less metabolically active, using actual body weight for an obese person will result in overestimation of energy requirements.

Using *ideal* body weight for a person who is more than 125% of his or her ideal body weight would not take into account the increased energy expenditure required for walking and moving excess weight around, as well as the increased lean body mass for structural support of extra fat tissue. Because of these concerns, the formula below is suggested for patients whose body weight is greater than 125% of the IBW. The factor of 0.25 acknowledges that 25% of excess weight in the obese person is as metabolically active as the body components in the lean person.

The formula is as follows:

$$[(\text{ABW} - \text{IBW}) \times 0.25] + \text{IBW} = \text{Corrected Weight (in kilograms)}$$

where ABW = actual body weight (kg) and IBW = ideal body weight (kg)

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Jequir E. Energy, obesity, and body weight standards. *Am J Clin Nutr.* 1987;45:1035.

ESTIMATION OF IDEAL BODY WEIGHT FOR AMPUTEES

In the case where a patient had an amputation, ideal body weight (IBW) cannot be compared to the standards for normal adults. Although body proportions vary from individual to individual, segmental weights can be used to prove an approximation of IBW.

Percent Total Body Weight by Individual Body Parts

Body Part	Percent
Head	8.0
Trunk	50
Upper arm	2.7
Forearm	1.6
Hand	0.7
Entire arm	5
Thigh	10.1
Calf	4.4
Foot	1.4
Entire leg	16

Determining Adjusted Body Weight for the Amputee
Using the IBW of the patient before the amputation, subtract the percentage of the body weight lost due to amputation. For a method of determining IBW, see Section II: Suggested Weights for Adults.

Example: Determine the adjusted IBW for a woman 5'5" with a below-knee amputation of the right leg.

IBW (female 5'5")	125 lb
Right below the knee (calf 4.4% + foot 1.5% = (-5.9%)	7.5 lb
Adjusted IBW	98.5 lb

Source: Grant A, DeHoog S. *Nutritional Assessment Support and Management*. 5th ed. Seattle, Wash: Grant/DeHoog; 1999.

ESTIMATION OF ENERGY REQUIREMENTS

The appropriate energy level is one that maintains ideal weight or achieves goals for anabolism or weight loss. Various formulas have been employed to estimate energy requirements. Such estimates must be adjusted by observation of clinical response.

Pounds × 10

Basal	Ideal body weight (lb) × 10
Anabolism (weight gain)	+ 500 kcal per day for weekly goal of 1lb weight gain (1.5 × basal has also been suggested)
Weight loss	- 500 kcal/day for weekly goal of 1lb weight loss

BEE (1)

Basal energy expenditure (BEE) is the predicted energy expenditure of a specific patient at a resting, fasting, unstressed state.

Male kcal/day = 66 + 13.8 (W) + 5.0 (H) – (6.8 × A)
Female kcal/day = 655 + 9.6 (W) + 1.8 (H) – (4.7 × A)

W = actual weight in kilograms if less than 125% of ideal body weight
Note: If greater than or equal to 125% of ideal body weight, use adjusted body weight. See Section II: Adjustment of Calculated Body Weight for the Obese.
H = height in centimeters
A = age in years

OR (using pounds and inches)
Male kcal/day = 66 + (6.3 × lb) + (12.9 × inches) – (6.8 × A)
Female kcal/day = 655 + (4.3 × lb) + (4.7 × inches) – (4.7 × A)

Calculating Energy Needs

To calculate daily needs, multiply the BEE by the activity factor (AF) times the injury factor (IF) (2).

Method 1:

Activity Factor	**Use**	**Injury Factor**	**Use**
Confined to bed	1.2	Minor surgery	1.2
Out of bed	1.3	Skeletal trauma	1.3
		Major sepsis	1.6
		Severe burn	2.1

As an alternative to the above calculation, a useful initial approximation of the energy needs of patients in the clinical setting can be obtained with 25 to 30 kcal/kg per day (3).

Note: The Harris-Benedict formula with a stress factor of 1.76 will often overfeed elderly patients. A stress factor of 1.00 to 1.55 will more closely match their needs. It is common to feed measured energy expenditure plus 10% to 20% to cover fluctuation throughout the day (4).

Method 2: Ireton-Jones Equation (5)

EEE (V) = 1925 – 10 (A) + 5 (W) + 281 (S) + 292 (T) + 851 (B)
EEE (SP) = 629 – 11 (A) + 25 (W) – 609 (O)
EEE = kcal/day

where
V = ventilator-dependent
SP = spontaneous breathing
A = age
W = weight in kilograms
S = sex (male = 1, female = 0)
T = trauma (present = 1, absent = 0)
B = burns (present = 1, absent = 0)
O = obesity >30% above IBW from 1959 Metropolitan Life Insurance tables (present = 1, absent = 0)

Energy Requirements Based on Body Weight and Activity Level (6)
In patients who are not catabolic, energy requirements based on activity level are often quite accurate. However, a major limitation of this system is the absence of a precise definition of overweight, normal weight, and underweight, as well as activity level.

Condition	Goal	Sedentary	Moderately Active	Active
Overweight	Weight loss	20-25 kcal/kg	30 kcal/kg	35 kcal/kg
Normal	Maintenance	25-30 kcal/kg	35 kcal/kg	40 kcal/kg
Underweight	Weight gain	30-35 kcal/kg	40 kcal/kg	45-50 kcal/kg

Energy Needs for Children and Young Adults (7,8)

	Age	Energy Needs, kcal/lb	Energy Needs, kcal/kg
	0-12 months	50	110
	1-10 years	45 to 32*	100 to 70*
Females	11-14 years	21	47
	15-18 years	18	40
Males	11-14 years	25	55
	15-18 years	20	45

Note: All values are approximate.
**Gradual decline with age.*

Indirect Calorimetry
Indirect calorimetry is an indirect measurement of resting energy expenditure (REE) based on quantification of an individual's respiratory gas exchange (ratio of oxygen consumed to carbon dioxide produced). From respiratory gas exchange measurements, a respiratory quotient (RQ) can be obtained that can provide additional information about individual substration utilization. Many of the energy equations available for estimating energy expenditure were derived as early as the 1900s from calorimetry studies of groups of well individuals. Many of the currently available stress factors and kilocalorie ranges proposed for estimating energy requirements for specific disease states are based on recent indirect calorimetry studies; however, the accuracy of these formulas for estimating requirements for the individual patient can vary.

Basal metabolic rate (BMR) and energy expenditure (EE) from the thermic digestion of continuous feedings and metabolic stress (eg, trauma, sepsis) are inherently measured during the calorimetry test period. Since patients are usually kept inactive during the short measurement of REE (eg, 0.5- to 2-hour measurement), EE from ambulation or routine nursing care (eg, bathing, turning, endotracheal suctioning) would not be reflected when estimating a 24-hour REE. Other factors known to affect EE, such as a change in medications that act as a stimulant or a sedative, changes in the degree or type of ventilator support, and day-to-day variations in the metabolic stress level of patients should be considered when monitoring and interpreting measured EE. Precise guidelines and more in-depth considerations for the use of indirect calorimetry have been published (5,8).

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ESTIMATION OF PROTEIN REQUIREMENTS

These requirements reflect recommendations for adult patients. Use of ideal weight, or adjusted body weight for obese individuals, is suggested for all equations because protein requirements relate to lean body mass. Use of actual weight in the calculations would overestimate the protein requirements of the obese person. However, in the underweight, malnourished patient, use of actual body weight has been suggested in equations using anabolic protein levels in order to avoid the consequences of overfeeding in these patients. A nitrogen balance test may be employed to evaluate adequacy of protein intake.

1. Grams per kilogram

Maintenance: Recommended Dietary Allowances (RDA): 0.8 to 1.0 g/kg ideal weight (1,2)

Anabolism: Critical illness/moderate stress: 1.2 to 1.5 g/kg (3)

Trauma: Greater than 1.5 g/kg (3)

2. Energy fraction

This method serves as a good check to method 1 because it ensures that adequate energy is planned to efficiently utilize protein. To achieve positive nitrogen balance, use the following table:

Metabolic State	Energy Fraction (%) From Protein
Normal and convalescent	7-10 (2)
Hypermetabolic	15-20 (2,4)

Note: Excessive protein intake may be associated with an elevated serum urea nitrogen level and increased urinary nitrogen excretion.

3. Energy-to-Nitrogen (N_2) Ratio (4)

Nitrogen intake: Nitrogen needs are based on total energy needs. Therefore, nitrogen balance improves as nitrogen intake increases at any given energy level. The energy (calorie)-to-nitrogen ratio considers the optimal amount of energy required for protein sparing, given the individual's stress level. A suggestion for maintenance is 1 g of nitrogen (6.25 g of protein) for 200 kcal for anabolic individuals, and 1 g of nitrogen for 150 kcal (2).

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LABORATORY INDICES OF NUTRITIONAL STATUS

Numerous laboratory values can be useful in assessing nutritional status. However, caution is necessary when interpreting laboratory values, and results from single laboratory values should be interpreted carefully. The laboratory tests listed below are commonly used to evaluate nutritional status (eg, protein levels, hematologic status).

Test	Purpose/Definition	Normal Range	Discussion
Protein Status			
Albumin	Sensitive to protein status	3.5-5.0 g/dL	Good indicator for nutritional status. Elevated levels occur only in dehydration.
Pre-albumin	Sensitive index of nutritional status.	19-43 mg/dL	More sensitive to dietary change then albumin. Responds within 3 days of dietary treatment.
Protein, total	Total protein is of little value as a sensitive index for estimating protein nutritional status	Serum value 6.4-8.3 g/dL	Decreased values occur with: nephrosis; severe burns malnutrition; overhydration hepatic insufficiency Increased values occur with: multiple myeloma; dehydration
Transferrin	Reflects changes in visceral protein status	200-400 mg/dL	Decreases with anemia and protein-energy malnutrition Increases with iron deficiency, infection, oral contraceptives, and pregnancy
Urea nitrogen	Urea is the principal end product of protein catabolism	10-20 mg/dL Values may be slightly higher in the elderly	Decreased values occur with: liver impairment; decreased protein intake overhydration; malabsorption high-carbohydrate, low-protein diets Increased values occur with: renal insufficiency; GI bleeding dehydration; lower urinary tract infection diabetes mellitus; obstruction starvation; congestive heart failure excessive protein intake or protein catabolism
Hematologic Status			
Red blood cells (RBCs)	Measures the number of RBCs in whole blood	M: 4.5-6.0 million/mm^3 F: 4.0-5.5 million/mm^3	Decreased values occur with: anemia; chronic infection leukemia Increased values occur with: dehydration
Hemoglobin (Hgb)	Part of the red blood cells that carries oxygen and carbon dioxide in the blood	M: 13-18 g/100 dL F: 12-16 g/100 dL	Men's Hgb may drop 1-2 g/100 mL with age. Women have no documented change. Although Hgb declines with age, other signs should be reviewed, eg, pale skin, pale conjunctiva.
Hematocrit (HCT)	Measures the percent of RBCs in the total blood volume	M: 42%-52% F: 37%-47%	Values may decrease slightly in the elderly
Mean corpuscular hemoglobin concentration (MCHC)	Measures the concentration of Hgb per unit of red blood cells	32%-36%	Values <30 indicate advanced iron deficiency anemia
Mean corpuscular volume (MCV)	Measures the average size of the RBC	80-95 mm^3	Increased values indicate pernicious anemia. Decreased values indicate iron deficient anemia.
Ferritin	Provides an index of iron stores in iron deficiency and iron overload	M: 12-300 µg/L F: 10-150 µg/L	Significantly higher in mend and post menopausal women. Decreased values occur with iron or protein deletion. Increased values occur with iron excess.
Prothrombin time (PT)	Measures velocity of blood clotting and is an indirect measure of vitamin K status	Adults: 11-12.5 seconds 85%-100% of control	Increased values occur with: vitamin K deficiency (common in elderly and hospitalized) liver disease; fat malabsorption drug therapy (antibodies, anticoagulants, aspirin) PT >25 seconds is associated with major bleeding

CLASSIFICATION OF SOME ANEMIAS

Test	**B12 Deficiency**	**Folate Deficiency**	**Iron Deficiency**	**Anemia of Chronic Disease**
RBC count	D	D	D	D
Hemoglobin	D	D	D	Slight D
Hematocrit	D	D	D	D
MCV	I	I	D	N
MCH	I	I	D	N
MCHC	N	N	D	N
Reticulocyte count	N or D	N or D	N or D	N or D
RDW	N or I	N or I	I	N
Serum ferritin	I	I	D	N or I
TIBC	N	N	N or I	N or D
Transferrin	N	N	N or I	N or D
Transferrin saturation (%)	N	N	D	N or D
Serum iron	N	N	D	D
Serum folate	N or I	D	N	N
Red cell folate	D	D	N	N
Vitamin B12	D	N	N	N
Red blood cells	Normochromic, macrocytic	Normochromic, macrocytic	Hypochromic, microcytic	Hypochromic, microcytic (both mild)
Other	Hypersegmented neutrophils, macro-ovalocytes	Hypersegmented neutrophils, macro-ovalocytes	Anisocytosis	Poikilocytosis (slight), anisocytosis (moderate)

I = increased; N = normal; D = decreased; TIBC = total iron-binding capacity

Source: Grant A, DeHoog S. *Nutrition Assessment Support and Management.* 5th ed. Seattle, Wash: Grant/DeHoog; 1999:183. Reprinted by permission.

DIAGNOSTIC CRITERIA FOR DIABETES MELLITUS

The diagnostic criteria for diabetes are issued by the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (1). This system of classification of diabetes is based on the cause of the disease, as opposed to the therapy used to treat the hyperglycemia.

Diagnosis of Diabetes

The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus advocates use of the following laboratory criteria for nonpregnant adults (1):

1. Symptoms of diabetes plus casual plasma glucose concentration greater than or equal to 200 mg/dL (11.1 mmol/L). Casual is defined as any time of the day without regard to the time since the last meal. The classic symptoms of diabetes include polyuria, polydipsia, and unexplained weight loss.
2. Fasting plasma glucose (FPG) concentration greater than or equal to 126 mg/dL (7.0 mmol/L). Fasting is defined as no energy intake for at least 8 hours.
3. Plasma glucose concentration 2 hours after glucose ingestion greater than or equal to 200 mg/dL during an oral glucose tolerance test (OGTT). The test should be performed, as described by the World Health Organization (WHO), using a glucose load containing the equivalent of 75 g of anhydrous glucose dissolved in water.

In the absence of unequivocal hyperglycemia with acute metabolic decompensation, these criteria should be confirmed by repeated testing on a different day. The OGTT is not recommended for routine clinical use (1).

Impaired Fasting Glucose (IFG) and Impaired Glucose Tolerance (IGT)

The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus endorses these concepts and notes the following criteria for the diagnosis of diabetes mellitus (1):

	"Normal"	**"Impaired"**	**"Diabetes"**
Fasting plasma glucose	≤110 mg/dL	≥110 and <126 mg/dL (IFG)	≥126 mg/dL
Glucose tolerance, at 2 hours after glucose load (during OGTT)	<140 mg/dL	≥140 and <200 mg/dL (IGT)	>200 mg/dL

Screening and Diagnosis Scheme for Gestational Diabetes Mellitus (GDM) (2)

Plasma Glucose	**50-g Screening Test (mg/dL)**	**100-g Diagnostic Test* (mg/dL)**
Fasting	--	105
1 h postprandial	140	190
2 h postprandial	--	165
3 h postprandial	--	145

Note: Screening should be performed between the 24th and 28th weeks of gestation in women meeting one or more of the following criteria: ≥25 years of age; <25 years of age and obese (ie, less than 20% over desired body weight or BMI ≥27 kg/m^2); family history of diabetes in first-degree relatives; member of an ethic/racial group with a high prevalence of diabetes (eg, Hispanic-American, Native American, Asian-American, African-American, or Pacific Islander).

*The 100-g diagnostic test is performed on patients who have a positive screening test. The diagnosis of GDM requires any two of the four plasma glucose values obtained during the test to meet or exceed the values shown above.

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MAJOR NUTRIENTS: FUNCTIONS AND SOURCES

Fat-Soluble Vitamins	Important Sources	Physiological Roles
Vitamin A (retinol, beta carotene)	Milk, butter, fortified margarine, whole milk Cheese, liver, egg yolk (retinol) Green leafy and stem vegetables, yellow fruits and vegetables (carotene), eg, spinach, asparagus, broccoli, carrots, apricots, and cantaloupe	Maintains normal vision in dim light, healthy skin, and mucous membranes Essential for normal skeletal and tooth development
Vitamin D (cholecalciferol)	Exposure to sunlight, fortified foods, fish liver oils	Maintains blood calcium and phosphorus levels Required for proper bone development
Vitamin E (tocopherol)	Vegetable oils Whole grains, wheat germ Leafy vegetables Egg yolk Legumes, nuts (especially almonds, peanuts, pecans, walnuts), sunflower seeds	Protects the integrity of normal cell membranes Assists in prevention of hemolysis of red blood cells Protects vitamin A, acting as an antioxidant
Vitamin K	Lettuce, spinach (green leafy vegetables), kale, cauliflower, cabbage Egg yolk Soybean oil Liver	Produces prothrombin in normal blood clotting
Water-Soluble Vitamins	**Important Sources**	**Physiologic Roles**
Ascorbic acid (vitamin C)	Citrus fruits, strawberries, cantaloupe, tomatoes, sweet peppers, cabbage, potatoes, kale, parsley, turnip greens, broccoli	Maintains integrity of capillaries Promotes healing of wounds and fractures Aids tooth and bone formation Increases iron absorption Protects folic acid Helps form collagen for healthy connective tissue
Thiamin (vitamin B1)	Pork, liver, chicken, fish, beef Whole grains, wheat germ, dried yeast, enriched cereal products Nuts and lentils	Metabolizes carbohydrates for energy Provides function of nerve cell membranes
Riboflavin (vitamin B2)	Milk Liver, meat, fish, eggs Enriched cereal products Green leafy vegetables	Metabolizes carbohydrates, proteins, and fats for energy Closely related to the metabolism of protein
Niacin	Liver, poultry, meat, fish, eggs Whole grains, enriched cereal products Peanuts, peanut butter	Metabolizes carbohydrate for energy
Pyridoxine (vitamin B6)	Pork, organ meats, meat, poultry, fish, legumes, seeds Whole grains	Metabolizes protein Converts tryptophan to niacin Synthesizes hemoglobin Maintains integrity of central nervous system

Water-Soluble Vitamins	Important Sources	Physiologic Roles
Vitamin B12 (cyanocobalamin)	Animal foods only: liver, meat, salt-water fish, oysters, eggs Milk	Essential for red blood cell maturation and normal function of all body cells (especially nervous system, gastrointestinal tract and bone marrow)
Folate	Green leafy vegetables Liver, beef, fish, dry beans, lentils Whole grains	Essential for DNA synthesis and synthesis and maturation of red blood cells
Pantothenic acid	Animal sources (esp. organ meats, egg yolk, and meat) Whole grains Legumes Yeast	Responsible for metabolism of carbohydrates, proteins, and fats for energy; formation of some hormones, hemoglobin, and nerve-regulating substances
Biotin	Organ meats, egg, yolk, legumes, nuts	Synthesizes fatty acids Helps in metabolism of carbohydrates for energy
Minerals	**Important Sources**	**Physiologic Roles**
Calcium	Milk Hard cheeses, eg, cheddar, Swiss, mozzarella, and provolone Yogurt, ice cream, cottage cheese Turnip and mustard greens, collards, kale, broccoli, cabbage	Maintains strength of bones and teeth Involved with transmission of nerve impulses, muscle contractions and relaxation, blood clotting, structure and function of cell membranes, and absorption of vitamin B12
Phosphorus	Milk and milk products Meat, poultry, fish and eggs Whole grain cereals and flours Nuts and legumes	Essential for structure of bones and teeth; release of stored energy; structure of RNA and DNA; cell permeability; and metabolism of carbohydrates, fats, and proteins
Magnesium	Whole grain breads and cereals Soybeans, nuts, dry beans and peas, green leafy vegetables	Fundamental to the production of energy, calcium, and phosphorus metabolism in bone; maintenance of the function and structural integrity of heart muscle as well as other muscles and nerves
Sodium	Use of salt at the table and in cooking Processed foods Milk Eggs, meat, poultry, fish Smoked meats Olives, pickles, soy sauce	Maintains normal osmotic pressure water balance, normal irritability of nerve cells and contraction of muscles, and permeability of the cell membrane
Potassium	Meats, poultry, fish, (especially veal and salmon) Fruits and vegetables (especially bananas, potatoes, tomatoes, and citrus fruits) Whole grain cereals	Maintains normal osmotic pressure and fluid balance Required to store energy within the cell Key to transmission of nerve impulse and contraction of muscle fibers, especially the heart muscle
Chloride	Use of salt at the table and in cooking	Regulates osmotic pressure, water balance, and acid-base balance of extracellular fluid Is a component of hydrochloric acid in the gastric juice

Trace Elements	Important Sources	Physiologic Roles
Iron	Liver, meat, fish and poultry Whole grain and enriched cereals Legumes Green leafy vegetables Eggs Dried fruit Foods cooked in iron pots and skillets (especially foods with a high acid content)	Essential to the formation of hemoglobin in blood and myoglobin in muscles, which supply oxygen to cells
Zinc	Animal products (especially liver and oysters) Beef, lamb, pork Whole grain cereals Legumes Peanuts Peanut butter	Essential in wound healing, synthesis of proteins, mobilization of vitamin A from liver, normal cellular immune functions, and normal growth of genital organs
Copper	Organ meats Shellfish (especially oysters and crabs) Whole grain cereals Hickory and brazil nuts, sesame and sunflower seeds Legumes (soybeans, kidney, navy, lima beans)	Essential for formation of red blood cells and the utilization of iron, production of energy, cell protection against oxidative damage, and synthesis of connective tissue
Iodine	Iodized salt used at the table and in cooking	Part of thyroid hormones Influences physical and mental growth, functioning of nervous and muscle tissues, circulatory activity, and metabolism of all nutrients
Fluoride	Fluoridated water Seafood	Increases deposit of calcium, which strengthens the bone and reduces the acid in the mouth, therefore decreasing tooth decay
Chromium Manganese Molybdenum Selenium Nickel Silicon Vanadium	Present in very small amounts in plant foods (ie, whole grains, dried beans and peas, nuts, seeds, fresh fruits and vegetables) Animal foods (meat, fish, poultry, eggs)	Essential as components of enzymes and hormones

PHYSICAL SIGNS OF NUTRITIONAL DEFICIENCIES

Body Part	Signs	Deficiencies
Hair	Color change	Protein-energy malnutrition
	Easy pluckability, sparseness	
	Alopecia	Biotin, zinc, vitamins A and E
	Brittle	
	Dryness	
Skin	Acneiform lesions	Vitamin A
	Follicular keratosis (scalelike plaques)	Vitamin A or essential fatty acids
	Xerosis (dry skin)	Vitamin A
	Ecchymoses; petechiae (hemorrhagic spots)	Vitamins C and K
	Thickening and hyperpigmentation of pressure points	Niacin
	Scrotal dermatosis	Niacin and riboflavin
Eyes	Pale conjunctiva (pale coloring of eyelid lining and whites of the eyes)	Iron, folate, or vitamin B12
	Bitot's spots (foamy spots on the whites of the eyes)	Vitamin A
	Conjunctival xerosis (inner lids and whites appear dull, rough)	Vitamin A
	Angular palpebritis (corners of eyes are cracked, red)	Riboflavin and niacin
Mouth	Decreased production of salivary fluids	Vitamin A
	Angular stomatitis (cracked, red, flaky at corner of mouth)	Vitamin B12
	Bleeding gums	Vitamin C
	Cheilosis (vertical cracks of lips)	Riboflavin
Tongue	Atrophic papillae (smooth, pale, slick tongue)	Folate, niacin, riboflavin, iron, or vitamin B12
	Glossitis (red, painful tongue)	Folate, niacin, and vitamin B12
	Magenta tongue (purplish, red tongue)	Riboflavin
Nails	Koilonychia (concave, spoon-shaped)	Iron
Extremities	Genu valgum or varum (knocked knees or bowed legs)	Vitamin D or calcium
	Loss of deep tendon reflexes of lower extremities	Thiamin and vitamin B12

FOOD AND DRUG INTERACTIONS[a]

Drug Classification	Effect of Food on Drug	Effect of Drug on Nutritional Status	Patient Guidelines
Analgesic			
Acetaminophen (Tylenol) Ibuprofen (Motrin)	Food delays but does not ↓ absorption	GI bleeding is possible Decreased platelet levels of vitamin C Decreased serum folate due to competing for serum protein binding sites	If medication (any analgesic) upsets stomach, take with meals
Aspirin/salicylate	None	Fecal iron loss; potassium depletion	Vitamin C supplementation is recommended for individuals receiving salicylates for treatment of rheumatoid arthritis May take with low-mineral carbohydrate snack
Antacid			
Magnesium trisilicate (Trisogel) Calcium carbonate (Tums) Sodium bicarbonate	None	May ↓ iron absorption ↑ thirst; ↑ weight (edema)	Take after meals with water Evaluate iron status regularly Take iron supplements separately 1 hour before or 2 hours after eating
Anticonvulsant			
Diphenylhydantoin (Dilantin)	Administer separately from tube feeding due to possible effects of bioavailability	Possible megaloblastic anemia with long- term therapy (responds to 25 µg/day of folate) Increased turnover of vitamin D Blocks conversion of vitamin D by liver; osteomalacia may result (responds to vitamin D) Increased vitamin C requirements Reduction in vitamin K–dependent coagulation factors Reduced serum B_{12} status Can ↓ taste acuity Hyperglycemia has been reported Folate need ↑ with long-term therapy; however, ↑ folate will ↓ absorption	Take with food or milk (drug may cause gastric irritation) Stop tube feeding 2 hours before and 2 hours after drug intake Liberal intake of dairy products is advised Vitamin D or folate supplement may be needed Take Ca or Mg supplement or antacids 2 hours before or after drug If patient has loss of seizure control, may need to ↓ folic acid supplement
Antibiotic/Anti-Infective			
Erythromycin Penicillin or ampicillin	Delayed absorption when taken with food	Anorexia; oral candidiasis; abdominal stress	Take on empty stomach with full glass of water Allow 1 hour to elapse between penicillin dose and consumption of fruit juice or other acidic beverage
Tetracycline (Achromycin)	Absorption impaired by concurrent intake of food and antacids containing	Can promote negative nitrogen balance	Take on empty stomach with full glass of water Avoid milk products, iron-fortified cereals, and iron supplements within 2 hours of dosage
Ciprofloxacin (Cipro)			Take multivitamins with minerals, Ca, Fe, Mg separately by 2 hours Stop tube feeding 2 hours before and 2 hours after drug intake
Sulfasalazine		Patients taking sulfasalazine may require a supplement of 1 mg/day of folic acid to prevent vitamin deficiency associated with competition of the drug for absorption of folate Possible ↓ vitamin K and vitamin B absorption	
Antifungal			
Griseofulvin (Fulvicin)	Fulvicin absorption improves with a fatty meal or whole milk	Taste loss; oral candidiasis; dry mouth; stomach pain	Take with whole milk or meal
Antihyperlipidemic			
Clofibrate (Atromid-S)		Nausea Reported decreased absorption of vitamins A, D, K, B_{12}, folate, and Fe	Take with food or milk Follow a low-cholesterol and low-fat diet
Colestipol (Cholestid; Probucol) Cholestyramine (Questran, Cuemid)		Constipation common	Increase intake of water and high-fiber foods Take with meals Take vitamin/mineral supplements 1 hour before or 4 hours after medication intake
Lovastatin (Mevacor)	Consuming high-fiber foods at same time medication is taken ↓ absorption of drug		Mevacor: Do not consume with high-fiber foods

[a]GI indicates gastrointestinal; ↑, increase; and ↓, decrease

Drug Classification	Effect of Food on Drug	Effect of Drug on Nutritional Status	Patient Guidelines
Antihyperlipidemic Clofibrate (Atromid-S)		Nausea Reported decreased absorption of vitamins A, D, K, B_{12}, folate, and Fe	Take with food or milk Follow a low-cholesterol and low-fat diet
Colestipol (Cholestid; Probucol) Cholestyramine (Questran, Cuemid)		Constipation common	Increase intake of water and high-fiber foods Take with meals Take vitamin/mineral supplements 1 hour before or 4 hours after medication intake
Lovastatin (Mevacor)	Consuming high-fiber foods at same time medication is taken ↓ absorption of drug		Mevacor: Do not consume with high-fiber foods
Antihypertensive Propranolol beta blockers (Inderal, Lopressor)	Food may increase, decrease, or delay absorption (depending on which beta blocker is used)	Dry mouth; diarrhea; nausea; vomiting; constipation May prevent the appearance of certain premonitory signs and symptoms of acute hypoglycemia in type 1 diabetes	Take with food Follow a sodium-restricted diet Avoid natural licorice Grapefruit juice may ↑ drug absorption; limit intake of juice
Bronchodilator Theophylline (Theo-24, Theo-Dur, Theolair, Slo-bid)	Drug effect is increased by caffeine; toxicity can result When plasma levels are measured, coffee, tea, cola, chocolate, and acetaminophen and xanthine contribute to high values; may ↑ risk of cardiovascular and central nervous system side effects Drug effect may be decreased by ingestion of charcoal-broiled meats High-protein/low-carbohydrate diet is associated with decreased drug level	May occasionally act as a GI irritant Anorexia Bitter aftertaste Raises glucose with high dosage	Avoid large amounts of caffeine and chocolate Take with food to help reduce GI irritation Avoid major changes in carbohydrate and protein composition of diet Avoid excessive intake of charbroiled meats
Cardiovascular Digoxin (Lanoxin)	Food delays but does not inhibit absorption except for bran, which may reduce absorption	Digitalis may exacerbate metabolic effects of hyperkalemia, especially with respect to myocardial activity May cause GI irritation Anorexia; weight loss Diarrhea	Take 2 hours after meals to lessen gastric irritation Take medication between meals if meals are high in bran; bran decreases effects and level of medication Diet should provide liberal potassium, Mg, and Ca intake Avoid natural licorice (imported)[b] and low Na intake

[a]GI indicates gastrointestinal; ↑ , increase; and ↓, decrease

Drug Classification	Effect of Food on Drug	Effect of Drug on Nutritional Status	Patient Guidelines
Vitamin Supplements Vitamin A	Adequate fat, protein, and vitamin E needed for absorption ↑ calories for carbohydrate intake; ↑ thiamin requirement	Toxic in excess doses	Avoid excessive intake of raw fish
Thiamin (B_1)	Foods high in thiaminase may ↓ thiamin activity		Take with food or milk to ↓ GI distress
Niacin (B_3)		Large doses may ↑ blood glucose and cause jaundice and GI disturbances; 3-9 g/day produces toxicity	For capsules, do not mix contents with jam or jelly
Pyridoxine (B_6)			
Vitamin C		Large doses may ↑ red blood cell hemolysis and destroy dietary vitamin B_{12} when taken with food May be relevant to kidney stone formation	Take vitamin B-12 supplement separately by 1 hour Take with iron supplement to ↑ iron absorption
Vitamin D		Toxic in excess doses	
Vitamin E		Large doses may induce vitamin K deficiency	
Mineral Supplements Fluoride		>20 mg/day will produce severe skeletal fluorosis Ca, vitamin C, or protein deficiency will ↑ fluorosis	Do not take with high-fat, low-sugar (rich) foods Keep Ca supplement and albumin hydroxide separate of fluoride by 2 hours
Potassium (K-Dur, K-Lor, K-Lyte)	Decreased absorption when taken with dairy products		Do not take with dairy products

[a]GI indicates gastrointestinal; ↑ , increase; and ↓ , decrease

Also find reference to the following drugs:

Anticoagulants	See Section III: Anticoagulant Therapy
Corticosteroids	See Section III: Corticosteroid Therapy
Calcium supplements	See Section IF: Nutrition Management of Calcium Intake
Chemotherapeutic agents	See Section III: Cancer
Monamine oxidase inhibitors	See Section IH: Tyramine Restricted Diet
Oral glucose lowering medications	Section III: Diabetes: Oral Glucose Lowering Medications and Insulin

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HERB AND DRUG INTERACTIONS

Herb Classifications	Common Indications	Possible Side Effects	Herb-Drug Interactions	Patient Guidelines
Chamomile *Matricaria recutita*	Internal uses: inflammatory diseases of gastrointestinal (GI) tract with GI spasms, eg, intestinal cramps (1,2) External uses: mild inflammation of the skin (2)	Allergy (rare) (1) Patients with severe allergies to ragweed should be warned about possible cross-reactivity to chamomile and other members of the aster family, eg, echinacea, feverfew, and milk thistle (2)	May exacerbate the anticoagulant effects of warfarin (4)	Avoid taking with other sedatives, eg, benzodiazepines or alcohol (1) Recommended daily dosage: internal use: 10 to 15 g (2)
Echinacea *Echinacea purpurea, Echinacea angustifolia, Echinacea pallida*	Prevention and treatment of colds; accelerates wound healing (1) Stimulates immune system (2) Antiatherosclerosis	Possible suppression of immunity with habitual use (1)	Immunostimulating effects of echinacea offset the immunosuppressive effects of corticosteroids and cyclosporine (7)	Not recommended for patients with tuberculosis, HIV, or other autoimmune disorders, or allergies to sunflowers (2) Safe dosages for long-term use: ½ to 1 tsp liquid (expressed juice of the herb stabilized at 22% alcohol) or 1 capsule dried juice (88.5 mg/capsule) TID (3). Not to be taken >8 weeks (1,3)
Feverfew *Tanacetum parthenium*	Prevention and treatment of migraines and associated nausea and vomiting (2) Antiarthritic (1)	Potential sensitization via skin contact with drug (2)	May interact with antithrombotic medications such as aspirin and warfarin (2)	Recommended daily dosage: 125 mg orally in encapsulated leaves (2-3 leaves), standard content of 0.2% parthenolide (3). A 4- to 6-week course of continual use of the herbal drug is suggested to improve migraines.
Garlic *Allium sativum*	Antiatherosclerosis (lipid-lowering antithrombotic, fibrinolytic, antihypertensive) (1)	Stomach upset Sulfuric odor, contact irritation (1)	May increase effect of regular high blood pressure and anticoagulant drugs such as aspirin or warfarin (4)	Recommended daily dosage: A commercial preparation containing 10 mg of allicin or a total allicin potential of 5000 mg in an enteric-coated form QD or BID. Raw garlic: 1 clove equal to 4 g QD or BID.
Ginger *Zingiber officinale*	Loss of appetite, nausea, travel sickness (1,2)	Heartburn (1) Allergic reaction (rare) (1)	May exacerbate the anticoagulant effects of warfarin (3)	Use only briefly during pregnancy. May prolong bleeding so do not use after surgery, in patients receiving anticoagulant drugs, or in anyone with a history of gallstones (3,4). Usual dose for antiemetic 1-2 g freshly ground ginger taken with liquid, taken in 2 divided doses

Herb Classifications	Common Indications	Possible Side Effects	Herb-Drug Interactions	Patient Guidelines
Ginkgo *Ginkgo biloba*	Intracerebral and peripheral vascular insufficiency (1) (dementia and claudication) Vertigo (vascular origin) Tinnitus (ringing in ears; vascular origin)	Gastrointestinal tract disturbance, headache, and rarely contact dermatitis (1,3)	May exacerbate the effects of anticoagulants or acetaminophen, since it has a blood-thinning effect (2,3)	Absorption is unaffected by food intake (1) Recommended daily dosage for cerebrovascular insufficiency: 120 mg of dried extract in 2 or 3 oral doses (2). A 6- to 8-week course is advised to determine effectiveness of therapy.
Ginseng *Panax ginseng* *Panax quinquifolium*	Stimulates the central nervous system; releases fatigue and stress (1,3) Anticancer (1) *Contraindications:* cardiac disorders; diabetes (3)	Tachycardia, hypertension (1) Overdoses may cause sleeplessness, hypertonia, and edema (2) When taken with caffeine may cause overstimulation and gastrointestinal distress (2)	May exacerbate the anticoagulant effects of warfarin (4) Do not use with patients undergoing steroid therapy or taking monoamine oxidase (MAO) inhibitors (3)	Recommended daily dosage: 100 mg QD or BID of 4%-7% ginsengosides (3)
Hawthorn *Crataegus*	Antiatherosclerosis, angina pectoris, early stages of congestive heart failure *Contraindication:* acute angina because herb action is too slow (1,2)	Side effects not well documented	Not documented	Recommended daily dosage: 600-900 mg hawthorn extracts standardized to 20% procyanidins or 2.2% flavonoid content (2,3). Duration of treatment is minimum of 6 weeks (2).
Kava *Piper methysticum*	Suppresses anxiety and the central nervous system (2) May relieve mild anxiety and sleeplessness (2) *Contraindications:* Pregnant or nursing women; patients with biologically caused depression (5)	In rare cases kava may cause dry, patchy skin and a temporary yellow discoloration of skin, hair, nails (1) Overdose can result in disorders of complex movement, accompanied by undisturbed consciousness, later tiredness and tendency to sleep (2)	May potentiate the effectiveness of substances that act on the central nervous system, eg, alcohol, barbiturates and psychopharmacologic agents	Recommended daily dosage: preparations equivalent to 60-120 mg kava pyromes

Herb Classifications	Common Indications	Possible Side Effects	Herb-Drug Interactions	Patient Guidelines
Licorice *Glycyrrhiza glabra*	Soothing stomach irritations Cough remedy and expectorant (2) *Contraindications:* Natural licorice (except deglycyrrhizinated-DGL) is not recommended for people with high blood pressure heart disease, diabetes, or for pregnant or lactating women (3)	Large amounts may lead to potassium loss, sodium retention, fluid buildup, high blood pressure, and cardiac complaints (2,4)	May counteract effects of thiazide medications. Increases potassium losses, which may also increase sensitivity to digitalis glycosides (3). Prolongs half-life of cortisol, which may lead to hypokalemia, high blood pressure, and edema (2).	Recommended daily dosage: 5-15 g (1-2 tsp) of dried root, containing 200 to 600 mg of glycrrhizin. Discontinue use after 4 to 6 weeks to prevent side effects (6).
Milk thistle *Silybum marianum*	Used as a tonic, as a stimulant, and for relief of functional disorders of the liver and gallbladder (2)	Patients with diabetes taking silymarin should carefully monitor blood glucose. Reduction in standard antihyperglycemic agents may be necessary to avoid hypoglycemia.	None known	Recommended daily dosage: 140 mg capsule, standardized to 70% silymarin, BID or TID (1) Available in the United States: 200-400 mg of concentrated extract, which equals 140 mg of silymarin
Saw palmetto *Serenoa repens*	Early noncancerous prostate enlargement Inhibits male hormones; has some effects on estrogen; may be anti-inflammatory (2,3)	Rare cases of gastrointestinal tract upset (1)	No significant adverse effects have been reported in clinical trials (2)	Prostate enlargement requires diagnosis and follow-up by a physician (5) Recommended daily dosage: 160 mg BID of an extract standardized to contain 85% to 95% fatty acids and steroids (3)
St. John's wort *Hypericum perforatum*	Internal uses: antidepressant, antianxiety (1) External uses: after therapy for acute and contused injuries, myalgia, and first-degree burns (1)	Photosensitivity (rare, with large doses) (1)	May exacerbate diuretics potassium-depleting effect (3) May counteract the effect of psychotherapeutic medications (3)	Recommended daily dosage: 300 mg TID of an extract standardized to 0.3% hypericin (1,2,3) or 40-80 drops tincture TID or 1-2 cups tea in a.m. and p.m. with 1-2 heaping teaspoons of dried herb per cup (4)
Valerian *Valerian officinalis*	Nervousness and insomnia (1,2)	Rarely headaches, heart palpitations, and insomnia (1) Long-term use may cause mild temporary headache (2)	May exacerbate drowsiness and fatigue side effects of drugs used to treat allergies or anxiety (eg, antihistamines) (4)	Not to be used with any other sedatives or antidepressants (2) Recommended daily dosage: For insomnia: 300-400 mg of standardized valerian root 1 h before bedtime (3) For anxiety: add 200-300 mg in the a.m. (2)

TID = three times a day; BID = two times a day; QD = every day; a.m. = morning; p.m. = evening.

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CLINICAL NUTRITION MANAGEMENT:
A REFERENCE GUIDE

INTRODUCTION

The material in this section is intended:

- to provide the dietitian with relevant information that may be considered in the development of the nutrition care plan

- to form the basis for the development of disease- or condition-specific protocols and nutrition prescriptions as required by the organization

For many of the diseases and conditions, information is included that would *not* necessarily be mentioned in the nutrition assessment care plan (eg, diagnostic laboratory indexes). This information is included to provide a more complete picture of the multidisciplinary management in order to strengthen the dietitian's role as a participating member of the health care team. In developing the individual patient care plan, the dietitian selectively discusses only those assessment parameters that are pertinent to the specific nutrition care approach.

The approaches mentioned for each condition are suggestions and are not to be interpreted as definitive nutrition therapy for the given condition. Medical approaches are listed with medical nutrition therapy approaches, so as to create an awareness of coordinated therapies. Diets approved for the organization's implementation are included in Section I. Condition-specific protocols, if developed by the organization from the following material, should be approved by the appropriate committee and placed in the organization's practice guidelines manual.

ANTICOAGULANT THERAPY

Discussion

Oral anticoagulants are used to create a partial deficiency of the active form of vitamin K, which is responsible for maintaining normal blood coagulation. By inhibiting the action of vitamin K, there is a reduced risk of abnormal blood clotting.

Indications

Oral anticoagulants are typically prescribed for 3 to 6 months to treat the following conditions:

- venous thrombosis
- pulmonary embolism
- myocardial infarction

Persons with prosthetic heart valves, atrial fibrillation with embolization, or heredity disorders that result in a hypercoagulant state may be treated with anticoagulants indefinitely (1).

Up until 1984, the literature contained case reports involving the intake of enteral nutrition support products by patients taking anticoagulants. Since that time, enteral nutrition products have been reformulated with lower contents of vitamin K; subsequently there has been a decrease in the number of case reports with changes in coagulation status (1). However, it has been cited that anticoagulant absorption may be impaired as a result of physical or chemical interactions with other ingredients contained in newly formulated enteral feeding preparations. In these cases, it is recommended to withhold the enteral feeding 3 hours before or after the drug administration (2).

Drug-drug interactions that increase or decrease the effect should be evaluated before concluding that diet is responsible for change in anticoagulant response. Drugs that increase the effect are agents for gout, anabolic steroids, antiarrhythmic agents, antibiotics, antifungal agents, antihyperlipidemic agents, cimetidine, disulfiram, isoniazid, omeprazole, sulfonylureas, and tamoxifen citrate. Drugs that decrease the effect are alcohol, anticonvulsant agents, cholestyramine, griseofulvin, oral contraceptives, rifampin, sucralfate, and vitamin K (3).

Approaches

The Dietary Reference Intake (DRI) for vitamin K is 1 μg/kg of body weight per day. The actual intake of vitamin K in Western countries is estimated to be 300 to 500 μg daily, but actual intake depends on consumption of foods high in vitamin K. Unlike other fat-soluble vitamins, stores of vitamin K are rapidly depleted if intake is deficient (1). This information may be helpful in assessing the vitamin K level of a patient who has had a low intake of food for a week or longer.

It would be useful to estimate the vitamin K content of a patient's diet in certain situations. These include at the initiation of oral anticoagulant therapy, before a requested change in the patient's dietary pattern, and when the prothrombin time (PT) changes and cannot be explained by a drug-drug interaction or change in disease status. The oral anticoagulant dose should be established based on the patient's normal vitamin K intake. After the dose is established, a reasonable goal is to maintain within ±250 μg of the vitamin K baseline. If major changes in food intake occur, the anticoagulant level may need to be reestablished. The most frequent reason for an increase in vitamin K is when a patient starts a weight-reduction diet and includes a greater number of vegetables that are high in vitamin K. Other reasons may include an adjustment in diet because of hospitalization or a change in seasons (1).

Patients should be educated on dietary changes that have an impact on anticoagulant therapy. They also should be informed of foods that are high in vitamin K (eg, cauliflower, broccoli, cabbage, spinach, kale, other dark green leafy vegetables, liver, soybeans, and green tea). They should be encouraged to keep their diet consistent with their present pattern. However, if there is a change in diet that includes these foods, they should contact their physician and have their PT monitored.

It is best for the patient taking anticoagulants to abstain from alcohol. However, an occasional light drink does not appear to be detrimental to the coagulation status (1).

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BURNS

Discussion
Thermal trauma results in marked hypermetabolism and hypercatabolism. Aggressive nutritional support is required to meet metabolic demands and to prevent the depletion of body energy and nitrogen stores (1). Energy requirements increase linearly in proportion to burn size to a maximum of approximately twice the normal levels (1). Factors such as agitation, pain, and heat loss during dressing changes are associated with a large increase in energy expenditure (2).

Many published formulas are being used to determine energy requirements. The values obtained from the equations are approximate and should be used only as guidelines.

Approaches
Energy

Adults
Indirect calorimetry, if available, should be used on admission to the hospital and at least once weekly until the patient is healed to obtain resting energy expenditure (REE). The REE is multiplied by a factor of 1.3 to 1.7 in order to achieve weight maintenance (3).

If indirect calorimetry is not available, the following formulas are commonly used.

Basal energy expenditure (BEE), calculated from the Harris-Benedict equation, can be used with variable stress factors according to percent of total body surface area burned (TBSAB) (4). To obtain estimated energy needs, calculate BEE × Activity Factor (AF) × Injury Factor (IF).

Activity Factor (AF)	Use
Bed rest	1.2
Ambulatory	1.3

Injury Factor (IF)	Use
<20% TBSAB	1.2-1.4
20%-25% TBSAB	1.6
26%-30% TBSAB	1.7
31%-35% TBSAB	1.8
36%-40% TBSAB	1.9
41%-50% TBSAB	2.0
>50% TBSAB	2.1

Children
Indirect calorimetry, if available, should be used on admission to the hospital and weekly thereafter until the patient is healed. The REE should be multiplied by a factor of 1.3 to provide total energy needs (5).

For less than 30% TBSAB, use the Dietary Reference Intake (DRI) for kilocalories, per age group, as a starting point to provide adequate energy intake (4). (See Dietary Reference Intakes in Section IA). For greater than 30% TBSAB, use the following formula, where BSA = Body Surface Area and BSAB = Body Surface Area Burned (6):

Galveston Infant	0-12 months	2,100 kcal/m^2 BSA+ 1,000 kcal/m^2 BSAB
Revised Galveston	1-11 years	1,800 kcal/m^2 BSA+ 1,300 kcal/m^2 BSAB
Galveston Adolescent	12-18 years	1,500 kcal/m^2 BSA+ 1,500 kcal/m^2 BSAB

Protein
Protein needs of burn patients are directly related to the size of the burn and severity. The increase in demand is necessary to promote adequate wound healing and to replace nitrogen losses through wound exudate and urine.

Adults (7,8)

<15 % TBSAB	1.2-1.5 g/kg of desirable body weight (DBW)
15-35% TBSAB	2.0-2.5 g/kg of DBW
>35% TBSAB	23%-25% of total energy

Children (4,9)

<1% TBSAB	3.0-4.0 g/kg
1-10% TBSAB	15% of total energy or non-protein calorie (NPC):N ratio 150:1
>10% TBSAB	20% of total energy or NPC:N ratio 100:1

Other estimates of protein needs of the burn patient include (7):

- 1 year to adult Total calorie: N ratio 120:1

- Nitrogen balance from a 24-hour urine collection analyzed for urea urinary nitrogen (UUN):

  N balance = [(24-hour UUN × 1.1) + (1 g for stool losses) + (estimated wound nitrogen loss)] × 6.25 g of protein per gram of nitrogen (4)

Wound Nitrogen Loss	<10 % open wound = 0.02 g N/kg per day
	11%-30% open wound = 0.05 g N/kg per day
	31 % open wound = 0.12 g N/kg per day

- The NPC:N ratio generally is 80-100:1 (10).

Parenteral Nutrition

Carbohydrate (3,7,11)
Adults: Maximum of 5 mg/kg per minute parenteral glucose infusion.
Children: Initiate dextrose at 7 to 8 mg/kg per minute and advance as needed to maximum of 20% dextrose solution.
Infants: Initiate dextrose infusion at 5 mg/kg per minute and advance to 15 mg/kg per minute over a 2-day period.
Should be approximately 50% of total energy.

Fat (9,11)

Adults	25%-30% of total energy
Children >1 year	30%-40% of total energy
Children <1 year	Up to 50% of total energy

Replacing the omega-6 fatty acids with omega-3 fatty acids may help avoid or reverse postburn immunosuppression (3).

Feeding Approaches (4,7)

% TBSAB	**Approach**
<20% TBSA not complicated by facial injury, inhalation injury, or preburn malnutrition	High-calorie, high-protein oral diet is generally sufficient
>20% TBSA	Nocturnal tube feeding to supplement dietary intake during the day may be adequate to meet needs; use nutrient intake analysis to ensure adequate intake

If feeding is to be given totally by nutrition support, the enteral route is preferred over total parenteral nutrition (TPN). Starting an intragastric feeding immediately after the burn injury (6 to 24 hours) has been shown to be safe and effective. Total parenteral nutrition should be reserved for only those patients with prolonged alimentary tract dysfunction.

Gastric ileus is common in the more centrally injured burn patient. For these patients, a transpyloric feeding may be indicated.

Micronutrient Requirements (12)

Electrolytes	Provide based on serum and urine data and fluid needs
Minerals	DRI
Trace elements	DRI
Minor burns (<10% TBSA) (children <3 yr)	One multivitamin daily
Major burns (>10%-20% TBSA) (children < 3 yr)	One multivitamin daily Vitamin C 250 mg twice daily Vitamin A 5,000 IU daily Zinc sulfate 110 mg daily
Minor burns (<10% TBSA) (adults and children ≥3 yr)	One multivitamin daily
Minor burns (>10% TBSA) (adults and children ≥3 yr)	One multivitamin daily Vitamin C 500 mg twice daily Vitamin A 10,000 IU daily Zinc sulfate 220 mg daily

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CANCER

Discussion

Nutritional status can have an important effect on the ability to tolerate treatment and achieve the desired clinical outcome.

Cancer Treatments With Potential to Negatively Affect Nutritional Status[a]

Treatment	Nutrition-Related Adverse Effects
Chemotherapy	
Corticosteroids (eg, cortisone, hydrocortisone, methylprednisolone, prednisone, prednisolone, triamcinolone) *Take with food or meals.*	Abdominal distention, anorexia, ↑ appetite, diarrhea, ulcerative esophagitis, GI bleeding, hypocalcemia, hyperglycemia or hypoglycemia, hypokalemia, hypertension, muscle mass loss, nausea, osteoporosis, pancreatitis, sodium and fluid retention, vomiting, weight gain
Hormones/analogs (eg, androgens, estrogens, progestins)	Anorexia, anemia, ↑ appetite, diarrhea, edema, fluid retention, glossitis, nausea, vomiting, weight gain
Immunotherapies (eg, B cell growth factor (BCG), interferon, interleukin)	Anorexia, diarrhea, edema, nausea, vomiting, stomatitis, taste perversion, weight loss
General chemotherapeutic agents (eg, alkylating agents, antibiotics, antimetabolics, mitotic inhibitors, radiopharmaceuticals, other cytotoxic agents)	Abdominal discomfort, anorexia, diarrhea, oral and GI ulceration, nausea, stomatitis, vomiting (premedication with antiemetics will sometimes relieve or decrease severity of symptoms)
Radiation therapy	
Head, neck, chest	Dysgeusia, dysosmia, dysphagia, esophagus, fibrosis, fistula, hemorrhage, odynophagia, stomatitis, stricture, trismus, xerostomia, tooth decay, tooth loss (tooth decay and loss can be prevented by an aggressive program of dental hygiene)
Abdomen, pelvis	Bowel damage, diarrhea, fistulization, malabsorption, nausea, obstruction, stenosis, vomiting
Surgery	
Radical head/neck	Altered appearance, chewing or swallowing difficulty, chronic aspiration, dysgeusia, dysphagia, impaired speech, odynophagia, voice loss
Esophagectomy	Diarrhea, early satiety, gastric stasis, hypochlorhydria, regurgitation, steatorrhea
Gastrectomy	Abdominal bloating and cramping, achlorhydria with lack of intrinsic factor, diarrhea, dumping syndrome, early satiety, hypoglycemia, mineral deficiencies, fat malabsorption, fat-soluble vitamin deficiency
Intestinal resection	Vitamin B_{12} deficiency, dehydration, diarrhea, fluid or electrolyte imbalance, hyperoxaluria, malabsorption, mineral depletion, renal stone formation, steatorrhea *Problems that develop are determined by the nature and extent of resection; nutritional intervention must be highly individualized*

Source: Barrocas A. Cancer. In: White J, ed. *The Role of Nutrition in Chronic Disease Outcome*. Washington, DC: Nutrition Screening Initiative; 1997. Reprinted by permission from the Nutrition Screening Initiative, a project of the American Academy of Family Physicians, the American Dietetic Association and the National Council on the Aging, Inc., and funded in part by a grant from Ross Products division, Abbott Laboratories.

[a]GI indicates gastrointestinal; ↑ I , increased.

Approaches

Problem	Nutrition Intervention
Chewing or swallowing difficulty (secondary to surgery, radiation therapy)	Modify consistency (See Section IB: Full Liquid Blenderized Diet; Dysphagia Feeding Plan)
Dryness, soreness, or inflammation of oral mucosa (secondary to tumor, chemotherapy, radiation therapy)	Evaluate effect of medications Consume fluids with meals Avoid acidic foods Avoid very coarse foods that do not soften in the mouth Cut foods into small pieces Moisten dry foods; modify diet consistency Try artificial saliva products For prevention of dental caries, between-meal candies and gum should be sugarless Avoid hot foods, to reduce risk of burning mouth Cold foods may be soothing Avoid alcohol Liocaine (Xylocaine) can be used to relieve pain before eating Use a straw or spoon for consuming liquids Saliva stimulants, such as sugarless candy or gum, may be beneficial
Anorexia and altered taste perception (secondary to systemic effects of cancer, radiation therapy to head and neck, chemotherapeutic agents)	Evaluate status of patient to determine whether other problems, such as pain, medication, or constipation, could be factors Recommend modifications in diet order as necessary Monitor intake Take a nutrition history to identify well-liked foods Vigorous nutrition intervention may reverse some of the factors causing anorexia and taste abnormalities Cold foods may be more acceptable than warm foods Chocolate and fruit-flavored supplements are well accepted Recommend well-seasoned foods (liberal use of herbs, spices, flavorings) Patient should rinse his or her mouth with tea, ginger ale, or salt water before and after eating
Lower threshold for bitter (meat rejection, especially beef)	Use nonmeat sources of protein: eggs, dairy products, poultry, or vegetable sources; poultry or fish may be better tolerated than red meat; fish with strong aroma may not be accepted
Elevated threshold for sweet	Add sugar to foods (sweet sauces, marinades)
Early satiety (secondary to malnutrition, obstruction, pain effects on decreased secretions and peristalsis, chemotherapeutic effects on digestive tract)	Recommend small, frequent meals with high-energy, nutrient-dense foods (addition of glucose polymers) Tell patient to drink liquids between, rather than with meals. Patient should keep his or her head elevated following a meal; avoid meals at bedtime Low-fat foods may be better tolerated; avoid fatty, greasy foods Light exercise is allowed if tolerated Intake may be best at breakfast Keep high-protein, high-energy snacks on hand for nibbling Advise patient to chew thoroughly and eat slowly
Nausea and vomiting (associated with chemotherapy, radiation therapy to abdominal and gastric areas, partial obstruction to gastrointestinal tract)	Evaluate effects and timing of medications Give antiemetic drugs ½ hour before meals Take deep breaths or sips of carbonated beverages, or suck on ice chips

Problem	**Nutrition Intervention**
Nausea/Vomiting *(continued)*	Try a dry diet (liquid between meals) Decrease intake of fatty foods Avoid cooking odors
Note: Nausea (vomiting usually over within 24-48 hours after last administration of chemotherapy and 24 hours after total body irradiation)	Avoid favorite foods when nauseated to prevent development of permanent dislike for such foods Eat foods without strong odors Cold foods are often better accepted than hot Vigorous nutritional intervention may reverse atrophy due to malnutrition Enteral route may be preferable to the parenteral, as it supplies nutrition directly to mucosal cells Use lactose-free supplements Decrease fiber content
Steatorrhea/diarrhea (secondary to thoracic esophageal resection, gastric resection, cancerous involvement of lymphatic, blind loop syndrome, obstruction of the pancreatic or bile ducts)	Decrease proportion of energy from fat Use medium-chain or long-chain triglycerides as necessary Decrease fiber content as needed; however, bulking agents and foods high in water-soluble fiber may be helpful if diarrhea is secondary to radiation Promote adequate fluid intake Recommend a lactose-controlled diet if required Evaluate all medications Increase foods and beverages high in potassium Evaluate quantity of intake of foods high in sugar and sorbitol, as both may cause diarrhea if consumed in large amounts
Protein-losing enteropathy (secondary to fistula, disruption of intestinal epithelium or lymphatics)	Recommend a high-protein intake Monitor nutritional status
Weight loss (secondary to increased basal metabolic rate (BMR), catabolism, decreased food intake, decreased absorption)	Provide high-energy, nutrient-dense foods Use 40-50 kcal/kg for repletion Use above strategies to promote food intake Note: Energy expenditure may be increased or decreased; diseases of long duration are associated with hypermetabolism
Constipation	Increase patient's fiber and fluid intake Light exercise is advised if tolerated
Heartburn	See Gastroesophageal Reflux Disease (GERD) later in this section

Note: Patients with radiation or surgery to the pelvic area may be at risk for bowel obstruction. Symptoms of potential bowel obstruction include cramping abdominal pain and or diarrhea and constipation. Those who have developed a partial obstruction may have thin, pencil-like stools or sloughing of necrotic tissue which may be mistaken for diarrhea. The patient should be advised not to take over-the-counter medications without his physician's approval, should follow a low-residue diet, and reduce intake of bowel stimulating foods such as caffeine and sorbitol (1).

Symptoms of complete bowel obstruction include cramping often accompanied by nausea and vomiting. Diarrhea may precede the complete cessation of bowel movements. The physician should be contacted immediately.

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CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Discussion

Chronic obstructive pulmonary disease (COPD) is characterized by the progressive obstruction of airways. COPD is subdivided into two types: chronic bronchitis or emphysema (1). Chronic bronchitis (type II) is defined in clinical terms and includes the presence of a chronic productive cough for 3 months in each of 2 successive years in a patient in whom other causes of chronic cough have been excluded (1). Emphysema (type I) is defined as an abnormal permanent enlargement of the airspace distal to the terminal bronchioles, accompanied by destruction of alveolar walls, without obvious fibrosis. It is estimated that approximately 14 million persons in the United States have COPD, with approximately 12.5 million of the cases resulting from chronic bronchitis and about 1.65 million from emphysema (1). Currently, COPD is ranked as the fourth leading cause of death (2).

The most common cause of COPD is exposure to tobacco smoke. Tobacco smoking accounts for an estimated 80% to 90% of the risk of developing COPD (1). Second-hand smoking, air pollution, and occupational exposure are other risk factors for developing COPD. $Alpha_1$-antitrypsin (AAT) is the only known genetic abnormality that leads to COPD and accounts for less than 1% of cases of COPD in the United States (1).

Treatment of COPD involves a combination of smoking cessation or avoidance of environmental smoke and pollution, pharmacologic therapy (eg, bronchodilators, corticosteroids or steroids, antibiotics, diuretics), pulmonary rehabilitation through aerobic exercise and upper extremity strength training (1,3) or oxygen therapy, and maintenance of nutritional status (4,5). Almost 50% of patients with COPD admitted to the hospital have evidence of malnutrition (6). Of patients who are critically ill with COPD and acute respiratory failure (ARF), 60% are malnourished related to the increased work required to breathe (1). Malnutrition is associated with wasting of respiratory muscles, resulting in respiratory muscle weakness. The combination of immunocompromise, related to long-term corticosteroid use, and respiratory muscle weakness, as a result of malnutrition, predisposes patients with COPD to respiratory tract infections such as pneumonia. In persons with COPD, a low body mass or a body weight greatly below ideal body weight is associated with reduced survival rates (7).

Approaches

The primary goal of medical nutrition therapy in the management of COPD is to preserve lean body mass, prevent unintentional weight loss, or maintain appropriate lean body mass: adipose tissue ratio, correct fluid imbalance and maintain nutritional status (4,5). Refer to the COPD Medical Nutrition Therapy Protocol (8) for detailed intervention strategies.

Acute respiratory failure (ARF) is often a secondary complication of COPD and adult respiratory distress syndrome (ARDS). Mechanical ventilation is generally the primary management, with the objective to keep the lungs at high volume and prevent airway closure. Acute respiratory failure occurs frequently in patients undergoing complicated surgery or as a result of trauma, septic shock, and multiorgan failure. During mechanical ventilation, early intervention and access for enteral feeding is recommended to prevent further deterioration in nutritional status. Depending on the functional status of the gastrointestinal tract, parenteral nutrition may be indicated. (Refer to Enteral Nutrition Support and Parenteral Nutrition Support in Section IB.)

Energy: Provide enough kilocalories to account for energy expenditure and prevent catabolism. Increased energy may be needed for patients with infection or weight loss. Some studies suggest increased metabolic needs with COPD; however, the literature varies in this regard (1,7,9,10). In patients who are clinically overfed, hypercapnia develops, the result of increased carbon dioxide (CO_2) production. Hypercapnia increases the demands of ventilation, which worsens the respiratory status or delays weaning from mechanical ventilation, or both. Overfeeding (energy in excess of metabolic demands) should be avoided (1,3,11). Weight loss is recommended for overweight patients with COPD. In these patients, weight loss improves respiratory muscle function and improves shortness of breath (4,5).

Protein: Provide enough protein to maintain visceral protein status and meet the demands of metabolic stress. Protein has been shown to increase minute ventilation, oxygen consumption, and ventilatory response to hypoxia and hypercapnia. In patients with ARF, high levels of protein may cause further fatigue, and protein requirements may need to be temporarily reduced (1).

Carbohydrate and fat: It has been proposed that patients with COPD might benefit from a high-fat, moderate-carbohydrate diet (eg, 40% to 55% carbohydrate, 30% to 40% fat, and 15% to 20% protein) (12). During anabolism, it may be beneficial to supply less than 50% of energy from dietary carbohydrates. With this therapy, fat intake is safe up to 55% of energy when combined with a high-calorie diet (13). The rationale has been that carbohydrate as a fuel substrate increases the respiratory quotient (RQ). This quotient represents gas exchange and is defined as CO_2 produced over O_2 consumed. The lower the RQ, the better the gas exchange and easier capacity for a patient to breathe. The type of energy substrate (fat, protein, and carbohydrates) and how the body utilizes the substrates determine the RQ. When oxidized for energy production, protein has an RQ of 0.8, fat has an RQ of 0.7, and carbohydrate has an RQ of 1.0. The clinical benefits of altering fat-to-carbohydrate ratios in patients with COPD when the energy supplied is appropriate have not been demonstrated (1,6,11,14). The marked increase in ventilatory demand attributed to carbohydrate administration has been noted when energy administration was far in excess of estimated demands (more than 200% of REE) (6).

Omega-3 fatty acids: Studies have demonstrated the influence of omega-3 fatty acids on airway responsiveness. Omega-3 fatty acids may inhibit arachidonic acid production of bronchoconstrictor leukotrienes (15). In one study, dietary fish oil consumption demonstrated protective effects for cigarette smokers against COPD (16). Further investigation is required to assess the relationship between omega-3 fatty acids and COPD. Currently, supplementation with fish oil is not recommended (17).

Electrolytes and trace elements: Disturbances of electrolytes are common in acutely ill patients with COPD. Patients with cor pulmonale may require sodium and fluid restriction. Hypophosphatemia, hypokalemia and hyperkalemia, hypocalcemia, and hypomagnesemia are associated with diminished diaphragmatic function (1). Improvements in respiratory function occur with repletion of these nutrients. Phosphorus deficiency reduces the blood’s ability to deliver oxygen to tissues and decreases contractility of respiratory muscles. Magnesium deficiency compromises respiratory muscle strength. Monitoring dietary intake of these key nutrients is recommended. Acidosis has been shown to predispose respiratory muscle fatigue (18). Reduced bone mass as measured by dual-energy x-ray absorptiometry (DXA) has been demonstrated in patients with COPD, providing evidence for nutritional concerns related to osteoporosis (18).

Antioxidants: Increasing evidence has demonstrated the impact that oxidizing agents have on the pathogenesis of emphysema and lung function. Antioxidant vitamins, particularly vitamin C, have demonstrated protective action in the human lung (16,17). A cross-sectional study of 9,074 adult subjects aged 30 years or older examined the effects of various dietary constituents on the occurrence of respiratory symptoms. Significant associations were observed for vitamin C, the ratio of dietary zinc to dietary copper, the ratio of dietary sodium to potassium, and the symptoms of bronchitis and wheezing (15). Studies are ongoing to investigate the relationship of various nutrients on lung function. Selecting food sources rich in antioxidants, vitamins, and minerals is recommended at this time in place of supplementation (19).

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CONGESTIVE HEART FAILURE

Discussion

Congestive heart failure (CHF) is a condition where the heart is unable to provide adequate cardiac output to meet the metabolic demands of the body. Unfortunately, the incidence, prevalence and morbidity of CHF are increasing and the annual costs for hospitalizations and expenditures exceed 8 billion dollars (1). Although CHF occurs at any age, it is the most common admitting diagnosis for hospitalization in persons age 65 years and older (2,3). Heart failure is more common among males than females in all ethnic groups. The prevalence is 25% greater among African Americans than Caucasians (4). In the United States, the primary cause of CHF is ischemic heart disease. Other causes of CHF include hypertension, valvular heart disease, myocardial fibrosis, drug use (especially alcohol), bacterial or viral infections, and some congenital conditions. The risk of developing CHF increases with a history of myocardial infarction, diabetes, hypertension, cigarette smoking, elevated ratio of total cholesterol to high-density lipoprotein (HDL)-cholesterol, and advanced age (1).

Indications

Congestive heart failure precipitates the onset of sodium retention and edema, which results from the inability of the body to excrete sodium at a rate in equilibrium with dietary sodium intake (5). The primary objective is fluid homeostasis evidenced by reduction of weight and increased sodium and water excretion, particularly if these are associated with improvement of symptoms (6). CHF is characterized by signs and symptoms that the heart is no longer able to pump blood at a level to meet the body's needs.

Signs and symptoms suggestive of CHF (7) include the following:

- Difficulty breathing, especially when lying flat in bed or with exertion
- Waking up breathless at night
- Frequent dry, hacking cough
- Poor tolerance to exercise
- Sudden, explained weight gain (eg, edema, ascites)
- Swelling in the lower extremities
- Fatigue, dizziness, weakness, or fainting
- Nausea and abdominal swelling

Diagnosis is verified through echocardiography or radionuclide ventriculography to assess left ventricular function by measuring the ejection fraction.

Treatment of CHF involves a combination of drug regimens, dietary modifications, exercise recommendations, and symptom management. Behavioral compliance to the treatment regimen has been correlated with successful outcomes of CHF. A multidisciplinary approach to treatment, including medical nutrition therapy, has demonstrated decreased hospital utilization and medical costs and improved quality of life in elderly persons with CHF (8).

Some adverse health outcomes associated with heart disease (4) are as follows:

- Reduced exercise tolerance or activity tolerance
- Stroke
- Increased incidence of peripheral vascular disease
- Renal failure

Patients with long-term CHF often experience severe malnutrition. Malnutrition occurs because of anorexia, poor dietary intake, hypermetabolism, increased circulating tumor necrosis factor, and/or a decrease in lean body mass.

A decrease in lean body mass occurs as a result of cardiac demands and leads to a condition called cardiac cachexia (9). Cardiac cachexia leads to further impairment of cardiac function. The primary objective of medical nutrition therapy is to prevent further malnutrition and improve the nutritional status in persons with cardiac cachexia.

Approaches

The primary objective of medical nutrition therapy is to complement pharmacotherapy in maintaining fluid and electrolyte balance while preventing cardiac cachexia. For detailed intervention, refer to the Congestive Heart Failure medical nutrition therapy protocol in *Medical Nutrition Therapy Across the Continuum of Care*. (10) Drug therapy should be closely monitored for drug-food interactions and drugs that affect the absorption of nutrients.

Calories: Provide enough calories to maintain reasonable body weight and visceral protein status. In some cases basal metabolic needs may be 20% to 30% higher (11). In obese patients, reducing weight improves cardiac output and shortness of breath.

Protein: Provide enough protein to maintain visceral protein status. For nutrition-compromised patients, protein requirements are 1.2 to 1.5 g/kg per day.

Sodium: Limit sodium to 2,000 mg (7). Severe heart failure may warrant less. Refer to Sodium-Controlled Diet in Section IF. Severe restrictions of sodium, for example, 1,000 mg or less, should be avoided for home use. Dietary restriction at this extreme may be unrealistic and difficult for patients to comply with.

Fluid: Fluid requirements are based on the clinical presence of edema, ascites, hyponatremia, and frequency of weight fluctuations. Fluid may need to be restricted to 1,000 mL to 2,000 mL/day with edema or if serum sodium levels fall below 130 mEq/L (12). Sudden increases in body weight of 3 to 5 lb suggest marked fluid retention (7). Refer to Nutrition Management of Fluid Intake in Section IB.

Alcohol: Alcohol provides limited nutrients and should be avoided or limited to 1 drink or less per day. Patients with alcoholism should avoid alcohol and seek alcohol rehabilitation.

Thiamin: Individuals taking loop diuretics, such as furosemide, in dosage of more than 80 mg/day, have demonstrated increased urinary excretion of thiamin and clinically significant thiamin deficiency. Thiamin deficiency causes high-output cardiac failure (beriberi) and may exacerbate cardiac function in patients with CHF (5). Thiamin supplementation may be indicated in persons taking loop diuretics. Food sources high in thiamin include, fortified cereals, bran, bread, and meats.

Minerals: Dietary minerals, including potassium, magnesium, and calcium, may be depleted due to diuretic therapy. It is recommended that potassium intake be 2 to 6 g day, unless the patient has renal impairment or is receiving a potassium-sparing diuretic such as spironolactone. Magnesium requirements may need to be 300 to 350 mg/day (11). Food sources of these minerals include low-fat dairy products, fruits, vegetables, and whole grain products (11,13).

Caffeine: Some studies have demonstrated that caffeine increases heart rate and causes dysrhythmias. More research is needed to assess the effect of caffeine on specific conditions. No studies have investigated the effects of caffeine intake on CHF outcomes. Because information is currently limited, it is generally recommended that caffeine be used in moderation: 300 mg/day or less.

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CORTICOSTEROID THERAPY

Discussion
Corticosteroids, in the synthetic forms of natural hormones, are potent anti-inflammatory medications that can be given orally or by injection. They can produce severe side effects, such as hypertension, high blood glucose levels, an increased risk of infection, osteoporosis, fluid retention, decreased ability to heal wounds and fragile skin. Widely used corticosteroid preparations are prednisone, prednisolone, hydrocortisone, methylprednisone, and dexamethasone (1).

Indications
Corticosteroids are used as (1):

- immunosuppressive therapy for organ transplant recipients
- treatment of numerous short term management of various inflammatory and allergic disorders: rheumatoid arthritis, collagen disease, dermatologic disease and autoimmune disorders (eg, systemic lupus erythematosus)
- treatment of ulcerative colitis, acute exacerbations of multiple sclerosis; and palliation in some leukemias and lymphomas
- treatment of hypercalcemia associated with cancer

Approaches
Dietary interventions may be needed for side effects of corticosteroids.

Problem	**Recommendation**
Decreased calcium absorption Osteroporosis ("glucocorticoid arthritis"), thought to result from decreased intestinal absorption and increased renal excretion of calcium	Ensure calcium intake (dietary or by supplementation) to meet Dietary Reference Intake for age. Increase sunshine exposure or dietary vitamin D.
Hyperglycemia (steroid induced glucose intolerance)	Adjust diet accordingly. May require insulin or oral glucose lowering medication
Altered lipid metabolism	Recommend fat-modified diet appropriate for specific type of hyperlipidemia. Follow guidelines of Step I Diet (2) in Section IC.
Edema; hypertension due to water retention	Begin sodium-restricted diet. Levels of 2-3 g have been recommended (2,3)
Weight gain due to increased appetite	Behavioral strategies for dealing with increased appetite Calorie-Controlled Diet (See Section IC) Exercise
Negative nitrogen balance secondary to increased protein catabolism	High-protein diet: 1-2 g/kg Adequate energy: 30-35 kcal/kg

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DIABETES MELLITUS

Information

The following information provides a more complete picture of total disease management of the patient with diabetes mellitus (type 1, type 2, or gestational diabetes mellitus [GDM]). Although this information may not be mentioned in the nutrition care plan (eg, physical examination or diagnostic laboratory studies), the dietitian can strengthen his or her role as a participating member of the health care team by understanding the impact and interpretation of this information. When developing the individual patient care plan, the dietitian selectively discusses only those assessment parameters that are pertinent to the specific nutritional or behavioral issues being addressed.

Laboratory studies (1):	Fasting plasma glucose (FPG) Serial blood glucose levels before each meal, HS (evening snack), 3 AM, postprandial Glycated hemoglobin (GHb)* (HbA_1 or HbA_{1c}) Fasting lipid profile, including high-density lipoprotein (HDL), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), triglycerides, and total cholesterol Renal function indexes (serum creatinine in adults, in children if proteinuria is present) Urine glucose (except in gestational diabetes), ketones, protein, sediment Electrolytes Test for microalbuminuria (eg, timed specimen or albumin-to-creatinine ratio) Thyroid function tests
Medical-clinical (1):	Insulin regimen or oral agent Blood pressure Current weight, weight history, "reasonable body weight," goal weight, growth and development pattern (children, adolescents) Activity level (exercise pattern) Nutrition history and diet recall (meal and snack times; % kcal from protein, carbohydrate, and fat) Self-monitoring of blood glucose (SMBG) level
Social:	Relevant social factors, such as employment schedule, culture, literacy level, family support, self-monitoring strategies (eg, SMBG records), and previous treatment programs, including nutrition and diabetes self-management training.

Approaches

Approaches are suggestions and are not to be interpreted as definitive nutrition therapy for the condition. Medical approaches are listed with medical nutrition therapy approaches, so as to create an awareness of coordinated therapies (2). Diets approved for facility implementation are included in Section I. Protocols for specific conditions, if developed by the facility from the following material, should be approved by the appropriate committee and incorporated into Section IC, Medical Nutrition Therapy for Diabetes Mellitus.

For Medical Nutrition Therapy approaches: See Section IC, Medical Nutrition Therapy for Diabetes Mellitus.

Monitoring (outcome assessment parameters):

- Body weight
- Food records
- Blood pressure
- Self-monitoring of blood glucose (SMBG) records
- Fasting lipid profile
- Glycated hemoglobin*
- Urine (ketones, glucose [except with GDM], protein

Education as appropriate: See Section IC, Medical Nutrition Therapy for Diabetes, Diabetes Nutrition Management: Meal Planning Approaches, for discussion of teaching materials to use with various meal planning approaches. Also refer to Diabetes Mellitus (Uncontrolled and Complications) and Gestational Diabetes Mellitus medical nutrition therapy protocols (3).

*Values in the reference range are different for HbA_1 vs HbA_{1c} (4).

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DIABETES MELLITUS: CONSIDERATIONS FOR EXERCISE

Alteration in nutrient needs

For individuals wishing to maintain their weight, increases in activity require increases in caloric intake. For adult men engaging in light activities, 30 kcal/kg body weight may suffice, while those who engage in heavy activity may need 50 kcal/kg. For women, light activity may increase need to 30 kcal/kg, while heavy activity may elevate needs to 44 kcal/kg (1). Protein needs may be increased with physical activities to a level of 1.2 grams protein/kg body weight for both men and women (1). Fluid replacement is also an important consideration (1).

For individuals with type 2 diabetes, exercise is a key factor to help achieve weight loss goals. It provides a way to create an energy deficit which will lead to weight loss. Research has shown the combination of diet, exercise, and behavior modification to be the most effective method for reaching weight loss goals (1).

Prevention of hypoglycemia

Individuals who are treated with oral glucose lowering medications and/or insulin are at risk for exercise-induced hypoglycemia. Adjustment in food and/or insulin should be based on individual management goals. Exercise which lasts 30 minutes or less usually does not require insulin adjustment. To prevent hypoglycemia due to physical activity lasting 30-60 minutes, extra carbohydrate may be consumed or insulin dosage may be adjusted. Insulin adjustment is preferred for planned exercise. Insulin may be decreased by 20-90%, depending on factors such as intensity and duration of exercise. Time of exercise relative to the peak action of insulin is also an important variable (1,2). Because individuals vary greatly in their responses to exercise, testing blood glucose before exercising, during the exercise if it will be prolonged, and after the exercise is recommended (2). An individual may be at risk for hypoglycemia up to 24 hours after the exercise bout (1).

Individuals who prefer to consume carbohydrates to prevent hypoglycemia during exercise should test their blood glucose prior to exercising, and consume an amount of food (15 grams carbohydrate) which will prevent hypoglycemia but not cause hyperglycemia. In general, a snack should be consumed if blood glucose is less than 100 mg/dL before exercising. Examples of blood glucose patterns which might be seen with exercise are found in reference 3. Insulin adjustment options also are discussed.

Exercise for individuals with complications

Some types of activities may be contraindicated for people with hypertension, retinopathy, neuropathy and other complications of diabetes mellitus. A detailed discussion of issues related to each type of complication is presented in reference 1.

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DIABETES MELLITUS: CONSIDERATIONS FOR SICK DAYS

Approaches

The patient should:

1. Contact physician when vomiting or diarrhea continues for ≥4 hours.
2. Test urine for ketones. Contact physician when test shows moderate to large amount of ketones.
3. For insulin-requiring patients, contact physician when blood glucose remains above 240 mg/dL even after supplemental insulin (as arranged with MD).
4. For oral glucose lowering medication users only, contact physician when premeal blood glucose remains ≥ 240 mg/dL for >24 hours.
5. Contact physician when signs of ketoacidosis, dehydration, drowsiness, abdominal or chest pain, difficulty breathing, sunken eyes, or fruity breath is present.
6. Contact physician when temperature is >100 degrees or patient is unable to take fluids for ≥ 4 hours.

Records should be kept of blood glucose and ketone test results; notes should be kept regarding weight loss, temperature, insulin dose, time given, and other medicines given (1).

Insulin or oral glucose lowering indications should be taken regardless of whether the patient is able to eat normal amounts. Follow physician's instructions for changes in insulin regimen. (Note: for people with type 2 diabetes who normally do not need insulin, the presence of infection may necessitate short-term use of insulin.)

Monitoring

Type 1	Check urine ketones and blood glucose every 4 hours, more frequently if blood glucose is high or if pregnant.
Type 2	Check blood glucose before meals and at HS; check for ketones if blood glucose is >240 mg/dL. (Although people with type 2 are not prone to develop ketoacidosis, illness can cause ketonuria.)

The patient should avoid physical exertion, and rest at a comfortable room temperature.

Electrolytes, especially sodium and potassium, may be lost as a result of vomiting, diarrhea, and diaphoresis. Salty liquids such as soup and broth can replenish sodium. Fruit juices, milk, yogurt, ice cream, and cream soups (made with milk) can supply potassium. Caffeinated beverages should be avoided.

Adequate consumption of water is vital. [Note: the person with type 2 diabetes is vulnerable to nonketotic hyperosmolar coma and dehydration if there is persistent glycosuria (2).]

- adults: 8 oz calorie-free fluid per waking hour unless physician instructs otherwise,
- children: 2-4 oz calorie-free fluid every waking hour (3).

If possible, maintain usual amount of carbohydrate intake. Ten to 15 grams of carbohydrate every ½ -1 hour is recommended (4). See Section IC: Carbohydrate Replacement When Meals Are Missed or Delayed.

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DIABETES MELLITUS: GASTROINTESTINAL COMPLICATIONS

GASTROPARESIS

Information

Gastroparesis may cause an individual's ability to tolerate solids to fluctuate. At times, some individuals may need to take liquid supplements to assure adequate intake of protein, calories and other nutrients. See reference 1 for detailed discussion of pathophysiology and treatments.

Approaches

General: improve glycemic control
Medical management includes

- bethanechol chloride (Urecholine) stimulates contractions in GI smooth muscles GI side effects: nausea
- metoclopramide (Reglan®)
  central antiemetic effect, dopamine antagonist
  GI side effects: none noted
- erythromycin (Eryped®)
  motilin receptor agonist
  GI side effects: nausea, vomiting
- cisapride (Propulsid®)
  enhances acetylcholine release in the gut
  GI side effects: abdominal cramping, diarrhea
- enzyme preparations for severe pancreatic insufficiency
- laxatives for treatment of constipation

Dietary approaches target the dysfunctional organ and are adjunctive to medical management. Patients vary tremendously in their abilities to tolerate different types of foods, so recommendations must be individualized. A certain amount of trial and learning is involved. Current recommendations for gastroparesis are designed to speed up gastric emptying and include

- Avoiding high fiber foods.
- Eating small frequent meals (6-7 per day), avoiding large meals.
- Grounding or pureeing solid foods such as meats so they may be tolerated better. Some individuals tolerate solids for the first 1-2 small meals and do better with liquids for the remainder of the day.
- Avoiding high fat foods and adding extra fats (butter, margarine, gravy, mayonnaise) to foods. Some individuals tolerate high fat liquids (whole milk, ice cream) well.
- Sitting up during and for 30 minutes after meals; walking after meals may enhance stomach emptying.

NAUSEA AND VOMITING

Information

Possible causes: neuropathy (gastroparesis); ketosis; morning nausea secondary to nocturnal hypoglycemia

Approaches

- Morning nausea: if caused by overnight hypoglycemia will usually be relieved by eating breakfast
- Ketosis: will correct with metabolic disarray
- Provide antiemetics as part of treatment of gastroparesis

CONSTIPATION

Information

"The incidence of constipation in people with diabetes is thought to be significantly higher and related to problems with the autonomic nervous system (2)". See reference 2 for detailed discussion of constipation in people with diabetes.

Approaches

Assess condition for potential causes

- check adequacy of fluid intake, insoluble fiber content of diet, physical activity, general physical and mental well-being
- review patient's list of medications (prescription and nonprescription) for medicines which cause constipation; note history of laxative use (frequency and duration)
- consider recommending formal evaluation if constipation is potentially secondary to other endocrinological, neurological, or gastrointestinal disorders
- if laxatives are recommended, carefully consider which type to recommend (see reference 2)

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DIABETES MELLITUS: ORAL GLUCOSE-LOWERING MEDICATIONS AND INSULIN

Oral Agents:

Generic Name	Trade Name*	Classification	Onset (h)	Duration (h)
Tolbutamide	Orinase®	Sulfonylurea	1	6-12
Chlorpropamide	Diabinese®	Sulfonylurea	1	24-72
Tolazamide	Tolinase®	Sulfonylurea	4-6	10-14
Glyburide	DiaBeta®	Sulfonylurea	1.5	12-24
	Micronase®			12-24
	Glynase®			24
Glipizide	Glucotrol®	Sulfonylurea	1	12-16
Glimepiride	Amaryl®	Sulfonylurea	2-3	12-24
Metformin	Glucophage®	Biguanide	1-3	6-12
Repaglinide	Prandin®	Meglitinide	.25-.5	1
Proglitazone	Actos®	Thiazolidinedione	0.5, peak 2-4	24
Rosiglitazone	Avandia®	Thiazolidinedione	1	12-24
Acarbose	Precose®	α-glucosidase inhibitor	Immediate	6
Miglitol	Glyset®	α-glucosidase inhibitor	Immediate	6

*All products names are registered trademarks of their respective companies.

Human Insulins:

Insulin	Onset (h)	Peak (h)	Effective Duration (h)	Maximum Duration (h)
Regular	0.5-1	2-4	2-5	6-8
NPH	1-4	6-10	10-16	24
Lente	1-1.5	6-10	4-12	24
Ultralente	4-6	18	6-16	24-36
Lispro	0.25-0.5	1-2	1-4	4

Intensive insulin therapy has been found to increase the risk of hypoglycemia. Weight gain was also a problem for participants in the Diabetes Control and Complications Trial. This weight gain may be due to increased retention of calories when mean blood glucose approached the normal range, or to overtreatment of hypoglycemia, or both. Some strategies to cope with these problems include more frequent weight checks, a decrease in daily energy intake, additional physical activity, and review of appropriate treatment of hypoglycemia.

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DIABETES MELLITUS: FAT REPLACERS AND ARTIFICIAL SWEETENERS

The desired outcomes of medical nutrition therapy for diabetes include maintaining blood glucose levels in a range as close to normal as possible, and restoring blood lipids to optimal levels. The appropriateness of specific modified food products for a given individual would thus depend on the relative priority of lipid management vs control of carbohydrate intake.

Fat Replacers

Fat replacers are compounds that replicate the functional and sensory properties of fats or mimic one or more characteristics of fat in a food. Usually they are categorized into three groups: carbohydrate-based molecules composed of simple or complex carbohydrate, gums, and gels (also carbohydrate-based); protein-based molecules; and fat-based molecules (1,2). Olestra, a noncaloric fat-based ingredient, was approved by the Food and Drug Administration (FDA) in January 1996. Products that contain olestra, such as potato chips, are required to display a list of possible side effects. These side effects may include decreased absorption of certain nutrients (vitamins A, D, E, and K and carotenoids) and potential side effects such as loose stools and abdominal cramping (3). Because the molecule is too large to be absorbed by the gastrointestinal (GI) tract, it adds no calories to the food.

Some unintentional effects of fat replacers are 1) intake of reduced-calorie foods may not always result in decreasing fat and calories in the diet because of overconsumption of other foods and 2) intake of reduced-fat or reduced-calorie foods may result in a higher intake of carbohydrates, which may affect glycemic control. When incorporating fat replacers into a patient's individualized meal plan, the dietitian should follow the guidelines of a "free-food" (<20 calories or <5 g of carbohydrate per serving and limit to three servings spread throughout the day). If the food product has 6 to 10 g of carbohydrate per serving, consider one half of a carbohydrate choice, or if it has 11 to 20 g of carbohydrate, consider one carbohydrate choice (2).

Artificial Sweeteners

Sweetening agents may be categorized as nutritive (those containing calories) and nonnutritive (those that do not contain calories). Nutritive sweeteners include sucrose, fructose, sorbitol, mannitol, and polydextrose. Nonnutritive sweeteners include aspartame, saccharin, acesulfame K, and sucralose.

Nutritive Sweeteners: "Restriction of sucrose in the diabetic diet because of concern about adverse effects on glycemia cannot be justified.… It is less clear whether dietary sucrose has adverse effects on lipidemia in people with diabetes." The American Diabetes Association reached these conclusions in 1994, after a review of 10 studies that compared glycemic response to ingestion of sucrose with glycemic response to ingestion of complex carbohydrates (4).

Fructose produces a smaller rise in plasma glucose than sucrose and other starches (5). When fructose is selected as the carbohydrate choice over sucrose for some individuals with diabetes, their blood glucose goals may be attained more easily. However, fructose-sweetened products may make a significant caloric contribution to the daily intake and cannot be considered "free" foods. Because of potential adverse effects of large amounts of fructose (20% of calories) on serum cholesterol and LDL-cholesterol, fructose may have no overall advantage as a sweetening agent (5). Some persons experience a laxative response from a load of fructose (≥20 g) (6).

Sorbitol, mannitol, and polydextrose are considered polyols and sometimes are listed on the Nutrition Facts label as "sugar alcohols." They elicit a lower glycemic response than does sucrose. Consumption in large amounts (eg, >50 g of sorbitol or 20 g mannitol) has been reported to cause osmotic diarrhea (6). Kilocalories from sugar alcohols vary but average about 2 kcal/g on food labels. There is no need to count the grams of sugar alcohols unless there are 5 or more grams per serving. If this is the case, subtract half of the grams of sugar alcohol from the total carbohydrate and then calculate the exchanges (7).

Nonnutritive Sweeteners: Aspartame (Nutrasweet®, Equal®), saccharin (Sweet' n Low®, Sugar Twin®), acesulfame K (Sunette®, Sweet One®), and sucralose (Splenda®) are approved by the FDA for use in the United States. The FDA also establishes the acceptable daily intake (ADI) for all food additives. It is defined as "the amount of a food additive that can be safely consumed on a daily basis over a person's lifetime without any adverse effects and includes a 100-fold safety factor." Actual intake by individuals with diabetes for all nonnutritive sweeteners is well below the ADI (5).

Technically, aspartame should not be listed as a noncaloric sweetener since it is equivalent in calories to table sugar. However, aspartame is so sweet (about 160 to 220 times sweeter than sucrose) that the small amount consumed in normal use has virtually no calories to consider. Aspartame is a dipeptide formed by the synthetic combination of two amino acids. After it has been metabolized, aspartame converts into phenylalanine, aspartic acid, and methanol. Because aspartame is a phenylalanine source, it should not be consumed by individuals with phenylketonuria (PKU).

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DYSPHAGIA

Discussion
Causes of dysphagia are classified as mechanical (trauma or surgical resection of one or more of the organs of swallowing) or paralytic (lesions of the cerebral cortex or lesions of cranial nerves of the brain stem).

Diseases and conditions in which dysphagia may result include the following:

Head injury	Cancer of head or neck
Brain tumors	Cerebral palsy
Multiple sclerosis	Stroke
Parkinson's disease	Alzheimer's disease
Huntington's chorea	Amyotrophic lateral sclerosis (ALS)
Myasthenia gravis	Auds (oral candidiasis)
Dementia	Laryngectomy (full or partial)

Signs and symptoms of dysphagia include:

Drooling	Aspiration of food or saliva
Retention of food in mouth	Choking
Coughing before, during, or after swallowing	Squirreling of food in cheeks
	Anorexia, weight loss, or malnutrition
Gurgly voice qualities	Fatigue during meals
Feeling of a lump in the throat	Spiking temperatures
Pneumonia	Dehydration

To define the therapeutic regimen, the multidisciplinary care team performs a comprehensive patient evaluation, which may include assessment of the following:

Diagnosis, treatments, surgical reports, and medications
Protein-energy malnutrition and other nutrient deficits
Energy and protein needs
Indications for enteral feeding
Olfactory and gustatory sensation
Excessive salivation
Food preferences and dislikes and typical meal pattern, elicited through patient and/or family interviews
Ability to self-feed
Dentition
Visual acuity
Paralysis or paresis
Obstruction
Respiratory status
Orientation, alertness, comprehension, memory, cooperation, motivation, emotional state, and fear of choking
Structure and function of all muscle groups involved in chewing and swallowing
Pain associated with food ingestion or swallowing
Onset, duration, and severity of swallowing problems
Food consistencies that can be consumed safely, as determined by clinical evaluation at bedside or by video swallow analysis

Approaches
See Nutrition Management of Dysphagia in Section IB.

Other Considerations
- In some patients with muscle weakness, avoid sticky foods, as they can adhere to the roof of the mouth, thus causing fatigue. For example, bread may tend to "ball up in the mouth." If this happens, bread can be torn into small pieces and sprinkled into foods. Note: For some patients, sticky foods (eg, peanut butter, caramels) may be used for exercise to improve tongue control, as recommended by the speech-language pathologist (SLP). Concentrated sweets may cause increased salivation.

- Certain foods (eg, Popsicles) may be used to practice sucking, as prescribed by the SLP.
- Offer a variety of food items to reduce boredom and possible reliance on certain foods.
- Foods should be served either warm (not tepid, but not hot enough to risk burning the mouth, secondary to loss of sensations), or cold (for increased stimulation).
- Offer foods in small amounts so the sight of large quantities of food does not overwhelm the patient. Select nutrient-dense foods.
- Do not use liquids to clear the mouth of food; the patient should drink liquids only after food has been cleared.
- The SLP should determine proper positioning: Some patients with neurologic impairments should sit in an upright position with hips flexed to a 90^{o} angle, back straight, feet flat on the floor, and head bent slightly forward. This allows the tongue to facilitate laryngeal elevation and subsequently protect the airway. An upright position also helps to close the glottis, decreasing risk of aspiration. Patient should be sitting up for 15 to 30 minutes before and after meals to prevent aspiration of any residue potentially remaining in the glottis area.
- Ensure a quiet atmosphere, free of distractions while the patient eats.
- Ensure patient comfort. Some patients may require medication to alleviate painful swallowing.
- It is important that the patient be encouraged to communicate problems and successes with the staff.
- It may be beneficial to stir medications into pudding if the patient has fluid restrictions.
- Allow the patient to set his or her own pace while eating.
- Have the patient or caregiver cleanse the patient's mouth before eating.

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RELATIONSHIP OF DYSPHAGIA TO THE NORMAL SWALLOW

Phase	Description of Normal Swallowing	Dysphagia Signs and Symptoms	Dietary Considerations
1	Oral preparatory phase: food is manipulated in the mouth and masticated if necessary	Drooling	Use semisolid consistencies that form a cohesive bolus; avoid thin liquids
2	Oral or voluntary phase: the tongue propels the food posteriorly	Inability to form bolus	Use semisolid consistencies to form a bolus; use moist, well-lubricated foods
		Pocketing food	Avoid foods with more than one texture; position food in sensitive areas; use cold, highly seasoned, flavorful food; try dense foods.
		Prolonged chewing and swallowing latency	Use highly textured foods (eg, diced, cooked vegetables and diced fruit); try dense cohesive foods; avoid sticky or bulky foods; assess ability to control liquids
		Marked prolongation of the feeding process	Use cohesive foods
3	Pharyngeal phase: begins with the triggering of the swallow reflex	Choking or coughing on liquid and/or solids	Use cohesive foods
	a. Elevation and retraction of the soft palate and complete closure of the velopharyngeal port to prevent material from entering the nasal cavity	Wet and gurgly vocal quality Nasal regurgitation	Include cohesive semisolid foods and thickened liquids
	b. Initiation of pharyngeal movement c. Elevation and closure of the larynx and all three sphincters (epiglottis, false folds, and true folds) d. Relaxation of the crycopharyngeal sphincter to allow the material to pass from the pharynx to the esophagus	Struggle behavior (feel for laryngeal elevation)	Use soft solids and thick to spoon-thick liquids; avoid sticky and bulky foods that tend to fall apart
4	Esophageal phase: bolus moves from the esophagus to the stomach	Indigestion	Avoid sticky and dry foods; try dense food followed by liquids
	Note: The esophageal phase of the swallow is not amenable to any kind of therapeutic exercise regimen. The videofluoroscopic study of deglutition generally does not involve examination of the esophagus.	Reflux Sensation of food lodged in the chest	Use semisolid, moist foods that maintain a cohesive bolus

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END-STAGE RENAL DISEASE

Discussion
Acute renal failure (ARF) generally presents with a sudden onset of symptoms. The medical history will include a recent isolated insult to the kidneys. The most common causes include:

- Shock, a sudden loss of blood supply to the kidneys from trauma, surgical complications, or both.
- Exposure to a nephrotoxic chemical or drug (eg, radiologic dyes, cleaning solvents, pesticides, and gentamicin).
- Recent streptococcal infection. If the insult occurred to a previously healthy kidney, the kidney will eventually rejuvenate if diet and/or dialysis can support the patient. Dialysis is usually a temporary therapy for these patients.

Chronic renal failure (CRF) is the result of progressive deterioration of kidney tissue over several months or years as scar tissue is substituted for viable kidney tissue. When about 90% or more of kidney function is lost, the person has reached end-stage renal disease (ESRD).

Some causes of ESRD are:

- Diseases of the glomerulus (glomerulonephritis)
- Damage to the blood vessels in the kidney by nephrosclerosis from high blood pressure
- Inherited diseases, such as polycystic kidney disease
- Obstructive diseases, such as kidney stones
- Congenital birth defects of the kidney and urinary tract
- Systemic and/or metabolic diseases such as diabetic nephropathy in which the kidney and urinary tract are irreversibly damaged, systemic lupus erythematosus, and hyperuricemia
- Abuse of analgesic or “street” drugs

Approaches
When evaluating the patient for nutrition intervention, the dietitian should be guided by norms established at the particular dialysis unit. Normal levels will seldom be the same as for those who are healthy individuals, since dialysis cannot completely replace real kidney function. Note that nephrologists may define normal levels differently. The following outlines the significance of biochemical parameters that are affected by ESRD.

Albumin: Uremia appears to depress albumin metabolism, and this can affect its concentration. Mean albumin levels are lower in patients with ESRD. Compared with normal levels, however, this may be a reflection of decreased protein intake (1). Albumin losses are greater with peritoneal dialysis. (See the discussion of protein requirements in Medical Nutrition Therapy for Renal Disease in Section IG.)

Lipids: Elevated lipid levels have been associated with accelerated cardiovascular disease in renal failure. The main abnormality seems to be a reduction in the catabolism of lipoproteins with unchanged or low hepatic synthesis. Most commonly, dialysis patients show an elevated cholesterol level.

Blood (serum) urea nitrogen (BUN): A nitrogenous waste product of protein metabolism, BUN most commonly becomes elevated with increased protein intake, catabolism, gastrointestinal bleeding, glucocorticoid use, or decreased dialysis efficiency. A low BUN value may be an indication of decreased protein intake, loss of protein through emesis or diarrhea, frequent dialysis, protein anabolism, or overhydration. Values greater than 90 to 100 mg/dL may lead to azotemia.

Potassium: Hyperkalemia (K+ greater than 6.0 mEq/L) is potentially life-threatening and may precipitate cardiac arrest if not treated. When hyperkalemia occurs in chronic renal failure, it is usually due to oliguria, excessive potassium intake, acidosis, the catabolic stress of infection, surgery, trauma, and glucocorticoid administration or hypoaldosteronism. In clinical practice, excessive potassium intake is frequently related to the use of potassium-containing salt substitutes and dietary noncompliance. Hypokalemia (K+ less than 3.5 mEq/L) may be caused by decreased dietary intake, vomiting, diarrhea, use of a potassium-depleting diuretic, excessive use of Kayexalate (a potassium binder), or dialysis against a low-potassium bath.

Sodium: Serum sodium levels must always be interpreted with current fluid status in mind. Hypernatremia can be caused by excessive water loss through diarrhea and vomiting (dehydration) and aggressive diuretic therapy without sodium restriction. Signs of hypernatremia include flushed skin, dry tongue and mucous membranes, and thirst. Hyponatremia can be caused by fluid overload and sodium depletion from sodium restriction along with sodium-losing nephropathy. Symptoms of hyponatremia include abdominal cramps and hypotension.

Calcium: The Renal Diet tends to be low in calcium, and there is decreased calcium absorption secondary to the abnormal metabolism of vitamin D. Hyperphosphatemia also leads to decreased serum calcium levels, which contribute to secondary hyperparathyroidism and renal osteodystrophy. The goal of therapy is to achieve serum calcium levels between 10.5 and 11.5 mg/dL. The presence of calcium in the dialysate helps to normalize serum calcium levels in the patient on hemodialysis, along with the use of an activated source of vitamin D (Calcitriol), an oral calcium supplement, and a phosphorus binder. A "corrected calcium"should be considered when the albumin level is low, not the serum calcium.

Phosphorus: Low levels of serum phosphate may lead to phosphorus depletion and osteomalacia. The goal of therapy is to maintain PO_4 level between 4.0 and 6.0 mg/dL.

Calcium-phosphorus product*:* It is best to maintain the calcium-phosphorus product (the result of multiplying the serum values of both) below 70, to prevent soft-tissue calcification.

Creatinine: Creatinine, another form of nitrogenous waste, is a product of muscle metabolism. Unlike BUN, the serum creatinine level is not directly affected by diet. Creatinine is used as a tool to assess renal function. A twice-normal serum creatinine level (normal, 0.5 to 1.5 mg/dL) suggests a greater than 50% nephron loss, whereas a serum creatinine level of 10 mg/dL suggests a 90% nephron loss or ESRD. Serum creatinine assessment can be used in determining the consistency of dialytic therapy, when serial measurements are used. Eventually a normal creatinine level can be established for each dialysis patient for his or her muscle mass and dialysis prescription. Sudden increases in serum creatinine levels can usually be traced to changes in the dialysis regimen, such as skipped treatments, decreased dialysis time, or poor blood flow through an access. Elevated BUN and serum potassium levels accompanied by a suddenly elevated serum creatinine level and a decrease in CO_2, usually indicate decreased waste product removal.

Glucose*:* Ideally, normal glucose levels should be maintained in all dialysis patients to prevent the complications of hypoglycemia and hyperglycemia. Abnormal carbohydrate metabolism resulting in hyperglycemia has been noted in individuals approaching ESRD. The cause is not specifically known, but it does seem to be resolved after several weeks of dialysis therapy or transplantation. High blood glucose levels can increase thirst. Protein catabolism often accompanies the elevated blood glucose levels in chronic renal failure.

GLOMERULAR FILTRATION RATE (CREATININE CLEARANCE) (1)

Creatinine clearance is the most commonly used measure of glomerular filtration rate (GFR). Normal GFR is 125 mL/min.

In principle, a reciprocal relationship between serum creatinine and creatinine clearance exists. To estimate creatinine clearance, factors such as body weight, age, and sex must be considered since creatinine increases with body weight and musculature and decreases with age. The relationship between serum creatinine and creatinine clearance is not valid for patients receiving dialysis, patients with acute renal failure, or patients in a catabolic state in whom muscle mass is being destroyed.

The following formulas apply:

$$\text{GFR (Men)} = \frac{\text{Weight (kg)} \times 140 - \text{Age}}{72 \times \text{Serum Creatinine (mg/dL)}}$$

$$\text{GFR (Women)} = \frac{\text{Weight (kg)} \times 140 - \text{Age}}{72 \times \text{Serum Creatinine (mg/dL)}} \times 0.85$$

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NUTRITION APPROACHES IN THE DIALYSIS PATIENT BASED ON ASSESSMENT PARAMETERS (1,2,3)

Biochemical Parameters	Reference Range	Goal Values for Dialysis	Approaches*
Sodium	136-145 mEq/L	Same	If high: assess sodium intake If low: assess fluid intake
Potassium	3.5-5.0 mEq/L	3.5-5.5mEq/L	If high: assess/limit potassium intake; modify K+ in dialysate If low: may liberalize potassium intake
Glucose	80-125 mg/dL	Same (higher for diabetic)	If high: avoid excess carbohydrate consumption If low: assess total energy intake
Calcium	8.5-10.5 mg/dL	9-11 mg/dL	If high: assess for use of calcium supplements or vitamin D If low: recommend calcium binders away from meals, such as at bedtime (4)
Phosphorus	2.3-4.7 mg/dL	4.5-6.5 mg/dL	If high: elevate/limit total phosphorus intake as needed; evaluate phosphorus binder used and timing If low: add 1 serving of high phosphorus food per day or adjust binder
Calcium-phosphorus product		<70	Reduce serum phosphorus concentrations before increasing calcium levels
Blood (serum) urea nitrogen (BUN)	4-22 mg/dL	<90-100 mg/dL	If high: assess/limit protein intake If low: Is patient losing weight? Assess protein and energy intake
Albumin	3.3-5.0 g/dL	4.0 g/dL	If low: assess/increase protein intake
Parathryoid hormone (NTACT)	1-60 pg/mL	>100 but <300 pg/mL	If high: evaluate PO_4 and calcium. Goal is to establish upper limits of calcium range while maintaining PO_4 levels. Adjust Calcitriol. If low: evaluate dosage of Calcitriol; it may need to be reduced
Hematocrit	Male: 42%-52% Female: 37%-47%	33%-36%	If high: check dose of Epoetin If low: check ferritin stores, check iron stores, and increase Epoetin
Hemoglobin	Male: 13-18 g/dL Female: 12-16 g/dL	11-12 g/dL 11-12 g/dL	If high: check dose of Epoetin If low: check ferritin stores, check iron stores, and increase Epoetin
Transferrin saturation	20%-50%	20%-50%	If high: follow same approach as for hematocrit If low: follow same approach as for hematocrit
Ferritin	12-300 ng/L	≥100 but <800 ng/L	If high: decrease iron supplementation; check for chronic inflammation

* See Section 1G: Medical Nutrition Therapy for Renal Disease

II. MEDICATIONS		**APPROACHES**
Phosphate binders		May liberalize dietary phosphorus restriction
Diuretics		If effective, may liberalize sodium restriction (diuretics may make BUN rise and decrease potassium)

III. OTHER PARAMETERS		**APPROACHES**
Interdialytic weight gain	Goal: 1-2 lb/day 2% to 5% of body weight (5)	If high: control fluid and sodium intake If low: patient could use more fluids
GFR/creatinine clearance		See discussion of GFR earlier in this section
Hypertension edema/ congestive heart failure		Sodium restriction
Hypotension		Assess sodium intake
Urine output (input and output)		Adjust fluid intake based on urine output to maintain stable dry weight
Complaint of altered taste sensation		Explore seasoning alternatives, as salt substitutes are contraindicated; problem may resolve as BUN normalizes Give zinc supplementation to counteract "taste loss"

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ENTERAL NUTRITION: MANAGEMENT OF COMPLICATIONS

Problem	Approaches
Diarrhea	Evaluate medication profile and administration Check for *Clostridium difficile* Try antidiarrheal medication after C *difficile* toxin infection has been ruled out Try fiber-containing formula Use continuous infusion administration technique. If hypoalbuminemia, use isotonic or peptide base formula Observe proper sanitation
Nausea	Try antiemetic Consider increasing energy density to decrease total volume Try gastric-emptying medication (Reglan) Use postpyloric feeding (duodenum, jejunum) Administer at room temperature Check tube placement Check for fecal impaction
Hyperglycemia	Monitor blood glucose levels Avoid overfeeding in total kilocalories Administer insulin or oral glucose lowering agent
Overhydration	Use more concentrated formula
Dehydration	Use less concentrated formula Supplement with additional water as needed
Clogged tube	Check for proper tube size (viscous formulas should be administered through a >10 French catheter) Flush with water (usually 20-30 mL) regularly and before and after administration of medicines
Constipation	Monitor hydration status Recommend rectal examination Add free water Consider fiber-containing formula with extra free water Increase physical activity if possible
Essential fatty acid (EFA) deficiency	Add 5 cc of safflower oil daily (1) Change formula to one that contains EFAs
Rapid/excessive weight gain	Check fluid input and output
Abdominal distention	Decrease rate Give an isotonic or warm formula

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GASTRIC REDUCTION SURGERY FOR OBESITY

Discussion
Severe obesity is a chronic condition that is very difficult to treat. Surgery to promote weight loss by restricting food intake or interrupting digestive processes is an option for severely obese people.

Indications
Criteria for surgical intervention for weight loss include:

- A body mass index (BMI) greater than or equal to 40 with no comorbid conditions or health risk *or*
- A BMI greater than or equal to 35 with comorbid conditions or health risks (1) *or*
- 100 lb over ideal body weight

Surgeons now use techniques that produce weight loss primarily by limiting how much the stomach can hold. These restrictive procedures are often combined with modified gastric bypass procedures that somewhat limit energy and nutrient absorption and may lead to altered food choices. As in other treatments for obesity, successful results depend mainly on motivation and behavior.

Two ways that surgical procedures promote weight loss are (2):

1. By decreasing food intake (restriction). Gastric banding, gastric bypass, and vertical-banded gastroplasty (VBG) are surgeries that limit the amount of food the stomach can hold by closing off or removing parts of the stomach. These operations also delay emptying of the stomach (gastric pouch).

2. By causing food to be poorly digested and absorbed (malabsorption). In the gastric bypass procedures, a surgeon makes a direct connection from the stomach to a lower segment of the small intestine, bypassing the duodenum and some of the jejunum.

Restriction Operations
Restriction operations for obesity include gastric banding and VBG. Both operations serve only to restrict food intake. They do not interfere with the normal digestive process. Restriction operations are the surgeries most often used for producing weight loss. Creation of a small pouch at the top of the stomach where the food enters from the esophagus restricts food intake. The pouch initially holds about 1 oz of food and expands to 2 to 3 oz with time. The pouch's lower outlet usually has a diameter of approximately ¼ inch. The small outlet delays the emptying of food from the pouch and causes a feeling of fullness. Restrictive operations lead to weight loss in almost all patients. However, some patients do regain weight. Approximately 30% of persons undergoing vertical-banded gastroplasty achieve normal weight, and about 80% achieve some degree of weight loss (2).

After an operation, the patient usually can eat only ½ to 1 cup of food without discomfort or nausea. Also, food has to be well chewed. Most patients undergoing this surgery lose the ability to eat a large amount of food at one time, but some individuals do return to eating modest amounts of food without feeling hungry.

Types of restriction operations include:

- Gastric banding: In this procedure, a band made of special material is placed around the stomach near its upper end, creating a small pouch and a narrow passage into the larger remainder of the stomach.

- Vertical-banded gastroplasty: This procedure is the most frequently used restrictive operation for weight control. Both a band and staples are used to create a small stomach pouch.

A common risk of restrictive operations is vomiting. This occurs when insufficiently chewed food particles overly stretch the small stomach. Other risks of VBG include erosion of the band, breakdown of the staple line, and, in a small number of cases, leakage of stomach juices into the abdomen. The latter requires an emergency operation. In a very small number of cases (less than 1%) infection or death from complications may occur (2).

Gastric Bypass Operations

Gastric bypass operations combine creation of small stomach pouches to restrict food intake and construction of bypasses of the duodenum and other segments of the small intestine to cause malabsorption. Gastric bypass operations that cause malabsorption and restrict food intake produce more weight loss than do restriction operations that only decrease food intake. Patients who have bypass operations generally lose two-thirds of their excess weight within 2 years.

Types of gastric bypass operations:

- Roux-en-Y gastric bypass: This operation is the most common gastric bypass procedure. First, a small stomach pouch is created by stapling or by vertical banding. This step causes restriction in food intake. Next, a Y-shaped section of the small intestine is attached to the pouch to allow food to bypass the duodenum (the first segment of the small intestine) as well as the first portion of the jejunum (the second segment of the small intestine). This step causes reduced absorption of energy and nutrients.

- Extensive gastric bypass (biliopancreatic diversion): In this more complicated gastric bypass operation, portions of the stomach are removed. The small pouch that remains is connected directly to the final segment of the small intestine, thus completely bypassing both the duodenum and jejunum. Although this procedure successfully promotes weight loss, it is not widely used because of the high risk for nutritional deficiencies.

The risks for pouch stretching, band erosion, breakdown of staple lines, and leakage of stomach contents into the abdomen are about the same for gastric bypass as for VBG. However, because gastric bypass operations cause food to skip the duodenum, where most iron and calcium are absorbed, risks for nutritional deficiencies are higher in these procedures (2). Iron deficiency is common. Other deficiencies that occur are vitamin B_{12} (in 26% to 70% of patients), folate (in 33% of patients), and vitamin A (in 10% of patients) deficiencies; low serum potassium (in 56% of patients); and low serum magnesium (in 34% of patients) (3). Anemia may result from malabsorption of vitamin B_{12} and iron in menstruating women, and decreased absorption of calcium may bring on osteoporosis and metabolic bone disease (2). Patients are required to take nutritional supplements that usually prevent these deficiencies.

Gastric bypass operations also may cause the “dumping syndrome,” whereby stomach contents move too rapidly through the small intestine. Symptoms include nausea, weakness, sweating, and faintness. Occasionally, diarrhea occurs after eating or the patient is unable to eat sweets without becoming so weak and sweaty that he or she must lie down until the symptoms pass. Refer to the Dumping Syndrome Diet in Section IB for appropriate medical nutrition therapy intervention and treatment.

Approaches

The more extensive the bypass operation, the greater is the risk for complications and nutritional deficiencies. Patients with extensive bypasses of the normal digestive process require not only close monitoring but also lifelong use of special foods and medications. Surgery to produce weight loss is a serious undertaking. Each individual should clearly understand what the proposed operation involves. Patients and physicians should carefully consider the following benefits and risks:

Benefits

- Immediately after surgery, most patients lose weight rapidly and continue to do so until 18 to 24 months after the procedure. Although most patients then start to regain some of their lost weight, few regain it all (1,2).

- Surgery improves most obesity-related conditions. Blood glucose levels have been shown to return to normal after surgery in 65% of obese patients with type 2 diabetes mellitus, 45 through 71 years old (4). Patients also usually experience lower blood pressure and lower serum cholesterol levels.

Risks

- Of patients who have weight-loss operations, 10% to 20% require follow-up operations to correct complications (1,2). Abdominal hernias are the most common complications requiring follow-up surgery. Less common complications include breakdown of the staple line and stretched stomach outlets.

- Gallstones develop in more than one-third of obese patients who have gastric surgery (1,5). Gallstones are clumps of cholesterol and other matter that form in the gallbladder. During rapid or substantial weight loss, a person's risk of developing gallstones is increased. Gallstones can be prevented with supplemental bile salts (eg, ursodiol) taken for the first 6 months after surgery (1).
- Nearly 30% of patients who have weight-loss surgery develop nutritional deficiencies such as anemia, osteoporosis, and metabolic bone disease. These deficiencies can be avoided if adequate vitamin and mineral intakes are maintained.
- Women of childbearing age should avoid pregnancy until their weight becomes stable because rapid weight loss and nutritional deficiencies can harm a developing fetus.

Postoperative Recommendations

The following recommendations should be given to the patient postoperatively (6, 7)

1. The diet should progress from clear liquids for 3 days to low-fat, low-sugar, pureed foods that are thinned enough to go through a straw. Thinned pureed foods should be given for 3 weeks, then progressed to semisolids for 1 week. By the fifth week, the patient is placed on a low-fat, low-sugar diet permanently. The diet does not limit foods high in carbohydrates; however, high-sugar foods are limited. Patients should be educated to consume adequate fluids and high-protein foods. Dehydration is common, particularly in the early postoperative period, but it can be easily managed. If inadequate protein intake occurs, the patient may experience hair loss.
2. The patient should eat slowly and drink between meals.
3. If vomiting occurs, the patient should eat more slowly, properly chew food, drink fluids after eating, lie down after eating, and should not overeat.
4. Generally a multivitamin-mineral supplement is needed. There is a risk of developing deficiencies in vitamin B_{12}, folate, iron, potassium, magnesium, and vitamin A. Monitor for vitamin B_{12} deficiency.
5. Food intolerances are common. Intolerances to high-sugar, high-fat foods, meats, raw vegetables, and bread are frequently seen. However, dry breads and crackers are usually well tolerated.

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GASTROESOPHAGEAL REFLUX DISEASE (GERD)

Discussion

GERD involves the symptomatic reflux of gastric contents- particularly acid, pepsin, and bile- into the esophagus which results in damage to the esophageal mucosa and leads to esophagitis, regurgitation, and heartburn. Heartburn is often elicited by lying flat or bending over. If the reflux is severe enough, the same positions may evoke actual regurgitation of gastric fluid into the mouth, causing choking, coughing, and possible pulmonary aspiration. Other symptoms may include dysphagia, pain on swallowing and water brash (when the mouth suddenly fills with a large amount of fluid secreted from the salivary glands) (1).

Ordinary the esophagus is protected from reflux of gastric contents by contraction of the lower esophageal sphincter (LES). In persons with chronic esophageal reflux, the sphincter pressure tends to be lower. Either increased intragastric pressure or decreased LES pressure causes GERD.

Treatment is aimed at modifying the factors that promote gastroesophageal reflux and irritation. Treatment requires a multifactorial approach and is aimed at nutrition and lifestyle modifications, drug therapy, consisting of antacids and hydrogen antagonists and, rarely, surgery.

Management goals are as follows:

1. Limit intragastric pressure.
2. Avoid substances that decrease the LES.
3. Decrease acidity of refluxed material to prevent irritation of the esophagus.

Therapeutic treatment is usually provided in three phases.

Phase 1

Approaches	**Rationale**
Consume small-volume meals; this may necessitate dividing meals into smaller meals and midmorning and midafternoon snacks, or consuming fluids between meals	
Maintain upright posture during and after eating	Intragastric pressure is increased by mechanical and postural factors
Reduce weight if needed (see Calorie-Controlled Diet in Section IC)	Regression of symptoms is likely to accompany weight loss
Avoid tight fitting clothing, frequent bending	
Avoid lying down after eating; consume bedtime snacks or meals at least 2 hours before retiring	
Elevate head of bed at least 6 inches when sleeping	
Limit fat in diet (see Fat-Controlled Diet in Section IC)	Intragastric pressure can be reduced if stomach emptying is enhanced; fat decreases LES pressure.
Avoid peppermint and spearmint	These substances decrease LES pressure
Avoid gastric stimulants: • Cigarette smoking • Alcohol • Chocolate • Coffee, regular • Caffeine	Goal: decrease acid production; these substances also decrease LES pressure

Approaches	Rationale
Limit food constituents that the patient claims cause discomfort; these may include citrus fruits and juices, tomato products, and carbonated beverages	
Treat with antacids containing aluminum hydroxide and Magnesium trisilicate (Gaviscon)	May reduce symptoms by forming a viscous barrier in the stomach that impedes reflux

Phase 2

Approaches	Rationale
Medical Approaches	
• Treat with Histamine H_2 antagonists	Prescribed to decrease acidity
• Cimetidine, rantidine	
• Omeprazole (Prilosec)	
• Bethanechol (Urecholine)	Increases LES pressure
• Metoclopramide (Reglan)	

Phase 3

Antireflux surgery	Occasional use for the patient in which maximal medical therapy is not successful, and persistent severe symptoms and complications are present. Although, significant improvement is seen postoperatively, recurrence of symptoms as well as histologic evidence of esophagitis is reported as time progresses (1).

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HIV INFECTION AND AIDS

Discussion

Human immunodeficiency virus (HIV) is a retrovirus, transmitted through contact with blood or body fluids from an infected person. This virus attacks helper T lymphocytes in the blood, often referred to as CD4 cells or T cells. The systematic destruction of the CD4 cells leads to a weakening of the body's immune function, increasing the host's vulnerability to opportunistic infections. Acquired immunodeficiency syndrome (AIDS) defines a specific stage of HIV infection when the progression of the virus has advanced and the immune system is severely compromised. There are a number of specific opportunistic infections as well as counts of the CD4 cells that define when a person has AIDS. The impact of nutrition on HIV and AIDS is significant.

A major component of the clinical syndrome in HIV infection and AIDS is HIV wasting. The Centers for Disease Control and Prevention (CDC) define the HIV wasting syndrome as profound involuntary weight loss of greater than 10% of baseline body weight, plus at least one of the following (1):

- chronic diarrhea (at least two stools a day for 30 days or longer)
- chronic weakness and documented fever for 30 days or longer in the absence of a concurrent illness or condition other than HIV infection that could explain the findings

Previous estimates of the prevalence of HIV wasting as the first AIDS-defining diagnosis ranged up to 37% (2). However, with the advent of the highly active antiretroviral therapy (HAART), researchers have shown that the prevalence of all AIDS-defining diagnoses has decreased (3). In a more recent study, while 63% of the patients showed evidence of malnutrition, the prevalence of wasting had decreased to 21% (4).

The causes of wasting and malnutrition in HIV disease are complex and multifactorial. Suspected mechanisms of weight loss and malnutrition include reduced intestinal absorption, abnormal utilization of nutrients, anorexia, altered metabolism, hypogonadism, and increased cytokine production (5-7).

It has been shown that there is an increase in resting energy expenditure (REE) with HIV infection that may contribute to weight loss. However, there is now increasing evidence to show that whereas REE does increase slightly, total energy expenditure (TEE) decreases. This decrease in TEE illustrates that HIV may increase the metabolic rate, but it more significantly decreases the infected individual's activity level and energy intake (8). This decline in general functional ability affects a person's exercise and eating patterns in ways that may greatly contribute to HIV wasting.

Wasting and weight loss also influences the timing of the progression from HIV to AIDS and death in AIDS. Studies have shown that a 5% to 10% weight loss over 4 months increases the relative risk for death and opportunistic infections twofold (9). Other research has demonstrated that an overall weight loss of 34% of ideal body weight (IBW) or 46% of usual body cell mass is linked to the occurrence of death (10). Evidence also exists that a combination of therapies to combat weight loss, malnutrition, and loss of lean body mass will be more effective in helping to reduce associated morbidity (11). There are many new and developing treatment options to choose from, including nutritional supplements, appetite-stimulating drugs, testosterone and testosterone analogues, growth hormone, resistance exercise, and cytokine modulation (7,12).

One of the greatest challenges facing health care providers is helping patients with HIV and AIDS to meet their nutrition needs. Complications frequently develop that interfere with nutritional intake. Additionally, as people with HIV begin to live longer and as the medication regimens become more complex, practitioners face other challenges, for example, chronic disease states such as diabetes, atherosclerosis, and heart disease are more of a concern (13). Some of the antiretroviral medications have been shown to cause side effects, such as lipodystrophy or fat redistribution, which must also be addressed. Some of the more common complications are listed in the following table (14-17), along with nutrition management strategies to optimize nutritional status.

Nutrition Management Strategies for People With HIV Infection or AIDS

Complication	Possible Cause	Nutrition Intervention
Anorexia	Medication Infection Fever Nausea Vomiting Diarrhea Pain Anxiety, depression Other medical therapies	Investigate and treat cause. Review medications for potential anorexia-causing side effects. Consider appetite stimulants. Recommend small, frequent nutrient-dense foods; eating in a pleasant atmosphere; and easy-to-prepare food or assistance with meals. Consider liquid nutritional supplements. Consider vitamin/mineral supplements. Consult dietitian.
Nausea and vomiting	Medication Infection Anxiety Fever Medical therapies	Investigate and treat cause. Review medications for potential nausea and vomiting side effects. Consider antiemetics. Alter medication times. Recommend small, frequent feedings; dry foods, soft foods, cold or room-temperature foods, and salty foods; elevation of upper body during and after meals; and liquids between meals. Ensure proper food-medication schedule. Consider liquid nutritional supplements. Consider vitamin/mineral supplements. Recommend oral rehydration. Consult dietitian.
Diarrhea	Medication Antibiotic therapy Infection Food-borne or water-borne illness Food intolerance Other medical conditions Medical therapy Anxiety Stress	Investigate and treat cause. Review medications for potential diarrhea-causing side effects Recommend oral rehydration; replace electrolytes; increase soluble-fiber foods; evaluate tolerance to gas-forming foods, fat, and lactose. Consider intravenous rehydration. Consider yogurt or acidophilus milk if long-term antibiotic therapy is required. Consider vitamin/mineral supplements. Consider pancreatic enzymes. Consult dietitian.
Oral and esophageal lesions	Medication Infection Malnutrition Oral and esophageal candidiasis Kaposi's sarcoma and other malignancies	Investigate and treat cause. Review medications. Recommend soft, nonspicy, nonacidic foods; pureed foods or thickened liquids; and oral supplements. Consider a topical analgesic to decrease mouth pain. Consider liquid nutritional supplements. Consider vitamin/mineral supplements. Consult dietitian.

Complication	Possible Cause	Nutrition Intervention
Early satiety	Medication Infection Nausea	Investigate and treat cause. Review medications. Recommend, small, frequent feedings; nutrient-dense foods; liquids between meals; and avoidance of greasy, fried foods and gas-forming foods. Consider liquid nutritional supplements as between-meals snacks. Consider vitamin/mineral supplements. Consult dietitian.
Food intolerances	Medication Infection GI disturbance Poor dentition Genetic cause	Investigate and treat cause. Review medications. Recommend alternative foods and textures; evaluate for nutrient deficiencies. Consider liquid nutritional supplements as tolerated. Consider vitamin/mineral supplements. Consult dietitian.
Taste/smell changes	Medication	Investigate and treat cause. Change, initiate, or discontinue medication. Recommend small, frequent feedings; experiment with a wide variety of foods and seasonings and alternative protein sources. Consult dietitian.

Nutritional Priorities

All patients with a new diagnosis of HIV infection should have a thorough nutrition assessment. Early referral to medical nutrition therapy in HIV-infected patients can improve nutritional status and may lead to an increased ability to fight opportunistic infections and a decreased number of hospitalizations (18-20). Early intervention efforts should be focused on optimizing nutrient stores before the onset of nutrition-related complications in an attempt to prevent or delay the onset of malnutrition and wasting.

Initial assessment: The assessment should include the patient's medical-surgical history, profile of medications and nutritional supplements, anthropometrics (calculation of body cell mass) if possible, laboratory data, diet history, financial evaluation, psychosocial assessment, and physical symptoms.

Establish energy requirements: Energy needs can be estimated by using the Harris-Benedict equation and multiplying by a stress factor of 1.2 to 1.8, with allowance for extra needs associated with fever and exercise. An alternative method to estimate energy needs is 25 to 45 kcal/kg of usual body weight. Both methods are acceptable and commonly used in practice (15-17).

Establish protein requirements: Protein needs for males and females can be estimated using a range of 1.0 to 2.0 g/kg. Consider renal and hepatic function, nitrogen balance studies, prealbumin, serum albumin, transferrin levels, and exercise regimen (15-17).

Establish fluid requirements: Water requirements for patients with normal fluid status can be estimated using 30 to 35 mL/kg of body weight or 9 to 12 (8-oz) cups per day. Coffee and other caffeine-containing beverages do not count as fluids and should be avoided because of their dehydrating effects. Consider increasing fluid requirements when the patient has fever, nausea, vomiting, or diarrhea or with initiation of medication, exercise, and inclement weather. Fluid restrictions may be indicated with renal or hepatic failure (16).

Vitamin and mineral recommendations: Researchers have identified vitamin and mineral deficiencies in individuals infected with HIV. Clinicians routinely recommend the use of a multivitamin and mineral supplement that provides 100% of the Dietary Reference Intakes (DRI) for vitamins and minerals. It is often recommended to take these multivitamin and mineral supplements twice daily. Other vitamins and mineral recommendations have been published that are not verified by research but may be considered within the realm of prudent practice (15,16). For example, some practitioners recommend additional supplementation of antioxidants such as vitamin E, vitamin C, beta-carotene, magnesium and selenium.

Exercise recommendations: Resistance exercise has been shown to help increase lean body mass, and HIV wasting has been shown to deplete lean body mass. Maintenance of lean body mass is very important in helping the body to resist opportunistic infections and to rebound after infection. Therefore, dietitians should recommend that all patients who are physically able begin a routine of resistance exercise. A physician or physical therapist should monitor program intensity and scope (9, 21).

Determine appropriate mode of nutrition support based on diagnostic findings:

- Oral feedings are preferred over any other feeding method. Efforts to maintain the oral feeding route should be maximized. Nutrient-dense foods and supplements should be used to support maintenance and restoration of nutritional status and body weight. Appetite stimulants may be indicated for patients experiencing anorexia. Two appetite stimulants have been approved for this purpose, megestrol acetate and dronabinol. It should be noted, however, that typically the weight gain associated with the use of these appetite stimulants is in the form of fat mass and not the desired lean body mass. Additionally, megestrol acetate may exacerbate diabetes mellitus (12).
- The enteral feeding route is preferred over parenteral administration in order to preserve gut structure and function. Assess patients carefully and reassess them on a regular basis (22).
- Parenteral nutrition may become necessary when a patient meets the criteria for initiation of total parenteral nutrition (TPN). Continual assessment and routine monitoring of laboratory values is essential.

Food Safety

Patients infected with HIV have weakened immune systems and are more susceptible to contracting food-borne illnesses. Food-borne illnesses often cause symptoms similar to those of the flu (diarrhea, nausea, vomiting, fever, and cramping). Symptoms range from mild to life-threatening. Practical guidelines for food safety for patients are as follows (15,23,24):

Shopping for Groceries

- Pay attention to "sell by" and "use by" dates on perishable products. Do not purchase or use outdated foods.
- Put raw meat, fish, and poultry in separate plastic bags before setting in your grocery cart with other foods.
- Avoid cans that have dents, bulges, or leaks.
- Avoid luncheon meats and cheeses from the deli case, as they may have been contaminated from improper food handling. Instead, use prepackaged processed meats and cheeses.
- Select the food items that need refrigeration just before checking out. If food needs to be held in the car for longer than 30 minutes, use a cooler to keep it cold.
- Buy only pasteurized dairy products.

Storing and Saving Food at Home

- Check refrigerator and freezer temperatures. Refrigerators should be 35°F to 41°F and freezers at or below 0°F.
- After returning home from grocery shopping, immediately place perishable foods in the refrigerator or freezer.
- Place uncooked meat, fish, and poultry products in separate plastic bags and set on a plate on the lowest shelf of the refrigerator to prevent raw juices from dripping onto other foods.
- Plan to use ground beef, ground poultry, and fresh fish within 1 or 2 days. Use beef steaks, roasts, and poultry within 3 or 4 days.
- Label all leftovers with the date. Wrap leftovers or store in closed container.
- Keep the interior of the refrigerator and freezer clean.
- Refrigerate leftovers as soon as possible. Foods left at room temperature for longer than 2 hours are susceptible to bacterial growth.
- Store leftovers in shallow containers rather than smaller, deep bowls. This will help the leftovers to more quickly cool to the proper temperature.
- Leftovers should be wrapped securely before refrigeration and should be eaten within 3 or 4 days.

Freezing and Defrosting Foods

- Thaw all frozen foods in the refrigerator. Place the frozen foods into a plastic bag or onto a plate in order to prevent juices from dripping onto other foods. Frozen food can be defrosted in the microwave oven, according to manufacturers' directions, then cooked immediately.
- Thawing food on the kitchen counter or in warm water invites trouble. Many harmful bacteria grow rapidly between 70°F and 120°F.
- If in doubt about the safety of a food, throw it out.

Preparing Food

- Wash hands using antibacterial soap with warm water before and after handling food, and especially after handling raw meat, poultry, and fish. Wash hands after sneezing or coughing.
- Use separate cutting boards, platters, trays, and utensils for cooked and uncooked meat, poultry, and fish. Always wash contact surfaces and utensils with a dilute bleach solution immediately after preparing these products.
- Scrub all fresh fruits and vegetables in hot, soapy water before eating.
- Avoid sushi, sashimi, seviche, raw oysters and clams, Caesar salads, homemade salad dressings and mayonnaise, homemade ice cream, homemade eggnog, and cookie dough or cake batter. These foods contain raw seafood, meat, poultry, or eggs and therefore may contain pathogens (bacteria) that are harmful.

Cooking

- All meat should be cooked to a minimum internal temperature of 160°F. This does not necessarily mean well done.
- Use an instant read thermometer for all types of meat, including pork and fish, to accurately determine the internal temperature. An instant read thermometer is different from a meat thermometer in that it does not stay in the meat while cooking. It has a small, round temperature display and should take only several seconds to give an accurate reading.
- Avoid cooking meats at a very low oven temperature (below 300°F) or overnight, as it may encourage bacterial growth before cooking is complete.
- Cook all ground meats until they are brown all the way through. This is especially important in a restaurant where you may not be able to check the internal temperature.
- Cook any stuffing separately from the meat.
- To marinate foods, keep them in the refrigerator in covered containers.
- Cook eggs until well done. Eggs that are cooked over easy or undercooked increase the risk of salmonella infection.
- Cook raw seafood within 24 hours of purchase.

Microwave Oven Cooking

- Do not cook meat that contains bones in the microwave. Bones can shield the surrounding meat from the microwaves and therefore leave some meat undercooked.)
- Because microwaves do not always cook foods evenly, try using a turntable to help increase the consistency.
- Check meat in several places to ensure that is cooked to the proper temperature throughout.

Water Safety

- Bacteria that may contaminate a water supply include *Giardia, Cryptosporidium, Microsporida, and Mycobacterium avium-intracellulare* (MAI).
- For drinking water, boil tap water 1 to 5 minutes.
- Only bottled water that has been purified by distillation, reverse osmosis, or absolute 1-µm filtration can be considered safe.
- Home water filters should use reverse osmosis or absolute 1-µm filtration. Safe water filters will be labeled "NSF Standard 53 Cyst Removal" on the box.
- Ice is safe only if it is made from water that has been boiled or properly distilled or filtered.

Eating Away From Home

- Make sure meat, fish, and poultry are cooked thoroughly. Check to see that burgers are no longer pink in the middle and the juices run clear. Send back undercooked meats for further cooking.
- When eating from a buffet, make sure cold foods are cold (at or below 41°F) and hot foods are hot (at or above 140°F). Avoid buffet foods when possible.
- Order fried eggs cooked on both sides. Send back scrambled eggs that look runny.

- Look for cleanliness at salad bars and at meat and deli counters. There is always a risk for immune-compromised individuals when they eat from salad bars. Often fruits and vegetables are not washed thoroughly and prepared foods are not kept at proper temperature to prevent bacteria from thriving.
- Make sure there are soap and towels in the restroom. If not, it may mean the wait staff and cooks will not wash their hands properly after using the restroom.
- Consumption of foods purchased from street vendors is risky business.

Foreign Travel
- Do not purchase foods from street vendors.
- Choose cooked foods over salads, fruit, and raw vegetables.
- Bring drinking water with you or drink only boiled water that has been cooled. Beverages made with boiled water, such as coffee or tea, are safer to drink, as are canned or bottled carbonated beverages, beer, and wine. Do not drink beverages containing ice cubes.

Note: The United States has one of the safest food supplies in the world. Be aware that not all countries have the same high standards for sanitation and food safety.

Medications
In recent years there have been many advances in the pharmacologic treatment of HIV infection. The advent of HAART has reduced viral loads in patients and increased their quality of life and length of life. However, a cure for AIDS still remains to be discovered.

Medications are used for three primary purposes (14,15, 25):
1. To fight the virus itself (see next paragraph)
2. As prophylaxis against opportunistic infections (most commonly initiated when the patient's CD4 cell count falls below 200 cells/mm^3).
3. To aggressively treat existing complications as needed

Medications that fight the virus are divided into three types:
1. Nucleoside analogue reverse transcriptase inhibitors. These drugs work by mimicking one of the body's own building blocks of DNA in the cell. They then interfere with reverse transcription, a process that is essential for HIV to replicate itself. Most HIV therapeutic regimens use two of these inhibitors in combination.
2. Non-nucleoside reverse transcriptase inhibitors. These drugs also target reverse transcription by attacking the reverse transcriptase enzyme that controls reverse transcription.
3. Protease inhibitors. These powerful drugs are at the center of the fight against HIV. The protease enzyme that HIV makes is very important in the final step of making a new copy of HIV. These drugs inhibit the protease enzyme, essentially stopping the replication of that HIV molecule.

It is important to recognize that HIV can quickly become resistant to a single drug. Therefore, antiretroviral regimens commonly include a combination of the above-mentioned drugs. Additionally, these drugs produce a wide range of side effects that can have a deleterious effect on a patient's nutritional status. Care should be taken to recognize these potential side effects and attempt to minimize them.

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HYPERLIPIDEMIA

Discussion
An aggressive, comprehensive approach to treat hyperlipidemia is one that implements stress management intervention, relaxation exercises, aerobic exercise regimen and a strict vegetarian diet with 10% or less fat calories of total energy intake. It follows guidelines from programs developed by Dean Ornish, MD (Reversing Heart Disease Program), and Robert Pritikin (New Pritikin Program) (1,2). Successful outcomes from this diet such as reduction of total and low-density lipoprotein (LDL)-cholesterol largely depend on patient motivation and compliance.

Approaches
The primary focus of the 10% Fat Diet is not to limit the *amount* of food eaten, but the types of food consumed. Similar to Dr. Dean Ornish's Reversal Diet (also known as the Life Choice Diet), the 10% Fat Diet is a low-fat vegetarian diet that allows frequent snacking between meals (1). The 10% Fat Diet consists primarily of fruits, vegetables, grains, legumes, nonfat dairy products, and egg whites. Approximately 20 to 25 g of fat a day is permitted, depending on the individual's frame size, sex, and exercise level.

Principles of the 10% Fat Diet (2-6) are:

- 10% or less of energy from fat (primarily polyunsaturated and monounsaturated)
- no foods high in saturated fat (eg, all meats and high-fat dairy products)
- 70% to 75% carbohydrates (mainly from complex sources)
- 15% to 20% protein
- 5 mg of cholesterol a day
- high in fiber
- no restriction in energy

Foods to avoid or severely restrict with the 10% Fat Diet include:

- all meats
- all oils and oil-containing products
- high-fat and reduced-fat dairy products (eg, whole and reduced-fat milk, yogurt, butter, cheese, egg yolks, and cream)
- sugar and simple carbohydrates (eg, honey, molasses, corn syrup, fructose, and sucrose). Limit fat-free desserts, sweets, candy to 0-2 servings per day; limit fruit juice to ½ cup serving per day.
- no more than 2 servings perday of nonfat milk and milk products
- avocados and olives
- nuts and seeds
- alcohol
- caffeine and other stimulants

SAMPLE MENU

Breakfast	Noon	Evening
Waffles	Vegetable Soup	Pasta With Marinara Sauce
Nonfat Yogurt	Tossed Green Salad	Black-Eyed Pea Salad
Fresh Cantaloupe	Wheat Bread	Mixed Greens
Orange Juice	Fresh Fruit	Dinner Roll
		Peaches

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HYPERTENSION

Discussion

An estimated 50 to 62 million adults in the United States have hypertension (1). The prevalence of hypertension is greater among blacks and among males until the age of 65 years. After 65, the prevalence is the same for men and women. *The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure* (JNC VI) places more emphasis than earlier reports on absolute risk and benefit using risk stratification as part of the treatment strategy (2).

Classification of Blood Pressure for Adults Aged 18 Years and Older

Category	**Systolic (mm Hg)**	**Diastolic (mm Hg)**
Optimal[a]	<120	<80
Normal	<130	<85
High normal	130-139	85-89
Hypertension[b]:		
Stage 1	140-159	90-99
Stage 2	160-179	100-109
Stage 3	≥180	≥110

Source: *The Sixth Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure. Arch Intern Med*. 1997;157:2413-2444.

[a]Optimal blood pressure with respect to cardiovascular risk is less than 120/80 mm Hg. Unusually low readings should be evaluated.

[b]Based on the average of 2 or more readings taken at each of 2 or more visits after an initial screening.

Approaches

JNC VI strongly advises lifestyle modifications as a definitive therapy for some, and adjunctive therapy for all persons with hypertension. If within 12 months an acceptable reduction in blood pressure has not been achieved with lifestyle modifications, pharmacological intervention is recommended, unless hypertension is severe (systolic ≥16 mm Hg) (2).

Components of Cardiovascular Risk Stratification in Patients With Hypertension

Major risk factors for cardiovascular disease include the following (2):

- Hypertension
- Hyperlipidemia
- Age over 60 years
- Sex (men and postmenopausal women)
- Family history of cardiovascular disease in women younger than 65 years or men older than 55 years
- Smoking
- Diabetes mellitus

Risk Stratification and Treatment

Blood Pressure/ Hypertension Stages (systolic mm Hg/diastolic mm Hg)	**Risk Group A (no-risk factors: no TOD/CCD[a])**	**Risk Group B (At least 1 risk factor, not including diabetes; no TOD/CCD)**	**Risk Group C (TOD/CCD and/or diabetes, with or without other risk factors)**
High-normal (130-139/85-89)	Lifestyle modification	Lifestyle modification	Drug therapy [c]
Stage 1 (140-159/90-99)	Lifestyle modification (up to 12 mo)	Lifestyle modification[b] (up to 6 mo)	Drug therapy
Stages 2 and 3 (≥160/≥100)	Drug therapy	Drug therapy	Drug therapy

Source: *The Sixth Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure. Arch Intern Med*. 1997;157:2413-2444.

Note: For example, a patient with diabetes and a blood pressure of 142/94 mm Hg plus left ventricular hypertrophy should be classified as having stage 1 hypertension with target organ damage (left ventricular hypertrophy) and with another major risk factor (diabetes). This patient would be categorized as "Stage 1, Risk Group C" and recommended for immediate initiation of pharmacologic treatment. Lifestyle modification should be adjunctive therapy for all patients recommended for pharmacologic therapy.

[a] TOD/CCD indicates target organ damage/clinical cardiovascular disease. (TOD is a secondary complication of primary disease.)

[b] For patients with multiple risk factors, clinicians should consider drugs as initial therapy plus lifestyle modifications.

[c] For those with heart failure, renal insufficiency, or diabetes.

Rationale for Making Lifestyle Modifications

Lifestyle Modification Factor	Rationale
Tobacco avoidance	Although not directly related to hypertension, tobacco use may impair the protective impact of antihypertensive medications on coronary heart disease (2).
Weight reduction (if over ideal weight)	Research has shown a direct positive correlation between body weight or body mass index and blood pressure (2-4). Weight reduction by energy restriction may result in a substantial decrease in blood pressure. Weight loss of 5 kg is associated with reductions of 4-5 mm Hg systolic and 2-4 mm Hg diastolic pressures (2,4).
Moderate alcohol intake	Consumption of >2 oz of ethanol a day may result in elevated blood pressure and resistance to antihypertensive treatment (2). Hypertensive patients should consume ≤1 oz of ethanol a day (eg, 24 oz of beer, 8 oz of wine, or 2 oz of 100-proof whiskey) (2). Rebound hypertension frequently occurs during alcohol withdrawal but generally reverses within a few days to 6 weeks (3).
Physical activity	Regular aerobic activities, such as walking, jogging, or swimming, may aid in the prevention and treatment of hypertension (2). Regular physical activity can enhance weight loss, reduce coronary heart disease risk (3), and prevent the rise in blood pressure associated with aging (3). Studies have shown that regular exercise can reduce systolic blood pressure by approximately 10 mm Hg (3). Since exercise can initially raise blood pressure, patients should consult their physician before beginning an exercise program (3). The JNC VI recommends 30-45 minutes of aerobic activity most days of the week.
Moderate sodium intake	A sodium intake <2,400 mg/day (100 mmol/day) is recommended (2). Individual response of blood pressure to variation in sodium intake differs; as groups, African Americans, older people, and patients with hypertension or diabetes are more sensitive to dietary changes in sodium (2). See Sodium-Controlled Diet in Section IF.
Adequate calcium intake	Population studies have shown an inverse association between blood pressure and calcium intake (2,5). However, no evidence suggests raising intake beyond the RDI (2).
Adequate potassium intake	Observational studies suggest that increased consumption of potassium is associated with a lower incidence of stroke (3). High potassium intake may also be protective against hypertension (2,5). The diet should emphasize the consumption of foods rich in potassium, except when contraindicated (eg, patients receiving angiotensin converting enzyme, or ACE, inhibitors or those with renal insufficiency). The JNC VI recommends intake of 3,510 mg/day (90 mmol/day) from food sources such as fresh fruits and vegetables.
Adequate magnesium intake	Magnesium, because of its vasodilative properties, may have beneficial effects on hypertension (3). However, no evidence suggests raising intake beyond the Dietary Reference Intake (2,5).
Dietary fat and cholesterol	Reducing fat and cholesterol are important steps toward reducing the risk for coronary heart disease (2). The Dietary Approaches to Stop Hypertension (DASH) clinical study demonstrated that a diet rich in fruits, vegetables, and low-fat dairy food, along with reduced saturated and total fats (<27% energy), significantly lowers blood pressure (2,6). The serving sizes from the *Food Guide Pyramid* are used as a guide (7). However, the recommended daily servings are as follows (6):

Food Group	Daily Servings
Grains and Grain Products	7-8
Vegetables	4-5
Fruit	4-5
Low-Fat or Nonfat Dairy Foods	2-3
Meats, Poultry, and Fish	2
Nuts, Seeds, and Legumes	4-5/week

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HYPERTRIGLYCERIDEMIA

Discussion

Elevated serum triglyceride levels are positively correlated with risk for coronary heart disease (CHD). This relationship is complex and may be explained by the association between high triglyceride levels, low levels of high-density lipoprotein (HDL)-cholesterol, and unusually atherogenic forms of low-density lipoprotein (LDL)-cholesterol. A high triglyceride level may also often reflect an increase in triglyceride-rich lipoproteins, which have atherogenic effects.

Classification of triglyceride levels, as defined by the 1992 National Institutes of Health Consensus Development Conference on Triglycerides, HDL, and Coronary Heart Disease, was developed to facilitate the guidelines for cholesterol management presented in Medical Nutrition Therapy for Hypercholesterolemia in Section IC (1).

Triglyceride Category	Serum Triglycerides (mg/dL)
Normal	<200
Borderline-high	200-400
High	400-1,000
Very high	>1,000

Indications

Medical nutrition therapy may be indicated in patients with elevated triglyceride levels. When assessing CHD risk, one should consider the standard cholesterol risk factors (eg, total cholesterol, LDL-cholesterol, and HDL-cholesterol). Individuals with hyperlipidemia secondary to familial disorders or other diseases (eg, diabetes) often have accompanying borderline-high and high triglyceride levels (2).

Drug therapy (fibric acids or nicotinic acid) generally is indicated to prevent acute pancreatitis or abdominal pain when triglyceride levels exceed 1,000 mg/dL (3).

Approaches (3,4)

Changes in lifestyle habits are the principal therapy for hypertriglyceridemia. These changes include:

- control of body weight
- consumption of a diet low in saturated fat and cholesterol
- regular exercise
- smoking cessation
- restriction or dietary modification of simple sugars and alcohol use

Borderline-High Triglycerides (200 to 400 mg/dL)

Most often this category is associated with obesity and marginally or distinctly elevated levels of plasma glucose (4) .

Offer self-management training to:

- reduce weight if patient is overweight
- limit alcohol intake (patients can be tested for sensitivity to alcohol by avoiding it for 2 to 4 weeks)
- increase physical activity under physician's supervision, if necessary
- limit fat, saturated fat, and cholesterol

High and Very High Triglycerides (greater than 400 mg/dL)

Restrict fat intake to 10% to 20% of total energy. See Medical Nutrition Therapy for Hyperlipidemia, 20% Fat Diet, and Fat-Controlled Diets in Section IC, or Hyperlipidemia earlier in this section.

Offer self-management training to:

- reduce weight, if patient is overweight
- restrict alcohol intake
- increase physical activity under physician's supervision, if necessary
- limit fat, saturated fat, and cholesterol

Certain medications (eg, nicotinic acid) are sometimes a consideration. The need to maintain the low-fat diet at all times is extremely important. Some patients with chylomicronemia are extremely sensitive to dietary fat and can develop pancreatitis from a single high-fat meal (1).

Secondary Hypertriglyceridemia *(1)*

The underlying disorder should be treated. Causes of secondary hypertriglyceridemia include the following:

- obesity
- excessive alcohol intake
- uncontrolled type 1 diabetes mellitus
- type 2 diabetes mellitus (degree often parallels obesity)
- nephrotic syndrome
- thiazide diuretics
- beta adrenergic blocking agents
- hypothyroidism
- chronic renal disease
- obstructive liver disease

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HYPOGLYCEMIA

Discussion

There are two primary categories of hypoglycemia: fasting and postprandial (reactive) hypoglycemia. True hypoglycemia (less than 40 mg/dL) releases certain hormones, such as catecholamines, which cause trembling, hunger, dizziness, weakness, headaches, and palpitations. Because many different causes of hypoglycemia exist, treatments are personalized according to the cause.

The most frequent cause of fasting hypoglycemia results from the use of insulin or oral glucose-lowering medications in the treatment of diabetes mellitus. See Medical Nutrition Therapy for Diabetes Mellitus in Section IC. Fasting hypoglycemia may occur in response to not having food for 8 hours or longer. Other less common causes are pancreatic tumors (insulinoma), pancreatic islet cell disease, severe heart failure, and critical organ failure. Certain medications, such as exogenous insulin, sulfonylureas, ethanol, salicylates, pentamidine, quinine, are also noted for causing hypoglycemia in some patients. Diet therapy is the primary treatment, and, in some cases, adjustments in medications also are needed. Surgery may be required to improve the situation for some conditions, such as insulinoma.

Postprandial hypoglycemia is seen most frequently as alimentary hypoglycemia (dumping syndrome) in adults who have undergone gastric surgery, such as Billroth gastrectomy. It usually occurs 1½ to 5 hours after meals, especially carbohydrate-rich meals. See Dumping Syndrome Diet in Section IB.

Currently, there are no widespread accepted criteria for the diagnosis of reactive hypoglycemia. The techniques range from confirming that the blood glucose level is low when the patient is experiencing a hypoglycemic reaction after an ordinary meal to performing an oral glucose tolerance test (OGTT). However, 10% of asymptomatic healthy persons respond to the OGTT with a lower-than-normal glucose level.

Approaches

Treatment of reactive hypoglycemia depends on the specific cause. Alimentary hypoglycemia following gastric surgery involves treatment, as stated in Section IB (Dumping Syndrome Diet). Other modifications that may be helpful are:

- Allow five to six small meals or feedings per day.
- Determine frequency and symptoms of hypoglycemia, activity levels, and exercise for the patient and schedule appropriate times for meals and snacks.
- Use a balanced diet with a mixture of complex carbohydrates, protein, fat, and fiber. The reaction occurs in response to a high carbohydrate load. If necessary, limit carbohydrate to 100 g and increase protein intake accordingly. Use more soluble fibers, such as fruits and vegetables, but avoid concentrated sugar in dried fruit.
- Limit alcohol because it inhibits gluconeogenesis.

Educate the patient on fast-acting carbohydrate foods that should be used or avoided. See Medical Nutrition Therapy for Diabetes Mellitus, Treatment of Hypoglycemia in Section IC.

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INBORN ERRORS OF METABOLISM

Discussion

Inborn errors of metabolism are inherited disorders in which there is an absence or reduced activity of a specific enzyme or cofactor. Impaired metabolism and disease result.

A rational approach to the nutrition intervention of an inborn error of metabolism requires some understanding of the pathogenic mechanisms and resulting consequences. One or both of the following mechanisms may be present, depending on the type of disorder:

1. The accumulated substrate or its metabolites may have toxic effects.
2. A harmful deficiency may result from the decreased synthesis of a necessary end product.

The rationale for nutrition intervention depends on which of these mechanisms is thought to be important. For example, in galactosemia, the goal is to reduce the accumulation of substrate (galactose and galactose-1-phosphate). In type I glycogen storage disease, the aim is to supply the deficient product (glucose). In phenylketonuria both reduction of the substrate (phenylalanine) and provisions of adequate amounts of the product (tyrosine) must be accomplished.

Successful nutrition intervention for patients with inborn errors requires a keen appreciation of the tremendous variability among individuals and a willingness to tailor the therapeutic approaches to the specific needs of each patient.

Approaches

The following table lists genetic disorders in which nutrition intervention has been employed.

Metabolic Disorders That Respond to Dietary Treatment

Disorder	Enzyme Defect	Nutrition Intervention	Special Formulas[a]	Possible Outcomes Without Effective Medical Treatment
Phenylketonuria (PKU)	Phenylalanine	Diet low in phenylalanine. Increase tyrosine in diet.	Lofenalac ® (MJ) Phenyl-free® (MJ), Phenex® (RL), Maxamaid® (SHS)	Growth delay, mental impairment, seizures
Tyrosinemia	Cytosol tyrosine aminotransferase	Diet low in phenylalanine and tyrosine	Product 3200 AB® (MJ), XYPHEN® (SHS), Tyromex® (RL)	Death, growth delay, mental impairment, renal disease, liver dysfunction, seizures, hypoglycemia, metabolic acidosis, hyperammonia
Maple syrup urine disease (MSUD)	Ketoacid decarboxylase	Diet low in leucine, isoleucine, and valine	MSUD Diet Powder® (MJ), MSUD Maxamaid® (SHS), Ketonex® (RL)	Death, growth delay, mental impairment, seizures, hypoglycemia, metabolic acidosis, hyperammonia

Disorder	Enzyme Defect	Nutrition Intervention	Special Formulas[a]	Possible Outcomes Without Effective Medical Treatment
Urea cycle defects	Depends on defect. Enzymes that may be defective include carbamoylphosphate synthetase, ornithine transcarbamoylase, angininosuccinic acid synthetase, argininosuccinic acid lyase, arginase	Diet low in protein, +/- L-amino acid(s) missing or inactive with defect. All conditions require a diet low in sodium benzoate, except in the arginase defect.	UCD® (MJ), Cyclinex® (RL)	Death, growth delay, mental impairment, seizures, hyperammonia
Organic acidemia	Depends on defect. Enzymes that may be defective include methlmalonyl coenzyme A (CoA) mutase or coenzyme B_{12} or propionyl CoA carboxylase	Diet high in energy and low in protein, +/- L-amino acid(s) missing or inactive with defect. For methlmalonyl CoA mutase or coenzyme B_{12}, supplement with B_{12}. In acute state, give IV fluids and bicarbonate	OS® (MJ), XMTVI Maxamaid® (SHS), Propimex® (RL)	Death, growth delay, mental impairment, renal disease, seizures, hypoglycemia, metabolic acidosis, hyperammonia
Galactosemia	Galactose-1-phosphate uridyl transferase	Diet free of galactose and lactose		Death, growth delay, mental impairment, liver dysfunction, hypoglycemia
Fructose intolerance	Fructose-1-phosphate aldolase	Diet free of fructose, sucrose, and sorbitol		Death, growth delay, renal disease, liver dysfunction, hypoglycemia, metabolic acidosis
Glycogen storage diseases	Type O: glycogen synthetase	Diet high in protein, frequent carbohydrate feedings; high protein feeding at night		Death, growth delay, renal disease, liver dysfunction, seizures, hypoglycemia, metabolic acidosis
	Type I: glucose 6-phosphatase	Normal diet with high carbohydrate feedings between meals; nasogastric drip at night		
	Type III: debrancher enzyme	Diet with normal energy and high protein intake; night feeding high in protein		
	Type VI: hepatic phosphorylase	High protein diet and frequent feedings		

[a]Medical products are made by the following manufacturers:
(MJ) Mead Johnson Nutritionals, Evansville, Ind; 800/755-4805
(RL) Ross Laboratories, Columbus, Ohio; 800/986-8755
(SHS) Scientific Hospital Supplies, Gaithersburg, Md; 800/365-7354

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IRON DEFICIENCY ANEMIA

Discussion
For a discussion of assessment, see Classification of Some Anemias in Section II.

Treatment should focus primarily on the underlying disease or situation leading to the anemia. The chief treatment of iron deficiency anemia is oral administration of inorganic iron in the ferrous iron form. The most widely used preparation is ferrous sulfite, and the dose is calculated in terms of the amount of elemental iron provided. Depending on the severity of the anemia, daily dosage of elemental iron should be 50 to 200 mg for adults and 6 mg/kg for children. Ascorbic acid greatly increases iron absorption. It takes 4 to 30 days to note improvement with iron therapy, especially the hemoglobin level. Iron therapy should be continued for several months, even after the hemoglobin level is restored, so that the body iron reserves are replete.

In addition to medication, attention should be given to the amount of absorbable iron in food. Dietary modification can be adjunctive to iron administration or can be prophylactic in the individual who is at risk for iron deficiency anemia. The diet can be modified to increase the iron intake for any individual.

Dietary strategies involve:

1. providing foods that have a higher iron density
2. increasing the iron absorption from food

Iron Density
The normal mixed diet has been said to have an iron density of around 6 mg/1,000 kcal. Beef, legumes, dried fruit, and fortified cereals are foods that rank the highest in iron content.

In general, foods that obtain most of their calories from sugar, fat, and unenriched flour have a low iron density. Foods made from whole grain and enriched flour, as well as unrefined foods (fruit, vegetables, and meats), have a higher iron density. Dairy products have a low iron density.

Iron Absorption
The Recommended Dietary Allowance (RDA) for iron for men and women are based on the assumption that an average of 10% of total dietary iron is absorbed. Thus, for men and postmenopausal women, for whom the RDA is 10 mg of iron, 1 mg of absorbable iron meets this requirement. Similarly, for adult women of childbearing age, for whom the RDA is 15 mg, 1.5 mg of absorbable iron is required.

Dietary iron is provided in the diet in two forms: heme and nonheme. Heme iron constitutes 40% of the iron present in meat, fish, and poultry. Nonheme iron constitutes the balance of the iron in meat, fish, poultry and all the iron present in plant food, eggs, milk, and cheese. Heme iron is better absorbed than nonheme iron. The absorption of nonheme iron is influenced by several dietary enhancing factors, particularly ascorbic acid and meat, fish, and poultry. Ascorbic acid binds iron to form a readily absorbed complex. Good sources of ascorbic acid include, but are not limited to, citrus fruit and juices, tomatoes and tomato juice, greens, broccoli, strawberries, and sweet potatoes.

Iron absorption is also influenced by other factors, such as:

- Nutritional status with respect to iron: Individuals with an iron deficiency will have greater iron absorption.
- The presence of substances that decrease iron absorption: Phytates, tannic acid, carbonates, oxalates, phosphates, ethylenediaminetetraacetic acid (EDTA), phosvitin. Phytates found in unleavened bread, unrefined cereals, and soybeans inhibit iron absorption. Tannic acid found in tea and coffee and phosvitin found in egg yolk have been shown to decrease iron absorption. Calcium phosphate salts and EDTA, a food preservative, can also reduce iron absorption.
- Cooking utensils: Cooking with an iron skillet may contribute minute amounts of iron to the diet.
- Gastric acidity: Subnormal acidity of the gastric juices, fairly common in older persons, can cause them to absorb less dietary iron.

Approaches

Guidelines to increase iron intake and absorption are as follows:

- Increase ascorbic acid at every meal.
- Include meat, fish, and poultry at each meal, if possible.
- Avoid drinking tea or coffee with meals.
- Avoid foods with high quantities of EDTA by checking food labels.
- Increase food selections that have a high iron density.

IRON CONTENT OF COMMON FOODS

Food	Amount	Iron (mg)
Sources of heme iron:		
Beef, cooked, lean	1 oz	0.7
Chicken, cooked	1 oz	0.4
Cod, cooked	1 oz	0.14
Egg	1 large	0.6
Liver, beef, cooked	1 oz	1.9
Liver, chicken, cooked	1 oz	2.4
Oysters, cooked	6 medium	5.0
Pork, cooked, lean	1 oz	0.33
Sources of nonheme iron:		
Apricots, dried	4	0.6
Bread, enriched	1 slice	0.7
Bread, whole wheat	1 slice	0.8
Cereal, dry, fortified	1 cup	4.5-18.0
Cream of wheat, cooked	¾ cup	9.0
Farina, cooked, enriched	½ c	7.4
Green beans	½ cup	0.9
Greens, turnip, cooked	½ cup	1.0
Kale, cooked	½ cup	0.6
Kidney beans, cooked	½ cup	2.6
Lentils, cooked	½ cup	3.3
Molasses, blackstrap	1 tbsp	3.5
Pasta, cooked, enriched	½ cup	1.25
Peanut butter	2 tbsp	0.6
Prunes	5	1.0
Prune juice	½ cup	1.5
Raisins	1/3 cup	1.0
Spinach, cooked	½ cup	1.4

Source: Pennington JAT. *Bowes & Church's Food Values of Portions Commonly Used*. Philadelphia, Pa: Lippincott;1998.

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NEPHROTIC SYNDROME

Discussion

The nephrotic syndrome results from the failure of the glomerular capillary wall to act as an impermeable barrier to plasma proteins. A 24-hour urinary protein excretion of 3.5 g is indicative of nephrotic syndrome. Other components of the syndrome are edema, hypoalbuminemia, and hyperlipidemia.

Causes of nephrotic syndrome include diabetes mellitus, systemic lupus erythematosus, amyloidosis, certain drugs, allergens, and toxins. Protein losses, which can be measured (10 to 20 g/day), commonly result in hypoalbuminemia and edema.

Approaches	Rationale
Protein • In general: 0.8-1.0 g/kg of ideal body weight (IBW). • In presence of malnutrition, good renal function, and massive proteinuria: allow ≤1.5 g/kg. • In presence of reduced glomerular filtration rate (GFR): Follow guidelines for chronic renal failure (see Diet in Renal Disease in Section IG), with additional grams of protein to match 24-hour urinary protein loss.	The recommended level of protein remains a matter of controversy. Historically, patients have received diets high in protein (up to 1.5 g/kg per day) in an attempt to increase serum albumin and to prevent malnutrition. However, studies have shown that a reduction of protein to as low as 0.6 g/kg per day can decrease proteinuria without adversely affecting serum albumin. Of the protein, 75% should be of high biological value. A range of 0.6 to 1.0 g/kg of IBW, depending on GFR and nutritional status, is recommended, plus gram-for gram-replacement of urinary protein losses. For children, the Dietary Reference Intake (DRI) for age with the addition of urinary protein loss is recommended.
Sodium • See Sodium-Controlled Diet (Section IF).	The level of sodium prescribed is based on severity of edema and hypertension. Generally, sodium is restricted to 1-3 g daily.
Energy • Calculate according to individual needs. • Fat-Controlled Diet is not required.	Should be adequate to achieve and maintain edema-free IBW. Hyperlipidemia (either hypercholesterolemia or hypertriglyceridemia) is a common manifestation of the nephrotic syndrome. The mechanism probably involves increased hepatic synthesis in response to decreased serum proteins as well as defective peripheral utilization of fat. Since the hyperlipidemia of nephrotic syndrome is a secondary manifestation, the impact of a fat-modified diet is probably insignificant. However, a reduction in saturated fat and cholesterol combined with weight loss (in obese patients) is recommended since these patients have an increased risk of cardiovascular disease.
Vitamins and minerals If diet is limited to ≤60 g of protein: • Supplement B vitamins (niacin, riboflavin, and thiamin). • Supplement 1-1.5 g of calcium.	Supplemental zinc may also be indicated, as zinc deficiency is common in nephrotic patients. Supplemental vitamin D and iron (for women) may also be needed to normalize serum levels.

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OBESITY AND WEIGHT MANAGEMENT

Discussion

Approximately 35% of women and 31% of men age 20 years and older are overweight or obese. One-fourth of children and adolescents ages 6 to 17 years is considered overweight or obese (1). The prevalence of overweight and obesity in the United States has increased substantially. The increase in overweight Americans rose from 25.4% (second National Health and Nutrition Examination Survey [NHANES II]) in 1976 to 1980, to 33.3% (NHANES III) in 1988 to 1991 (2). In 1998, an estimated 97 million adults in the United States are considered overweight or obese — 55% of the population (3). Obesity contributes to many adverse health outcomes, including type 2 diabetes; cardiovascular disease; hypertension; stroke; osteoarthritis; gallbladder disease; sleep apnea and respiratory problems; and endometrial, breast, prostrate, and colon cancers (1,3). Obesity-related conditions are estimated to contribute to 300,000 deaths yearly, ranking second only to smoking as a cause of preventable death (4). The total cost of obesity amounted to $99.2 billion in 1995, with $51.6 billion being direct medical costs (5).

Obesity is the result of a positive energy balance; energy intake exceeds energy expenditure. Several lifestyle factors, including excessive energy intake, fat intake, and physical inactivity, are associated with the pathophysiology of obesity. Growing evidence suggests a strong link between genetic factors and the pathogenesis of obesity. Genes involved in energy regulation like leptin, a signal protein for satiety produced in the adipose tissue, and other hormones or peptides, such as neuropeptide Y, may have important implications for understanding the causes of obesity (6). Ongoing research is required to determine the role of genetic factors in obesity treatment.

Adults (Age 18 years and Older)

The body mass index (BMI) is most frequently used to classify an adult's degree of overweight or obesity. A BMI is calculated by dividing weight in kilograms by height in meters squared. BMI = weight (kg)/ height (m^2).

The BMI is correlated with body fatness. Several studies have indicated the relationship between an elevated BMI and an increased incidence of morbidity and mortality. According to the *Dietary Guidelines*, the cutoff for a healthy weight for both men and women is a BMI of 25 kg/m^2. Studies have demonstrated that morbidity increases significantly above a BMI of 25. A BMI of 25 to 29.9 kg/m^2 is considered overweight. Obesity is defined as a BMI of 30 kg/m^2 or more (3). Guidelines established by the American Obesity Association suggest determining BMI-related health risk not only based on the BMI but also by evaluating the presence of comorbid conditions and/or other risk factors that place individuals at an increased health risk. For more information on these guidelines, refer to the Weight Management Protocol Disease Management Decision Chart in *Medical Nutrition Therapy Across the Continuum of Care: Supplement 1* (7).

Classification of Obesity

Weight Category	BMI
Overweight	25.0-29.9
Obesity	30.0-34.9 (class I)
	35.0-39.9 (class II)
Extreme obesity	>40.0 (class III)

Source: National Heart, Lung, and Blood Institute Obesity Education Initiative Expert Panel. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. Available at: http://www.nhlbi.nih.gov/nhbli/htm. Accessed June 24, 1998.

The presence of excess fat in the abdomen out of proportion to total body fat is an independent predictor of increased risk and morbidity. Evidence from epidemiologic studies shows waist circumference to be a better marker of abdominal fat content than the waist-to-hip (WHR) ratio; waist circumference also is the most practical anthropometric measurement for assessing a patient's abdominal fat content before and during weight-loss treatment (3). However, these waist circumference measurements lose their incremental predictive power in patients with a BMI of 35 kg/m^2 or more because these patients will exceed the cutoff points (3).

Sex-Specific Waist Circumference Denoting Risk of Metabolic Complications With Obesity

Sex	Weight Circumference
Male	>102 cm (40 inches)
Female	> 88 cm (35 inches)

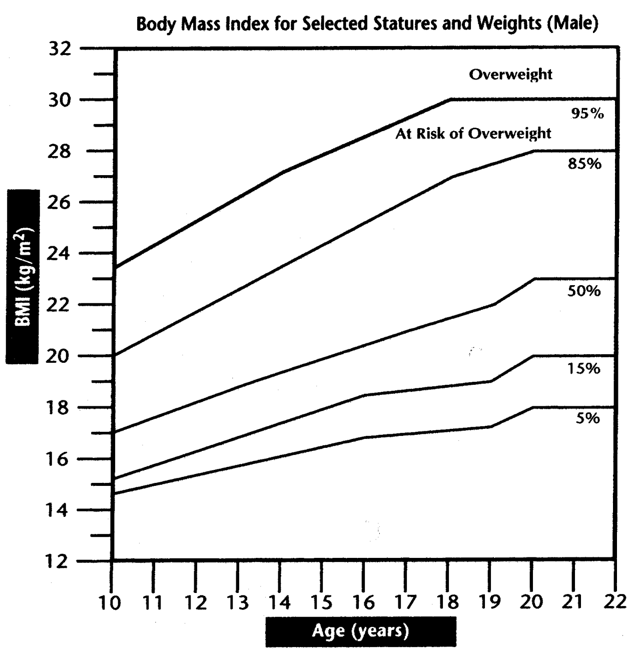
Source: National Heart, Lung, and Blood Institute Obesity Education Initiative Expert Panel. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. Available at: http://www.nhlbi.nih.gov/nhbli/htm. Accessed June 24, 1998.

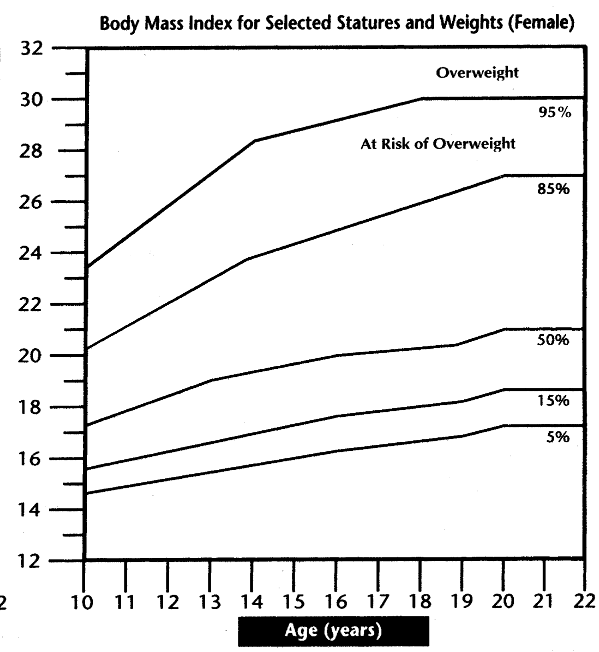
Children and Adolescents

In the United States one child in five is overweight, and the number of overweight children continues to grow. Over the last two decades, this number has increased by more than 50%, and the number of "extremely" overweight children has nearly doubled (8). The classification of overweight for children is determined by plotting the height and weight on growth charts. The height and weight growth charts developed by the National Center for Health Statistics (NCHS) are most commonly used. The NCHS weight-for-height curve is appropriate for the prepubescent child. The NCHS is a valid measure for overweight (greater than the 90th percentile) females younger than 10 years and males younger than 11.5 years (9). However, it is not useful to assess weight for height in an adolescent. Body mass index (BMI) percentiles are suggested to assess weight for height in adolescents. For individuals 6 to 17 years of age, the third National Health and Nutrition Examination Survey (NHANES III) study defined overweight as a body mass index (BMI) exceeding the 95th percentile for BMI for those of the same age and sex. The American Medical Association's Guidelines for Adolescent Preventative Services recommend that if the BMI percentile is greater than 95, the child is overweight, and if the BMI percentile is 85 to 95, the child is at risk for overweight (10).

Children with a body weight greater than the 85th percentile should be referred to a second-level screen to determine underlying causes. The second-level screen includes family history, blood pressure, total cholesterol, in-depth diet history, and behavioral and environmental assessment. An in-depth medical assessment is recommended for children at or above the 95th percentile (7,11).

After the adolescent's height and weight are measured, the BMI can be calculated, as described above. Once the BMI is determined, use the appropriate chart below to determine whether the adolescent needs further evaluation or counseling regarding his or her weight. The BMI should not be calculated if the adolescent has disabilities that confound measurements of height or weight.





Source: Green M, ed. *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*. Arlington, Va: National Center for Education in Maternal and Child Health; 1994.

Like adults, children and adolescents who are obese have an increased risk for vascular disease. Likewise, children and adolescents who are overweight have a higher incidence of high blood pressure and high cholesterol. The risk for overweight children remaining overweight in adulthood is strongly correlated. Weight gain among children and adolescents is attributed to a combination of poor dietary habits, family lifestyle, physical inactivity, ethnicity, socioeconomic status, and genetic makeup. Obesity is more prevalent among girls and Hispanic, African American, and American Indian children (8). Parenteral obesity of at least one parent more than doubles the risk of a child's obesity in adulthood, whether or not the child is obese (12).

Approaches

Children and Adolescents

Early intervention is recommended. The goal of treatment is not weight loss, but to slow the rate of weight gain so that children and adolescents grow into their adult weight. Overweight children should not be put on restrictive diets. Children and adolescents must receive adequate vitamins, minerals, protein, and energy to maintain healthy growth. Governmental dietary guidelines currently recommend that children older than 2 years of age gradually begin adopt a diet that, by age 5, contains no more than 30% of energy from fat. A diet low in fat, saturated fat, and cholesterol (less than 300 mg/day) is encouraged for most school-age children and adolescents (13-15).

Adequate exercise also is encouraged. The US Surgeon General's Report on Physical Activity and Health recommends 30 minutes a day of moderate to vigorous physical activity for children and adults (16).

Adults

Weight management is defined as the adoption of healthful and sustainable eating and exercise behaviors indicated for a reduced risk for disease and for improved feelings of energy and well-being (17). A nonrestrictive approach to eating based on internal regulation of food (hunger and satiety), exercise, and healthful eating habits should be emphasized. The probability of long-term maintenance of weight loss and goals is increased in persons who exercise regularly, use social support to maintain eating and exercise habits, view their eating and exercise regimens as a permanent lifestyle, and do not allow lapses to deter them from their lifestyle (3,6).

Energy: Energy requirements should be based on individual needs to promote gradual weight loss. Consideration of a realistic energy goal is important for successful patient compliance with a weight-management program. It is recommended that the rate of weight loss be 0.5 to 1.5 lb/week. The recommended *minimum* energy level is 1,200 kcal/day for women and 1,500 kcal/day for men (18). See the Calorie-Controlled Diet for Weight Management in Section IC.

Protein: To preserve lean body mass, intake should be 0.8 to 1.2 g of dietary protein per kilogram of body weight (19).

Fat: Fat should be 20% to 30% of total energy. Limit saturated fats to less than 6% to 8% of fat calories.

Carbohydrates: Carbohydrates should make up 50% to 60% of total energy. Selecting sources high in fiber is recommended, for example, fruits, vegetables, whole grain breads, cereals, and legumes. Consumption of 20 to 35 g of fiber daily has been demonstrated to reduce energy density of food consumed and promote satiety by delaying gastric emptying (20).

Exercise: The US Surgeon General's Report on Physical Activity and Health recommends 30 minutes of moderate to vigorous physical activity per day for children and adults (16). Increased physical activity should be a key component of a weight-loss program (3,17). A combination of weight resistance or strength training and aerobic exercise is recommended to preserve lean body mass and promote the loss of adipose tissue.

Behavior modification: Behavior modification is an integral component of weight loss and weight management and should be combined with a healthy eating plan to achieve optimal outcomes (17). Behavior modification is based on the premise that eating is a conditioned response. A goal of behavior modification is to help the patient realize and eliminate the associations that control eating behavior.

Very-low-calorie diets (VLCD): These specialized feeding regimens provide less than 800 kcal/day and are recommended *only* to patients who are at a very high health risk related to obesity. Criteria for these regimens are a BMI greater than or equal to 30 with no comorbidities or risk factors, or a BMI greater than or equal to 27 with comorbidities or other risk factors (1). Individuals on a VLCD should be under the supervision of a physician. The typical treatment duration is 4 to 6 months. Patients provided less than 800 kcal/day are at risk for protein, vitamin, and mineral deficiencies.

High-quality protein (0.8 to 1.5 g/kg of ideal body weight [IBW] per day) and a minimum of 50 g of carbohydrate should be provided. Depending on the formulation and regimen used, vitamin and mineral supplementation may be needed (1). People with a history of gallbladder disease, cardiac abnormality, cancer, renal or liver disease, type 1 diabetes, or HIV should use these regimens with caution. Studies have shown that weight loss as much as 20 kg over 12 to 16 weeks have provided significant improvements in diabetes, hypertension, and cardiovascular conditions when using VLCD regimens (1). However, weight is gradually regained after treatment, and the long-term outcome of VLCD has demonstrated that most individuals regain all the weight they lost within 5 years of stopping the diet (1,18).

Pharmacotherapy: The pharmacologic agents currently available for obesity intervention are designed to contribute to energy deficit through a variety of mechanisms (21). Fenfluramine (Pondimin) and dexfenfluramine (trade name Redux) have been voluntarily withdrawn from the market because of reports of their association with valvular heart disease. They are serotoninergic agents and act primarily by increasing serotonin levels in the brain, leading to a decrease in appetite (17).

Cathecholaminergic drugs, such as phentermine and phentermine resin (Adipex-p, Fastin, and others), which frequently are prescribed with fenfluramine and dexfenfluramine, have a different mechanism of action and still remain available. They decrease appetite and food intake by increasing the availability of norepinephrine in the brain. Merida, a centrally acting agent, is classified as a selective serotonin and norepinephrine reuptake inhibitor; it does not stimulate release of neurotransmitters. Merida seems to reduce body weight by modifying intake through increased satiety, and animal data suggest that it may also raise energy expenditure by stimulating thermogenesis (22). Xenical, a pancreatic lipase inhibitor, is the first obesity medication that acts nonsystemically. Patients should take this medication with meals, as it takes effect within 2 hours of ingestion. Patients receiving Xenical should follow a moderately low-fat diet (less than 30% fat of total energy), with fat distributed evenly at each meal. Side effects may include gas, oily leakage, and diarrhea.

Criteria for pharmacotherapy include a BMI of 30 or more with no comorbid conditions, or BMI of 27 or more with comorbid conditions and/or a very high health risk (3). Complications include dry mouth, nausea, headache, and insomnia (1,3,17,21), increased blood pressure, and increased heart rate. Patients who should avoid this regimen for weight loss are those with unstable cardiovascular disease, are under 18 years of age, are pregnant or lactating, or are receiving monoamine oxidase inhibitors (MAOIs), antidepressants, or migraine medications. Medical nutrition therapy, exercise, and behavior modification should be provided in adjunct to pharmacotherapy (3,17,21). Studies demonstrate that individuals receiving anorexiant medications lose on average 0.5 lb/week (1). Weight loss plateaus by 6 months, and weight regain occurs after medication therapy stops. A limited number of studies have evaluated the safety and efficacy of anorexiant medications for more than 2 years. The physician must continually assess drug therapy for efficacy and safety (3).

Surgery: Weight loss surgery is one option for weight reduction in a limited number of patients with severe obesity: those with a BMI greater than or equal to 40 or a BMI of 35 or more with comorbid conditions (3). Roux-en-Y gastric bypass and vertical banded gastroplasty are the most commonly performed and widely accepted surgical procedures for weight loss (3,17). The primary benefit of surgical therapy is durable weight loss and maintenance of weight loss (1). The average weight loss associated with gastric reduction surgery is 40% to 75% of excess body weight, which correlates to approximately 30% to 40% of initial weight (1). Most weight loss occurs in the first 6 months and continues for up to 18 to 24 months. The initial 6 months is marked by the most rapid weight reduction and improvements in comorbid conditions (1). Prospective studies show that the average weight 10 years after surgery is approximately 55% of excess body weight, with a weight regain of 10% to 15% of the initial weight lost (23). Criteria for surgical intervention for weight loss includes a BMI of 40 or more with no comorbid conditions or health risk, or a BMI greater than or equal to 35 with comorbid conditions or health risks (1,3) or a body weight 100 lb over IBW. A preoperative behavior change program is highly recommended. Complications include those associated with any surgery, gallstones, nutritional deficiencies requiring supplementation, and the dumping syndrome. Refer to Gastric Reduction Surgery for Obesity earlier in this section.

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PANCREATITIS

Discussion
The pancreas has both endocrine and exocrine functions. When food stimulates the release of secretin and cholecystokinin (CCK), the pancreas secretes bicarbonate, trypsin, amylase, and lipase. Pancreatic lipase reserves are large; as much as 80% of pancreatic lipase secretion can be lost without interfering with fat digestion.

The causes and pathogenesis of pancreatitis are unknown in most cases, but gallbladder disease, alcoholism, and hypertriglyceridemia are associated with an increased incidence of acute pancreatitis.

Acute pancreatitis produces a hypermetabolic response that alters carbohydrate protein, fat, and energy metabolism (1-5). Pancreatitis can also produce a hemodynamic response, which is similar to that of sepsis. This response includes increased cardiac output, decreased peripheral resistance, and increased oxygen consumption, currently known as the systemic inflammatory response syndrome (SIRS). Energy expenditure reportedly increases by 20% to 50% above normal (2-5). Protein catabolic rate and urea production rates are significantly increased compared with controls. Compared with healthy controls, the suppression of gluconeogenesis with feeding is impaired in patients with acute pancreatitis (5).

Data	**Reference Range**	**Discussion**
Serum amylase	30-95 IU	Elevated with pancreatic dysfunction, due to liberation of digestive enzymes from pancreas into neighboring tissues and bloodstream
Serum bilirubin	0.2-0.9 mg/dL	Elevated values may be due to compression of the distal common duet within the pancreas, biliary stones, or inflammation of the liver and bile ducts
Serum lipase	<1.5 IU/mL	Elevated with liberation of lipase from the pancreas into the bloodstream
Blood glucose	70-110 mg/dL	Elevated with impaired secretion of insulin in response to glucose load because of inflammatory destruction of islets of Langerhans Glucagon released from alpha cells may contribute to the elevation of blood glucose.
Fecal fat	5-6 g/100 g of stool	Elevated with fat malabsorption secondary to impaired digestion of fat due to impaired secretion of pancreatic lipase Value may reach 50 g/24 hours.
Serum carotene	90-280 μg/dL 100-300 IU/dL	Decreased secondary to fat malabsorption associated with steatorrhea This test is rarely done.
Serum calcium	9-11 mg/dL	Decreased due to soap formation between interstitial calcium and fatty acids
Hematocrit	42-52% (males) 37-47% (females)	Elevated due to hemoconcentration when serum exudes into the abdomen Decreased in severe hemorrhagic pancreatitis
X-ray		Calcification of pancreas
Physical examination	Subjective	Hypoactive bowel sounds Abdominal pain, nausea, vomiting Bulky foul-smelling stools and flatulence indicate fat malabsorption.

Approaches

Treatment of acute pancreatitis has been based on the conventional wisdom of "resting" the gastrointestinal tract. The provision of TPN does not alter the rate of complications, nor does it reduce the severity of the pancreatitis (6). Nutrition support is unlikely to benefit well-nourished patients with mild, acute, or chronic relapsing pancreatitis when the condition lasts less than 1 week (7,8).

When patients have been unable to tolerate oral intake for longer than 1 week, TPN has been the standard of care. Lipid emulsions can be safely used if serum triglyceride levels are monitored and remain below 400 mg/dL (9). However, several prospective studies have recently demonstrated that enteral feedings with a tube placed into the jejunum, beyond the ligament of Treitz, are as effective as TPN in providing nutrition (10-12). Jejunal feedings resulted in significantly fewer infections and overall complications compared with TPN in severe pancreatitis (12). Jejunal feedings are the preferred route of providing nutrition to patients with complicated pancreatitis, who remain intolerant of oral intake.

There is no evidence to support the contention that a fat-restricted diet will influence the recurrence rate of pancreatitis, except in those patients with severe hypertriglyceridemia. Patients who develop a pancreatic exocrine deficiency should not routinely require a fat-restricted diet when they take pancreatic enzymes with food.

Approach	Rationale
First oral feeding	Clear liquids to establish tolerance Patients who tolerate clear liquids may tolerate diet advancement.
Total energy	20%-50% greater than normal Patients with exocrine insufficiency may require more energy to compensate for malabsorption.
Protein	1.3-1.6 g/kg to support the acute phase response and to reduce catabolism
Fat	Patients with exocrine insufficiency should receive pancreatic enzymes. A low-fat diet is not necessary for most patients, can make it difficult to achieve energy goals, and does not influence recurrence of pancreatitis. Note: During measurement of 72-hour (quantitative) fecal fat, patients need to be on a 100-g fat diet and have actual fat intake calculated.
Carbohydrates	Normal percentage of carbohydrates
Fluids	Patients may have increased fluid, chloride, sodium, potassium, and calcium needs secondary to nasogastric suction, diarrhea, or emesis.
Elemental feedings	Research with jejunal feedings has been conducted with semielemental formulas, but intact protein (polymeric) formulas may be used if exocrine function is intact. Intragastric or intraduodenal infusion of elemental formulas can provoke a clinical exacerbation in acute pancreatitis.
Parenteral feedings	Indicated when patients will not tolerate enteral nutrition for >1 week Check triglyceride level before intravenous lipid emulsion is infused.
Fiber	Avoid high-fiber diets in patients with exocrine insufficiency; large amounts of fiber can increase steatorrhea.
Vitamins	Patients with malabsorption (who are not receiving parenteral nutrition/vitamins) need supplementation of fat-soluble vitamins.
Monitoring	Parenteral: Check lipids for clearance. Oral intake: If steatorrhea continues, monitor for serum deficiencies of folic acid, B_{12} and fat-soluble vitamins.

Approach	Rationale
Self-management training	Avoid alcohol Small feedings In exocrine insufficiency, pancreatic enzymes must be taken at the same time as food, at all meals and snacks. A low fat diet is not routinely required.
Pancreatic enzymes	Must be taken while eating. Do not crush enteric coated enzyme capsules. The use of H_2 receptor antagonists (eg, cimetidine, ranitidine, famotidine) or proton-pump inhibitors (omeprazole) increases the efficiency of pancreatic enzyme supplements (even when enteric enzymes are used), by decreasing gastric acid production.

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PARENTERAL NUTRITION (PN) : METABOLIC COMPLICATION OF TPN

Complication	Cause	Symptom	Treatment
Hyperglycemia	Trauma Infection Diabetes mellitus Excessive dextrose administration Corticosteroids	Elevated blood glucose (BG)	Provide insulin when necessary to maintain blood glucose 110-130 mg/dL[1] Decrease dextrose in PN <5 mg/kg/min
Hypoglycemia	Sudden cessation of TPN Excessive insulin Administration	Low blood glucose Headache Sweat Thirst Disorientation Convulsions Coma	Decrease insulin administration Give intravenous dextrose
Hyperglycemic Hyperosmotic Nonketotic coma	Dehydration from osmotic diuresis	Lethargy Stupor Convulsions BG >1,000 mg % Serum osm >350 mOsm/L	Discontinue TPN Give hyposmolar solution Insulin to correct blood glucose
Azotemia	Dehydration Renal Insufficiency Excess protein administration	High BUN	Increase free fluid administered Reduce protein intake
Hypophosphatemia	Alcoholism Intractable vomiting Inadequate intake Refeeding syndrome Vitamin D deficiency Hyperparathyroidism	Anorexia Muscle Weakness Parathesias Long Bone Pain Coma Respiratory Distress	Increase phosphorus in PN Additional intravenous supplementation
Cholestasis	Disuse of GI tract Overfeeding	Elevated total bilirubin Elevated alkaline phosphatase	Reduce total energy provided Decrease dextrose to <5 mg/kg/min
Steatosis (fatty liver)	Continuous feedings Overfeeding Essential fatty acid deficiency (EFAD)	Elevated LFT	Cycle TPN Decrease total calories provided Decrease dextrose to <5 mg/kg/min
Hypomagnesemia	Malabsorption Massive small bowel resection Acute pancreatitis Prolonged NG suction Intestinal fistula Vomiting	Muscle weakness Depression Apathy Nausea Vomiting Irritability Vertigo Ataxia Muscle tremor	Increase Mg in PN Additional intravenous supplementation
Hypermagnesemia	Excess Mg administration Renal insufficiency	Drowsiness Weakness Nausea Vomiting Cardiac arrhythmia Hypotension	Decrease Mg in PN

PARENTERAL NUTRITION (PN): METABOLIC COMPLICATIONS OF TPN (con't)

Complication	Cause	Symptom	Treatment
Hyponatremia	Fluid overload Excess GI loss Excess urinary loss Adrenal insufficiency CHF SIADH	Decreased Na serum levels Irritability Confusion Seizures	Decrease fluid intake Adjust Na intake as condition dictates
Hypernatremia	Dehydration Excessive Na intake Osmotic diuresis	Increased serum Na levels Convulsions Irritability Restlessness Coma	Fluid replacement Decrease Na intake in PN if excessive (also consider decreasing Na from other intravenous sources)
Hyperphosphatemia	Renal insufficiency Excess phosphorous administration	Elevated serum phosphorous	Decrease phosphorous in PN
Hypokalemia	Inadequate K^+ intake Diarrhea Intestinal fistula Anabolism Metabolic alkalosis K^+ wasting medications Vomiting	Ileus Cardiac arrhythmia	Increase K^+ in PN Additional intravenous supplementation
Hyperkalemia	Renal insufficiency Excessive K^+ administration Medication (spironolactone)	Cardiac arrhythmia Parasthesias	Decrease K^+ in PN (also consider decreasing K^+ from other intravenous sources) K^+ binders
Hypocalcemia	Hypoalbuminemia Inadequate vitamin D intake Hypoparathyroidism Inadequate Ca intake Increased GI losses Inadequate phosphorus intake	Parasthesias Tetany Muscular cramping	Increase Ca^{2+} in PN (Check adjusted serum Ca^{2+} if hypoalbuminemic or ionized Ca^{2+} prior to increasing Ca^{2+} in PN)
Hypercalcemia	Excess vitamin D administration Prolonged immobilization Stress Hyperparathyroidism Malignancy	Thirst Polyuria Decreased appetite Nausea Vomiting Itching Muscle weakness	Decrease Ca^{2+} in PN

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CALCULATING TOTAL PARENTERAL NUTRITION

1. Steps for Calculating TPN
   Assess calorie, protein, and fluid requirements.

1. Determine calories to be provided as fat.
2. Convert fat calories to volume of lipid emulsion or lipid concentration in 3-in-1 solution (or total nutrient admixture TNA).
3. Determine calories provided from protein.
4. Determine amino acid concentration.
5. Determine calories provided from carbohydrate.
6. Determine carbohydrate (dextrose) concentration.
7. Determine if final solution can be compounded.

These steps will be outlined in detail below.

II. Determine amount of each substrate.
Use the guidelines in Table 1 to calculate for usual and maximum substrate amounts. After these determinations have been made, substrate concentrations are easily calculated based ion TPN volume. End concentrations reflect grams of substrate in the final volume of TPN solution.

Table 1. Substrates in TPN

Substrate	**Usual Amount**	**Maximum Units of Substrate**
Carbohydrate (CHO)	40-60% of total kcal	<5 mg/kg/day 2.0-2.5 g/kg/day
Protein (PRO)	1.0-2.0 g/kg/day	2 g/kg/day
Fat	20-40% daily total kcal	<1 g/kg/day in high stress

Note: Sample calculations are based on total calorie needs rather than nonprotein calorie needs. Either method may be used; however, the former yields approximately 250 to 350 calories more.

Use the following calculations use, these estimated needs: 1,700 kcal, 70 g protein

1. Determine kcal to be provided as fat.

Estimated kcal x desired percent of fat = kcal as fat
1,700 kcal x 30% = <u>510 kcal from fat</u>

2. Convert fat kcal to volume of lipid emulsion.

Fat kcal ÷ kcal/mL lipid emulsion = volume of lipid emulsion

510 kcal ÷ 1.1 (10% emulsion) kcal/mL =
463 mL of 10% lipid
or

510 kcal ÷ 2.0 (20% emulsion) kcal/mL =
255 mL of 20% lipid

Some facilities prefer lipid to be ordered in volumes as packaged by the supplier (250 mL or 500 mL).

For this example, 500 mL of 10% lipid will be used, leaving 1,500 mL for the remaining TPN solution.

3. Determine kcal to be provided from protein.

Estimated protein needs x kcal/g protein = 70 g protein x 4 kcal/g = 280 kcal protein

4. Determine amino acid concentration (AA).

$\frac{\text{g protein}}{\text{TPN volume}} \times 100 =$ %amino acids

$\frac{\text{70 g}}{\text{1,500 mL}} \times 100 =$ <u>4.7% amino acids</u>

5. Determine kcal to be provided from carbohydrate.

Estimated kcal needs - (kcal as fat + kcal as protein) = carbohydrate kcal
1,700 kcal - (510 kcal + 280 kcal) = <u>910 kcal</u>

6. Determine carbohydrate concentration.

a. Carbohydrate kcal ÷ kcal/g dextrose = g dextrose

910 kcal ÷ 3.4 kcal/g = 268 g dextrose

**Dextrose solutions are 3.4 kcal/g rather than 4 kcal/g*

b. $\frac{\text{g dextrose}}{\text{volume TPN}} \times 100 =$ %dextrose

Reprinted by permission: from Fish J. Worksheet for calculating total parenteral nutrition. *Support Line*. 1995: 17(6): 10-13.

III. Calculate macronutrient concentrations

A. 2-in-1 (traditional) solution calculations:

Calculate 2-in-1 solution using 2,000 mL fluid
(this volume will include lipid emulsion)

7. Determine final order.

1,500 mL 4.7% AA, 17.9% dextrose, 500 mL 10% lipid (Lipid volume was rounded from 463 to 500 mL.)

B. Calculate a 2-in-2 solution with a fluid restriction of 1,250 mL.

1. Determine kcal to be provided as fat.

Estimated kcal x desired percent = kcal as fat 1,700 kcal x 30% = 510 kcal fat

2. Convert fast kcal to volume of lipid emulsion

A 20% lipid solution is preferred for fluid restricted patients.
kcal as fat ÷ kcal/mL lipid emulsion = volume lipid 510 kcal ÷ 2 kcal/mL (20% emulsion) = 255 mL

This can be rounded to 250 mL, leaving 1,000 mL for the remaining TPN solution.

3. Determine kcal to be provided from protein.

Estimated protein needs x kcal/g protein = kcal protein
70 g x 4 kcal/g = 280 kcal protein

4. Determine amino acid concentration (AA).

g protein x 100 = %AA
TPN volume
70 g x 100 = 7.0% AA
1,000 mL

5. Determine kcal to be provided from carbohydrate.

Estimated kcal needs - (kcal as fat + kcal as protein) = carbohydrate kcal 1,700 kcal - (510 kcal + 280 kcal) = 910 kcal carbohydrate

6. Determine carbohydrate concentration.

a. Carbohydrate kcal ÷ kcal/g dextrose = g dextrose
910 kcal ÷ 3.4 kcal/g = 268 g dextrose
b. g dextrose x 100 = %dextrose
volume TPN
268 g x 100 = 26.8% dextrose
1,000 mL
268 g x 100 = 17.9% dextrose
1,500 mL

7. Determine final order.

1 liter AA, 26.8% dextrose, and 250 mL 20% lipid. This solution will not compound, so the dextrose will have to be reduced to 17.5% until fluid restrictions are lifted.*
(See compounding guidelines for specific calculations in Section IV.)
*If your pharmacy uses a 15% amino acid stock solution, this will compound.

C. Calculate a 3-in-1 solution with 2,000 mL fluid

1. Determine kcal to be provided as fat.

Estimated kcal x desired percent = kcal as fat 1,700 kcal x 30% = 510 kcal fat

2. Convert fat kcal to volume of lipid emulsion.

a. kcal fat ÷ kcal/g + g fat
kcal ÷ 9 kcal/g* = 56.7 g fat
b. g fat x 100 = % lipid
TPN volume
56.7 g x 100 = 2.8% lipid
2,000 mL

* 9 kcal/g is used as an estimate; however, lipid emulsions are actually 10 kcal/g because of components other than fat within the emulsion.

3. Determine kcal to be provided from protein.

g protein x kcal/g = kcal as protein
70 g x 4 kcal/g = 280 kcal protein

4. Determine amino acid concentration (AA).

g protein x 100 = %AA
TPN volume
70 g x 100 = 3.5% AA
2,000 mL

5. Determine kcal to be provided from carbohydrate.

Estimated kcal needs - (kcal as fat + kcal as protein) = kcal carbohydrate
1,700 kcal - (510 kcal + 280 kcal) = 910 kcal carbohydrate

6. Determine carbohydrate concentration.

a. kcal dextrose ÷ kcal/g dextrose = g dextrose
910 kcal ÷ 3.4 kcal/g = 268 g dextrose

b. g dextrose x 100 = % dextrose
volume TPN
268 g x 100 = 13.4% dextrose
2,000 ml

7. Final Order:
2 liters 3.5% AA, 13.4% dextrose, and 2.8% lipid

D. Calculate a 3-in-1 solution with a 1,250 mL fluid restriction.

1. Determine kcal to be provided as fat.

Estimated kcal x desired percent == kcal as fat 1,700 kcal x 30% = 510 kcal fat

2. Convert fat kcal to volume of lipid emulsion.

a. kcal fat ÷ kcal/g = g fat
510 kcal ÷ 9 kcal/g = 56.7 g fat

b. g fat x 100 = % lipid
TPN volume

56.7 g x 100 = 4.5% lipid

1,250 mL

3. Determine kcal to be provided from protein.

g protein x kcal/g = kcal as protein
70 g x 4 kcal/g = 280 kcal protein

4. Determine amino acid concentration (AA).

g protein x 100 = % AA
TPN volume
70 g x 100 = 5.6%AA
1,250 mL

5. Determine kcal to be provided from carbohydrate.

Estimated kcal needs - (kcal as fat + kcal as protein) = carbohydrate kcal
1,700 kcal - (510 kcal + 280 kcal) = 910 kcal carbohydrate

6. Determine carbohydrate concentration.

a. kcal dextrose ÷ kcal/g dextrose = g dextrose
910 kcal ÷ 3.4 kcal/g = 268 g dextrose

b. g dextrose x 100 = % dextrose
TPN volume
268 g x 100 = 21.4% dextrose
1,250 mL

7. Determine final order.
1.25 liters 5.6% AA, 21.4% dextrose, and 4.5% lipid. This solution will not compound; therefore, the dextrose will have to be reduced to 12.3% dextrose until fluid restrictions are lifted.*

*If your pharmacy uses a 15% amino acid stock solution, this will compound.

IV. Compound parenteral nutrition.
Assume stock solutions of 70% dextrose, 10% amino acids, and 20% lipids.

1. Determine TPN volume and grams of carbohydrates, protein and fat.
2. Determine volume of 70% dextrose stock solution.
3. Determine volume of 10% amino acid stock solution.
4. Determine volume of 20% lipid.
5. Determine volume of sterile water and additives.
6. Adjust dextrose or other substrates if solution cannot be compounded at the desired volume.

Sample calculations:

A. 2-in-1 solution with fluid restriction 1,250 mL.

1. Determine TPN volume and grams of carbohydrate, protein, and fat (see III.B.)
1,250 mL volume
250 mL 20% lipid
268 g carbohydrate
70 g protein

2. Determine volume of 70% dextrose solution.
g dextrose ÷ g/100 mL stock solution = volume of stock solution
268 g ÷ 70 g/100 mL = 383 mL 70% dextrose solution

3. Determine volume of 10% AA solution.

g protein ÷ g/100 mL stock solution = volume of stock solution
70 g ÷ 10 g/100 mL = 700 mL 10% AA solution

4. Determine volume of 20% lipid.

250 mL (see II.B.2))

In a 2-in-1 solution, this is separate from the TPN solution This will leave 1,000 mL for AA and dextrose.

5. Determine volume of sterile water and additives.

Desired volume TPN solution - (volume of dextrose + volume AA) = volume for water and additives

1,000 mL - (383 mL + 700 mL) = -83 mL

These volumes of stock solution do not fit into the desired TPN volume.

6. Adjust solution.

a. Determine the volume available for dextrose.
Desired volume - (volume of AA solution + volume or additives*) = volume available for dextrose.

1,000 mL (700 mL = 50 mL) = 250 mL
*Usually 50-100 mL is needed for additives.

a. Determine new grams of dextrose.

b. Volume of dextrose x solution concentration = g dextrose stock solution
250 mL x 70 g/100 mL = 175 g dextrose

c. Determine dextrose concentration.

$\frac{\text{g dextrose}}{\text{TPN volume}}$ x 100 = % dextrose

$\frac{175\text{ g}}{1{,}000\text{ mL}}$ x 100 = 17.5% dextrose

B. 3-in-1 solution with fluid restriction of 1,250 mL

1. Determine TPN volume and grams of carbohydrate, proten and fat (see III.D.)

1,250 mL volume
268 g carbohydrate
70 g protein
56 g fat

2. Determine volume of 70% dextrose solution

g dextrose ÷ g/100 mL stock solution = volume of stock solution
268 g ÷ 70 g/100 mL = 383 mL 70% dextrose solution

3. Determine volume of 10% AA solution.

g protein ÷ g/100 mL stock solution = volume of stock solution
70 g ÷ 10 g/100 mL = 700 mL 10% AA solution

4. Determine volume of sterile water and additives.

Desired TPN volume - (volume dextrose solution + volume AA solution + volume lipids) = volume of water and additives

1,250 mL -(383 mL + 700 mL + 280 mL) = -113 mL

This solution will not compound.

Adjust solution.

5. Determine the volume available for dextrose.

a. Desired volume - (volume of AA solution + volume lipid + volume additives) = volume available for dextrose

b. Determine new grams of dextrose.
Volume of dextrose x solution concentration = g dextrose stock solution
220 mL x 70 g/100 mL = 154 g dextrose

c. Determine new dextrose concentration.

$\frac{\text{g dextrose}}{\text{TPN solution}}$ x 100 = % dextrose

$\frac{154\text{ g}}{1{,}250\text{ mL}}$ x 100 = 12.3% dextrose

PEPTIC ULCER

Discussion

Peptic ulcer disease includes esophageal, gastric and duodenual ulcers. Research identifies the Helicobacter (H.) pylori bacteria as the primary cause in 95% of gastric and duodenal ulcers (1, 2, 3). The remaining 5% is caused by non-steroidal anti-inflammatory medication usage (eg, aspirin and ibuprofen) and excessive production of stomach acid. The treatment for individuals infected with the H. pylori bacteria includes healing the ulcer with acid suppressing medication and curing the infection by using antibiotics (3, 4, 5, 6).

There is no evidence that food, beverages, or spices cause or reactivate ulcers (3, 4).

Medical Approaches	**Rationale**
Avoid foods not tolerated. (See Section ID: Gastrointestional (GI) Soft Diet)	Eliminate foods that cause pain or discomfort to the patient during the acute phases
Antisecretory medication (histamine H_2 antagonist blocker) Cimetidine (Tagamet), Ranitidine (Zantac) Famotidine (Pepcid), Nizatidine (Axid)	Reduces gastric acid and pepsin secretion
Antibiotics	Inhibits growth and destroys microorganisms, ie, H. pylori bacteria
Antacids	Buffers acidity
Sucralfate (carafate)	Forms protective coating over ulcer

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PNEUMONIA

Discussion

Pneumonia is defined as inflammation and consolidation of lung tissue in response to an infectious agent (1). Several organisms and disease conditions have been identified to infect or inflame the lungs. The epidemiology of the disease has changed due to changes in the microorganisms and modalities used to treat the condition. The incidence of pneumonia requiring hospitalization is highest among the elderly (2). Subgroups at risk for pneumonia include individuals with chronic obstructive pulmonary disease (COPD), diabetes mellitus, asthma, alcoholism, and congestive heart failure and diseases that affect the immune system (eg, HIV disease/AIDS and cancer). Mechanically ventilated patients are at most risk for developing hospital-acquired pneumonia.

Approximately 50% of pneumonia cases are caused by viruses and tend to be less severe than those of bacterial origin (1-3). Pneumococcus (*Streptococcus pneumoniae*) is the most common cause of bacterial pneumonia (4). Aspiration pneumonia results when solid or liquid food passes into the lungs, causing infection. Aspiration pneumonia results in approximately 50,000 deaths per year, mostly in the elderly (1). Nosocomial pneumonia is the leading cause of death from hospital-acquired infection in the United States (2).

Prevention of pneumonia primarily includes maintenance of immune status and pneumococcal vaccination. Treatment of pneumonia involves a combination of pharmacologic therapy (eg, antibiotics), pulmonary rehabilitation, and maintenance of nutritional status. Protein energy malnutrition (PEM) is associated with involuntary weight loss, functional impairment and impaired immunity (3). It has been demonstrated that nutritional status plays a critical role in the modulation of immune function. In a study of 277 patients admitted to the hospital for treatment of community-acquired pneumonia, the most important factor independently associated with fatal disease was a low serum albumin level (4). In the same study, a serum albumin level under 3.0 g/dL during treatment of the pneumonia was also associated with death due to pneumonia after discharge. Craven and colleagues identified malnutrition as a risk factor for nosocomial pneumonia in hospitalized patients (5).

Approaches

The primary goal of medical nutrition therapy in the management of pneumonia is to preserve lean body mass and immune function, prevent unintentional weight loss, and maintain nutritional status. For detailed intervention strategies, refer to the Pneumonia Medical Nutrition Therapy Protocol in *Medical Nutrition Therapy Across the Continuum of Care* (6).

Energy: Provide enough energy to maintain reasonable body weight. Increased energy may be needed for patients with infection, fever, or weight loss.

Protein: Provide enough protein to maintain visceral protein status and meet the demands of infection.

Fluid: Fluids are encouraged, unless contraindicated. From 3 to 3.5 L of fluid per day has been recommended to liquefy secretions and help lower temperature in febrile patients (7).

Nutrients and the immune system: Several nutrients have been linked to the preservation and maintenance of immune function. Nutrients that have been identified include vitamins A, E, and B_6, zinc, copper, selenium, the amino acids glutamine and arginine, and omega-3 fatty acids. These nutrients all seem to modulate specific aspects of human immune function (8). Current studies do not demonstrate a direct cause and effect relationship with the incidence of pneumonia. The current thought is that these nutrients may play a key role in the immune function, leading to less of a risk of developing pneumonia (9). Currently, supplementation with these identified nutrients is not warranted. However, it is recommended to increase the consumption of foods that provide these nutrients as good sources, such as fruit, vegetables, grains, meats, and fish.

Aspiration risk reduction: Instituting feeding techniques that prevent risk for aspiration may be indicated in patients who demonstrate symptoms of aspiration, such as coughing before, during, or after consumption of solids, liquids or medications; drooling; pocketing food in the mouth; and repetitive movement of the tongue from front to back of the mouth. To reduce the risk of aspiration, consider the following strategies (10):

- Position patient at a 90^{o} angle during meals.
- Serve food at appropriate temperatures.
- Limit mealtime distractions.

- Encourage small bites.
- Avoid using straws since liquids will be rushed to the back of the mouth before swallowing is safe.
- Make sure food is moist. Gravy or sauces may be used to soften food.
- Avoid serving thin liquids, as they can be easily aspirated. Thickened liquids will slow transit time.

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PRESSURE ULCERS

Discussion
Pressures ulcers have four physical factors that contribute to skin breakdown: pressure, friction, shearing, and maceration. Pressure is the most important external factor that can damage the tissue due to inadequate oxygen to the tissue. Friction occurs from the skin rubbing against another surface, such as when the patient slides down in bed, so that there is a loss of cells from the epidermis (the outer layer of the skin). Shearing occurs when two layers of skin slide on each other and move in opposite directions, such as when the patient is transferred from bed to stretcher, thereby causing damage to the underlying tissue. Maceration is caused from excessive moisture, which softens the skin and reduces its resistance.

Four classifications commonly are used to describe the severity of the pressure ulcer:

Stage 1: Red area on skin but no break in skin
Stage 2: Blister formation with some skin broken, resulting in a shallow skin ulcer with distinct edges
Stage 3: Skin loss that exposes subcutaneous tissue and produces some drainage
Stage 4: Deeper skin breakdown, which involves fascia, muscle, and tendon and may go as far as the bone

Pressure ulcers develop for multiple reasons. Causes include restricted mobility, fractures, level of conscious, incontinence, peripheral vascular disease causing poor circulation and lack of oxygen to the tissue, impaired sensory perception, weight loss, and poor nutritional status.

Approaches
It is important to identify and assess patients who are at risk for the development of pressure ulcers. Assessment of pressure ulcer risk should be documented on a validated tool, such as the Braden scale. Patients identified at risk should be monitored at regular intervals in a preventive program when appropriate. Monitoring may include a systematic skin inspection at least daily (paying particular attention to the bony prominence) and evaluation of nutritional and hydration status according to the organization's protocols.

Patients who require treatment should receive adequate nutrition, including energy, protein and fluids, and vitamins and minerals. The following guidelines will usually meet the patient's needs. Provide:

- A well-balanced diet high in energy and high biological value protein.
- Adequate energy intake of 30 to 35 kcal/kg of the present body weight. (If the patient is overweight, use IBW or adjusted IBW.)
- From 1.25 to 1.50 g of protein per kilogram of present body weight with high biological value protein. Use lower range for stages 1 and 2 and the higher range for stages 3 and 4 and multiple sites.
- Small, frequent meals
- Proper hydration to maintain skin elasticity. The optimal intake is 30 to 35 mL/kg of body weight or a minimum of 1,500 mL/day. See Nutrition Management of Fluid Intake in Section IA for guidelines on increasing fluid requirements of the patient being treated on an air-fluidized bed.
- Vitamin C and zinc supplementation due to their assistance in wound healing. Provide 100 to 200 mg of vitamin C and 25 to 60 mg of zinc through food or supplementation. The usual pharmacologic dose given is 220 mg of zinc sulfate, which provides 51 mg of zinc.
- Tube feeding or oral supplementation as indicated. If the patient is tube fed, make sure adequate amounts of vitamin C and zinc are provided.

Treat a low hemoglobin level or hematocrit, as for any other anemia, with supplementation. However, frequently anemia is caused by factors other than poor nutritional intake.

Take steps to control glucose levels by diet and/or insulin. Long-standing hyperglycemia is associated with vascular disease, which impairs the skin's ability to maintain integrity and heal when damaged.

Treatment of pressure ulcers should always be provided by a multidisciplinary team. Treatment includes nutrition intervention, nursing intervention (reduction of pressure, reduction of shearing, skin/wound care, feeding assistance, and a bowel and bladder program), medical intervention (treatment of infection and other medical conditions), and physical and occupational therapy (promotion of increased activity and feeding ability).

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WILSON'S DISEASE

Discussion

Wilson's disease is an inherited disorder of copper metabolism that is characterized by the abnormal transport and storage of copper, resulting in hepatolenticular degeneration, neurologic damage, and damage to the kidney, brain, and cornea. Onset may occur from 5 to 40 years of age. Liver disease is always present when a patient with Wilson's disease presents with any symptoms. Wilson's disease is a highly treatable condition; with proper therapy, the disease progress can be halted, and often symptoms can be improved.

Copper promotes iron absorption for hemoglobin synthesis, formation of bone and myelin sheath. Most of copper in the copper-albumin complex is converted to ceruloplasmin in the hepatic tissues. In Wilson's disease, tissue deposition occurs instead of ceruloplasmin formation.

Approaches

Wilson's disease is treated with a copper chelating agent, such as penicillamine (Cuprimine, Depen) or trientine (Syprine), to keep the patient in a negative copper balance. The chelating agent bonds with copper to form stable complexes that are excreted in the urine. A patient initially treated with a chelating agent may receive maintenance therapy with zinc acetate (Galvin). This is particularly important for the patient who has experienced adverse reactions to chelating agents. Zinc acetate acts by blocking the absorption of copper in the intestinal tract, which results in both the depletion of accumulated copper and prevention of its reaccumulation.

Chelating agents should be taken orally before meals. A vitamin B_6 supplement is needed with this medication. Usually 25 mg/day of vitamin B_6 is adequate. Zinc may also be necessary. If the treatment with penicillamine alone does not achieve a negative copper balance, a low-copper diet (1 to 2 mg/day) may be an appropriate adjunct.

A normal diet provides 2 to 5 mg/day of copper. To achieve 1 to 2 mg/day of copper, limit intake of the following foods:

- Organ meats, such as liver, kidney, and brain
- Shellfish, such as oysters, crab, and lobster
- Dried legumes, except peas
- Whole wheat and bran breads and cereals
- Baked potato with skin
- Sweet potato
- Dried fruits, such as raisins, dates, and prunes
- Mushrooms
- Chocolate
- Nuts and seeds
- Wild game, such as duck and goose
- Mineral water

No alcohol is permitted due to its hepatotoxic action.

Zinc acetate (Galvin) is given in 50-mg doses three times a day. Take separate from food and beverages (other than water) by 1 hour. Avoid liver and limit shellfish (the only restrictions). Check the copper content of drinking water. If copper is greater than 1 ppm, deionized water should be used.

Do not use copper or bronze cooking utensils.

Make sure supplements are copper free.

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CAFFEINE AND THEOBROMINE CONTENT OF SELECTED FOODS AND BEVERAGES

	Caffeine mg per serving	Theobromine mg per serving
Carbonated Beverages (12 oz.)		
Cola, regular and diet, unless caffeine free	31-37	
Dr. Pepper, regular and deit	37	
Fanta Orange, Patio Orange	0	
Fresca	0	
Hires	0	
Mountain Dew	55	
Mr. Pibb, regular and sugar-free	27	
Mellow Yellow	35	
Sprite, 7-Up	0	
Kick	58	
Coffee[a] (5 oz.)		
Brewed, Percolator	103	
Ground	59	
Instant	57	
Decaffeinated	2	
Tea [a] (6 oz.)		
American black, 3 min. brew	36	2
From instant (1 tsp)	30	2
Green, 5 min. brew	26-36	
Herb	none detected	
Chocolate Foods		
Chocolate, baking (1 oz.)	57	346
Chocolate candy, milk (1 oz.)	6	50
Chocolate, sweet dark (1 oz.)	27	137
Chocolate milk (1 c)	5 (2-7)	*
Chocolate pudding (1/2 c)	7	88
Chocolate syrup (1 oz.)	5	68
Carob powder	0	
Chocolate ice cream (4 oz.)	2	41
Cocoa beverage (6 oz.)	5 (2-8)	*

[a] The amount of caffeine depends upon the ratio of coffee or tea to water, method of preparation, blend of coffee or tea, and the length of exposure of the coffee or tea to hot water.

* Data not available

Source

Pennington J. *Bowes & Church's: Food Values of Portions Commonly Used.* 17th ed. Philadelphia, Pa: 1998.

METRIC/ENGLISH CONVERSIONS OF WEIGHT AND MEASURES

METRIC EQUIVALENTS

1 centimeter (cm)	= 10 millimeters (mm)
1 kilogram (kg)	= 1000 grams (g)
1 gram (g)	= 1000 milligrams (mg)
1 milligram (mg)	= 1000 micrograms (μg)
1 liter (L)	= 1000 milliliters (mL)
1 mL liquid	= 1 gram
	= 1 cubic centimeter (cc)

ENGLISH TO METRIC

1 inch (in)	= 2.54 centimeters
1 pound (lb)	= 0.45 kilograms
	= 454 grams (actual amount is 453.6 g)
1 quart (qt)	= 0.946 liter
	= 946 milliliters
1 pint (pt)	= 480 milliliters
1 fluid ounce (fl oz)	= 30 milliliters (actual 28.35 mL)

ENGLISH EQUIVALENTS

1 bushel =	4 pecks
	= 8 quarts
1 gallon =	4 quarts
	= 2 pecks
1 peck	= 2 quarts
1 quart (qt)	= 2 pints
	= 4 cups
	= 32 fluid ounces
1 pint (pt)	= 2 cups
	= 16 fluid ounces
1 cup (c)	= 16 tablespoons
	= 8 fluid ounces
1 tablespoon (tbsp)	= 3 teaspoons
	= 0.5 fluid ounce
	= 15 milliliters
1 teaspoon (tsp)	= 1/6 fluid ounce
	= 5 milliliters

METRIC TO ENGLISH

1 centimeter	= 0.39 in
1 kilogram	= 2.2 lb
1 gram	= 0.035 ounce (oz)
1 milligram	= 0.015 grain
1 liter	= 1.057 quarts

MILLIGRAM/MILLIEQUIVALENT CONVERSIONS

ELEMENT	ATOMIC WEIGHT	VALENCE
Calcium	40.08	2
Chlorine	35.45	1
Magnesium	24.31	2
Phosphorus	30.97	3
Potassium	40 (39.10)	1
Sodium	23 (22.98)	1
Sulfur	32.06	2

Conversions:

mg to mEq: Divide the milligrams by the atomic weight; multiply by the valence.

Example: $\frac{\text{200 mg Sodium}}{\text{Atomic Weight (23)}} \times \text{Valence (1)} = 87 \text{ mEq}$

mEq to mg: Multiply milliequivalents by the atomic weight; divide by the valence.

Example: 90 mEq Sodium $\times$ 23 $\div$ 1 = 2070 mg

SALICYLATE CONTENT OF SELECTED FOODS

The restriction of foods containing salicylates may be used to treat urticaria (hives). Berries and dried fruits are high in salicylates, as are most herbs and spices. Aspirin use or penicillin and food molds may also be restricted. Hives may appear within minutes or up to two hours after eating, depending on where the food is absorbed in the digestive tract.

Note: The most common foods that cause hives are chocolate, fish, tomatoes, eggs, fresh berries and milk (1). Of these foods, only fish, eggs, tomatoes and fresh berries contain salicylates Their salicylate content is <.1 mg/100 mg, <.1 mg/100 mg, <.5 mg/100 mg, and 1.0-4.99 mg/100 mg respectively.

FOOD GROUP	.50-.99 mg salicylate/ 100 mg	1.0-4.99 mg salicylate/ 100 mg	5.0-10.0 mg salicylate/ 100 mg
Fruits	apple, canned or granny smith avocado cherries, sweet figs, dried grapes, red grape juice, dark grapefruit mandarin orange peach tangelo	apricot berries, all except fresh raspberries (which is higher) cantaloupe cherries, canned cranberry sauce currants, black and red dates, fresh and dried grapes, sultana orange pineapple plum, dark red	raisins prunes, canned raspberries, fresh
Vegetables	alfalfa broad beans broccoli chili peppers, green/yellow cucumber without peel eggplant with peel mushrooms, canned okra spinach, fresh squash sweet potato, white tomato, canned watercress	chicory chili peppers, red endive peppers, sweet green radishes tomato paste tomato sauce zucchini	
Nuts	macadamia nuts pine nuts pistachios	almonds peanuts waterchestnuts	
Other	sherry, sweet wine	all spices and herbs if used in high amounts	

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IMMUNOCOMPROMISED GUIDELINES
(CMC, CIR, University Hospital Specific)

Patients who are immunosuppressed due to chemotherapy or radiation therapy must incorporate immunocompromised guidelines into their current diet regimen. Dietary modification includes the elimination of foods considered to contain potential pathogens while decreasing the bacterial content of other foods. Well-cooked, hot foods are recommended while uncooked foods such as fresh fruits, vegetables and garnishes are eliminated (9, 10). When this diet is indicated, it may be ordered as the "Immunocompromised Diet" or state "No Fresh Fruits, Fresh Vegetables".

MECHANICAL SOFT DIET/DENTAL SOFT DIET

Order as: Mechanical Soft Diet or Dental Soft Diet.

FULL LIQUID BLENDERIZED DIET

Order as: Wired Jaw. This diet will be sent when orders for "free liquid blenderized diet" are written.

ENTERAL NUTRITION SUPPORT

For ordering Tube Feeding Support within CHS facilities, order as; Dietitian Consult for Tube Feeding or Specify: Product name, volume, rate, timing, initial rate and progression to goal volume/rate, and amount of water needed to flush tube and/or meet fluid requirements.

PARENTERAL NUTRITION SUPPORT

For CMC, CIR, University, Mercy, Mercy South; refer to the facility TPN order sheet and monitoring guidelines. Consult Dietitian or Pharmacist for assistance in ordering TPN and monitoring guidelines.

MEDICAL NUTRITION THERAPY FOR DIABETES MELLITUS

How to Order:
- Diabetic Diet - dietitian consult - determine calorie level
- Diabetic Diet - state calorie level
- Jovanovic Diet
- Unmeasured Diabetic Diet

GASTROINTESTINAL SOFT DIET

How to order the diet for CMC, CIR, University; order as Soft Diet or Gastrointestinal Soft Diet.

SODIUM CONTROLLED DIET

For CHS facilities:

Order the sodium restriction as grams of sodium:

1 gram
2 grams
3 grams
4 grams

Include any other diet restrictions needed, i.e. diabetic, etc.

KETOGENIC DIET

For CHS patients order diet as: Ketogenic **and** enter a consult for the dietitian.

CLEAR LIQUID DIABETIC DIET

GENERAL DESCRIPTION

The standard diet provides approximately 305 grams of carbohydrate. The planned total intake averages 1400 calories.

NUTRITIONAL ADEQUACY

The diet is inadequate in all nutrients. Duration of this diet over 48 hours will require high protein and high calorie supplements to ensure adequate nutrition.

HOW TO ORDER: Clear Liquid ADA
(Levels other than 300 grams of carbohydrate or 1400 calories must be specified.)

CLEAR LIQUID DIABETIC DIET
Nutritional Guidelines

SAMPLE MENU

Breakfast		CHO		
	Apple juice - 8 oz.	30 gm		
	Clear broth	-		
	High-protein jello - 4 oz.	30 gm	Mid-morning Snack	CHO
	Coffee	-	Apple juice	15 gm
	Sugar substitute	-		
		60 gm		
Lunch		CHO		
	Clear broth	-		
	Cranberry juice - 8 oz.	40 gm		
	Gingerale - 8 oz.	30 gm	Mid-afternoon snack	CHO
	High-protein jello - 4 oz.	30 gm	Jello	15 gm
	Iced tea	-		
	Sugar substitute	-		
	Lemon juice	-		
		100 gm		
Dinner		CHO		
	Clear broth	-		
	Grape juice - 8 oz. - 1/2	40 gm		
	7 UP® - 8 oz.	30 gm	Bedtime snack	CHO
	High-protein jello - 4 oz.	30 gm	Apple juice	15 gm
	Iced tea	-		
	Sugar substitute	-		
	Lemon juice	-		
		100 gm		

Approximate Analysis
Calories: 1400
Carbohydrate: 305 gm
Protein: 50 gm

UNMEASURED DIABETIC DIET

PURPOSE

To provide a simple diet modification for the glucose intolerant patient with no calorie restriction.

INDICATIONS AND RATIONALE

This diet may be prescribed for the patient with a mild glucose intolerance and at an appropriate weight level but who may benefit from a moderate restriction of simple carbohydrates. This diet may allow for an improvement in intake and can be used for those patients who cannot or will not follow a more detailed diet using the Exchange Lists.

NUTRITIONAL ADEQUACY

This diet is adequate in all nutrients when proper food selections are made.

HOW TO ORDER: Unmeasured Diabetic Diet

GENERAL DESCRIPTION

The diet is based upon the regular diet with the following exceptions:

1) Avoid sugar and concentrated sweets containing glucose, corn syrup, sucrose, dextrose, maltose, fructose, mannitol, sorbitol and xylitol.
2) Meals and snacks (if needed) should be eaten at regular intervals (do not go without eating longer than five hours between meals).
3) Food exchange lists and measures are not used and calories are not limited.
4) Provide less salt and sodium containing foods.

UNMEASURED DIABETIC DIET
NUTRITIONAL GUIDELINES

FOOD GROUPS	***FOODS ALLOWED***	***FOODS TO AVOID***
BEVERAGES	Coffee, tea, decaf coffee, low-fat milk, unsweetened carbonated beverages	Milkshakes, condensed milk, alcoholic beverages (permitted only with physician's approval), sweetened beverages, fruit drinks, whole milk and cream
MEATS AND PROTEIN FOODS	Poultry without skin, fish, veal, most nuts, beef, lamb, pork - limit 3-4 times per week, cottage cheese, low fat cheese and egg substitute, limit whole eggs to 3 a week, peanut butter	Fried meats, poultry with skin, limit organ meats and egg yolks, cheese made from whole milk and cream
VEGETABLES	All vegetables allowed	Fried, glazed or sugared vegetables
BREADS & STARCHES BREADS	Regular breads, crackers, dinner rolls limit use of muffins, biscuits, pancakes, waffles	Frosted breads, sweet rolls, doughnuts, fruit breads
CEREALS& GRAINS	Any cooked or dry cereal without sugar or honey coating, rice, pastas, macaroni, spaghetti, noodles	Sugar coated cereals or cereals containing sugar, sugar or honey coated fruits, nuts, natural cereals
STARCHY VEGETABLES	White or sweet potatoes, grits, com, dried beans and peas, lima beans, green peas, winter squash	Fried vegetables, glazed or sugared vegetables
FRUITS	Fresh fruits, canned or frozen unsweetened fruits, unsweetened fruit juices, dried fruits	Fruits with sugar, sweetened juice, glazed or candied fruits
FATS	Margarine, salad dressing, most vegetable oils	Shortening, creams, butter, bacon, completely hydrogenated fats, coconut oil, palm oil
SWEETS	Dessert - fresh fruit, unsweetened frozen canned fruit, unsweetened gelatin, sugar-free pudding (made with skim-milk) Sweets - Sugar-free gums, sugar-free jam, jelly or syrup	Pies, cakes, cookies, ice cream, sherbet, pastries, sweetened pudding and gelatin Sugar, honey, molasses, jam, jelly, preserves, syrup, frosting & icing, candy, chewing gum and marshmallows
MISCELLANEOUS	Pepper, herbs, spices, unsalted nuts, pimento, lemon & lime juice, unsweetened cranberries & rhubarb, vinegar, mustard, hot pepper sauce	Sweet pickles and relish, sweetened cranberries & sauce, carameled popcorn

SAMPLE MENU		
BREAKFAST	*LUNCH*	*DINNER*
Cereal - Bran flakes Meat - Low fat cheese Bread - Whole wheat toast Fruit - Orange juice Fat - Margarine Milk - Skim milk Beverage - Coffee, sugar substitute	Meat - Baked chicken without skin Starchy Vegetable - Baked potato Vegetable - Green beans Bread - Whole wheat roll Fruit - Unsweetened applesauce Fat - Margarine	Meat - Veal roast Starch - Rice Vegetable - Stewed tomatoes Bread - Yeast roll Fruit - Cantaloupe Fat - Margarine Beverage - Iced tea with sugar substitute & lemon juice

REFERENCES

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Diabetes in Children

Insulin- dependent diabetes mellitus (IDDM) is one of the most prevalent chronic diseases in childhood, affecting I in every 600 school-aged children. The initial diagnosis is often made after the child presents in diabetic ketoacidosis with symptoms of polydypsia, polyuria, polyphagia, and weight loss (1). Treatment is based on three key components: age appropriate diet, insulin therapy, and physical activity (1). Of the treatment modalities listed above, diet can be the most challenging. Adequate calories and nutrients to attain normal growth and development must be provided. An Individualized meal plan that is compatible with the usual eating habits and lifestyle of the child encourages compliance while achieving the goals of medical nutrition therapy (NINT) (1,2). The degree of metabolic control that is achieved in children and adolescents with IDDM can effect the long-term prognosis of their disease (3).

Infants and toddlers with IDDM have special nutritional concerns. Often because the young child cannot verbalize hypoglycernic symptoms, blood glucose levels may need to be maintained slightly higher than desired (4). Children at this age are commonly both erratic eaters and very active. Therefore, careful blood glucose monitoring must be combined with well-timed snacks and insulin injections (1,3).

During the school age years, children become increasingly aware of how they may be different from others of their age and seek peer approval, which is reflected in their food choices (1). Seasonal sports and spontaneous physical activities must also be considered when planning snacks and meals. Teachers, bus drivers, and coaches should be made aware of the child's diagnosis and of the signs, symptoms, and treatment of hypoglycemia

The management of diabetes during adolescence is probably more difficult than at other ages due to the teenager's desire to achieve autonomy over his own environment (6). Sufficient calories and nutrients must be provided for the demands of puberty. Yet, the desire to "fit in" with his peers can lead to dietary non-compliance. Obesity may become a problem especially for adolescent females, and calorie levels should be monitored closely. The possibility of eating disorders should be considered when significant weight loss or unexplained poor diabetes control occurs. Lifestyle changes which may impact their diabetes control, such as eating more fast foods and using alcohol, should be addressed in an objective, nonjudgmental manner (1. 5).

GOALS OF MEDICAL NUTRITION THERAPY (2, 7)

The overall goal of NINT for pediatric diabetics is the same as for adults, which is "to assist individuals with diabetes in making changes in nutrition and exercise habits leading to improved metabolic control" (2). Specific goals of NINT include:

- Providing sufficient calories and nutrients to attain normal growth and development rates (refer to Pediatrics section for calculation).

- Maintaining blood glucose levels as normal as possible by balancing food intake with insulin and level of physical activity.
- Achieving optimal serum lipid levels.
- Preventing and treating acute and long-term complications of diabetes.
- Improving overall health by making optimal food choices.

Use of nutritional guidelines such as the Food Guide Pyramid can be helpful. An individualized diet prescription should be developed that integrates one's usual eating and exercise patterns with their insulin regimen and unique management goals. There is no one "best" meal planning approach to use, but generally a scheduled intake of 3 meals plus 2 or 3 snacks is recommended for children. Special attention should be given to the amount of total carbohydrate that is consumed at each meal and snack.

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REACTIVE HYPOGLYCEMIA

PURPOSE

To provide for the maintenance of near normal blood glucose levels for individuals who oversecrete insulin.

INDICATIONS AND RATIONALE

Plasma glucose levels of less than 40 gm/dl occurring 1-3 hours after a meal and accompanied by symptoms such as palpitations, perspiration, pallor, anxiety, hunger, or tremors indicate reactive hypoglycemia. Symptoms usually spontaneously disappear in an hour or less or are promptly relieved by the ingestion of carbohydrate (1). Diagnostic symptoms may be misinterpreted due to the similarities between symptoms of hypoglycemia and anxiety since both are mediated by the release of epinephrine (1).

Fasting hypoglycemia occuring after long periods without adequate food or from poor eating habits may require frequent intake of large amounts of carbohydrate to prevent glycopenic episodes.

Hypoglycemia resulting from alcohol (which blocks glucose production by the liver) or other drugs such as salicylate in aspirin requires establishment and maintenance of adequate glucose intake until the offending agent has been cleared from circulation. Other serious conditions may be tumors of the pancreas, which stimulate excessive insulin secretion, and adrenal insufficiency, a rare condition that prevents the adrenal glands from responding to certain body needs, especially under stress (2). Frequent intakes of large amounts of carbohydrate would be indicated.

Following a partial gastrectomy, symptoms of dumping such as epigastric fullness, nausea, weakness and palpitations occur within 30-60 minutes after eating a large meal and should not be confused with symptoms of hypoglycemia (refer to the postgastrectomy diet). Some patients experience hyperglycemia 30-60 minutes after consuming a glucose load which results in excess insulin secretion and subsequent hypoglycemia 2-3 hours later (1).

NUTRITIONAL ADEQUACY

This diet meets the National Research Council's Recommended Dietary Allowances for all nutrients except iron requirements for pregnancy, lactation, women of child bearing age and adolescents. Diets of less than 1200 calories however are not nutritionally adequate and a multivitamin and mineral supplement is indicated to achieve adequate nutrient requirements.

HOW TO ORDER: Hypoglycemic Diet
Specific calorie and/or carbohydrate levels may be ordered.

NUTRITIONAL GUIDELINES

Dietary management of reactive hypoglycemia is accomplished by the avoidance of simple carbohydrates such as jellies, honey, sugar, candies, cookies, pies, cakes, and sweetened carbonated beverages (1, 2). Complex carbohydrates are generally not restricted since they are more slowly absorbed and result in significantly lower plasma glucose and insulin levels. The calorie distribution of carbohydrate, protein, and fats should be planned to provide approximately 50% carbohydrate, 20% protein, and 30% fat. The calorie level is determined by the patient's need to achieve or maintain desirable body weight. Adequate fiber intake is encouraged (1, 2).

Small frequent feedings are recommended to prevent fluctuations in blood glucose levels with time spans of no greater than five hours between feedings (1, 2). An appropriate snack would include a complex carbohydrate and a protein source (1). Alcoholic and caffeinated beverages are generally not recommended due to their hypoglycemic effects (1).

This diet provides six feedings daily with nutrient distribution of approximately 50% carbohydrate, 20% protein, and 30% fat with no concentrated sweets. Calorie levels are planned according to individual requirements and are established to maintain ideal body weight or promote weight loss.

MEAL PLAN		
BREAKFAST	***LUNCH***	***DINNER***
1 starch exchange 1 meat exchange 1 fruit exchange 1 milk exchange 1 fat exchange	2 starch exchanges 2 meat exchanges 2 vegetable exchanges 1 fruit exchange	2 starch exchanges 2 meat exchanges 2 vegetable exchanges 1 fruit exchange 1 fat exchange
MID-MORNING SNACK	***MID-AFTERNOON SNACK***	***BEDTIME SNACK***
1 starch exchange 1 meat exchange 1 fruit exchange	1 starch exchange 1 meat exchange 1 fruit exchange	1 starch exchange 1 milk exchange

SAMPLE MENU		
BREAKFAST	*LUNCH*	*DINNER*
Toast - 1 slice Egg substitute - 1 Orange juice - ½ cup Milk, skim - 1 cup Margarine - 1 tsp. Coffee, decaf Sugar substitute Salt and pepper	Green peas - ½ cup Hot roll - 1 Baked skinless chicken - 2 oz. Carrots - 1 cup Fresh orange Ice tea Sugar substitute Salt and pepper	Mashed potatoes - ½ cup Hot roll - 1 Roast beef - 2 oz. Green beans - 1 cup Peach halves - 2 unsweetened Iced tea Sugar substitute Salt and pepper
MID-MORNING SNACK	***MID-AFTERNOON SNACK***	***BEDTIME SNACK***
Crackers - 6 Cheese 1 oz. Fresh apple Diet soft drink	Graham crackers - 3 squares Peanut butter - 1 Tsp. Banana - ½ small Diet soft drink	Cornflakes - ¾ cup Milk, skim - 1 cup Sugar substitute
		Approximate Analysis Calories: 1800 Carbohydrate: 239 grams Protein: 97 grams Fat: 55 grams

REFERENCES

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DYSPHAGIA DIET
THERAPEUTIC FEEDING TEAM (TFT)

PURPOSE

To standardize dysphagia dietary levels used by the Therapeutic Feeding Team at the Charlotte Institute of Rehabilitation and other CMHA facilities as appropriate. The dietitian will clarify the consistencies of foods allowed in each level.

INDICATIONS AND RATIONALE

This diet is ordered for patients with swallowing disorders. Swallowing disorders can result from a mechanical alteration or paralization during any of the four phases of swallowing: oral, preparatory, pharyngeal and esophageal.

Patients with cerebral vascular accidents may have vascular abnormalities of the middle and anterior cerebral arteries causing an interruption of the corticospinal tract. Primitive oral-motor reflexes are released (tonic bite, rooting, and suck-swallow reflex) and the patient may experience unilateral paresis of the tongue, oral cavity and pharynx. Dysphagia may also result from head injury, brain tumors, and damage to trigeminal nerves, VII-facial, IX-glossopharyngeal, X-vagus, XI-assesory, and XII-hypoglossal.

Dysphagia can occur in anyone who has an impaired cough or gag reflex, a speech problem, or scarce, excessive or thick oral secretions. The elderly are susceptible to dysphagia due to changes in oral secretions. Dysphagia can cause complications of choking, aspiration or airway obstruction.

The effects of dysphagia on nutritional status may include inadequate dietary intake resulting in weight loss, vitamin and mineral deficiencies and possibly protein-calorie malnutrition.

The dietitian will coordinate with other team members (speech pathologist, occupational therapist, nurse, and physician) to evaluate swallowing deficits, provide appropriate food and liquid consistencies and make recommendations.

Food and liquid consistencies are advanced according to: 1) improvement in the swallowing disorder, 2) tolerance by the patient, and 3) identification by the TFT that the patient is at decreased risk for complications.

Patients may require enteral nutrition support during swallowing retraining. The patient's oral intake should be monitored and tube feedings reduced in proportion to the amount of oral intake recorded on calorie counts. A minimum of 75% of the daily calorie needs should be from oral intake before the tube feeding is decreased.

Proper positioning of the patient allows for the alignment of the alimentary canal. This can be achieved by the following: 1) placing the patient in an upright position in the bed or chair with the hips flexed at a 90-degree angle, 2) proper height of the elbows in relation to the table, 3) having the patient seated in an upright position 15-30 minutes before and after the feeding.

If a special test meal (IVP, etc.) is ordered but thin liquids have not been approved, other means of temporary liquid support may be needed, i.e. NGT, IV feeding.

NUTRITIONAL ADEQUACY

This diet can be planned to meet the National Research Council's Recommended Dietary Allowances.

HOW TO ORDER: Dysphagia Diet (identify solid and liquid levels)

Examples:

Dysphagia Diet - Pureed, thick liquid
Dysphagia Diet - Mechanical soft, modified liquid
Dysphagia Diet - Pureed, NPO liquid

NUTRITIONAL GUIDELINES

The dietary levels are divided into solid foods and liquid consistencies. All patients are assumed to be "NPO-liquid" unless the level is specified. The patient may progress from one level to another based on their ability to chew and/or swallow foods or liquids. The TFT member will identify any consistency changes tolerated by the patient.

LIQUID DIETARY SCALE
Characteristics

2. Ultra thick liquid (Pudding consistency = 3 tsp. Thick-it® or equivalent added to 4 oz. liquid).
   The following liquids are allowed with thickener added to make a pudding consistency:
   - Cream soups: mushroom, chicken, potato, tomato, celery
   - Juices, sodas, coffee, tea, milk

3. Thick liquid (Honey consistency = 2 tsp. Thick-it® or equivalent added to 4 oz. liquid).
   The following liquids are allowed with thickener added to make a honey consistency:
   - Soups, juices, milkshakes, ice cream, sodas, milk, coffee and tea

4. Modified liquid (Nectar consistency = 1/2 to 1 tsp. Thick-it® or equivalent added to 4 oz. liquid).
   Any thin liquid with thickener added to nectar consistency.
   The following do not require thickener:
   - Tomato juice, buttermilk, or Great Shakes®

5. Thin liquid (Only thin liquids allowed).
   - Broth, jello, coffee, tea, juice, soda, milk, strained cream soup, water

6. Normal.

SOLID DIETARY SCALE
Characteristics

2. Pureed (Food requires minimal gumming or chewing).

- Meats and meat alternatives:
  Baby food meats, pureed meats, soft boiled eggs, soft poached eggs, cottage cheese, cream sauces with cheese.
  Yogurt: plain, vanilla, lemon, coffee flavors.

- Vegetables:
  Cooked: pureed or baby food vegetables.
  Raw: none.

- Cereal and grains:
  Strained cereals, cream of wheat, grits.
  Mashed white or sweet potatoes.

- Fruits:
  Baby food fruits, mashed banana.

- Fats:
  Margarine, butter, gravy, cream sauce.

- Soups:
  Thickened cream soups.

- Desserts:
  Plain puddings, custards.

- Sweets:
  Honey, sugar, sugar substitutes, jelly.

- Miscellaneous:
  Salt, pepper, lemon, mild spices.

3. Modified Pureed (All foods on a pureed diet are allowed. Food requires more active gumming).

- Meat and meat alternatives:
  Spinach cheese souffle, baked fish fillet (finely flaked with fork), scrambled eggs, fruited yogurt.

- Cereals and grains:
  Dry cereal (with milk), oatmeal.

4. Mechanical (All foods on pureed and modified pureed diets allowed. Soft texture foods that are easy to chew, swallow and digest).

- Meat and meat alternatives:
  Ground meats, fish, poultry, soft casseroles (without raw vegetables), soft meat salads (without raw vegetables).

SOLID DIETARY SCALE
Continued

- Vegetables:
  Cooked: soft cooked vegetables.

- Cereals and grains:
  Bread-soft (no crust), soda crackers, graham crackers, potatoes (no skin), noodles, rice, soft sandwiches.

- Fruits:
  Bananas, peeled and chopped apples, oranges, grapes, soft berries, canned fruits.

- Desserts:
  Cream pies, soft cakes.

5. Soft (Foods are easy to chew, swallow and digest). NO hard raw fruits or vegetables, fried foods, or spicy foods.

- Meats and meat alternatives:
  All soft, tender meats, casseroles, fish, poultry, fried eggs, omelets.

- Cereals and grains:
  Soft bread, dinner rolls, hot breads, sweet rolls, pancakes.

- Vegetables:
  Shredded lettuce.

- Fats:
  Salad dressing, margarine, butter.

6. Normal

- No consistency modified dietary restrictions; other restrictions as specified by physician, e.g. no added salt, low cholesterol, etc.

BEDSIDE SWALLOWING EVALUATION MENU/TRAY

The following food items will be served to patients when ordered:

- Therapeutic Feeding Team evaluation tray:
  Lemon-lime drink
  4 oz. tomato juice
  8 oz. water
  1 slice of cheese
  2 slices of white bread
  1 package of crackers
  4 oz. of fruit cocktail
  1 oz. of chicken salad
  1 oz. of applesauce
  Straw
  Silverware/napkin
  China plate
  China 6" bowl

REFERENCES

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MODIFICATIONS IN RENAL DISEASE

For CMC, CIR, University facilities; the following section details Nutrition Management and Diet Order Guidelines for renal disease and Cardiac/Kidney Transplant.

The healthy kidney performs excretory and regulatory functions. Through the filtering capability of the glomeruli and the secretory/resorptive capability of the renal tubules, the kidney can regulate the body's water, excrete end products of protein metabolism, and remove excess sodium, potassium, and phosphorus (1, 2, 3, 4). Through its endocrine functions, the kidney affects blood pressure regulation, red blood cell formation, and assists in the conversion of Vitamin D to its active form (1, 2, 3). The kidney is also active in the maintenance of the body's acid-base balance (2).

Renal failure can occur as a result of recent injury to the kidney as in acute renal failure or as a progressive deterioration of kidney function due to an underlying disease state, e.g. chronic renal failure (1, 2). Acute renal failure is generally sudden in onset and is often reversible. Causes include sepsis, shock, or exposure to a nephrotoxic substance such as antibiotics or radiocontrast material (1, 2, 5). Chronic renal failure is generally more gradual in onset. Causes include diseases such as diabetes mellitus, hypertensive nephrosclerosis, glomerulonephritis, polycystic kidney disease, or systemic lupus erythematosus (1, 2, 5). End-stage renal disease is reached when a person has lost 90% or more of kidney function (2).

Compromised renal function results in an impaired ability to excrete excess water, sodium, potassium, phosphorus, and end products of protein metabolism (2, 3). Also affected is Vitamin D metabolism which can lead to impaired intestinal absorption of calcium (1, 3). Persons with renal failure will often suffer from protein-calorie malnutrition (3). Goals of dietary intervention are to promote adequate nutritional status, provide sufficient energy to promote positive nitrogen balance and avoid breakdown of endogenous protein, reduce formation of nitrogenous wastes, and maintain fluid and electrolyte balance (2, 6). The regulation of protein, fluids, sodium, and potassium varies on an individual basis depending on the cause of renal failure, the stage of renal failure, and treatment modalities (2). Specific recommendations are found in the rationale and guidelines for renal disease.

LABORATORY ASSESSMENT OF RENAL FUNCTION

The following laboratory tests are commonly utilized to assess and monitor renal function (2, 7):

1) Serum creatinine
2) BUN-blood urea nitrogen
3) BUN/Cr ratio
4) Measured creatinine clearance
5) Estimated creatinine clearance

Serum Creatinine

1) The normal range is 0.7-1.5mg% (results may vary from one laboratory to another).

2) Creatinine is a waste product of muscle metabolism and is eliminated by the kidneys. The amount of creatinine produced and eliminated by the individual on a daily basis is very constant.

3) There is a relationship between serum creatinine and renal blood flow in that as renal blood flow decreases, serum creatinine rises.

4) Serum creatinine is a more reliable indicator of renal function than BUN because serum creatinine levels are not directly influenced by diet or liver disease.

5) A common cause of elevated serum creatinine levels is acute or chronic renal dysfunction. In general, the more severe the renal impairment, the higher the serum creatinine levels. Treatment of the underlying renal disorder will generally result in decreased serum creatinine levels.

6) Increased age is associated with decreased efficiency of renal function. Therefore, one would expect increased serum creatinine levels; however, this is not always the case. Many elderly patients with decreased renal function present with a normal serum creatinine which can be attributed to a decrease in muscle mass with age. In other words, if there is less muscle mass in the face of decreased renal function, less creatinine is produced and serum creatinine remains "normal."

BUN

1) The normal range is 5-25 mg% (results may vary from one laboratory to another).

2) Urea is a waste product of protein metabolism and is produced in the liver from ammonia. Urea is eliminated by the kidneys.

3) A BUN > 90 mg/dl may result in uremic symptoms.
Renal disease is a common cause of increased BUN, as seen in uremia or azotemia.

4) Non-renal causes for increased BUN can include catabolism, starvation, GI bleed, or dehydration.

5) Decreased BUN may be seen in liver failure, overhydration, or increased protein synthesis.

BUN/Creatinine Ratio

1) 1) The BUN/Cr ratio is a mathematical calculation used to differentiate between renal and non-renal causes for an elevated BUN.

2) A normal BUN/Cr ratio is 10 to 15:1.

3) A patient with an elevated BUN secondary to non-renal causes, i.e., dehydration, shock, CHF, GI bleeding, often has a BUN/Cr ratio greater than 15:1.

4) Patients with primary renal disorders generally have a normal BUN/Cr ratio.

Measured Creatinine Clearance (MCC)

1) MCC is used for assessment of renal function. Urine is collected for 24 hours and the amount of creatinine excreted is measured. Plasma creatinine is also measured during the collection period. Results are reported in ml/min.

2) Normal ranges vary slightly according to sex and age, and are approximately 75-125 ml/min.

3) MCC is an indicator of glomerular filtration rate.

Estimated Creatinine Clearance

1) This is a calculated value used when there is no time or opportunity for a measured creatinine clearance test. It provides an approximate value for creatinine clearance.

2) One formula is as follows:

$$\text{Creatinine Clearance} = \frac{98 - 16\,(\text{Age} - 20)}{\text{Plasma Creatinine Concentration}}$$

NUTRITIONAL ADEQUACY

It is important to realize that renal failure alters the body's ability to properly metabolize protein, vitamins, and minerals. Particular attention must be paid to all nutrients to ensure proper amounts are being provided to the patient. Vitamin supplementation specific for renal failure is generally recommended throughout all stages of renal disease. Specific nutrient guidelines are listed throughout the following sections.

HOW TO ORDER RENAL DIETS: Order by specific category (below) or by specific amounts of protein, sodium, potassium, phosphorus, and fluid.

Renal Failure Diet (Conservative Management)
Renal Failure Diet - Hemodialysis
Renal Failure Diet - Peritoneal Dialysis
Post Renal Transplant Diet

**Note: If a "renal" diet order is given the predialysis diet will be sent until the unit dietitian verifies the order and specifies the appropriate level renal diet.

***Note: For renal transplant diet guidelines, please refer to the "Post Transplant Diet" section of this manual.

RENAL FAILURE DIET
CONSERVATIVE MANAGEMENT

PURPOSE

To promote adequate nutritional status, reduce the formation of nitrogenous wastes, prevent negative nitrogen balance, maintain fluid and electrolyte balance, and delay progression of renal failure (2, 3, 4).

INDICATIONS AND RATIONALE

This diet is designed for individuals who have renal failure but sufficient renal function to live without dialysis. By achieving the goals listed above, dialysis can be postponed by varying lengths of time depending on the progression of the disease causing renal failure (2, 3, 4).

NUTRITIONAL GUIDELINES

PROTEIN: Provide 0.6 grams per kilogram but not less than 35-40 grams protein per day. High biological value protein (HBV) should comprise 60-75% of the protein intake (3, 4, 6, 8).

CALORIES: 30-35 kilocalories per kilogram or sufficient energy to prevent catabolism and maintain optimal nutritional status (4, 6, 8). If the loss of body mass is judged to be of more value than reducing nitrogenous wastes to the lowest level possible, a gradual loss of no more than one-half pound per week is recommended.

SODIUM: Provide 2-4 grams per day. Patients with salt-losing nephropathies may require more sodium (6).

POTASSIUM: May not be restricted unless urinary output is less than 1 liter per day and serum potassium is elevated; if so, 40-70 mEq potassium per day is generally recommended.

FLUIDS: Usually not controlled until end-stage renal disease occurs (3, 6).

PHOSPHORUS: 600-800 milligrams per day (6, 8). Use of phosphate binders may be indicated.

CALCIUM: 1,000-1,500 milligrams per day (8). Because some foods high in calcium may also be high in protein and phosphorus, calcium supplementation may be necessary (8).

VITAMINS: Supplementation with B-Complex and C vitamins is recommended (6, 8).

SAMPLE MENU		
BREAKFAST	**LUNCH**	**DINNER**
1/2 cup pineapple juice 1/2 cup whole milk 3/4 cup cornflakes 1 slice white toast 2 tsp. margarine 1 tsp. jelly 1 Tbsp. creamer Coffee	Sandwich: 2 ounces sliced turkey 2 slices white bread lettuce 2 tsp. mayonnaise 1/2 cup green bean salad with SF dressing 1 fresh apple 2 tsp. sugar 1 cup iced tea	2 ounces roast beef 1/2 cup mashed potatoes 1/2 cup cooked carrots 1/2 cup mixed greens 1 dinner roll 10 pillow mints 2 tsp. margarine 2 tsp. sugar 1 cup iced tea
Approximate Analysis Calories: 2200 Protein: 80 grams (66% HBV) Sodium: 2 grams Potassium: 66 mEq Phosphorus: 1100 milligrams		

RENAL FAILURE DIET
HEMODIALYSIS

PURPOSE

To maintain adequate nutritional status, attain and maintain ideal body weight, reduce the formation of excessive nitrogenous wastes, prevent negative nitrogen balance, maintain a fluid weight gain of no greater than 1-2 pounds per day, and maintain serum electrolytes in an acceptable range (2).

INDICATIONS AND RATIONALE

This diet is designed for individuals on hemodialysis. Protein can be liberalized from the pre-dialysis period since the artificial kidney is now regularly removing nitrogenous wastes (9). The recommended protein level is adjusted to compensate for amino acid and peptide losses during hemodialysis treatment (approx. 6-10 gms free amino acids and 3-4 gm peptides lost per treatment) (9). Energy provisions may now include a decrease in calories provided for the obese patient to lose up to 1 pound per week (9). Potassium and fluid restrictions are usually more severe since urine and potassium output is usually low (9). Water soluble vitamins are lost through the artificial kidney membrane (3, 4, 9).

NUTRITIONAL GUIDELINES

PROTEIN: Provide 1-1.2 grams per kilogram. At least 50% of the protein should be HBV (3, 4, 6, 9).

CALORIES: Adjust to attain and maintain ideal body weight (6, 9):

weight maintenance:	35 calories/kilogram/day
weight loss:	25-30 calories/kilogram/day
weight gain:	40-50 calories/kilogram/day (6, 9).

SODIUM: 1-3 grams per day (9).

POTASSIUM: 50-70 mEq per day (6, 9).

FLUIDS: Provide fluids based on urinary output per 24 hours plus 500-1000 cc per day to allow for a fluid weight gain of 1-2 pounds per day (6, 9).

PHOSPHORUS: 800-1200 milligrams per day (6, 9). Use of phosphate binders may be indicated, with calcium carbonate being the preferred choice for phosphate binding (9).

CALCIUM: Calcium supplementation is often indicated, and serum calcium should be monitored (9).

VITAMINS: B vitamins, vitamin C, and folic acid supplementation is recommended as follows (3):

SAMPLE MENU		
BREAKFAST	**LUNCH**	**DINNER**
1/2 cup pineapple juice 1/2 cup whole milk 3/4 cup corn flakes 1 egg 1/2 cup grits 1 slice white toast 2 tsp. margarine 1 tsp. jelly 2 tsp. sugar 1 Tbsp. creamer Coffee	Sandwich: 2 ounces sliced turkey 2 slices white bread lettuce 2 tsp. mayonnaise 1/2 cup green bean salad with SF dressing 1 fresh apple 2 sugar cookies 2 tsp. sugar 1 cup iced tea	2 ounces roast beef 1/2 cup mashed potatoes 1/2 cup cooked carrots 1/2 cup mixed greens 1 dinner roll 1 cup sherbert 2 tsp. margarine 2 tsp. sugar 1 cup iced tea
Snacks: 1 small bagel, 2 graham crackers		
Approximate Analysis: Calories: 2100 Protein: 70 grams (57% HBV) Sodium: 2 grams Potassium: 57 mEq Phosphorus: 1100 mg		

RENAL FAILURE DIET
PERITONEAL DIALYSIS

PURPOSE

To promote adequate nutritional status, replace protein lost in dialysate, prevent negative nitrogen balance, attain and maintain ideal body weight, and maintain electrolytes in an acceptable range (2).

INDICATIONS AND RATIONALE

Peritoneal dialysis enables patients to dialyze themselves (or with assistance) at home. Dialysate solution is drained into the peritoneal cavity where excess waste products and fluid move via passive diffusion from the peritoneal capillaries into the dialysate. Dialysate solution is generally exchanged three or four times a day or night. Insulin may be added to the dialysate. Because glucose is absorbed from the dialysate, a reduction in dietary calories provided may be indicated to prevent undesirable weight gain. Because protein is lost to the dialysate solution, dietary protein needs are higher with this form of dialysis (3, 10).

NUTRITIONAL GUIDELINES

PROTEIN: 1.2-1.5 grams per kilogram. At least 50% should be HBV (3, 10).

CALORIES: Adjust to attain and maintain ideal body weight (10):

Weight maintenance:	25-35 calories/kilogram/day
Weight loss:	20-25 calories/kilogram/day
Weight gain:	35-50 calories/kilogram/day

SODIUM: 3-4 grams (10).

POTASSIUM: Unrestricted unless serum potassium is elevated, then 50-80 mEq/day (6, 10).

FLUID: As tolerated (6, 10).

PHOSPHORUS: 1200 milligrams per day (10). Use of phosphorus binders may be indicated, due to high protein content of the diet it may be difficult to further restrict dietary phosphorus (6, 10).

CALCIUM: Serum calcium should be monitored and calcium supplements ordered if serum calcium is low.

VITAMINS: Supplementation with the following vitamins is recommended (10):

Vitamin C	100 milligrams
Folate	1 milligram
Pyridoxine	10 milligrams

All other water soluble vitamins to meet the RDA.

IRON: May be supplemented as per individualized need.

SAMPLE MENU		
BREAKFAST	**LUNCH**	**DINNER**
1/2 cup pineapple juice 1/2 cup whole milk 3/4 cup corn flakes 1 egg 1/2 cup grits 1 slice white toast 2 tsp. margarine 1 tsp.jelly 2 tsp. sugar 1 Tbsp. creamer Coffee	Sandwich: 2 ounces sliced turkey 2 slices white bread lettuce 2 tsp. mayonnaise 1/2 cup green bean salad with SF dressing 1 fresh apple 2 sugar cookies 2 tsp. sugar 1 cup iced tea	3 ounces roast beef 1/2 cup mashed potatoes 1/2 cup cooked carrots 1/2 cup mixed greens 1 dinner roll 1 cup sherbert 2 tsp. margarine 2 tsp. sugar 1 cup iced tea
Snack: 2 graham crackers		
Approximate Analysis: Calories: 2200 Protein: 80 grams (66% HBV) Sodium: 2 grams Potassium: 66 mEq Phosphorus: 1100 milligrams		

SUMMARY OF DIETARY RECOMMENDATIONS IN RENAL FAILURE			
	CONSERVATIVE MANAGEMENT	***HEMODIALYSIS***	***PERITONEAL DIALYSYS***
PROTEIN:	0.6 gm/kg (but no less than 35-40 grams of protein per day). 60-75% HBV	1.0-1.2 gm/kg 50% HBV	1.2-1.5 gm/kg 50% HBV
CALORIES:	30-35 kcal/kg or sufficient to prevent catabolism and maintain optimal nutritional status.	Weight maintenance: 35 kcal/kg/day Weight loss: 25-30 kcal/kg/day Weight gain: 40-50 kcal/kg/day	Weight maintenance: 25-35 kcal/kg/day Weight loss: 20-25 kcal/kg/day Weight gain: 35-50 kcal/kg/day
SODIUM:	2-4 grams per day or as needed	1-3 grams per day	3-4 grams per day
POTASSIUM:	40-70 mEq per day may be unrestricted	50-70 mEq per day	50-80 mEq per day may be unrestricted
FLUID:	Ad Lib	500-1,000cc plus urinary output per day	As tolerated
PHOSPHORUS:	600-800 mg/day control with binders	800-1200 mg per day	1200 mg per day
VITAMIN SUPPLEMEN-TATION:	Yes	Yes	Yes
Note: For renal transplant diet guidelines, please refer to the " Post Transplant Diet" section of this manual.			

SUGGESTED MEAL PLANS FOR RENAL FAILURE DIETS						
Protein (grams)	40	50	60	70	80	90
Sodium (milligrams)	809	974	1129	1288	1573	2093
Potassium (milligrams)	1425	1755	1885	2415	2573	2695
Phosphorus (milligrams)	560	695	790	915	1035	1135
Food Exchanges						
Milk (4oz.)	1	1	1	1	1	1
Meat (oz.)	3oz.	4oz.	5oz.	6oz.	7oz.	7oz.
Bread/Starch	5	6	7	8	10	14
Vegetable	2	3	3	3	3	3
Fruit	2	2	2	4	3	4
Free Foods: Sweets, low protein breads, low protein desserts, SF fats						

POST TRANSPLANT DIET
CARDIAC/RENAL

PURPOSE

To meet the nutritional needs of the post transplant patient during the catabolic period induced by the use of high levels steroids; to minimize the profound side effects of large doses of steroids; to prevent the cushingoid appearance that often accompanies the use of steroids; and to reduce the likelihood of hyperglycemia developing from steroid use (1, 2).

INDICATION AND RATIONALE

Post transplant patients receive doses of steroids that have a profound side effect on metabolism (3, 6). Steroids increase protein catabolism and muscle wasting (6), can promote sodium retention and potassium excretion often resulting in hypertension and/or edema (5), can produce fasting hyperglycemia, decreased glucose tolerance, glycosuria, and relative resistance to insulin (7). Appetite increases and excessive weight gain are also problems for many post transplant patients (3). The weight that is gained is distributed in a typical cushingoid pattern, i.e.; a moon face and an increase in abdominal girth (7). Prednisone also can affect bone growth by impairing epiphyseal growth, retarding cartilage growth, reducing bone matrix with reabsorption of calcium and reducing osteoblast formation. This coupled with the demineralization that many longtime dialysis patients have experienced creates a need for optimizing conditions for bone growth (3, 4).

NOTE: By the time patients are on a maintenance dose of prednisone, usually 10-15 mg per day, a diet which will maintain ideal body weight, promote serum cholesterol levels below 200 mg/dl, and restrict sodium as needed to maintain desirable blood pressure is appropriate.

NUTRITIONAL GUIDELINES

PURPOSE:	1.7-2.0 gms per kg IBW (8, 9).
CALORIES:	Sufficient to achieve optimal weight for height (8, 9).
CARBOHYDRATE:	2-3 gm CHO per kg IBW Avoid concentrated sweets, increase fiber (7, 8, 10).
FAT:	Strive for < 30% of calories from fat with unsaturated to saturated fat ratio of 2:1 (8).
SODIUM:	If appropriate for the patient's medical condition, restrict to 2-4 gm/day (5).
POTASSIUM:	Not restricted unless serum potassium is elevated.
CALCIUM:	RDA (8).
PHOSPHORUS:	Unrestricted (8).
VITAMINS:	One multivitamin supplement per day (8).
IMMUNOSUPPRESSIVE PRECAUTIONS:	If appropriate for the patient's medical condition, this may be ordered in addition to the transplant diet order.

SAMPLE MENU		
BREAKFAST	**LUNCH**	**DINNER**
1 cup skim milk 1/2 cup orange juice 1 serving egg substitute 1/2 cup grits 1 slice toast 2 tsp. margarine Coffee	Sandwich: Chicken salad (made with 2oz. chicken and 2 tsp. mayonnaise) 2 slices bread fresh carrot and green pepper sticks fresh pear 3 gingersnaps Iced tea	3oz. boiled fish filet 2/3 cup rice 1/2 cup green beans 1 dinner roll 1 1/4 cup strawberries 2 tsp. margarine Iced tea
Snack: 3 graham cracker squares, 8 animal crackers and 1 cup skim milk.		
Approximate Analysis: Calories: 1800 50% CHO Protein: 92 gm 20% PRO Sodium: 2 gm 30% FAT		

HEART DISEASE PREVENTION DIET

General Description

Heart Disease Prevention Diet is designed to provide a healthy nutritional plan for individuals in the prevention or rehabilitation of cardiovascular disease. Cholesterol is limited to 100 milligrams/1000 calories/day. Total fat is limited to less than 30% of the calories with less than 10% of the total kilocalories as saturated fat. Sodium is restricted only with the physician's order. Emphasis is placed on complex carbohydrates, particularly on foods high in water-soluble fiber. Modifications in caloric levels are advised for the obese to assist in control of serum cholesterol and/or hypertension. It is recommended that 25-35 grams of dietary fiber (both soluble and insoluble fiber) be included in the diet daily (13).

HEART DISEASE PREVENTION DIET NUTRITIONAL GUIDELINES		
FOOD GROUPS	*FOODS ALLOWED*	*FOODS TO AVOID*
MEAT & MEAT SUBSTITUTES:	LIMIT TO 5-7 OUNCES PER DAY: Chicken, skinless, fresh ground; Turkey, skinless, fresh ground; Cornish hen, skinless; Domestic duck, skinless; Fish, canned in water, fresh or frozen; Veal; Egg whites; Egg substitutes; Dried beans, peas & lentils; Shellfish, except shrimp & lobster Tofu; Wild game such as: rabbit, venison, pheasant, skinless wild duck, skinless others; Processed meats and cheeses with no more than 3 grams of fat per ounce; Cottage Cheese (1% of fat or less). LIMIT TO 8-9 OUNCES PER WEEK: Beef lean cuts: round, ground round, sirloin, chuck, loin; Pork lean cuts: tenderloin, Canadian bacon, Cured ham, center loin chop; Lamb lean cuts: loin chop, leg; LIMIT TO 3 OUNCES PER WEEK: shrimp, lobster, sardines (without oil); Peanut butter in moderation; Meat dishes, casseroles and meat salads prepared with allowed ingredients. *Bake, broil, roast, grill or stew meats. Skin and trim visible fat prior to cooking.*	Fried meat; Commercially breaded and battered meat; fish sticks, chicken fingers, others; Processed meats and cheeses with more than 3 grams of fat per ounce; Goose; Mutton; Spare ribs; Pigs feet; Regular ground beef; Organ meats: kidney; liver; heart; sweetbreads; brains; others; "Prime" grades of meat; Heavily marbled cuts of meat; Egg yolks; Pastrami; Corned beef; Meat dishes, casseroles and meat salads prepared with excessive fats or ingredients not allowed; Caviar; Roe.

FOOD GROUPS	*FOODS ALLOWED*	*FOODS TO AVOID*
FAT & FAT SUBSTITUTES	LIMIT TO 3-6 SERVINGS PER DAY: Oils: canola, safflower, corn, cottonseed, soybean, sesame, olive peanut; Margarine whose first ingredient is a liquid oil listed above or water. Mayonnaise & salad dressing (regular & lowfat) made with allowed oils; Nuts & seeds except those not allowed: FAT SUBSTITUTES (SERVINGS NOT LIMITED): Imitation powder butter substitutes, No stick cooking spray, Fat free salad dressing, Fat free mayonnaise, Fat free sour cream, Powdered dry gravy mixes Homemade gravy with fat removed.	Butter; Lard; Bacon drippings; Ham hocks; Salt pork; Suet; Meat fat; Coconut oil; Palm & palm kernel oil; Shortening; Hydrogenated oil; Cream cheese; Margarine whose first ingredient is a partially hydrogenated oil; Cheese sauces and cream sauces unless prepared with allowed ingredients; Nuts: macadamia, cashews, Brazil.
FRUITS & VEGETABLES:	All fruits and vegetables except those not allowed: Avocado and olives in moderation.	Vegetables served with cream or cheese sauce; Vegetables & fruit salads prepared with regular mayonnaise or regular dressings; Vegetable casseroles made with ingredients not allowed; Fried vegetables & fruits; Frenck fries; other; Coconut.

FOOD GROUPS	*FOODS ALLOWED*	*FOODS TO AVOID*
MILK & MILK PRODUCTS:	Skim milk; Lowfat milk (0-1% fat); Buttermilk (0-1% fat); Chocolate milk (0-1% fat); Nonfat dry milk; Evaporated skim milk; Sugar free hot chocolate mix; Nonfat yogurt; Lowfat yogurt (1% fat); Sour cream, fat free; Cheeses (see meat section).	Whole milk; Lowfat milk (2% fat); Chocolate milk (2% fat); Eggnog; Evaporated whole milk; Sweetened condensed milk; Cream; Half & Half Yogurt (2% fat or more); Sour cream; Cream cheese, regular & light; Neufchatel cheese; Non-dairy cream substitutes & whipped toppings containing palm oil, coconut oil or hydrogenated oil; Whipping cream; Cheeses (see meat section).
BREADS & CEREALS:	Hot cereals: grits, oatmeal, oat bran, cream of wheat, Cold cereals, except those made with disallowed fats; Brown & white rice; Pasta: spaghetti noodles, macaroni noodles, lasagna noodles; Crackers with no more than 3 grams of fat per serving: melba toast, saltines, rusk, zwieback, Wasa, matzoh, Finn bread, rye wafers bread sticks, others; Rice cakes; Bagels; English muffins; Hot dog & hamburger buns; Breads: whole wheat, rye, raisin, pumpernickel, oat, white, French, Italian; Pita breads; Brown & serve rolls; Boston brown bread; Biscuits, cornbread, muffins, pancakes, waffles prepared with allowed ingredients; Flour or corn tortillas, baked.	Granola cereals, unless low fat; Cereals containing disallowed oils & fat; Rice and pasta dishes containing disallowed ingredients; Crackers with more than 3 grams of fat per serving: butter type, cheese crackers, others; Ramen noodles; Chow mein noodles; Egg noodles; Commercially prepared or prepackaged mixes for biscuits, cornbread, muffins, pancakes and waffles; Croissants; Coffee cakes; Sweet rolls; Danish; Doughnuts; Breads mad with egg, cheese, shortening, butter, lard or whole milk; Fried breads; Hush puppies; Breads and other cereal/grain products containing more than 3 grams of fat per serving.

FOOD GROUPS	*FOODS ALLOWED*	*FOODS TO AVOID*
DESSERTS & SNACKS:	Any dessert with no more than 3 grams of fat per serving; Fruits: fresh, canned, frozen; Gelatins, plain or fruited; Gelatin desserts with allowed ingredients; Puddings made with skim milk; Angel food cake; Graham crackers; Animal crackers; Ginger snaps; Fig bars; Arrowroot cookies; Fruit juice bar; Popsicles; Lowfat frozen yogurt; Fudgsicles; Sherbet made with skim or lowfat milk; Cocoa powder; Hard candies; Marshmallows; Gum drops; Jelly beans; Pretzels; Air popped popcorn without added fat; Microwave popcorn with no more than 3 grams of fat per serving; Crackers (see bread section).	Snacks and desserts with more than 3 grams of fat per serving: ice milk, ice cream, pies, cookies, candy, cake, others; Fried snack foods: potato chips, corn chips, cheese curls, pork rinds, others; Buttered popcorn; Popcorn cooked in oil; Popcorn, commercial with more than 3 grams of fat per serving; Sherbet made with whole milk; Chocolate; Crackers (see bread section).
BEVERAGES:	Tea, regular or decaffeinated; Coffee, regular or decaffeinated; Carbonated beverages; Fruit juices; Fruit ades; Vegetable juices; Milk (see milk section).	Milk (see milk section); Alcohol (limit to 1 serving per day): Examples: 2.5 oz - 80 proof whiskey, 8 oz. wine, 16 oz. beer.
MISCELLANEOUS:	Pepper; Herbs; Spices; Salt as allowed by physician; Salt substitute as allowed by physician; Sugar, white & brown; Sugar substitutes; Flavoring extracts; Lemon juice; Vinegar; Catsup; Mustard; Broth; Bouillon; Broth based soups; Vegetable soups; Pickles; Chewing gum; Jams/Preserves; Jelly; Marmalade; Syrup; Honey; Molasses; Barbecue sauce; Soy sauce; Worcestershire sauce; Sweet and sour sauce; meat tenderizers; Steak sauce; Tobasco.	Creamed soups; Chunky meat based soups unless homemade with appropriate ingredients; Tartar sauces.

PUREED DIET

This diet provides foods that require a minimal amount of chewing and allows ease in swallowing. Food items are offered according to the patient's preferences and tolerences.

PUREED DIET NUTRITIONAL GUIDELINES		
FOOD GROUPS	**FOODS ALLOWED**	**FOODS TO AVOID**
BEVERAGES	All	None
MEAT AND PROTEIN FOODS		
Meat	Pureed: beef, chicken, turkey, pork, liver, veal, lamb, baked or broiled fish, if tolerated	Bacon, sausages, spiced meats, processed meats
Eggs	Poached, boiled, creamed, scrambled if tolerated	Fried
Cheese	Cheese sauces, ricotta, and cottage cheese, any melted into soups or other foods	All others
Yogurt	Plain, vanilla, lemon, coffee, other fruit yogurt not containing berries or whole fruit	All others
VEGETABLES		
Cooked	Any pureed, vegetable juices	Whole vegetables
Raw	None	All
BREADS AND STARCHES		
Breads	As tolerated, white, whole wheat bread or toast, saltines, graham crackers and other plain crackers, milk toast, thin pancakes	Any other hard breads and rolls, waffles, doughnuts, bagels, whole grain breads
Cereal & Grains	Refined cooked cereal, dry refined cereal, if tolerated	Dry cereal, unless tolerated
Pasta	Tender macaroni, spaghetti, noodles	Rice, brown and wild rice, wheat pasta

PUREED DIET NUTRITIONAL GUIDELINES		
FOOD GROUPS	**FOODS ALLOWED**	**FOODS TO AVOID**
STARCHY VEGETABLES	Whipped potato, pureed sweet potato, any pureed	All others
FRUITS		
Canned or Cooked	Any pureed except those with seeds or pits	Fruits with seeds or pits including strawberries, blackberries, figs
Dried	None	All
Juices	All	None
Fresh	Mashed banana	Raw fruits
FATS	Margarine, butter, oil, shortening, cream, mayonnaise, gravy, salad dressing	All others
SOUPS	Strained broth, bouillon and consomme, strained cream soups	All others
SWEETS	Sugar, jelly, honey, syrup	All others
DESSERTS	Plain pudding, custard, ice cream, sherbet, water ice, jello, vanilla wafers, butter cookies, plain cream pie, blenderized desserts	All others
MISCELLANEOUS	Salt, pepper, mild herbs and spices, condiments, vinegar, vanilla and flavor essences, strained cranberry sauce	Nuts and nut butters, pickles, popcorn

MEDICAL NUTRITION THERAPY FOR GESTATIONAL DIABETES MELLITUS

JOVANOVIC DIET

PURPOSE

To provide adequate nutrition, maintain optimal glucose levels, and to avoid ketosis in the pregnant diabetic woman.

INDICATIONS AND RATIONALE

This diet was developed by Lois Jovanovic-Peterson, M.D. to treat pregnant women with Type I and Type II diabetes mellitus. Calorie levels are established based on the patient's weight: 25 Cal/kg if the patient is >120% of ideal body weight, 30 Cal/kg if the patient is at normal weight, 40 Cal/kg if <80% ideal body weight. This meal plan consists of 3 meals and 3-4 snacks daily with the following calorie distribution: 40% carbohydrate, 20% protein, 40% fat (see below for specific meal distributions). Due to the early morning hypercortisolemia of pregnancy, breakfast tends to be small and low in carbohydrates. Fruit and cereals are often avoided at this meal because of their tendency to elevate postprandial glucose levels. Avoidance of "white foods" such as white bread, rice and potatoes is recommended. This diet can be utilized as the primary treatment for gestational diabetes or as a complement to a 3 or 4 shot/day insulin regimen.

The Jovanovic Diet has been proven very effective in clinical trials, especially when used in conjunction with home blood glucose monitoring. Since pregnancy is essentially a diabetogenic state, the decreased level of carbohydrate intake improves glucose control. The increased fat intake provides necessary calories.

This diet has two disadvantages. Some women find the regimentation of the feeding schedule difficult. Also because of the increased fat intake, satiety leads to meal/snack omission.

NUTRITIONAL ADEQUACY

This diet alone will not meet the nutritional requirements of pregnancy. Supplementation with a prenatal vitamin and iron preparation is recommended. Calcium intake should be closely monitored in the design of the meal pattern. Calorie levels should also be monitored to assure optimal weight gain and prenatal outcome. Diets with calorie levels under 1800 are generally insufficient to meet the increased energy and nutrient needs of pregnancy.

HOW TO ORDER: Jovanovic Diet - specify calorie level or Dietitian Consult to determine calorie level.

Table 4. DIVISION OF CALORIES/CARBOHYDRATES

TIME	MEAL	%CALORIES/CARBOHYDRATES
8:00 a.m.	Breakfast	10%
10:30 a.m.	Snack	5%
12:00 p.m.	Lunch	30%
3:00 p.m.	Snack	10%
5:00 p.m.	Dinner	30%
9:00 p.m.	Snack	15%

REFERENCES

1) Your Guide To A Healthy Happy Pregnancy. A Bio Dynamics Pamphlet. Boehringer Mannhein Diagnostics Publication. 1981.

2) A Practical Guide to the Diagnosis and Management of Gestational Diabetes. A Boehringer Mannheim

Diagnostics Publication. 1986.

3) Jovanovic-Petersen, L., Sparks, S.P., Petersen, L.M. Dietary manipulation as a primary treatment for gestational diabetic pregnancy. Diabetes Professional. 1989/90; Winter: 11.

SUGGESTED MEAL PLANS FOR JOVANOVIC DIETS

*These diet plans have been calculated using 2% milk.

Calorie Levels		1800	1900	2000	2100	2200	2300	2400	2600
Carbohydrate (gm)		170.5	175.5	200.5	206.5	214	227	241	260.5
Protein (gm)		97.5	99.5	103.5	107.5	109	115	120	136.5
Fat (gm)		80	85	85	97.5	97.5	102.5	105	122.5
Breakfast									
8:00	Starch	1	1	1	1	1	1	1	1
	Meat	1	1	1	1	1	1	1	1
	Vegetable	0	0	0	0	0	0	0	0
	Fruit	0	0	0	0	0	0	0	0
	Milk	0	0	1/2	1/2	1/2	1/2	1/2	1
	Fat	1	2	1	2	2	2	2	2
Snack									
10:00	Starch	0	0	0	0	0	1	1	2
	Meat	0	0	0	0	0	0	0	1
	Vegetable	0	0	0	0	0	0	0	0
	Fruit	0	0	0	0	0	0	0	0
	Milk	1	1	1	1	1	0	0	0
	Fat	0	0	0	0	0	1	1	1
Lunch									
12:00	Starch	2	2	3	3	3	3	3	3
	Meat	2	2	2	2	2	2	2	2
	Vegetable	1	1	1	1	1	2	1	1
	Fruit	0	0	0	0	0	0	0	0
	Milk	1	1	1	1	1	1	1	1
	Fat	2	2	2	2	2	2	3	2
Snack									
3:00	Starch	1/2	1/2	1/2	1/2	1	1	1	1.5
	Meat	1	1	1	1	1	1	1	1
	Vegetable	0	0	0	0	0	0	0	0
	Fruit	1	1	1	1	1	1	1	1
	Milk	0	0	0	0	0	0	0	0
	Fat	0	0	1	1	1	1	1	1
Supper									
5:00	Starch	2	2	3	3	3	3	4	3
	Meat	2	2	2	2	2	2	3	2
	Vegetable	1	2	1	1	1	2	1	1
	Fruit	0	0	0	0	0	0	0	0
	Milk	1	1	1/2	1	1	1	1/2	1
	Fat	3	3	3	3	3	3	3	2
Snack									
9:00	Starch	1	1	1	1	1	1	2	2
	Meat	0	0	0	0	0	1	1	1
	Vegetable	0	0	0	0	0	0	0	0
	Fruit	0	0	0	0	0	0	0	0
	Milk	1	1	1	1	1	1	1	1
	Fat	0	0	0	1	1	1	0	1

The following Pediatric Nutrition section if nutrition management provides guidelines for care for the *CHS* pediatric patient.

Sections E-1 through E-13 of the Morrison Manual of Clinical Nutrition Management may also be used to guide nutrition management of the pediatric patient.

PEDIATRIC NUTRITION

The following Pediatric Nutrition section of nutrition management provides guidelines for care for t he CHS pediatric patient.

Sections E-1 through E-13 of the Morrison Manual of Clinical Nutrition Management may also be used to guide nutrition management of the pediatric patient.

PURPOSE

An awareness of the importance of nutrition in pediatrics has increased tremendously over the years. Optimal nutrition should be provided from infancy through adolescence to maximize growth and development potential and to support the nutritional status of those children with abnormal metabolic needs. Sound childhood nutrition will promote the development and reinforcement of good dietary habits for the prevention of adult disease states.

INDICATIONS AND RATIONALE

The successful oral alimentation and/or nutrition support regimen for the infant or child is individualized based on age, sex, growth history, diagnosis, and clinical status. Consideration also is given to one's developmental level, oral and neuromuscular skills, and unique feeding behaviors.

NUTRITIONAL ADEQUACY

The pediatric diets described for those with essentially normal needs for age are adequate in all nutrients as described by the National Research Council's Recommended Dietary Allowances (RDA) (1). Diets planned to meet the needs of infants or children with an abnormal metabolism and chronic or acute illnesses must be assessed on an individual basis for nutritional adequacy.

HOW TO ORDER: Pediatric Diet For Age (specify age)
Specify Therapeutic Diet For Age (as indicated)

PEDIATRIC NUTRITIONAL ASSESSMENT

Accurate determination of nutritional status is the first step in nutrition care planning. Nutritional assessment may involve a routine initial screening or it may require a more in-depth review of nutritional requirements if the patient is considered to be "at risk" (2). Each assessment typically involves an evaluation of anthropometric, biochemical, clinical, and dietary information (2, 3).

ANTHROPOMETRIC INFORMATION

Comparison of physical growth parameters to reference standards can assist in detecting acute and chronic nutritional problems (2, 3). The National Center for Health Statistics (NCHS) has developed a series of percentile charts appropriate for assessing the growth of infants and children in the United States (4). Two age intervals are utilized for each sex: birth to 36 months and 2 to 18 years. Measurements between the 25th and 75th percentiles usually represent normal growth. Sensitivity to movements away from the median of the curve, i.e., the 50th percentile or standard, can assist in earlier detection of nutritional deficits or excesses, and with facilitation of timely and appropriate interventions (5, 6, 7).

WEIGHT

Weight below the 10th percentile or above the 90th percentile may indicate a weight deficit, or excess, respectively. Actual weight can be calculated as a percentage of standard weight (i.e., the 50th percentile for height and sex or age and sex) as follows (3):

$$\% \text{ standard} = \frac{\text{actual weight} \times 100}{\text{standard weight}}$$

> 120% standard=	excess
80-90% standard=	marginal deficiency
60-80% standard=	moderate deficiency
< 60% standard=	severe deficiency

A recent change in weight (loss or gain) is also noteworthy as it is often an indicator of an acute nutrition-related problem. Percent weight change can be evaluated as follows (3):

$$\text{Percent weight change} = \frac{\text{usual weight} - \text{current weight} \times 100}{\text{usual weight}}$$

An infant or child is considered nutritionally at risk when he or she presents with an acute weight loss of more than 10% of usual body weight (2, 8). Daily changes in weight are a function of such factors as hydration status, renal function, fluid management therapies, and abnormal losses, e.g., diarrhea, vomiting, surgical drainage, and nasogastic suction (5, 7, 8, 9).

LENGTH OR HEIGHT

Stature is a reproducible growth parameter that, along with weight, can be helpful in assessing growth failure and chronic undernutrition (3). Height is measured on children over age 2 who can stand unassisted; recumbent length is measured prior to this.

WEIGHT FOR LENGTH OR HEIGHT

The ratio of weight to length or height more accurately distinguishes between "wasting" or acute malnutrition, from "stunting", or chronic malnutrition (3, 5, 6). That is, in general a low weight-for-age or low weight-for-length/height without a low length/height for age is indicative of an acute deficit such as that secondary to a hypermetabolic condition (5). In chronic conditions, weight-for-length/height tends to stay more proportionate. However, any growth measurement below the 10th percentile or greater than the 90th percentile warrants further evaluation (2, 3, 6, 7).

GROWTH MONITORING

Monitoring rates of growth, especially weight gain, provides evidence as to success or failure of a nutritional care plan (2, 3). Average daily gains in length/height and weight are given in Table 1. Growth velocity can also be evaluated by plotting serial measurements on the growth charts (4-7).

Table 1. GAINS IN LENGTH AND WEIGHT OF REFERENCE CHILDREN				
	BOYS		**GIRLS**	
Age	*Length mm/day*	*Weight g/day*	*Length mm/day*	*Weight g/day*
0-1 mo.+	1.03	29.3	0.94	26
1-2 mo.	1.13	35.2	1.1	28.6
2-3 mo.	1.06	29.9	0.94	24.3
3-4 mo.	0.8	20.8	0.77	18.6
4-5 mo.	0.65	16.6	0.65	16.1
5-6 mo.	0.57	15.2	0.63	15
6-9 mo.	0.52	12.6	0.51	11.2
9-12 mo.	0.42	10.7	0.43	10
12-18 mo.	0.34	7.2	0.32	8.7
18-24 mo.	0.26	6.1	0.29	6.2
2-3 yr.+	0.22	5.7	0.24	6
3-4 yr.	0.21	5.5	0.2	5.1
4-5 yr.	0.19	5.4	0.19	4.7
5-6 yr.	0.17	5.5	0.17	5.1
6-7 yr.	0.15	5.9	0.16	6.4
7-8 yr.	0.14	6.7	0.16	8.2
8-9 yr.	0.14	7.8	0.16	9.9
9-10 yr.	0.15	9.1	0.17	11.2

+mo. = months; yr. = years
Source: Adapted and used with permission from
American Journal of Clinical Nutrition (1982; 35:1174). Copyright© 1982, American Society for Clinical Nutrition.

HEAD CIRCUMFERENCE

Head circumference is typically measured up to age 36 months. It is a less sensitive indicator of nutritional status but a measurement below the 5th percentile may reveal a history of chronic under nutrition (3, 5).

BIOCHEMICAL INFORMATION

Depending on the degree of nutritional assessment, various biochemical indices may also be obtained (2, 3, 5-10). Common indices used for evaluation are listed below. Reference ranges will vary with the age of the infant or child (3).

1. Protein Metabolism
   a. Somatic compartment - nitrogen balance studies; urinary creatinine excretion; urinary 3-methylhistidine.
   b. Visceral compartment - albumin; thyroxine-binding prealbumin; retinol-binding protein; transferrin.
   c. Acute phase reactants - serum C-reactive protein (CRP).

2. Hematologic status - hemoglobin; hematocrit; MCV; MCH; serum iron; TIBC; serum ferritin; also serum folate, B12, and copper.

3. Immunocompetence - delayed cutaneous hypersensitivity; total lymphocyte count.

4. Other mineral, trace element, and vitamin levels as indicated, e.g., serum phosphorus, magnesium, and calcium; serum electrolytes.

5. Liver function tests; renal function tests; lipid profile; acid-base balance; glucose tolerance.

CLINICAL AND DIETARY INFORMATION

In addition to evaluating growth and biochemical data, other pertinent information may need to be evaluated to complete the assessment, including (2, 3, 5):

1. Birth data

2. Medical history and current diagnosis
   a. presence of a chronic illness or congenital or chromosomal abnormalities
   b. recent trauma, infection or surgery
   c. past and present treatment modalities

3. Nutritional history and dietary analysis
   a. past and present feeding modalities
   b. level of gastrointestinal function
   c. usual and current intake vs. estimated requirements
   d. food allergies and intolerances
   e. feeding skills and behavior
   f. vitamin/mineral supplementation

The nutritional assessment of the pediatric patient is a necessary exercise in effectively evaluating the potential impact of one's medical condition on his or her nutritional status (2, 5, 6).

DETERMINATION OF NUTRIENT NEEDS IN PEDIATRIC PATIENTS

Nutrient requirements as estimated by the RDA are designed for metabolically normal, healthy infants and children with an allowance for growth and activity needs (1). Recommended allowances for daily energy and protein intakes from the RDA are as follows (refer also to the Appendix):

GROUP	YEAR	ENERGY Cal/Kg	PROTEIN Gm/Kg
Infants	0.0-0.5	108	2.2
	0.5-1.0	98	1.6
Children	1-3	102	1.2
	4-6	90	1.1
	7-10	70	1.0
Males	11-14	55	1.0
	15-18	45	0.9
Females	11-14	47	1.0
	15-18	40	0.8

With stress or disease, requirements may vary significantly from those predicted by the RDA. For example, burns, sepsis, seizure activity, trauma, and certain congenital diseases tend to increase requirements while developmental disabilities tend to decrease them (3, 5, 6, 8-17). The impact of illness on the nutritional requirements of the pediatric patient must be evaluated on an individual basis and reassessed periodically during the course of hospitalization (2, 5, 6, 9, 10, 15).

MACRONUTRIENT REQUIREMENTS

ENERGY

A more precise calculation of total energy requirement begins with an assessment of basal energy needs. Determining actual measured energy expenditure (MEE) by indirect calorimetry is a more accurate way to estimate energy requirements in the critically ill pediatric patient than is making an estimate based on predicted resting energy expenditure (REE) (9, 10). When use of a metabolic cart is not possible or is not indicated, requirements may be determined by use of the Harris-Benedict equation for estimating basal energy expenditure (BEE) or by estimating basal metabolic rate (BMR). Activity, injury, or stress factors are then applied to determine total daily energy needs (3, 8-14).

The Harris-Benedict equation was originally developed for adults and older children weighing over 30 kg and 10 years of age (3, 8, 11). Estimating BMR from weight, age, and sex is possible for infants and children whose height or length is not available or whose weight is less than 75 kg (3, 13). Table 2 provides estimates of BMR based on weight for children age 1 week to 16 years. Only one BMR is used for infants of either sex from birth to age 10 months. The weight (in kg) of an infant or child is represented by a figure giving metabolic rate as calories/hour. This number is then multiplied by 24 (hours) to determine daily BMR (3).

Seashore (14) has published guidelines for estimating basal energy needs of critically ill pediatric patients based on a BMR formula that does not rely on calculation of body surface area. The Seashore equation is: BMR = [55 - (2 x Age)] x Wt. in kg. For children whose actual weights fall outside the 10th and 90th percentiles, weight-age rather than chronological age is used in the equation.

Recommended increases above the BEE or BMR for activity range from 0% for comatose state; 10% for bed rest; 25-30% for light activity; to 50-75% for moderate to heavy activity (3, 8, 14). For critically ill patients, "stress" factors, rather than simply "activity" factors, are more relevant to apply to the BEE or BMR figure when calculating energy needs for specific disease states or medical conditions (3, 5, 8-15). Table 3 lists suggested stress factors for estimating energy requirements for critically ill pediatric patients (8, 9, II- 15).

When applying stress factors in calculating needs for the mechanically-ventilated, critically-ill, pediatric patient, the implications of the following research findings should be considered:

1) Clinically stable patients have decreased energy requirements as compared to unstable patients (9, 12, 16).
2) Energy expenditure is lower in patients subjected to pharmacologic paralysis as compared to nonparalyzed patients (9,17).
3) Measured resting energy expenditure (REE) has been shown to be an average of 1.5 times predicted BEE during the early phase of injury (12).
4) Measured energy requirements (MEE) in the acute phase of metabolic stress, a hypercatabolic state, are lower than in the adaptive phase that follows; i.e., energy required for growth is negligible during this hypermetabohc phase. The anabolic phase that follows is associated with the resumption of somatic growth (10, 12,13, 15,17).
5) Overfeeding of total calories, especially as carbohydrate, should be avoided in pediatric patients with respiratory failure as this may exacerbate respiratory insufficiency secondary to hypercapnia (9, 10, 12, 15, 17).

Age I wk+ to 10 mo+		*Age 11 to 36 me+*			*Age 3 to 16* yr+		
Metabolic Rate		Metabolic Rate			Metabolic Rate		
Weight (kg)	(Cal/H) Male **or** Female	weight Male	(Cal/H) (kg)	Female	Weight (kg) Male	(Cal/H)	Female
3.5	8.4	9.0	??.O	21.2	15	35.8	33.3
4.0	9.5	9.5	??.B	22.0	20	39.7	37.4
4.5	**10.5**	10.0	23.6	22.8	25	43.6	41.5
5.0	**11.6**	10.5	24.4	23.6	30	47.5	45.5
5.5	**12.7**	11.0	25.2	24.4	35	51.3	49.6
6.0	13.8	11.5	26.0	25.2	40	55.2	53.7
6.5	14.9	12.0	26.8	26.0	45	59.1	57.8
7.0	**16.0**	12.5	27.6	26.9	50	63.0	61.9
7.5	**17.1**	13.0	28.4	27.7	55	66.9	66.0
8.0	**18.2**	13.5	29.2	28.5	60	70.8	70.0
8.5	19.3	14.0	30.0	29.3	65	74.7	74.0
9.0	20.4	14.5	30.8	30.1	70	78.6	78.1
9.5	21.4	15.0	31.6	30.9	75	82.5	82.2
10.0	99.5	15.5	32.4	31.7			
10.5	23.6	16.0	33.2	32.6			
11.0	24.7	16.5	34.0	33.4			

+wk=week; mo=months; yr=years

Source: Adaptedfrom Altman, P.L., and Dittmer, D.S. eds. Metabolism. Bethesda, MD: FASEB; 1968. Used with permission from FASEB.

Approximate Stress Factors*

Representative Stress State	*Stress Factor* .9 -
Simple starvation	1.0
Postoperative recovery; uncomplicated surgery Respiratory	1.0 - 1.2
failure; on ventilator	1.2 - 1.25
Sepsis (moderate)	1.1 - 1.3
Sepsis (severe)	1.4 - 1.8
Trauma: Nfild (e.g., long bone fracture)	1.15 - 1.3
Trauma: Central nervous system; sedated Trauma: Moderate to	1.3 - 1.5
severe; on ventilator Burns (proportionate to burn size)	1.5 - 1.75
	1.25 - 2.0

** Multiply basal metabolic rate by stressfactorfor approximate energy requirements.*

Source: Adaptedfrom Pollack, M.M. Nutritional support of children in the intensive care unit. Paper presented at The Symposium on Recent Advances in Pediatric Nutrition, New Orleans, LA. March 1, 1990.

The energy requirement for growth and anabolism averages up to 50 percent times basal needs in a healthy infant or child. Those with long-term growth failure and/or protein-calorie malnutrition may require 2.0 to 3.0 times the basal energy requirement for significant growth and anabolism to occur (11, 14). [Refer also to the section on failure-to-thrive.]

For children with developmental disabilities (e.g., Down syndrome, myelomeningocele, cerebral palsy) caloric requirements based on height or height-age are felt to be more appropriate than those based on age or weight alone (3, 18). Many of these children are small for their age and have a limited activity level. Table 4 provides guidelines for estimating caloric requirements in children with developmental disabilities (18).

Condition	*Caloric Recommendations*
Ambulatory, ages 5 to 12 years	13.9 Kcal/cm height
Nonambulatory, ages 5 to 12 years	11.1 Kcal/cm height
Cerebral palsy with decreased levels of activity	10 Kcal/cm height
Cerebral palsy with normal or increased levels of activity	15 Kcal/em height
Athetoid cerebral palsy, adolescence	Up to 6,000 Kcal
Down syndrome, boys ages 5 to 12 years	16.1 Kcal/cm height
Down syndrome, girls ages 5 to 12 years	14.3 Kcal/cm height
Myelomeningocele	Approximately 50% of RDA for age after infancy. May need as little as 7 Kcal/cm height.

Source: Used with permission from Pemberton, C.M., et al., eds.: Mayo Clinic Diet Manual. 6th edition. Toronto: B.C. Decker, Inc.; 1988; p. 320.

PROTEIN

Protein needs can be estimated from established protein requirements for age with adjustments for the degree of catabolism or malnutrition (7, 10, 11). Estimated protein requirements of the pediatric patient generally range from 1.5 to 3.0 grams/kg/day. To promote efficient protein utilization and growth, 150 to 250 nonprotein calories are required per gram of nitrogen; 100 to 150 per gram is required for severe to moderate stress (9,11, 13,19-21).

CARBOHYDRATES

Carbohydrates play a significant metabolic role as several organs have an absolute requirement for glucose. A minimum carbohydrate intake of 50 to 100 gm/day for infants and children is suggested by the Food and Nutrition Board (1, 19). A range of 10 to 12 mg/kg/min glucose provision appears sufficient to inhibit protein catabolism to minimize gluconeogenesis (15).

and children is suggested by the Food and Nutrition Board (1, 19). A range of 10 to 12 mg/kg/min glucose provision appears sufficient to inhibit protein catabolism and to minimize gluconeogenesis (15).

FAT

A rich source of linoleic acid should provide at least 3 to 5 percent of the total caloric intake in order to prevent essential fatty acid deficiency. Additional fat, if metabolically tolerated, may supply energy to meet increased calorie needs, not to exceed 60% of total calories (7, 11, 19). Recommended fat intakes for the pediatric patient generally range from 0.5 to 3.0 gm/kg/day for infants and 1.0 to 2.5 gm/kg/day for children (7, 11, 19, 21).

NUTRIENT DISTRIBUTION

Table 5 provides general guidelines for the recommended distribution of carbohydrate, protein, and fat as percentages of total calories for infants and children (3, 7, 19). This distribution may need adjustment for the individual pediatric patient, especially when nutrition support is indicated, to achieve the desired nonprotein calorie to nitrogen ratio and to accomodate differences in metabolic tolerance (7-15).

AGE GROUP	*CARBOHYDRATE*	*PROTEIN*	*FAT*
Full term, normal infant and toddlers < age 2	35-65%	7-16%	30-55%
Children > age 2	50-60%	10-20%	30-40%

FLUID REQUIREMENTS

Individual fluid needs are a reflection of clinical status. Table 6 provides general guidelines for estimating maintenance fluid requirements for neonates, infants, and children (7, llF 20).

	AGE	WEIGHT	*FLUID RECOMMENDATION*
Neonates (fuU-term)	lst day 2nd day 3rd day 4th day 5th day and thereafter		60-75 ml/kg 75- 85 ml/kg 85-100 ml/kg 100-125 n-d/kg 125-150 ml/kg
Older infants and children (1 month and older)		1-10 kg 10-20 kg > 20 kg	100 ml/kg/day 1000 ml + 50 ml **for** each kg **over 10** 1500 **nil + 20 nil for** each kg **over 20**

OTHER NUTRIENT REQUIREMENTS

The RDA (refer to the Appendix) for vitamins, minerals, and trace elements continue to be the basis on which recommendations for intake by the pediatric patient are made (1, 19). Disease-specific effects on digestion and absorption of various micronutrients that may increase or decrease requirements should be considered (3, 5, 7, 13, 15, 19).

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SPECIAL PEDIATRIC NUTRITION PROBLEMS

NUTRITIONAL CONSIDERATIONS FOR THE PREMATURE AND LOW BIRTH WEIGHT (LBW) INFANT

GENERAL DESCRIPTION

Approximately 6-7% of infants born in the U.S. each year weigh less than 2500 grams at birth (1). The survival rate of even the smallest such infants is improving (2). This has resulted in an increased awareness of the special nutrient needs of the LBW infant. All infants of LBW are not alike. Infants who are normally grown but premature differ from infants who are malnourished in utero and gestationally more mature (3). Generally, the smaller and more premature infants have greater nutritional requirements in the early months of life (1). Newborns less than 32 to 34 weeks of gestation have uncoordinated sucking and swallowing reflexes which must be considered (3). Very low birth weight (VLBW) infants, i.e., less than 1500 grams, and sick, larger neonates may need special nutritional support that combines parenteral and enteral nutrition, regardless of their gestational age (1, 3, 4, 5).

Nourishing the LBW, preterm infant is a challenging task in the presence of inadequate nutrient stores, increased nutritional requirements, digestive enzyme deficiencies, and immature organ development (1, 4, 5, 6). Nutritional management is further complicated by an increased risk for development of a variety of medical problems affecting many body systems, including (5, 7, 8):

System	Common Problems
Cardiovascular	Patent ductus arterious, cellular hypoxemia, congestive heart failure
Gastrointestional	Chronic diarrhea, necrotizing enterocolitis, hyperbilirubinemia
Hematological	Anemia, Vitamin E deficiency
Immunological	Neonatal sepsis, pneumonia
Metabolic	Osteopenia, hypocalcemia, hypoglycemia
Neurological	Intracranial bleeding, hypoxia
Renal	Fluid and electrolyte imbalance
Respitory	Respitory distress syndrom. bronchopulmonary dysplasia
General	Growth failure; chronic disease

System	Common Problems
Respiratory	Respiratory distress syndrome, bronchopulmonary dysplasia
General	Growth failure; chronic disease

ENERGY REQUIREMENTS

Energy needs of the LBW infants will vary with gestational age, birth weight, clinical status, and mode of feeding (1, 3). Most LBW infants achieve satisfactory growth when given intakes of 90-110 cal/kg/day parenterally and 120-130 cal/kg/day enterally (1-7).

Stable LBW infants gain an average of 20-30 grams per day (3, 7, 8). Infants with bronchopulmonary dysplasia, congenital heart defects, and intrauterine growth retardation (IUGR) may require increased calories to maintain growth (2, 8, 9, 10). Preterm infants may experience a relative malabsorption secondary to immaturity, especially of certain carbohydrates and fats (3).

PROTEIN, FAT, AND CARBOH-YDRATE REQUIREMENTS

In general, a protein intake of 3.5-4.0 g/kg/day for enterally fed and 2.5-3.0 g/kg/day for parenterally fed premature or LBW infants appears to be adequate (1-6). Protein quality, as well as quantity, requires special consideration when feeding the LBW infant (4, 7). In addition to the eight amino acids known to be essential to adults, tyrosine, cysteine, and taurine may be essential to LBW infants because of their immature enzyme systems (1, 3,4).

The LBW infant may be at risk for the development of fatty acid deficiency in the first week of life due to their limited endogenous fat reserves at birth (7). As early as possible after birth, at least 3% of the caloric intake should be provided by linoleic acid(2). Large amounts of PUFA should be avoided because they cause an increased vitamin E requirement (6). Long chain fatty acids are not as well absorbed by the LBW infant as are medium chain triglycerides (2). Human milk fat is well absorbed, primarily because it contains lipases and a unique fatty acid composition (5).

Lactose may not be efficiently absorbed in the early days of life since lactose activity is not maximal until near term (3). Formulas containing glucose polymers are usually better tolerated, as glucosidase enzymes are active even in preterm infants (2, 3, 5).

VITAMIN AND MINERAL REQUIREMENTS

The premature, LBW infant requires all of the vitamins and minerals that are essential for full-term infants, but may have increased requirements for certain nutrients because of low body stores and physiological immaturity (3, 5, 7). These include calcium, phosphorus, vitamin D, vitamin E, and folic acid (1-6). Sodium and potassium may also require attention in infants born at <33 weeks gestation and in those receiving diuretic therapy (4, 5).

FLUID REQUIREMENTS

Fluid requirements are highly variable and dependent on the clinical status of the infatn. Fluid needs are affected by many factors, such as use of radiant warmers or phototherapy, abnomral fluid losses, and renal mturity (3, 4, 12, 13). A daily fluid intake of 120-150 ml/kg/day will meet the requirements of most LBW infants; however, some VLBW infants may require up to 200 ml/kg/day (1, 7, 13).

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NUTRITIONAL CONSIDERATIONS FOR THE INFANT AND CHILD WITH FAILURE TO THRIVE (FTT)

GENERAL DESCRIPTION

The term "failure to thrive" (FTT) is used to describe a syndrome in which the growth of an infant or young child fails to occur in a progressive manner as expected for age (1). Weight less than 80 to 85 percent of the median for age or less than the 3rd or 5th percentile on standard growth charts are common criteria for growth failure (1, 2). A drop on the growth curve of two or more major centiles for a particular child, i.e. a "falling off." the curve, may also be indicative of FTT (2). Growth failure accounts for at least 1 to 5 percent and as high as 10 percent of all pediatric hospitalizations (3).

ETIOLOGY& TREATMENT

The etiology of FTT encompasses a combination of social, economical, psychological, and medical factors but has traditionally been catagorized as being either primarily organic or inorganic in nature (2). Organic causes are often associated with prenatal influences; HIV infection, chronic renal disease, or other ongoing illness; an increase in metabolic needs (e.g., congenital heart disease, BPD); an inadequate intake secondary to CNS disorders; or with a gastrointestinal disturbance (e.g., CF, IBD) (2, 4). Nonorganic causes are generally attributed to environmental or psychosocial deprivation (1, 3, 5). Initial treatment of FTT stresses stabilization of medical problems, nutritional rehabilitation, and developmental stimulation. Long-term treatment is more successful with on-going multidisciplinary counseling and follow-up (1-3, 6).

ESTIMATING CATCH-UP GROWTH REQUIREMENTS

The ultimate goal of nutrition therapy for the child with FTT is "catch-up growth", a phenomenon consisting of an initial rapid acceleration of growth followed by a gradual deceleration until the normal growth channel is reached (2, 5). Prior to any intervention, a comprehensive nutrition assessment is performed. Then, energy and protein requirements are estimated. Guidelines for estimating catch-up growth requirements are detailed in Table 14 (2).

Increases in the caloric density of the diet are often necessary to ensure an adequate intake without significant increases in volume or quantity of food. Table 15 lists recommendations for supplementation (1). If a child is unable physically and/or emotionally to orally consume optimal calories and other nutrients, alternative methods of feeding should be explored (3).

Catch-up growth in children with a history of prematurity may be rapid in the first 6 to 9 months of life, but it appears limited after 24 months (3).

Table 14. ESTIMATING CATCHUP GROWTH REQUIREMENTS

$$\text{Catchup Growth Requirement (kcal/kg/day)} = \frac{\text{Calories Required for Weight Age (kcal/kg/day)} \times \text{Ideal Weight for Age (kg)}}{\text{Actual Weight (kg)}}$$

1) Plot the child's height and weight on the NCHS growth charts. 2) Determine at what age the present weight would be at the 50th percentile (weight age). 3) Determine recommended calories for weight age. 4) Determine the ideal weight (50th percentile) for the child's present age. 5) Multiply the value obtained in (3) by the value obtained in (4). 6) Divide the value obtained in (5) by actual weight.

Estimated protein requirements during catchup growth can be similarly calculated:

$$\text{Protein Requirement (g/kg)} \quad \frac{\text{Protein Required for Weight Age (g/kg)} \times \text{Ideal Weight for Age (kg)}}{\text{Actual Weight (kg)}}$$

Source: Adapted from Peterson, K, Washington, J.S., Rathbun, J. Team management offailure to thrive. J Am Diet Assoc. 1984; 84: 810-815.

Table 15. CALORIC SUPPLEMENTATION

INFANTS

1) FORMULA
- a) Increase caloric density in 2 to 3 cal/oz steps up to 27 to 28 cal/oz. (See Tables 10 and 11).
- b) Increase caloric density beyond this through addition of modular fat or carbohydrate supplement (e.g., Polycose, MCT Oil, Microlipid) in approx. equal proportions up to 30 to 36 cal/oz.

2) SOLIDS
- a) Read labels to determine caloric content and select most nutrient-dense items.
- b) Fortify strained and table foods with infant cereal; dry milk powder; carbohydrate and/or fat additives.

TODDLERS

1)BEVERAGES
- a) Increase caloric density of milk drinks through addition of dry n-dIk powder, instant breakfast powder; add carbohydrate and/or fat additives to fruit and milk drinks.
- b) Offer Pediasure or other liquid nutrition products.

2) SOLIDS
- a) Increase caloric density of foods preferred by child. Use carbohydrates and/or fat additives. Add gravies, sauces, grated cheese, margarine wherever feasible.
- b) Serve nutrient-dense snacks (e.g., crackers with peanut butter).

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NUTRITIONAL MANAGEMENT OF INBORN ERRORS OF METABOLISM

GENERAL DESCRIPTION

Inborn errors of metabolism (IEM) are groups of inherited biochemical disorders resulting from an abnormality in a specific enzyme involved in the metabolism of a nutrient, most often an amino acid, carbohydrate, or lipid (1-3). The enzyme may be absent or dysfunctional and usually governs a single biochemical reaction, such as synthesis or transport (1, 3). This derangement, in turn, may lead to a deficiency of a certain endproduct or a toxic accumulation of a certain metabolite which triggers the clinical symptoms of the disorder (1, 2).

INDICATIONS AND RATIONALE

Identification and treatment of an IEM must begin early in life to prevent CNS damage and to protect organ function (2, 3). Nutritional therapy is based on an understanding of the underlying defect as it affects the normal nutrient needs of the infant or child (3). As much as possible, normal growth and development is promoted during treatment.

DIFFERENHAL DIAGNOSIS OF IEM

The majority of cases of IEM present with acute onset during infancy or are discovered in early childhood during the work-up for "developmental delay" (2, 4). Characteristic symptoms of acute onset include metabolic acidosis, hyperammonemia, hypoglycemia, and ketonuria. One or more of these primary symptoms may be accompanied by one or more of the following (2, 4, 5): seizures and / or hypotonia; apnea or respiratory stress; FTT; abnormal odor of urine; liver dysfunction; persistent vomiting; coma; lethargy; unexplained hemorrage; and sepsis. Diagnosis is complicated by the nonspecificity of the symptoms which can mimic other medical conditions (4). Extensive laboratory evaluation is necessary for the definitive diagnosis and might include urine organic acids; serum and urine amino acids; serum lactic acid; very long chain and free fatty acids; plasma carnitine; and urine acylcarnitine profile (2, 4). Enzymatic and molecular DNA studies of skin fibroblasts, leukocytes, or tissue biopsies provide other pertinent information (4).

The incidence of individual IEM are rare but the cumulative incidence may be as high as 1 in every 5000 live births (4). Newborn screening for a few of the more prevalent IEM, including PKU, galactosemia, and MSUD, is done in most states. These represent only a fraction of the more than 70 genetically distinct IEM which occur in infancy (4).

Broad categories of IEM include (2):

1) Amino acidopathies
2) Organic acidopathies
3) Urea cycle defect
4) Simple carbohydrate or glycogen defect
5) Complex carbohydrate or lipd defect
6) Fatty acid defect

NUTRITIONAL THERAPY IN IEM

Four general approaches are used in treating an IEM (1-5):

1) Restriction or elimination of metabolic precursors to minimize toxicities.
2) Replacement of metabolic products to correct deficiencies.
3) Provision of an antagonist to help eliminate (detoxify) the dangerous accumulated metabolites.
4) Administration of pharmacologic doses of vitamins (or cofactors) in vitamin-responsive or vitamin-dependent IEM to increase function of a given enzyme.

Many metabolic disorders require a specific semi-synthetic formula or "medical food" to meet nutritional requirements (6). Table 16 lists a few of the most common metabolic disorders in which nutritional therapy is essential to successful management of the disorder (3, 6, 7). The reader should refer to the references at the end of this section for more detailed dietary guidelines for a specific IEM. Also, Table 7 and the Appendix list various products and their indications for use in the management of specific IEM in infancy and childhood.

Special attention must be paid during periods of metabolic stress (e.g., surgery, infection) to ensure adequate caloric intake is provided to prevent tissue catabolism(5, 7). Chronic, long-term therapy is a life-long endeavor and requires continuing nutritional, medical, and laboratory monitoring.

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Table 16. NUTRITIONAL THERAPY FOR COMMON METABOLIC DISORDERS

METABOLIC DISORDER	*ENZYME DEFECT*	*NUTRITIONAL THERAPY*
Phenylketonuria (PKU)	phenylalanine hydroxylase	Controlled phenylalanine intake; supplement tyrosine.
Maple Syrup Urine (MSUD)	branched-chain keto-acid decarboxylases	Controlled intake of branched chain amino acids (leucine, isoleucine, valine); protein intake restricted in Types H and III; thiamine supplements in Type IV.
Propionic Acidemia	propionyl CoA carboxylase	Protein intake restricted to meet minimum requirements; controlled intake of threonine, isoleucine, methionine, valine; biotin supplements; carnitine supplements.
Methymalonic Acidemia (MMA)	methylmalonyl-CoA	Protein intake restricted to meet minimum requirements; controlled intake of threonine, isoleucine, methionine, valine; vitamin B12 supplements; carnitine supplements.
Galactosemia	galactose-1-phosphate uridyl transferase	Galactose-free diet; calcium and vitamin D supplements if soy formula or fortified soy milk is not accepted.

NUTRITIONAL MANAGEMENT OF CYSTIC FIBROSIS

GENERAL DESCRIPTION

Cystic Fibrosis (CF) is a complex multisystem disease inherited by an autosomal recessive trait and is the most common genetic disorder in American children, with an incidence of 1:2,000 among Caucasians and 1:17,000 among Blacks(l). The biochemical defect in CF is one of electrolyte transport in which there is decreased permeability of the sweat gland to chloride ions (1). Exocrine gland dysfunction leads to the production of a thick sticky mucous rather than normal thin secretions which can result in ductal obstruction (2, 3). Sweat and salivary gland secretions contain an abnormally high concentration of electrolytes (1, 2, 4). The confirming diagnosis is based primarily on a positive sweat test, i.e., a sweat chloride concentration > 60mEq/L (4).

INDICATIONS AND RATIONALE

Many organs may be adversly affected in CF including the respiratory and gastrointestinal tracts, the pancreas, and the hepatobiliary system (1, 4). Characteristic signs and symptoms are recurrent respiratory tract infections, chronic cough, diarrhea with steatorrhea, and FTT (2, 4). Therapy is aimed towards control of the principle complications of the disorder (1-4):

1) Chronic pulmonary disease with increased pulmonary workload.
2) Exocrine pancreatic insufficiency with fat malabsorption secondary to reduced secretion of enzymes, bicarbonate, and bile salts.
3) Endocrine pancreatic insufficiency with abnormal carbohydrate metabolism, glucose intolerance, and possible development of diabetes mellitus.
4) Chronic malnutrition and growth failure secondary to malabsorption, inadequate energy intake, and an increased energy expenditure.

Medical treatment for CF usually consists of physiotherapy; aerobic exercise; antibiotic and bronchodilator therapy; pancreatic enzyme replacement; and a wellbalanced high calorie/high protein diet with liberal fat and sodium and supplemental vitamins and minerals (1-4).

NUTRITIONAL MANAGEMENT

Maintenance of optimal nutritional status in patients with CF has been associated with improved growth and pulmonary function, and longer survival (2, 5). In addition to the usual components of nutritional assessment, age of diagnosis and the manifestation of the disease process must be considered (2).

Infants with CF may experience meconium. ileus, GER, and FTT. Hypoproteinemia edema and anemia may also be present. For an adequate intake to be achieved enteral or parenteral nutrition support may be required initially (2). With proper administration of pancreatic enzymes', age iippropriate formulas and/or breastmilk supplemented with glucose polymers or MCT Oil can support adequate growth (1-4, 6). Use of a more elemental or predigested formula, e.g., Pregestimil, is preferable for the severely malnourished infant until Acceptable weight gain is established (1, 4).

The child or adolescent who is newly diagnosed with CF or has been noncomplaint with treatment may sho W_ signs of PCM, vitamin-mineral deficiencies and growth retardation (3). Even well-managed patients may develop anorexia and weight loss as pulmonary function deteriorates (2, 5). Patients who fall below a weight to height ratio of 80 to 85% of standard are candidates for more aggressive nutritional intervention, such as nocturnal gastrostomy fedings (1, 2, 7).

S UMMARY OF NUTRITIONAL RECOMMENDATIONS (1 -5)

ENERGY	RDA x 1.2 to 1.5; adjust to maintain normal growth.
PROTEIN	RDA x 1.5 to 2.0; or 15 to 20% of total energy requirements.
CARBOHYDRATE	40 to 50% of total caloric intake; avoid concentrated sweets if glucose intolerant.
FAT	Unrestricted as tolerated; or 35 to 50% of total caloric intake.
ESSENTIAL FATTY ACIDS	3 to 5% of total caloric intake
VITAMIN AND MINERAL SUPPLEMENTATION	Daily multivitamin/mineral supplement with iron at dose of RDA x 1.0 to 2.0 for age and sex; plus additional supplements if necessary to supply: Vitamin A - 5,000 to 10,000 IU/day Vitamin D - 400 to 800 IU/day Vitamin E (water-miscible) - 50 IU/day for infants; 100 IU/day for age 2 to 5; 200 IU/day for age 6 to 12; 400 IU/day for > 12. Vitamin K - 2.5 to 5 mg x 2/week during infancy; 5mg x 2/week for chronic antibiotic users or if prothrombin time is prolonged. Zinc - 15 mg/day Zinc - 15 mg/day

SODIUM - Liberal use of table salt and "salty" foods with additional 2 to 4 gm/ day for hot weather or strenuous exercise.

PANCREATIC ENZYME REPLACEMENT With each meal or snack; dose as prescribed by physician.

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NUTRITIONAL MANAGEMENT OF PEDIATRIC DIARRHEA

GENERAL DESCRIPTION

Diarrhea is a common gastrointestinal (GI) problem in the pediatric population (1, 2). Although normal stool patterns vary widely between individuals, diarrhea is characterized by a noticeable increase in the number, volume, and fluidity of the stools as compared to usual (2, 3). In general, diarrhea is defined as a stool weight greater than 10 g/kg/24 hours in infants or greater than 200 g/day in children (2). The disease may be further classified as acute; chronic, nonspecific; or chronic, intractable.

INDICATIONS AND RATIONALE

The consequences of diarrheal disease will vary in relation to its severity, duration, and etiology and to the age and previous nutritional status of the child (2, 3). Malabsorption, such as that secondary to mucosal injury or to decreased disaccharidase concentrations, and a reduced dietary intake during and following diarrhea are major contributors to the risk for malnutrition and growth failure (1-3).

CLASSIFICATION OF DIARRHEA

ACUTE DIARRHEA

ETIOLOGY

Acute diarrhea is usually caused by an enteropathologic agent which is viral, bacterial, or parasitic in origin (4). The pathogen infects the G1 tract by a number of mechanisms resulting in an osmotic, secretory, or hemolytic diarrhea (2-4). Less common causes of acute diarrhea include drug inducement, food intolerance, and extraintestinal infection (2, 4). Acute diarrhea by definition resolves within 1-2 weeks of onset, whereas chronic diarrhea persists for more than 2 weeks (1, 2).

NUTRITIONAL MANAGEMENT

The management of acute diarrhea essentially progresses over 3 phases: rehydration, maintenance of hydration/ prevention of dehydration; and reintroduction of regular diet for age (5, 6). Mild to moderate cases tend to be self-limiting and resolve with the aid of oral rehydration therapy (ORT); whereas serious cases may result in severe dehydration and metabolic acidosis requiring intravenous fluid therapy (1VT) (1, 7, 8).

The amount of an oral rehydration solution (ORS) to be administered during oral therapy is based on an individual's maintenance fluid requirements, estimated fluid deficit, and the volume of ongoing losses (7, 8). Table 17 compares several solutions commonly used.

Table 17. COMPARISON OF ORAL REGYDRATION SOLUCTINS (ORS) - (PER LITER)

Solution	*CHO Source*	*Base Source*	gm *CHO*	*mEq Base*	*mEq* Na+	*mEq K+*	***mEqCl***
Pedialyte##	Glucose	Citrate	25	30	45	20	35
RehydralytoW##	Glucose	Citrate	25	30	75	20	65
Lytren#	Glucose	Citrate	20	30	50	25	45
Resol+	Glucose	Citrate	20	34	50	20	50
Infalyte++	Glucose	Bicarbonate	20	30	50	20	40
WHO-ORS	Glucose	Citrate	20	30	90	20	80

Product Information:

Mead Johnson Nutritionals, Evansville, IN, 1990.
Ross Laboratories, Columbus, OH, 1990.
+ Wyeth-Ayerst Laboratories, Philadelphia, PA, 1990.
++ Pennwalt Corporation, Rochester, NY, 1990.

These solutions contain a 2.0% to 3.0% carbohydrate source and electrolytes. Solutions with a higher sodium content (75 to 90 mEq/L) are intended for rapid treatment of significant dehydration (6). Food-based ORT and starch containing ORS's have been developed which may reduce stool output and promote more rapid fluid absorption (4, 5, 9).

ADEQUACY

ORT solutions contain an inadequate supply of energy and nutrients and are not suitable for exclusive use for more than 24 hours(l). Rehydration followed by the early, gradual reintroduction of the usual diet for age is currently recommended to prevent deterioration of nutritional status (4, 6, 10). An extended period of fasting or "bowel rest" should be discouraged as the benefits of continued feeding tend to outweigh any adverse effects (10). Withholding of diet may be indicated, however, in the presence of severe dehydration, circulatory failure, CNS disturbances, intractable vomiting, and marked abdominal distension (6, 7).

Use of the BRAT diet (consisting of bananas, rice, applesauce and tea or toast) for the treatment of diarrhea has not been supported by research nor is now generally recommended. This diet is deficient in fat, protein, total calories, vitamins, and minerals and does not provide the needed electrolytes that ORS provides (11). Refer to the Soft Diet section of the diet manual for guidelines regarding foods that are usually well tolerated when re-introducing solid foods into the child's diet.

SPECIFIC RECOMMENDATIONS FOR THE ORAL MANAGEMENT OF ACUTE DIARRHEA (1, 5-8, 10)

1) Treatment of acute dehydration

   a) Generally 40 to 50 ml/kg ORS is given over the first 2 to 4 hours for mild dehydration; 80 to 100 ml/kg over 6 hours for moderate dehydration.

   b) Rehydration requiring longer than 6 hours to achieve and severe dehydration with evidence of shock are indications for use of intravenous therapy (IVT).

   c) In the presence of vomiting, frequent small feedings, 5 to 15 ml every 5 minutes, should be given by spoon or syringe.

2) Maintenance of hydration/prevention of dehydration

   a) Ongoing losses are replaced with 4 to 8 oz. of ORS for each diarrheal stool, or 10 to 15 ml / kg / hr; ORS should be offered until diarrhea ceases.

   b) After 12 to 24 hours of treatment, ORS can be alternated with a low-solute fluid such as water, breast milk, or diluted fruit juice until diarrhea ceases.

   c) Total fluid volume should not exceed 150 ml/kg/24 hr.

3) Reintroduction of regular diet for age

   a) For the breast-fed infant
      - Breast milk can be offered once the initial rehydration is complete.
      - ORS should be alternated with breastn-dlk ad fib to satisfy thirst.

   b) For the formula-fed infant
      - The regular formula should be resumed within 24 hours after treatment begins.
      - Milk-based formulas may be better tolerated if diluted to half- or threequarters strength for 1 to 2 days following an extended NPO period.
      - A lactose-free or hypoallergenic formula should be offered for suspected lactose intolerance or transient malabsorption.
      - For infants older than 4 to 6 months, reintroduction of previously tolerated solid foods should not be delayed more than 24 hours, and should begin with easily digested, complex carbohydrates (e.g., oat cereal, mashed potatoes, pasta).

   c) For children over one year of age
      - Rehydration with ORS is preferrable to water or diluted fruit juices.
      - Products with high carbohydrates, low electrolyte and base content such as carbonated beverages, sweetened tea, and Kool-aid should be avoided during initial treatment.
      - Solids: Starches (complex carbohydrates) and protein sources should be reintroduced first. Fat is not restricted. Cooked vegetables, fruits, and milk or milk substitute should be gradually resumed over the next 3 to 7 days.

CHRONIC, NONSPECIFIC DIARRHEA

ETIOLOGY

Chronic, nonspecific diarrhea is also known as "toddler's diarrhea" because onset typically occurs between 6 and 18 months of age with spontaneous resolution in most children by age 40 months (1, 3, 12). Symptoms include intermittent episodes, e.g., 3 to 8/day for 4 to 5 days each month, of watery stools containing mucus and undigested food (2, 12). There is usually no clearly definable precipitating cause, although infections and certain dietary factors and drugs are though to contribute (1, 3, 12). Overfeeding; giving excessive amounts of fluid; consuming a low-residue, high-carbohydrate, low-fat diet; and sorbitol. malabsorption have each been implicated (1, 3, 4, 12).

NUTRITIONAL MANAGEMENT (1, 3,12)

1) The diet should be evaluated for excessive total caloric intake, or overfeeding.
2) Clear fluid intake, especially of fruit juices with a high fructose/ glucose ratio, should not exceed 150 to 200 ml/kg/day.
3) Sorbitol-rich foods such as sugar-free candy or gum, dried prunes, and pear juice should be avoided.
4) A diet especially low in fat should be adjusted to provide 30 to 55% of total calories from fat, or 4 gra fat/kg/day.

A thorough dietary history and evaluation of a "stool log" can be helpful in guiding the therapeutic intervention (12). A growth curve that plateaus despite consumption of an apparently adequate caloric intake in the child with chronic diarrhea is an indication for a more extensive differential diagnostic work-up (4,12).

CHRONIC, INTRACTABLE DIARRHEA

ETIOLOGY

The classic definition of the syndrome of intractable diarrhea includes the following criteria: age of onset less than 3 weeks; duration greater than 2 weeks; and stool cultures which are negative for enteric pathogens (13, 14). It is now recognized that intractable diarrhea is a major cause of malnutrition, growth failure, and mortality in infants and toddlers throughout the world (2, 4, 5, 13, 15).

The precipitating cause of the diarrhea may remain unidentified, but injury to the intestinal mucosa with associated villous atrophy is not uncommon (13, 14). In the absence of intestinal injury, anatomic anomalies, disorders associated with secretory diarrhea, or inborn errors of metabolism are suspected (3, 13). A vicious cycle of malabsorption, malnutrition, and secondary infection may ensue (13, 14).

NUTRITIONAL MANAGEMENT

There are three main objectives of therapy for intractable diarrhea in infancy (1, 13,14): 1) To correct fluid and electrolyte imbalances. 2) To reverse catabolism and growth failure through provision of adequate calories, protein, and other nutrients. 3) To diagnose and treat any underlying disorder associated with the diarrhea.

Following rehydration with either ORT or 1VT, calorie and protein requirements for catch-up growth are estimated and nutrition support is initiated. In less severe cases, semielemental (e.g., hypoallergenic) or elemental formula feedings are attempted first, by mouth or by continuous intragastric drip feeds. Severly malnourished infants may require an initial period of primarily parenteral nutrition therapy with a gradually increasing proportion of requirements being provided via the enteral. route (13-15). Current treatment modalities favor the use of at least a minimal amount of an enteral feeding, such as "trickle" feeds of a lactose-free, protein hydrolysate formula dripped at a low rate to promote villous recovery and enhance GI function (13-15). In addition, there is evidence that intravenous administration of albumin in hypoalbuminemic pediatric patients presenting with reduced enteral feeding tolerance can expediate nutritional repletion (13, 15, 16). The length of time necessary for complete recovery from intractable diarrhea varies from as little as 8 to 10 days to as long as 6 months (13).

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NUTRITIONAL MANAGEMENT OF THE PEDIATRIC ONCOLOGY PATIENT

GENERAL DESCRIPTION

Nutrition support goals for the pediatric oncology patient are to prevent or reverse malnutrition; promote growth and development; improve survival and tolerance of treatment; and maximize quality of life (1, 2). As the nutrient requirements of cancer patients are not well-defined, it is important to assess individual needs with special consideration of the type and stage of cancer, treatment protocols, and response to therapy (1, 2). (Note: See also the adult oncology chapter of the diet manual).

INDICATIONS AND RATIONALE

The type of neoplastic diseases associated with the highest nutritional risk in pediatric patients include (2, 3):

1) Advanced diseases with solid tumors such as Stage III and 11-V Wilm's tumor and neuroblastoma
2) Acute non-lymphocytic and multiple relapse leukemias
3) Medulloblastoma

Neoplastic diseases felt to have a lower nutritional risk include (2, 3):

1) Non-metastatic solid tumor
2) Acute lymphocytic leukemia with good prognosis
3) Advanced diseases in remission

In addition to physiological stresses such as surgery, fever, and infection, factors that may alter nutrient requirements and endanger nutritional status in the cancer patient include (1, 2, 3):

1) Local consequences of the tumor mass, such as impaired GI function or mechanical obstruction.
2) Distant tumor effects, such as hormonal imbalance and insufficient metabolism.
3) Malabsorption, stomatitis, mucositis, ileus, nausea/ vomiting/ diarrhea induced by chemotherapy or radiotherapy.
4) Anorexia caused by altered taste perceptions or learned food aversions.

SPECIAL CONSIDERATIONS

Nutritional status at the time of diagnosis is felt to be a strong prognostic indicator of outcome for children with cancer, especially in the highest-risk disease group (2) (i.e., patients who are determined to be malnourished at diagnosis have poorer survival rates).

This association has been found in patients meeting one or more of the following criteria (2):

1) ≥5% weight loss
2) weight for height < 5th percentile
3) serum albumin of ≤3.2 g/dl.

Studies of pediatric oncology patients suggest that serum proteins with shorter halflives than albumin, especially prealbumin, are more useful indicators of both subclinical malnutrition and successful early repletion (1-3, 5, 6).

NUTRITIONAL MANAGEMENT

Nutrient and fluid requirements may be estimated using the methods described in the first section of this chapter. To use the basal energy expenditure (BEE) equation to estimate energy needs, a factor of 1.8 to 1.9 has been suggested to allow for growth, stress, and light activity (4). Protein intake provided at 2.5 to 3.0 g/kg/day has been shown to improve serum protein concentrations (2). Fluid needs are increased during antineoplastic therapy (usually twice maintenance) and high-output renal failure (1).

In the child presenting with malnutrition, or for one who cannot or will not consume an adequate amount orally, nonvolitional enteral or parenteral nutrition support may be required (1, 2, 3). Enteral support with nutrient-dense foods and/or tube feedings is most effective in the lower nutritional risk groups (2). For high risk groups, or those with compromised GI function, central hyperalimentation has been shown to be effective in promoting growth and preventing or reversing protein-energy malnutrition (1, 2, 3).

Feelings of anxiety, isolation, depression, and fear may alter appetite and decrease the child's willingness to eat. Children may be angry about being ill and food then becomes a tool to manipulate their environment (1). De-emphasizing food as an issue may improve oral intake once the child is feeling better. Minimizing meal disruptions, feeding the child when he is rested and relaxed, and offering frequent praise and appropriate rewards are other strategies for improving intake (1).

Refer to the adult oncology section of the diet manual for suggestions to maximize intake in the patient experiencing undesirable side effects of cancer and/or cancer treatment.

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PEDIATRIC WEIGHT CONTROL

GENERAL DESCRIPTION

A weight control program for pediatric patients provides sufficient calories and nutrients to allow for a reduction in the rate of weight gain or a gradual weight loss without compromising growth and development (1, 2). The most successful weight management plans incorporate exercise and behavior modifications into the treatment, in addition to the diet therapy, and are family-based (3).

INDICATIONS AND RATIONALE

The prevalence of obesity in children and adolescents was shown to have increased by 54% and 39%, respectively, over a 15-year period in a recent national survey (1, 4). Pediatric obesity has been associated with a higher risk for several chronic medical conditions including hyperlipidernia; FITN; gallbladder disease; and respiratory and orthopedic problems (1-5). Psychosocial difficulties, such as peer ostracism and low selfesteem, are also more common among obese children (1, 4).

Obesity with an onset in late childhood or early adolescence is more likely to become severe, to be resistant to successful treatment, and to persist into adulthood (1-5). An increasing awareness of the environmental and family variables which seem to be important determinants of childhood obesity (e.g., excessive T.V. watching with decreased activity and increased consumption of calorically-dense snack foods; parental obesity) underscores the value of early, preventive intervention at the family and community levels (3,4).

NUTRITIONAL MANAGEMENT

A) ASSESSMENT

Criteria that are used to diagnose pediatric obesity include (1, 2, 4, 5): 1) Weight > 20% of normal (standard) for height and age. 2) Triceps skinfold thickness ≥ 85th percentile.

In addition, the degree of obesity may be specified as follows (2):

$$\%\text{Standard} = \frac{\text{Actual weight}}{\text{Standard weight for height or age}} \times 100$$

120 to 139% standard = mildly obese
140 to 159% standard = moderately obese
> 160% standard = severely obese

Assessing the degree of obesity can be helpful in estimating the appropriate calorie level for the pediatric weight control diet plan.

B) ESTIMATING CALORIC REQUIREMENTS

The goal of weight control for mildly obese children is stabilization or maintenance of weight while the child continues to increase in stature, i.e., to "grow into" the weight until the weight for height is at the standard percentile (2, 5). In contrast, moderately to severely obese children are medically at higher risk and gradual weight reduction is indicated (2, 5).

1) For the mildly obese child or adolescent in Tanner Stage 1, 11, or III: use BMR (see Table 2) or BEE for current weight, height, and age plus an adjustment for activity level, 10 to 100% above basal.
2) For the moderately to severely obese child or adolescent in Tanner Stages IV and V: use BMR or BEE for standard weight for current height and age plus an adjustment for activity level.

C) NUTRITIONAL ADEQUACY

The weight control diet can be designed to meet the RDA for all nutrients if it provides at least 1200 calories and a variety of foods are eaten (2). The calorie-controlled diet for the pediatric patient should provide sufficient macro- and micro- nutrients to meet lean fissue growth requirements (5).

For additional dietary guidelines for weight management, refer to the Calorie Controlled chapter of the diet manual.

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NUTRITIONAL CONSIDERATIONS FOR THE PEDIATRIC DIABETIC

GENERAL DESCRIPTION

Type I or insulin-dependent diabetes mellitus (IDDM) is the third most common chronic illness in childhood with a prevalence of about 1.3 per 1000 children in the U.S. (1). The primary objectives of medical treatment are similar to those for adults with IDDM, and include: (a) the maintenance of blood glucose and lipid levels at normal or near-normal levels; and (b) the provision of calories and nutrients at levels which will promote a normal growth rate and an ideal body weight, and which are consistent with age and activity requirements (1, 2, 3).

INDICATIONS AND RATIONALE

Children with IDDM have the same basic nutritional requirements as other children with two important differences (3):

1) The need to avoid concentrated sweets.
2) The need to maintain consistency in the timing and quantities of food eaten at meal and snack times from day to day.

Attention to these two needs will facilitate the design of an insulin regimen that is more likely to promote well-controlled blood glucose levels (1, 2).

NUTRITIONAL MANAGEMENT

IMPLEMENTING THE DIET

Children with diabetes usually require 3 meals and 3 snacks (i.e., mid-morning, mid-afternoon, bedtime) when a two-shot per day insulin regimen is used, although 3 meals plus 2 snacks may be sufficient for the adolescent diabetic (3). Attendance of school and social functions and participation in sports requires special attention and pre-planning for the school-age child with diabetes (2, 3).

Use of the American Diabetic Association/American Dietetic Association (ADA) diabetic exchange system for meal planning in combination with home glucose selfmonitoring (SMBG) seems to enhance blood glucose control if compliance with each is good (1, 4). The following are general guidelines for nutritional management of the pediatric diabetic. Refer to the adult diabetic chapter of the diet manual for additional information regarding nutrition care planning for the pediatric diabetic and about the ADA exchange system.

GENERAL GUIDELINES FOR THE PEDIATRIC DIABETIC DIET (1-5):

1) Calories - RDA for age with adjustments for'growth rate and activity level.
2) Protein - RDA for age, or 10 to 20% of total calories; distribute proportionately among meals and snacks.
3) Carbohydrate - 50 to 65% of total calories with an emphasis on complex carbohydrates and soluble fiber - rich sources; distribute proportionately among meals and snacks; avoid concentrated sweets.
4) Fat - 25 to 35% of total calories with an emphasis on polyunsaturated and monounsaturated sources; cholesterol intake ideally < 300mg/day.
5) Non-nutritive sweeteners - Use in moderation; aspartame intake ideally < 50mg/kg/day; monitor sorbitol intake for tolerance.
6) Sodium - Avoid added salt.
7) Alcohol - Not recommended; has a hypoglycemic effect; may contribute to hyperhpidemia.
8) Encourage a "clean plate;" discourage "nibbling."
9) Keep readily absorbable carbohydrate within reach to treat hypoglycemic reactions.
10) Periodic and regular nutritional assessments every 3 to 6 months are recommended.

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NUTRITIONAL CONSIDERATIONS FOR THE PEDIATRIC CARDIOLOGY PATIENT

GENERAL DESCRIPTION

Cardiovascular diseases in children may be broadly classified as either congenital or acquired. Congenital heart disease (CHD) is a major cause of death in the first year of life (1, 2). The incidence of CHD is widely reported to be 7 or 8 in each 1000 live births (1-3). At least 50% of these infants require surgical intervention, either corrective or palliative, before age 1 (3). The incidence of acquired pediatric heart disease is not well documented but is thought to be much less common (1, 2).

The etiology of the heart defect in most cases of CHD is unclear and is probably multi-factorial (1). Factors which have been associated with a higher incidence of CHD include (1, 4, 5):

1) Prenatal factors - viral illnesses (e.g., rubella); maternal drug ingestion; fetal alcohol syndrome; maternal insuhn-dependent diabetes; lUGR and prematurity.
2) Genetic factors - familial history of cardiac defect; chromosomal abnormalities (e.g., Down syndrome, Turner syndrome).

In addition, children with CHD have higher incidence of certain other co-existing clinical conditions, especially (1-5):

1) Growth retardation
2) Extra-cardiac anomalies, such as renal agenesis and tracheoesophageal fistula
3) Cardiac cachexia
4) Congestive heart failure (CHF)
5) Recurrent respiratory infections
6) Gastroesophageal. reflux

For diagnostic purposes, congenital heart defects, or "lesions", may be divided into two major categories based on the alteration in blood circulation. These are defined as (1, 3):

1) Acyanotic - Where there is no evidence of mixing of desaturated (or poorly oxygenated) blood in the systemic arterial circulation. May be relatively asymptomatic if the defect is small and the heart is able to compensate. The most common types are ventricular septal defect (VSD) and patent ductus arteriosus, (PDA).

2) Cyanotic - Where there is evidence of desaturated blood entering the systemc: arterial circulation. Cyanosis; anemia or polycythen-da; and an increased or decreased pulmonary blood flow may be clinically apparent. Most common types are transposition of the great arteries and tetralogy of Fallot (TOF). Table 18 lists common types of acyanotic and cyanotic congenital heart defects (1, 3, 6).

Tabel 18. COMMON TYPES OF ACYANOTIC AND CYANOTIC CONGENITAL HEART DEFECTS

Acyanotic	Cyanotic
Ventricular septal defect (VSD)	Transportation of the great arteries
Patent ductus ateriosus (PDA)	Tetralogy of Fallot (TOF)
Atrial septal defect (ASD)	Tricuspid atresia
Atrioventricular canal defect	Pulmonary atresia
Pulmonary stenosis	Truncus arteriosus
Aortic stenosis	Double outlet right ventricle
Coarctation of the aorta	Single ventricle
Hypoplastic left ventricle	Total anomalous pulmonary venous connection

It should be noted that a definitive diagnosis cannot be made based simply on a classification of "cyanotic" or "acyanotic" since manifestations of a particular defect can be variable and may change with time (1).

Examples of acquired cardiovascular disorders include (1):

1) CHF
2) Bacterial endocarditis
3) Rheumatic fever
4) Cardiomyopathy
5) Systemic hypertension
6) Kawasaki disease
7) Cardiac dysrhythmias
8) Cardiovascular manifestations of HIV infection (7)
9) Pediatric hyperhpidemia secondary to another primary disease state (e.g., hepatic disease, nephrotic syndrome) and/or corticosteroid therapy

This section deals primarily with the management of congenital heart disease.

INDICATIONS AND RATIONALE

The highest occurrence of severe growth retardation and cardiac cachexia have been reported in children with CHD who have had a history of CHF or pulmonary hypertension, especially in combination with a cyanotic defect (1-6). The possible mechanisms leading to growth retardation and impaired nutritional status in infants and children with abnormal cardiovascular hemodynamics have five main postulated etiologies (2-6, 8-10):

1) Inadequate caloric intake - secondary to anorexia; early satiety; fatigue due to chronic hypoxia, labored respiration, and diuretic-induced electrolyte or watersoluble vitamin imbalance; tachypnea; dyspnea; emesis due to delayed gastric emptying, presence of GER or medications.

2) Relative hypermetabolism - resting metabolic rate (i.e., oxygen consumption) per kilogram body weight is increased due to: an increase in cardiac and respiratory work from 5 to 10 percent of BEE to 25 to 30 percent; and/or changes in body composition as growth failure progresses, such as cardiornegaly and loss of subcutaneous fat, which result in a higher proportion of metabolically active tissue compared to a normal healthy child.

3) Cellular hypoxemia - reduced peripheral blood flow; acidosis.

4) Malabsorption - secondary to mild to moderate protein-losing enteropathy of an unclear etiology, possibly related to tissue hypoxia; presence of intestinal edema related to hypoalbuminemia; impaired pancreatic function and abnormal intestinal motility as a result of impaired perfusion and tissue atrophy; medication-induced diarrhea.

5) Frequent respiratory infections or other concomitant systemic illness.

While the etiology of malnutrition in CHD patients is probably multifactorial, data suggest that enhanced protein-energy needs play a larger role than does reduced caloric intake (8, 9). Prolonged nutritional deficits and progressive growth disturbances may heighten surgical risks in those patients awaiting operative intervention (8). If possible during the pre-op period, a nutritional assessment should be completed and nutritional repletion begun if indicated, either as an outpatient or during hospitalization (4).

Surgical intervention usually facilitates the patient's response to nutritional rehabilitation, although some defects require repeated surgeries or eventual transplantation (4, 5). During the post-surgical period, special consideration must be given to the potential side effects of frequently used medications (e.g., diuretics, digitalis, cardiac glycosides, corticosteroids) on appetite; fluid and electrolyte imbalance; and carbohydrate and lipid tolerance (2). Moreover, extended mechanical ventilation, metabolic instability, and a slow return of normal bowel function will affect the timing, mode, and formulation of the nutrition support regimen that is implemented (4-6).

NUTRITIONAL ASSESSMENT

The nutritional assessment of the infant with CHD or acquired CVD should include the usual evaluation of anthropometric, biochemical, clinical, and dietary information (2, 6). Weight may be an unreliable indicator of growth in these patients in the presence of CHF and fluid retention (6). Nevertheless, criteria for evaluating growth failure are similar to those described for evaluating organic FTT, including a low weight for length (i.e., < 5th percentile); a flattening of the weight, length, and head circumference curves for age; and a below-average daily weight gain (2,5).

In addition to the usual assessment information, previous and current dietary regimens should be assessed for estimated renal solute load (RSL) and electrolyte and total fluid (free water) intakes along with Cal/kg/day, protein gm/kg/day, and percentage distribution of total calories (2). Observations of feeding sessions to evaluate ability to coordinate suck and swallow with breathing and possible formula intolerances are beneficial as are records of stool frequency and consistency (2, 4, 6).

DETERMINING AND MEETING NUTRITIONAL REQUIREMENTS

Energy, protein and other nutrient requirements are dependent on the current clinical status of the patient; on the evidence of nutritional deficits; the age of the patient; the severity of the cardiac lesion; and the degree of growth retardation (4, 6, 8). Estimated needs to promote growth and repletion can be calculated by using the catch-up growth requirement equation in the FTT chapter of the pediatric section (see Table 14); by multiplying the BMR (Table 2) by a factor of 2.0 to 3.0; or by providing 30 to 60 cal/kg/day over the RDA for age (5, 6).

To achieve the goal intake, various methods may be indicated. These include ad lib feeds of calorically-dense formula, oral gavage, nasogastric, or nasoduodenal enteral. feedings (i.e., nonvolitional feeding); or parenteral hyperalimentation (2, 6, 8, 10, 11). Continued attention must be given to balancing goals for growth with hydration and respiratory status, organ function, and gastrointestinal tolerance (14). Continuous nasogastric or nasoduodenal feedings of a standard, lactose-free, or semi-elemental formula, alone or in combination with a 20% intravenous hpid, intravenous lipid infusion, have been successfully used to improve overall nutritional status during the pre-op and post-op periods in the critically ill pediatric patient who presents with CHF, cardiac cachexia, and intestinal dysfunction (6, 8, 11).

GOALS OF NUTRITIONAL THERAPY

Short-term goal for patients with CHD and acquired CVD are to promote optimal nutritional status while preventing an increased fluid accumulation and electrolyte imbalances during diuretic therapy and periods of activity intolerance, continued use of concentrated feedings, and restricted fluid intake (1, 2). Long-term goals are to achieve a normal growth pattern, within realistic limits; and to promote development of ageappropriate feeding skills (2).

SPECIFIC RECOMMENDATIONS FOR INFANTS

Changes to calorically-dense formulas, i.e., greater than the standard 20 cal/oz. density, should be made gradually to allow GI adaptation to increasing osmolality and RSL (4). Formulas should first be concentrated to 24 to 28 cal/oz. (Tables 10 and 11) with additional calories provided through supplementation with modular fat and carbohydrate products to achieve a final density of 30 to 36 cal/oz. Expressed human milk can be similarly enhanced through addition of a human milk fortifier plus fat and carbohydrate additives (4, 6, 10). Please refer to Tables 7 and 15 and the Appendix for more information regarding formulas and caloric supplements appropriate for use in the pediatric population.

In summary, general guidelines for promoting catch-up growth and nutritional repletion in infants with CHD are as follows (2-6, 8-11):

1) Provide caloric intake of 130 to 170 cal/kg/day using calorically-dense formulas. Modular fat additives (e.g., MCT oil, Microlipid) have the advantage of allowing increased caloric density with minimal increases in the volume, osmolality, or C02 production-potential of the formula. Monitor urine output and specific gravity when hypercaloric formulas are used, especially in conjunction with diuretics.

2) Provide protein intake of 2.5 to 4.0 gm/kg/day to promote accretion of lean body mass and for repletion. Protein should represent 8 to 12% of total calories, on average.

3) Provide fluid intake of 90 to 150 ml/kg/day and adjust total fluid (free H20) allowance per physician.

4) Provide sodium intake at 2 to 4 n-LEq/kg/day and potassium at 2 to 3 mEq/kg/day initially with adjustments based on lab monitoring, changes in medications, and fluid status. A low-sodium formula (e.g., SMA 20, SIMILAC PM 60/40) may be indicated for the infant with excess fluid accumulation or CHF. Most comercially prepared infant foods are relatively low in sodium; attention should be paid to the sodium content of home-prepared infant foods (2).

5) With restricted formula volumes, provide a daily pediatric multivitamin supplement; provide one with iron if hematologic status indicates need. Provide other vitamin/mineral supplements as indicated, such as potassium.

6) Infants with CHF might benefit from a regimen of small volumes of formula being offered at frequent intervals, every 2 to 3 hours, using a soft nipple with a moderately large opening; gavage feedings may be recommended if infant becomes fatigued prior to taking a specified amount (1).

SPECIFIC RECOMMENDATIONS FOR CHILDREN (1, 2,4,12):

1) Estimate nutritional requirements for catch-up growth calories using the methods previously suggested in the FTT section; or provide calories at the RDA level for age and sex.

2) Provide protein at 2 to 3 times the RDA level for age and sex for catch-up growth and repletion; or provide protein at 12 to 16% of total calories, on average.

3) Keep total fluid (free H20) allowance at 1 to 11/2 maintenance requirements; or as specified by physician.

4) Limit sodium to 3 to 4 mEq/kg/day up to 2 gm/day total; or other level as specified by physician for control of CHF or hypertension.

5) Provide potassium supplements and/or encourage consumption of potassiumrich foods to replace losses induced by diuretic therapy

6) Provide other vitamin /mineral supplements as indicated.

7) Provide calorie and protein supplements throught the use of low sodium modular components or complete enteral formula products such as Pediasure.

Refer to the adult cardiology chapter of the diet manual for additional guidelines regarding sodium restricted diets as adapted from the American Heart Association (AHA) guidelines. The AHA guidelines can also be used to develop a healthy eating plan for individuals over the age of 2 who have been identified as having either genetically determined, "primary" hyperlipidemia or acquired hyperlipidemia. The goal of dietary management for these children is to improve the hpid profile to reduce the risk of cardiovascular disease while supporting normal growth and development (13).

HOW TO ORDER:

1) Specify Pediatric Diet for Age if no sodium restriction or fat modification is indicated.

2) Specify Pediatric Cardiology Low Salt Diet for Age to provide 1000 to 2000 mg sodium/day or approximately 2. to 4 mEq/kg/day sodium when consumed in child-size portions.

3) Specify Regular Diet for Age with No Added Salt (NAS) to provide 2000 to 4000 mg sodium/day or approximately 4 to 6 mEq/kg/day sodium when consumed in child-size portions; or 4000 to 6000 mg/day in adult portions.

4) Specify an exact level of sodium where intake is being closely monitored.

5) Specify Heart Disease Prevention Diet (HDPD) for fat modification.

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ADDITIONAL RESOURCES:

The American Heart Association
National Center
7320 Greenville Avenue
Dallas, TX 75231

Note: AHA offers many publications related to congenital heart disease intended as guides for parents, such as: 1) Feeding Infants with Congenital Heart Disease; and, 2) If Your Child has a Congenital Heart Disease.

Low Lactose Diet
Nutritional Guidelines

FOOD GROUPS	*FOODS LIMITED*
BEVERAGES	Milk in any form from a human or animal source that has not been treated with lactase enzyme: whole, skim, non-fat, sweet acidophilus, buttermilk, chocolate, malted, dried, evaporated or condensed; Ovaltine®; hot chocolate
MEAT AND PROTEIN FOODS	
Meat	Any meat or meat product prepared with milk such as creamed or with milk gravies
Egg	Eggs creamed or with milk gravies; quiche
Cheese	Any in excess of I oz. or as tolerated
Yogurt	AU except in limited amounts (unpasteurized yogurt may be better tolerated)
Meat Substitutes	Any prepared with milk
VEGETABLES	Those with sauces made with milk or cream
BREADS AND STARCHES	
Bread	None
Cereal and Grain	Those prepared or served with milk
Starchy Vegetable	Those with sauces made from milk or cream
Fruit	None
FATS	None
SOUPS	Soups prepared with milk or cream
SWEETS/DESSERTS	Any prepared with milk or cream such as ice cream, ice milk, sherbet, pudding, custard; chocolates, caramel, butterscotch or toffee
MISCELLANEOUS	Milk gravies, cream sauces

NOTE: the following ingredients DO NOT contain lactose:
lactate, lactic acid; lactoalbumin; lactylate, sodium caseimate; casein hydrolysates;
calcium compounds, Kosher foods marked "pareve' or 'parve'; whey protein

Low Lactose Diet
Nutritional Guidelines

FOOD GROUPS	*FOODS ALLOWED*	*FOODS LIMITED*
BEVERAGES	Tea; coffee, freeze dried coffee, instant coffee*, soft drinks and soft drink mixes*, soybean milk substitutes, lactose free supplements, fruit and vegetable juices and drift'	Milk in any form from a human or animal source: whole, skim, non-fat, sweet acidophilus, buttermilk, chocolate, malted, dried, evaporated or condensed; Ovaltine®, hot chocolate, instant coffee*, soft drinks and soft drink mixes'
MEATAND PROTEIN FOODS		
Meat	Beef, lamb, pork, veal, ham, fish, seafood, poultry, and organ meats prepared without milk or milk products*; frankfurters and luncheon meats'; strained or junior meats and meat combinations'	Any meat or meat product prepared with or containing milk or milk products: creamed and breaded* meat, seafood or poultry; sausage, frankfurters, liver sausage or pudding, cold cuts, bologna*
Egg	Poached, boiled, fried or scrambled prepared without milk or milk products	Any prepared with milk or milk products
Cheese	None	AR
Yogurt	None	AR
Meat Substitutes	Peanut butter*; nuts; dried beans and peas; lentils	Soybean products or peanut butter containing lactose'
VEGETABLES	Any canned, fresh, or frozen vegetables prepared without milk or milk products	Any prepared with milk or other lactose containing ingredients: breaded, buttered or creamed vegetables, instant potatoes, com curls, frozen french fries*
BREADS AND STARCHES		
Bread	French, Italian and Vienna bread; kosher breads and crackers; homemade and commercial breads and crackers made without milk or milk products'; rice cakes*; soda crackers*	Any bread or cracker containing milk or milk products: pancakes, waffles, biscuits, muffins, combread, and prepared mixes
Cereal and Grain	Cooked cereals: grits, cream of wheat and oatmeal; prepared cereals without lactose*; rice, macaroni, noodles	Instant and dry cereals containing milk or lactose containing ingredients*
Starchy Vegetable	Baked, boiled, or whipped white or sweet potato without milk or milk products; dried beans and peas	Any made with milk or milk products: commercial french fries*, instant potato mixes*, com curls, creamed, mashed, or au gratin potatoes; rice with milk gravy

Low Lactose Diet
Nutritional Guidelines

FOOD GROUPS	*FOODS* ALLOWED	*FOODS LIMITED*
FRUIT	All fresh, canned, or frozen that are not processed with lactose'	Any canned or frozen containing lactose*
FATS	Margarines and salad dressings which do not contain milk or milk products*, oils, shortening, bacon, lard, mayonnaise, some non-dairy creamers*, olives	Margarine and salad dressings containing milk or milk products; sweet and sour cream, whipped topping; non- dairy creamers
SOUPS	Broth, homemade soup with allowed ingredients	Creamed soup, canned and commercially prepared soup that contain milk products*
SWEETS	Sugar, honey, molasses, syrup, jam, jelly, marmalade, preserves; pure sugar candies: gum drops, hard candy, lollipops, jelly beans	Chocolate candies, butterscotch, caramel, toffee; chewing gum and artificial sweeteners containing lactose*
Desserts	Angel food cake, water and fruit ices, gelatin, homemade baked products made with allowed ingredients	AU cakes, cookies, ice cream, ice milk, custard, yogurt, puddings, pies, sherbets and commercial dessert mixes containing milk or milk products*; gelatin made with carrageen
MISCELLANEOUS	Catsup, chili sauce, horseradish, soy sauce, Worchestershire sauce, mustard, vinegar, 100% pure cocoa powder, pure herbs and spices, salt, pepper, olives, pickles, plain popcorn, gravies and cream sauces made without milk*; pure monosodium glutamate	Some cocoas*; antibiotics, vitamin and mineral preparations and spice blends containing lactose*; buttered popcorn; cordials and liquers; monosodium glutamate extender; milk gravies; cream sauces

I Check labels for the following ingredients which contain lactose: milk, milk products; milk solids; skim milk powder, lactose, lactulose, dry milk curds or whey, demineralized whey, whey solids; cas6n

NOTE the following ingredients DO NOT contain lactose: lactate; lactic acid; 14ctoalbumin; lactylate; sodium caseimate; casein hydrolysates; calcium communds; Kosher foods marked "pareve' or "parve'; whey protein