INDIANA
DIET
MANUAL

EIGHTH EDITION

INDIANA DIETETIC ASSOCIATION
Preface

The Indiana Dietetic Association has designed and prepared the 2011 Diet Manual to accommodate a variety of institutional care providers. The goal of this manual is to provide basic concepts in nutrition and dietetics for food service providers in these institutions, as well as resources for further information. Food service professionals and other staff members will be able to use this manual as a guide in meal planning for diverse populations. Physicians may use this to aid in determining appropriate modified diets. In addition, nurses and other staff members may use the manual to interpret and carry out physician orders or dietitian recommendations.

The Indiana Dietetic Association reviews and revises the Diet Manual as needed every five years. With each new edition, we aim to incorporate the most up to date information available. The manual is divided into five sections:

1. Nutrition Assessment
2. Principles of Nutrition
3. Medical Nutrition Therapy
4. Diet Therapy
5. Appendix

The first section covers nutrition assessment of adults and children, including methods of determining nutrition requirements. The second section uses the US Dietary Guidelines and Pyramid Food Guide to describe the basic principles of nutrition care. Upon the release of the 2010 Guidelines, a revised supplemental section will be sent to buyers. The third section includes guidelines for nutritional management of specific diseases. The fourth section is intended provide a guide for food services to fill prescriptions for diet modifications. The appendices include pediatric growth charts and information on infant formulas.

As in the Seventh Edition, this manual utilizes the American Dietetic Association’s Nutrition Care Process (NCP) Model (Lacey & Pritchett, 2003, p.1063) in order to address nutrition care for a variety of diseases and conditions. The NCP has the following 4 steps:

1. Nutrition Assessment
2. Nutrition Diagnosis
3. Nutrition Intervention
4. Nutrition Monitoring and Evaluation

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Section 1A: Adult Nutrition Assessment

**Adult Nutrition Assessment**

The first step in the nutrition care process is nutrition assessment. Dietetics professionals use nutrition assessment in several ways:

- to determine a person’s current nutrition status and needs
- to develop a plan for improvement
- to monitor the outcomes of interventions
- to decide when to change the care plan

Some facilities develop a nutrition screening process to identify who needs a full nutrition assessment. They choose risk factors for their specific population. A variety of healthcare staff can complete simple, brief screening. This frees the dietitians to focus on those with greater needs. It is important to note that nutrition screening and assessment must be completed in a preset time frame. Accrediting or regulatory agencies often specify the time allowed (Charney & Malone, 2009, p. 16).

Nutrition assessment must include multiple factors. No factor has adequate specificity and sensitivity to be used alone. The key components of nutrition assessment covered in this section are:

- medical diagnosis
- patient history
- anthropometric data
- biochemical data
- nutrition-focused physical exam

**Glossary**

*Medical diagnosis* is the identification of a disease or pathology of specific organs or body systems that can be treated or prevented. It does not change as long as the disease or condition is present.

*Nutrition diagnosis* is the identification and labeling of a specific nutrition problem that a dietitian can treat independently. It changes as the person’s response changes.

**Medical Diagnosis**

In the past, the medical diagnosis has provided the organizational framework for nutrition assessment and care planning. The medical nutrition therapy section of this manual provides guidelines for steps in the nutrition care process based on the medical diagnosis.

The American Dietetic Association has developed standardized language for making nutrition diagnoses. Medical and nutrition diagnoses are not the same. Dietitians use medical and health history data to evaluate the nutrition-related causes or consequences of disease. Beyond this, they cluster, synthesize and analyze assessment information of all types to identify and label nutrition problems (Nutrition Diagnosis and Intervention: Standardized Language for the Nutrition Care Process. Chicago, American Dietetic Association, 2007, p. 3-5)
Section 1A: Adult Nutrition Assessment

Patient History

Use several sources for the patient history. Review the medical records. Interview the person, the family, or other caregivers. For a thorough assessment, include the following factors from the ADA’s nutrition care process.

**Medical and Health History**
- Present and past illness or disease
- Family medical history
- Mental health history

**Social History**
- Socioeconomic status
- Cultural and religious beliefs
- Daily routines and activity patterns
- Education level
- Cognitive abilities

**Diet History**
- Food and beverage intake
- Eating patterns
- Current diet modifications
- Food preferences, intolerances, or allergies

**Nutrition Knowledge**
- Knowledge and beliefs about nutrition
- Self-monitoring and health management experiences
- Previous nutrition counseling experiences

**Meal Management**
- Meal planning
- Food availability
- Food purchasing
- Food preparation methods
- Food safety practices

**Anthropometric Data**

Height and weight are the most commonly used anthropometric data in adults. Other measures include data on body composition from skin fold thickness and muscle circumference. Monitoring changes in anthropometric data is used in evaluating the effectiveness of the current nutrition interventions.

**Height**
To determine height, use either of the following methods.
Section 1A: Adult Nutrition Assessment

**Standing.** Measure the person:
- standing, flat-footed, without shoes
- with legs, head, and back straight
- with arms at the side

**Arm Span.** Use this method if the person cannot stand:
- extend the dominant arm at a 90° angle
- measure the distance from the sternal notch to the tip of the middle finger on the dominant hand
- double this measurement (Charney & Malone, 2009, p. 156)

**Weight**
To find weight, use a standing, chair, or bed scale.

**Evaluation of Weight Change**
Investigate unplanned weight changes. Rule out errors due to changes in clothing, bedding, or equipment, or errors in the scales. Confirm subjective reports of weight change with objective weight data and/or by physical exam.

Find the percentage weight change by using the following equation:

\[
\text{% of weight change} = \frac{\text{UBW} - \text{CBW}}{\text{UBW}} \times 100
\]

where:
- \( \text{UBW} \) = usual body weight
- \( \text{CBW} \) = current body weight

Example: a person’s weight decreased from 129 to 101 pounds in 6 months.

\[
\frac{129 - 101}{129} \times 100 = 28 \text{ divided by } 129 \times 100 = .22 \times 100 \text{ or } 22\% \text{ weight loss in } 6 \text{ months}
\]

(Charney & Malone, 2009, p 159-160)

Evaluate reasons for reported weight loss such as inadequate calorie intake, inadequate hydration, use of diuretics, or loss of tissue from immobility or amputation. Table 1A-1 provides interpretation of weight loss due to inadequate calorie intake.

Weight gain also may be a serious nutrition problem. Reasons for weight gain include extra calorie intake, medication changes, or fluid retention.

**Table 1A-1: Assessment of Weight Change**

<table>
<thead>
<tr>
<th>Time</th>
<th>Significant Weight Loss (%)</th>
<th>Severe Weight Loss (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 week</td>
<td>1 to 2</td>
<td>greater than 2</td>
</tr>
<tr>
<td>1 month</td>
<td>5</td>
<td>greater than 55</td>
</tr>
<tr>
<td>3 month</td>
<td>7.5</td>
<td>greater than 7.5</td>
</tr>
<tr>
<td>6 month</td>
<td>10</td>
<td>greater than 10</td>
</tr>
</tbody>
</table>


**Desirable or Healthy Body Weight**

*The Hamwi Method*
Section 1A: Adult Nutrition Assessment

This method provides a rough estimate of desirable body weight based on height. It does not accurately account for age, race, or frame size differences (Charney & Malone, 2009, p. 154). Use the following calculation.

Men = 106 lb for 5 ft + 6 lb/in over 5 ft
Women = 100 lb for 5 ft + 5 lb/in over 5 ft

Add 10% for large-framed people; subtract 10% for small-framed ones. For people who have had amputations, adjust the desirable weight using the percentages in Table 1A-2.

Table 1A-2: Percentage of body weight contributed by specific body parts

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Body Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand</td>
<td>.07</td>
</tr>
<tr>
<td>Arm, below the elbow</td>
<td>2.3</td>
</tr>
<tr>
<td>Entire arm</td>
<td>5.0</td>
</tr>
<tr>
<td>Foot</td>
<td>1.5</td>
</tr>
<tr>
<td>Leg, below the knee</td>
<td>5.9</td>
</tr>
<tr>
<td>Leg, at the knee</td>
<td>9</td>
</tr>
<tr>
<td>Leg, above the knee</td>
<td>15</td>
</tr>
</tbody>
</table>


The Body Mass Index (BMI)

Another way to evaluate body weight is to look at body mass (National Heart, Lung, and Blood Institute [NHLBI], 2000, p. 1). However, BMI cannot be used to evaluate people with amputation, edema, or large muscle mass. To determine BMI, use the following calculation.

BMI = weight (in kg) / height² (in M)
BMI = weight (in lb) / height² (in in) x 703.1

To interpret BMI use the following guidelines:
Normal: 19-27
Underweight: less than 19
Overweight: 28-30
Obese: greater than 30

Waist Circumference

Waist circumference is an especially useful measure to determine disease risk in people who have a BMI classified as normal or overweight. Monitoring waist circumference is helpful in estimating abdominal fat changes over time, especially if BMI does not change. It has the same predictive value as waist-to-hip ratio but it is simpler to perform. Measuring at the top of the iliac crest (the highest and widest part of the pelvis) will give you the most accurate reading.
Use the following guidelines to identify people with a greater risk for development of diabetes, high lipid levels, high blood pressure and cardiovascular disease (NHLBI, 2000, p. 1).

Men: greater than or equal to 40 in
Women: greater than or equal to 35 in

Glossary

**Acute phase response (APR)** refers to the hormonal response that occurs with inflammation associated with conditions such as infection, injury, surgery, and cancer.

**Albumin**

Serum albumin is a protein produced by the liver that is commonly used to assess adequate protein intake. Current research suggests that it is not an indicator of nutrition status so much as it is of the severity of illness (Fuhrman, Charney, & Mueller, 2004, p. 1258). It has long been thought of as a poor indicator of acute nutrition changes since it has a half-life of 14-20 days. Alterations in albumin levels, which are caused by the acute phase response (APR) to injury or illness, by hydration, by blood loss, or by malabsorption, limit its value as a nutrition indicator. See Table 1A-3. Serum albumin may be most useful in predicting high risk of mortality (Charney & Malone, 2009, pp. 65-66).

**Table 1A-3: Factors that decrease or increase albumin**

<table>
<thead>
<tr>
<th>Albumin Level (grams per deciliter)</th>
<th>Decrease</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal 3.5 to 5</td>
<td>Acute phase response</td>
<td>Intravascular volume depletion</td>
</tr>
<tr>
<td>Depletion:</td>
<td>Severe liver failure</td>
<td>Intravenous albumin or plasminate, blood</td>
</tr>
<tr>
<td>Mild 3.0 to 3.4</td>
<td>Redistribution: Intravascular volume overload, third-spacing, pregnancy, lying recumbent</td>
<td>transfusions(temporary rise)</td>
</tr>
<tr>
<td>Moderate 2.4 to 2.9</td>
<td>Increased losses: nephrotic syndrome, burns, exudates, protein-losing enteropathy, severe zinc deficiency</td>
<td>Anabolic steroids, possibly glucocorticoids</td>
</tr>
<tr>
<td>Severe less than 2.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prealbumin

Prealbumin (also called transthyretin) is another serum protein produced by the liver. It has a half-life of only 2-3 days, so it is not useful as an indicator of long-term nutritional intake. However, prealbumin has been used as an indicator of acute nutrition status and to evaluate the effectiveness of nutrition interventions (Charney & Malone, 2009, p. 69). Alterations in prealbumin occur as a result of the same conditions that make albumin a poor nutrition indicator (Fuhrman, Charney, & Mueller, 2004, p. 1258). See Table 1A-4.
Section 1A: Adult Nutrition Assessment

Table 1A-4: Factors that decrease or increase prealbumin

<table>
<thead>
<tr>
<th>Prealbumin Level (milligrams per deciliter)</th>
<th>Decrease</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal 16 to 40</td>
<td>Acute phase response</td>
<td>Acute kidney failure</td>
</tr>
<tr>
<td>Depletion:</td>
<td>Severe liver disease</td>
<td>Chronic kidney disease</td>
</tr>
<tr>
<td>Mild 10 to 15</td>
<td>Untreated hyperthyroidism</td>
<td>Anabolic steroids</td>
</tr>
<tr>
<td>Moderate 5 to 9</td>
<td>Nephrotic syndrome</td>
<td></td>
</tr>
<tr>
<td>Severe less than 5</td>
<td>Severe zinc deficiency</td>
<td></td>
</tr>
</tbody>
</table>


Table 1A-5: Factors that decrease or increase serum electrolytes

<table>
<thead>
<tr>
<th>Measure</th>
<th>Decrease</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum Calcium (Ca)</td>
<td>Hypoparathyroidism, Kidney disease, Malnutrition, Malabsorption, Rickets, Low vitamin D, Low albumin level, Osteomalacia, Pancreatitis, Alkalosis, High serum phosphorous</td>
<td>Hyperparathyroidism, Addison's disease, Cancer, Granulomatous infections ie. Sarcoidosis, TB Prolonged immobilization Antacids</td>
</tr>
<tr>
<td>Serum Phosphorous (P)</td>
<td>Hyperparathyroidism, Hypercalcemia, Malnutrition, Rickets, Hyperinsulinism, Alkalosis, Gram-negative sepsis IV Glucose administration</td>
<td>Hyperparathyroidism, Addison's disease, Acidosis, Bone metastasis, Low serum calcium, Kidney disease, Rhabdomyolysis, Sarcoidosis</td>
</tr>
<tr>
<td>Serum Magnesium (Mg)</td>
<td>Malabsorption, Malnutrition, Kidney disease, Diabetic acidosis, Diuretics, Hypoparathyroidism, Chronic diarrhea, Alcoholism</td>
<td>Kidney disease, Hypothyroidism, Dehydration, Addison’s disease, Use of magnesium-containing antacids or salts</td>
</tr>
<tr>
<td>Serum Potassium (K)</td>
<td>Diarrhea, Vomiting, Diuretics, Burns, Trauma, Surgery, Cystic fibrosis, Hyperaldosteronism, Cushing syndrome, IV Glucose administration</td>
<td>Acidosis, Hemolysis, Diuretics, Kidney disease, Addison's disease, Hypoaldosteronism, Dehydration, Cell injury: accidents, burns, surgery, chemotherapy</td>
</tr>
<tr>
<td>Serum Sodium (Na)</td>
<td>Diarrhea, Vomiting, Overhydration, Low sodium intake, Diuretics, Congestive Heart failure, Edema, Chronic renal insufficiency, Addison’s Disease</td>
<td>Dehydration, High sodium intake, Osmotic diuresis, Cushing’s syndrome, Burns, Diabetes insipidus, Aldosteronism</td>
</tr>
</tbody>
</table>


**C-Reactive Protein (CRP)**

C-reactive protein is not a nutrition marker. It is, however, a good indicator of the acute phase response. To determine if the APR influences the
levels of other serum proteins, draw CRP levels at the same time (Charney & Malone, 2009, p. 65). Serial CRP levels have also been used to help identify when inflammatory processes are ebbing and aggressive nutrition support may begin.

**Electrolytes**
Serum electrolyte values indicate hydration status and acid-base balance. See Table 1A-5 for factors that will affect electrolyte levels.

**Hemoglobin and Hematocrit**
Hemoglobin is the carrier of oxygen in red blood cells. Hematocrit refers to the volume of packed red blood cells. They are used as biochemical measures of iron status, but they are not specific for iron deficiency. Both are decreased in the third stage of iron deficiency. Both vary with age and gender (hemoglobin also varies by race). Both are increased in dehydration, but decreased in overhydration, blood loss, malnutrition, and chronic infection.

**Nutrition-Focused Physical Examination**
A review of physical status is part of a comprehensive nutrition assessment. Nutrition assessment information can come either from a direct examination or from the findings of another health care provider (Charney & Malone, 2009, p. 40). The following factors should be included (pp. 41-43)

**General Survey**
- Body positioning
- Level of awareness and ability to communicate
- Functional ability with activities of daily living (ADLs) such as ability to shop for groceries, prepare meals, or self-feed

**Physical Appearance**
- Amputations
- Musculature and fat stores, signs of wasting, or altered body composition
- Changes in nails or hair

**Oral Health**
- Condition of teeth and gums; ability to chew
- Condition of lips and tongue; ability to swallow

**Skin**
- Presence of bruises, wounds, or pressure ulcers
- Presence of rashes or dermatitis
- Moisture and texture, or presence of edema
- Condition of mucous membranes
Diabetes Mellitus

Background

Diabetes mellitus is a group of metabolic diseases characterized by elevated blood glucose levels (hyperglycemia) resulting from defects in insulin secretion, insulin action, or both. Recent research also identifies several other pathophysiologic defects that contribute to hyperglycemia. These include elevated postprandial glucagon levels, an accelerated rate of gastric emptying, and inability to achieve satiety, which are due to deficiencies of amylin and glucagon-like peptide-1 (GLP-1) (Aronoff, Berkowitz, Shreiner, & Want, 2004).

Insulin is a hormone manufactured by the beta cells of the pancreas. Cells throughout the body need insulin in order to use glucose from digested food as an energy source. Amylin is co-secreted with insulin in response to food and determines how much and how fast glucose enters the circulation. GLP-1 is a gut hormone that has multiple modes of action including enhancing insulin secretion in a glucose-dependent manner (Riddle & Drucker, 2006). Chronic high blood glucose leads to damage to or failure of various organs including the eyes, kidneys, nerves, heart, and blood vessels. As a result, diabetes is a leading cause of

- visual impairment and blindness,
- chronic kidney disease,
- nerve damage,
- amputations,
- heart disease, and
- stroke.

There are four major factors that influence the ability to control diabetes and they are

- food intake (especially carbohydrate source foods),
- exercise/physical activity,
- medications, and
- stress (physical and/or emotional).

Types of Diabetes

- **Type 1**
  - The beta cells no longer produce insulin or amylin.
  - Daily injections of insulin and possibly amylin analog are required to control blood glucose.
  - Usually diagnosed during childhood or early adolescence.
  - It affects 1 in 600 children

- **Type 2**
  - The beta cells do not make enough insulin.
  - The insulin does not act effectively due to the insulin resistance at the cellular level.
  - In the early stages, blood glucose is managed with lifestyle modifications such as reduced food intake and increase physical activity.
  - Later, oral glucose-lowering medications an incretin mimetic (GLP-1 injection) may be prescribed (Riddle & Drucker, 2006).
Finally, with the progression of beta cell dysfunction, Type 2 diabetes advances to an insulin-requiring state.

- More often diagnosed during adulthood. However, with the increasing incidence of childhood obesity, the number of children and youth diagnosed with Type 2 diabetes is also increasing.

- People from certain ethnic or racial groups (African-American, Native American, Hispanic, and Asian/Pacific Islander) and those with a family history of Type 2 diabetes have a higher risk of developing Type 2 diabetes.

### Three major factors that influence glucose control in diabetes:
- Food intake (especially carbohydrate-containing foods)
- Exercise and/or physical activity
- Medications

### Carbohydrate Counting
Dietary carbohydrate, found in foods that contain various types of starch and sugar, has the largest impact on blood glucose levels after eating. Individuals with diabetes monitor carbohydrate intake with one of two methods of carbohydrate counting. One method involves counting carbohydrate servings that each contain about 15 grams of carbohydrate consumed.

### Monitoring Blood Glucose
Self-monitoring of blood glucose (SMBG) is recommended with both types of diabetes. People who take insulin should monitor a minimum of 2-4 times a day, depending on their insulin regimen. SMBG before each meal and the bedtime snack is helpful to assess the insulin dose needed and to make changes, if needed. Individuals managing their diabetes with lifestyle modifications or oral medications should monitor before breakfast and at least one other time each day.

In addition, SMBG 2 hours after a meal provides information about the effectiveness of meal time treatment. If 2 hour post-meal glucose levels are greater than 180 mg/dl, the person needs to decrease carbohydrate intake, increase activity, or adjust medications. Monitoring at 2-3 a.m. is useful for evaluating nighttime low blood glucose (hypoglycemia) and high blood glucose in the morning.

Continuous glucose sensors are also available for use in conjunction with SMBG. Continuous glucose monitoring is done through the measurement of interstitial glucose, but requires calibration with the SMBG. These sensors are not used to replace SMBG, but to define trends in blood sugars that could aide in the management of a patient’s diabetes. The patient still must complete a fingerstick before making treatment decisions related to their diabetes. The continuous glucose sensors have alarms associated with hyper and hypoglycemic levels defined by the patient. The sensor tracks the trend of the blood glucose and will notify the patient of glucose levels that are above or below the set parameters, thus hopefully assisting and avoidance of these acute situations.

### Insulin & Injectables
Currently there are many types of insulin available. They may be delivered by a number of methods including
Section 3C: Diabetes Mellitus

- vial and syringe,
- insulin pens, and
- insulin pumps

Often a combination of different types of insulin, with different actions, may be used to mimic normal insulin secretion as closely as possible. The number of insulin injections per day varies. The insulin dose depends on basal needs, sensitivity to insulin, food intake (especially carbohydrates), and the amount of physical activity performed.

Rapid acting insulin analogs maybe given before, during or immediately after a meal. Short-acting insulin should be injected 30-45 minutes prior to the first bite of food. Administration of analogs after a meal may help reduce the higher glucose levels that occur after a high fat meal. Changes in the dose of rapid-acting insulin can be individualized according to algorithm that increases the dose for higher glucose levels and decreases the dose when glucose levels are lower.

In addition to insulin, there are also injectable medications for the treatment of diabetes that are not insulin. These are known as incretin mimetics. This class of medications are hormones that are released from the gastrointestinal tract as food enters the digestive system. They are known as glucose-dependent insulino-tropic peptide (GIP) and glucagon-like peptide-1 (GLP-1). Their first function is to increase the amount of insulin that will be excreted. The amount secreted is dependent on the amount of glucose ingested. Due to this, they must be dosed within 60 minutes of the meal and should not be dosed after the meal is finished. In addition, other functions of incretin mimetics are to slow gastric emptying and increase satiety. In addition, GLP-1 has the function of preventing the release of glucagon. These medications can be used alone or in combination with other diabetes drugs to improve glycosylated hemoglobin levels.

**Oral Medications**

For Type 2 diabetes, there are also several kinds of oral glucose-lowering medications. These medications help to lower blood levels by several different mechanisms including

- increasing insulin production by the pancreas,
- decreasing glucose production by the liver,
- improving insulin sensitivity,
- delaying carbohydrate absorption, and
- slow breakdown of incretin hormones. This will increase the response of insulin to glucose levels and decreasing glucagon concentration.

Refer to Table 3C-1 for comparison of the classes of oral agents currently available.

**Exercise**

Physical activity is another factor that affects glucose levels. Exercise may improve insulin sensitivity independent of weight loss. It is important to find out what activities the person enjoys and to identify easy ways for becoming more active. At least 30 minutes of exercise 5 to 7 times a week is recommended.
Hypoglycemia
Hypoglycemia is an abnormally low blood glucose level. It is also referred to as low blood sugar, insulin reaction or insulin shock. In hypoglycemia, blood glucose is less than 70 mg/dl. There are many things that can cause hypoglycemia. The most common culprits include
• too much insulin,
• extra physical activity or exercise,
• not enough food (particularly carbohydrate sources), and
• delayed meals or snacks.
Hypoglycemia may occur at any time, but is most likely before meals, during the peak action time of insulin, and during or after exercise. Hypoglycemia should be treated as follows:
• Blood sugar should be checked to affirm symptoms are from hypoglycemia
• 15 grams of carbohydrate should be given. (i.e., ½ cup of fruit juice or 3 glucose tablets)
• Recheck blood sugar in 15 minutes. If still less than 70 mg/dl, repeat treatment with an additional 15 grams of carbohydrate.
• Once blood sugar had returned above 70 mg/dl and symptoms have resolved, the individual needs to follow this treatment with a meal or snack containing carbohydrate, protein and fat. (i.e., ½ sandwich or peanut butter and crackers). This will prevent a rapid drop in blood sugar again.
• Frequent occurrences of hypoglycemia may indicate adjustments need to be made in medications or treatment plans.

Diabetes and Medical Nutrition Therapy
The objective of Medical Nutrition Therapy (MNT) for all ages include (Diabetes Care, January 2008, p. S61-S78):
• optimizing blood glucose levels, lipids and blood pressure,
• preventing and treating chronic complications such as obesity, heart disease, retinopathy, hypertension, and nephropathy,
• improving health by promoting healthy food choices and regular physical activity,
• accounting for individual’s differences by considering age, culture, lifestyle, and the individual’s wishes and willingness to change.
In addition, for children and youth with Type 1 diabetes
• Provide food intake adequate for normal growth and development.
• Integrate insulin regimens into usual eating and physical activity habits.
In addition, for children and youth with Type 2 diabetes
• Provide healthy food choices and opportunities for regular physical activity.
In addition, for pregnant and lactating women
• Provide adequate energy and nutrients needed for optimal outcomes.
In addition, for older adults
• Help meet the nutritional and psychosocial needs of the aging.
Nutrition Care

**Nutrition Assessment**
- Assess weight, height, body mass index, and recent weight changes.
- Evaluate the person’s usual food intake, meal and snack times, portion sizes, and food preparation methods.
- Obtain information on the daily schedule including
  - day care, school and work,
  - physical activity,
  - family and cultural and habits,
  - educational level,
  - psychosocial and economic issues,
  - diabetes knowledge, and
  - insulin or other medication regimen

**Nutrition Intervention**
- Develop an individualized meal plan based on the person’s food preferences, daily schedule and medical needs.
- Recommend consistency in the amount of carbohydrate eaten at meals and snacks and the timing of meals and snacks for people on conventional insulin therapy and for those who do not calculate carbohydrate intake and corrective doses of insulin.
- Provide a meal plan that is approximately
  - 50-60% carbohydrate
  - 10-20% protein
  - 30% fat
- Limit saturated fat to less than 10% of total calories and dietary cholesterol to less than 300 mg per day to help reduce the risk of heart disease. Guidelines for dietary fiber and sodium are the same as for the general population.
- It is not necessary to restrict sugar and sugar-containing foods to control blood glucose. Teach people with diabetes to estimate the amount of carbohydrate eaten and include it in their meal plan goals. This will allow them to eat many common foods, such as sweetened cereal, cookies, brownies, and ice cream, in the context of healthy eating.
- For children and youth with Type 1 diabetes, provide adequate food intake to promote normal growth and development and a healthy body mass index.
- For the newly diagnosed person, focus on improving blood glucose by educating them about carbohydrate counting and the effects of food and physical activity on blood glucose. A meal plan with regular meals and snacks, along with carbohydrate goals that are moderately less than their usual intake, will help to control blood glucose and may allow weight to stabilize or begin to drop.
- The elderly person with diabetes is more likely to be normal or underweight rather than overweight. Nutrition goals should focus on
Section 3C: Diabetes Mellitus


- Educate the person to recognize symptoms of hypoglycemia and to treat and prevent it. For example, for physical activity beyond the usual routine:
  - Eat or drink 15 grams of carbohydrate before exercising, for every hour of the activity
  - For strenuous exercise lasting more than one hour, include protein with the carbohydrate
  - Adjust these guidelines depending on the insulin regimen.

If the blood glucose level is 70-100 mg/dl before the evening snack:
  - Eat or drink an additional 15 grams of carbohydrate before the evening snack.

If the blood glucose level is less than 70 mg/dl before the evening snack:
  - Treat the low blood sugar first with 15 grams of carbohydrate or glucose, then wait 15 minutes and retest
  - If the blood glucose is still less than 70 mg/dl, eat or drink another 15 grams of carbohydrate
  - If the blood glucose is more than 70 mg/dl, have the regular evening snack with an additional 15 grams of carbohydrate.

- Provide information about how to safely consume alcoholic beverages, if appropriate. Although some alcoholic beverages contain carbohydrate, the alcohol itself is not converted to glucose and may cause a low blood sugar and contribute to impaired judgment. The following are the guidelines to prevent low blood glucose levels with alcohol use:
  - Do not skip meals or snacks when drinking alcohol.
  - Consume additional carbohydrate if drinking more than the equivalent of two alcoholic beverages.
  - Inform someone with you that you have diabetes.
  - Do not drive after drinking.
  - Do not take extra insulin when drinking.

- Negotiate and establish goals with the person for ongoing nutrition and diabetes education.

Nutrition Monitoring

- Monitor diabetes control in relation to medication or lifestyle changes.
- Review SMBG and food intake records.
- Evaluate adherence to the nutrition care plan.
- Note changes in body mass index. Improved blood glucose control may result in unwanted weight gain unless the meal plan or activity routine is adjusted. With Type 1 diabetes, tight glucose control may lead to more frequent hypoglycemia that requires additional carbohydrates and calories.
- Examine the pattern of weight gain or loss, and listen carefully to the individual’s concerns about weight and body image. Chronic high blood sugars with reported large insulin doses and unexplained weight loss may
indicate intentional under-dosing or insulin omission in an attempt to lose weight. Young women, especially, may be tempted by this strategy.

- While the incidence of eating disorders is no greater in those with diabetes than those without diabetes, take advantage of counseling sessions to regularly discuss healthy eating, regular physical activity, and acceptance of the diversity of body shapes and sizes.

- For people with diabetes who are overweight, once their glucose is controlled, discuss healthy weight management strategies.

- Abnormal lipid profile results may improve as blood glucose levels normalize. If cholesterol and triglyceride levels do not improve, try to promote weight loss, implement cholesterol and triglyceride lowering nutrition therapy, or treat with a lipid-lowering medication.
<table>
<thead>
<tr>
<th>Drug Class</th>
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<th>Brand &amp; Generic Names</th>
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<th>Special Considerations</th>
<th>Side Effects</th>
<th>Indications</th>
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</thead>
<tbody>
<tr>
<td><strong>First Generation Sulfonylureas (SFUs)</strong></td>
<td>-insulin secretagogue&lt;br&gt;-hypoglycemic agent&lt;br&gt;-works in fasting and postprandial periods</td>
<td>Diabase (chlorpropamide)</td>
<td>Pfizer</td>
<td>100-500 mg daily</td>
<td>-Rarely used anymore&lt;br&gt;-Very long acting (up to 72 hours)&lt;br&gt;-Use with caution in elderly and those with kidney disease&lt;br&gt;-May cause Antabuse reaction if used with alcohol&lt;br&gt;-May cause low sodium levels</td>
<td>-Hypoglycemia&lt;br&gt;-Weight gain&lt;br&gt;-Rash&lt;br&gt;-Nausea and Vomiting</td>
<td>Type 2 diabetes</td>
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<tr>
<td></td>
<td></td>
<td>Tolinase (Tolazamide)</td>
<td>UpJohn Pharmacia</td>
<td>100-1000 mg in divided doses</td>
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<td></td>
<td></td>
<td>Orinase (Tolbutamide)</td>
<td>Pharmacia</td>
<td>500-3000 mg in divided doses</td>
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<tr>
<td><strong>Second Generation Sulfonylureas (SFUs)</strong></td>
<td>-insulin secretagogue&lt;br&gt;-hypoglycemic agent&lt;br&gt;-works in fasting and postprandial periods</td>
<td>Amaryl (glimepiride)</td>
<td>Aventis</td>
<td>1.8 mg Daily</td>
<td>Give with first meal of the day.</td>
<td>-Fewer side effects than first generations.</td>
<td>Type 2 diabetes</td>
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<tr>
<td></td>
<td></td>
<td>DiaBeta (glyburide)</td>
<td>Aventis</td>
<td>1.25-20 mg</td>
<td>Give daily or divided doses</td>
<td>-Less interactions with other medications</td>
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<td></td>
<td>Micronase (glyburide)</td>
<td>Pharmacia &amp; Upjohn</td>
<td>1.25-20 mg</td>
<td>Give daily or divided doses</td>
<td>-Hypoglycemia&lt;br&gt;-Weight gain&lt;br&gt;-Rash&lt;br&gt;-Nausea and Vomiting</td>
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<tr>
<td></td>
<td></td>
<td>Glynase (glyburide)</td>
<td>Aventis</td>
<td>0.75-12 mg</td>
<td>Give daily with first meal or in divided doses</td>
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<td></td>
<td>Glucotrol (glipizide)</td>
<td>Pfizer</td>
<td>2.5-40 mg</td>
<td>Give 30 minutes before meals</td>
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<td>Glucotrol XL (glipizide, extended-release tablets)</td>
<td>Pfizer</td>
<td>5-20 mg</td>
<td>Give with breakfast</td>
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<tr>
<td><strong>Meglitinides</strong></td>
<td>-insulin secretagogue&lt;br&gt;-hypoglycemic agent&lt;br&gt;-works in postprandial period</td>
<td>Prandin (repaglinide)</td>
<td>Novo Nordisk</td>
<td>0.5-16 mg</td>
<td>-Given in divided dose from 0.5-4 mg at each meal&lt;br&gt;-Give within 30 minutes of each meal. If meal skipped, don’t take.</td>
<td>-Hypoglycemia (mild)&lt;br&gt;-URI&lt;br&gt;-Headache</td>
<td>Type 2 diabetes</td>
</tr>
</tbody>
</table>
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<table>
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<tr>
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<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Phenylalanines</td>
<td>-insulin secretagogue</td>
<td>Starlix (nateglinide)</td>
<td>Novartis</td>
<td>180-360 mg in divided doses (60-120 mg with each meal)</td>
<td>-works faster than SFUs with shorter duration of action</td>
<td>-may cause hypoglycemia</td>
<td>-less weight gain than SFUs</td>
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<tr>
<td></td>
<td>-hypoglycemic agent</td>
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<td>-do not use with SFUs</td>
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<td></td>
<td>-works in post prandial period</td>
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<td>-can use with metformin</td>
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<td>-give within 30 minutes of each meal. Skip dose if meal is skipped</td>
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<td>-use with caution in patients with liver disease</td>
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<td></td>
<td></td>
<td>-may cause hypoglycemia</td>
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<td></td>
<td></td>
<td>-less weight gain</td>
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<tr>
<td>Biguanides</td>
<td>-decrease hepatic glucose output</td>
<td>Glucophage (metformin)</td>
<td>Bristol-Myers Squibb</td>
<td>1000-2550 mg in divided doses (1000-2000 mg in divided doses for pediatric patients age 10-16)</td>
<td>-give with food</td>
<td>-diarrhea</td>
<td>-reduced B12 levels</td>
</tr>
<tr>
<td></td>
<td>-increases peripheral glucose uptake and utilization</td>
<td>Romet (liquid)</td>
<td>Ranbaxy</td>
<td>500-2000 mg with evening meal</td>
<td>-less weight gain</td>
<td>-nausea</td>
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<tr>
<td></td>
<td>-decreases intestinal absorption of glucose</td>
<td>Glucophage XR (metformin extended release)</td>
<td>Bristol-Myers Squibb</td>
<td>1000-2550 mg with evening meal</td>
<td>-do not use in patients with liver or kidney disease or alcohol abuse</td>
<td>-flatulence</td>
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<td></td>
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<td></td>
<td>First Horizon Pharmaceuticals</td>
<td>1000-2000 mg with evening meal</td>
<td>-use cautiously in the elderly</td>
<td>-lactic acidosis</td>
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<td></td>
<td>Biovail Pharmaceuticals</td>
<td>1000-2000 mg with evening meal</td>
<td>-avoid in patients medically treated for heart failure</td>
<td>-reduced B12 levels</td>
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<td></td>
<td>-do not take for 48 hours following a procedure that uses contrast dye. Assess renal function before restarting</td>
<td>-extremely rare hypoglycemia with monotherapy</td>
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</tbody>
</table>
## Section 3C: Diabetes Mellitus

<table>
<thead>
<tr>
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<th>Side Effects</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Alphaglucosidase Inhibitors</td>
<td>- slows intestinal absorption of some carbohydrates by inhibiting digestive enzymes - works postprandially</td>
<td>Precose (Acarbose)</td>
<td>Bayer</td>
<td>≤ 60 kg body weight, 50 mg three times a day with meals &gt;60 kg body weight, 100 mg three times a day with meals 75-300 mg in divided doses (25 mg – 100 mg per meal. Titrate up)</td>
<td>- gradually increase dose to minimize side effects. - give with the first bite of each meal. - must treat hypoglycemia with glucose tablets or gel. - no hypoglycemia with monotherapy</td>
<td>- flatulence - diarrhea - abdominal pain</td>
<td>Type 2 diabetes</td>
</tr>
<tr>
<td>Thiazolidinediones (glitazones or TZDs)</td>
<td>- insulin sensitizer - improves muscle cell response to insulin, thus using glucose more efficiently - inhibits hepatic glucose production - works during fasting periods</td>
<td>Avandia (Rosiglitazone)</td>
<td>GlaxoSmithKline</td>
<td>4-8 mg in single or divided doses 15-45 mg daily</td>
<td>- liver toxicity, liver function tests must be done routinely - use with caution in CHF. Not recommended for use in class III or IV heart failure - requires 4-6 weeks to see full effect - anovulatory pre-menopausal females may ovulate - Use with insulin Avandia: at max dose of 4 mg daily, Actos 30 mg</td>
<td>- fluid retention (may contribute to heart failure) - decrease in hemoglobin &amp; hematocrit - loss of effect of some oral contraceptives with Actos - no hypoglycemia with monotherapy</td>
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<tr>
<td>Dipeptidyl Peptidase-4 Inhibitor (DPP-4 Inhibitor)</td>
<td>Slaows inactivation/breakdown of incretin hormones, ↑ insulin response to glucose levels &amp; ↓ glucagon concentration.</td>
<td>Januvia (Sitagliptin)</td>
<td>Merck</td>
<td>100 mg daily 50 mg daily in moderate renal insufficiency; 25 mg daily in severe renal insufficiency</td>
<td>- give daily with or without food - recommended renal function assessment prior to initiation</td>
<td>- upper respiratory infection - nasopharyngitis - headache</td>
<td>Type 2 diabetes</td>
</tr>
<tr>
<td>Drug Class</td>
<td>Modes of Action</td>
<td>Brand &amp; Generic Names</td>
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<tr>
<td>Combinations</td>
<td>Varies depending on combination. See individual drug actions of both medications in the combination.</td>
<td>Glucovance (Glyburide and Metformin)</td>
<td>Bristol-Meyers Squibb</td>
<td>1.25 mg/250 mg – 20 mg/2000mg</td>
<td>-same as for glyburide and metformin</td>
<td>-same as for glyburide and metformin</td>
<td>Type 2 diabetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metaglip (Glipizide and Metformin)</td>
<td>Bristol-Meyers Squibb</td>
<td>2.5 mg/250 mg daily. Do not exceed 20 mg/2000 mg daily.</td>
<td>-same as for glipizide and metformin</td>
<td>-same as for glipizide and metformin</td>
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<tr>
<td></td>
<td></td>
<td>Avandamet (Rosiglitazone and Metformin)</td>
<td>GlaxoSmithKline</td>
<td>Gradually titrate dose up. Do not exceed 8 mg/2000 mg daily</td>
<td>-same as for rosiglitazone and metformin</td>
<td>-same as for rosiglitazone and metformin</td>
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<td></td>
<td></td>
<td>Actoplus Met (Pioglitazone and Metformin)</td>
<td>Takeda Pharmaceuticals</td>
<td>15 mg/500 mg – 45 mg/2550 Gradually titrate. Do not exceed 45mg/2550 mg.</td>
<td>-same as for pioglitazone and metformin</td>
<td>-same as for pioglitazone and metformin</td>
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<td></td>
<td></td>
<td>Avandaryl (Rosiglitazone and glimepiride)</td>
<td>GlaxoSmithKline</td>
<td>4 mg/1 mg with first meal of the day and carefully titrated, do not exceed 8 mg/4 mg daily.</td>
<td>-same as rosiglitazone and glimepiride</td>
<td>-same as rosiglitazone and glimepiride</td>
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<tr>
<td></td>
<td></td>
<td>Duetact (Pioglitazone and Glimepiride)</td>
<td>Takeda Pharmaceuticals</td>
<td>30 mg/2 mg daily Do not exceed 30 mg/4 mg daily</td>
<td>-same as pioglitazone and glimepiride</td>
<td>-same as pioglutazone and glimepiride</td>
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<tr>
<td></td>
<td></td>
<td>Janumet (Sitagliptin and Metformin)</td>
<td>Merck</td>
<td>100 mg/1000 mg twice daily with meals. Do not exceed 100 mg/2000 mg daily</td>
<td>-same as sitagliptin and metformin</td>
<td>-same as sitagliptin and metformin</td>
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<tr>
<td></td>
<td></td>
<td>Prandimet (Repaglinide and Metformin)</td>
<td>Novo Nordisk and Sciele</td>
<td>1 mg/500 mg or 2mg/500 mg. Max daily dose of 10 mg/2500 mg. Give over 2-3 meals. Max per meal is 4 mg/1000 mg.</td>
<td>-same as repaglinide and metformin</td>
<td>-same as repaglinide and metformin</td>
<td></td>
</tr>
<tr>
<td>Drug Class</td>
<td>Mode of Action</td>
<td>Brand Name</td>
<td>Generic</td>
<td>Dose</td>
<td>Adverse Effects</td>
<td>Implications</td>
<td></td>
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<tr>
<td>Incretin mimetic</td>
<td>Increases glucose sensitive insulin secretion, slows gastric emptying</td>
<td>Byetta</td>
<td>Exenatide</td>
<td>Start at 5 mcg twice a day within 1 hour of start of meal.</td>
<td>Nausea may occur with initiation. Usually will lessen with time.</td>
<td>Used in people who still have functioning beta cells. Give within 1 hour of 2 largest meals of the day. Store unused pens in refrigerator. Once used store less than 77 degrees Fahrenheit. Discard after 30 days.</td>
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<td></td>
<td>Increase to 10 mcg twice a day within 1 hour of start of meal.</td>
<td>Observe for signs and symptoms of acute pancreatitis including severe abdominal pain with possible vomiting.</td>
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<tr>
<td>Amylin</td>
<td>Secreted by the pancreatic beta cells and works with insulin to affect post-meal glucose levels. Suppresses post-meal release of glucagon Slows gastric emptying and can decrease appetite.</td>
<td>Symlin</td>
<td>Pramlintide</td>
<td>In on insulin prior to Symlin the decrease premeal insulin by 50%. Basal dose may also need to be decreased to avoid severe hypoglycemia. For Type 1 diabetes start with 15 mcg prior to meals, increase to 30, 45 or 60 mcg if no persistent nausea. Decrease to 30 mcg as maintenance, if persistent nausea. For Type 2 diabetes start with 60 mcg prior to each meal and increase to 120 mcg if no nausea</td>
<td>Hypoglycemia if prior insulin doses are not decreased when initiated. Nausea, vomiting, and anorexia may occur with initiation. This will usually subside over time.</td>
<td>Used with people taking insulin. Pre-meal and/or total daily dose may be less. Doses are ordered in micrograms. Administered with insulin syringe or pen. Give immediately prior to meals or snack more of more than 30 grams of carbohydrate. Do not take if meal is skipped. Store at less than 77 degrees F.</td>
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<th>Maximum Duration</th>
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<td><strong>Rapid-Acting</strong></td>
<td></td>
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</tr>
<tr>
<td>Humalog (Lispro)</td>
<td>Within 15 minutes</td>
<td>½ - 1 ½ hours</td>
<td>3-4 hours</td>
<td>4-6 hours</td>
<td>Should be dosed within 15 minutes of eating.</td>
</tr>
<tr>
<td>NovoLog (Aspart)</td>
<td>Within 15 minutes</td>
<td>½-1 ½ hours</td>
<td>3-4 hours</td>
<td>4-6 hours</td>
<td></td>
</tr>
<tr>
<td>Apidra (Glulisine)</td>
<td>Within 15 minutes</td>
<td>½-1 ½ hours</td>
<td>2.5-3 hours</td>
<td>3-4 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Short-Acting</strong></td>
<td>½-1 hour</td>
<td>2-3 hours</td>
<td>3-6 hours</td>
<td>6-8 hours</td>
<td>Should be dosed within 30 minutes of eating.</td>
</tr>
<tr>
<td>Humulin R (Regular)</td>
<td>½-1 hour</td>
<td>2-3 hours</td>
<td>3-6 hours</td>
<td>6-8 hours</td>
<td></td>
</tr>
<tr>
<td>Novolin R (regular)</td>
<td>½-1 hour</td>
<td>2-3 hours</td>
<td>3-6 hours</td>
<td>6-8 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Intermediate Acting</strong></td>
<td>2-4 hours</td>
<td>6-10 hours</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td>Higher risk of hypoglycemia at peak times if meals are skipped.</td>
</tr>
<tr>
<td>Humulin N (NPH)</td>
<td>2-4 hours</td>
<td>6-10 hours</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td></td>
</tr>
<tr>
<td>Novolin N (NPH)</td>
<td>2-4 hours</td>
<td>6-10 hours</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Long-Acting</strong></td>
<td>2-4 hours</td>
<td>No distinct peak of action. The action of these insulin is relatively flat throughout their duration.</td>
<td>24 hours</td>
<td>24 hours</td>
<td>Should not be mixed with any other insulin in the same syringe.</td>
</tr>
<tr>
<td>Lantus (glargine)</td>
<td>45 minutes-2 hours</td>
<td>No distinct peak of action. The action of these insulin is relatively flat throughout their duration.</td>
<td>24 hours</td>
<td>24 hours</td>
<td></td>
</tr>
<tr>
<td>Levenmir (determir)</td>
<td>2-4 hours</td>
<td>No distinct peak of action. The action of these insulin is relatively flat throughout their duration.</td>
<td>24 hours</td>
<td>24 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Fixed Combinations</strong></td>
<td>½-1 hour</td>
<td>Same as N and R</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td>Humalog and Novolog mixes should be given within 15 minutes of eating.</td>
</tr>
<tr>
<td>Humulin 70/30 (70% N &amp; 30% R)</td>
<td>½-1 hour</td>
<td>Same as N and R</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td></td>
</tr>
<tr>
<td>Humulin 50/50 (50% N &amp; 50% R)</td>
<td>½-1 hour</td>
<td>Same as N and R</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td></td>
</tr>
<tr>
<td>Novolin 70/30 (70% N &amp; 30% R)</td>
<td>½-1 hour</td>
<td>Same as N and R</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td></td>
</tr>
<tr>
<td>Novolin 50/50 (50% N &amp; 50% R)</td>
<td>½-1 hour</td>
<td>Same as N and R</td>
<td>10-16 hours</td>
<td>14-18 hours</td>
<td></td>
</tr>
<tr>
<td>Humalog Mix 75/25 (75%)</td>
<td>Within 15 minutes</td>
<td>Same as N and Lispro</td>
<td>Same as N and Lispro</td>
<td>Same as N and Lispro</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Within 15 minutes</td>
<td>Same as N and Lispro</td>
<td>Same as N and Lispro</td>
<td>Same as N and Lispro</td>
<td></td>
</tr>
</tbody>
</table>
Section 3C: Diabetes Mellitus

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lispro protamine &amp; 25% Lispro</td>
<td></td>
</tr>
<tr>
<td>Humalog Mix 50/50 (50% Lispro protamine &amp; 50% Lispro)</td>
<td></td>
</tr>
<tr>
<td>Novolog 70/30 (70% Aspart Protamine &amp; 30% Aspart)</td>
<td></td>
</tr>
</tbody>
</table>
Section 3C: Diabetes Mellitus

Cross References

Section 3C: Gestation Diabetes
Section 3F: Cardiovascular Disease
Section 3J: Obesity
Section 4A: Calorie Controlled Diet
Section 4B: Carbohydrate Controlled Diet
Section 4D: Cholesterol Controlled Diet
Section 4D: Triglyceride Controlled Diet

References:


More Information:

American Association of Diabetes Educators
100 West Monroe Street, Suite 400
Chicago, IL 60603-1901
Section 3C: Diabetes Mellitus

(312) 424-2426
www.diabeteseducator.org

American Diabetes Association
1701 North Beauregard Street
Alexandria, VA 22311
(800) DIABETES or (800) 342-2383
www.diabetes.org

American Dietetic Association
Evidence Analysis Library: Diseases and Conditions:
Adult diabetes 1 and 2 evidence analysis project.
www.eatright.org

Centers for Disease Control and Prevention
www.cdc.gov

International Diabetes Center
www.icdpublishing.com

National Diabetes Information Clearinghouse
www.diabetes.niddk.nih.gov

The following manufacturer’s websites provide information for these new medications:
www.symlin.com
www.byetta.com
www.amylin.com
Gestational Diabetes

Background

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy. The definition applies whether insulin or only diet modification is used for treatment, and whether or not the condition persists after pregnancy. Approximately 7% of all pregnancies are complicated by GDM, resulting in more than 200,000 cases annually (American Diabetes Association, 2010, p. S15).

GDM results in increased health risk to both the woman and her child, both in the perinatal period and in the long term (American Diabetes Association, 2010, p. S15). Fasting blood glucose greater than 105 mg/dl may be linked to increased fetal death in the last 1-2 months of pregnancy. In less severe cases, the baby is also more likely to have macrosomia, neonatal hypoglycemia, jaundice, hypocalcemia, and polycythemia. For the mother, GDM increases the risk of hypertensive disorders, infections and a need for cesarean section in the event of macrosomia.

Women with GDM are more likely to develop diabetes later in life, particularly Type 2. Children of women with GDM are more likely to develop obesity, glucose intolerance, and diabetes as children or young adults.

Risk assessment for GDM should be done on the first prenatal visit. Clinical risk factors include (American Diabetes Association, 2010, p. S16)

- obesity,
- personal history of GDM,
- presence of glucose in the urine,
- diagnosis of polycystic ovarian syndrome, and
- family history of diabetes

Women with these characteristics should have their glucose tested as early as possible, then (if normal) again at 24-28 weeks of gestation along with the testing of women with average risk of GDM. Only women meeting all of the following characteristics may be excluded from testing

- age less than 25 years,
- weight normal before pregnancy,
- member of an ethnic group with low prevalence of diabetes,
- no known diabetes in first-degree relative,
- no history of abnormal glucose tolerance, and
- no history of poor obstetric outcome

Diagnosis of GDM is made with several types of glucose testing (American Diabetes Association, 2010, p. S13, S16).

High risk women may be diagnosed with GDM by the same methods the general diagnosis of diabetes is made:

- If they have two results of either fasting blood glucose \( \geq 126 \) mg/dl
- If they have a glucose tolerance test (GTT) performed and their blood glucose is \( \geq 200 \) mg/dl, 2 hours after a 75 gram glucose load.
- If classic symptoms are present and random blood glucose is \( \geq 200 \) mg/dl
Section 3C: Diabetes Mellitus

- A1C ≥ 6.5%

For other women, diagnosis of GDM is made by either a one step or two step approach done between weeks 24-28 of gestation.

Two step approach:
- Step One: Perform a 1 hour GTT after 50 gram glucose load. If blood glucose is ≥ 140 mg/dl, then proceed to step two.
- Step Two: Perform a 3 hour GTT after 100 gram glucose load. To make the diagnosis of GDM at least two of the following criteria must be found:
  - Fasting ≥ 95 mg/dl
  - 1 – hour ≥ 180 mg/dl
  - 2 – hour ≥ 155 mg/dl
  - 3 – hour ≥ 140 mg/dl

One step approach:
  - This approach skips the one hour GTT screening and simply performs the 3 hour test. This approach may be used in clinics with high prevalence of GDM.

Objectives

The medical nutrition therapy objectives for GDM (American Diabetes Association, 2004b, p. S42) are to
- achieve and maintain normal blood glucose
- ensure adequate nutrition for maternal and fetal health, growth, and development, and
- prevent ketone production that results from too little carbohydrate

Nutrition Care

Nutrition Assessment

The American Dietetic Association’s (2001) nutrition practice guidelines for GDM recommend assessing
- current weight, pre-pregnancy weight, and the weight gain goal for pregnancy,
- results of glucose tolerance tests, hemoglobin and hematocrit,
- appetite, discomforts, intolerances, cravings, aversions, presence of pica, and
- the woman’s infant feeding plan.

Nutrition Intervention

- The primary nutrition intervention for GDM is a carbohydrate controlled meal plan. Develop the meal plan in collaboration with each woman in order to individualize care. Refer to Table 3C-2 for a summary of nutrition recommendations for GDM.
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- Typically, the meal plan (American Diabetes Association, 2004b, p. S42-S43) includes
  - Three small-to-moderate sized meals
  - 2-4 snacks
  - Limited carbohydrate at breakfast when it is least tolerated, and
  - Careful distribution of carbohydrate intake
- Specific recommendations are based on individual assessment of self-blood glucose monitoring and results.
- Determine calorie needs (American Diabetes Association, 2001) using the Harris-Benedict equation with either actual prepregnancy weight or adjusted body weight for obese women plus 150 to 300 additional calories per day to meet the energy needs of pregnancy during the 2nd and 3rd trimesters. Adjusted body weight = [(actual body weight-desired body weight) x 0.25] + desired body weight.
- An alternative way to determine calorie needs supported by some studies is to use 30-34 kcal/kg for normal weight women and 23-25 kcal/kg current weight for obese women (American Diabetes Association, 2001).
- Typically, carbohydrate comprises 40-45 percent of the total calories; however, the ideal amount of carbohydrate is unknown. Distribute carbohydrate among 6 to 8 meals and snacks throughout the day, with smaller amounts (15 to 45 grams) of carbohydrate at breakfast and snacks (American Diabetes Association, 2001).
- An evening snack is usually required to prevent starvation ketosis overnight. The snack should include a source of carbohydrate and may also include a source of protein (American Diabetes Association, 2001).
- Use self-monitoring of blood glucose (SMBG) data to evaluate the glycemic response to particular foods at different times of the day to determine the appropriate foods and timing of foods for each woman.
- Limit foods high in sucrose, such as soft drinks, lemonade, other sweetened beverages, candies, and desserts, due to the low nutrient density of these foods (American Diabetes Association, 2001).
- Advise moderation in use of nonnutritive sweeteners. Aspartame, acesulfame-K, and sucralose are all considered safe during pregnancy. Since saccharin crosses the placenta and may remain in fetal tissue due to slow fetal clearance, the American Dietetic Association suggests careful use of saccharin in pregnancy (American Diabetes Association, 2001).
- Protein rich foods in meals and snacks do not significantly affect blood glucose, so they can replace carbohydrate rich foods as a source of calories (American Diabetes Association, 2001).
- Moderate exercise has been shown to lower maternal blood glucose (American Diabetes Association, 2004a, p. S90). Women without medical contraindications should be encouraged to continue or start a program of moderate exercise.

<table>
<thead>
<tr>
<th>Calories</th>
<th>Sufficient to promote adequate weight gain and avoid ketonuria.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate distribution</td>
<td>Based on effect of intake on blood glucose levels. Distributed throughout the day. Frequent feedings, smaller portions, in order to avoid ketonuria.</td>
</tr>
<tr>
<td>Sucrose and other caloric sweeteners</td>
<td>May be included based on ability to maintain blood glucose goals, nutritional adequacy of food intake, and contribution to total meal plan.</td>
</tr>
<tr>
<td>Protein</td>
<td>The protein needs of pregnancy are an additional 10 grams above the RDA, which is 0.8 gm/kg of desirable body weight for adult women.</td>
</tr>
<tr>
<td>Fat</td>
<td>Often increased due to increased protein intake; limit saturated fat.</td>
</tr>
<tr>
<td>Sodium</td>
<td>Not routinely restricted.</td>
</tr>
<tr>
<td>Fiber</td>
<td>May be increased for relief of constipation.</td>
</tr>
<tr>
<td>Nonnutritive sweeteners</td>
<td>Generally safe in pregnancy. Moderation is advised.</td>
</tr>
<tr>
<td>Vitamins and Minerals</td>
<td>Assess for specific individual needs. Iron at 12 weeks. Folic acid supplementation ideally should start before pregnancy.</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Avoid</td>
</tr>
<tr>
<td>Caffeine</td>
<td>Limit to less than 300 mg/day.</td>
</tr>
</tbody>
</table>

Nutrition Monitoring

- Review SMBG and food intake records.
- Track weight changes and compare to the weight gain goal.
- Monitor results of urine ketone and urine protein testing, and blood pressure.
- Evaluate how well the woman is adhering to the care plan. Listen to her concerns and answer her questions.
- If nutrition therapy is not enough to control glucose levels, medication may also be prescribed. Insulin, as opposed to oral medications, shows the most consistent results. Educate the woman about more careful carbohydrate intake to avoid episodes of hypoglycemia.

Cross References

Section 4B: Carbohydrate Controlled Diet
Section 3C: Diabetes Mellitus

References


More Information

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American Dietetic Association
www.eatright.org

Diabetes Care and Education Dietetic Practice Group of the American Dietetic Association
www.dce.org