

## VII: PREVENTIVE AND LIFESTYLE MEASURES

### A. Aspirin Therapy

- Use aspirin therapy as a secondary prevention strategy in men and women with diabetes who have evidence of large vessel disease. This includes those with a history of myocardial infarction, vascular bypass procedure, stroke or transient ischemic attack, peripheral vascular disease, claudication, and/or angina.
- In addition to treating the primary cardiovascular risk factor(s) identified, consider aspirin therapy as a primary prevention strategy in type 1 or type 2 diabetes; in particular, subjects with the following:
  - A family history of coronary heart disease
  - Tobacco use
  - Hypertension
  - Obesity
  - Albuminuria (micro or macro)
  - Dyslipidemia
  - Age >30 years
- Use enteric-coated aspirin in doses of 81–325 mg/day.
- In patients with severe CVD, clopidogrel can be used in conjunction with aspirin therapy.
- People with aspirin allergy, bleeding tendency, recent gastrointestinal bleeding, and clinically active hepatic disease are not candidates for aspirin therapy. Other antiplatelet agents may be an option for these patients.
- Use of aspirin has not been studied in individuals with diabetes who are under the age of 30 years.
- Aspirin therapy should not be recommended for patients under the age of 21 years because of the increased risk of Reye's syndrome associated with aspirin use.

### B. Tobacco Cessation

#### Assessment of tobacco use and history

Systematic documentation of a history of tobacco use must be obtained from all adolescent and adult individuals with diabetes.

#### Counseling on tobacco prevention and cessation

- All health care providers should advise individuals with diabetes not to initiate use of tobacco.
- This advice should be consistently repeated to prevent smoking and other tobacco use among children and adolescents with diabetes under age 21 years.
- Among tobacco users, cessation counseling must be completed as a routine component of diabetes care.
- Every user of tobacco products should be urged to quit in a clear, strong, and personalized manner that describes the added risks of tobacco use and diabetes.
- Every tobacco user should be asked if he or she is willing to quit at this time:
  - If no, initiate brief and motivational discussion regarding the need to stop using tobacco, the risks of continued use, and encouragement to quit as well as support when ready.
  - If yes, assess preference for and initiate either minimal, brief, or intensive cessation counseling and offer pharmacological supplements as appropriate.
  - Refer to Wyoming Quitline, 1-866-WYO-QUIT or 1-866-996-7848 or [www.wy.quitnet.com](http://www.wy.quitnet.com).

### C. Immunization

#### Influenza

- Consistent with the recommendations of the Advisory Committee on Immunization Practices (ACIP), the influenza vaccine should be recommended every year for patients with diabetes, age 6 months and older, beginning each September.

- The ACIP recommends two doses of influenza vaccine administered at least 1 month apart (the last administered before December) for children <9 years of age who have never been vaccinated.
- Vaccination of health care workers and family of patients with diabetes may prevent person-to-person transmission.

## Pneumococcal

- According to the ACIP, pneumococcal vaccination is indicated to reduce invasive disease from pneumococcus in people with diabetes.
- There is insufficient evidence to support revaccination of people with diabetes unless other special circumstances exist.
  - A one-time revaccination is recommended for individuals >64 years of age previously immunized when they were <65 years of age if the vaccine was administered more than 5 years prior.
  - Other indications for repeat vaccination potentially relevant to patients with diabetes include:
    - nephrotic syndrome
    - chronic renal disease
    - other immunocompromised states, such as post-organ transplantation.
- Pneumococcal vaccine may be administered with other vaccines (by a separate injection in another anatomic site) without an increase in side effects or decrease in efficacy.

## D. Physical Activity/Exercise

Physical activity is one of the cornerstone management tools for diabetes. However, according to the U.S. Surgeon General, less than 30% of adults in the U.S. are currently achieving regular physical activity. This is also true of Wyoming residents. The current recommendations call for individuals to obtain 30-60 minutes of moderate to vigorous activity most days to help reduce the incidence of obesity, cardiovascular disease, and diabetes.

The benefits derived from activity for individuals with diabetes are improved insulin sensitivity; increased fibrinolysis; and decreased blood pressure, C-reactive protein, lipids, glucose levels, body fat and weight. There may also be a decrease in the need for exogenous insulin and oral medication. People often experience an improvement with symptoms associated with depression and stress.

Physical activity is a useful therapeutic tool in patients with, or at risk for, diabetes. However, like any therapy its effects must be thoroughly understood. This means that the diabetes health care team should understand how to analyze the risks and benefits of physical activity in a given patient.

### Evaluation of the Patient Before Exercise

- Before increasing usual patterns of physical activity or an exercise program, the individual with diabetes should undergo a detailed medical evaluation with appropriate diagnostic studies.
- A careful medical history and physical examination should focus on the signs and symptoms of disease affecting the heart and blood vessels, eyes, kidneys, feet, and nervous system.

### Cardiovascular System

- A graded exercise test is recommended if a patient, about to begin a moderate- to high-intensity physical activity program, is at high risk for underlying cardiovascular disease, based on one of the following criteria:
  - Age >35 years
  - Age >25 years and
    - Type 2 diabetes of >10 years duration
    - Type 1 diabetes of >15 years duration
  - Presence of any additional risk factor for coronary artery disease
  - Presence of microvascular disease (proliferative retinopathy or nephropathy, including microalbuminuria)
  - Peripheral vascular disease
  - Autonomic neuropathy

- In patients who exhibit nonspecific electrocardiogram (ECG) changes in response to exercise, or who have nonspecific ST and T wave changes on the resting ECG, alternative tests such as radionuclide stress testing may be performed.
- In patients planning to participate in low-intensity forms of physical activity (<60% of maximal heart rate) such as walking, the physician should use clinical judgment in deciding whether to recommend an exercise stress test.
- Patients with known coronary artery disease should undergo a supervised evaluation of the ischemic response to exercise, ischemic threshold, and the propensity to arrhythmia during exercise. In many cases, left ventricular systolic function at rest and in response to exercise should be assessed.

### Peripheral Arterial Disease

- Evaluation of peripheral arterial disease (PAD) is based on signs and symptoms, including intermittent claudication, cold feet, decreased or absent pulses, atrophy of subcutaneous tissues and hair loss.
- Treatment for intermittent claudication is tobacco cessation and a supervised physical activity program.
- The presence of a dorsalis pedis and posterior tibial pulse does not rule out ischemic changes in the forefoot. If there is any question about blood flow to the forefoot and toes on physical examination, toe pressures as well as Doppler pressures at the ankle should be carried out.

### Retinopathy

- In patients who have active proliferative diabetic retinopathy (PDR), strenuous activity may precipitate vitreous hemorrhage or traction retinal detachment. These individuals should avoid anaerobic exercise and physical activity that involves straining, jarring, or Valsalva-like maneuvers.

**TABLE 21**

**Considerations for Activity Limitation in Diabetic Retinopathy**

Level of Retinopathy	Acceptable Activities	Discouraged Activities	Ocular Reevaluation
None	Dictated by medical status	Dictated by medical status	12 months
Mild, nonproliferative	Dictated by medical status	Dictated by medical status	6-12 months
Moderate, nonproliferative	Dictated by medical status	Activities that dramatically elevate blood pressure; power lifting, heavy valsalva	4-6 months
Severe, nonproliferative	Dictated by medical status	Activities that substantially increase systolic blood pressure, valsalva maneuvers, and active jarring, boxing, heavy competitive sports	2-4 months (may require laser surgery)
Proliferative	Low impact, cardiovascular conditioning, swimming, walking, low impact aerobics, stationary cycling, endurance exercises	Strenuous activities, valsalva maneuvers, pounding or jarring, weight lifting, jogging, high-impact aerobics, racquet sports, strenuous trumpet playing	1-2 months (may require laser surgery)

## Nephropathy

- Specific physical activity recommendations have not been developed for patients with incipient microalbuminuria (>30 mg/24 hr albumin excretion) or overt nephropathy (>300 mg/24 hr).
- There is no clear reason to limit low-to-moderate-intensity forms of activity in patients with nephropathy, but high-intensity or strenuous physical activity should probably be discouraged in these individuals unless blood pressure is carefully monitored during exercise.

## Neuropathy: peripheral

Peripheral neuropathy (PN) is an indication to limit weight-bearing exercise. Repetitive exercise on insensitive feet can ultimately lead to ulceration and fractures.

**TABLE 22**

**Exercises for Patients with Loss of Protective Sensation**

Contraindicated exercise	Recommended exercise
Treadmill	Swimming
Prolonged walking	Bicycling
Jogging	Rowing
Step exercises	Chair exercises
	Other non-weight-bearing exercise
	Resistant arm exercises

## Neuropathy: autonomic

- Autonomic neuropathy may limit an individual's physical activity capacity and increase the risk of an adverse cardiovascular event during physical activity.
- Resting or stress thallium myocardial scintigraphy is an appropriate noninvasive test for the presence and extent of macrovascular coronary artery disease in these individuals.
- Hypotension and hypertension after vigorous physical activity are more likely to develop in patients with autonomic neuropathy, particularly when starting a physical activity program.
- Because these individuals may have difficulty with thermoregulation, they should be advised to avoid physical activity in hot or cold environments and to be vigilant about adequate hydration.

## Exercise and type 1 diabetes

People with type 1 diabetes are at greater risk to develop hypoglycemia during exercise. General guidelines that may prove helpful in preventing hypoglycemia can be summarized as follows:

1. Metabolic control before physical activity:
  - Avoid physical activity if fasting glucose levels are >250 mg/dL and ketosis is present, and use caution if glucose levels are >300 mg/dL and no ketosis is present
  - Ingest added carbohydrate if glucose levels are <100 mg/dL
2. Blood glucose monitoring before and after physical activity:
  - Identify when changes in insulin or food intake are necessary
  - Learn the glycemic response to different physical activity conditions
3. Food intake:
  - Consume added carbohydrate as needed to avoid hypoglycemia
  - Carbohydrate-based foods should be readily available during and after physical activity

## General exercise recommendations

- Aerobic physical activity should be recommended, but taking precautionary measures for physical activity involving the feet is essential for many patients with diabetes.
  - The use of silica gel or air midsoles as well as polyester or blend (cotton-polyester) socks to prevent blisters and keep the feet dry is important for minimizing trauma to the feet.
  - Proper footwear is essential and must be emphasized for individuals with peripheral neuropathy.

- Individuals must be taught to monitor closely for blisters and other potential damage to their feet, both before and after physical activity.
- A diabetes identification bracelet or shoe tag should be clearly visible when exercising.
- Proper hydration is essential, as dehydration can affect blood glucose levels and heart function adversely. Adequate hydration prior to physical activity is recommended (e.g., 17 ounces of fluid consumed 2 hours before physical activity).
- Precautions should be taken when exercising in extremely hot or cold environments.
- Moderate weight training programs that utilize light weights and high repetitions can be used for maintaining or enhancing upper body strength in nearly all patients with diabetes.
- High-resistance exercise using weights may be acceptable in some individuals with diabetes. However, caution should be used in older individuals or those with long-standing diabetes.

## Special population groups

### *Pregnancy*

Women with pre-existing diabetes can exercise during pregnancy. Women on insulin may need to be continuously monitored and their insulin adjusted to normalize blood glucose levels. If the woman has vascular complications, the recommendations for any patient with vascular compromise should be followed.

Gestational diabetes is considered a state of insulin resistance. Exercise has been shown to improve blood glucose levels by improving peripheral resistance to insulin.

Recommendations from the American College of Obstetricians and Gynecologists for exercise in pregnancy include:

- Regular exercise (at least 3 times a week) is preferred to intermittent activity.
- Moderate exercise: one that doesn't cause fetal distress, low infant birth weight or uterine contractions.
  - Example: arm exercises in a sitting position, before a meal, using 2 lb. cans of food. Do this for 20 minutes 3 times a week. Discontinue if a contraction is felt. It is a good cardiovascular workout if the patient cannot sing "Row, row, row your boat . . . dream" all in one breath.
- Avoid the supine position after the first trimester. Prolonged periods of motionless standing should also be avoided.
- Since there is a decrease in available oxygen for aerobic activity during pregnancy, women should be encouraged to modify the intensity of their exercise according to maternal symptoms. They should stop exercising when fatigued and not exercise to exhaustion.
- Morphologic changes in pregnancy should serve as a relative contraindication to types of exercise in which loss of balance could be detrimental to maternal or fetal well being. Activity that involves the potential of even mild abdominal trauma should be avoided.
- Care should be taken to ensure adequate caloric intake to meet the needs of exercise and pregnancy.
- Women who exercise during the first trimester should be taught to augment heat dissipation by ensuring adequate hydration, appropriate clothing, and optimal environmental surroundings.
- Contraindications for exercising during pregnancy include:
  - Pregnancy-induced hypertension
  - Pre-term rupture of membrane
  - Pre-term labor during the prior or current pregnancy
  - Incompetent cervix
  - Persistent second to third trimester bleeding
  - Intrauterine growth retardation

Further guidelines on pregnancy, diabetes, and exercise can be found in *Guidelines for Exercise Testing and Prescription* from the American College of Sports Medicine; and *The Health Professional's Guide to Diabetes and Exercise* from the American Diabetes Association.

## Children

Hypoglycemia is the most frequent problem associated with type 1 diabetes in children during exercise. This is due to an increase in insulin sensitivity and a decrease of glucagon stores. Hypoglycemia can be minimized by providing snacks before, during, and after the activity, depending upon the type of the activity and the timing of the insulin being used.

The physical needs of children should be assessed prior to implementing an exercise plan. The necessary adjustments of food intake and/or insulin adjustments must be made. Care should also be taken to assess the child's feelings about their disease and their willingness to address hypoglycemia in front of their peers.

Children with type 2 diabetes benefit from exercise similar to adults. Since these children are often overweight, they may need assistance with overcoming barriers that may exist for developing an exercise program (e.g., teasing, lack of support, lack of skills, etc.).

## Exercise prescription

According to the American Heart Association, between 700-2000 calories/week should be expended for physical conditioning and health benefits. When planning an exercise program, individuals should be taught the FITT method: frequency, intensity, type, and time.

## Frequency

Evidence indicates that little health benefits are derived when exercise is <2 days a week. The American College of Sports Medicine recommends exercise be performed at least 3 nonconsecutive days each week and ideally 5 days a week. Individuals trying to lose weight may need to complete 6-7 days a week until target weight is reached.

## Intensity

Health care providers need to consider the intensity with which each person with diabetes should exercise. Special consideration should be given to those with known coronary artery disease, autonomic neuropathy and those receiving medications like  $\beta$ -blockers. Based upon recommendations from the American College of Sports Medicine, the minimum training intensity for aerobic health benefits is 60% of the maximal heart rate, which can be estimated by the equation  $HR_{max} = 220$  minus the individual's age. This also equates to a rating of perceived exertion (RPE) of 12 on the Borg 6-20 scale.

**TABLE 23**

**Borg 6-20 Perceived Exertion Scale**

Rating of Perceived Exertion (RPE)	Verbal Description	Rating of Perceived Exertion (RPE)	Verbal Description
6		14	
7	Very, very light	15	Hard
8		16	
9	Very light	17	Very hard
10		18	
11	Fairly light	19	Very, very hard
12		20	
13	Somewhat hard		

Low to moderate intensity (60-80% maximum heart rate or RPE 12-13) activity is recommended for people with diabetes to receive the best health benefits. Individuals that were exercising at a high intensity prior to the diagnosis of diabetes should be able to continue with the activity, but may need some assistance in medication adjustments and with the signs and symptoms of hypo- and hyperglycemia.

Individuals participating in a resistance training program should complete 1-3 sets (one set equals 8-12 repetitions), at 60-80% of 1 repetition maximum. The individual lifting the maximum amount of weight possible, one time, with proper form determines a repetition maximum. This range may vary based upon the individual's goals and clinical status.

It is important that all individuals be instructed on how to properly warm up and cool down with each exercise session. This will help prevent cardiac and musculoskeletal injuries. A practical warm up and cool down can be completed by performing the activity at a lower intensity for 5 minutes. Stretching is also recommended to maintain flexibility.

### ***Type***

Aerobic, resistant training, and flexibility activities provide the best overall health benefit. Each activity works together to develop lean body mass, improve cardiovascular function, promote weight loss/maintenance, and improve or maintain range of motion and balance. Aerobic activities can include walking, jogging, swimming, cycling, dance, etc. Resistant activities may consist of weight machines, free weights and/or resistance bands.

An example of incorporating each activity into an exercise program would be walking Monday, Wednesday, and Friday, weight machine on Tuesday and Thursday, with stretching exercises at the end of each session for flexibility.

### ***Time***

Lower intensity activities will need to be performed longer to achieve the same health benefits of moderate to high intensity activities. Exercise sessions typically need be 20-60 minutes long. Individuals who are just starting to exercise should start out with less time and gradually increase the duration over time. Once a desired duration is reached, an individual can work on increasing the intensity.

### ***Maintenance and Motivation***

Fifty percent of the people who start an exercise program typically drop out within one year. Some specific steps that can be taken to lower drop out rates include:

- Ensure that the person has reasonable expectations at the start of the program.
- Have the new participant make a firm commitment to adhere to the program via a written contract.
- Start the exercise program at a comfortable level and progress gradually.
- Choose enjoyable activities that can be performed at a convenient time and location.
- Set realistic goals to ensure a gradual progression of exercise training.
- Review the person's performance on a regular basis and give them feedback about their progress.
- Reinforce positive changes in behavior via appropriate rewards.
- Use stimulus control strategies (e.g., write exercise time in appointment books) and cognitive strategies (e.g., have participants consider the pros and cons of exercise).
- Optimize social support from friends and relatives.
- Train in relapse prevention.

Individuals may also benefit from a referral to an exercise physiologist or physical therapist to help them learn how to start and maintain an exercise routine.

## **E. Medical Nutrition Therapy**

### **Nutrition Recommendations**

Medical nutrition therapy is one of the cornerstone treatments for diabetes. Recommendations have changed through the years for the most effective nutrition prescription for individuals with diabetes. Currently, there is not a "one size fits all diet." The "ADA" diets used over the years are not approved by the American Diabetes Association or the American Dietetics Association and should not be used; nor should blanket nutrition prescriptions that are not tailored to the individual. Since diabetes is a

chronic disease, which changes as life experiences change, regular visits to a registered dietitian/certified diabetes educator (RD, CDE) are recommended to provide an ongoing nutrition plan specific to the individual with diabetes that will achieve optimal outcomes and goals.

The American Diabetes Association published Evidence Based Nutrition Principles and Recommendations in 2002 with modifications published in 2004. Evidence is labeled alphabetically as A, B, C or E, with the most conclusive evidence having an A designation and the least clear evidence labeled C. Level E denotes evidence that is based upon clinical experience. The best available evidence must still take into account individual circumstances and preferences.

### **Goals of Medical Nutrition Therapy for Diabetes**

- Achieve and maintain optimal metabolic outcomes including blood glucose levels in the normal or near normal range and lipoprotein profiles and blood pressure levels that reduce the risk for cardiovascular disease.
- Prevent and treat chronic complications associated with diabetes.
- Prevent and treat other health related disorders.
- Address individual nutritional needs based upon personal, cultural, and lifestyle choices, while respecting the individual's preferences and willingness to change.
- Encourage a healthy eating style that promotes the enjoyment of food, eating, and a healthy body image, while nourishing the body.

### **Goals for Specific Populations and Situations**

- For youth with type 1 diabetes, integrate insulin regimens into usual eating and physical activity habits to provide adequate energy to ensure normal growth and development.
- For youth with type 2 diabetes, facilitate changes in eating and physical activity habits that reduce insulin resistance and improve metabolic status.
- For pregnant and lactating women, provide adequate energy and nutrients needed for optimal outcomes.
- For older adults, provide for the nutritional and psychosocial needs of an aging individual.
- For individuals treated with insulin or insulin secretagogues, provide self-management education for treatment and prevention of hypoglycemia, acute illnesses, and exercise-related blood glucose problems.
- For individuals at risk for diabetes, decrease risk by encouraging physical activity and promoting food choices that prevent weight gain and facilitate moderate weight loss.

### **Primary Prevention, Energy Balance and Obesity**

Excess calories and body fat, especially centrally located, can increase insulin needs and insulin resistance. Individuals with type 1 diabetes should be encouraged to obtain and maintain a healthy body weight and healthy percentage of body fat.

Studies have shown that individuals who are overweight or obese, who lose 5-7% of their body weight, have improved blood pressure, glucose, and lipid levels. Individuals with type 2 diabetes who are overweight, or those at risk of developing type 2 diabetes, including those with metabolic syndrome and PCOS, should receive continued assistance in losing weight and maintaining a healthy body weight.

### **Recommendations**

- In insulin-resistant individuals, reduced energy intake and modest weight loss improve insulin resistance and glycemia. Therefore weight loss is recommended for all overweight individuals at risk for diabetes. (A Level)
- Structured programs that emphasize lifestyle changes, modest decreased energy intake, physical activity ( $\geq 150$  minutes/week), and regular participant contact have the best likelihood of producing long-term moderate weight loss (7% of body weight), and are recommended for people at risk of developing type 2 diabetes. (A Level)
- Exercise and behavior modification are most useful as adjuncts to other weight loss strategies. Exercise is helpful in maintenance of weight loss. (B Level)

- Weight loss medication in conjunction with lifestyle modification can be considered in the treatment of overweight and obese individuals with type 2 diabetes. (B Level)
- Bariatric surgery can be considered for individuals with a BMI  $\geq 35$  kg/m<sup>2</sup> and type 2 diabetes to help improve glycemia. Long-term studies on the benefit and risk of bariatric surgery on pre-diabetes and diabetes continue. (B Level)
- Low carbohydrate diets of <130 grams per day are not recommended since the long-term effects of these diets are unknown. Although these diets produce short-term weight loss, maintenance of weight loss is similar to low-fat diets and the impact on CVD risks is uncertain. (B Level)
- Individuals at risk for developing type 2 diabetes should be encouraged to consume the recommended amount of dietary fiber (14 gram/1000 calories). They should also be encouraged to eat foods containing whole grains. At least one-half of grain intake should be whole grain. (B Level)
- Data does not support consumption of alcohol to prevent type 2 diabetes. (B Level)
- Currently studies are inconsistent to support recommending a low glycemic load diet to reduce the risk for diabetes. However, low glycemic index foods that are rich in fiber and other nutrients are to be encouraged. (E Level)
- Some research has been conducted related to vitamin D and the prevention of type 1 diabetes, but currently no nutrition recommendations can be made for preventing type 1 diabetes. (E Level)
- The data for preventing the development of type 2 diabetes in children and adolescents is still insufficient, but an approach similar to preventing the disease in adults is reasonable providing that nutritional needs for normal growth and development are maintained. (E Level)

## Secondary Prevention - Macronutrients and Diabetes

There continues to be controversy in the medical and nutrition fields concerning the correct distribution of carbohydrate, protein, and fat in an individual's diet. All metabolic parameters, goals, individual preferences, and lifestyle habits should be considered when developing an eating plan. The individual with diabetes should be included in the decision-making process.

### Carbohydrates

Carbohydrates include all sugars, starches, and fiber. Carbohydrates are a primary fuel for the body and should be included in the diet of a person with diabetes. Pattern management, food records, metabolic control, and other health conditions should be used to help individuals with diabetes determine the appropriate amount and type of carbohydrate that is best for their goals.

### Recommendations

- The total amount of carbohydrate in meals or snacks is important in determining the overall effect on blood glucose levels. (A Level)
- Sucrose containing foods can be included in the diet of an individual with diabetes but they must be included in the total carbohydrate content for the meal or snack, or covered with appropriate medication. (A Level)
- Non-nutritive sweeteners have proven to be safe when consumed within the acceptable daily intake levels established by the FDA. (A Level)
- Individuals receiving intensive insulin management should adjust pre-meal insulin doses based on the carbohydrate content of meals. (A Level)
- The glycemic index and load may provide a slight additional benefit over that observed when just total carbohydrate is considered. (B Level)
- As with the general public, increased consumption of dietary fiber is encouraged. (B Level)
- Foods containing carbohydrate from whole grains, fruits, vegetables, and low-fat milk should be included in a healthy diet. (B Level)
- Individuals receiving fixed daily insulin doses should try to be consistent in day-to-day carbohydrate intake. (C Level)
- Low carbohydrate diets of <130 grams/day are not recommended for the management of diabetes. (E Level)

## Protein

Protein intake in the United States usually accounts for 15-20% of the total caloric intake. This amount of protein intake does not appear to be associated with the development of diabetic nephropathy. However, long-term effects of consuming >20% of energy as protein on the development of nephropathy has not been determined.

Protein requirements can be higher in individuals with type 2 diabetes who have moderate glycemic control due to an increase in protein turnover. In individuals with type 1 diabetes being treated with conventional insulin therapy, studies have demonstrated an increase in protein catabolism. Since most individuals consume at least 50% more protein than what is needed, people with diabetes appear to be protected against protein malnutrition when consuming a typical diet.

### Recommendations

- Ingested protein, in individuals with type 2 diabetes, can increase insulin response without increasing plasma glucose concentrations. Thus, protein should not be used to treat hypoglycemia or prevent nocturnal hypoglycemia. (A Level)
- For people with diabetes and normal renal function, there is insufficient evidence to suggest that usual protein intake (15-20%) should be modified. (E Level)
- Currently, high-protein, low-carbohydrate diets are being recommended by some health care providers. Short-term studies have shown these diets can promote weight loss and improve glycemia. However, long-term studies have not been conducted to determine if the weight loss persists, the long-term impact on LDL cholesterol, long-term glycemic control, or any links with other disorders or diseases. (E Level)

## Fat

The primary dietary fat goal for individuals with diabetes is to limit saturated fat and dietary cholesterol due to the negative impact these dietary lipids exhibit on serum lipid levels. Recommendations for total cholesterol and saturated fat intake are consistent with the American Heart Association recommendations.

Diets low in total fat (<10% of energy) and high in carbohydrates increase postprandial blood glucose levels, triglycerides and may decrease HDL when compared to isocaloric high monounsaturated fat diets. However, high-monounsaturated fat diets have not been shown to improve fasting plasma glucose or A1c values. Polyunsaturated fats, when substituted for saturated fats, lower total and LDL cholesterol but not as well as monounsaturated fats. Care should be taken to adjust intake of monounsaturated fats with the individual's total energy needs.

Trans-fatty acids can impact serum lipid levels similar to saturated fats. They can also lower HDL levels in the blood and should be limited.

### Recommendations

- Less than 7% of energy intake should be derived from saturated fats. (A Level)
- Dietary cholesterol should be <200 mg/day. (A Level)
- Two or more servings of fish per week (except commercially fried fish) provide omega-3 fatty acids and are recommended. (B Level)
- Trans-fatty acids should be limited. (E Level)

## Micronutrients

Individuals with diabetes who are able and willing to improve their diet through wise food choices by incorporating a wide variety of foods from all the basic food groups will most likely meet their micronutrient needs. Classic vitamin deficiencies like scurvy, pellagra, or beriberi are typically not seen in the U.S. However, suboptimal intake of some vitamins due to the inability and/or unwillingness to improve one's diet, or poor glycemic control can increase the risk for chronic diseases or complications. Likewise excessive intake of micronutrients in the form of supplements can also lead to imbalances and

toxicity. Each person with diabetes should be assessed to determine if they might benefit from extra supplementation. Special population groups like vegetarians, elderly, pregnant or lactating women may benefit from a multivitamin/mineral supplement.

Deficiencies of certain minerals, such as potassium, magnesium, zinc and chromium may aggravate carbohydrate intolerance. Potassium and magnesium deficiencies are easy to detect and supplementation can be added. Chromium and zinc deficiencies are harder to determine. Some studies have shown benefit with chromium supplementation, others have not.

Vanadium salts are being explored to determine if they have a role in blood glucose control. Since significant evidence for efficacy has not been established and there is an increase risk of toxicity, no current recommendations exist.

### **Recommendations**

- There is no concise evidence of the benefit from vitamin and mineral supplementation in people with diabetes who do not have deficiencies. Exceptions include folate for prevention of birth defects and calcium for the prevention of bone disease. (A Level)
- Routine supplementation with antioxidants is not currently recommended due to uncertainties related to long-term use. (A Level)

### **Alcohol**

Alcohol recommendations for people with diabetes are the same as the general public. If people do not currently drink, they are not advised to start. However, if an individual chooses to drink, moderation is recommended.

Alcohol can have hypoglycemic and hyperglycemic effects in people with diabetes. Studies have shown that moderate amounts of alcohol ingested with food had no acute effect on blood glucose or insulin levels.

### **Recommendations**

- If individuals choose to drink alcohol, daily intake should be limited to one drink for adult women and two drinks for adult men. One drink is defined as 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of distilled spirits. (B Level)
- To reduce risk of hypoglycemia, alcohol should be consumed with food, especially at night. (E Level)

## **Special Populations and Conditions**

### **Type 1 Diabetes**

- Insulin therapy should be integrated into the individual's nutrition and physical activity pattern. (E Level)
- Insulin doses can be adjusted for planned exercise; however, for unplanned exercise, extra carbohydrate may be needed. (E Level)

### **Type 2 Diabetes**

- Individuals should be encouraged to adopt lifestyle habits that reduce the intake of calories, saturated and trans fatty acids, cholesterol, and sodium, while increasing physical activity. (E Level)
- Blood glucose monitoring is helpful to determine whether adjustments with food and activity will be adequate to obtain targeted goals, or if medication is also needed. (E Level)

## Pregnancy and Lactation with Diabetes

Nutrition requirements during pregnancy and lactation are similar for women with and without diabetes. Carbohydrate amount and distribution should be based upon the clinical outcomes, hunger, glucose levels, weight gain and ketone levels; but a minimum of 175 grams per day should be ingested. Carbohydrate intake in the morning should be limited to 15-45 grams due to increased insulin resistance at this time. A meal plan with 3 meals and 3 snacks can help prevent hyperglycemia and hypoglycemia and control postprandial blood glucose levels. Some women are unable to eat this often, but need to be counseled about avoiding more than 10 hours from bedtime to breakfast to prevent ketone production.

**TABLE 24**  
**Nutrient Needs During Pregnancy and Lactation with Diabetes**

Nutrient	Pre-conception	Pregnancy	Lactation
Calories	Individualized based on wt goals: 30 kcal/kg normal weight 25 kcal/kg overweight 20 kcal/kg obese	+ 300 after week 13	+500 for duration of lactation
Protein	12-20% of calories	20-25% of calories	Same as pregnancy
Carbohydrate	Individualized	40-45% GDM 40-50% Others	Individualized
Fat	Individualized	30-40%, emphasize monounsaturated fats	Individualized
Folic Acid	400 mcg	800 mcg	400 mcg
Iron	15-18 mg	27 mg	15-18 mg

- Gestational diabetes is a risk factor for developing type 2 diabetes so postnatal counseling should focus on lifestyle modifications aimed at reducing weight and increasing physical activity. (A Level)
- Patients should be counseled to avoid ketonemia from ketoacidosis. Starvation ketosis should be avoided. (C Level)
- MNT for gestational diabetes focuses on food choices for appropriate weight gain, normoglycemia, and absence of ketones. (E Level)
- In some women with gestational diabetes, modest energy and carbohydrate restriction may be appropriate. (E Level)

## Older Adults with Diabetes

- Energy requirements for older adults are less than for younger adults. Obese older adults may benefit from a moderate energy restriction and an increase in physical activity. (E Level)
- A multivitamin once a day may be beneficial. (C Level)

## Cardiovascular Disease

- In normotensive and hypertensive individuals, sodium intake should be reduced to 2300 mg/day. A diet high in fruits, vegetables, and low-fat dairy products lowers blood pressure. (A Level)
- Obtain an A1c as close to target as possible without significant hypoglycemia. (B Level)
- A modest amount of weight loss beneficially affects blood pressure. (C Level)
- If patients also have symptomatic heart failure, dietary sodium should be <2000 mg/day. (C Level)
- Patients may reduce their risk for CVD if a diet high in fruits, vegetables, whole grains, and nuts is maintained. (C Level)

## Microvascular

- In individuals with microalbuminuria and overt nephropathy, a reduction of protein to 0.8–1.0 gm per kg body weight per day may slow the progression of nephropathy and improve renal function. (B Level)
- MNT that reduces risk factors for CVD may also improve microvascular complications. (C Level)

## Hypoglycemia

- Ingesting 15-20 grams of glucose is the preferred treatment, although any form of carbohydrate that includes glucose may be used. (A Level)
- Patients should respond to hypoglycemia treatment within 10-20 minutes. Additional treatment may be necessary so a repeat test of blood glucose within 60 minutes should be performed. (B Level)

## Acute Illness

- Insulin and oral hypoglycemic agents should be continued. (A Level)
- It is important to drink adequate fluids, ingest carbohydrates, and test blood glucose and ketones during acute illness. (B Level)

## Patients in Acute Care Facilities

- A menu planning system that utilizes consistent carbohydrate content of meals should be considered by medical care facilities. (E Level)
- Improving the care of patients with diabetes during and after hospitalizations can occur with an interdisciplinary team, implementing MNT and providing timely disease specific discharge planning. (E Level)

## Patients in Long-Term Care Facilities

- Undernutrition in the institutionalized elderly is a concern and caution should be exercised when prescribing weight loss diets. (B Level)
- Residents should be served a regular menu with a consistent carbohydrate amount. (C Level)
- “No concentrated sweets” or “no sugar added” diets have no basis and should not be prescribed. (E Level)
- An interdisciplinary team should be utilized to integrate MNT into the overall diabetes management. (E Level)

## Disordered Eating

Individuals with diabetes, PCOS, or pre-diabetes, especially woman, are at an increased risk for eating disorders and disordered eating practices that meet the DSM-IV diagnostic criteria. The treatment for these diseases can foster an environment for the development of disordered eating due to the emphasis placed on food, activity, metabolic control and weight. Common practices include insulin omission, binge eating, purging, severe food restrictions, and dieting. There is an increase in complications associated with eating disorders. Individuals should be screened based upon the DSM-IV criteria.

Since recovery from an eating disorder can take years, a referral to a mental health professional trained in eating disorders is necessary. Regular communication is needed between the health care team members to provide the best treatment outcomes for the individual.

Health care professionals need to encourage a healthy eating style when counseling individuals with diabetes, pre-diabetes, or PCOS. Emphasis should be placed on achieving health. Morality judgments (good versus bad) attached to food choices, weight, or metabolic parameters do not have a place in achieving medical nutrition therapy goals.

## Summary

Medical nutrition therapy needs to be individualized. Monitoring of metabolic parameters and quality of life issues are necessary to assess when changes in therapy are needed and to ensure successful outcomes. Access to ongoing nutrition self-management training needs to be available to all individuals with diabetes.

## F. Oral Health

Individuals with diabetes are at risk for oral health complications including:

- Caries
- Periodontal disease
- Xerostomia
- Oral candidiasis
- Lichen planus
- Infection and delayed healing
- Taste impairment

Dental infections may be a contributing factor for uncontrolled blood glucose. Dental care, blood glucose control, proper nutrition, and absence of tobacco use are needed to prevent oral health complications.

Individuals with diabetes should be encouraged to brush teeth twice a day with fluoride toothpaste and clean between the teeth with floss or an inter-dental cleaner at least once a day. They should be seen by a dental care specialist twice a year for cleaning and an oral health exam. Individuals with dentures should obtain an oral health exam yearly. Follow-up may be more frequent if any complications are identified. Medication adjustments may be needed if an infection is present or surgery is needed.

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