Are you up to the challenge of mentoring future pharmacists and still able to meet your patients’ needs?

Is it time for a patient’s Rx Bill of Rights? 13
Reduce hospital readmissions with MTM 29
Rx drugs from the secondary market are risky business 31

PHARMACY PRECEPTORS

Are you up to the challenge of mentoring future pharmacists and still able to meet your patients’ needs?

Medical nutrition therapy, physical activity, and health maintenance considerations for patients with diabetes PAGE 48

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**Goal:** To assist pharmacists on how to advise and educate patients with diabetes on medical nutrition therapy, physical activity, and health maintenance considerations.

After participating in this activity, pharmacists will be able to:

- Discuss the role of lifestyle changes in diabetes prevention and maintenance
- Identify dietary sources of carbohydrates, proteins, and fats
- Describe basic concepts of carbohydrate counting, the glycemic index, and meal planning for patients with diabetes
- List health maintenance considerations for the patient with diabetes
- Discuss sick-day management concepts for patients with diabetes

**Abstract**

With the prevalence of diabetes on the rise, timely and ongoing interventions are needed to promote healthy living and prevent chronic disease. Lifestyle modifications such as medical nutrition therapy (MNT) and physical activity have been shown to improve metabolic control, reduce the risk of developing type 2 diabetes, and decrease mortality. Therefore, all patients with pre-diabetes or existing diabetes should receive formal and ongoing MNT counseling in conjunction with regular physical activity. Meal planning utilizing all macronutrients is recommended to meet normal nutrient needs and glycemic control.

**Medical nutrition therapy, physical activity, and health maintenance considerations for patients with diabetes**

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**Faculty Disclosure:** Dr. Nigro and Ms. Ellis have no actual or potential conflict of interest associated with this article.

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Diabetes mellitus is a complex metabolic disorder caused by various pathophysiologic abnormalities, most notably beta-cell dysfunction, increased peripheral resistance to insulin, and impaired incretin secretion/sensitivity. It is estimated that approximately 26 million (8.3%) Americans have diabetes and an additional 79 million with pre-diabetes are at risk for developing the disease. Persistent hyperglycemia can lead to both microvascular (nephropathy, neuropathy, and retinopathy) and macrovascular (coronary and peripheral vascular) complications. According to recent data, diabetes is the seventh leading cause of death in the United States and costs the healthcare system approximately $174 billion in direct and indirect medical costs.

Without targeted interventions for both prevention and treatment, the prevalence and cost of diabetes will continue to rise. Four modifiable risk factors are believed to contribute to the development of chronic disease: lack of physical activity, poor nutrition, tobacco use, and excessive alcohol consumption. According to 2010 data from the Centers for Disease Control and Prevention (CDC), approximately 36% of patients with diabetes are sedentary and 84% are overweight or obese. Because both physical inactivity and poor nutrition are risk factors for the development of type 2 diabetes, prevention and treatment approaches must include lifestyle interventions. The American Diabetes Association (ADA) recommends that all patients with pre-diabetes and established type 2 diabetes implement lifestyle changes at the time of diagnosis.

**Lifestyle interventions for diabetes prevention**

At the core of diabetes management is lifestyle modification, which includes medical nutrition therapy (MNT) and physical activity. MNT and physical activity are both individually effective prevention and treatment strategies, but their combination has been shown to delay the development of type 2 diabetes, according to findings from the Diabetes Prevention Program (DPP) study.

The DPP was a randomized, controlled trial to assess whether lifestyle interventions or treatment with metformin could prevent or delay the onset of diabetes in high-risk individuals (those with impaired glucose tolerance). A total of 3,234 nondiabetic patients between 25 and 85 years of age were randomly assigned to 1 of 3 groups: intense lifestyle interventions, standard lifestyle recommendations plus metformin 850 mg twice daily, or standard lifestyle recommendations plus placebo. Standard lifestyle recommendations highlighted general healthy eating tips and were provided by written instruction and through an annual 20- to 30-minute in-person session. Those in the intense lifestyle intervention group were prescribed a healthy low-calorie, low-fat diet in conjunction with 150 minutes per week of moderate-intensity physical activity. The goal was to lose and maintain a 7% reduction in body weight. Average follow-up was 2.8 years.

At the conclusion of the study, those in the intensive lifestyle intervention group had a 58% reduction in the risk for developing type 2 diabetes compared to a 31% reduction observed in the metformin group. DPP study findings confirm the impact of early lifestyle changes in reducing the incidence of diabetes. For this reason, the ADA recommends that all patients with pre-diabetes or existing diabetes should receive formal and ongoing MNT counseling in conjunction with regular physical activity.

**Medical nutrition therapy**

Medical nutrition therapy involves an as-
The United Kingdom Prospective Diabetes Study is among the largest randomized, controlled trials to show this benefit. Over 3,000 newly diagnosed patients with type 2 diabetes received nutrition counseling from a registered dietician (RD) for up to 3 months prior to study randomization. During this time, the mean glycosylated hemoglobin (A1c) decreased 1.9%. Table 1 summarizes some additional benefits of MNT.

It is worth noting that MNT interventions for patients with established type 2 diabetes differ in several ways from interventions for prevention. Because of the progressive nature of diabetes, MNT interventions progress from prevention or delay of obesity, to the prevention or delay of type 2 diabetes, to strategies to improve metabolic control. The overall goals of MNT are listed in Table 2. Regulation of blood glucose is the primary focus of MNT for patients with diabetes, so dietary techniques that help maintain glycemic control and prevent hyperglycemia or hypoglycemia are essential. A patient-specific nutrition prescription that involves a mix of carbohydrate, protein, and fat (macronutrients) should be created, preferably by an RD. The nutrition prescription should be based on the lifestyle changes that the patient is willing to make to lower the percentages of carbohydrates, proteins, and fats.

Currently, there is no single recommended “diabetic diet.” Many studies have tried to identify the optimal percentage of macronutrients for patients with type 2 diabetes; however, it appears that such a plan does not exist. Using the Dietary Reference Intakes (DRI) seems to be the best diet approach.

Although MNT is usually provided by an RD, pharmacists are well suited to offer nutritional advice as part of medication therapy management (MTM) services and routine patient counseling. The following discussion is intended to help the pharmacist gain familiarity with each macronutrient as well as to appreciate the anticipated effects of macronutrients on blood glucose control.

There is no single recommended “diabetic diet.”

**Carbohydrates.** Carbohydrates have the greatest postprandial influence on blood glucose levels and serve as the primary stimulus for insulin release. Carbohydrates are significant sources of energy, water-soluble vitamins, minerals, and fiber. Food sources include grains such as pasta, bread, and cereal; fruits; milk; sweets or desserts; and starchy vegetables such as corn, beans, and peas. Carbohydrates can be further classified by their grain content. Refined carbohydrates have had the bran and germ (components of the wheat plant) removed during milling. This process removes the fiber and other key vitamins and minerals. Examples of refined carbohydrates include white bread, white rice, and many pastry products. Whole grains, or unrefined carbohydrates, have the bran and germ intact and therefore are good sources of fiber, as well as other nutrients such as selenium, potassium, and magnesium. Examples of whole grains include 100% whole wheat bread, brown rice, and bulgur.

The consumption of carbohydrates from refined carbohydrate-containing food sources such as sugar-sweetened beverages, high fructose corn syrup, white grain products, and potatoes has significantly increased in the United States during the past decade. The U.S. Department of Agriculture reported that individuals cur-
Proteins are molecules composed of amino acids that are responsible for various cellular functions including muscle growth and repair. Despite much research, protein does not appear to slow the absorption of carbohydrates; therefore adding protein to the diet will not decrease glucose levels. Even in those with well-controlled type 2 diabetes, studies show that protein does not have an effect on blood glucose concentrations. Therefore the consumption of protein will not correct or prevent hypoglycemia, nor will it raise glucose concentrations. Of total daily calories, 10% to 20% from protein are recommended for those who do not have compromised renal function. For those with renal insufficiency, protein should be limited to 0.8 g/kg daily or less than 10% of total calories. Food sources of protein include meats, poultry, fish, and dairy.

Fat. Fats and lipids make up approximately 34% of the energy in the human diet. Fat acts as insulation and is essential for the digestion and absorption of fat-soluble vitamins and phytochemicals. Fat also aids in cellular membrane structure. Food sources include oils, salad dressings, mayonnaise, nuts, and butter. Unlike protein, fats have been shown to delay glucose absorption. Because individuals with diabetes are at high risk of developing cardiovascular disease, the ADA recommends that only 25% to 35% of total calories come from fat, with less than 7% of those calories from saturated fats. Both saturated and trans fats should be avoided or minimized due to their atherogenic properties.

Polyunsaturated and monounsaturated fatty acids have gained recent attention for their potential beneficial effects on serum lipids. Patients with diabetes should replace saturated and trans fatty acids with sources of either monounsaturated or polyunsaturated fatty acids to help reduce low-density lipoprotein cholesterol. Food sources of monounsaturated fatty acids include olive and canola oil, avocados, cashews, and select fish oils. Food sources of polyunsaturated fatty acids include vegetable oil, flaxseed oil, walnuts, and shellfish.

Fiber. Although fiber is not classified as a macronutrient, it is worth discussing. Fiber is readily found in fruits, vegetables, and whole grain products. Fiber, specifically the soluble form, has been studied not only for its potential beneficial effects on glycemic control but also for its effects on serum lipids. Soluble fiber has viscous properties that help delay gastric emptying. Similarly, insoluble fiber has also been shown to lower postprandial glucose levels.

Not only do the type and quantity of carbohydrates affect glucose levels but several factors also influence glycemic response to foods. These include amount of carbohydrates, type of sugar, nature of the starch, cooking and food-processing method, and food particle size and form. Other factors that influence glycemic response are fasting and preprandial glucose concentrations and the severity of glucose intolerance. Many studies have demonstrated that similar glycemic responses occur from a variety of carbohydrate sources when the amount of carbohydrates is consistent. Recommended carbohydrate intake is 45% to 65% of total calories.

TABLE 2
GOALS OF MEDICAL NUTRITION THERAPY

Achieve and maintain:

- Blood glucose concentrations in the normal range or as close to normal as is safely possible to prevent or reduce the risk for complications of diabetes
- A lipid and lipoprotein profile that reduces the risk for vascular disease
- Blood pressure levels in the normal range or as close to normal as is safely possible
- Nutrient intake and lifestyle modifications that prevent, or at least slow, and treat the chronic complications of diabetes
- Individualized MNT taking into account personal and cultural preferences and willingness to change
- Pleasure of eating maintained by limiting food choices only when indicated by scientific evidence

Abbreviations: MNT, medical nutrition therapy  
Source: Ref 14
An important priority for food and meal planning is the total amount of carbohydrates that a person consumes for meals and snacks. Carbohydrate counting assists patients with diabetes in determining the portions and amounts of carbohydrates allotted for each meal and/or snack. Carbohydrate counting portions foods so that 15 g of carbohydrate, regardless of type, equals 1 serving or 1 exchange. 16 Exchange lists are grouped into 6 categories: starch, fruit, milk, vegetables, meat or meat substitutes, and fat. Foods on each list contain similar macronutrient values and can therefore be “exchanged” for each another. Table 3 provides a list of carbohydrate exchanges. 30

This approach focuses on the amount of carbohydrates, not their source. For effective carbohydrate counting, an individual must have a meal plan, an understanding of which foods contain carbohydrates, proficiency at reading nutrition labels, and tools for measuring food. Individuals who choose to count carbohydrates should test their blood glucose level both before eating and 1 to 2 hours after. This will help patients determine whether they are eating adequate amounts of food and will also reinforce the impact of carbohydrates on glucose control.

The amount of carbohydrates that is appropriate for consumption at mealtimes and for snacks should be determined by an RD and should be based on the individual’s glucose control, food preferences, and eating habits. As mentioned previously, there is no specific diabetic diet that meets the needs of all patients.

Use of the GI is an alternate meal-planning technique. The GI is a rating scale that measures the changes in blood glucose after the consumption of carbohydrates. 15 Certain foods, such as white potatoes, cause an immediate rise in glucose followed by a less rapid fall, whereas others, such as apples, create smaller increases over a much longer period. 24

It is important to note that the GI does not measure how rapidly blood glucose levels increase. The GI ranks carbohydrate exchanges according to their postprandial effect and compares these rankings on a weight-to-weight basis in grams. 15 This is then compared with the response of a reference food (usually glucose or white bread) of a similar amount. 31 Foods having a GI value less than 55 are considered low GI foods and result in less postprandial fluctuations. Moderate GI foods are those falling between 55 and 70. Foods with a GI value greater than 70 are considered high GI foods and will cause greater postprandial glucose elevations as well as hyperinsulinemia. It is important to note that although consumption of low GI foods may help stabilize blood glucose, they are not always low in calories or fat. Examples of low GI foods include Kellogg’s All-Bran cereal, brown rice, spaghetti, carrots, beans, apples, and grapefruit. Foods with a moderate GI include pita bread, oatmeal cookies, and tortilla chips. Food with high GI include bagels, whole wheat and white bread, pumpkin, French fries, potatoes, and many nutrition and sports bars. 32

### Physical activity

As discussed previously, physical inactivity is a primary, modifiable risk factor for the development of type 2 diabetes. According to data from the CDC, more than one-third of all U.S. adults do not meet national recommendations for aerobic physical activity. 33 Interventions that aim to increase activity have been shown to have important benefits in patients with and at risk for developing diabetes. Studies have linked regular physical activity with a reduction in cardiovascular mortality, enhanced patient quality of life, and improved glycemic control. 34-37

Currently, the ADA endorses the recommendations set forth in the 2008 Physical Activity Guidelines for Americans. 38

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**TABLE 3**

<table>
<thead>
<tr>
<th>Food list</th>
<th>Carbs (g)</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starch</td>
<td>15</td>
<td>0-3</td>
<td>0-1</td>
<td>80</td>
</tr>
<tr>
<td>Fruit</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td>Milk</td>
<td>12</td>
<td>8</td>
<td>8</td>
<td>160</td>
</tr>
<tr>
<td>Whole</td>
<td>2%</td>
<td>12</td>
<td>8</td>
<td>120</td>
</tr>
<tr>
<td>1%</td>
<td>12</td>
<td>8</td>
<td>5</td>
<td>110</td>
</tr>
<tr>
<td>Fat Free</td>
<td>12</td>
<td>8</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>Sweets</td>
<td>15</td>
<td>Varies</td>
<td>Varies</td>
<td>Varies</td>
</tr>
<tr>
<td>Nonstarchy vegetables</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Meat</td>
<td>High-fat</td>
<td>0</td>
<td>7</td>
<td>8+</td>
</tr>
<tr>
<td>Medium</td>
<td>0</td>
<td>7</td>
<td>4-7</td>
<td>75</td>
</tr>
<tr>
<td>Lean</td>
<td>0</td>
<td>7</td>
<td>0-3</td>
<td>45</td>
</tr>
<tr>
<td>Plant-based</td>
<td>Varies</td>
<td>7</td>
<td>Varies</td>
<td>Varies</td>
</tr>
<tr>
<td>Fat</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>45</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Varies</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Ref 30

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**TABLE 4**

<table>
<thead>
<tr>
<th>TYPES OF MODERATE-INTENSITY EXERCISES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Brisk walking</td>
</tr>
<tr>
<td>• Cycling</td>
</tr>
<tr>
<td>• Swimming (moderate effort)</td>
</tr>
<tr>
<td>• General home care / cleaning</td>
</tr>
<tr>
<td>• Mowing lawn</td>
</tr>
<tr>
<td>• Home repair / painting</td>
</tr>
<tr>
<td>• Fishing (standing / casting)</td>
</tr>
<tr>
<td>• Golf (carrying clubs / pulling cart)</td>
</tr>
<tr>
<td>• Tennis and other racket sports</td>
</tr>
</tbody>
</table>

Source: Ref 38
patients with diabetes are encouraged to perform at least 150 minutes of moderate-intensity aerobic activity per week. Moderate intensity is defined as activity requiring a metabolic equivalent task (MET) score of 3.0 to 6.0 or using 50% to 70% of maximum heart rate. A 2007 meta-analysis of 10 prospective cohort studies showed that patients who engaged in moderate-intensity activity had an approximate 30% lower risk of type 2 diabetes compared to sedentary adults. Examples of moderate-intensity activities are included in Table 4.

Patients are discouraged from going more than 2 consecutive days without exercise. For those with type 2 diabetes, additional recommendations apply. Unless contraindications exist, patients with type 2 diabetes should engage in 2 weekly sessions of resistance training involving large muscle groups. Combining both aerobic and resistance training appears to have synergistic effects in patients with type 2 diabetes and reduces Ae more than either alone.

Walking at least 2 hours weekly is associated with a reduction in mortality in adults with diabetes.

Starting an exercise program can be overwhelming and confusing for patients. Pharmacists and other healthcare professionals can play an integral role in helping patients understand the benefits of exercise and assisting with the development of an exercise plan. For patients who may be unwilling to modify their current behavior, barriers to change should be explored. Motivational interviewing techniques including expressing empathy, resisting the righting reflex, reflective listening, and supporting self-efficacy can be used. For patients new to exercise, an effective activity suitable for all ages is walking. A 2003 prospective cohort study found that walking at least 2 hours per week was associated with a significant reduction in both all-cause and cardiovascular mortality in adults with diabetes compared to sedentary adults. Walking is safe, easily accessible, and appropriate for patients of advanced age or those with mobility challenges (e.g., arthritis). Use of a pedometer can help track the number of steps walked daily. A general goal is to walk 10,000 steps daily. Patients struggling to achieve this goal can start by walking as tolerated and work to increase the number of steps over time. Achieving this daily goal may help build self-efficacy and motivate patients to adhere to their exercise plan.

Although the benefits of increased physical activity are plentiful, exercise-induced hypoglycemia can occur, especially for patients taking insulin or oral secretagogues. Signs and symptoms may include mental confusion, irritability, tingling or tremor of the hands, fatigue, sweating, and visual changes. This form of hypoglycemia is believed to be the result of hyperinsulinemia and the body’s inability to adapt to the reduced need for insulin during exercise. In an effort to reduce the risk of exercise-induced hypoglycemia, patients with diabetes can be provided with these counseling tips:

- Always carry a quick-acting glucose source that provides 15 g of carbohydrate to correct low blood sugars. An example is 3 glucose tablets or 1 tablespoon of table sugar.
- Carry a self-monitoring blood glucose (SMBG) meter at all times. If you start to experience the signs and symptoms of hypoglycemia, test your blood sugar to verify and treat appropriately.

For patients with type 1 diabetes, referral to a certified diabetes educator (CDE), RD, or primary care provider (PCP) is suggested before the commencement of any exercise program. Patients with type 1 diabetes may need insulin dose adjustments or modifications to their carbohydrate consumption before workouts.

Other health maintenance considerations for diabetes management

Immunizations. The risk of developing serious illness from influenza and pneumonia are highest in children, adults older than 65 years of age, and those with chronic disease. The ADA recommends that patients with diabetes receive appropriate and timely vaccinations. All patients 6 months and older should receive a yearly influenza vaccine. Patients should be immunized with the trivalent inactivated influenza vaccine (TIV) via intramuscular injection. Furthermore, the pneumococcal polysaccharide vaccine (PPSV23) should be given to all patients with diabetes 2 years of age and older. A one-time revaccination dose is recommended for individuals 19 years through 64 years of age who were previously immunized when they were younger than 65 years of age, as long as the previous dose was administered more than 5 years earlier. Patients with diabetes may have additional comorbid conditions such as hepatitis that may require supplemental vaccination. Administration of the hepatitis B series should be considered, based on current CDC recommendations.

Foot, eye, and oral care. It is estimated that a majority of diabetes-induced foot amputations are the result of an avertable foot complication. Patient education about foot care can help minimize foot complications associated with diabetes. Proper foot care requires these main interventions: an annual, comprehensive foot exam (usually performed by a podiatrist) and daily foot monitoring. The annual foot exam can identify early signs of peripheral artery disease, peripheral neuropathy, and other foot complications such as ulcers, foot infections, and hypertrophic nails. Visual inspection of foot integrity and musculoskeletal deformities, assessment of pedal pulses, and testing for loss of protective sensations are
Drug Topics. Because blood pressure should begin within 5 years of diagnosis. Blood pressure of 130/80 mm Hg or lower. All patients with pre-diabetes or existing diabetes should receive formal and ongoing diabetes self-management education, MNT counseling, and regular physical activity. Meal planning utilizing all macronutrients is recommended to meet normal nutrient needs and glycemic control. Effective diabetes management requires a team-based approach to care. Pharmacists and other healthcare professionals can play a pivotal role in helping patients achieve improved outcomes through ongoing education and patient engagement.

**TABLE 5**

**FOOT CARE RECOMMENDATIONS**

- Maintain blood glucose in the target range
- Check feet daily for cuts, blisters, or other abnormalities
- Wash and dry feet daily
- Maintain adequate foot hydration
- Trim/cut toenails when needed
- Wear proper fitting shoes and socks at all times
- Avoid walking barefoot
- Increase physical activity

Source: Ref 49

In an effort to reduce the risk and slow the progression of retinopathy, glycemic and blood pressure control should be optimized. For most patients this requires achieving an A1C of 7% or lower and goal blood pressure of 130/80 mm Hg or lower. For patients older than 10 years of age with type 1 diabetes, retinopathy screening should begin within 5 years of diagnosis. For those with type 2 diabetes, screening should start at the time of diagnosis. Dilated eye exams should be performed by an ophthalmologist or optometrist who is knowledgeable and experienced in diagnosing diabetic retinopathy. After the initial screening, patients should be screened on a yearly basis.

Patients with diabetes are also at increased risk of developing oral complications, including but not limited to periodontitis, oral caries, gingivitis, taste disturbances, and oral infections. Because diabetes itself causes gingival changes and increased susceptibility to infections, treating periodontal disease can be challenging. Poor glycemic control, defined as an A1C of 9% or higher, is a primary risk factor for developing oral complications, but smoking may also contribute. Therefore effective prevention and treatment strategies include maintaining glycemic control, tobacco cessation (in appropriate patients), and proper dental hygiene. The CDC recommends routine teeth cleaning and dental checks every 6 months. If periodontal disease is present, more frequent follow-up is suggested. Patients can engage in proper oral care by brushing and flossing their teeth at least twice daily.

**Sick-day management.** Sick days are commonly referred to as a period of acute illness (e.g., infection, fever) during which blood glucose levels can fluctuate and be difficult to maintain. Patients with poorly controlled diabetes have enhanced susceptibility to infections due to altered immune response and chronic inflammation.

Illnesses characterized by fever stimulate the production of stress hormones, which promote gluconeogenesis, resulting in hyperglycemia. Conversely, symptoms such as nausea, vomiting, and diarrhea induce hypoglycemia as a result of reduced dietary intake and delayed gastric emptying.

Children, adolescents, and older adults are at high risk of developing complications from sick days. It is critical to work with these groups and develop a plan of care for coping with sick days.

Much of the guidance available discusses sick-day management strategies for children and adolescents. Despite formal recommendations for adults, the following principles can be generalized to all patients as part of a sick-day plan:

- **Continue to take medications and insulin as prescribed.** Uninterrupted use of oral antidiabetic agents and insulin can help prevent diabetic ketoacidosis and hyperglycemic hyperosmolar syndrome.
- **Increase the frequency of blood glucose testing.** Encourage patients to test blood glucose every 3 to 4 hours. Those with severe illness and/or poorly controlled diabetes may need more frequent testing every 1 to 2 hours.
- **Maintain adequate fluid intake to prevent dehydration.** Persistent hyperglycemia and fever can induce fluid loss. Older adults are at increased risk due to decreased thirst sensation, impaired response to intravascular volume depletion, and increased prevalence of diuretic use. If symptoms of vomiting or diarrhea are present, counsel patients to consume electrolyte-containing beverages such as oral rehydration solution.

**Notify PCP of acute illness.** Because blood glucose can be difficult to regulate during acute illness, medication adjustments may be needed. Informing a PCP is also critical when persistent symptoms of fever, vomiting, diarrhea, and dehydration are experienced. Patients presenting with such symptoms may be referred to the emergency room for further evaluation and management.

**Conclusion**

With the prevalence of diabetes on the rise, timely and ongoing interventions are needed to promote healthy living and prevent chronic disease.

Lifestyle modifications such as MNT and physical activity have been shown to improve metabolic control, reduce the risk of developing type 2 diabetes, and decrease mortality. All patients with pre-diabetes or existing diabetes should receive formal and ongoing diabetes self-management education, MNT counseling, and regular physical activity.

Meal planning utilizing all macronutrients is recommended to meet normal nutrient needs and glycemic control.
6. Continued...