MYTHS ABOUT DIABETES AND TREATMENT

Myth #1 *You can catch diabetes from someone else.*

No. Although we don't know exactly why some people develop diabetes, we know diabetes is not contagious. It can't be caught like a cold or flu. There seems to be some genetic link in diabetes, particularly type 2 diabetes. Lifestyle factors also play a part.

Myth #2 *People with diabetes can't eat sweets or chocolate.*

If eaten as part of a healthy meal plan, or combined with exercise, sweets and desserts can be eaten by people with diabetes. They are no more "off limits" to people with diabetes than they are to people without diabetes.

Myth #3 *Eating too much sugar causes diabetes.*

No. Diabetes is caused by a combination of genetic and lifestyle factors. However, being overweight does increase your risk for developing type 2 diabetes. If you have a history of diabetes in your family, a healthy meal plan and regular exercise are recommended to manage your weight.

Myth #4 *People with diabetes should eat special diabetic foods.*

A healthy meal plan for people with diabetes is the same as that for everyone – low in fat (especially saturated and trans fat), moderate in salt and sugar, with meals based on whole-grain foods, vegetables and fruit. Diabetic and "dietetic" versions of sugar-containing foods offer no special benefit. They still raise blood glucose levels, are usually more expensive, and can also have a laxative effect if they contain sugar alcohols.

Myth #5 *If you have diabetes, you should only eat small amounts of starchy foods, such as bread, potatoes and pasta.*

Starchy foods are part of a healthy meal plan. What is important is the portion size. Whole-grain breads, cereals, pasta, rice and starchy vegetables like potatoes, yams, peas and corn can be included in your meals and snacks. The key is portions. For most people with diabetes, having 3-4 servings of carbohydrate-containing foods is about right. Whole-grain starchy foods are also a good source of fiber, which helps keep your gut healthy.

Myth #6 *People with diabetes are more likely to get colds and other illnesses.*

No. You are no more likely to get a cold or another illness if you have diabetes. However, people with diabetes are advised to get flu shots. This is because any infection interferes with your blood glucose management, putting you at risk of high blood glucose levels and, for those with type 1 diabetes, an increased risk of ketoacidosis.

Myth #7 *Insulin causes atherosclerosis (hardening of the arteries) and high blood pressure.*

No, insulin does not cause atherosclerosis. In the laboratory, there is evidence that insulin can initiate some of the early processes associated with atherosclerosis. Therefore, some physicians were fearful that insulin might aggravate the development of high blood pressure and hardening of the arteries. But it doesn't.

Myth #8 *Insulin causes weight gain, and because obesity is bad for you, insulin should not be taken.*

Both the UKPDS (United Kingdom Prospective Diabetes Study) and the DCCT (Diabetes Control & Complications Trial) have shown that the benefit of glucose management with insulin far outweighs (no pun intended) the risk of weight gain.

Myth #9 *Fruit is a healthy food. Therefore, it is ok to eat as much of it as you wish.*

Fruit is a healthy food. It contains fiber and lots of vitamins and minerals. Because fruit contains carbohydrates, it needs to be included in your meal plan. Talk to your dietitian about the amount, frequency and types of fruits you should eat.

Myth #10 *You don't need to change your diabetes regimen unless your HbA_{1c} is greater than 8 percent.*

The better your glucose control, the less likely you are to develop complications of diabetes. An HbA_{1c} in the sevens (7s), however, does not represent good control. The ADA goal is less than 7 percent. The closer your HbA_{1c} is to the normal range (less than 6 percent), the lower your chances of complications. However, you increase your risk of hypoglycemia, especially if you have type 1 diabetes. Talk with your health care provider about the best goal for you.

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PROMOTING HEALTHY DIETARY HABITS IN PATIENTS WITH TYPE 2 DIABETES

Eating well-balanced meals is an important part of maintaining good health when you have diabetes.[1] Depending on how long you have had diabetes, you may be able to lower your HbA_{1C} levels by 1% to 2% by making healthy food choices over just an 8-week period.[2]

NUTRITIONAL RECOMMENDATIONS

By following a healthy eating plan, you can improve your overall health.[1] Your health care team can help you devise a plan that will:[2]

- Safely reach and maintain normal or near-normal blood glucose and blood pressure levels
- Reach and maintain a lipid and lipoprotein profile (cholesterol and other fats in the blood) that reduces the risk for heart and artery disease
- Slow or possibly prevent the development of diabetes-related complications by adopting a healthy lifestyle
- Take into consideration your personal preferences and any cultural needs, as well as your willingness to change
- Continue to make eating a pleasurable experience by not limiting food choices unless there is strong scientific evidence to support it
- Follow the current nutritional recommendations for patients with type 2 diabetes, as outlined in the **Table**.[1-3]

MEAL PLANNING[1]

Eating well when you have diabetes takes practice and planning. Your health care team can help you create a meal plan, possibly using one of the following options:

The Plate Method is a simple technique. You only need a dinner plate—no special tools or counting is involved. Fill about $^1/_2$ of the dinner plate with non-carbohydrate-containing vegetables. Then divide the other half of the dinner plate into equal sections (about $^1/_4$ of the plate) and fill one with starchy foods and the other with meat or other foods high in protein.

Carbohydrate Counting helps you set a limit on the number of carbohydrates you should eat in one day. This method keeps track of the amount of carbohydrates in foods and takes into consideration your level of physical activity and your medications. Carbohydrate counting can be easier when you use nutritional labels on food products that state the serving size and total amount of carbohydrates.

The Glycemic Index (GI) measures how a food containing carbohydrates raises blood glucose and ranks foods by comparing them to a reference food, either white bread or glucose. Foods are ranked as having a high, medium, or low GI. When you use GI to plan meals, you usually choose foods with a low or medium GI, but you can balance the choice of a high-GI food with low-GI foods.

The Diabetes Food Pyramid groups foods into 6 categories on 4 levels based on their carbohydrate and protein content. At the bottom of the pyramid are bread, grains, and other starches. The next highest level contains vegetables and fruits. Milk and meats and other proteins are on the next level, and at the top of the pyramid are fats, oils and sweets. The Diabetes Food Pyramid also recommends a number of daily servings of each food group, so you can make choices based on your blood glucose goals, calorie and nutritional needs, lifestyle, and food preferences.

No single meal or diet plan is appropriate for all patients. Work with your health care team to create a meal plan tailored to your lifestyle and personal preferences that will help to achieve blood glucose and other goals.

TABLE. DIETARY RECOMMENDATIONS FOR PATIENTS WITH TYPE 2 DIABETES.[1-5]

Component	Proportion of Total Calories	Daily Amount
Carbohydrates	40%-60%	182 g
Protein	~15%-25%	77 g
Total fat Saturated fat Monounsaturated fat Polyunsaturated fat	25%-35% <7% ≤20% ≤10%	62 g
Dietary cholesterol		<200 mg
Sodium		<2300 mg
Dietary fiber		>14 g/1000 cal

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2. American Diabetes Association. Nutrition recommendations and interventions for diabetes. A position statement of the American Diabetes Association. *Diabetes Care*. 2008;31(Suppl 1):S61-S78.
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INCREASING PHYSICAL ACTIVITY FOR PATIENTS WITH TYPE 2 DIABETES

Exercise is an important part of a healthy lifestyle, especially for patients with diabetes. The goal is to make exercise a part of every day by doing enjoyable activities.[1]

- Regular exercise in patients with diabetes helps lower blood sugar and blood pressure, and improves cholesterol levels for a healthy heart.[1,2]
- Burning calories contributes to weight loss, and staying active can keep the pounds off.[1]
- Lowering blood sugar and weight may mean taking less insulin or fewer diabetes pills.[1]
- By participating in structured exercise activities for at least 8 weeks, glycosylated hemoglobin (HbA_{1C}) can be lowered by an average of 0.66%, and there is even greater benefit with higher levels of exercise.[2]

The American Diabetes Association currently recommends moderate exercise for at least 30 minutes/day, 5 days/week.[2,3]

- A comprehensive exercise routine should include aerobic (physical) exercise, strength training, flexibility exercises, and other forms of activities to stay active throughout the day.
- Recommendations for these activities for patients who have no medical or physical limitations are (**See charts on back**):[1,3,4]
  - Moderate-intensity aerobic activity for ≥30 minutes 5 days per week, or vigorous-intensity aerobic activity for ≥20 minutes 3 days per week, unless contraindicated.
- Activity can be divided into ≥10-minute segments to achieve the 30-minute goal.
- Overweight or obese patents may target 60-90 minutes, 6-7 days per week.
  - Resistance training 3-4 days per week to increase lean muscle mass. This includes upper-, core-, and lower-body strengthening exercises using free weights, resistance machines, or resistance bands.
  - Stretching exercises when muscles are warm or at the end of the activity to loosen muscles and prevent soreness.

There is no single activity program that suits every patient with diabetes.[1,5]

- Work with your clinician and the health care team to develop an activity program that fits your physical abilities, medical needs, interests, and lifestyle.
- Your health care team may recommend that you meet with an exercise physiologist or physical therapist trained to work with people with diabetes.
- The key is to choose safe and effective activities that you can enjoy and do on a regular basis.
- Make detailed plans and set realistic and specific goals.
- Keep track of your progress, perhaps using a physical activity log or a pedometer.

EXAMPLES OF AEROBIC EXERCISE AND STRENGTH TRAINING[1,2,5]

Aerobic Exercise (30 minutes/day, >5 days/week)

- Brisk walking outdoors with family or friends (and the dog!)
- Brisk walking on a treadmill
- Low-impact aerobics
- Swimming or water aerobics
- Bicycling outdoors or on a stationary bicycle indoors
- Volleyball or basketball
- Tennis
- Ice skating or roller skating
- Dancing
- Raking leaves
- Mowing the lawn
- Washing the car
- Heavy housecleaning
- Pushing a stroller

Strength Training (3 times a week)

- Lift weights at home
- Join a strength training class
- Use the hotel fitness center when traveling

REMAINING ACTIVE THROUGHOUT THE DAY[1,4,5]

- Park farther away from entrances to work or shopping for a longer walk
- Walk or bike to the destination if a short distance away
- Get off the bus one stop earlier
- Take the stairs instead of the elevator
- Walk for 30 minutes after work before driving home in traffic
- Walk home from the train or bus, taking a longer route
- Walk with a colleague or friend for 20 minutes at the start of lunch hour
- Walk around while you talk on the phone
- Avoid using the drive-up window
- Carry things up the stairs in two trips instead of one
- Play with the children
- Do some housecleaning every day
- Exercise at home while watching television
- Join a social dance club or exercise program that meets several times a week
- Go to a shopping mall, flea market, country fair, museum, or art gallery
- If wheelchair-bound, wheel yourself for part of every day

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MEDICATIONS FOR TYPE 2 DIABETES

AVAILABLE PHARMACOLOGIC OPTIONS AND RECOMMENDATIONS

- The 2009 ADA/EASD consensus statement for the initiation and adjustment of therapy for type 2 diabetes and the 2009 AACE clinical practice guidelines for the management of diabetes provide guidance in selecting antidiabetic medications and their appropriate use to meet glycemic goals.[1,2]

TABLE 1. TYPE 2 DIABETES MEDICATIONS[1,3,4]

Biguanide	Suppresses hepatic glucose production Increases glucose uptake and utilization in skeletal muscle
Sulfonylureas	Enhance pancreatic insulin secretion
TZDs	Increase sensitivity of muscle, fat, and liver cells to insulin Suppress hepatic glucose production Increase glucose uptake in skeletal muscle and adipose cells Stimulate pancreatic insulin secretion
Glucosidase inhibitors	Inhibit carbohydrate breakdown in GI tract
Glinides	Stimulate pancreatic insulin secretion
GLP-1 agonists and DPP-4 inhibitors	Slow gastric motility Suppress hepatic glucagon production Augment glucose-mediated insulin secretion
Amylin agonist	Slows gastric emptying Inhibits glucose-dependent glucagon production
Bile acid sequestrant	Exact mechanism unknown May alter intestinal glucose absorption and/or hepatic glucose production
Insulin	Replaces basal and/or post-prandial endogenous insulin deficiencies

GUIDANCE FOR IMPLEMENTING COMBINATION THERAPY[1,2]

- Type 2 diabetes is a progressive disease, and many patients will require additional antidiabetic medications over time.
- The preferred option of the ADA/EASD algorithm is the addition of a sulfonylurea or basal insulin if therapeutic lifestyle changes and metformin fail to achieve the goal, followed by intensification of insulin therapy with additional pre-prandial injections.
- Consider the synergistic effects of particular combinations and other interactions when implementing combination therapy. Keep in mind that, in general, two agents with different mechanisms of action will have the greatest combined effect.

AACE = American Association of Clinical Endocrinologists; ADA = American Diabetes Association; BID = twice a day; CHF = congestive heart failure; EASD = European Association for the Study of Diabetes; DPP-4 = dipeptidyl peptidase-4; GI = gastrointestinal; GLP-1 = glucagon-like peptide-1; HbA_{1C} = glycosylated hemoglobin; NPH = neutral protamine Hagedorn; PO = orally; QD = once daily; TID = three times a day; TZDs = thiazolidinediones.

TABLE 2. TYPE 2 DIABETES MEDICATIONS: CLINICAL FEATURES[1,2,4]

Antidiabetic Agents	Dosing	HbA_{1c} Reduction (Monotherapy)	Hypoglycemia	Weight Change	Contraindications/ Caveats
Biguanide: Metformin	500-2000 mg QD to 2000 mg daily PO in divided doses with meals	~1%-2%	No	Neutral	Dose adjustment in renal impairment
Sulfonylureas: Chlorpropamide, glimepiride, glipizide, glyburide	0.75-40 mg in single or divided doses	~1%-2%	Yes	Gain	Dose adjustment in renal or liver impairment
α–Glucosidase Inhibitors: Acarbose, miglitol	25-100 mg TID with the first bite of each meal	~0.5%-0.7%	No	Loss	Tolerability issues
Glinides: Nateglinide, repaglinide	60-120 mg TID before meals	0.5%-1.5%	Yes	Gain	None
Thiazolidinediones: Pioglitazone, rosiglitazone	15-45 mg QD (pioglitazone) or 4 mg QD or BID (rosiglitazone)	1.0%-1.5%	No	Gain	Contraindicated in CHF
GLP-1 Agonist: Exenatide	5-10 mcg BID before 2 main meals	~1.0%	No	Loss	Dose adjustment in renal impairment
DPP-4 Inhibitors: Saxagliptin, sitagliptin	100 mg QD with or without food	~0.8%-1.0%	No	Neutral	Dose adjustment in renal impairment
Amylin Agonist: Pramlintide*	60-120 mcg immediately before meals	0.5%-1.0%	No	Loss	Contraindicated in gastroparesis
Bile Acid Sequestrant: Colesevelam	3750 mg QD or 1875 mg BID (tablets) or 3.75 g QD or 1.875 g BID (oral)	~0.5%-0.7%	No	Neutral	Contraindicated in hypertriglyceridemia
Insulin	1-4 injections day	1%-3%+	Yes	Gain	None

*Approved for use in the US only as adjunctive therapy with regular insulin or rapid-acting insulin analogs.

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1. Nathan DM, Buse JB, Davidson MB. A consensus statement of the ADA and the EASD. *Diabetes Care*. 2009;32:193-203.
2. Rodbard HW, Jellinger PS, Davidson JA, et al. Statement by an AACE/ACE consensus panel. *Endocr Pract*. 2009;15:540-559.
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MANAGING PATIENTS WITH DIABETIC KIDNEY DISEASE

MANAGEMENT OF GLYCEMIA IN CKD[1-4]

Intensive treatment of hyperglycemia can prevent diabetic kidney disease (DKD) and may slow the progression of established CKD.

- The target HbA_{1C} for all patients with diabetes, with or without CKD, should be <7%.
- Pharmacologic options for glycemic control are limited in patients with advancing CKD (stages 3 to 5) because drugs excreted even in part by the kidney will accumulate (***Table***).
  - – Discontinue or avoid: metformin, most sulfonylureas, nateglinide, α-glucosidase inhibitors, GLP-1 receptor agonists.
  - – Reduce dosage of DPP-4 inhibitors.
  - – Glipizide, repaglinide, and TZDs can be used safety (undergo hepatic metabolism and/or clearance).

BLOOD PRESSURE MANAGEMENT IN CKD[1-4]

Treatment of hypertension slows the progression of CKD by reducing the rate of GFR decline and the time to end-stage renal disease and renal transplantation.

- Target BP in diabetes and CKD stages 1-4 is <130/80 mm Hg.
- Individuals with diabetes and hypertension in CKD stages 1-4 should be treated with an ACE-I or an ARB, usually in combination with a diuretic (***Table***).
- Other agents, such as calcium channel blockers, and β-blockers, may be used to further lower BP in patients already taking an ACE-I or ARB.

LIPID MANAGEMENT IN CKD[1-4]

- The LDL-C goal should be <100 mg/dL, with a level <70 mg/dL as a therapeutic option (***Table***).
- Statin therapy is recommended for diabetic patients with CKD stages 1 to 4 and an LDL-C >100 mg/dL.
- The NKF advises against statin therapy in patients with type 2 diabetes on maintenance hemodialysis therapy who do not have a specific CV indication for treatment.

NUTRITIONAL MANAGEMENT IN DIABETES AND CKD[1-4]

- The recommended daily allowance of dietary protein for individuals with diabetes and CKD stages 1 to 4 is 0.8 g/kg body weight.

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TABLE. MANAGEMENT OF DIABETIC NEPHROPATHY BY STAGE OF RENAL FUNCTION[3,5]

Stage and Description	GFR (mL/min per 1.73 m^2 BSA)	Management Recommendations	Pharmacologic Recommendations
1: Renal damage with normal or mildly increased GFR	≥90	• HbA_{1C} goal: ~7% • BP goal: <130/85 mm Hg • LDL goal: <100 mg/dL	• Add ACE-I/ARB if urine microalbumin ≥30 mg/g creatinine
2: Renal damage with mildly decreased GFR	60-89	• Same glucose, BP, and lipid goals as stage 1	• ACE-I/ARB recommended for all patients
3: Moderately increased GFR	30-59	• Same glucose, BP, and lipid goals as stage 1 • Refer to nephrology to prepare for impending renal failure if not meeting treatment goals • Monitor for anemia • Monitor for secondary hyperparathyroidism	• ACE-I/ARB recommended for all patients • Discontinue metformin, all sulfonylureas except glipizide, nateglinide, α-glucosidase inhibitors, GLP-1 analogs • Reduce doses of DPP-4 inhibitors • Add erythropoietin if Hgb <9 g/dL • Add ergocalciferol when 1.25-dihydroxyvitamin D is <30 ng/mL or when PTH >2 x ULN
4: Severely decreased GFR	15-29	• Same glucose, BP, and lipid goals as stage 1 • Refer to nephrology to prepare for impending renal failure and consideration of shunt placement • Monitor for anemia • Monitor for secondary hyperparathyroidism	• ACE-I/ARB recommended for all patients with careful monitoring of serum potassium • Insulin therapy recommended for most patients • Add erythropoietin if Hgb <9 g/dL • Add ergocalciferol when 1.25-dihydroxyvitamin D is <30 ng/mL or when PTH >2 x ULN
5: End-stage renal failure	<15 or dialysis	• Dialysis or kidney transplantation	

ACE-I = angiotensin-converting enzyme inhibitor; ADA = American Diabetes Association; albumin-creatinine ratio (ACR); ARB = angiotensin receptor blocker; BSA = body surface area; BP = blood pressure; CKD = chronic kidney disease; CVD = cardiovascular disease; DPP-4 = dipeptidyl peptidase-4; GFR = glomerular filtration rate; GLP-1 = glucagon-like protein-1; HbA_{1C} = glycosylated hemoglobin; Hgb = hemoglobin; LDL = low-density lipoprotein cholesterol; NKF = National Kidney Foundation; PTH = parathyroid hormone; TZDs = thiazolidinediones; ULN = upper limits of normal.

MOTIVATIONAL TIPS FOR PATIENTS WITH TYPE 2 DIABETES

Living with type 2 diabetes can be frightening and frustrating at times. It is important to stay motivated to follow your treatment plan to control your blood sugar. Following your treatment plan will help reduce the risk for complications such as heart disease, foot problems, kidney or eye disease, and depression.

PLAN FOR SUCCESS

Making a good action plan that fits easily into your life is the key to staying motivated.

- Set goals that are within your reach.
- Plan exactly what you want to do.
- As you become comfortable with your plan, try to do a little more over time.
- Ask your health care team to provide you with a meal planner, an exercise planner, a blood sugar log, and a medication schedule that will help you to:
  - Make healthy food choices
  - Eat the right portions
  - Watch your calories
  - Make sure you have some physical activity every day
  - Vary your physical activities to keep them interesting
  - Monitor your blood sugar level, and keep it from being too high or too low
  - Take your medications as directed

STAY ON TRACK

To stay motivated to eat right, keep active, and watch your blood sugar levels:

- Remember that success comes one step at a time.
- Focus on your successes—make reaching your goals a part of your life!
- Become a problem solver—if you are having trouble following the plan, think of what the problem might be and think of one step you could take to get back on track.
- Teach your family and friends about type 2 diabetes so they can help you reach your goals.
- Stay in touch with your health care team between appointments.
- Get support from your family, friends, co-workers, and health care team.

BUILD A SUPPORT SYSTEM

Having people around you who care about you and want to help can make living with type 2 diabetes easier and help you stay motivated.

- Enlist the help of one or more people who:
  - Can help with daily tasks and chores so you have enough time to exercise
  - Are willing to exercise with you
  - Want to make meal planning and preparation fun for both of you
  - Will remind you to check your blood sugar
  - Will go to medical appointments with you
  - Can attend diabetes support groups with you
  - Are good listeners for emotional support
- Join a community-based support group for emotional and social support. Some groups are even geared to specific populations, including African Americans, Latinos, and Native Americans.
- Check with your employer to see if your company works with a local hospital or medical association to run a diabetes program for its employees.

DEAL WITH EMOTIONAL ISSUES

When you have diabetes, it is not unusual to feel angry, sad, or depressed. You may also feel frustrated at times. It is normal to think it is unfair to have diabetes, or to feel like denying that you have diabetes at all. However, feeling down can be a sign of depression. Be sure to talk to your health care provider if you:

- Feel a sadness that will not go away
- Have no energy
- Have little or no interest in things

Sometimes, poor control of blood sugar can cause feelings that are similar to depression.

- Your health care provider can determine if your feelings are due to this or another physical cause.
- If you have depression, your health care provider can refer you to a mental health specialist who can help with counseling and/or medication.

YOUR HEALTH CARE TEAM: A MOTIVATIONAL COACH

- Your health care team is there not only to monitor your weight and blood sugar levels—they can also reinforce what you are doing, tell you how you can improve your diabetes care, and help you plan and set goals.
- Be prepared for your health care team appointments
  - Bring a written list of questions to ask.
  - Be sure to tell the doctor or other provider about any problems you are having physically or emotionally.
- Your health care team can also assist with health insurance options for your individual situation; for example, if you are over age 65, a veteran, disabled, or unemployed.

RESOURCES

Websites

American Diabetes Association. http://www.diabetes.org
American Association of Diabetes Educators. http://www.diabeteseducator.org
National Diabetes Education Program. http://www.ndep.nih.gov/diabetes/diabetes.htm.

Magazines

Diabetes Forecast
Diabetes Self-Management
Diabetic Living

Books

The New *Family Cookbook for People with Diabetes* by the American Diabetes Association and the American Dietetic Association; 2007.
The "I Hate to Exercise" Book for People With Diabetes by Charlotte Hayes; 2006.
The Ultimate Diabetes Meal Planner by Jaynie Higgins; 2009.
Diabetes Can Be Sweet...Once You Bury It by Julie Wanner Rossetti; 2005.
The Best Life Guide to Managing Diabetes and Pre-diabetes by Bob Greene, MD; 2009.
What to Expect When You Have Diabetes: 170 Tips for Living Well With Diabetes by the American Diabetes Association Staff; 2008.
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