



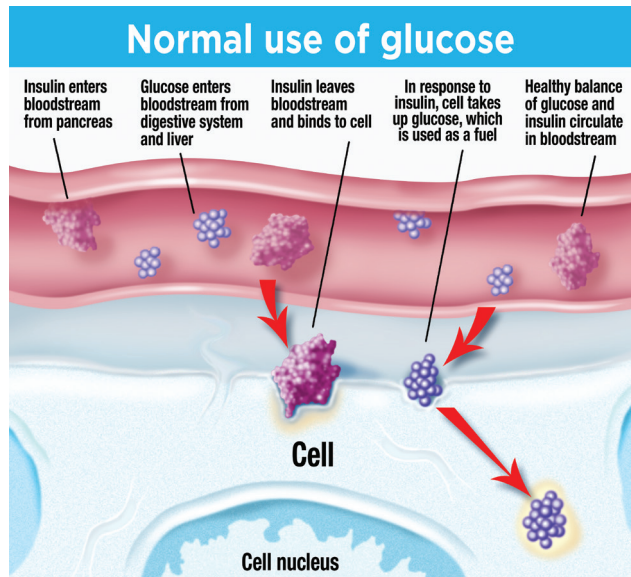
Background Basics

What is Diabetes?

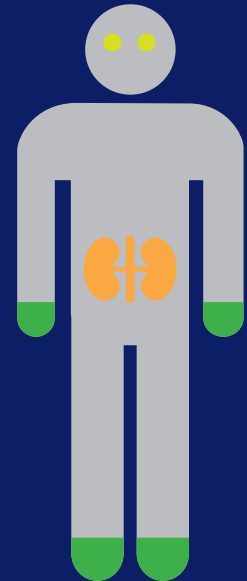
Diabetes is a chronic health condition in which the body cannot produce or use insulin effectively. Insulin is made in the pancreas, and it is released after a meal to deliver glucose (energy) to the cells.

When the body does not have insulin (or cannot use it effectively), glucose begins to build up in the bloodstream. Over time, high blood glucose levels can lead to complications, including retinopathy, peripheral neuropathy, albuminuria and nephropathy.

Diabetes Mellitus. *The Merck Manual Home Edition*. 2013. http://www.merckmanuals.com/home/hormonal_and_metabolic_disorders/diabetes_mellitus_dm/diabetes_mellitus.html. Accessed February 7, 2015.



Complications caused by diabetes:



- Retinopathy
- Peripheral Neuropathy
- Albuminuria and Nephropathy

"Diabetes Mellitus." *The Merck Manual Home Edition*. Merck Sharp & Dohme Corp., July 2013. Web. 07 Feb. 2015.

did you know?

**1 in 4 people with diabetes
DO NOT KNOW they have it.**

More than 29 million Americans have diabetes; 1 in 4 doesn't know. Centers for Disease Control and Prevention. 2014. <http://www.cdc.gov/media/releases/2014/p0610-diabetes-report.html>. Accessed February 11, 2015.

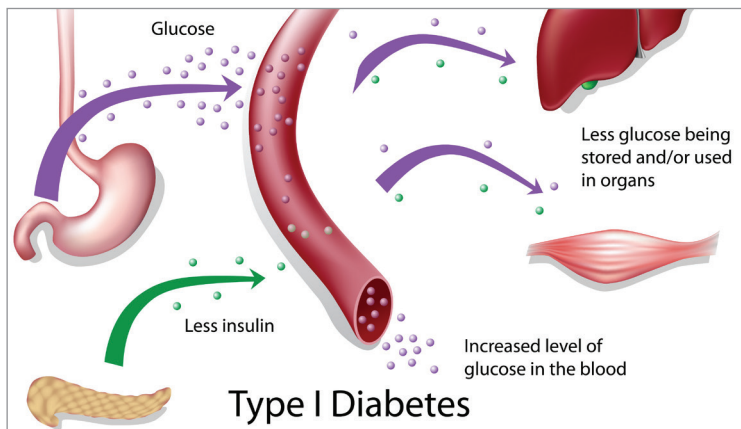


Background Basics

Types of Diabetes Mellitus (DM):

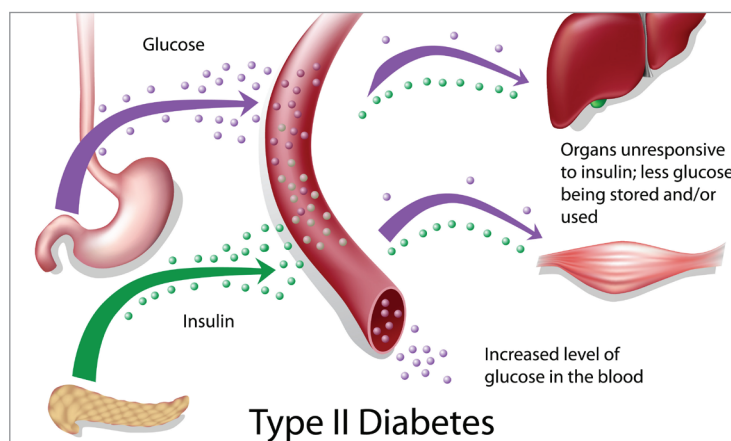
- **Type 1** – the pancreas does not produce insulin and is usually diagnosed in children and young adults.

Approximately 5% of diabetes patients have Type 1 DM.



- **Type 2** – the pancreas does not make enough insulin to support the body and/or the body does not use insulin effectively.

Approximately 95% of diabetes patients have Type 2 DM.



Type 1 Diabetes. American Diabetes Association.
<http://www.diabetes.org/diabetes-basics/type-1/>. Accessed February 7, 2015.

Facts About Type 2. American Diabetes Association.
<http://www.diabetes.org/diabetes-basics/type-2/facts-about-type-2.html>. Accessed February 4, 2015.

A third type of diabetes, Gestational Diabetes, develops in the mother during pregnancy

Standards of Medical Care in Diabetes-2015. Standards of Medical Care in Diabetes-2015. 2015. Accessed January 5, 2015.

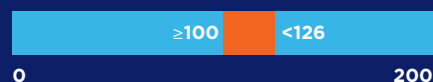
did you know?

Pre-Diabetes

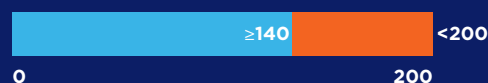
Pre-diabetes (also known as impaired glucose tolerance or impaired fasting glucose), is a term used to describe patients who have higher than average blood glucose but don't yet qualify for a diabetes diagnosis.

The criteria for pre-diabetes are shown in the chart below:

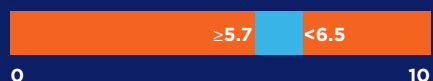
FASTING BLOOD GLUCOSE (mg/dL)



ORAL GLUCOSE TOLERANCE TEST (mg/dL)



A1C (%)



Diagnosing Diabetes and Learning About Prediabetes. American Diabetes Association.
<http://www.diabetes.org/diabetes-basics/diagnosis>
Accessed February 9, 2015.

86
MILLION

86 million American adults
– more than 1 out of 3 –
have prediabetes.

Center for Disease Control and Prevention. National Diabetes Statistics Report, 2014. National Diabetes Statistics Report, 2014. <http://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf>. Accessed February 9, 2015.



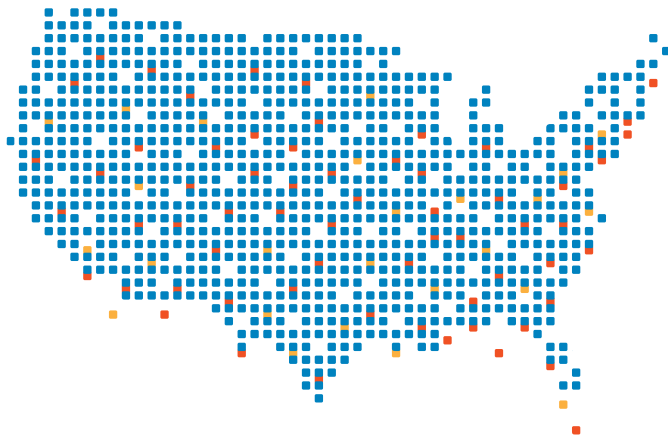
Background Basics

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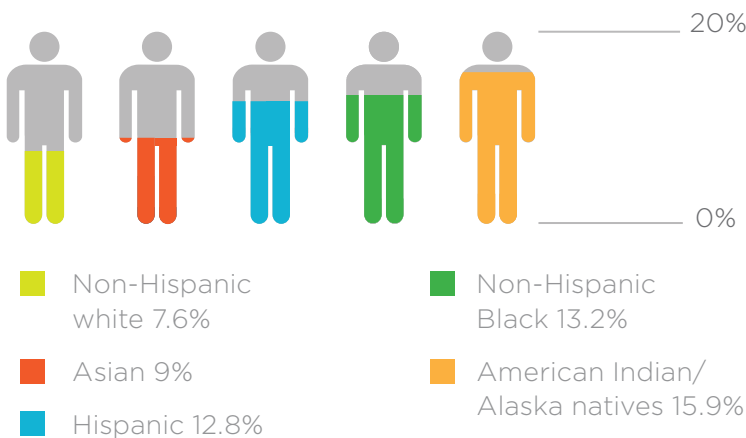
National Diabetes Statistics

The CDC estimates 9.3% of the U.S. population has diabetes

- 21 million diagnosed
- 8.1 million undiagnosed



Distribution of diabetes among the U.S. population by race/ ethnicity



% of diagnosed >20 y/o

Center for Disease Control and Prevention. *National Diabetes Statistics Report, 2014*. National Diabetes Statistics Report, 2014. <http://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf>. Accessed February 9, 2015.

It is estimated that 1 of 3 U.S. adults will have diabetes by 2050, with the current trend.

did you know?

Diabetes. Chronic Disease Prevention and Health Promotion. 2011. <http://www.cdc.gov/chronicdisease/resources/publications/aag/ddt.htm>. Accessed February 7, 2015.

Worldwide Diabetes Statistics

- 4 of 5 people with diabetes live in low to middle-income countries



- Diabetes caused 4.9 million deaths in 2014
- 387 million people living with diabetes worldwide
- The International Diabetes Foundation estimates 592 million people will be living with diabetes in 2035
- >79,000 children develop DM Type 1 every year

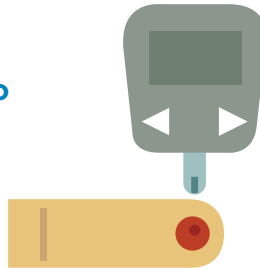
IDF DIABETES ATLAS 2014 Sixth Edition.; 1818. http://www.idf.org/sites/default/files/atlas-poster-2014_en.pdf. Accessed February 9, 2015.

10 facts about diabetes. World Health Organization. <http://www.who.int/features/factfiles/diabetes/facts/en/index7.html>. Accessed February 9, 2015.



Blood Glucose Monitoring

Ongoing patient self-management education and support are critical to preventing acute complications and reducing the risk of long-term complications in Patients With Diabetes (PWD).



The American Diabetes Association (ADA) Standards of Medical Care are intended to provide clinicians, patients, and other interested individuals with the components of diabetes care, general treatment goals, and tools to evaluate the quality of care.

The Assessment of Glycemic Control section of the ADA Standards of Care describes two primary techniques that are available for health providers and patients to assess the effectiveness of the management plan on glycemic control: patient self-monitoring of blood glucose (SMBG), and A1C. Continuous Glucose Monitoring (CGM) devices are also an option for patients, but these devices are still not approved by the US Food and Drug Administration as the sole agent to monitor glucose.

The Standards of Medical Care states that “SMBG allows patients to evaluate their individual response to therapy and assess whether glycemic targets are being achieved. Results of SMBG can be useful in preventing hypoglycemia and adjusting medications (particularly prandial insulin doses), medical nutrition therapy, and physical activity. Evidence also supports a correlation between SMBG frequency and lower A1C¹.”

Furthermore, it states that “SMBG frequency and timing should be dictated by the patient’s specific needs and goals. SMBG is especially important for patients treated with insulin to monitor for and prevent asymptomatic hypoglycemia and hyperglycemia.”

Miller, KM, Beck, RW, Bergenstal, RM, et al. Evidence of a Strong Association Between Frequency of Self-Monitoring of Blood Glucose and Hemoglobin A1C Levels in T1D Exchange Clinic Registry Participants. *Diabetes Care*. 2013;36(7):2009-2014. doi:10.2337/dc12-1770.

American Diabetes Association. Standards of Medical Care in Diabetes – 2015. *Diabetes Care*. 2015; 38 (1) 1 – 99.

Other Monitoring

In addition to blood glucose, many other things can be monitored to give clinicians tools to better assess diabetes control including:

- **A1C**
establishes average blood glucose levels within the last 3 months
- **Ketones**
allows monitoring for life threatening complications (Diabetic Ketoacidosis)
- **Blood Pressure**
lipid panels and CVD (Cardio Vascular Disease) screening – monitors for complications of DM and comorbidities
- **Albumin**
allows monitoring for DM related kidney damage

American Diabetes Association. Standards of Medical Care in Diabetes – 2015. *Diabetes Care*. 2015; 38 (1) 1 – 99.



Blood Glucose Monitoring

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Importance of Monitoring

Monitoring of blood glucose is one of the key things to assessing patients' diabetes control.

- Monitoring allows both the patient and their healthcare professional to assess:
 - If medications are working well or need to be adjusted
 - If patients are following the correct dietary plan
 - If patients are adhering to medications
- Blood glucose monitoring is also important for patients to assess when to self-adjust insulin regimens (when allowed by physician plan), when to treat hypoglycemia and when to seek medical attention.
- Monitoring also allows the patient to see in real time how improving nutrition, medication adherence and exercise will improve blood glucose (BG)

American Diabetes Association. Standards of Medical Care in Diabetes – 2015. *Diabetes Care*. 2015; 38 (1) 1 – 99.





Blood Glucose Monitoring

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Current Guidelines on Timing

- In 2015 the American Diabetes Association (ADA) released new guidelines for the treatment of DM.
- In 2011 the American Association of Clinical Endocrinologists (AACE) released the Medical Guidelines for Clinical Practice for Developing a Diabetes Mellitus Comprehensive Care Plan, which was updated with a simplified treatment algorithm in 2013.

American Diabetes Association. Standards of Medical Care in Diabetes – 2015. *Diabetes Care*. 2015; 38 (1) 1 – 99.

Handelsman, Y, Mechanick, JI, Blonde, L, et al. American Association of Clinical Endocrinologists Medical Guidelines for Clinical Practice for Developing a Diabetes Mellitus Comprehensive Care Plan. *Endocrine Practice*. 2011;17(s2):1-53. doi:10.4158/EP.17.S2.1.

ADA recommendations:

Recommended blood glucose testing timing for all patients using multiple-dose insulin and beneficial for all other patients

- Before meals or snacks
- “Occasionally postprandially”
- At bedtime
- Before exercise
- When experiencing hypoglycemia symptoms or when treating hypoglycemia
- Before “critical tasks” (e.g driving, exercising, etc.)

American Diabetes Association. Standards of Medical Care in Diabetes – 2015. *Diabetes Care*. 2015; 38 (1) 1 – 99..

AACE recommendations:

Recommended blood glucose testing timing for all patients using insulin, and for non-insulin DM patients.

- At least two times a day but preferably anytime before insulin administration
- Patients with symptoms, history of lack of BG control or frequent low blood glucose may need monitoring after meals or during the night

Handelsman, Y, Mechanick, JI, Blonde, L, et al. American Association of Clinical Endocrinologists Medical Guidelines for Clinical Practice for Developing a Diabetes Mellitus Comprehensive Care Plan. *Endocrine Practice*. 2011;17(s2):1-53. doi:10.4158/EP.17.S2.1.

World Diabetes Day is celebrated on November 14th to mark the birthday of Frederick Banting who, along with Charles Best, was instrumental in the discovery of insulin in 1922, a life-saving treatment for diabetes patients.

did you know?

Each year, the American Diabetes Association (ADA) releases new diabetes treatment guidelines, the American Diabetes Association Standards of Medical Care.





Blood Glucose Monitoring

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Blood Glucose Patient Goals:

Glycemic Index Recommendations for Adults (Non-Pregnant)

A1C	<7.0%
Preprandial capillary plasma glucose	80-130 mg/dL (3.9-7.2 mmol/L)
Peak postprandial capillary plasma glucose	<180 mg/dL (<10.0 mmol/L)

- Glycemic goals in pediatrics are generally less strict due to potential for hypoglycemic unawareness and growth needs.
- In patients without severe hypoglycemia, tighter goals may be considered.
- Continuous glucose monitoring (CGM) combined with a structured intensive insulin regimen can lower A1C in adults (greater than age 25) with type 1 diabetes.
- Lowering of A1C through CGM and an insulin therapy may also be helpful with children, teens and younger adults.
- CGM can also be used as a supplemental tool with self monitoring blood glucose, especially for patients with hypoglycemic unawareness and/or frequent hypoglycemic episodes.

American Diabetes Association. Standards of Medical Care in Diabetes – 2015. *Diabetes Care*. 2015; 38 (1) 1 – 99.



Contour® Next Blood Glucose Meter



Blood Glucose Monitoring

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Paired Testing

Market research suggests that over 19 MM people with diabetes check their blood glucose (Roper 2013). While the number of testers has increased, the frequency of testing has declined. Along with other reasons for the decline, many patients with diabetes don't understand their numbers or don't know what to do with the BG results they get.

Some people see their blood glucose numbers as moving up and down for no reason, while others think of their numbers as a grade on a test or a judgment of how well they have done with their meal plan and exercise routine. It's easy for people with diabetes to skip testing when they don't understand or want to know the results.

Paired Testing is a relatively new approach to BG testing. Paired Testing means patients test their blood glucose level twice—before and again after a meal or activity—and compare the numbers. When they compare the pair of numbers, they can see how their decisions or actions affect their blood glucose level, and can see what they can do to improve. Paired Testing can help them make informed and wise decisions, which, in turn, may help them feel more confident and in charge of their diabetes.

The paired testing approach can help answer important questions, such as:

- Why their blood glucose level may be going up and down
- How their moods may be related to blood glucose level
- Whether or not their actions are making a real difference in their diabetes care

Having your patients try Paired Testing can help them assess other important issues as well, such as:

- How stress affects their blood glucose level
- How their favorite drinks impact their blood glucose level
- Why their blood glucose level sometimes seem too high in the morning
- Whether changes in their blood glucose level affect their sleep

GfK. 2103 US Roper Diabetes Patient Study.

A meter with a meal marker and audible reminder increases post-prandial and paired testing.

Using a meal marker resulted in

- Increased understanding of how to make decisions
- Better understanding of the difference between pre-meal and post-meal results

did you know?

"Adrenal Disorders." *American Association of Clinical Endocrinologists* (2011): 1-211. Web. 22 Jan. 2015.

BEFORE



AFTER



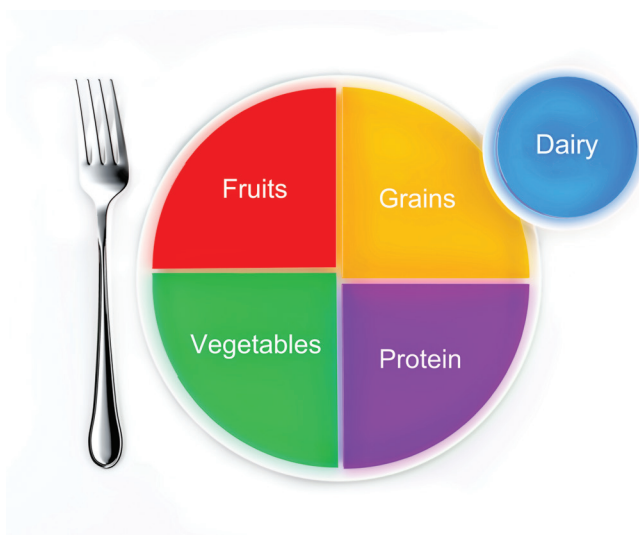


Healthy Eating

One of the most important tools for controlling diabetes progression is the achievement and maintenance of healthy eating habits.

The goals of nutrition therapy in diabetes are to promote and support healthful eating patterns, emphasizing a variety of nutrition dense foods in appropriate portion sizes to improve overall health, and specifically to:

- Attain individualized glycemic, blood pressure and lipid goals
- Achieve and maintain body weight goals
- Delay or prevent complications of diabetes



A healthy diet will lead to an immediate positive effect on patients' blood glucose levels. Over time this will also improve patients' weights and minimize long term complications like kidney damage and retinopathy.

Evert, AB, Boucher, JL, Cypress, M, et al. Nutrition Therapy Recommendations for the Management of Adults With Diabetes. *Diabetes Care*. 2013;36(11):3821-3842. doi:10.2337/dc13-2042.

There is an emerging global epidemic of diabetes that can be traced back to rapid increases in obesity and physical inactivity.

did you know?

ADA Goals for Diabetes Nutrition



1. Achieve and maintain:
 - Blood glucose levels in the normal range or as close to normal as is safely possible
 - 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
2. Prevent, or at least slow, the rate of development of the chronic complications of diabetes by modifying nutrient intake and lifestyle
3. Address individual nutrition needs, taking into account personal and cultural preferences and willingness to change
4. Maintain the pleasure of eating by only limiting food choices when indicated by scientific evidence



Healthy Eating

Carbohydrates

The body uses carbohydrates as its main fuel source. Carbohydrates are digested and then absorbed into your blood stream, where they are known as blood sugar or blood glucose. The glucose enters the body's cells with the help of insulin. Extra glucose is stored in the liver, muscles and other cells for later use or if unused, it is converted to fat.

Managing Carbohydrate Intake

Regulating the amounts of carbohydrate and available insulin is the key strategy for glycemic control. Patients should count carbohydrates and adjust insulin accordingly.

A balanced diet should consist of healthy carbohydrates such as:

- Fiber-rich fruits and vegetables
- Whole grains
- Low-fat dairy products
- Beans and legumes

Products containing added sugars should be avoided.

Evert, AB, Boucher, JL, Cypress, M, et al. Nutrition Therapy Recommendations for the Management of Adults With Diabetes. *Diabetes Care*. 2013;36(11):3821-3842.

Carbohydrate Counting

Monitoring carb intake by carb counting is a key strategy in achieving blood sugar control. Since carbs raise blood sugar, you may be asked to count them. Examples of carbohydrates are beans, grains, starchy vegetables, fruit, dairy products, sweets, and snacks.

Should you avoid carbohydrates? Absolutely not! Carbohydrates are your body's main source of fuel. By counting your carbs, you can make decisions that can help you control your weight and your blood sugar.

Consult with your HCP about limiting the carbs you eat each day.

Evert AB, Boucher JL, Cypress M, et al; for American Diabetes Association. Nutrition therapy recommendations for the management of adults with diabetes. *Diabetes Care*. 2013;36(11):3821-3842.

EXAMPLES OF CARBOHYDRATES

TYPE: CEREAL
1 SERVING SIZE: TENNIS BALL
APPROX. # OF CARBS: 15g



TYPE: PASTA & RICE
1 SERVING SIZE: LIGHT BULB
APPROX. # OF CARBS: 23g



TYPE: BREAD
1 SERVING SIZE: CASSETTE TAPE
APPROX. # OF CARBS: 15g



TYPE: BAKED WHITE POTATO
1 SERVING SIZE: COMPUTER MOUSE
APPROX. # OF CARBS: 15g



TYPE: FRUIT
1 SERVING SIZE: BASEBALL OR WOMAN'S FIST
APPROX. # OF CARBS: 20g



TYPE: SODAS & JUICES
1 SERVING SIZE: 1/2 CAN OF SODA
APPROX. # OF CARBS: 14g



TYPE: DESSERTS & SWEETS
1 SERVING SIZE:
CAKE: DECK OF CARDS
BROWNIE: DENTAL FLOSS PACKAGE
APPROX. # OF CARBS: 20g



Clinical Diabetes. Carbohydrate Counting: The Basics. 23(3):123-124.



Healthy Eating

Glycemic Index

Glycemic index (GI) is a way of expressing how carbohydrate-containing foods raise blood glucose. It is based on the principle that some carbohydrate-containing foods will raise blood glucose more rapidly than others. This is due to the rate at which the body breaks them down.

- High GI foods (≥ 70) will raise blood glucose quickly.
- Low GI foods (≤ 55) will generally raise blood glucose more slowly.

GI Considerations

- Only foods containing carbohydrates have a glycemic index; fats and proteins do not.
- Pairing low GI foods with high GI foods can help to balance out effects on blood glucose levels.
- Even though Glycemic Index is a great indicator for healthy eating, food choices cannot be based on the GI values alone. For example, a baked potato has a high GI and ice cream has a low GI, yet a baked potato is a healthier food choice compared to ice cream. Therefore, it is important to combine different meal planning tools to maintain a healthy and balanced diet.

Glycemic Index and Diabetes. *American Diabetes Association*. 2014. Available at: <http://www.diabetes.org/food-and-fitness/food/what-can-i-eat/understanding-carbohydrates/glycemic-index-and-diabetes.html>. Accessed January 20, 2015.

HIGH GI FOODS

"WHITE STARCHY FOODS"

- WHITE BREAD
- WHITE RICE
- WHITE POTATOES

SOME FRUITS INCLUDING:

- GRAPES
- WATERMELON
- BANANAS

MEDIUM GI FOODS

- BROWN RICE
- PITA BREAD
- WHOLE WHEAT BREAD
- COUSCOUS
- QUICK OATS

LOW GI FOODS

- PASTA
- BARLEY
- SWEET POTATOES
- LIMA BEANS
- ROLLED OATS
- NON-STARCHY VEGETABLES
- MOST FRUITS

FACTORS THAT AFFECT GI OF FOODS

- **Ripeness** – the more ripe a fruit or vegetable is, the higher the GI
- **Processing** – foods that are more natural and less processed tend to have lower GI, for example:
 - Juice has a higher GI than whole fruit
 - A mashed potato has a higher GI than a whole baked potato
- **Cooking method** – the longer a food is cooked (e.g. al dente pasta vs. soft-cooked pasta) may increase its GI

Glycemic Index and Diabetes. *American Diabetes Association*. 2014. Available at: <http://www.diabetes.org/food-and-fitness/food/what-can-i-eat/understanding-carbohydrates/glycemic-index-and-diabetes.html>. Accessed January 20, 2015.

Proteins

The body breaks down proteins into amino acids, which are used to build new proteins. When carbohydrates and fats are not readily available, the body will use dietary protein as energy.

- Proteins include meats, fish, cheese and beans.
- Proteins function as building blocks for bones, muscles, cartilage, skin, and blood.
- They are also building blocks for enzymes, hormones, and vitamins.
- Proteins, fat and carbohydrates are nutrients that provide calories.
- Taking fruits, juice or sweets with proteins, slows absorption of carbohydrates.

Lean proteins are an ideal food option for patients with diabetes because they offer filling, healthy food choices that contain no carbohydrates. This means they do not raise blood glucose.

- Lean protein examples:
 - Fish, chicken (without the skin), and eggs.

USDA MyPlate Protein Foods Group -- Nutrients and health benefits.
Available at: <http://www.choosemyplate.gov/food-groups/protein-foods-why.html>.
Accessed January 22, 2015.

Protein Foods. American Diabetes Association. 2014.
Available at: <http://www.diabetes.org/food-and-fitness/food/what-can-i-eat/making-healthy-food-choices/meat-and-plant-based-protein.html>.
Accessed January 21, 2015.





Healthy Eating

Fats

Fat in food is broken down into fatty acids that travel through the bloodstream for the cells to use. Excess fatty acids are packaged for storage in fat cells as triglycerides.

Saturated fats and trans fats (e.g. butter, lard, chocolate, poultry skin, palm oil, margarine, shortenings) raise the body's cholesterol levels.

- High cholesterol is a risk factor for heart disease
- Patients with diabetes are at an increased risk of cardiovascular disease and many already have the comorbidity of dyslipidemia.

A decrease in the amount of saturated fat, and the replacement of saturated fat with healthy, unsaturated fats will reduce the risk of cardiac complications in these patients.

- Monounsaturated fats and polyunsaturated fats (e.g. avocado, canola, nuts, olive oil, peanut butter) are preferred
- EPA and DHA (fatty fish) and n-3 linolenic acid (ALA) are recommended for prevention of heart disease



Healthy Eating

Meal Planning Tools

A diabetes meal plan is a guide for how much and what kinds of food patients with diabetes can choose to eat at meals and snack times.

A good meal plan should fit in with a patient's schedule and eating habits.

The right meal plan will help improve blood glucose, blood pressure, and cholesterol numbers and also help keep weight on track, whether a patient needs to lose or maintain weight.

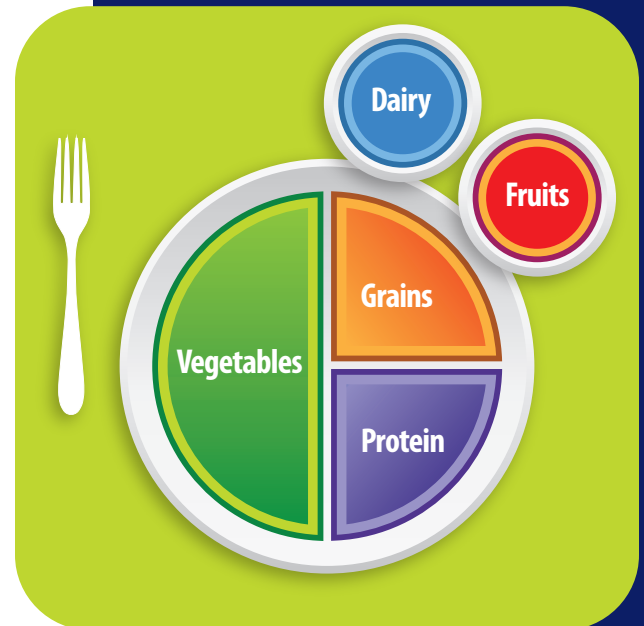
The plate method is one example of a meal planning tool.

Evert, AB, Boucher, JL, Cypress, M, et al. Nutrition Therapy Recommendations for the Management of Adults With Diabetes. *Diabetes Care*. 2013;36(11):3821-3842. doi:10.2337/dc13-2042.

Six steps to filling a meal plate:

1. Divide the plate in half and then divide one side in half (See diagram to the right)
2. Fill the largest section ($\frac{1}{2}$ of the plate) with non-starchy vegetables
 - eg. spinach, carrots, lettuce, greens, green beans, mushrooms, peppers, broccoli
3. Fill one of the smaller sections ($\frac{1}{4}$ of the plate) with grains and starchy foods (carbohydrates)
 - eg. bread, rice, pasta, green peas, potato, beans, tortilla
4. Fill the other smaller section ($\frac{1}{4}$ of the plate) with protein
 - eg. chicken, turkey, fish, lean beef, eggs, tofu
5. Add a small serving of fruit or dairy if allotted
6. Drink a low-calorie or zero calorie beverage such as water, unsweetened tea, or coffee

Create Your Plate. American Diabetes Association. 2014. Available at: <http://www.diabetes.org/food-and-fitness/food/planning-meals/create-your-plate/>. Accessed January 21, 2015.





Healthy Eating

How To Read A Food Label

When reading the nutrition facts on a food label, patients with diabetes should:

- Start at the top with the serving size.
- The most important item on the label is the amount of “Total Carbohydrates”.
- Try to avoid foods with a high amount of saturated fat, trans fat, cholesterol, and sodium.
- Foods with a high amount of potassium, dietary fiber, vitamins A and C, calcium and iron are good.
- Daily Value (DV): Based on a 2,000 calories/day, 20% or more is high.

Pay attention to the serving size.

This bag of trail mix contains 5 individual servings (1 oz per serving) that are 140 calories each.

Patient should talk to HCP about the amount of cholesterol to have per day.

Every 15 Grams
Total Carbohydrate
= 1 Carbohydrate
Serving

Trail Mix	
Nutrition Facts	
Serving Size 1 oz (28g/About 6 pieces)	
Servings Per Container About 5	
Amount Per Serving	
Calories 140	Calories from Fat 80
% Daily Value*	
Total Fat 9g	14%
Saturated Fat 1.5g	6%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 95mg	4%
Total Carbohydrate 12g	4%
Dietary Fiber 1g	6%
Sugars 7g	
Protein 3g	
Vitamin A 0%	Vitamin C 0%
Calcium 2%	Iron 6%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
Calories: 2,000 2,500	
Total Fat	Less than 65g 80g
Saturated Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram:	
Fat 9 • Carbohydrate 4 • Protein 4	

No more than 30% of total calories should come from fat in a daily diet. For example, no more than 600 calories for a 2000-calorie diet.

Patients with diabetes should avoid saturated and trans fats. “Monounsaturated” and “polyunsaturated” fats are better.

Patient should talk to HCP about the total amount of dietary fiber per day based on the number of calories consumed each day.



Healthy Eating

Sweeteners

Nutritive sweeteners including sucrose, fructose, dextrose, corn sugar, maltose and honey, add carbohydrates and calories to diets. While called “nutritive”, they are low in nutritional value.

- Patients with diabetes should avoid intake of nutritive sweeteners
- High intake of nutritive sweeteners contributes to cardiovascular disease, obesity and increase in blood glucose

Evert, AB, Boucher, JL, Cypress, M, et al. Nutrition Therapy Recommendations for the Management of Adults With Diabetes. *Diabetes Care*. 2013;36(11):3821-3842. doi:10.2337/dcl3-2042.

Artificial sweeteners can be used in place of nutritive sweeteners to sweeten foods or beverages without adding calories or affecting blood glucose levels.

Substituting artificial sweetener for sugar may help maintain healthy body weight.

The current FDA tested and approved artificial sweeteners are:

- acesulfame potassium (Sweet One)
- aspartame (NutraSweet or Equal)
- saccharin (Sweet ‘N Low)
- sucralose (Splenda)
- neotame
- advantame

The FDA has also claimed rebaudioside A (Truvia or PureVia) as generally recognized as safe for consumption.

Low-Calorie Sweeteners. *American Diabetes Association*. 2014. Available at: <http://www.diabetes.org/food-and-fitness/food/what-can-i-eat/understanding-carbohydrates/artificial-sweeteners/>. Accessed January 21, 2015.

did you know?

Many foods containing low-calorie sweeteners will provide some calories and carbohydrates from other ingredients. Foods that carry claims like “sugar-free”, “reduced sugar” or “no sugar added” are not necessarily carbohydrate-free or lower in carbohydrate than the original version of the food. Check the nutrition facts panel for more information.

Low-Calorie Sweeteners. *American Diabetes Association*. 2014. Available at: <http://www.diabetes.org/food-and-fitness/food/what-can-i-eat/understanding-carbohydrates/artificial-sweeteners/>. Accessed January 21, 2015.

POSSIBLE SIDE EFFECTS:

- Due to a lack of studies about the long term effects, artificial sweeteners should be avoided or used in limitation in children and pregnant women.
- Aspartame is the only artificial sweetener which is digested by the body
- Some people cannot tolerate aspartame, especially people with PKU metabolism disorder.

Low-Calorie Sweeteners. *American Diabetes Association*. 2014. Available at: <http://www.diabetes.org/food-and-fitness/food/what-can-i-eat/understanding-carbohydrates/artificial-sweeteners/>. Accessed January 21, 2015.





Healthy Eating

Other Considerations

Alcohol:

- The ADA has very specific recommendations for patients with diabetes who consume alcohol. Alcohol can have a negative effect on a patient's blood glucose for up to 24 hours.
- The ADA recommends:
 - Only drink with food and never replace the carbohydrate portion of a meal with alcohol
 - Drink only when blood glucose is under control

Eating Away from Home:

- Eating out can be tricky for patients with diabetes as many foods contain “hidden” fats and carbohydrates
- The American Diabetes Association (ADA) recommends:
 - Eat only recommended portion sizes and take the rest home or share
 - Ask for sauces on the side
 - Avoid breaded foods and breads brought to the table
 - Request restaurant nutrition information

Ordering Tips. *American Diabetes Association*. 2013. Available at: <http://www.diabetes.org/food-and-fitness/food/what-can-i-eat/food-tips/eating-out/ordering-tips.html>. Accessed January 22, 2015.

Alcohol. *American Diabetes Association*. 2014. Available at: <http://www.diabetes.org/food-and-fitness/food/what-can-i-eat/making-healthy-food-choices/alcohol.html>. Accessed January 21, 2015.



ADA RECOMMENDATIONS FOR MAXIMUM ALCOHOL CONSUMPTION PER DAY BY PATIENTS WITH DIABETES





Physical Activity

The ADA Standards of Medical Care – 2015 includes exercise as an important part of the diabetes management plan. Regular exercise has been shown to improve blood glucose control, reduce cardiovascular risk factors, contribute to weight loss, and improve well-being.



Exercise, or physical activity, includes anything that gets people moving, such as walking, dancing, or working in the yard. Regular physical activity is important for everyone, but it is especially important for patients with diabetes and those at risk for diabetes.

Standards of Medical Care in Diabetes-2015. *Standards of Medical Care in Diabetes-2015*. 2015. Available at: http://care.diabetesjournals.org/content/suppl/2014/12/23/38.supplement_1.dcl/january_supplement_combined_final.6-99.pdf. Accessed January 5, 2015.

did you know?

Following regular exercise training, cells can better respond to insulin and effectively take glucose out of the blood and into the cell.

Exercise and Type 2 Diabetes. *ACE Fitness*. Available at: <http://www.acefitness.org/fitness-fact-article/2608/exercise-and-type-2-diabetes/>. Accessed October 24, 2014.

Colberg, SR, Sigal, RJ, Fernhall, B, et al. Exercise and Type 2 Diabetes: The American College of Sports Medicine and the American Diabetes Association: joint position statement. *Diabetes Care*. 2010;33(12):e147-e167. doi:10.2337/dc10-9990.

Benefits of Physical Activity

- Improved glucose control
- Reduced CV risk factors
- Reduced weight
- Lowered BMI, BP, and LDL
- Decreased risk of falls and fractures
- Improved sense of well-being
- Reduced symptoms of depression

Structured exercise for 8 consecutive weeks has been shown to lower HbA1C on average by 0.66%

Boule, NG. Effects of Exercise on Glycemic Control and Body Mass in Type 2 Diabetes Mellitus: A Meta-analysis of Controlled Clinical Trials. *JAMA: The Journal of the American Medical Association*. 2001;286(10):1218-1227. doi:10.1001/jama.286.10.1218.

American Association of Clinical Endocrinologists/AACE Diabetes Resource Center. *Treatment of T2DM*. Available at: <http://outpatient.aace.com/type-2-diabetes/treatment>. Accessed September 10, 2014.

Standards of Medical Care in Diabetes-2015. *Standards of Medical Care in Diabetes-2015*. 2015. Available at: http://care.diabetesjournals.org/content/suppl/2014/12/23/38.supplement_1.dcl/january_supplement_combined_final.6-99.pdf. Accessed January 5, 2015.



Physical Activity

Guidelines For Physical Activity

Many studies have shown that regular physical activity improves glucose control in persons with type 2 diabetes. Physical activity is also a factor in weight loss and is particularly important in the weight maintenance phase.

Colberg, SR, Sigal, RJ, Fernhall, B, et al. Exercise and Type 2 Diabetes: The American College of Sports Medicine and the American Diabetes Association: joint position statement. *Diabetes Care*. 2010;33(12):e147-e167. doi:10.2337/dci10-9990.

ADA 2015 Guidelines for Physical Activity



Adults

≥ 150 min/wk moderate intensity aerobic activity or ≥ 75 min/wk of vigorous aerobic activity spread over ≥ 3 days/wk with no more than 2 consecutive days w/o exercise. Individuals should limit and/or break up idle or inactive time, specifically any inactivity of more than 90 minutes.



Children <18

≥ 60 minutes physical activity/day

Standards of Medical Care in Diabetes-2015. *Standards of Medical Care in Diabetes-2015*. 2015. Available at: http://care.diabetesjournals.org/content/suppl/2014/12/23/38.supplement_1.dcl/january_supplement_combined_final.6-99.pdf. Accessed January 5, 2015.

AACE Additional Guidelines for Physical Activity

In addition to the guidelines recommended by the ADA, the AACE stresses the importance of daily, unstructured physical activity such as walking.

- Patients can wear a pedometer to track steps throughout the day.
- AACE recommends at least 10,000 steps per day.



American Association of Clinical Endocrinologists AACE Diabetes Resource Center. *Treatment of T2DM*. Available at: <http://outpatient.aace.com/type-2-diabetes/treatment>. Accessed September 10, 2014.

did you know?

5 to 10 minutes of running each day can add years to life. Researchers found that 24% of people who ran regularly were 30% less likely to die from any cause over the course of the study and 45 percent less likely to die from heart disease than were those who didn't run.

Lee, D, Pate, RR, Lavie, CJ, Sui, X, Church, TS, Blair, SN. Leisure-Time Running Reduces All-Cause and Cardiovascular Mortality Risk. *Journal of the American College of Cardiology*. 2014;64(5):472-481. Available at: <http://www.sciencedirect.com/science/article/pii/S0735109714027466>. Accessed December 22, 2014.

Examples of Physical Activity

Moderate Intensity



- Walking 2 miles in 30 min
- Stair walking for 15 min
- Bicycling 5 miles in 30 min
- Water aerobics for 30 min
- Gardening for 30-45 min
- Vacuuming for 30-45 min

Vigorous Activity



- Running
- Jump rope
- Cycling class
- Sports Conditioning (e.g. Boot Camp, Zumba, Body Sculpting)
- Step aerobics
- High-Intensity Interval Training (e.g. Kickboxing)

Guide to Physical Activity. *Exercise and Fitness*. Available at: http://www.nhlbi.nih.gov/health/educational/lose_wt/phy_act.htm. Accessed September 8, 2014.



Physical Activity

Exercise and Blood Glucose Control

For patients with diabetes, it's important to check blood glucose levels before exercising to ensure safety.

Blood glucose response to exercise will vary depending on:

- Blood glucose level before starting activity
- Intensity of the activity
- Time length of the activity
- Changes made to insulin doses

Blood Glucose Range	Result	Recommendation
< 100 mg/dL	Blood glucose is too low to exercise safely.*	Eat a small (15g) carbohydrate-containing snack (fruit or crackers) before workout.*
100-300 mg/dL	Safe pre-exercise blood sugar range.	
≥ 300 mg/dL	Safe to exercise without ketosis and feeling well.	Important to stay hydrated.

*This only applies to individuals taking insulin or the secretagogues more likely to cause hypoglycemia (e.g., sulfonylureas such as glyburide, glipizide, and glimepiride, as well as nateglinide and repaglinide).

Colberg, SR, Sigal, RJ, Fernhall, B, et al. Exercise and Type 2 Diabetes: The American College of Sports Medicine and the American Diabetes Association: joint position statement. *Diabetes Care*. 2010;33(12):e147-e167. doi:10.2337/dc10-9990.

New fitness tracking devices provide the ability to track movement (such as steps, miles, calories burned, sleep patterns and heart rate).

did you know?





Physical Activity

dialogue
DIABETES CONSULT for PHARMACY

Exercise Intensity Levels

Exercising at the correct intensity can help patients get the most out of physical activity. For most healthy adults, the Department of Health and Human Services (HHS) recommends these exercise guidelines:

- **Aerobic activity.** At least 150 minutes a week of moderate aerobic activity, such as brisk walking, swimming or mowing the lawn, or 75 minutes a week of vigorous aerobic activity such as running or aerobic dancing. A combination of moderate and vigorous activity, preferably spread throughout the course of a week, is a good plan.



- **Strength training.** Strength training exercises are most effective when performed at least twice a week. Examples include free weights, weight machines or activities that use one's own body weight, such as rock climbing or heavy gardening.

Colberg, SR, Sigal, RJ, Fernhall, B, et al. Exercise and Type 2 Diabetes: The American College of Sports Medicine and the American Diabetes Association: joint position statement. *Diabetes Care*. 2010;33(12):e147-e167. doi:10.2337/dc10-9990.

Standards of Medical Care in Diabetes-2015. *Standards of Medical Care in Diabetes-2015*. 2015. Available at: http://care.diabetesjournals.org/content/suppl/2014/12/23/38.supplement_1.dcl/january_supplement_combined_final.6-99.pdf. Accessed January 5, 2015.

Researchers analyzed 14 exercise studies involving 915 adults with type 2 diabetes. Aerobic exercise (such as walking and bike riding) was better at lowering A1C levels than was resistance training.

Schwingshackl, L, Missbach, B, Das, S, König, J, Hoffmann, G. Impact of different training modalities on glycaemic control and blood lipids in patients with type 2 diabetes: a systematic review and network meta-analysis. *Diabetologia*. 2014;57(9):1789-1797. doi:10.1007/s00125-014-3303-z.



A combination of both types of exercise was best, lowering A1C by 0.17 percentage points more than aerobic exercise alone and 0.62 percentage points more than resistance training alone.

Colberg, SR, Sigal, RJ, Fernhall, B, et al. Exercise and Type 2 Diabetes: The American College of Sports Medicine and the American Diabetes Association: joint position statement. *Diabetes Care*. 2010;33(12):e147-e167. doi:10.2337/dc10-9990.

did you know?

Empowering patients to make decisions about their goals, priorities and daily diabetes care activities is an effective method of helping patients take care of themselves.

Funnell, M. M., and R. M. Anderson. "Empowerment and Self-Management of Diabetes." *Clinical Diabetes* 22.3 (2004): 123-27. Web. 23 Jan. 2015.



Physical Activity

Measuring Heart Rate

Exercise intensity must generally be at a **moderate or vigorous** level in order to deliver the most benefit. Measuring heart rate is a technique used to determine the intensity of physical activity.

■ Maximum heart rate

To estimate a person's maximum heart rate, subtract their age from 220. For example a 40 year old would subtract 40 from 220, leaving 180. Therefore 180 beats per minute (bpm) is their maximum heart rate during physical activity.

Example: 40 years old

$$\begin{array}{r} 220 \\ - 40 \\ \hline \end{array}$$

180 maximum bpm

■ Moderate intensity activity

(50-70% of maximum heart rate) For a maximum heart rate of 180 bpm: $0.5 \times 180 = 90$ bpm and $0.7 \times 180 = 126$ bpm. Therefore the moderate intensity target range is 90-126 bpm.

■ Vigorous intensity activity

(70-85% of maximum heart rate) For a maximum heart rate of 180 bpm: $0.7 \times 180 = 126$ bpm and $0.85 \times 180 = 153$ bpm. Therefore the vigorous intensity target range is 126-153 bpm.

When initiating an exercise plan, patients should start off with a goal of around 50% of their maximum heart rate during activity to avoid overexertion.

did you know?

Calculating Heart Rate

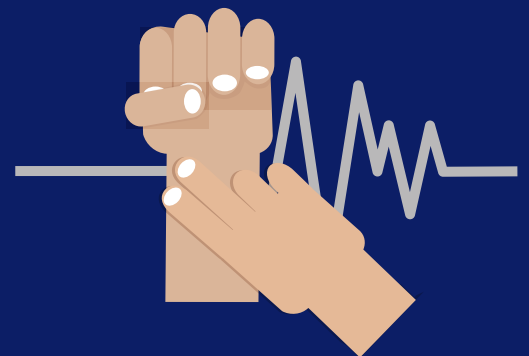
Patients can:

- Buy a personal heart monitor at a drugstore to wear during physical activity



OR

- Manually measure their heart rate by stopping momentarily during activity and taking their pulse by:
 - Placing two finger between the bone and tendon over the wrist on the thumb side
 - Counting the number of beats they feel for 15 seconds
 - Multiplying this number by 4The resulting number is their heart rate in bpm.



Target Heart Rate and Estimated Maximum Heart Rate. Centers for Disease Control and Prevention. 2011. Available at: <http://www.cdc.gov/physicalactivity/everyone/measuring/hearttrate.html>. Accessed December 23, 2014.



Physical Activity

Measuring Health and Fitness

Weight alone may not be a clear indicator of good health because it does not distinguish between pounds that come from body fat and those that come from lean body mass or muscle. To better measure health and fitness, Body Mass Index (BMI) and body fat percentage are two frequently used calculations.

BMI is a measure of health based on a person's height and weight.

- Metric Formula: $BMI = \text{weight in kg} \div \text{height in meters}^2$
- Standard Formula: $BMI = (\text{weight in pounds} \div \text{height in inches}^2) \times 703$

Body Mass Index (BMI)

Example:

Height 73" (6'1")

Weight 175 lb

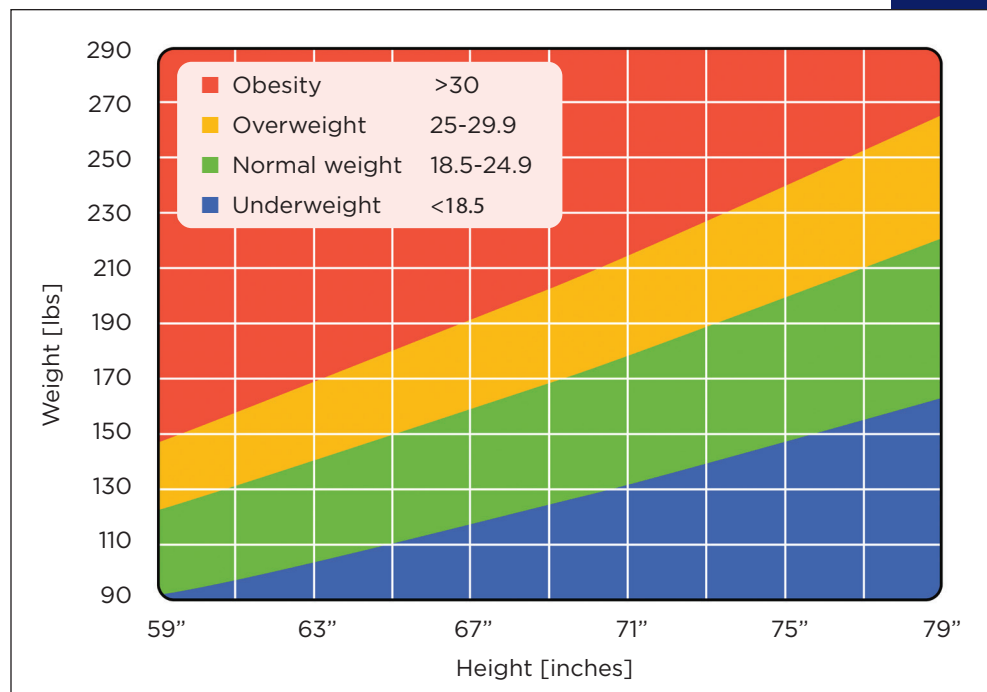
BMI =

$(175 \div 732) \times 703 =$

$(175 \div 5,329) \times 703 =$

$.03284 \times 703 = 23$

BMI of 23 = Normal Weight



Adapted from: Body Mass Index Table 1. Body Mass Index Table 1.
Available at: http://www.nhlbi.nih.gov/health/educational/lose_wt/bmi/bmi_tbl.htm.
Accessed October 2, 2014.

did you
know?

An overweight or obese BMI increases a patient's risk for health problems such as heart disease, high blood pressure, type 2 diabetes, gallstones, breathing problems, and certain cancers.

Why Is a Healthy Weight Important?. *Maintain a Healthy Weight*. Available at: http://www.nhlbi.nih.gov/health/educational/lose_wt/index.htm. Accessed September 16, 2014.



Physical Activity

Body Fat Percentage

BMI is used to determine whether a person is at a healthy weight for their height. But BMI doesn't tell the whole story because it doesn't measure body composition. So one may have a normal BMI while their body fat percentage is high enough to increase health risks.

- Achieving a healthy body fat percentage can be done through healthy eating and the addition of physical activity.
- Body composition is just as important as maintaining a healthy weight.



Zeratsky, K. normal body weight?. *Mayo Clinic*. 2014. Available at: <http://www.mayoclinic.org/diseases-conditions/obesity/expert-answers/normal-weight-obesity/faq-20058313>.

Weight Management

For patients with diabetes, being overweight or obese increases the risk for comorbidities and potential complications. A combination of physical activity and a healthy diet is the best way to lose weight. Losing just a few pounds can help with diabetes control and can reduce risk for other health problems. Weight loss benefits also include improved glycemic control, BP, and/or lipid levels.

The ADA recommends starting off with a 7% body weight reduction goal

- For a 180 lb person, this equals a weight loss goal of 12.6 lb

Standards of Medical Care in Diabetes-2015. *Standards of Medical Care in Diabetes-2015*. 2015. Available at: http://care.diabetesjournals.org/content/suppl/2014/12/23/38.supplement_1.dcl/january_supplement_combined_final.6-99.pdf. Accessed January 5, 2015.

Interpretation of BMI for adults

For adults 20 years old and older, BMI is interpreted using standard weight status categories that are the same for all ages and for both men and women. For children and teens, on the other hand, the interpretation of BMI is both age- and sex-specific.

For more information about interpretation for children and teens, see the Child and Teen BMI Calculator at

<http://nccd.cdc.gov/dnpabmi/Calculator.aspx>

The standard weight status categories associated with BMI ranges for adults are shown in the following table.

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 and Above	Obese

For example, here are the weight ranges, the corresponding BMI ranges, and the weight status categories for a sample height.

Height	Weight Range	BMI	Weight Status
5' 9"	124 lbs or less	Below 18.5	Underweight
	125 lbs to 168 lbs	18.5 – 24.9	Normal
	169 lbs to 202 lbs	25.0 – 29.9	Overweight
	203 lbs or more	30.0 or higher	Obese

About BMI for Adults. *Centers for Disease Control and Prevention*. 2014. Available at: http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html. Accessed January 15, 2015.



Physical Activity

Impact of Exercise

Regardless of the type of diabetes, regular physical activity is important for overall health and wellness.

With type 1 diabetes, it's very important to balance insulin doses with food and activity.

A type 1 patient should plan ahead and know their body's typical blood glucose response to exercise. This will help keep their blood glucose from going too low or too high.

Preventing Lows

Blood glucose response to exercise will vary depending on:

- blood glucose level before starting activity
- the intensity of the activity
- the duration of activity
- changes made to insulin doses

Sometimes people experience a drop in blood glucose during or after exercise, so it is very important they monitor their blood glucose, take proper precautions, and be prepared to treat hypoglycemia.

In order to learn how different types of activity affect them, they should frequently check their blood glucose before, during, and after an exercise session.

Increased activity may require a lower insulin dose or eating extra carbohydrates before exercising to keep blood glucose in a safe range. Some activities may cause blood glucose to drop quickly, while others may not.

- If blood glucose levels are trending down before a workout, a pre-exercise snack is warranted. Carry a carbohydrate food or drink (like juice or glucose tabs) to quickly raise blood glucose.
- If blood glucose level is less than 100 mg/dl before activity, a small carbohydrate snack (about 15 grams) will increase blood glucose and reduce the risk for hypoglycemia. This is especially important if circulating insulin levels will be higher during the time of exercise and if the exercise lasts longer than 30 minutes.
- If on an insulin pump, patients may be able to avoid adding an extra snack by lowering their basal insulin rate during the activity.

If the patient with type 1 diabetes has repeated problems with low blood glucose dropping during or after exercise, they should consult with their physician.

High Blood Glucose:

Blood glucose can also run high during or after exercise, particularly when doing a high-intensity exercise that increase stress hormone levels.

If they feel well, and do not have ketones in their blood or urine, it should be fine to exercise.

In order to learn how different types of activity affect them, they should frequently check their blood glucose before, during, and after an exercise session.



Before



During



After

Colberg SR, Sigal RJ, Fernhall B, Regensteiner JG, Blissmer BJ, Rubin RR, Chasan-Taber L, Albright AL, Braun B, American College of Sports Medicine, et al. *Diabetes Care*. 2010 Dec; 33(12):e147-67.

Exercise and Type 1 Diabetes. *American Diabetes Association*. 2014. Available at: <http://www.diabetes.org/food-and-fitness/fitness/exercise-and-type-1-diabetes.html>. Accessed December 23, 2014.



Physical Activity

Safety Tips

To help prevent injuries, dehydration, and hypoglycemia when exercising, patients with diabetes should:

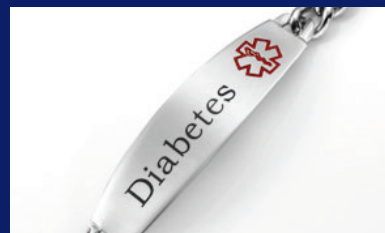
- Start slowly, especially if they have not been active for a while.
- Talk to their health care team about which activities are safest.
- Warm up for 5 minutes before starting to exercise and cool down for 5 minutes after. Warm up or cool down should be a lower intensity than the rest of the time exercising.
- Avoid doing activity in extremely hot or cold temperatures.
- Drink plenty of water before, during, and after activity.
- Be prepared to test for and treat a low if they feel it coming on, and carry a source of carbohydrate to treat low blood glucose if needed.
- Consider having a sports drink that provides carbohydrates if exercising for an extended period (more than an hour or two).
- Engage in activities that are energizing but not too hard. Patients with diabetes should use the “talk test” – If they become short of breath and can’t talk, they should slow down.
- Take care of their feet by wearing shoes and clean socks that fit well.
- Carefully inspect their feet before and after activity for blisters, redness, or other signs of irritation. Talk to their doctor if experiencing a foot injury or a non-healing blister, cut, or sore.
- Stop doing an activity if they feel any pain or lightheadedness and talk to their doctor about any unusual symptoms that they experience.

Risk of Injury

- Patients should check with their health care provider before making big changes in their exercise plan. If they have any diabetes complications, there may be certain exercises they should avoid.
 - The age and previous level of physical activity should be considered when developing a program.



- Patients should wear a medical ID tag, especially during exercise, so if a hypoglycemic event or collapse occurs, proper medical help can be given.



- Patients should NOT exercise when urine tests show elevated ketones and blood glucose.

