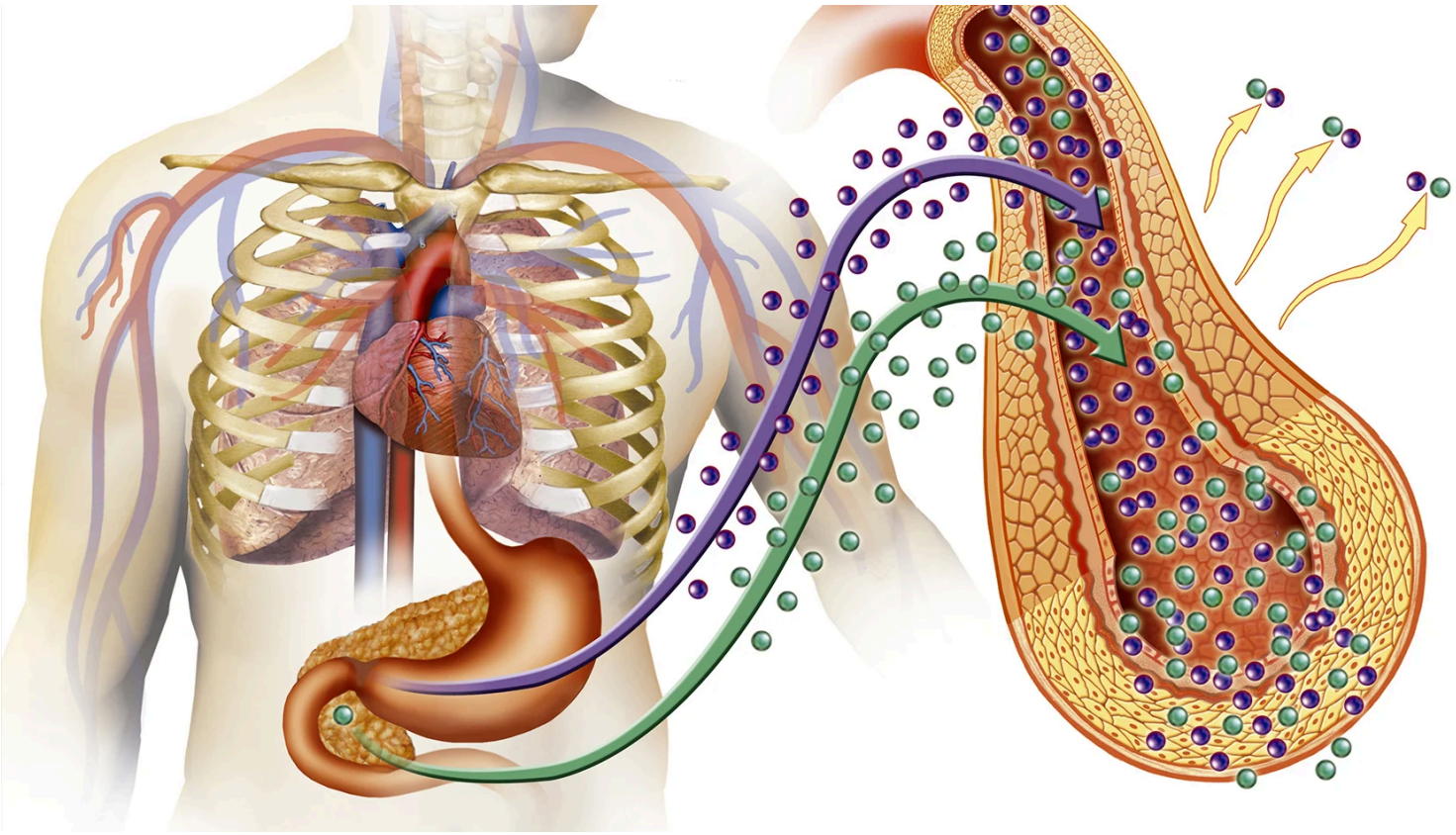

PATIENT RESOURCES

Diabetes and Endocrine Function

January 24, 2022

An estimated 30 million Americans have diabetes, a disease in which there is too much sugar in the bloodstream. About 7 million of them, however, have not yet been diagnosed with the disease.

Endocrine Connection

Diabetes occurs when the pancreas, a gland behind the stomach, does not produce enough of the **hormone insulin**, or the body cannot use insulin properly. Insulin helps carry sugar from the bloodstream into the cells. Once inside the cells, sugar is converted into energy for immediate use or stored for the future. That energy fuels many of our bodily functions.

The body produces glucose from the foods you eat. The liver also releases sugar when you are not eating. The pancreas produces the hormone insulin, which allows glucose from the bloodstream to enter the body's cells where it is used for energy. In type 2 diabetes, too little insulin is produced, or the body cannot use insulin properly, or both. This results in a build-up of glucose in the blood.

People with diabetes are at risk of developing serious health problems (**complications**). If your blood glucose level stays too high for too long, complications can include:

- Blindness
- Kidney disease and failure
- Nerve damage which can result in nerve pain or injury to the feet or other extremities without feeling pain
- Heart attacks (with or without symptoms)
- Stroke

▸ **Diagnosis and Screening**

There are three blood tests that can be used to check the levels of glucose in your blood and diagnose prediabetes or diabetes:

- **Fasting Blood Glucose Test (FBG):** Blood is drawn in the morning after you go without food overnight or for at least 8 hours.
- **Oral Glucose Tolerance Test (OGTT):** This test is also done in the morning after going without food overnight or for at least 8 hours. Blood is drawn before

you drink 8 ounces of a sugar solution and 2 hours after. This test is more precise but less convenient than the FBG test.

- **Hemoglobin A1C Test (A1C):** This test shows what your average blood glucose levels have been over the past 3 months. You can eat and drink normally before the test.

If you are living with diabetes, lifestyle is an important part of your care. It is very important that you eat a good balance of real foods every day and exercise regularly. Managing your diabetes also means taking medicine, if needed, and testing your blood sugar levels each day.

▸ Prediabetes

Prediabetes occurs when blood glucose levels are higher than normal, but not high enough for a diabetes diagnosis. Over time, this can increase your risk of heart disease and stroke, as well as your risk of developing type 2 diabetes. Unfortunately, prediabetes symptoms are hard to spot, so many people have the condition and do not know it.

The U.S. Centers for Disease Control indicates that about 79 million American adults over the age of 20 have prediabetes. As the population ages, becomes increasingly overweight and increasingly inactive, the number of adults with prediabetes continues to grow. The number of young people with this condition is also increasing. Common risk factors include:

- Being obese or overweight
- Not getting enough exercise
- A family history of type 2 diabetes
- Being 45 or older
- African American, Latino/Hispanic or American Indian family background
- Having had gestational diabetes
- Giving birth to a baby weighing more than 9 pounds

Preventing prediabetes is done with lifestyle changes, including a healthy diet that is high in vegetables and fruits and low in fat and processed foods. Regular physical activity, averaging 30 minutes five days per week, is also important. Maintaining a healthy weight or losing 5–10% of your weight if you are overweight, can also help.

In addition to lifestyle changes, a few drugs have been proven to lower the risk of developing diabetes if you have prediabetes. These drugs do have side effects, and their benefits wear off when you stop taking the drug, making lifestyle change the best option for tackling this problem.

▸ Type 1 Diabetes

Type 1 diabetes, sometimes called insulin-dependent diabetes or juvenile diabetes, can develop at any age but most often occurs in children, teens, and young adults. In type 1 diabetes, a person’s pancreas produces little or no insulin, so insulin treatment is needed for a lifetime.

The causes of type 1 diabetes are not fully known. In most cases, the body’s immune system attacks and destroys the part of the pancreas that produces insulin. This occurs over a period of time. So early on in type 1 diabetes, people may not have any symptoms. It is only when enough of the insulin producing cells are affected and insulin levels are low that the blood sugar rises and symptoms of diabetes start to occur. Because type 1 is an autoimmune disease, people with other autoimmune, conditions, such as Hashimoto’s disease or primary adrenal insufficiency (also known as Addison's Disease), are more likely to develop type 1 diabetes. Overall, cases of type 1 diabetes seem to be increasing.

The symptoms of type 1 diabetes can look like other conditions or medical problems. If you (or your child) have these symptoms, talk with your doctor as

soon as possible.

- Increased thirst
- Increased urination
- Constant hunger
- Weight loss
- Blurred vision
- Constantly feeling tired

People with type 1 diabetes must have daily injections of insulin to keep a normal level of glucose in the blood. Blood glucose is kept under the best control with three or more injections per day using long and short acting insulin, or when insulin is delivered throughout the day with an insulin pump. A healthy diet, exercise, and regular monitoring of blood glucose levels are also important to manage diabetes.

▸ Type 2 Diabetes

Type 2 diabetes is the most common form of the disease, affecting 90–95% of people with diabetes. In type 2 diabetes, the body is resistant to the action of insulin, meaning it cannot use insulin properly, so it cannot carry sugar into the cells. Although the body makes some insulin, it is not enough to overcome this resistance. You are more likely to develop type 2 diabetes if you are overweight, have a family history of diabetes, or have a history of diabetes during pregnancy. Other groups more likely to have the disease are people over age 45 and non-Caucasians. A simple blood test can tell you if you have diabetes.

Individuals with this condition have a pancreas that is able to produce insulin, but their bodies are unable to use or process the insulin that is made. Over time, the pancreas may stop creating insulin altogether, but type 2 diabetes starts with the inability to process the insulin that is made.

Being older (over 45) and overweight are the greatest risk factors for developing diabetes. Other factors that increase your chances of developing high blood glucose include:

- Having a parent or sibling with diabetes
- Having an African American, Latino/Hispanic, or American Indian family background
- Having had gestational diabetes (diabetes during pregnancy) or giving birth to a baby weighing more than 9 pounds
- Having high blood pressure (140/90 mm Hg or higher)
- Having low levels of HDL (good) cholesterol (below 35 mg/dL in men or 45 mg/dL in women) or high levels of triglycerides (above 250 mg/dL)
- Having polycystic ovary syndrome (PCOS)
- Being physically inactive

▸ Type 1 Diabetes vs. Type 2 Diabetes

People with both type 1 and type 2 have high blood glucose levels, but the reasons for those high levels differ. Differences between type 1 and type 2 diabetes include:

Age of diagnosis: Type 1 is typically diagnosed in children or young people (but it can be diagnosed in older individuals as well), while type 2 diabetes is generally diagnosed in adults and occasionally children.

Treatment options: For individuals with type 1 diabetes, the only effective treatment is insulin. For people with type 2 diabetes, oral medications (pills), insulin, or non-insulin injectables may be used.

Hypoglycemia: Blood sugar levels can drop to dangerously low levels in people with type I diabetes, but it can also occur in individuals with type 2 diabetes. Certain medications, such as insulin, may increase the risk of hypoglycemia.

Preventability: While certain experimental medications may postpone the development of type 1 diabetes, there are no means of preventing type 1 diabetes. Type 2 diabetes can sometimes be prevented with lifestyle changes.

▸ Gestational Diabetes

Gestational Diabetes is a temporary form of diabetes that can occur when a woman is pregnant. During pregnancy, the placenta produces hormones that help the baby develop. These hormones also block the effects of insulin in the woman's body, increasing her blood sugar levels. Most women who have gestational diabetes have no symptoms.

If a woman has high blood sugar in pregnanct, she will have to follow a special diet for the rest of the pregnancy. In some cases, she may also need to take insulin. High blood sugar in women with gestational diabetes can affect them and their baby. These risks include:

- Premature delivery and preeclampsia (pregnancy-induced high blood pressure).
- The baby grows too large. Very large babies may get stuck in the birth canal and have birth injuries. Large size also increases the chances of needing a cesarean (surgical) delivery.
- May cause stillbirth. Uncontrolled gestational diabetes also increases the risk of jaundice and breathing problems in the newborn.
- After birth, the baby may develop low blood sugar (hypoglycemia), a potentially dangerous condition. While in the womb, the baby's pancreas produces large amounts of insulin in response to the mother's high blood sugar, and it

continues to do so after delivery. Without the sugar supplied by the mother, excess insulin can cause the baby's own glucose level to drop too low.

Gestational diabetes affects about 4–8 of every 100 pregnant women in the United States. Any pregnant woman can develop the condition, but some women are at greater risk than others. Among women with the below risk factors, as many as 14 in 100 develop gestational diabetes. Known risk factors include:

- Age (older than 25 years; the risk is even greater after age 35)
- Race (occurs more often in African Americans, Hispanics, American Indians, and Asian Americans)
- Overweight and obesity
- Personal history of gestational diabetes or prediabetes
- Having delivered a baby weighing more than 9 pounds
- Family history of type 2 diabetes (in parents or siblings)

▸ **Monogenic Diabetes (MODY)**

Monogenic Diabetes (MODY) is the least common form of diabetes. It is developed as a result of single gene mutations. Monogenic diabetes appears in several forms and most often affects young people.

▸ **Type B Insulin Resistance**

Type B Insulin Resistance is a very rare form of diabetes and a component of an autoimmune disorder.

▸ **Questions for Your Healthcare Provider**

- Do I need to be checked for prediabetes?
- If I have prediabetes, should I be checked for type 2 diabetes? How often?
- Should I take medicine to treat my prediabetes?
- What are the benefits and risks of prediabetes medicines?
- How can I lose weight if I need to?
- What can I (or my child) do to keep blood glucose level on target?
- What should I (or my child) eat?
- Which medicines do I (or my child) need?
- What type of exercise is best for me (or my child)?
- How often should I (or my child) check blood glucose levels?
- Should I (or my child) see a diabetes educator?
- Should I (or my child) see an endocrinologist?
- Should I have my blood glucose level tested?
- What are the results of my testing and what do they mean?
- What can I do to bring my glucose levels back to normal?
- What can I do to prevent gestational diabetes?
- I have gestational diabetes. How often should I check my blood glucose level?
- How often should I check my blood glucose after my baby is born?
- Can gestational diabetes lead to other health problems?

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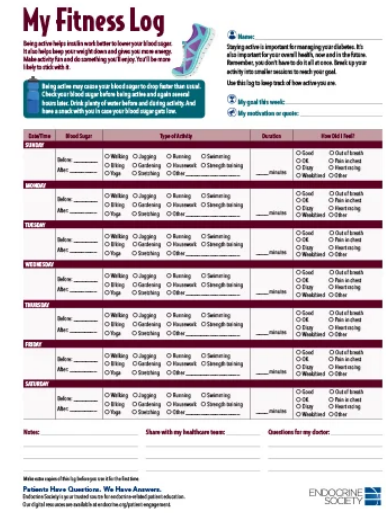

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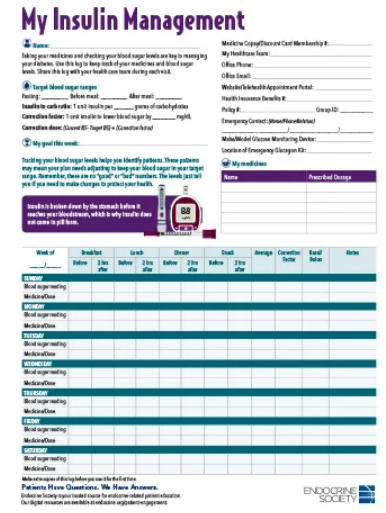

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