While scrutinize low-quality websites manually, observed that they (1) give brief definitions but provide either limited or no information about approved treatments, (2) use ambiguous words or phrases in the text such as "there are things to do" but no further details are provided, (3) contain irrelevant information such as unapproved holistic treatments or advertisements. The following sample websites are giving:

Examples of low-quality websites:

1. (Coverage score 0)

As can be seen in this example, there is no information about the treatment except for very general definitions about the disease.

Diabetes

Diabetes is a disease where your body **can**not control its blood sugar levels properly – either because your body doesn't make enough (or any) insulin, or because your cells have become resistant to insulin.

Only give definition of Insulin.

Insulin is a chemical produced in the pancreas. It helps your body process sugars.

- If blood sugar levels aren't kept under control, diabetes **can** be life-threatening.
- Diabetes **can** lead to other health conditions, including kidney failure, eye disease, foot ulceration and a higher risk of heart disease.
- Keeping your blood sugar at a safe level means you're less likely to have other health problems.

There's no cure for diabetes, but there are things you **can** do to stay well. Support from your friends, and health care providers **can** help.

Use ambiguous words or phrases in the text such as "there are things to do" but no further details are provided

Heart and diabetes checks

Diabetes is our largest and fastest growing health issue we face in New Zealand. Diabetes is closely linked with heart disease (also known as cardiovascular disease or CVD), and together they are responsible for the deaths of more New Zealanders each year than cigarettes are. Many of these deaths are preventable. The More Heart and Diabetes Checks Health Target has been established to help save these lives – aiming to have regular heart and diabetes checks for at least 90 percent of those at risk of developing these conditions. Find out more about heart and diabetes checks.

How common is diabetes?

There are over 240,000 people in New Zealand who have been diagnosed with diabetes (mostly type 2). It is thought there are another 100,000 people who have it but don't know.

- Diabetes is most common among Māori and Pacific Islanders. They're three times as likely to get it as other New Zealanders.
- South Asian people are also more likely to develop diabetes.
- The number of people with both types of diabetes is rising – especially obesity-related type 2 diabetes.

Type 1 diabetes

Type 1 diabetes is when your body has stopped producing insulin. People with type 1 diabetes need to inject insulin to live.

- Type 1 diabetes is usually diagnosed in children.
- Type 1 diabetes is less common than type 2 diabetes.

Type 2 diabetes

There is very little information on the type 2 diabetes.

Type 2 diabetes is when your cells have become insulin resistant or your body doesn't produce enough insulin to keep you healthy.

- Type 2 diabetes usually develops in adults but it is becoming more common in children.
- Type 2 diabetes is the only type of diabetes linked with obesity.

Diabetes in pregnancy

Pregnant women **can** also develop diabetes. This is known as gestational diabetes (or 'diabetes in pregnancy'). It usually goes away when the baby is born.

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2. (Coverage score 1)

Get the facts about diabetes, its impact on the body, and how to live with the disease.

About Diabetes

Diabetes is a group of diseases that causes high blood sugar (glucose) levels. Diabetes occurs when the body is unable to produce or effectively use insulin. Insulin is a hormone produced by the body that takes nutrients and sugars from food and sends them to cells to use as fuel.

Type 1 Diabetes

Only give definition of Insulin.

Type 1 diabetes is diagnosed when the body's immune system attacks its own cells and completely stops producing insulin. It isn't clear what causes the immune system to act this way, causing the pancreas to stop producing insulin. Lilly Diabetes and Disney have come together to offer unique support materials for families with type 1 diabetes. For more information, visit T1EverydayMagic.com.

Type 2 Diabetes

The reason for getting one point is because it only mentions diet and exercise.

Type 2 diabetes occurs when the body isn't able to produce enough insulin or cells develop an insulin resistance. *Type 2 diabetes **can** be the result of a combination of genetics, poor diet, lack of exercise, or obesity. Living a normal life with diabetes is possible with proper treatment, diet, and exercise.* Through our medicines, resources, and support programs, Lilly helps make life better for people with diabetes. For more information on type 1 or type 2 diabetes, visit our resources page.

Example of high-quality website

***1. (Coverage score 24*)**

One of the treatment options not available on many websites.

Bariatric Surgery

Bariatric surgery (Gastric Bypass or Laparoscopic Gastric Banding) is sometimes considered for adults with a body mass index (BMI) above 35 and type 2 diabetes, especially if the diabetes is difficult to control with lifestyle changes and medicines.

Although small trials have shown benefits to blood glucose control in patients with type 2 diabetes and high BMI, there isn't enough evidence for people with BMIs lower than 35.

There are two main types of bariatric surgery:

Gastric bypass surgery: shrinks the stomach (from the size of a fist to that of a thumb) and shortens the path food takes through the small intestine. This limits the number of calories absorbed. This change is permanent.

Laparoscopic Gastric Banding also known as "Lap-banding": a belt is wrapped around the stomach. This belt cinches the stomach so that it will feel full with less food. This change can be adjusted or reversed if needed.

Because bariatric surgery is not regarded as a cure, it is recommended that individuals who have undergone a bariatric procedure continue to have the regular screenings that are recommended for people with diabetes, whether or not their glucose levels have normalized.

In addition, they need careful ongoing assessments of blood glucose control conducted by their health care provider, as those with normal blood glucose levels after surgery are at risk for a return of hyperglycemia.

Aspirin

Studies suggest that taking a low-dose aspirin every day **may** lower the risk of heart attacks for some people with diabetes.

Usually, men over 50 and women over 60 years old with other risk factors such as high blood pressure or cholesterol problems. It **may** also help people with diabetes who have had a heart attack or a stroke, or who have heart disease.

Exactly why aspirin works is not completely understood, but it **may** be because it helps keep red blood cells from clumping together. These cells seem to clump together more readily in people with diabetes. When blood cells clump, a blood clot **can** form and narrow or block a blood vessel. This **can** lead to a heart attack or stroke.

Taking a daily low-dose aspirin is not safe for everyone it's best to ask your health care provider whether you **should** take aspirin. Most people take a pill containing a dosage of 81 milligrams and is usually labeled as low-dose aspirin.

Can Diabetes Pills Help Me?

Only people with type 2 diabetes **can** use pills to manage their diabetes, people with type 1 diabetes must use insulin. These pills work best when used with meal planning and exercise. This way you have three therapies working together to lower your blood glucose levels. Diabetes pills don't work for everyone. Although most people find that their blood glucose levels go down when they begin taking pills, their blood glucose levels **may** not go near the normal range.

Will They Help?

What are the chances that diabetes pills will work for you? Your chances are low if you have had diabetes for more than 10 years or already take more than 20 units of insulin each day. On the other hand, your chances are good if you developed diabetes recently or have needed little or no insulin to keep your blood glucose levels near normal. Diabetes pills sometimes stop working after a few months or years. The cause is often unknown. This doesn't mean your diabetes is worse. When this happens, oral combination therapy **can** help. Even if diabetes pills do bring your blood glucose levels near the normal range, you **may** still need to take insulin if you have a severe infection or need surgery. Pills **may** not be able to control blood glucose levels during these stressful times when blood glucose levels shoot up. Also, if you plan to become pregnant, you will need to control your diabetes with diet and exercise or with insulin. It is not safe for pregnant women to take oral diabetes medications. There is no "best" pill or treatment for type 2 diabetes. You **may** need to try more than one type of pill, combination of pills, or pills plus insulin.

Clinical Trials

A clinical trial is a way to carefully test a new drug or device in patients before it is approved by the FDA to be used in the general public. Clinical trials are an important step in our being able to have new treatments for diabetes and other conditions. The American Diabetes Association is currently a partner providing support for the following clinical studies and initiatives:

TrialNet

Type 1 Diabetes TrialNet is an international network of researchers who are exploring ways to prevent, delay and reverse the progression of type 1 diabetes.

GRADE

GRADE is a comparative effectiveness study looking at what medications work best at lowering blood glucose levels in patients who are newly diagnosed with diabetes.

RISE

The Restoring Insulin Secretion study (RISE) includes 3 studies examining whether aggressive glucose lowering will lead to recovery of pancreas function in those with prediabetes and early type 2 diabetes.

D2d

The goal of the Vitamin D and type 2 diabetes (D2d) study is to determine whether vitamin D supplementation is safe and effective in delaying the onset of type 2 diabetes in people at risk for the disease, and to gain a better understanding of how vitamin D affects glucose metabolism.

Accelerating Medicines Partnership

The Accelerating Medicines Partnership (AMP) is a bold new venture between the NIH, non-profit organizations and biopharmaceutical companies to transform the current model for developing new diagnostics and treatments. By jointly identifying and validating promising biological targets of disease, the partnership strives to increase the number of new diagnostics and therapies for patients and reduce the time and cost of developing them.

FNIH Biomarkers Consortium

The Biomarkers Consortium is a public-private biomedical research partnership managed by the Foundation for the National Institutes of Health that endeavors to discover, develop, and qualify biological markers (biomarkers) to support new drug development, preventive medicine, and medical diagnostics.

Clinical Trials Links and Resources

By policy, the American Diabetes Association does not list or promote specific clinical trials other than the trials above in which it is a formal collaborator. This policy also applies to patient surveys. There are far too many trials and surveys being conducted at any given time for the Association to be able to evaluate them on an individual basis. However, the following resources from the Food and Drug Administration and the National Institutes of Health provide more information about clinical trials and how to determine which trials are being conducted in a location near you.

ClinicalTrials.gov

A registry and results database of federally and privately supported clinical trials conducted in the United States and around the world. ClinicalTrials.gov gives you information about a trial's purpose, who **may** participate, locations and phone numbers for more details.

National Institutes of Health (NIH)

The National Institutes of Health (NIH), a part of the U.S. Department of Health and Human Services, is the nation's medical research agency making important discoveries that improve health and save lives.

Food and Drug Administration (FDA)

FDA is responsible for protecting the public health by assuring the safety, efficacy and security of human and veterinary drugs, biological products, medical devices, our nation's food supply, cosmetics, and products that emit radiation.

Centers for Medicare and Medicaid Service: Clinical Trials Coverage (CMS)

Is There a Danger of Interactions?

In general, diabetes pills are safe and work well. But like any other drug, they must be used with care. All diabetes pills **can** interact with other medicines. Because of the chance of medication interactions, you need to tell your doctor about all medicines you are taking. While you're taking diabetes pills, you **should** check with your doctor before starting anything new â□” even over-the-counter items. Any sulfonylurea or meglitinide **can** cause blood glucose levels to drop too low (hypoglycemia). Metformin or the glitazones rarely cause hypoglycemia unless taken with insulin stimulators (sulfonylureas or repaglinide) or insulin injections. Acarbose or miglitol, taken as prescribed, does not cause hypoglycemia. However, hypoglycemia **can** occur when acarbose or meglitol is taken in combination with other diabetes medications.

Disadvantages of Using an Insulin Pump

Although there are many good reasons as to why using an insulin pump can be an advantage, there are some disadvantages.

The disadvantages of using a pump are that it:

- Can cause weight gain
- Can cause diabetic ketoacidosis (DKA) if your catheter comes out and you don't get insulin for hours
- Can be expensive
- Can be bothersome since you are attached to the pump most of the time
- Can require a hospital stay or maybe a full day in the outpatient center to be trained

There are pluses and minuses to using a pump. Even though using an insulin pump has disadvantages, most pump users agree the advantages outweigh the disadvantages.

Additional Resources

How do Insulin Pumps Work?
Advantages of Using an Insulin Pump
Getting Started with an Insulin Pump

Give advantages and disadvantages for decision making; also additional resources

Advantages of Using an Insulin Pump

Some advantages of using an insulin pump instead of insulin injections are:

- Using an insulin pump means eliminating individual insulin injections
- Insulin pumps deliver insulin more accurately than injections
- Insulin pumps often improve A1C
- Using an insulin pump usually results in fewer large swings in your blood glucose levels
- Using an insulin pump makes delivery of bolus insulin easier
- Insulin pumps allow you to be flexible about when and what you eat
- Using an insulin pump reduces severe low blood glucose episodes
- Using an insulin pump eliminates unpredictable effects of intermediate- or long-acting insulin

- Insulin pumps allow you to exercise without having to eat large amounts of carbohydrate

Facts about Type 2

Type 2 diabetes is the most common form of diabetes. In type 2 diabetes, your body does not use insulin properly. This is called insulin resistance. At first, the pancreas makes extra insulin to make up for it. But, over time your pancreas isn't able to keep up and **can**'t make enough insulin to keep your blood glucose levels normal. Type 2 is treated with lifestyle changes, oral medications (pills), and insulin. When glucose builds up in the blood instead of going into cells, it **can** cause two problems:

- Right away, your cells **may** be starved for energy.
- Over time, high blood glucose levels **may** hurt your eyes, kidneys, nerves or heart.

Some people with type 2 **can** control their blood glucose with healthy eating and being active. But, your doctor **may** need to also prescribe oral medications or insulin to help you meet your target blood glucose levels. Type 2 usually gets worse over time – even if you don't need medications at first, you **may** need to later on. Some groups have a higher risk for developing type 2 diabetes than others. Type 2 diabetes is more common in African Americans, Latinos, Native Americans, and Asian Americans/Pacific Islanders, as well as the aged population. Patient Education Materials — Taking Care of Type 2 Diabetes This two-page introduction to type 2 diabetes is in PDF format so you **can** download it, print it, and hand it out to patients. You **can** also download the Spanish version.

Getting Started with an Insulin Pump

Once you have talked with your diabetes care team and have become comfortable with all of the options on your insulin pump, you and your team will need to do the following in order to get you started.

1. Determine how much insulin to use in the insulin pump by averaging the total units of insulin you use per day for several days. (You may start with about 20% less if you are switching to rapid-acting insulin.)
2. Divide the total dosage into 40-50% for basal and 50-60% for bolus insulin.
3. Divide the basal portion by 24 to determine a beginning hourly basal rate.
4. Then, adjust the hourly basal rate up or down for patterns of highs and lows, such as more insulin for dawn phenomenon and less for daily activity.
5. Determine a beginning carbohydrate dose (insulin:carb ratio) using the 450 (or 500) rule. Divide by the total units of insulin/day to get the number of grams of carbohydrate covered by one unit of insulin. This dose may be raised or lowered based on your history and how much fast-acting insulin you took in the past.
6. Determine the dose of insulin to correct high blood glucose with the 1800 (or 1500) rule. Divide 1800 by the total units of insulin/day to see how much one unit of insulin lowers your blood glucose. This dose must be evaluated by your health care team. It is often too high for children or for people who have not had diabetes very long.

Good Insulin Pump Habits

It may take several months to get comfortable with the pump. During those first months is the time to adopt some good habits. Here are some tips to help you adjust:

- Take your insulin at a specific time, such as five minutes before you eat, so you don't forget boluses
- When traveling anywhere, bring extra supplies or at least an insulin pen, in case you are unable to use your pump for some reason
- With an insulin pump, when you eat, what you eat, and how much you eat is up to you. You can eat more carbohydrate and still manage your blood glucose, but weight gain can happen. Talk to a dietitian about this when you start on the pump. It's a lot easier to not to gain weight, than it is to lose it after you have already gained it
- When you take the insulin pump off or turn it off, figure out a system to remember to turn it back on. Listen to the alarms on the pump or set a timer
- Make a habit of recording blood glucose checks, carbohydrate amounts, carbohydrate doses, correction doses, and exercise when you do them. It really helps to sit down and look over your blood glucose record at the end of every week (or even every day) to see if you have any problem areas. Reviewing your records is the key to improving blood glucose control
- Your diabetes provider and Insulin Pump Company have record forms, or you can make your own. Just be sure that you have enough room to record everything you need. Keeping daily records is best, but some people find keeping records for two weekdays and one weekend day gives enough information to see the patterns

Ask for Help

This is a lot of information. Fortunately, you don't need to be an expert on insulin pumps overnight.

If you are uncertain about anything, you can go to your diabetes care team for help. Everyone learns at a different pace and it is okay if it takes you a while to get the hang of it.Â

Additional Resources

- How Do Insulin Pumps Work?
- Advantages of Using an Insulin Pump
- Disadvantages of Using an Insulin Pump

How Do Insulin Pumps Work?

If you have been diagnosed with diabetes, you **may** feel overwhelmed by all the new information you have learned and will continue to learn about managing your diabetes. You already know your main goal **should** be to get your blood glucose (sugar) levels under control in order to increase your chances of a complication-free life. Many people know this, but need to know how to achieve good diabetes management, while balancing the day-to-day demands of diabetes with other life demands. An insulin pump **can** help you manage your diabetes. By using an insulin pump, you **can** match your insulin to your lifestyle, rather than getting an insulin injection and matching your life to how the insulin is working. When you work closely with your diabetes care team, insulin pumps **can** help you keep your blood glucose levels

within your target ranges. People of all ages with type 1 diabetes use insulin pumps and people with type 2 diabetes have started to use them as well.

How They Work?

Insulin pumps deliver rapid- or short-acting insulin 24 hours a day through a catheter placed under the skin. Your insulin doses are separated into:

- Basal rates
- Bolus doses to cover carbohydrate in meals
- Correction or supplemental doses

Basal insulin is delivered continuously over 24 hours, and keeps your blood glucose levels in range between meals and overnight. Often, you program different amounts of insulin at different times of the day and night. When you eat, you use buttons on the insulin pump to give additional insulin called a bolus. You take a bolus to cover the carbohydrate in each meal or snack. If you eat more than you planned, you **can** simply program a larger bolus of insulin to cover it. You also take a bolus to treat high blood glucose levels. If you have high blood glucose levels before you eat, you give a correction or supplemental bolus of insulin to bring it back to your target range.

Placing the Pump

Knowing how an insulin pump works is one thing. But you **may** be wondering where you are supposed to put it. You **can** buy a pump case or it **can** be attached to a waistband, pocket, bra, garter belt, sock, or underwear. You **can** also tuck any excess tubing into the waistband of your underwear or pants. When you sleep, you could try laying the pump next to you on the bed. You could even try wearing it on a waistband, armband, legband, or clip it to the blanket, sheet, pyjamas, stuffed toy, or pillow with a belt clip. Showering and bathing are other instances when you **should** know where to put your insulin pump. Although insulin pumps are water resistant, they **should** not be set directly in the water. Instead, you **can** disconnect it. All insulin pumps have a disconnect port for activities, such as swimming, bathing, or showering. Some pumps **can** be placed on the side of the tub, in a shower caddy, or in a soap tray. There are also special cases you **can** buy. You **can** hang these cases from your neck or from a shower curtain hook. No matter what you **may** think, you **can** still have fun when you are using an insulin pump. When you exercise or play sports, you **can** wear a strong elastic waist band with a pump case. You **can** also wear it on an armband where it is visible. Women **can** tape the insulin pump to the front of their sports bra. Some coaches do not allow any devices to be worn because getting the pump knocked into you or falling on it **can** be painful. In this case, you **may** just need to take the insulin pump off.

When You Have to Disconnect

When you disconnect your pump, you are stopping all delivery (basal and bolus) by the pump.

Here are some important tips to remember when disconnecting your pump.

1. It is important for you to remember that if you stop your pump while it is in the middle of delivering any bolus -- it will NOT be resumed. You may need to program a new one.
2. Be sure to bolus to cover the basal rate you will miss. If your blood glucose level is under 150, you can wait an hour to bolus.
3. Do not go longer than one to two hours without any insulin.
4. Monitor your blood glucose every three to four hours.

Now that you know how the insulin pump works and how to wear it, take a look at some of the facts to see if this is right for you.

Additional Resources

- Advantages of Using an Insulin Pump
- Disadvantages of Using an Insulin Pump
- Getting Started with an Insulin Pump

How Much Do Oral Medications Cost? Costs vary widely among the different medications. Even the same medication **can** vary in price from store to store. Call around to find the best price for the one you take. Generic versions of some sulfonylureas are available. These cost less than brand-name products and in general are reliable. There is now a generic Metformin (Glucophage). To save you more money, ask your doctor to prescribe the largest tablet strength suitable for the dose you need. One 500-mg tablet, for example, often costs much less than two 250-mg tablets. You **can** then use a pill splitter (available at any pharmacy) to cut the larger tablet into halves or quarters to get the appropriate dose, if necessary. Caution: Some extended-release drugs will not work properly if they are cut into pieces; check with your pharmacist or doctor before using a pill splitter. Diabetes pills aren't perfect, but they **can** help to lower glucose levels for many people with type 2 diabetes. Keeping your blood glucose levels close to normal will help to reduce your risks for the long-term complications in the future and help you feel your best today.

It contains a lot of information about insulin except the definition. There is detailed information about types of insulin.

Insulin Basics

- There are different types of insulin depending on how quickly they work, when they peak, and how long they last.
- Insulin is available in different strengths; the most common is U-100.
- All insulin available in the United States is manufactured in a laboratory, but animal insulin can still be imported for personal use.

Inside the pancreas, beta cells make the hormone insulin. With each meal, beta cells release insulin to help the body use or store the blood glucose it gets from food.

In people with **type 1 diabetes**, the pancreas no longer makes insulin. The beta cells have been destroyed and they need insulin shots to use glucose from meals.

People with **type 2 diabetes** make insulin, but their bodies don't respond well to it. Some people with type 2 diabetes need diabetes pills or insulin shots to help their bodies use glucose for energy.

Insulin cannot be taken as a pill because it would be broken down during digestion just like the protein in food. It must be injected into the fat under your skin for it to get into your

blood. In some rare cases insulin can lead to an allergic reaction at the injection site. Talk to your doctor if you believe you may be experiencing a reaction.

Types of Insulin

- **Rapid-acting insulin**, begins to work about 15 minutes after injection, peaks in about 1 hour, and continues to work for 2 to 4 hours. *Types: Insulin glulisine (Apidra), insulin lispro (Humalog), and insulin aspart (NovoLog)*
- **Regular or Short-acting insulin** usually reaches the bloodstream within 30 minutes after injection, peaks anywhere from 2 to 3 hours after injection, and is effective for approximately 3 to 6 hours. *Types: Humulin R, Novolin R*
- **Intermediate-acting insulin** generally reaches the bloodstream about 2 to 4 hours after injection, peaks 4 to 12 hours later, and is effective for about 12 to 18 hours. *Types: NPH (Humulin N, Novolin N)*
- **Long-acting insulin** reaches the bloodstream several hours after injection and tends to lower glucose levels fairly evenly over a 24-hour period. *Types: Insulin detemir (Levemir) and insulin glargine (Lantus)*

Premixed insulin can be helpful for people who have trouble drawing up insulin out of two bottles and reading the correct directions and dosages. It is also useful for those who have poor eyesight or dexterity and is convenient for people whose diabetes has been stabilized on this combination.

In 2015 an inhaled insulin product, Afrezza, became available in the U.S. Afrezza is a rapid-acting inhaled insulin that is administered at the beginning of each meal and can be used by adults with type 1 or type 2 diabetes. Afrezza is not a substitute for long-acting insulin. Afrezza must be used in combination with injectable long-acting insulin in patients with type 1 diabetes and in type 2 patients who use long-acting insulin.

- **Inhaled insulin** begins working within 12 to 15 minutes, peaks by 30 minutes, and is out of your system in 180 minutes. *Types: Technosphere insulin-inhalation system (Afrezza)*

Characteristics of Insulin

Insulin has 3 characteristics:

- **Onset** is the length of time before insulin reaches the bloodstream and begins lowering blood glucose.
- **Peaktime** is the time during which insulin is at maximum strength in terms of lowering blood glucose.
- **Duration** is how long insulin continues to lower blood glucose.

Insulin Strength

All insulins come dissolved or suspended in liquids. The standard and most commonly used strength in the United States today is U-100, which means it has 100 units of insulin per milliliter of fluid, though U-500 insulin is available for patients who are extremely insulin resistant.

U-40, which has 40 units of insulin per milliliter of fluid, has generally been phased out around the world, but it is possible that it could still be found in some places (and U-40 insulin is still used in veterinary care).

If you're traveling outside of the U.S., be certain to match your insulin strength with the correct size syringe.

Insulin Pumps

Insulin pumps are small computerized devices that deliver insulin in two ways:

- In a steady measured and continuous dose (the "basal" insulin)
- As a surge ("bolus") dose, at your direction, around mealtime.

Doses are delivered through a flexible plastic tube called a catheter. With the aid of a small needle, the catheter is inserted through the skin into the fatty tissue and is taped in place. The insulin pump is not an artificial pancreas (because you still have to monitor your blood glucose level), but pumps **can** help some people achieve better control, and many people prefer this continuous system of insulin delivery over injections. Pumps **can** be programmed to releases small doses of insulin continuously (basal), or a bolus dose close to mealtime to control the rise in blood glucose after a meal. This delivery system most closely mimics the body's normal release of insulin. You'll want to check with your insurance carrier before you buy a pump and supplies. Most carriers cover these, but some don't.

For More Information

Advantages of Using an Insulin Pump
Disadvantages of Using an Insulin Pump
Getting Started with an Insulin Pump
How Do Insulin Pumps Work?
See the 2015 Consumer Guide to insulin pumps (PDF)

Insulin Routines

- Insulin is required for people with type 1 diabetes and sometimes necessary for people with type 2 diabetes.
- Syringe is the most common form of insulin delivery, but there are other options, including insulin pens and pumps.
- Insulin should be injected in the same general area of the body for consistency, but not the exact same place.
- Insulin delivery should be timed with meals to effectively process the glucose entering your system.

Insulin Therapy

With the help of your health care team, you can find an insulin routine that will keep your blood glucose near normal, help you feel good, and fit your lifestyle.

Type 1

People diagnosed with type 1 diabetes usually start with two injections of insulin per day of two different types of insulin and generally progress to three or four injections per day of insulin of different types. The types of insulin used depend on their blood glucose levels. Studies have shown that three or four injections of insulin a day give the best blood glucose control and can prevent or delay the eye, kidney, and nerve damage caused by diabetes.

Type 2

Most people with type 2 diabetes may need one injection per day without any diabetes pills. Some may need a single injection of insulin in the evening (at supper or bedtime) along with diabetes pills. Sometimes diabetes pills stop working, and people with type 2 diabetes will start with two injections per day of two different types of insulin. They may progress to three or four injections of insulin per day.

Fine-Tuning Your Blood Glucose

Many factors affect your blood glucose levels, including the following:

- What you eat
- How much and when you exercise
- Where you inject your insulin
- When you take your insulin injections
- Illness
- Stress

Self Monitoring

Checking your blood glucose and looking over results can help you understand how exercise, an exciting event, or different foods affect your blood glucose level. You can use it to predict and avoid low or high blood glucose levels. You can also use this information to make decisions about your insulin dose, food, and activity.

For more information, see our Blood Glucose Control section.

Insulin Delivery

Many people who take insulin use a syringe, but there are other options as well.

Insulin Pens

Some insulin pens contain a cartridge of insulin that is inserted into the pen and some are pre-filled with insulin and discarded after all the insulin has been used. The insulin dose is dialed on the pen, and the insulin is injected through a needle, much like using a syringe. Cartridges and pre-filled insulin pens only contain one type of insulin. Two injections must be given with an insulin pen if using two types of insulin.

Pump Therapy

Insulin pumps help you manage diabetes by delivering insulin 24 hours a day through a catheter placed under the skin. Read more about insulin pumps.

Site Rotation

The place on your body where you inject insulin affects your blood glucose level. Insulin enters the blood at different speeds when injected at different sites. Insulin shots work fastest when given in the abdomen. Insulin arrives in the blood a little more slowly from the upper arms and even more slowly from the thighs and buttocks. Injecting insulin in the same general

area (for example, your abdomen) will give you the best results from your insulin. This is because the insulin will reach the blood with about the same speed with each insulin shot.

Don't inject the insulin in exactly the same place each time, but move around the same area. Each mealtime injection of insulin should be given in the same general area for best results. For example, giving your before-breakfast insulin injection in the abdomen and your before-supper insulin injection in the leg each day give more similar blood glucose results. If you inject insulin near the same place each time, hard lumps or extra fatty deposits may develop. Both of these problems are unsightly and make the insulin action less reliable. Ask your health care provider if you aren't sure where to inject your insulin.

Timing

Insulin shots are most effective when you take them so that insulin goes to work when glucose from your food starts to enter your blood. For example, regular insulin works best if you take it 30 minutes before you eat.

Too much insulin or not enough?

High morning blood glucose levels before breakfast can be a puzzle. If you haven't eaten, why did your blood glucose level go up? There are two common reasons for high before-breakfast blood glucose levels. One relates to hormones that are released in the early part of sleep (called the Dawn Phenomenon). The other is from taking too little insulin in the evening. To see which one is the cause, set your alarm to self-monitor around 2 or 3 a.m. for several nights and discuss the results with your health care provider.

Insulin Storage and Syringe Safety

Although manufacturers recommend storing your insulin in the refrigerator, injecting cold insulin can sometimes make the injection more painful. To avoid this, many providers suggest storing the bottle of insulin you are using at room temperature. Insulin kept at room temperature will last approximately 1 month.

Remember though, if you buy more than one bottle at a time to save money, store the extra bottles in the refrigerator. Then, take out the bottle ahead of time so it is ready for your next injection.

Here are some other tips for storing insulin:

- Do not store your insulin near extreme heat or extreme cold.
- Never store insulin in the freezer, direct sunlight, or in the glove compartment of a car.
- Check the expiration date before using, and don't use any insulin beyond its expiration date.
- Examine the bottle closely to make sure the insulin looks normal before you draw the insulin into the syringe.

If you use regular, check for particles or discoloration of the insulin. If you use NPH or lente, check for "frosting" or crystals in the insulin on the inside of the bottle or for small particles or clumps in the insulin. If you find any of these in your insulin, do not use it, and return the unopened bottle to the pharmacy for an exchange and/or refund.

Syringe Reuse

Reusing syringes may help you cut costs, avoid buying large supplies of syringes, and reduce waste. However, talk with your doctor or nurse before you begin reusing. They can help you decide whether it would be a safe choice for you. If you are ill, have open wounds on your hands, or have poor resistance to infection, you should not risk insulin syringe reuse. Syringe makers will not guarantee the sterility of syringes that are reused.

Here are some tips to keep in mind when reusing syringes:

- Keep the needle clean by keeping it capped when you're not using it.
- Never let the needle touch anything but clean skin and the top of the insulin bottle.
- Never let anyone use a syringe you've already used, and don't use anyone else's syringe.
- Cleaning it with alcohol removes the coating that helps the needle slide into the skin easily.

Syringe Disposal

It's time to dispose of an insulin syringe when the needle is dull or bent or has come in contact with anything other than clean skin.

If you can do it safely, clip the needles off the syringes so no one can use them. It's best to buy a device that clips, catches, and contains the needle. Do not use scissors to clip off needles â□” the flying needle could hurt someone or become lost.

If you don't destroy your needles, recap them. Place the needle or entire syringe in an opaque (not clear) heavy-duty plastic bottle with a screw cap or a plastic or metal box that closes firmly. Do not use a container that will allow the needle to break through, and do not recycle your syringe container.

Your area may have rules for getting rid of medical waste such as used syringes. Ask your refuse company or city or county waste authority what method meets their rules. The CDC has more information about safe needle disposal in your area.

When traveling, bring your used syringes home. Pack them in a heavy-duty holder, such as a hard plastic pencil box, for transport.

Give information about other medications

Other Injectable Medications ,

Besides insulin, there are other injectable drugs used to treat diabetes.

GLP-1 Receptor Agonists

These medications stimulate insulin production while suppressing the liver’s glucose output. They may decrease appetite and promote some weight loss. They can initially cause nausea, which may get better or go away with time. They generally do not cause hypoglycemia, though if you are taking a sulfonylurea, your doctor may reduce the dose of that to reduce the risk for hypoglycemia.

- Albiglutide (Tanzeum); weekly
- Dulaglutide (Trulicity); daily
- Exenatide (Byetta); twice daily

- Exenatide Extended Release (Bydureon); weekly
- Liraglutide (Victoza); daily

Amylin Analogue

This medication slows food from moving too quickly through the stomach and helps keep after-meal glucose levels from going too high. It can suppress appetite and may cause weight loss. It also reduces glucose production by the liver. It is taken before meals and may cause nausea, which usually reduces over time.

- Pramlintide (Symlin); with meals

Dietary Supplements: Side Effects and Drug Interactions

Dietary supplements **may** seem safe or mild because they're natural. Many think that something natural couldn't hurt them. Yet, serious side effects and drug interactions **can** occur when taking dietary supplements. For example, supplements such as aloe vera, fenugreek, and vanadium **may** cause excessive bleeding during surgery or interact with anesthetics. Other supplements **may** interfere with prescription medications. For example, ginseng **may** interfere with the drug warfarin's ability to prevent blood clotting. St. John's wort, which people often take for depression, **can** interact with antidepressants, as well as many other prescription medications. Your health care provider is the best resource for assessing the risks and benefits of taking a dietary supplement. He or she **should** know the potential side effects of supplements—and the risk for interactions with your other medications. Next: Talking to Your Health Care Provider

Tips for Emergency Preparedness

We have always needed to be ready for emergencies. Wherever you live, there is the chance of something happening to disrupt your daily life, whether it's a hurricane, an earthquake, a tornado, or a blizzard. Recent concerns about terrorist attacks have simply increased our awareness of the need to be prepared if a disaster strikes.

Have a Plan

Everyone is now advised to have a plan in place in the case of an emergency, and people with diabetes must consider proper diabetes care when they make emergency plans.

Emergency Supplies

Consider storing three days worth of diabetes supplies, which, depending on how you take care of your diabetes, could include oral medication, insulin, insulin delivery supplies, lancets, extra batteries for your meter and/or pump, and a quick-acting source of glucose. You **may** also want to have an extra glucagon emergency kit. All these items **should** be kept in an easy-to-identify container, and stored in a location that is easy to get to in an emergency.

Emergency Contacts

Your emergency supply kit **should** also contain a list of emergency contacts and, if you are a parent of a child in school or daycare, physician's orders that **may** be on file with your child's school or day care provider. As always, it is a good idea to wear medical identification that will enable colleagues, school staff members, or emergency medical personnel to identify and address your medical needs. If you are a parent of a child with diabetes, it is important that your child's school has clearly identified the school staff members who will assist your child in the event of an emergency evacuation. For those who are away from home, consider informing your colleagues, friends, and family members about your diabetes and where your emergency supply kit is kept. Taking a few minutes right now to gather supplies and inform those around you about your diabetes, **may** make a world of difference in maintaining blood glucose control and staying healthy under stressful circumstances. For additional tips to assist you in managing your diabetes in emergency situations, our book Diabetes 911 **may** be for you .

Other Resources Preparing for Pandemic Flu Medical Advice for People with Diabetes in Emergency Situations (PDF) Centers for Disease Control and Prevention Federal Emergency Management Agency US Department of Health and Human Services

What About Insulin?

Although it is a common practice to try pills before insulin, you may start on insulin based on several factors, including the following:

- How long you have had diabetes
- How high your blood glucose level is
- What other medicines you take
- Your overall health

Combination Therapy

Because diabetes pills seem to help the body use insulin better, some people take them along with insulin shots. The idea behind this "combination" therapy is to try to help insulin work better.

Read more about diabetes pills:

- Can diabetes pills help me?
- What are my options?
- Is there danger of interactions?
- How much does it cost?

What Are My Options?

Give treatment options

There are different types, or classes, of drugs that work in different ways to lower blood glucose (blood sugar) levels:

- Sulfonylureas
- Biguanides
- Meglitinides

- Thiazolidinediones
- DPP-4 inhibitors
- SGLT2 Inhibitors
- Alpha-glucosidase inhibitors
- Bile Acid Sequestrants

Sulfonylureas

Sulfonylureas stimulate the beta cells of the pancreas to release more insulin. Sulfonylurea drugs have been in use since the 1950s. Chlorpropamide (Diabinese) is the only first-generation sulfonylurea still in use today. The second generation sulfonylureas are used in smaller doses than the first-generation drugs. There are three second-generation drugs: glipizide (Glucotrol and Glucotrol XL), glyburide (Micronase, Glynase, and Diabeta), and glimepiride (Amaryl). These drugs are generally taken one to two times a day, before meals. All sulfonylurea drugs have similar effects on blood glucose levels, but they differ in side effects, how often they are taken, and interactions with other drugs.

Biguanides

Metformin (Glucophage) is a biguanide. Biguanides lower blood glucose levels primarily by decreasing the amount of glucose produced by the liver. Metformin also helps to lower blood glucose levels by making muscle tissue more sensitive to insulin so glucose can be absorbed. It is usually taken two times a day. A side effect of metformin may be diarrhea, but this is improved when the drug is taken with food.

Meglitinides

Meglitinides are drugs that also stimulate the beta cells to release insulin. Repaglinide (Prandin) and nateglinide (Starlix) are meglitinides. They are taken before each of three meals.

Because sulfonylureas and meglitinides stimulate the release of insulin, it is possible to have hypoglycemia (low blood glucose levels).

You should know that alcohol and some diabetes pills may not mix. Occasionally, chlorpropamide and other sulfonylureas, can interact with alcohol to cause vomiting, flushing or sickness. Ask your doctor if you are concerned about any of these side effects.

Thiazolidinediones

Rosiglitazone (Avandia) and pioglitazone (ACTOS) are in a group of drugs called thiazolidinediones. These drugs help insulin work better in the muscle and fat and also reduce glucose production in the liver. The first drug in this group, troglitazone (Rezulin), was removed from the market because it caused serious liver problems in a small number of people. So far rosiglitazone and pioglitazone have not shown the same problems, but users are still monitored closely for liver problems as a precaution. Both drugs appear to increase the risk for heart failure in some individuals, and there is debate about whether rosiglitazone may contribute to an increased risk for heart attacks. Both drugs are effective at reducing A1C and generally have few side effects.

DPP-4 Inhibitors

A new class of medications called DPP-4 inhibitors help improve A1C without causing hypoglycemia. They work by by preventing the breakdown of a naturally occurring compound in the body, GLP-1. GLP-1 reduces blood glucose levels in the body, but is broken down very quickly so it does not work well when injected as a drug itself. By interfering in the process that breaks down GLP-1, DPP-4 inhibitors allow it to remain active in the body longer, lowering blood glucose levels only when they are elevated. DPP-4 inhibitors do not tend to cause weight gain and tend to have a neutral or positive effect on cholesterol levels. Sitagliptin (Januvia), saxagliptin (Onglyza), linagliptin (Tradjenta), alogliptin (Nesina) are the DPP-4 inhibitors currently on the market in the US.

SGLT2 Inhibitors

Glucose in the bloodstream passes through the kidneys, where it can either be excreted or reabsorbed. Sodium-glucose transporter 2 (SGLT2) works in the kidney to reabsorb glucose, and a new class of medication, SGLT2 inhibitors, block this action, causing excess glucose to be eliminated in the urine. Canagliflozin (Invokana) and dapagliflozin (Farxiga) are SGLT2 inhibitors that have recently been approved by the FDA to treat type 2 diabetes. Because they increase glucose levels in the urine, side effects can include urinary tract and yeast infections.

Alpha-glucosidase inhibitors

Acarbose (Precose) and miglitol (Glyset) are alpha-glucosidase inhibitors. These drugs help the body to lower blood glucose levels by blocking the breakdown of starches, such as bread, potatoes, and pasta in the intestine. They also slow the breakdown of some sugars, such as table sugar. Their action slows the rise in blood glucose levels after a meal. They should be taken with the first bite of a meal. These drugs may have side effects, including gas and diarrhea.

Bile Acid Sequestrants

The bile acid sequestrant (BAS) colesevelam (Welchol) is a cholesterol-lowering medication that also reduces blood glucose levels in patients with diabetes. BASs help remove cholesterol from the body, particularly LDL cholesterol, which is often elevated in people with diabetes. The medications reduce LDL cholesterol by binding with bile acids in the digestive system; the body in turn uses cholesterol to replace the bile acids, which lowers cholesterol levels. The mechanism by which colesevelam lowers glucose levels is not well understood. Because BASs are not absorbed into the bloodstream, they are usually safe for use by patients who may not be able to use other medications because of liver problems. Because of the way they work, side effects of BASs can include flatulence and constipation.

Oral combination therapy

Because the drugs listed above act in different ways to lower blood glucose levels, they may be used together. For example, a biguanide and a sulfonylurea may be used together. Many combinations can be used. Though taking more than one drug can be more costly and can increase the risk of side effects, combining oral medications can improve blood glucose control when taking only a single pill does not have the desired effects. Switching from one single pill to another is not as effective as adding another type of diabetes medicine.