

MANAGING YOUR DIABETES WITH AN INSULIN PUMP

practical considerations
to keep you safe and informed



TABLE OF CONTENTS

Chapter 1

What can I expect when using an insulin pump?

Chapter 2

Safety Concerns

Chapter 3

Troubleshooting

Disclaimer:

This e-book is not meant to be comprehensive and include everything you need to know to safely use an insulin pump. For complete training and information, refer to your insulin pump user manual and your insulin pump trainer or endocrinologist/provider. For any questions related to programming the pump, call the 800 number on the back of your device.



CHAPTER 1

What can I expect from using an insulin pump?



Because you are thinking about managing your diabetes with an insulin pump, you may have read brochures, blogs, or reviews to obtain information about the pros and cons of insulin pump therapy.

You may have also met with your Insulin Pump Trainer and had most of your questions answered. But can you picture what living with an insulin pump is really going to be like?

- The pump does not manage your diabetes for you; it's just a tool to help you.
- A pump may be more work, especially in the beginning, and may be more expensive, but most people find the extra effort and cost are worth the benefits.
- New pump users have commented that learning to manage their diabetes with an insulin pump is almost like starting over with a new diagnosis; there is a learning curve and it takes time to get used to it.

We asked a pump user who used to take injections to keep a journal for a week and do a comparison of her daily experiences using each method of insulin delivery.

She wears a pump with tubing, but there are also tubeless options available.

We hope that by sharing this, it will give you a peek into what differences you might also experience or need to consider.

Journal of an actual pump user:

Activity Eating

Insulin Shots

Test blood glucose, (BG) figure insulin to carb ratio, draw up or use pen.

Insulin Pump

Take BG, enter carbohydrate grams, push button

Exercising

Unplanned exercises, will I go low? Should I decrease my mealtime insulin or consume extra carbohydrates?

Have to plan ahead for pump site. Don't put site in legs if running. Where is the pump going to go? Which shorts do I wear? Will pump bounce be in the way or uncomfortable? Should I take it off? Decrease basal accordingly using the temporary basal rate.

Getting Dressed

No pump to conceal

Infusion set is not concealed. Where is it going to go with this outfit? Will people see my pump site?

Driving

Take BG and treat if necessary

Take BG and treat if necessary. If trend graph on Continuous Glucose Monitor (CGM) shows BG headed downward, may use temporary basal rate to prevent going low.

Working

Do I have all my supplies? Meter, insulin, syringes, pen needles?

Is my pump on? One second to check. Do I have my CGM and pump backup supplies?

Trying on Clothes (While Shopping)

Just do it.

Be careful not to dislodge the pump from its site or to drop it on the floor.

Activity
Out with friends

Insulin Shots

Remember insulin, pen needles and excuse myself to the bathroom to test BG and take insulin before meal arrives.

Insulin Pump

Take BG in the car, enter carbs when meal arrives without leaving the table, give bolus at table.

Site changes and rotation

Move each injection site every day to avoid poor insulin absorption.

Where should I put the infusion set considering the next three days of activities? (Need to change site every 2-3 days.) Is the weekend coming up? Need to make sure I put extra insulin in reservoir for extra carbs on the weekend.

Intimacy

Do I need to worry about going low and need to eat before falling asleep?

If I take pump off, remember to put back on BEFORE falling asleep. Do I need to test my BG or worry about it going low?

Sleeping

Check BG. Do I need a snack?

Have to have a place for pump and tubing to avoid pulling it out or falling off the bed. Check BG. No snack needed because overnight basal rates should prevent BG from dropping.

Vacation/
Travel

Bring all supplies. No Need to alert TSA of foreign object on body. Don't send insulin through x-ray if going through security multiple times as it could harm the insulin.

Bring all supplies. Alert TSA that I am wearing a pump since there's special screening for that.

Activity

Swimming pool
or beach

Insulin Shots

Just swim, and be aware of BG
going low.

Insulin Pump

Disconnect pump with
tubing from base of infusion
set, which stays. Watch
clock, and put pump or
bolus back on. At the
beach, can't get sand in
pump or expose insulin to
the heat of the sun, so it's
best to remove it and switch
to shots.

Shower / Bath /
Hot Tub

Hop in and take as long a bath
or shower as I like. Watch for
low BG if I recently injected
insulin.

Disconnect pump with
tubing from base of infusion
set, which stays. Remember
to put back on once I
remember where I left it.
How long has it been off?
How much insulin have I
missed while the pump has
been off? Take BG if it's
been a while with pump off. I
should get dressed right
away so I have a place to
put my pump. No pump in
hot tub!

Going to the
restroom

Just do it.

Where's my pump? Whoops,
it's on my waistband! Need
to move it so the tubing
doesn't pull out with pants
down. Must clip to bottom of
shirt temporarily. Tuck in
tubing when done.

Now that you have an idea of the more practical, day-to-day considerations of wearing an insulin pump, let's review some basic information to help you understand how pump therapy works.



Mimicking the Pancreas:

The features of an insulin pump were designed to match, as closely as possible, the way a human pancreas works to provide insulin when the body needs it. That's why there are two kinds of insulin delivery: basal and bolus.

Basal Insulin

Basal insulin delivery can be thought of as the “background” insulin the body needs just to maintain basic functions without any regard to eating. The pump delivers the basal insulin in hundredths of a unit per hour, 24 hours a day. The amount is programmed each hour so the pump will match your different insulin pump needs throughout the day. This is impossible to do with insulin injections.

Bolus Insulin

“Bolus” insulin is the extra burst of insulin needed to keep blood glucose (BG) levels from going too high after you eat carbohydrates and other nutrients, and to correct (lower) a high blood glucose.

Taking Advantage of Basal and Bolus Options

One of the advantages of pump therapy over injections is that you can change the insulin delivery to fit the situation. This is what a normal functioning pancreas does automatically. For example, your insulin needs change with the following conditions when:

- Your activity level changes, you need less insulin when more active and more insulin when less active
- Your meals are prolonged over several hours at a special event or celebration, for example
- At different times of day according to day/night schedule
- For women, a few days before and during menstrual period and during pregnancy
- You are sick
- You drink alcohol
- Your meals have more or less carbohydrates
- You eat a high fat or high protein meal
- You have recently given some insulin that is still acting in your body

Insulin pumps have programming to address each of these situations. Some of these key features are listed below in order of importance:

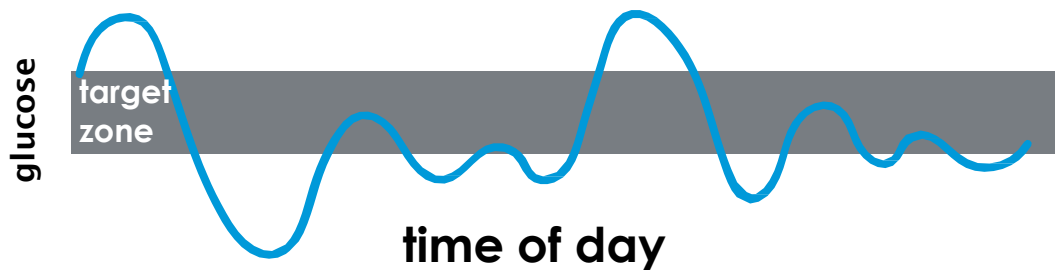
- Bolus Calculator calculates suggested bolus dose based on current blood glucose level and carb grams, and takes into account active insulin (or insulin on board).
- Insulin on Board/Active Insulin is the amount of insulin still working in your body after a previous bolus. This prevents “stacking” of multiple insulin doses, which can lead to low blood glucose.
- Temporary Basal Rate allows you to reduce or increase basal rates temporarily for a specific amount of time, for circumstances like exercise or illness

Use of Continuous Glucose Monitor

You may have the option to use a Continuous Glucose Monitor (CGM) with your pump.

This device measures glucose levels throughout the day and night at frequent intervals through a sensor that you insert under the skin.

It transmits these values to your insulin pump, a wireless-handheld device, or a mobile phone.



The purpose of CGM is to identify trends in your glucose patterns so that you can act before your glucose goes out of goal or to get it back into goal more quickly.

A CGM will tell you whether your glucose levels are rising or falling, and how fast the changes are happening.

You can also set alerts that notify you when you rise above or fall below a certain glucose value.

CHAPTER 2

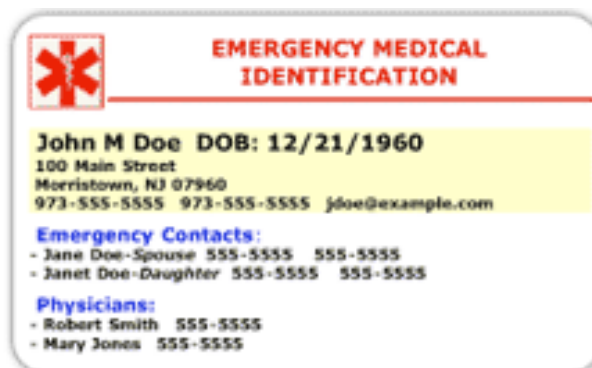
Working through safety concerns



When you rely on a mechanical device for your insulin, it's important to pay extra attention to make sure it is working properly. In this section, we will review what you should know to be safe.

Medical ID

When you switch to using an insulin pump, it is wise to also change your medical ID. This lets emergency personnel know that you wear a pump. There are many bracelet, necklace, and watch attachment options available to suit your style. At a minimum, you should have a wallet card with this information. Ask the pump company if they provide these.



Infusion Sets

Not all pumps have infusion sets, but if yours does, there are features you should be aware of.

There are several types of infusion sets designed to meet the different needs of users.

Some go in straight; others at an angle. Some have long tubing; others are shorter.

There are products to help to secure the infusion set in place and others to help remove it without damaging your skin.

There are products for protecting the skin if you are sensitive to the adhesive on the infusion set.

Skin Issues/Preventing Infection

It is important to rotate your infusion sites in order to prevent the buildup of fatty tissue that can occur at overused sites.

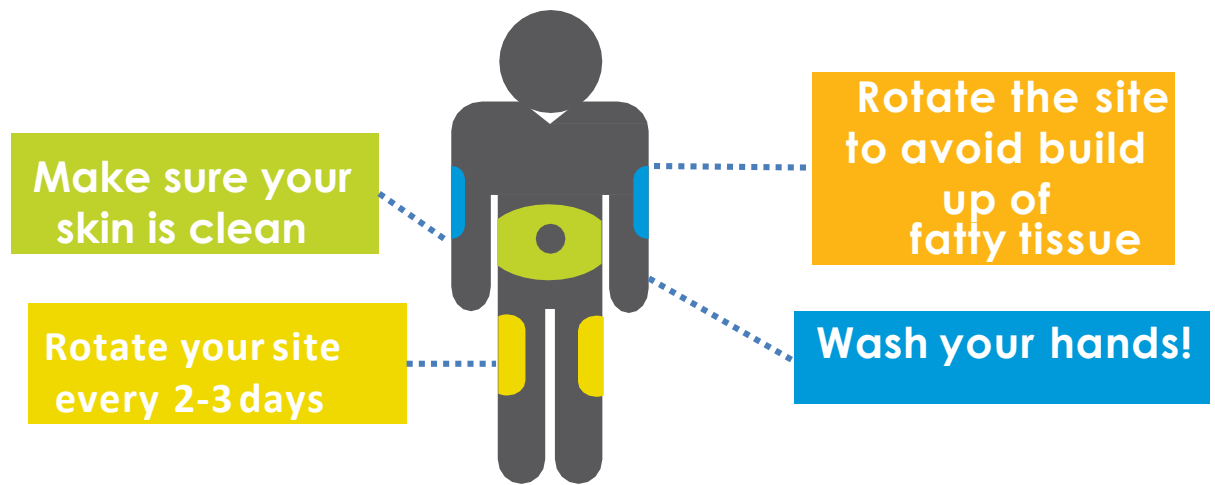
When this happens, your insulin action can be significantly decreased because it can't be absorbed as quickly as it should be.

Although injection site infections are rare, they are serious if they do occur.

Be sure to wash your hands before inserting a new infusion set and make sure your skin is clean.

Some people find it convenient to insert a new infusion set right after getting out of the shower.

Change your site every 2-3 days to reduce the risk of an infection and other pump issues.



Disconnecting and Reconnecting the Pump

If you disconnect from the pump for more than 60 minutes, you will need a plan for replacing the insulin you miss.

Discuss this plan ahead of time with your insulin pump trainer.

Using Your Pump During Water Activities: Swimming Pools, Beaches, and Hot Tubs

Some insulin pumps are water resistant to the depth of the deep end of a swimming pool, but not to the depth for scuba diving or similar activities.

You will need to check the manufacturer's guidelines for use in water.

If you are planning a beach vacation, consider the two things that are attractive about these trips: the sand and the sun. Exposing the pump to the hot sun may degrade the insulin, and getting sand in the pump can ruin the motor and gears, causing the pump to stop delivering insulin.

Switching from pump to injections may be easier and safer for beach vacations.

The heated water in hot tubs can degrade insulin and affects absorption. so it's important to disconnect the pump prior to getting in.

MRIs, Xrays, Scans

If you are scheduled to have an X-ray, MRI, CT scan, or other type of diagnostic imaging involving radiation exposure, remove your insulin pump, transmitter, and glucose sensor and place them outside the testing area.

The pump and CGM electronics may be affected by all of these tests.



Traveling with a Pump and/or Sensor

Always carry your pump and diabetes supplies in your carry on bag. Make sure your insulin vials are in the original box with the prescription label.

You may also want to ask your provider for a letter to carry with you to show at the security line explaining the medical necessity of having these supplies.

Both the conveyer belt and the full body scanner use a form of x-ray which may affect your insulin, pump, and sensor, so ask for alternate hand screening.

Check the TSA website ahead of time for updates and call ahead with any specific questions. Be sure you are wearing a medic alert ID identifying pump use, especially if traveling overseas.

It is a good idea to investigate the medical care available at your destination ahead of time and know where the American Embassy is located.

Although CGM devices do use some radio frequency, it's not the type that interferes with the flight, so you should be able to keep it running during the entire flight. Frequent blood glucose monitoring is essential for safety during flight.

Also, keep well hydrated with nonalcoholic, caffeine-free beverages throughout the flight.

If you are changing time zones, remember to reset your pump and meter clocks for the local time when you arrive.

If you are traveling to a high altitude area, do some research ahead of time with the manufacturer of your blood glucose meter to find out how the altitude will affect the functioning of your meter.

Back-Up Supplies

Here is what we suggest for your kit and why:

- One infusion set or extra pod to have in case a problem occurs with the one you're wearing.
- Back up long-acting insulin prescription at a 24 hour pharmacy. Update each year.
- An insulin syringe so you can pull rapid acting insulin should your pump malfunction.
- Your current vial of rapid acting insulin for reservoir and infusion set changes.
- An extra reservoir/cartridge for changing the whole system if needed.
- Extra batteries so you will always have a power source to run the pump and sensor.
- BG meter to calibrate your sensor and be able to check BG when needed.
- Treatment for hypoglycemia such as glucose tablets.
- Snack food to help prevent lows, in case of increased activity or delayed meal.
- Ketone test strips to be able to check when you are ill or BGs are high.
- Glucagon in case of a severe low glucose.

CHAPTER 3

Troubleshooting

It is critical to know what to do in the event you have low or high blood glucose.

Pumps are now more sophisticated and have alarms and built-in safety systems.

However, as the user, you are still in control of the device. Knowledge of preventive and corrective measures when something goes wrong can help you avoid a costly visit to the emergency room.

In this section, we will review how managing high and low blood glucose is different when utilizing an insulin pump.

Hypoglycemia (Low Blood Glucose)

If your pump settings are correct and you are using the pump features as intended, then hypoglycemia should happen less frequently.

Using the bolus calculator routinely helps to prevent hypoglycemia, as it takes into account the active insulin on board, as well as automatically covering carb grams entered and figuring a correction amount for blood glucose above target.

For hypoglycemia when blood glucose is above 50, treat with 15 grams of fast-acting carbohydrate and DO NOT enter this into your bolus calculator.

Retest blood glucose after 15 minutes, repeat as needed until blood glucose is back into target range.

If blood glucose is less than 50, suspend your pump, treat with 30 grams of fast-acting carbohydrate and DO NOT enter this into your bolus calculator.

Retest blood glucose after 15 minutes and repeat as needed until blood glucose is back into target range, and then resume your insulin pump.

Hypoglycemia unawareness

Some people lose their symptoms of low BG over time and are unaware when their BG drops.

If you do not sense your low BG's until it drops below 50, discuss this with your diabetes care team so they can provide you with tools and techniques to address this. One technique based on research is to notice how you feel when your BG is normal and compare that to feelings you have when it is dropping.

Although you may not have typical signs and symptoms, you can look for subtle cues such as not being able to think of a word, or not being able to do simple math or write your name legibly.

Hyperglycemia (High Glucose)

There are several potential causes of hyperglycemia that you should consider when your BG is not responding to extra boluses:

- Kinked infusion set- Your infusion set may be partially blocked, leading to partial delivery of insulin. This doesn't always trigger an occlusion alarm, so don't rely on the alarms; best to go by blood glucose levels and troubleshoot.
- Infection or illness- the stress of illness usually raises blood glucose, requiring more insulin, even if you are not eating as usual.
- Insulin leakage, catheter moved - Leakage can occur if the infusion set catheter or pod becomes dislodged or if the connection between the tubing and infusion site becomes disrupted.

- **Degraded insulin** If your insulin has been exposed to heat or cold, it won't work as well. You may need to try using new insulin to see if this corrects your blood glucose levels.
- **Air in tubing** Air bubbles take the place of insulin, so if present, you will not get your intended dose of insulin. Always check your tubing for the appearance of air bubbles. It may be necessary to hold the tubing in front of a colored object in order to see the air bubbles.

DKA/Ketone testing

Because your insulin pump uses only rapid acting insulin, there is no backup insulin if the pump fails to deliver.

When you don't receive insulin for a period of time, you can quickly develop a condition called Diabetic Ketoacidosis (DKA) that can be life threatening.

Your body needs insulin to be able to utilize glucose for fuel. Without enough insulin, your body starts breaking down fats and muscle for fuel.

This leads to the buildup of toxic substances called ketones, which are a form of acids. As the acids build up, these are all signs that you are getting seriously sick from your diabetes:

- nausea and/or vomiting
- abdominal pain
- change in breathing and fruity breath
- change in level of consciousness
- fatigue
- lightheadedness
- excessive thirst and urination
- visual changes

Do not delay getting medical attention if you experience any of these signs or symptoms.

Urine ketone test strips are available for use at home and can be purchased at most drug stores.

We recommend that you test for ketones whenever you are feeling ill, have an infection, or your glucose result is over 250.

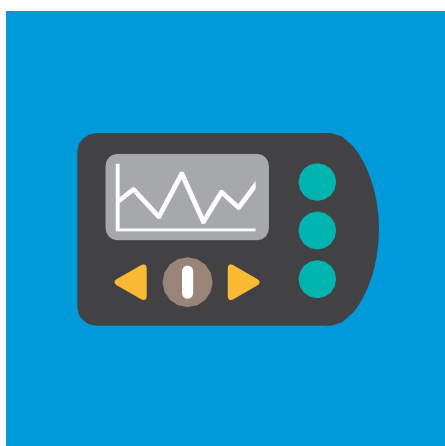
The level of ketones determines the urgency of the situation.

You should review the specifics of sick day guidelines and DKA prevention with your pump trainer.

It may be necessary to give insulin by injection and completely change out your reservoir/cartridge, infusion set and site, so keep supplies on hand.

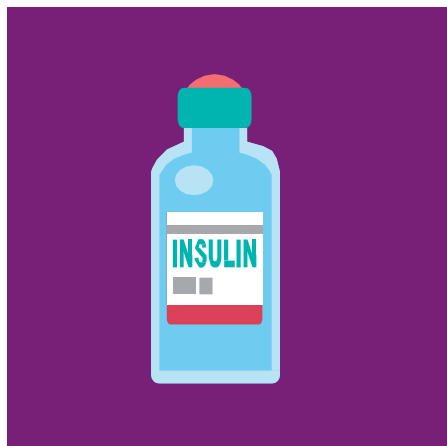
It is critical to stay well hydrated any time your glucose levels go up, so drink plenty of water and non-sugary beverages.

HAPPY PUMPING!



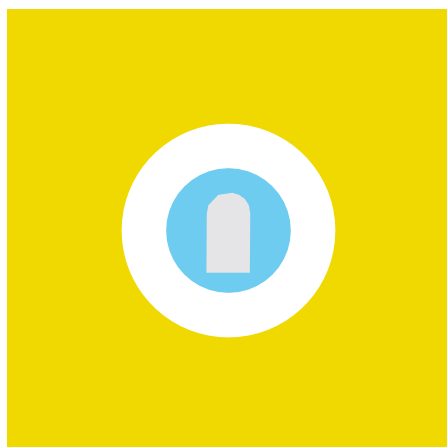
Using an insulin pump can provide the flexibility you need to be able to fit diabetes management into your busy life.

With this type of system, your insulin delivery can be tailored to your specific needs.



However, you may have to pay attention to things you haven't needed to, and you may get sick from your diabetes much more quickly if there is a problem with the device.

We hope that the information we have provided here paints a realistic picture of the pros and cons of using an insulin pump to manage your diabetes.



You can refer back to this e-book at any time for a refresher.