

Insulin Pump Therapy

What is an Insulin Pump?

There are four components to an insulin pump: the pump itself, a reservoir, tubing, and an infusion set.

An insulin pump is a small, battery-powered computer that is about the size of a pager. It is worn clipped to a belt or waistband, or in a pouch or pocket. The pump holds a reservoir filled with rapid-acting insulin. The pump is programmed to give small continuous amounts of insulin from the reservoir through a small plastic tube connected to your body. At the end of the tubing is a small needle which is used to insert the cannula (a small hollow tube) into the fatty tissue of the stomach or other area. The needle is then removed leaving the cannula behind, which is called the infusion set. Some pumps do not have a tube and the insulin is housed in a device worn on the body. The reservoir and infusion set are changed every 2-3 days. The pump can be disconnected from the infusion set for short periods for activities such as swimming, bathing, or exercise.

The insulin pump is not an “artificial pancreas” and is not automatic. You must program it to give insulin when you need it. Therapies such as multiple daily injections (MDI) and insulin pump therapy, formally known as continuous subcutaneous insulin infusion (CSII), keep blood sugars in a tighter range. Blood sugars must be monitored at least 4-7 times every day for pump therapy to be safe and effective. **An insulin pump does not monitor your blood sugar levels.**

How Does an Insulin Pump Work?

An insulin pump allows you to imitate normal insulin delivery in the body by more precisely matching your insulin needs. The insulin is delivered in 2 ways:

- **Basal:** A small amount of background insulin delivered continuously 24 hours per day. The basal rate keeps the glucose levels in the target range when no food is eaten (overnight and in between meals). Different basal rates can be programmed into the pump throughout the 24-hour period, based on individual needs. Once the basal rates are set correctly, they need to be fine-tuned with weight changes or major changes in routine. Temporary basal rates can be set for activity, illness, menstrual cycle, or temporary changes in routine.
- **Bolus:** A larger amount of insulin that is delivered over a short period of time. A bolus can be given anytime, but **CANNOT** be pre-programmed. A **pre-meal** bolus is given with food, based on the grams of carbohydrate eaten. A **correction** bolus is an extra amount of insulin given when blood sugar levels are high. This is much like how rapid acting insulin is delivered on multiple daily injections (MDI).

Initially basal and bolus doses are set by your healthcare team, but you will be taught how to self-adjust these doses on an ongoing basis.

What are the Benefits of Insulin Pump Therapy?

1. **Precise Dosing:** Insulin delivery is based on individual needs and is set exactly. This makes it possible to keep blood sugar levels close to normal most of the time. This also makes it easier to manage sleeping in, overnight lows, illness, unstructured mealtimes, and erratic schedules.
2. **Flexibility:** Since only rapid-acting insulin is used, there is no deposit of long-acting insulin waiting to be absorbed. This provides flexibility in the timing and size of meals, as well as improved control while travelling, exercising, dealing with illness, and working with an unpredictable schedule.
3. **More predictable absorption** of insulin because only rapid acting insulin, and only one area of absorption every 2-3 days, is used. This eliminates the problem of different absorption rates from different sites. The abdomen is the usual site for a pump infusion set, while the buttock/hip area may be used, especially for small children or lean individuals. Thighs and arms are alternative sites.
4. **Fewer and less severe lows** because of more predictable and precise insulin delivery.
5. **Improved Control of Diabetes.** Almost all insulin pump users report better control of diabetes than they were able to get with injections.

What are the Challenges of Insulin Pump Therapy?

1. **Risk of Ketoacidosis (DKA):** Because there is no deposit of long-acting insulin in the body, any interruption to the insulin delivery could cause blood sugars to rise quickly. Ketones can start developing in just a few hours without insulin. Extra care needs to be taken to prevent and control high blood sugar levels. DKA only occurs in Type 1 diabetes. Persons with Type 2 diabetes wearing an insulin pump are still at risk of dehydration and illness if insulin delivery is interrupted for longer durations.
2. **Infection or Irritation at the Infusion Site:** Site rotation is just as important in insulin pump therapy as it is when using syringes. Infusion sites **MUST** be changed every 2-3 days.
3. **Hypoglycemia:** Tighter control of blood sugar levels can lead to an increase in lows in some patients. These lows are usually less severe.
4. **Body Image Concerns:** Some people do not like the idea of being attached to a device all the time. Speak to your diabetes educator to discuss options to address these concerns.
5. **Steep Learning Curve:** Education is key for successful insulin pump therapy. Homework and reading need to be done to prepare for learning how to use your insulin pump and ongoing follow-up with your healthcare team is mandatory.