

INSULIN PUMPS

- Blood glucose regulation is of great concern for insulin-dependent patients with excessive glucose in blood (hyperglycemia) or low glucose profile (hypoglycemia) due to excess insulin delivery.
- Both conditions can cause dangerous complications for diabetic patients and hence glucose regulation in blood is of prime importance.
- Insulin pumps are used to deliver insulin in small quantities, allowing glucose level to remain as close as possible to that non-diabetics person.
- Different control techniques are used to maintain the glucose level and most of them depend on an exact mathematical or empirical model of insulin- glucose interaction.
- Insulin pumps are small, computerized devices that mimic the way the human pancreas works by delivering small doses of short acting insulin continuously (basal rate).
- The device also is used to deliver variable amounts of insulin when a meal is eaten (bolus). The basal insulin rates are usually set up in patient pump with doctor, and patient can have one or multiple basal settings programmed in pump, based on patient needs.
- Patient program the amount of insulin for patients mealtime bolus directly on the pump. Most pumps come with built-in bolus calculators to help you figure out how much insulin need at mealtime based on glucose levels and the amount of carbohydrates.
- The pump, which is about the size of a smart phone or deck of cards, is worn on the outside of body and delivers insulin through a tube (catheter), connected to a thin cannula, placed into the layer of fat under skin, typically around stomach area. The

- pump can be worn around waist in a pump case or attached to a belt or bra, in a pocket, or on an armband. There are a variety of custom-made accessories available.
- To use an insulin pump, patient will need hands-on training from diabetes care team. They will teach how to fill a pump reservoir, prime tubing, select an infusion site, change an infusion set, disconnect the device, calculate and program basal and bolus doses, troubleshoot potential problems, create backup plans in case of pump failure, and prevent diabetic ketoacidosis.

Types of Pumps

A variety of insulin pumps are available, and your diabetes care team can help you choose the best pump for you. In general, there are two types of pump devices:

1. **Traditional Insulin pumps** have an insulin reservoir (or container) and pumping mechanism, and attach to the body with tubing and an infusion set. The pump body contains buttons that allow you to program insulin delivery for meals, specific types of basal rates, or suspend the insulin infusion, if necessary.

2. **Insulin patch pumps** are worn directly on the body and have a reservoir, pumping mechanism, and infusion set inside a small case. Patch pumps are controlled wirelessly by a separate device that allows programming of insulin delivery for meals from the patch.

✓ Many pumps connect wirelessly with blood glucose meters, which measure blood sugar levels using a drop of blood from the fingertip. Some pumps connect wirelessly with continuous glucose monitoring devices, which are inserted under the skin and monitor blood sugar levels all day long.

✓ Pumps vary in how much insulin they hold, whether or not the pump has a touch screen or is waterproof, and have a variety of advanced features as well as safety

✓ features. Safety and user features may include programmable bolus, customizable reminders, alerts for missed bolus dose or missed glucose measurement, and alarms in the event of a blockage that prevents the continuous infusion of the insulin through the pump. One of the integrated systems that combines insulin pump and continuous glucose monitoring sensor can also be programmed to suspend insulin delivery if the glucose levels reach a preset low threshold level.

The Parts of an Insulin Pump

Traditional insulin pumps contain three main parts:

- **pump.** Traditional insulin pumps are battery powered and contain an insulin reservoir (or container), pumping mechanism, and buttons or touch screen to program insulin delivery. Pumps send insulin through tubing into an infusion set that delivers the insulin to your body.
- **tubing.** A thin plastic tube (catheter) is connected to the insulin reservoir and insulin flows into the subcutaneous tissue through the infusion set. There are several length sizes of tubing length. They are chosen based on how you wear the insulin pump. For example, longer tubing may be good for people who wear their pump far from the infusion set.
- **infusion set.** Infusion sets are made of Teflon or steel and attach to your skin with an adhesive patch. On the underside of the infusion set is a short thin tube (cannula) that is inserted in your skin with a small needle that is housed within the cannula to deliver insulin into a layer of fatty tissue. The needle is necessary to puncture the skin and insert the set. After insertion, the needle is removed and the thin cannula stays under the skin. The set is usually implanted around your stomach area, but can be placed on the thigh, hips, upper arms

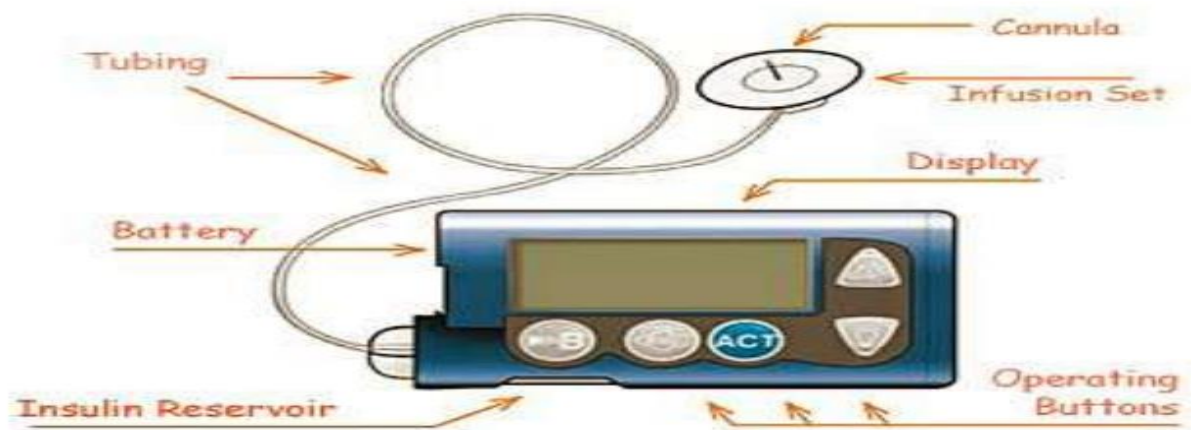


Fig: 5.2.1 Dosing of Insulin , (Source:web)

Advantages of an Insulin Pump

- A pump is more accurate than shots, helping you better manage blood sugar levels.
- It may improve your A1c levels.
- It's easier to plan for exercise.
- It's easier to bolus.
- It helps manage early morning high blood sugar, also called the “dawn phenomenon.”

Disadvantages of an Insulin Pump

- Patient need to enter information into the pump all day and change out the infusion set every few days.
- Patient need to commit to using it safely, including checking your blood sugar to make sure the pump is working right. Otherwise, you risk a life- threatening problem called diabetic ketoacidosis (DKA).
- Patient need training to learn to use the pump, which means several visits with health care team or a full day of outpatient training.
- Pump supplies can be expensive.