

## Insulin Pump

### Introduction:

- An insulin pump is a small, battery-operated, portable device about the size of a cellphone or a pager. It is worn externally either in the patient's pocket or on a special belt, or it can be concealed under the clothing.
- An insulin pump attempts to mimic the function of a normal pancreas that secretes insulin.
- Insulin pumps help diabetes patients control their blood sugar levels more efficiently and more easily. Diabetics generally prefer insulin pumps to daily injections.
- It is often prescribed to type 1 diabetes patients, and, in some cases, it may be prescribed to type 2 diabetes patients depending on the case.

### Requirements for Safe and Effective Use of Insulin Pumps:

- The patient must be mentally stable and has a strong sense of responsibility.
- The patient must commit to self-measuring glucose levels.
- Insulin doses must be determined based on blood glucose levels, the amount carbohydrates in meals, and daily activities.
- The patient must be capable of calculating carbohydrates.

### Insulin Doses:

Insulin doses administered by an insulin pump are separated into:

- **Basal rates:**

Basal insulin is delivered continuously throughout the day. It keeps blood glucose levels in range between meals and overnight. Often, patients program different amounts of insulin to be delivered at different times of the day and night.

The appropriate doses are determined by the doctor.

- **Bolus Doses to Cover Carbohydrate in Meals:**

When the patient eats a meal, an additional insulin dose called a bolus is required to cover the carbohydrates in each meal. The patient should insert the amount of carbohydrates in the meal by using the buttons on the insulin pump, as well as measure their blood sugar levels. The pump responds by providing options of insulin doses that are proportional to the amount of carbohydrates in the meal and the patient's current blood sugar levels. It is then up to the patient to give the pumping order.

- **Correction or Supplemental Doses:**

The pump also provides options of insulin doses when the patient has high blood sugar levels. The patient inserts their current blood sugar levels, then chooses the appropriate dose by giving the pumping order.

### **The Basic Components of an Insulin Pump:**

#### **1. A small device that consists of:**

- Buttons to program insulin delivery.
- A display screen.
- Battery.
- Insulin reservoir.

#### **2. Reservoir:**

A plastic box containing insulin. It is located inside the pump and it should be replaced every two to three days along with the tube.

### 3. **Tube:**

A thin tube extending from the reservoir to the plastic needle that is inserted under the skin. The tip of the plastic needle (the cannula) is inserted by another small needle that is removed after the cannula is held in place and secured with a special adhesive patch. There are several different types of tubes for each pump, and they vary depending on the length of the tube and the depth of the plastic needle (cannula).

### 4. **Infusion set:**

A tool that helps insert the plastic needle quickly and easily.

### **How an Insulin Pump Works:**

Insulin pumps are programmed to automatically deliver certain amounts of fast-acting insulin that is stored in the pump's reservoir. Insulin is delivered to the body through a tube attached to a small plastic needle, which is inserted under the skin. This allows the skin to absorb insulin gradually. Insulin doses can be easily adjusted at any time.

### **Basic Patient Data Required for Programming Insulin Pumps:**

An insulin pump is programmed by entering some basic information about the patient, such as:

- Target blood sugar level.
- Active insulin time.
- Insulin sensitivity.
- Levels of carbohydrates.

In addition to the data required for programming constant basal rates and temporary bolus doses (when needed).

### The Advantages of Using an Insulin Pump:

- It improves the patient's quality of life and makes it easier for them to live with the disease.
- Fewer injections and needles.
- Tighter control over blood sugar levels (it reduces the risk of low blood sugar and improves average blood sugar levels).
- Easier and more efficient insulin delivery (with the press of a button).
- Insulin pumps allow patients more flexibility with their meal choices, mealtimes, and daily activities.

### The Disadvantages of Using an Insulin Pump:

- Insulin pumps can be expensive.
- Higher risk of skin infections and skin irritation.
- It may take the patient a while to adjust when switching from injections to an insulin pump.
- It requires the patient to check their blood sugar level at least four times a day.
- It can cause diabetic ketoacidosis due to pump malfunction if the tube gets blocked, as it prevents the body from getting enough insulin and causes blood sugar levels to increase.
- The length of the tube may cause the patient some discomfort.
- It can cause weight gain and fat accumulation if the patient fails to commit to recommended daily intake of calories.

### Guidance for Bathing:

Some insulin pumps are water resistant, while others are not, either way the patient has two options to choose from when bathing, they are:

- **Disconnecting the pump while bathing:**

Patients are advised not to disconnect the pump for more than an hour. If the patient can bathe quickly, then this option is acceptable. However, if the patient takes a long time, then blood sugar levels may rise or drop based on the following: the time the patient had their last meal before disconnecting the pump, the patient's physical activity levels during the day, and the temperature of the water. Higher water temperatures stimulate the body to absorb more insulin.

It is advisable for the patient to measure their blood sugar levels before and after disconnecting the pump to become more familiar with their body's reaction.

- **Keeping the pump connected but making sure not to expose it to water and heat:**

The patient is advised to place the pump in a safe location and cover it with a towel to avoid getting it sprayed by water. It is also important not to expose the pump to high temperatures because heat can affect the quality of the insulin.

#### **General Guidelines:**

- The tube of the insulin pump should be inserted in the same spots where insulin shots are supposed to be injected.
- It is recommended to change the insertion site every two to three days.
- The pump can be placed anywhere the patient finds appropriate (for example: It can be attached to the waistband on a belt, or secured on a thigh band, etc).

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