

What is Insulin Pump Therapy?



Keywords

BGL: blood glucose level

Carbohydrate: Sugars and starches, when digested they break down to form glucose in the bloodstream

Insulin pump: programmable device used to deliver insulin

IPCs: insulin pump consumables

Basal (rate): insulin continuously delivered and slowly released as background insulin

Bolus: the amount of insulin delivered at one time to cover the carbohydrate quantity to be eaten or to correct a blood glucose level (BGL) outside the target range

Wizard: a pump feature that calculates an estimated bolus

Temporary basal rate: changes to the basal insulin rate for a selected period of time

Insulin Pump Consumables:

- » **Cannula or infusion set:** small tube inserted into the body to deliver the insulin
- » **Reservoir or cartridge:** holds the insulin for the pump

Learning objectives

People using insulin pumps will be coming to you to purchase their IPCs and may ask questions about their supplies or need your support.

This module will provide you with general information about pumps, covering:

- » the types of pumps available
- » how a pump works
- » pump features
- » the advantages and disadvantages of a pump

What does the pump do?

- » An insulin pump is a small, programmable, battery operated electronic device about the size of a mobile phone.
- » A pump is designed to mimic how insulin is produced by the islet cells in the pancreas to maintain BGLs.
- » The pump holds a reservoir or cartridge with two to three days supply of rapid-acting insulin.
- » It continuously pushes insulin out in response to the pump programming or when the person uses the pump to give insulin in response to a meal or to correct their BGL.



Parts of the pump

Infusion set, includes a cannula and tubing:

» **Cannula:** is a very soft flexible tube or a steel needle that is inserted into the subcutaneous fat on the stomach, thigh or outer buttocks for 2 – 3 days

» **Tubing:** connects the cannula to the pump's reservoir

Insulin Pump: device programmed to deliver insulin

Reservoir: cartridge of insulin changed every 2 -3 days

What additional supplies does a pump use?

The main supplies are:

- » batteries - AA or AAA
- » fast acting insulin – Novorapid, Humalog or Apidra
- » skin alcohol wipes



How does a pump work?

Insulin is delivered in two ways:

1: BASAL or background rates

- » is a small amount of insulin that is delivered continuously and can be adjusted to the person's lifestyle
- » an amount is set for each hour and delivered in 4 -5 minute increments
- » can be increased or decreased for periods of time called a "Temporary Basal Rate"
- » it replaces long acting insulin, such as Lantus or Levemir

2: BOLUS

- » is a calculated dose of insulin to cover the estimated carbohydrate intake and/or to correct a high BGL
- » uses the bolus wizard to calculate the dose
- » can be delivered on demand
- » eliminates the need for multiple injections
- » discretely delivers insulin

How does a pump work?

- » Insulin pumps use only rapid acting insulin – Novorapid, Humalog or Apidra.
- » The pump is worn 24 hours a day but can be taken off for 1 -2 hours when required for sport, swimming or showering.
- » BGLs targets and basal/bolus rates are programmed into the wizard by the person's health care team.

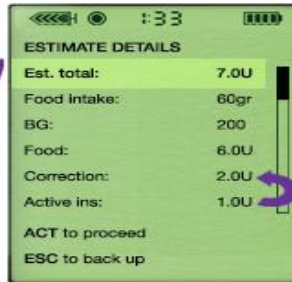
The Bolus Wizard



- Calculates total bolus

$6.0 + 1.0 = 7.0$ units

- User presses ACT to accept and deliver insulin or scrolls to change dose.



Pumps currently on the market

Main Brands:

- » **Roche** - Accu Chek Combo (image 1)
- » **Medtronic** – Paradigm, Veo & 640G (image 2 and 4)
- » **AMSL** – Animas Pump (image 3)
- » **Dana Pump** (not common in Australia) (image 5)



(1)



(2)



(3)



(4)



(5)

Features of a pump

All pumps sold in Australia have a 4 year warranty

» **Wizard** – a feature of the pump programming that calculates an estimated bolus dose based on grams or serves of carbohydrate and correction for BGLs outside pre-set target ranges (high or low)

» **Tracking Active Insulin** – a feature of the pump that monitors and considers how much insulin is still active when using the wizard to set a bolus dose

» **Bolus types** – depending on the composition of the meal the pump can deliver the bolus dose in different ways, such as over an extended time period when dining out

» **Temporary Basal Rate** – the amount of basal insulin delivered per hour can be changed for a selected period of time

Features of a pump

» **Alarms** –an audible alarm or vibration that warns the pump user for conditions that affect the pump, such as low battery power

» **Infusion sets** - there are sets with varying cannula lengths and types (needle or Teflon), and varying tubing lengths

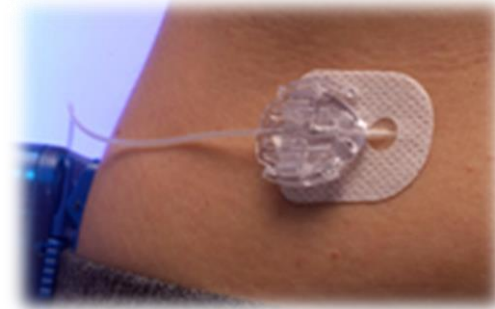
» **Support software** allows the pump user to keep records of their bolus, carbohydrate amounts, BGLs through an external device such as a computer, tablet or smart phone

» **Food database** – a feature that provides support in counting carbohydrates (optional)

» **Water resistance** – depending on the brand or model

Why choose an insulin pump?

- » **Simplified insulin doses** - less injections per day, a button enables the pump user to deliver set insulin doses
- » **Convenience** – people on insulin pumps are able to be flexible with the quantity and timing of their meals
- » **Diabetes Management** – insulin pumps can simplify diabetes management which reduces BGL fluctuation and diabetes complications
- » **Lifestyle** – insulin pumps enable people with diabetes to administer insulin discretely, reduce the risk of hypoglycaemia and make it easier to manage shift work



Why choose an insulin pump?

An insulin pump may assist with the following:

- » **Hypo unawareness** – absence of recognisable symptoms of low BGLs
- » **Severe hypos** – hypoglycaemia leading to unconsciousness
- » **Gastroparesis** – a complication of diabetes causing delayed digestion of food that causes unpredictable swings in BGLs

- » **Extreme insulin sensitivity or allergy** – requires treatment with only rapid acting insulin in small amounts
- » **Planning for and during pregnancy** – improved management of blood glucose swings, the ability to make very small insulin dose adjustments or the basal rate can be changed hourly, allowing the user to closely match insulin delivery with insulin need

Advantages of pumps

more stable BGLs reduce the risk of diabetes related complications and increase quality of life

- » reduced risk of hypoglycaemia
- » easier to treat highs and lows using temporary basal rates
- » no daily injections – infusion set is replaced every 2 -3 days
- » more flexible eating habits – insulin bolus matches the amount of carbohydrates consumed, removing the need to eat enough carbohydrate to cover insulin injections
- » easier to manage intense exercise periods
- » easier to manage day-to-day living

Additional considerations

Pumps require commitment:

- » regular BGL monitoring before and after meals
- » calculating carbohydrate intake
- » the user needs to know how to change the infusion set properly to reduce kinks in the tubing and to minimise the risk of infection at the insertion site

Pumps are visible:

- » they are attached 24 hours a day, even when asleep

Cost:

- » pumps and IPCs are expensive, compared to pen needles and syringes

Note: Some Private Health Insurance covers the cost of insulin pumps – speak to your Private Health Insurance provider for more information.

Other considerations:

- » pumps do not function automatically. Doses must be programmed into the wizard.
- » buttons must be pressed to deliver the bolus dose for carbohydrate or to correct high BGLs
- » potential risk of Diabetic Ketoacidosis (DKA) due to pump mishaps

What are ketones?

Ketones are produced when the body burns fat for energy or fuel. They may be produced when you lose weight or if there is not enough insulin to help the body use glucose (sugar) for energy. Without enough insulin, the body converts fat to energy and ketones are left behind in the blood and appear in the urine.

Ketone testing is recommended if the person:

- » feels sick, tired, thirsty or is passing urine frequently
- » has nausea or abdominal pains
- » has high BGLs (hyperglycaemia) over a period of time

High ketone levels may lead to Diabetes Ketoacidosis (DKA) if left untreated.

Ketone testing

Ketones can be found by testing urine and blood:

- » subsidised urine test strips are available for ketone testing through the NDSS
- » blood ketone testing strips may be purchased as an alternative option

For more information about blood ketone testing please call the NDSS Helpline on **1300 136 588**.

Diabetic Ketoacidosis (DKA)

Diabetic Ketoacidosis is a serious illness for people living with type 1 diabetes

- » The blood glucose is high causing dehydration or symptoms such as nausea, vomiting, abdominal pains, laboured breathing or an unusual fruity smelling breath or body odour (similar to nail polish remover).
- » Ketones are found in the blood when there is insufficient insulin and fat is used for energy instead of glucose .
- » Advise the person to contact their doctor or diabetes team for advice.
- » Recommend the person refer to the Clinical Guiding Principals for Sick Day Management of Adults with Diabetes (available at ndssaccesspoints.learnupon.com under the resource tab).

Commencing on a pump

1. The person considering pump therapy is assessed by their diabetes team for suitability - such as their ability to understand the wizard feature, willingness to test their BGLs more frequently and carbohydrate count, manual dexterity to push the buttons, mental health, wellbeing and commitment to working with their team to achieve stable BGLs.
2. Pre-pump education is usually delivered by a team that includes a diabetes nurse educator, endocrinologist and dietitian, starting with the basics, and increasing their skills over time.
3. Only people with type 1 diabetes or gestational diabetes can access IPCs through the NDSS.



Things to remember

- » Never press a person's pump buttons, even if asked – you could be changing their settings or giving them an insulin dose, so it is best to refer them back to their diabetes team if they aren't sure how to work their pump.
- » Never change someone's pump setting, even if you know how, as this is a delivery device for insulin.
- » Recommend they go back to see their credentialed diabetes educator (CDE) or doctor if they are having issues with their pump or ask them to call their pump supplier's customer care line.
- » If they don't already have a personalised pump back up plan, advise them to contact their diabetes team for a personalised plan.
- » If your customer is purchasing a different infusion set than previously purchased (as seen in NDSS Connect under previously purchased products) ensure your customer has sought advice from their diabetes team.

For further information please call the NDSS Helpline on **1300 136 588**.

Disclaimer: The information in this resource is intended as a guide only. It should not replace individual medical advice. If your customer has any concerns about their health or further questions, they should be raised with their diabetes team.