

INSULIN PUMP THERAPY: OVERVIEW

Overview

Insulin can be delivered in multiple ways, by pen, or by an insulin pump, to match needs of food eaten. Diabetes is managed with different skills and tools. An insulin pump is a tool to help you manage your diabetes much like a glucose meter or insulin pen. Other skills that help in the day-to-day management are counting carbohydrates, checking glucose levels, giving insulin, or correcting above target glucose levels. These skills are still required when you switch to insulin pump therapy. A pump may help with some bolus delivery options or lifestyle challenges and can be especially helpful for very small insulin adjustments. People using MDI can often see the same results in blood glucose and A1C as someone using an insulin pump.

Using a pump can bring on some challenges, and they may not be for everyone. The goal of this overview is to help you decide if pump therapy is right for you. Success in diabetes management is not all based on the method of insulin delivery, but rather the amount of effort that is put into daily diabetes care.

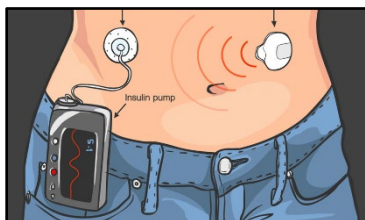
Important Self-Management Practice:

Whether you are on a pump or MDI, attention to the following is important to improve overall glucose management.

- Check glucose before meals and at bedtime
- Record keeping
 - Record glucose, food, exercise (can also be entered into CGM apps)
 - Review your records every 1-2 weeks to look for patterns of high or low glucose
 - Adjust your insulin, (carb ratios and corrections) based off those reviews
- Match Insulin to food intake
 - Carbohydrate counting
 - Correction factors
 - Food composition
- Healthy lifestyle
 - Balanced eating
 - Activity/exercise
 - Taking all insulin
- Regular follow up with your health care team
 - Growth and development
 - Review of diabetes treatment options
 - Regular screening for diabetes complications
 - Do an A1C every 3 months

What is an Insulin Pump?

An insulin pump is a small, battery-powered, mini-computer insulin delivery device. It can be tubed or tubeless. For both types of pumps, insulin is delivered under the skin through a small, soft Teflon cannula (tube). Both types of pumps have a reservoir filled with rapid-acting insulin (Admelog®, Trurapi® or Apidra®). All infusion sets must be changed every 2–3 days.



Tubed pumps are about the size of a deck of cards and are worn clipped to a belt or waistband, or in a pouch or pocket, and they are attached to the infusion tubing and cannula. The cannula is introduced under the skin using a small needle, which is then removed and discarded. Tubed pumps can be disconnected from the infusion set only for **short** periods for swimming, bathing and occasionally for exercise.

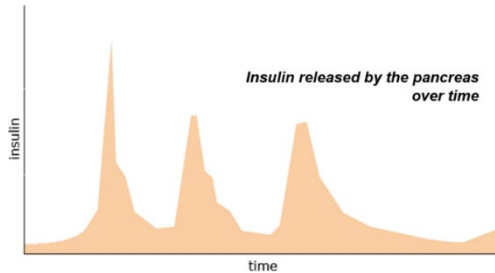


A **tubeless** pump (“pod”) is worn attached directly to the skin, the cannula projecting from the underside of the pod. The cannula is inserted under the skin with an introducer needle, which then retracts into the pod. No needle remains under the skin. Tubeless pumps are operated wirelessly with a small electronic device (“PDM”). Once inserted, a tubeless pump cannot be removed until its useable life is finished.

A pump does **not**:

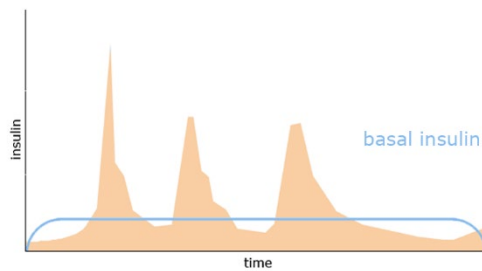
- Automatically give bolus insulin
- Monitor blood glucose (requires CGM)
- Think for you
- Program itself
- Count carbohydrates
- Take away the need for blood glucose checks
- Prevent high or low blood glucose levels
- Adjust insulin for food, illness, or activity

Let's Look a Little Deeper into the Details



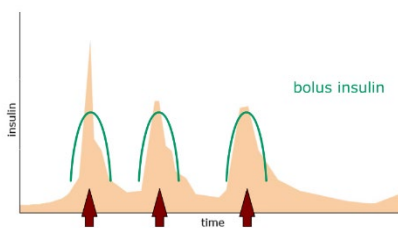
- An insulin pump tries to imitate what normally happens in the body.
- It uses only rapid-acting insulin that is programmed to match individual insulin needs.
- It can provide more flexibility and improved blood glucose.
- The pump will only do what the user has programmed.
- Newer pumps used in combination with a sensor may have some options to stop background insulin delivery to help prevent low glucose levels

Basal Insulin



- The basal rate keeps the glucose levels in the target range between meals and overnight.
- A small amount of background insulin delivered 24 hours a day
- The pump can be programmed to deliver different basal rates throughout the 24-hour period, based on individual needs.
- Usually about 40% of daily insulin needs.
- Replaces basal insulin (Levemir, Basaglar, Tresiba, Lantus or Toujeo)

Bolus insulin



- A larger amount of insulin delivered over a short period of time
- Can be given as needed, however it can't be pre-programmed.
- A **pre-meal** bolus is given based on the grams of carbohydrates to be eaten.
- A **correction** bolus is an extra amount of insulin given when the blood glucose is above target.
- It should bring the blood glucose back to target within 3–4 hours.

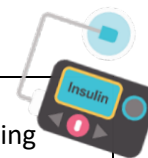
Comparing MDI versus an Insulin Pump



MDI

- Long-acting basal insulin and rapid-acting insulin are used
- 1–2 doses of basal insulin every 24 hours
- A bolus of rapid-acting insulin is given for carbohydrates and to bring down high blood glucoses
- Once injected, basal insulin can't be turned off or adjusted
- Not attached to a device

Insulin Pump



- Only rapid-acting insulin is used
- Continuous infusion of rapid-acting insulin.
- Rapid-acting insulin is given for carbohydrates and to bring down high blood glucoses
- Temporary basal rates can be set to increase or decrease the basal insulin
- The pump can only be disconnected for short periods of time

Differences between MDI and Pump Doses

MDI

- Requires calculations for both food and corrections
- Doses are usually rounded up or down to make 0.5-unit dose adjustments
- Some younger children do not require insulin to cover their snacks

Insulin Pump

- Requires a bolus for both meals and snacks (may also include a correction)
- Can deliver much smaller doses of insulin and in small increments (3.2 units versus 3 units)
- Accurate carbohydrate counting is important
- Considers when last insulin dose given
- Calculates any insulin still working from previous dose to prevent insulin stacking
- Can deliver bolus in different ways (now versus over an extended period of time)

How Does the Pump Calculate the Insulin Dose?

Pumps calculate the bolus insulin amount based on the:

- Current blood glucose
- Target blood glucose
- Grams of carbohydrate to be consumed
- Insulin-to-carbohydrate ratio (ICR, carb ratio)
- Insulin sensitivity factor (ISF, correction factor)
- Time insulin is expected to last (active insulin/insulin-on-board)



Bolus Wizard		9:00 AM
BG	6.9 mmol/L	0.4 U
Active Ins. adjust.		0.0 U
Carbs	30g	2.0 U
Bolus		2.4 U
Next		

Pumps only work when the blood glucose and carbohydrates are entered into the pump.

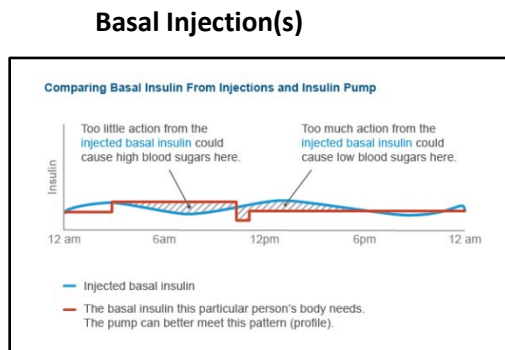
Basal Rates:

The amount of background insulin that is required in a 24-hour day. It is:

- Programmed into the pump based on individual needs
- Usually about 35–40% of your total daily insulin requirements
- Entered in as units per hour (U/hour) instead of units
- Can be broken down into hourly rates
- Precise amounts of insulin given in increments as small as 0.025 unit

Starting basal rates, bolus doses, insulin-to-carb ratios and correction formulas are set with the diabetes team according to each person's unique needs.

For example: Basal insulin requirements are 12 units per day



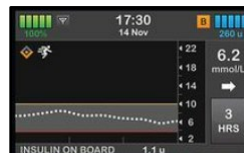
Once the basal rates are set correctly, they will need to be fine-tuned with growth or major changes in routine.

Temporary Basal Rates/Temp Targets

All insulin pumps allow you to set increased or decreased temporary basal rates for a set amount of time. A temporary basal rate should be set when the standard basal rate may be too high or too low. Some pumps also allow you to set a temporary glucose target.

Short-term adjustments can be made for:

- Changes in activity level
- Illness
- Travel
- Trying out new basal rates
- After a low blood glucose
- After an evening meal with large amounts of protein and fat



Insulin carb ratios (ICR) and insulin sensitivity factors (ISF) also need to be fine-tuned with growth or major changes in routine.

Important note to remember, for both ICR and ISF adjustments, the higher the number the less insulin is being given. For example: a carb ratio of 30 provides less insulin than a carb ratio of 20.

How Much Do Pumps Cost in BC?

Coverage is dependent on your PharmaCare plan and any associated deductible and family maximum. If you are covered under Plan C (B.C. Income Assistance), Plan F (Children in the At Home Program), or Plan W (First Nations Health Benefits), PharmaCare covers 100% of the cost. If you are covered under the Fair PharmaCare plan, PharmaCare covers 70% of costs above your deductible and 100% of costs above your family maximum. Tandem pumps are currently not covered by PharmaCare. Many extended health plans will also cover up to 80% of the cost of a pump.

PharmaCare recently updated its coverage in 2024

- Tier 1 – Omnipod, Ypsomed and Medtronic (new)
 - Omnipod provides PDM at no cost – pods based on deductible
 - Ypsomed offers a starter kit for \$800, which can apply to deductible
 - Medtronic (770G and 780G)
 - See above for coverage – most families will need to meet their deductible first
- Tandem t:slim x2 with Basal-IQ and Control-IQ is NOT currently approved by BC PharmaCare

Pump supplies (infusion sets, reservoirs, and tubeless pods) cost about \$300–500 per month, depending on the insulin dose and frequency of site/pod changes, and these are also covered by BC Fair PharmaCare and extended health plans.

Be sure that your family is registered for the BC Fair PharmaCare program! All pump and pump supply coverage is based on this program.

You may also be eligible for funding through your extended benefits. Your extended benefit company may require a “Letter of Medical Necessity” from your endocrinologist to proceed. Most pump companies can supply this.

You will need to re-apply for PharmaCare pump coverage every 5 years. BC PharmaCare has specific criteria for funding a subsequent pump.

Important Tips for Success Prior to Starting a Pump:

- Both parent **and** child are interested in pump therapy
- **Discuss your interest with your child’s endocrinologist and healthcare team. This decision should be made with the support of your diabetes team.**
- Have a strong diabetes knowledge base
- Know how to count carbohydrates and practice doing this well in advance of beginning the pump. Older children and teens should know how to do this independently
- Check glucose 4-6 times per day
- Enter all carbohydrates and insulin into CGMS
- Analyze glucose readings regularly and make independent insulin adjustments
- You rotate injection sites and use your abdomen regularly. You do not use EMLA for injections
- For teens, you allow your parents to be involved and participate in your diabetes care. Realistic expectations of what pump therapy can do and the time commitment required
- Times near school holidays and special occasions, sports tournaments, summer camp, or final exams are not the best to start pump therapy, as the child’s routine is disrupted. Time is needed to establish the correct initial settings
- Have computer access to upload and analyze reports.

School:

- For children who are too young to operate the pump themselves, parents will need to plan something in advance with the pre-school or daycare, as they usually don't operate the pump
- Nursing Support Services (NSS) will help set up a delegated care plan for younger children while they are school to help with giving insulin. This may take a few weeks to train support staff.
- Parents are responsible for boluses until delegated staff are educated
- All food choices for school need to be clearly labelled and a parent needs to be available by phone at all times
- It is important to remember that the child should have as few disruptions to the school schedule as possible.

What Comes Next?

- Discuss with your diabetes doctor if you have not already done so
- Attend pump workshop (watch video at home)
- Complete pump readiness and carb counting assessments (found in workshop presentation)
- Independently look at pump options
- Once decided, click on QR code at end of workshop presentation to let diabetes team know pump choice and that you are "ready to go"
- Name will be added to training waitlist. Training wait may be up to 3 months
- Most successful pump starts are done during times of stable routines (not during sports camps, winter or spring break, vacations, being outside of BC)
- Clinic will contact you to set up training
- Once you have training date:
 - You will have pre-pump homework to complete
 - Discuss change of therapy with school

Pump Readiness Workshops:

BCCH has developed a pump readiness workshop (currently offered on our website in pdf format) for families interested in pump therapy, or those who need a refresher on how different foods impact blood glucose. Topics covered include:

- MDI vs pump comparison
- Pump overview and maintenance
- Illness and ketones
- Carb counting
- Food composition and effects on blood glucose levels
- Readiness assessments
- Company reps and contacts information
- Pump process – what comes next

Preparation for Pump Start:

- Your pump will usually be shipped to you a couple weeks before your training date
- Once you receive the pump, take it out of the box and practice programming it directly on the pump. Everyone should be comfortable with the buttons, screens, and navigation
- View the instructional videos and read the manuals that come with the pump
- Register and set your pump up for the appropriate therapy management to upload data:
 - CareLink™ for Medtronic™ MiniMed™ pumps
 - Glooko® for Omnipod® pumps (requires clinic ID code to share data with clinic)
 - Tandem Source for Tandem pumps (requires clinic ID code)

Once Started on Your Pump:

- You will be in contact with your pump trainer very regularly for the first month
- The first 2 weeks after a pump start should be as normal routine as possible to help fine-tune initial pump settings
- It is expected that you will continue to upload the pump every couple of weeks to be able to review the data and make adjustments as needed, as well as **upload prior to all clinic appointments.**

Additional Questions?

If you have additional questions, you can email our insulin pump educators at pumpeducation@cw.bc.ca.

If you feel you are ready to proceed to insulin pump therapy, then the next step is to go through the [Insulin Pump Readiness Workshop](#), which gives you more specific information about the types and brands of insulin pumps available in BC.

To access the *Readiness Workshop*, scan this QR code or click this link:
<http://www.bcchildrens.ca/endocrinology-diabetes-site/documents/pumpworkshop.pdf>.

