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Navigating the Changing Insulin Pump Landscape

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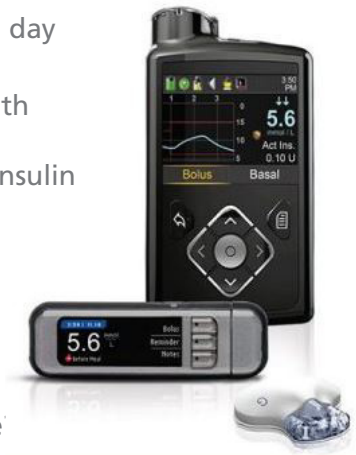
Our patients with type 1 diabetes face hundreds of choices each day regarding their diabetes management:

- Should I check my blood sugar? and what should I do with my result?
- How much carbohydrate is in this meal? and how much insulin should I take for it?
- Where should I inject my insulin today?



Of course, the larger question our patients are facing is

- Should I stick to my insulin injection regimen or should I change to an insulin pump?
- And if I choose pump therapy, which pump is best for me

The question of whether or not to change from daily injections to an insulin pump regimen has become a very common one, both for those who are newly diagnosed and for those who have lived with diabetes for many years. While both injection and insulin pump therapy are considered standard care for people living with Type 1 diabetes, they are very different regimens that offer distinct advantages and disadvantages to the patient.

Pump Therapy – The Basics

An insulin pump is a medical device that delivers rapid acting insulin continuously, 24 hours per day. The insulin is delivered through a small cannula that is inserted underneath the skin. Through the cannula, the pump delivers insulin in 3 different modes:

1. Basal insulin (background insulin that is delivered continuously, 24 hours a day)
2. Bolus insulin (the insulin delivered to cover carbohydrate intake) and
3. Correction insulin (additional doses added when blood glucose is high)

Once a patient starts using a pump, the continuous infusion of rapid insulin replaces the need for basal insulin (long acting insulin) via injection. For the bolus component, insulin pumps contain a bolus calculator that can be programmed with the patient's personal insulin:carbohydrate ratio to optimize the accuracy of the dose given, even to one decimal place. For the correction function, the patient's own insulin sensitivity factor (ISF or 'cor-

rection factor') is also pre-programmed to help the patient precisely calculate and deliver the appropriate dose. The pump's bolus calculator also includes an 'active insulin' feature to accommodate for any insulin already delivered which hasn't been fully absorbed - to protect against insulin dose accumulation, known as 'stacking'.

How do I know if pump therapy is right for my patient?

The choice to change from injection therapy to insulin pump therapy is often a matter of personal preference; however, there are also a number of clinical indications to consider. According to the Diabetes Canada 2018 Clinical Practice Guidelines, pump therapy should be considered for people with type 1 diabetes who are not able to achieve their glycemic targets despite optimization of a basal bolus regimen, those with significant glucose variability or dawn phenomenon, history of severe hypoglycemia or hypoglycemia unawareness, those with very low insulin requirements who might benefit from fractional doses, or in women trying to achieve target during pregnancy.

The ideal candidate for pump therapy is someone who:

- is motivated to learn and improve their glycemic control
- is already skilled in using an insulin: carbohydrate ratio and carbohydrate counting
- is willing to frequently monitor blood sugar (minimum of 4 times per day)
- understands sick day management and is willing to test blood ketone levels if needed
- is committed to attending regular follow up visits with the health care team

Once a patient decides to start pump therapy, it's time to choose which pump is best for them. With recent changes in the insulin pump manufacturing market, many patients and providers have become confused about their options. Since 2015, Canadians have had the option to choose from 3 different

insulin pump manufacturers, Medtronic, OmniPod and Animas. In October 2017, Animas announced that it would no longer be producing insulin pumps and discontinued the sale of its Animas Ping and Vibe. Moving forward, Animas' goal is to transition all current Animas users to a different insulin delivery system, and completely exit the market by September 2019. In this transition, Animas has selected Medtronic as their partner of choice.

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Insulin pumps currently available in Canada

With Animas exiting the pump market in Canada, patients wishing to switch to pump therapy from injections or upgrade their current pump have two choices: the Medtronic MiniMed or the Omnipod systems. Each of these pumps offers distinct features.

Medtronic launched the 'MiniMed 630G system with SmartGuard technology', the newest version of the MiniMed pump, in October of 2016. Key features of this system are the new, user-friendly pump design (waterproof, high-definition full colour screen), more intuitive menus, and increased customization in the menus. The MiniMed 630G continues the prior option of integrating continuous glucose monitoring (CGM), using the Medtronic Enlite sensor, allowing patients to view their sensor data on the pump screen. This new platform now further offers SmartGuard technology for use with CGM - when activated, it will suspend basal insulin delivery for up to 2 hours if the patient hasn't responded to the low glucose alarm.

Insulet launched the Omnipod system in Canada in March 2011. Omnipod offers the only insulin pump in Canada with no tubing. A waterproof pod contains the reservoir for insulin and pumping mechanism, with an automatic insertion mechanism. Once the pod's adhesive patch is applied to the skin, the internal cannula inserts itself automatically with the push of a button, with no visible needle. Insulin doses are calculated and delivered via the Personal Diabetes Manager (PDM), which serves a dual purpose as the blood glucose meter. (Figure 1)

FIGURE 1 **Comparison of insulin pump systems currently available in Canada**

Pump	Omnipod	Minimed 630G
Key features	• Completely tubeless • Bolus delivery managed via remote (PDM – Personal Diabetes Manager) • Automated insertion and priming • Waterproof pods	• Integrated Continuous Glucose Monitoring (CGM) with Suspend on Low • Paired BG meter can also function as a wireless meter-remote for remote bolusing (only for manual and preset bolus)
Insulin reservoir size	200 units	300 units
Connection type	No tubing	Infusion set and tubing
Basal rate increments	0.050 units	0.025 units
Insulin:Carb ratio increments	1.0	0.1 (below 10), 1.0 (10 or above)
Maximum bolus amount	30 units	75 units
Integrated CGM available?	No, CGM only available through stand-alone options. Sensor readings not sent to PDM	Yes, extra cost associated with sensors. Sensor readings sent to pump
BG meter connection	PDM functions as the BG meter and uses Freestyle strips	Ascensia's Contour Next Link 2.4 meter connects wirelessly and sends BG readings to pump
Warranty	5 years One-time PDM replacement available if damaged or lost	4 years CGM transmitter: 1 year
Customer support	24 hour customer care and technical support	24 hour customer care and technical support
Contact information	**1.855.763.4636**	**1.800.284.4416**

Options for Current Animas Users

Soon after Animas announced their exit from the Canadian insulin pump market, Animas Product Support (technical support, replacement pumps) and supply distribution (pump supplies including infusion sets, reservoirs, accessories) transitioned to Medtronic. Any remaining Animas pump users should contact Medtronic at 1.800.284.4416 for these services. Animas pump supplies will continue to be shipped to patients in need until September 2019. Current Animas pump users have 3 options for upgrade, depending on the end date of their warranty:

Animas user with warranty that has already expired
These patients need to purchase a new pump (out of pocket, through insurance or using government funded programs depending on the region), and can choose between the MiniMed 630G system and OmniPod system at the time of purchase.
These patients should have a backup plan for insulin delivery (ex. MDI injections). In the event that their pump stops working or is lost, Animas will no longer provide replacement or loaner pumps.

Animas user with warranty expiring before September 2019
These patients can continue to use their Animas pumps with services and supplies provided by Medtronic, until September 2019. Patients wishing to trial the Omnipod can do so for the remainder of their warranty period, through the Omnipod Welcome Program. When their warranty expires, patients can choose to purchase one of the two available pumps (out of pocket, through insurance, or a government funded program).

Animas user with warranty expiring after September 2019
These patients can choose one of two free upgrade options: The Minimed 630G through the Animas Exchange Program, or the OmniPod through the OmniPod Welcome Program (until December 2018).

People living with type 1 diabetes are faced with many daily challenges and choices. One of the decisions that will have the greatest impact is their chosen method of insulin delivery. Pump therapy is an option for many people with type 1 diabetes, to help reduce the daily burden of living with the disease, and to improve their overall control. As the insulin pump landscape in Canada continues to evolve and incorporate new technology, patients will continue to need support from health care providers in their decision making.

On the fence about pumping for your patient?

Here are some pro's and con's:

Insulin Pump Therapy

Pro's

- More refined and precise insulin dosing
- Easier to adjust for a variable lifestyle
- Bolus calculator to assist with dose calculations
- Lower risk of hypoglycemia
- Less injections (one cannula insertion every 3 days)
- Potential A1c improvements
- Potential for integration with continuous glucose monitoring

Con's

- Can be more expensive
- Greater risk of diabetic ketoacidosis if insulin delivery is interrupted
- Needs to be worn 24/7
- Requires more training and a willingness to use technology

Injection Therapy

Pro's

- Less expensive
- Requires less education and training
- No technical savvy required
- Lower risk of diabetic ketoacidosis if a dose is missed
- No diabetes equipment attached to the body

Con's

- Increased potential for hypoglycemia related to different insulin action profiles
- More glucose variability
- More injections (4+/day)
- Less precise insulin delivery
- Difficult to adjust for day to day lifestyle variability (ie. unscheduled exercise or inconsistent meal timing)
- Need to do dose calculations manually or with a calculator or app

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