



## Insulin pumps with closed-loop functionality

In 2020 the artificial pancreas (AP) became a reality for individuals living with Type 1 diabetes, almost 100 years after the discovery of insulin. The AP was achieved through closed-loop functionality - the ability of an insulin pump to automatically & safely deliver basal (background) & rapid (meal-time) insulin to provide optimal glycemic (blood sugar) control. Closed loop technology became available through great coding & dramatic advances in [CGM/sensors](#) over the last few years.

See [this youtube recording](#) of our [The Weekly](#) HCL pump webinar from 2020-May-14.

See the table below for a list of HCL pump systems available as of 2020-May-14.

| HCL pump options Canada 2020-May-14 |                       |           |             |        |                     |                  |
|-------------------------------------|-----------------------|-----------|-------------|--------|---------------------|------------------|
| Name                                | Pharmacare?           | sensor    | software    | tubing | smartphone control? | add-on required? |
| obsolete Medtronic pump             | no                    | Dexcom G6 | Loop*       | yes    | iPhone only         | Riley link       |
| <a href="#">Omnipod</a>             | yes                   | Dexcom G6 | Loop*       | no     | iPhone only         | Riley link       |
| <a href="#">Medtronic 670G</a>      | <a href="#">yes**</a> | Guardian  | proprietary | yes    | coming soon         | no               |
| <a href="#">Tandem T-slim X2</a>    | not yet               | Dexcom G6 | proprietary | yes    | not yet             | no               |

Click [here](#) for a pdf document that compares the functionality of all production insulin pumps on the Canadian market as of 2019-Dec-30. Neither the Omnipod nor the Medtronic 630G, the two pumps covered by BC Pharmacare as of 2020-May-14, have out-of-the-box HCL capability. For more information on the Pharmacare deductible for insulin pumps click [here](#). Note, as of 2020-May-14 BC Pharmacare does not cover sensors/CGM.

HCL functionality became available to retail consumers in Canada in late 2018 with the [Medtronic 670G](#) pump/CGM system. Experimental *non-retail hybrid closed-loop systems with all the features of production hybrid closed-loop systems like the Medtronic 670G have been available for several years (see "Looping" below)*. With the Medtronic 670G system optimal basal insulin infusion rates can be set up by allowing the sensor/CGM to record 2+ days of glucose data during the basal state. Activation of

the “auto” function implements the optimized basal rates which then run automatically while the sensor/CGM checks the sugar every 5 minutes. If the sugar drops below <6.7 (or 8.3 if in "exercise" mode) or rises above 14.0 the basal infusion will be automatically stopped & only restarted once the sugar level moves into the 6.7-13.9 range. This results in more Time in Range (Time to Target), fewer lows (in particular fewer severe lows) and better A1c.

The [Tandem "basal IQ"](#) pump, combined with the Dexcom G6 CGM came to market 2020-Apr-1 and is a direct competitor of the Medtronic 670G. [Here](#) is a comparison of the Medtronic 670G and the Tandem basal IQ.

The [Omnipod Horizon closed loop system](#), also developed in partnership with Dexcom, is being tested pre-release in the USA - it is not expected in Canada until late 2020. [tidepool.org](#) is working on getting the [Loop](#) app (see below) approved by the US FDA and using it together with the soon to be released Omnipod Dash.

Lilly also has a hybrid closed loop system [under development](#) as well as a smart pen system for rapid insulin boluses.

### Looping

High quality HCL, not currently approved by the FDA or Health Canada, is also available using do-it-yourself, open-source, “looping” software. People who use looping technology are called “loopers”. There are currently three looping systems available to Canadians: Loop, OpenAPS and AndroidAPS. All three are good (see discussion below).

BCDiabetes’ recommendation for loopers is the tubeless [Omnipod system](#) running with [Loop](#) (compatible only with iPhones). Twenty current BCDiabetes patients are currently using this system. BCDiabetes recommends this system because of Omnipod’s low cost and its [coverage by BC Pharmacare](#). Once CGM is [covered by BC Pharmacare](#) this fantastic option will be affordable for most technology savvy British Columbians living with Type 1 diabetes.

[Loop](#) and [OpenAPS](#) both require a compatible insulin pump (an old Medtronic Pump or an Omnipod), an iPhone (not android-compatible), a CGM (Dexcom or Freestyle Libre/MiaoMiao), and a [RileyLink](#) (a small external device about the size of a TicTac box, approx, CAD\$200). See [this document](#) for full looping instructions.

If you have questions or want to make the jump to looping you can find information by joining the [“Looped” Facebook group](#) or feel free to email [Nadine Pedersen](#), a local volunteer for the [NightScout Foundation](#).

[AndroidAPS](#) has a possible advantage over Loop and OpenAPS in that it does not require a RileyLink - however we at BCDiabetes know less about AndroidAPS because none of our advisors use it. It has its own [Facebook group](#). In terms of pumps it requires either a Dana-R or Dana-RS from Sooil (neither yet for sale in Canada), or the Roche Accu-Chek Combo “Disetronic” pump (last sold in Canada in 2016) and a compatible Android phone (iPhones not supported).

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