Insulin pumps with hybrid closed-loop functionality

Hybrid closed-loop (HCL) functionality is the ability of an insulin pump to automatically & safely deliver basal (non-meal-time) insulin. HCL technology became available through great coding & dramatic advances in CGM/sensors over the last few years. HCL is half-way to the “artificial pancreas”, a completely autonomous insulin-delivery system (for both basal and meal-time insulin).

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Pharmacare?</th>
<th>sensor</th>
<th>software</th>
<th>tubing</th>
<th>smartphone control?</th>
<th>add-on required?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omnipod</td>
<td>yes</td>
<td>Dexcom G6</td>
<td>Loop*</td>
<td>no</td>
<td>iPhone only</td>
<td>Riley link</td>
</tr>
<tr>
<td>Medtronic 670G</td>
<td>yes**</td>
<td>Guardian</td>
<td>proprietary</td>
<td>yes</td>
<td>coming soon</td>
<td>no</td>
</tr>
<tr>
<td>Tandem T-slim</td>
<td>not yet</td>
<td>Dexcom G6</td>
<td>proprietary</td>
<td>yes</td>
<td>not yet</td>
<td>no</td>
</tr>
</tbody>
</table>

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](http://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” technology. 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). Ten current BCDiabetes patients are currently using this system. Here are [some observations](#) one of them made. 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).

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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