Looking at
Hybrid Closed Loop
Systems

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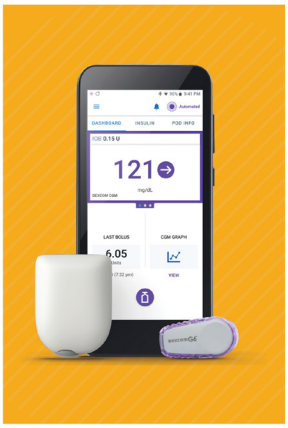
Children with Diabetes®



Looking at Hybrid Closed Loop Systems

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Diabetes technologies are changing quickly, so we at CWD want to make sure you have the up-to-date information on what's available to you in the U.S. For your reference and to help with any decisions you may need to make, we put together this chart of the current hybrid closed-loop systems for people with diabetes, as well as some helpful information about closed-loop systems.

Some Quick Definitions:
Basal – Background insulin
Bolus – insulin taken for food or correcting a higher than target blood glucose
CGM – Continuous Glucose Monitor
Open Loop – when the pump is operating independently of the continuous glucose monitor
Hybrid Closed-Loop – when the pump and CGM work together to manage glucose levels to a certain extent
CGM Share – the ability to share CGM data with someone else who can view the data remotely (see our article about sharing glucose data)
Calibration – the requirement of entering a fingerstick glucose level to confirm the sensor glucose

Hybrid Closed Loop Systems on the market

t:slim X2 Control-IQ

Omnipod 5

Medtronic 670/770 G

CGM Type	Dexcom G6	Dexcom G6* *must use mobile app*	Medtronic Guardian 3
CGM Wear	10 days	10 days	7 days
CGM Share	Yes, with phone	Yes, with phone	770 only, Carelink Connect app
System Target	Fixed at 110 mg/dl (6.1 mmol/l)	Adjustable Algorithm target	Fixed at 150 mg/dl (8.3 mmol/l)

Activity or Exercise Feature	Exercise mode target to 140-160 mg/dL (7.7 mmol/l - 8.8 mmol/l); requires manual start/stop Sleep mode turns off auto correction, tightens target range	Activity changes tar-get BG to 150 mg/dL (8.3 mmol/l) and reduces insulin for a set duration between 1-24 hours	Temp target to 150 mg/dL (8.3 mmol/l) for set time of 30 min- 24 hours
Extended Bolus Option	Yes for up to 2 hours	No	No
Open Loop Mode Activates	No CGM data >20 minutes	No CGM >20 min, maximum delivery or insulin paused for too long, can return to automated mode after 5 minutes for these	Maximum delivery, loss of CGM data, concerns with sensor accuracy, sensor glucose > 300 mg/dL (16.6 mmol/l) for 1 hour or >250 mg/dL (13.8 mmol/l) for 3 hours
Bolus Automation	Auto-corrections if predicted glucose >180 mg/dL (10 mmol/l), will deliver 60% calculated correction dose	No – only basal changes	No – only basal changes
Considerations	Pump is metal and will alarm in metal detectors May experience signal loss of CGM if pump is facing away from CGM or inwards towards body Remote bolusing now an option via t:connect app	System may suspend if glucose dropping quickly May get frequent "Automated Delivery Restriction" in the first few weeks but should improve Can utilize pharmacy benefit for system Only tubeless option	Calibrations required for the CGM and to stay in Auto Mode Avoid calibrating during time of rapid glucose change System will give prompts for how to return to Auto Mode

When should you opt to switch to open loop?

There are some situations where getting out of closed-loop is recommended, such as:

- To use temporary basal rates
- May consider for illness, excessive stress, presence of ketones, during use of steroids, or a time in which your insulin needs are different than usual.
- Use for 2-4 hours after syringe or pen injection because the system will not know you took the injection.

Why is it called "Hybrid Closed-Loop"?

For all these systems, the person wearing the devices must manually input the carbohydrates they consume to bolus for meals. For two of them, you also must manually make a correction if the basal adjustments do not bring you down sufficiently. There are more closed-loop systems currently undergoing study and development that will need less user interaction, and hopefully one day they won't need any interaction!

How do I get one of these?

The easiest way would be to reach out to your healthcare provider or to the company itself. Endocrinology offices may have physical pumps that you can look at in clinic so that you can get a better feel for them. Then comes the issue of figuring out what your insurance is willing to cover, which is what dictates many people's decisions on which system to obtain. Most insurance companies will allow a person with diabetes to get a new insulin pump every four years, which means whatever you choose, you could be stuck with for four years.

There are a couple of great additional resources that can help you decide what device to use –

1. Diabeteswise.org is a website designed by diabetes psychologist Dr. Korey Hood and his team at Stanford University to help people with diabetes choose what technologies fit best into their lives. They also have information about the cost of devices, guides on how to get devices, and personal stories from others living with diabetes.

2. Panther Program has a device comparison chart with even more details than the one we created above. They also have other great resources for when you have skin challenges related to diabetes devices as well. This was created by Dr. Laurel Messer out of the Barbara Davis Center in Colorado.

Sometimes you will need to advocate for yourself to get the device of your choice and having a supportive health care provider can be extremely valuable for this. There are also times when the provider is the reason you have not been able to get the device, and in that case it's probably time to find a new provider. (See our article on Implicit Bias and Prescribing Habits for more info)

Bottom Line:
It's great to have options because people are different, and everyone has their own needs and desires. Not everyone wants to wear a pump or CGM, and that's okay. You have to do what's best for you and your diabetes, because at the end of the day, you're the driver of your own diabetes bus. Here's to hoping you find something that makes the ride easier for you!