**Choosing Diabetes Insulin Pump Technology**

*The aim of this guide is to help you decide which diabetes technology you would like to use. It has been designed to be viewed online so you can follow the links to additional information. (Many thanks to UCLH diabetes team for allowing MPFT to adapt their leaflets.)*

***Diabetes management***

There are different ways to deliver insulin and measure glucose levels using technology. This guide has been created to help you choose between the options available to you. Diabetes management technology includes insulin pumps and glucose sensors. To decide what technology you would like to use, you need to think about what you wish to use for both glucose monitoring and insulin delivery. You can find out more about diabetes technology here: [Type 1 Technology & Resources - DigiBete](https://www.digibete.org/type-1-technology-resources/)

***Continuous glucose monitoring (CGM)***

Continuous glucose monitoring (CGM) automatically tracks glucose levels throughout the day and night. There are 2 types of CGM. Real time CGM (rtCGM) where the glucose levels are transmitted to a receiver/mobile device continuously (every 5 minutes) or intermittently scanned CGM (isCGM) where the sensor must be scanned to check glucose levels. NICE guidelines recommend that anyone diagnosed with Type 1 Diabetes has access to CGM.

***Real time CGM***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***CGM Name*** | **Currently Available at MPFT?** | ***Connect to Pumps?*** | ***Follow Available?*** | ***Description*** |
| **Dexcom**  **One** | Y | N | N | *Has a sensor and a separate transmitter similar to G6.*  *Fewer alarm options than the Dexcom G6 and G7.* |
| **Dexcom**  **G6** | N\* | Y | Y | *Has a sensor and a separate transmitter.* |
| **Dexcom**  **G7** | N | N | Y | *Sensor with inbuilt transmitter.* |
| **Medtronic**  **Guardian™**  **4** | N\* | Y | Y | *Sensor with separate transmitter.* |
| **Libre 2** | Y | N | Y | Sensor with inbuilt transmitter. |
| **Libre 3** | N\* | Y | Y | *Sensor with inbuilt transmitter.* |

*\*NICE (National Institute for Health and Care Excellence) is due to release a technical appraisal document in December 2023. This will increase availability of CGM to enable use with pumps. This is likely to be completed in phases and rolled out over an agreed time duration.*

***Insulin pumps***

An insulin pump is attached to the body via a small cannula. It is worn 24 hours per day. It delivers small amounts of insulin continuously using programmed basal (background) rates. When you eat, you also use a bolus calculator to enter the carbohydrate and deliver a bolus of insulin. Insulin pumps can be used as a stand-alone device alongside CGM (glucose is manually entered into the pump) or used as part of a hybrid closed loop system (glucose data transmitted to the insulin pump). Insulin pumps are currently offered with a 4 year warranty/funding cycle, this means once you have chosen the pump manufacturer you will not be able to move to a different system for 4 years under current NHS funding arrangements. It is also your responsibility to insure your pump, either via home contents insurance policies or specialist insulin pump insurance policies.

***What is the latest pump technology?***

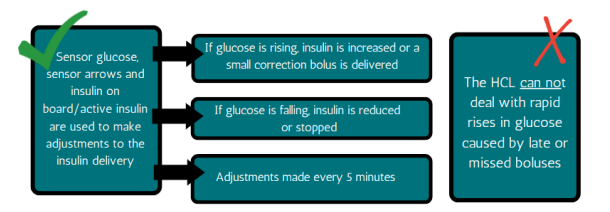
The latest diabetes technology is called a hybrid closed loop system (HCL). The glucose sensor and insulin pump are communicating with each other every 5 minutes.

The algorithm in the insulin pump uses the sensor information and adjusts insulin delivery automatically. If your glucose is rising, it will increase insulin delivery or deliver an additional bolus as a correction. If your glucose is falling, it will decrease or suspend insulin delivery.

With all HCL systems, it is still necessary to tell the pump when you are eating by entering the carbohydrate into the pump and giving a bolus of insulin 5 –15 minutes (depending on the type of insulin) before you eat. This helps the system work efficiently and can prevent delayed hypoglycaemia.

If you wish to use a HCL system, then it is important that you use a sensor that works for you. To get the best from the HCL you should wear the sensor at least 90% of the time.

***HCL expectations***



You can learn more about pumps and HCL here: [Expert Opinions: Pump Choices | The Association of British Clinical Diabetologists (abcd.care)](https://abcd.care/resource/expert-opinions-pump-choices)

*There are currently 4 HCL systems available at MPFT (although sensor funding pathway is not yet approved)*



* [Expert Opinions: Tandem T-Slim | The Association of British Clinical Diabetologists (abcd.care)](https://abcd.care/resource/expert-opinions-tandem-t-slim)
* [Expert Opinions: Medtronic Minimed 780G | The Association of British Clinical Diabetologists (abcd.care)](https://abcd.care/resource/expert-opinions-medtronic-minimed-780g)
* [Expert Opinions: Ypso Pump | The Association of British Clinical Diabetologists (abcd.care)](https://abcd.care/resource/expert-opinions-ypso-pump)
* Expert Opinions: Omnipod 5 – to be updated.

***Pump / HCL Comparison***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Medtronic MiniMedTM 780G | Tandem T-Slim X2 | YpsoPump | Omnipod 5 |
| HCL  Technology | [New Medtronic MiniMed™ 780G Insulin Pump system - YouTube](https://www.youtube.com/watch?v=4n4u5PdxYfA) | [How Control-IQ Technology Works on the t:slim X2 Insulin Pump - YouTube](https://www.youtube.com/watch?v=ADUDwM1SxeE) | [CamAPS FX hybrid closed loop app | Cambridge artificial pancreas (camdiab.com)](https://camdiab.com/) | [SmartAdjust™ Technology 101: How the Omnipod® 5 Works | Omnipod](https://www.omnipod.com/en-gb/current-podders/resources/omnipod-5/smartadjust-technology) |
| Glucose  Sensor | Guardian 4 | Dexcom G6 | Dexcom G6 | Dexcom G6 |
| In warranty  software  updates | Yes | Yes | Yes | Yes |
| Tubed Pump | Yes | Yes | Yes | No |
| Remote bolusing | No | No | Yes | Yes |
| Mobile phone  required for  HCL to work | No  But needed for  follow option  and automatic  uploads | No  But device with  G6 app needed for  follow option | Yes  Android only | Yes  Dexcom G6 app |
| Follow option | Yes  Carelink  Connect app | Yes  Dexcom Follow  app (only if  user also  carries a  device with G6  app) | Yes  Companion  app (android  only)  OR  Glooko app | Yes  Dexcom Follow  app (only if user  also carries a  device with G6  app) |
| Cannula  options | [MiniMed™ Mio™ Advance infusion set – how to use it - YouTube](https://www.youtube.com/watch?v=2For6SAvxRQ)  [How to insert the Medtronic MiniMed Sure-T infusion set - diabetes therapy - YouTube](https://www.youtube.com/watch?v=pTXEqEUhZ_Q) | [How to Insert an AutoSoft 90 Insulin Pump Infusion Set - YouTube](https://www.youtube.com/watch?v=S8__zp7PdZM)  [How To Insert a New TruSteel Insulin Pump Infusion Set - YouTube](https://www.youtube.com/watch?v=geB83jHwsgo) | [mylife YpsoPump Orbit infusion sets - mylife Diabetescare – United Kingdom (mylife-diabetescare.com)](https://www.mylife-diabetescare.com/en-GB/products/infusion-systems/mylife-ypsopump-orbit.html) | N/A |
| Cartridge size | 180 units  300 units | 300 units | 160 units  (prefilled  Novorapid or  self-filled) | 200 units  reservoir within  each Pod |
| Can be used as  a stand-alone  pump? | Yes | Yes | Yes  MyLife app is  required for  bolus advice | Yes |

The table below provides more detail about the features of the different systems:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Medtronic MiniMedTM 780G | Tandem T-Slim X2 | YpsoPump | Omnipod 5 |
| Training Requirement | Pump workbook to be completed for all systems before pump start or upgrade | | | |
| Are the  basal rates  used in the  algorithm | No | Yes | No | No |
| All basal profiles must be kept up to date for times when not in HCL | | | |
| Glucose  target | 5.5 or  6.1 or  6.7 mmol/L | 6.3mmol/L | User can  choose  glucose target | 6.1 or  6.7 or  7.2 or  7.8 or  8.3mmol/L |
| Additional  features | Temporary target can be used to reduce insulin delivery e.g. for  prevention of hypos during exercise. No  corrections given when temporary target set. | **Sleep activity:**  Narrows target  range for sleep  but will not give  correction  boluses.  **Exercise**  Higher treatment range 7.8 8.9mmol/L  Correction boluses will still be given | **Ease off** and  **Boost** functions to  allow for management of exercise, stress and  illness etc. | **Activity** feature can be used to raise  glucose target. |
| Uploading | Automatic uploads to CareLink Personal if using the CareLink app.  If app is not being  used, blue dongle  is supplied with  new pumps to  upload to a  computer | Micro USB  cable required  to upload to  Glooko | Automatic  uploads to Glooko | Automatic  uploads to Glooko |
|  | **Medtronic MiniMedTM 780G** | **Tandem T-Slim X2** | **YpsoPump** | **Omnipod 5** |
| Min / Max basal rate | Bolus dose 0.025, 0.05, 0.1 units up to max 35 units.  Basal split evenly across the hour.  Pulse rate;  <1 unit =0.025units  >1 unit = 0.05units  >10 units= 0.1units | 0.1 – 15 units per hour  Programmable in 0.001 unit increments | 0 – 40 units per hour  Programmable in 0.01 – 0.5 unit increments | 0 – 30 units per hour |
| Min / Max bolus | Bolus Speeds  Standard : 1.5 units/minute  Quick : 15 units/minute  Programming Increments  0.025 units  0.05 units  0.1 units | 0.05 – 25 units | 0.1 - 30.0 units  In 0.1, 0.5, 1.0 or 2.0 unit increments | 0.05 – 30 units  Increments of 0.05 units.  Insulin-to-carb ratio in 0.1 grams carb/units increments. |
| Watertightness | IPX8 3.6m <24 hrs | 1m for 30 mins | 1m for 60 mins | POD 7m < 60mins |
| Size | 9.68cm length  5.36cm width  2.49cm depth | 7.95cm length  5.08cm width  1.52cm depth | 7.8cm length  4.6cm width  1.6 cm depth | Pod size: 3.9cm x 5.2cm x 1.44cm  Controller size: 14.4cm x 6.75cm x 1.72cm |
| Weight | 102g | 112g | 83g | Pod weight: 26g with empty reservoir.  Controller Handset weight: 165g |
| Power Supply | Battery  For best results, use a new AA lithium (FR6) battery. | Rechargeable lithium polymer battery up to 120 hours | Battery  1.5 V alkaline battery (LR03), size AAA | PDM rechargeable Rechargeable lithium-ion battery. |
| Approved (tested) Insulin | Novorapid  Humalog | Novorapid  Humalog | Fiasp  Novorapid  Humalog  Apidra  Lyumjev | Novorapid  Humalog |