**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 | NoBut needed for follow option and automatic uploads | NoBut device with G6 app needed for follow option | YesAndroid only | YesDexcom G6 app |
| Follow option | Yes Carelink Connect app | YesDexcom Follow app (only if user also carries a device with G6 app) | YesCompanion app (android only)ORGlooko app | YesDexcom 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 units300 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 or6.1 or 6.7 mmol/L | 6.3mmol/L | User can choose glucose target | 6.1 or6.7 or7.2 or7.8 or8.3mmol/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/LCorrection 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 hourProgrammable in 0.001 unit increments | 0 – 40 units per hourProgrammable in 0.01 – 0.5 unit increments  | 0 – 30 units per hour  |
| Min / Max bolus | Bolus SpeedsStandard : 1.5 units/minuteQuick : 15 units/minuteProgramming Increments0.025 units0.05 units0.1 units | 0.05 – 25 units | 0.1 - 30.0 unitsIn 0.1, 0.5, 1.0 or 2.0 unit increments | 0.05 – 30 unitsIncrements 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 length5.36cm width2.49cm depth | 7.95cm length5.08cm width1.52cm depth | 7.8cm length4.6cm width1.6 cm depth | Pod size: 3.9cm x 5.2cm x 1.44cmController 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 | BatteryFor best results, use a new AA lithium (FR6) battery. | Rechargeable lithium polymer battery up to 120 hours | Battery1.5 V alkaline battery (LR03), size AAA | PDM rechargeable Rechargeable lithium-ion battery. |
| Approved (tested) Insulin | NovorapidHumalog | NovorapidHumalog | FiaspNovorapidHumalogApidraLyumjev | NovorapidHumalog |