

# A guide for insulin pump users

## **Food bolus options**

Information for patients



# Aim

The aim of this leaflet is to give you information on the different insulin pump bolus settings available, plus guidance on which bolus to use for the type of food you are eating.

# Introduction

When using an insulin pump, you need to give insulin to cover the carbohydrate (CHO) in meals and snacks you eat. This is called a bolus dose.

Different food will have different effects on your blood glucose levels. Changing the type of bolus you give to match the carbohydrate in your meal or snack will help to keep your blood glucose levels in control. However, make sure that you count the CHO content of your meal correctly.

Before using the bolus options on your pump, make sure that you have turned on the bolus function (also known as the bolus calculator or bolus wizard). You can access this through settings > system set up / bolus wizard. Please ask your dietitian or diabetes specialist nurse to support you with this if you are unsure.

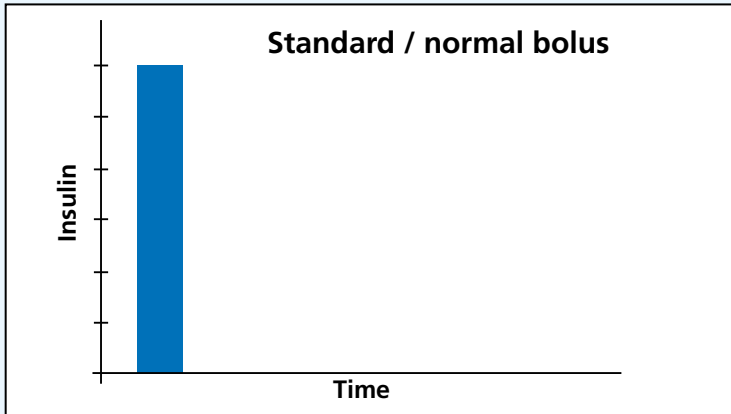
If you are on a standard pump (not a hybrid closed loop insulin pump) – your insulin pump will give different bolus options e.g. standard, extended, combo or dual wave bolus, and the names will depend on the pump that you are using. The best one to choose will depend on the food that you are eating.

**The different bolus options will be explained individually.**

# Choosing the type of bolus to use on a Standard insulin pump

## 1. Normal or standard bolus

This option delivers the full amount of insulin straight away.



The standard bolus is the best option for a moderate carbohydrate containing meal, that is not very high in fats/ protein, e.g. egg mayonnaise sandwich, a piece fruit and a low fat yoghurt.

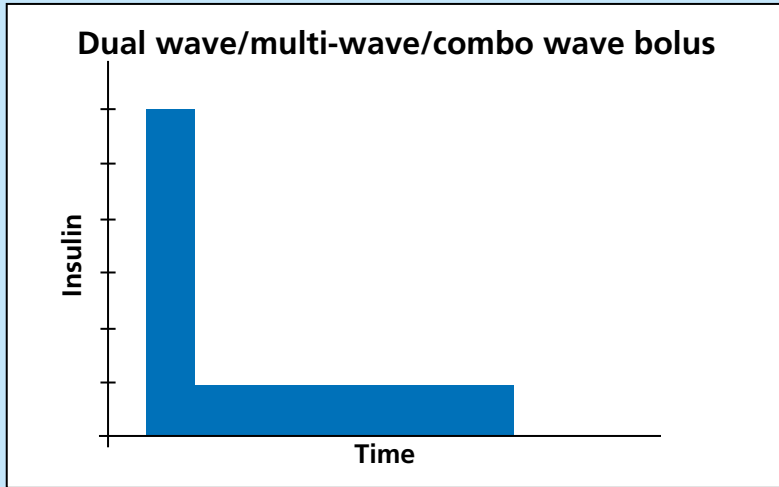
A super bolus may be helpful for very high GI meals, e.g. white toast and jam or refined breakfast cereals. Your dietitian can explain how to set up a super bolus for a specific meal. These meals can also be adapted to make them lower GI so that a standard bolus could be used. Your dietitian can provide further advice to help with meals or snacks that cause a rapid blood sugar spike followed by a sharp drop.

If you are using Novorapid, Humalog or Apridra in your pump, giving your bolus 15 – 20 minutes before eating will help minimise the rise in your blood glucose level.

If you are using ultra rapid acting insulins, e.g. FIASP or Iyumjev – these insulins can start working within a few minutes and so can usually be given just before a meal, however, consider your pre meal blood sugar when deciding regarding pre-bolus. And reviewing your libre/ Dexcom sensor data for an individualised approach to pre-bolusing can be helpful too.

## 2. Dual wave/multi-wave/combo bolus

This bolus option means that the insulin is delivered in two stages. The first stage is when some of the insulin is delivered as a standard (normal) bolus and the second stage is where the rest of the insulin dose is delivered over a period of time chosen by you (1-8 hours).



You will therefore need to consider the composition of the food you are eating, e.g. is it higher in fat/protein, therefore requires a longer duration?

### Example

A suitable starting point is 50/50 – 70/30 split where the 50 – 70% is delivered up front and the rest, i.e. 50 – 30% is extended over a suitable duration, e.g. 2-3 hours, most suitable to match the glucose absorption from the meal.

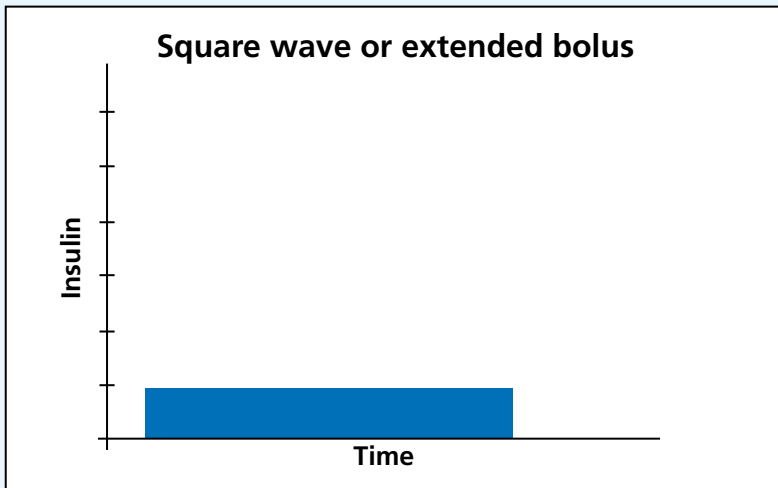
This type of bolus should be used for meals that are high carbohydrate (above 60 – 80g)/ high fat (above 25g)/ high protein (above 40g). These amounts are more specific for adults, please discuss with your dietitian regarding paediatrics. Examples that may need this type of bolus may be more common with restaurant or take-away food, e.g. fish and chips, burger and fried chips, or steak, onion rings, chips and vegetables or a Chinese/ Indian meal, a creamy pasta dish, pizza. You

may find that these foods can cause a drop in blood sugar after eating if all the insulin is given up front before the meal, and can cause a delayed rise in blood sugars 3 – 5 hours after the food is consumed.

For a very low GI meal you may want to try a 50/50 split given across 2 hours.

### 3. Square wave or extended bolus

This bolus gives you the option of delivering the insulin required for your meal gradually, over a longer period of time.



It can be useful to choose this option if you are eating over a long period of time, e.g. a buffet style restaurant, parties, or when snacking while watching a film.

You may also be advised to use this type of bolus if you are having problems with delayed stomach emptying related to your diabetes (a condition called gastroparesis).

The period of time you should deliver the insulin depends on your individual response to the food you eat.

Two hours is a useful starting point but large carbohydrate meals which contain a lot of fat may need up to six hours.

If you require more guidance on bolus options please contact your diabetes specialist dietitian or diabetes specialist nurse.

# Factors that affects the blood glucose response to meals include:

## 1. Glycaemic index (GI)

The GI is a guide to how carbohydrate foods affect your blood glucose levels. A high GI food increases the blood glucose levels quickly for a shorter amount of time, whereas a low GI food results in a slower and more prolonged rise in your blood glucose levels, therefore two meals with the same carbohydrate content can affect your blood glucose levels differently depending on their glycaemic index.

Food	Low GI	High GI
<b>Starches</b>	Multi-grain bread, chapatti, noodles, pasta, basmati rice, sweet potato	Crumpet, bagel, white bread, baguette, white rice, mash potato
<b>Cereals</b>	Porridge, All Bran	Rice Krispies, Cornflakes, Cheerios, Cocopops
<b>Fruit</b>	Apple, banana, orange, mango, peaches	Grapes, watermelon
<b>Vegetables and pulses</b>	Sweetcorn, peas, carrots, beans, lentils, plantain	Swede
<b>Confectionary</b>	Yoghurts, ice cream, chocolate	Rice crackers, pancakes, donuts

## **2. Fat and protein**

The presence of fat (fried food, butter, cream, cheese) and protein (meat, fish, eggs) as part of a meal will slow down the time of digestion which will cause the glucose to be released slower into the bloodstream.

## **3. Fibre**

Food high in fibre such as granary breads, wholegrain or bran cereals, fruits, vegetables, beans, pulses and potato skins are digested and released more slowly.

## **4. Meal size**

A large amount of carbohydrate will take longer to digest than a smaller amount.

## **5. Processing**

Easy cook rice has a higher GI than basmati rice and rolled oats has a higher GI than whole jumbo oats. This is due to the processing methods.

## **6. Cooking method**

Mashed potato has a higher GI than boiled new potato in the skin.

## **7. Ripeness**

A riper banana will have a higher GI than an unripe banana as the starch naturally breaks down into sugar and is digested and absorbed more quickly.

## **How does the GI effect my choice of bolus?**

When eaten in large quantities, foods with a lower GI may require you to extend your bolus for longer, therefore knowledge of GI and carbohydrate quantity of your foods will help you to decide the most suitable bolus option.

## **What do I do if I decide to have more food such as a pudding, while the bolus is still running?**

It is possible to deliver a standard bolus (top-up) while a dual or multi-wave bolus is running. This is useful if you decide to eat extra food.

The delivery of insulin can also be stopped if necessary, e.g. if you made a mistake or do not eat as much as expected.

## **How do I know if the bolus is working?**

To check if the standard bolus worked, check your blood glucose levels two hours after eating. This reading should be no more than 2-4 mmol above your pre-meal reading.

For a dual wave, multi-wave or combo bolus, you should check your blood glucose levels every 2 hours for the duration of the bolus, and 2 hours after.

For example, if you used a dual wave bolus option over two hours, check your pre-meal blood glucose level, then again two hours after eating and again at 4 hours after eating.

You will be able to assess if the chosen bolus worked for the food eaten or if you need to try something different. Your dietitian or specialist nurse can help you with this.



# Accounting for fats and proteins

Some people will find that they need to allow for fats and protein when giving their insulin bolus, particularly if the meal has more than 25g of fat, or 40g of protein. And as long as carbohydrate counting is as accurate as possible, if there is a recurring pattern of a certain meal causing a delayed rise (up to 5 hours later) consider trialling an increase in the bolus dose as mentioned below.

Rather than counting fats and proteins gram for gram, you may wish to trial a 20-30% increased bolus at the meal while ensuring that you split your insulin dose, again starting with a 50:50 to 70:30 split over 2-3 hours. Based on your after meal tests you can increase your insulin in 5-10% increments if your blood glucose remains raised. If the trialled split does not work well, try a different split or extension duration, dependent on blood glucose trend.

## Example

Using an additional dose for high fat and high protein meal, e.g. a pepperoni pizza with 120g carbs and using a 1:8 insulin to carb ratio. Normally this would require 15 units of insulin but due to the slowly digested meal a split dose is used as well as an additional dose to manage a previously experienced delayed rise (from the higher fat and protein intake). With an additional 20% this meal requires a total of 18 units of insulin (15 units + extra 20% of 3 units). The 18 units can be given as a split dose of 60% up front e.g. 10.8 units and 40% – 7.2 units extended across 2-3 hours.

**It is essential to ensure that you monitor regularly when you are trialling this to ensure safety.**

Please note these are starting suggestions, please discuss with your diabetes team before and during trying these additions.

# Hybrid closed loop pumps and managing high fat, high protein meals (HFHP meals)

<b>Omnipod 5</b>	<p>Try 100% of the carbs but if this causes a hypo for a specific meal (despite accurate carbohydrate counting) within 1 – 2 hours, consider entering a reduced amount of carbs next time e.g. 50 – 70%. An insulin action time of 2 hours will help the pump to correct more aggressively after 2 hours when a delayed rise occurs.</p> <p>If despite the above there is a delayed rise that the pump is unable to manage then consider 60% up front and 40% after an hour or as the BG starts to rise.</p> <p>As these pumps do not allow for entering a % of the bolus the carbohydrate split will need to be calculated, e.g. if 100g carbs is eaten from a pizza initially 60g and 40g later on.</p>
<b>Medtronic 780g</b>	<p>Only if finding a hypo occurs soon after a HFHP meal with accurate carb counting – next time trial entering only 50 – 75% (these would have to be entered as grams of carbs and not as a % of the total meal dose) before eating the meal and allow the pump to manage the delayed rise. A 2 hour active insulin time can be helpful to allow the pump to do this more easily. If despite trying this there is still delayed hyperglycaemia that the pump cannot manage appropriately consider adding the rest of the remaining bolus after the meal as the blood sugar starts to rise, this could be anytime after the meal up to approximately 2 hours or so (see example above).</p>
<b>Ypsompump My life CamAPS FX</b>	<p>Consider splitting the bolus and add the remaining (second) carbohydrate amount of carbohydrate in the <b>Add meal</b> function AND by choosing <b>Slowly absorbed meal</b>.</p> <p>Entering 40 – 60% of the usual meal bolus to start. And the rest through the add meal function as above.</p>
<b>T slim</b>	<p>Extended bolus option can be used in Control IQ, trial a 50/50 or 60/40 split across 2 hours.</p>

This information on managing HFHP with an HCL system will be individually tailored to your situation as everyone may be slightly different in terms of their rate of food digestion and what bolus type may work best.

# Notes

## **Nutrition and Dietetics Department**

Clinic 5, King's Treatment Centre, King's Mill Hospital  
Mansfield Road, Sutton in Ashfield, Nottinghamshire, NG174JL  
**01623 622515**, extension **6025**

### **Further sources of information**

NHS Choices: [www.nhs.uk/conditions](http://www.nhs.uk/conditions)  
Our website: [www.sfh-tr.nhs.uk](http://www.sfh-tr.nhs.uk)

### **Patient Experience Team (PET)**

PET is available to help with any of your compliments, concerns or complaints, and will ensure a prompt and efficient service.

**King's Mill Hospital:** 01623 672222

**Newark Hospital:** 01636 685692

**Email:** [sfh-tr.PET@nhs.net](mailto:sfh-tr.PET@nhs.net)

If you would like this information in an alternative format, for example large print or easy read, or if you need help with communicating with us, for example because you use British Sign Language, please let us know.

You can call the Patient Experience Team on 01623 672222 or email [sfh-tr.PET@nhs.net](mailto:sfh-tr.PET@nhs.net).

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