



A guide to...

Adjusting Insulin Pump Doses

Patient information

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One of the aims of your child's (or your) diabetes care is to achieve target blood glucose levels and target HbA1c level. Evidence shows that this can reduce the risk of developing complications, such as nerve damage, eye disease, kidney disease and heart disease.

Target blood glucose levels are:

- between 4 and 7mmol/L on waking and before meals;
and
- between 5 and 9mmol/L two hours after meals.

HbA1c target is below 48mmol/mol (or individualised lowest achievable HbA1c target agreed with you and the diabetes team).

(The HbA1c test indicates your/ your child's blood glucose levels for the previous two to three months. The HbA1c measures the amount of glucose that is being carried by the red blood cells in the body.)

You are advised to routinely perform at least 5 blood glucose tests per day.

This information leaflet advises how to adjust insulin doses, with a view to having as many of your child's glucose levels in the target range as often as possible. This can be challenging for different reasons. The diabetes team will support you to adjust insulin doses, until you feel confident to make adjustments to insulin doses independently.

This information leaflet is not intended for patients on a hybrid closed loop system (Medtronic 670g, 780g, Tandem T:slim with Control IQ). Please speak to the diabetes team for more information.

Before you adjust doses:

- **It is a requirement to review a minimum of three days of blood glucose levels to safely adjust doses.**
- **If both hypoglycaemia and hyperglycaemia episodes occur, adjust for hypoglycaemia first.**
- **Focus on one part of the day**
- **Monitor impact of an insulin adjustment for three days to observe any emerging patterns**

Hypoglycaemia (low blood glucose levels, less than 4mmol/L)

If your child is having three or more episodes of unexplained hypoglycaemia per week, insulin doses may need adjustment.

Consider possible causes of hypoglycaemia

- Taking too much insulin
- Taking insulin at the wrong time
- Not eating enough carbohydrate food, for example missing carbohydrate from a meal or snack
- Physical activity and exercise
- Hot or cold temperatures
- Stress or Illness
- Alcohol

When does hypoglycaemia occur?

Before breakfast	<ul style="list-style-type: none"> • Reduce basal rate by 10% for two hours before hypo
2 hours after breakfast	<ul style="list-style-type: none"> • Reduce the breakfast bolus dose by changing the insulin to carbohydrate ratio (ICR) at breakfast
Before lunch	<ul style="list-style-type: none"> • Reduce basal rate by 10% for two hours before hypo • A fasting basal profile is recommended if hypos continue - Eat a carb-free breakfast and observe the impact.
2 hours after lunch	<ul style="list-style-type: none"> • Reduce the lunch bolus by changing the insulin to carbohydrate ratio (ICR) at lunch
Before evening meal	<ul style="list-style-type: none"> • Reduce basal rate by 10% for two hours before hypo • A fasting basal profile is recommended if hypos continue
2 hours after evening meal	<ul style="list-style-type: none"> • Reduce the evening meal bolus by changing the insulin to carbohydrate ratio (ICR) at evening meal
0300 hrs	<ul style="list-style-type: none"> • Reduce basal rate by 10% for two hours before hypo

Persistent hypoglycaemia may require adjustment in ratios for carbohydrate (insulin to carbohydrate ratio). See table below for examples.

Adjust doses by approximately 10%:

How to adjust the insulin/carbohydrate ratio		
1/20g	➔	1/22g
1/18g	➔	1/20g
1/16g	➔	1/18g
1/14g	➔	1/16g
1/12g	➔	1/14g
1/10g	➔	1/12g
1/9g	➔	1/10g
1/8g	➔	1/9g
1/7g	➔	1/8g

Monitor impact of an insulin adjustment for three days to observe any emerging patterns.

Hyperglycaemia (High blood glucose levels)

Check for potential reasons for high blood glucose levels:

- Is the pump functioning correctly?
- Has the insulin been stored at the correct temperature? Is the insulin in date?
- Is rapid acting insulin given at the correct time before meals?
- Is the correct insulin dose given? Is the bolus supervised/ supported by parent/ carer? Are insulin doses missed?
- Is hypoglycaemia treated correctly?
- Are the cannula sites healthy? Lumpy sites (lipohypertrophy) can affect insulin absorption
- Does the child/ young person have an illness/ infection?
- Is the child/ young person less active than usual?
- Is the child/ young person experiencing stress?
- Is the child/ young person experiencing hormonal changes?
- Is the child/ young person going through a period of growth?
- Is the child/ young person taking other medications?

Remember if you / your child has 2 blood glucose levels of 14mmol/L or more measure blood ketones. If ketones are 0.6mmol/L or more follow sick day rules.

When does hyperglycaemia occur?

Before breakfast	<ul style="list-style-type: none"> Do overnight testing to rule out a rebound hyper from a previous hypo during the night Once nocturnal hypos are ruled out, increase basal rate by 10% for two hours before hyper
2 hours after breakfast	<ul style="list-style-type: none"> Increase the breakfast bolus dose by changing the insulin to carbohydrate ratio (ICR) at breakfast
Before lunch	<ul style="list-style-type: none"> Do you have a mid-morning snack? If yes, increase the snack bolus by changing the ICR at your snack If you do not have a snack; increase basal rate by 10% for two hours before hyper A fasting basal profile is recommended if hypers continue - Eat a carb free breakfast and observe the impact.
2 hours after lunch	<ul style="list-style-type: none"> Increase the lunch bolus dose by changing the insulin to carbohydrate ratio (ICR) at lunch
Before evening meal	<ul style="list-style-type: none"> Do you have an after-school snack? If yes, increase the snack bolus by changing the ICR at your snack If you do not have a snack increase basal rate by 10% for two hours before hyper A fasting basal profile is recommended if hypers continue - Eat a carb free breakfast and observe the impact
2 hours after evening meal	<ul style="list-style-type: none"> Increase the evening meal bolus dose by changing the insulin to carbohydrate ratio (ICR) at evening meal
0300 hrs	<ul style="list-style-type: none"> Increase basal rate by 10% for two hours before hyper

Persistent elevations of BG may require adjustment in ratios for carbohydrate (insulin to carb ratio). See table below for examples.

How much to adjust insulin for carbohydrates: approximate 10% adjustments:

How to adjust the insulin/carbohydrate ratio		
1/20g	→	1/18g
1/18g	→	1/16g
1/16g	→	1/14g
1/14g	→	1/12g
1/12g	→	1/10g
1/10g	→	1/8g
1/8g	→	1/7g
1/7g	→	1/6g
1/6g	→	1/5g

Monitor impact of an insulin adjustment for three days to observe any emerging patterns

Fasting Basal Profiles/ Basal Rate Testing

What is a fasting basal profile/ basal rate test and why do I need to do it?

The purpose of testing your basal rate is to ensure that it is meeting your body's requirement. To achieve good results from pump therapy we need to make sure that your basal rate is adjusted to match your requirements as you grow.

How do we do it?

You need to fast, taking no intake of carbohydrate for at least four hours prior to starting the test and then for the duration (four to six hours). The meal before starting the test needs to be less than 50g of carbs and not contain too much fat (pizza is not a good idea!). You can then eat your normal carb meals four to six hours after the carb free meal.

You only need to do the test for the part of the day that is causing you concern. For example, if you are worried about hyperglycaemia in the evening:

- you can have carbs at lunch, 12pm (less than 50g)
- from 4pm the 'test' can start
- eat a carb free evening meal
- record glucose level from 4pm until end of test
- if no carbs are eaten until breakfast the following morning the overnight checks are part of the 'test'

When should we do it?

If there is a period of highs or lows and you have already made several doses changes it is a good idea to take carbs out of the equation to work out what is causing the fluctuations in your glucose level.

It is good practise to carry out a fasting basal profile before clinic appointments. That way your team can assess your basal needs and make meaningful dose adjustments.

Understanding the result:

Let's take the example above...

You notice your glucose level rises at 8pm, and obviously you haven't had any carbs. The rise is because your basal insulin is not matching the needs of your body. You need to increase your basal insulin rate for two hours before the time you want it to affect. Therefore, in this example, you should increase your basal rate at 6pm and for the duration of the high level. Once you see the glucose drop, you can keep your basal rate at the previous setting. For example:

- the glucose level is high by 8pm, therefore you need to increase your basal rate by 10%
- You notice your glucose level stays high until 12am but you see that it starts to drop between 12:30am and 1am.
- Therefore, you should increase your basal rate from 6pm to 12am. You can then repeat the fasting basal test a week or so later if you want to be certain this worked.

Contact the diabetes team if you require help with any dose adjusting.