

D: Low and High Glucose Levels

D1: Low blood glucose levels (Hypoglycaemia)

Hypoglycaemia - what is it? How to recognise and treat with confidence.

In someone without diabetes, the body is able to balance the blood glucose (BG) level between 3.5 and 7mmol/L the majority of the time. In Type 1 diabetes, where insulin is injected either by pen or pump it is much harder to keep the BG between this narrow range.

In diabetes we define Hypoglycaemia (Hypo's) if a BG level goes below 3.9mmol/L

What sort of things can cause a hypo?

Too much insulin - perhaps too large a dose or too many doses (known as "insulin stacking")

Being more active than usual

Not eating or drinking as much as usual – perhaps missing a meal or loss of appetite due to illness

After drinking alcohol

Stress, hot weather

Lipohypertrophy also referred to as lumpy injection sites

How will you know if your child is having a hypo?

Your child will usually experience some of these sensations first as their body tries to correct the hypo

This may include:- Shaking, pounding heart, hungry, sweating, dizzy, feeling weak

The effect of low BG levels on the brain means that it may then become:-

More difficult to concentrate or perform skills as well as usual or they may complain of a headache.

Their behaviour may also seem different to usual. You may notice they seem more:-

Irritable, Tearful, Quiet, Drowsy or Uncooperative, Pale

Hypoglycaemia at night time

Some children have hypos at night without it disturbing their sleep, so can be more difficult to detect.

If they have a number of hypos this can also affect awareness so identifying and preventing them is important.

Bedtime BG levels do not necessarily predict the BG overnight so checks around 2-3am may be recommended by your diabetes team.

If your child has exercised in the afternoon or early evening hypos later in the evening or overnight (approx. 7-11 hours later) can be more likely so checking overnight is a good idea.

How to treat a hypo

Take some fast acting glucose. For many children over about 10yrs of age 15g glucose carbohydrate is required.

To calculate this more precisely use 0.3g/kg of body weight

Here is a chart showing the usual amounts of fast acting glucose required for children of different ages and include 2g, 5g, 10g and 15g hypo treatment. This will raise BG level by about 3-4mmols.

	2g glucose Less than 2years old	5g glucose 2-5yrs old	10g glucose 5-10yrs old	15g glucose Over 10yrs old
Lift Glucose shot	10mls	20mls	40mls	60mls
Lift Glucose tablets 1 tablet contains 4g	-	1 tab	2-3	4
Lucozade energy tablets 1 tablet contains 3g	1	2	3	5
Dextrosol 1 tablet contains 3g	1	2	3	5
Jelly sweets (average weight)	3g	6g	12g	18g

Dextrogl	¼ tube	½ a tube	1 tube	1½ tubes
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Recheck the BG after 15mins, if still below 3.9mmol/L repeat the hypo remedy as you won't do any harm but will help your child to recover quickly.

If you find you regularly need to repeat the hypo remedy please discuss with your diabetes team.

Dextrogl

This treatment can be used if your child is sleepy or uncooperative and not wanting to eat or drink is a glucose gel such as "Dextrogl".

Glucose gel can be placed on fingertip and put in the mouth or squirted in the side of the cheek onto the gums and massaged on the outside.

Chocolate is not recommended for hypos.

This is because it contains fat which slows the absorption of glucose, and lactose which is a more slowly absorbed carbohydrate so your child will likely take longer to recover.

Fructose (fruit sugar) is absorbed slightly slower than glucose but not as slowly as lactose. It may be an option if apple or orange juice is more acceptable, and you find it works quickly enough.

In the case of a severe hypo

This is a rare occurrence which can lead to loss of consciousness and/or seizure and requires assistance by another person to administer Glucagon. If you would like to refresh skills in how to do this at any time please contact the diabetes team. There is also a short video on how to administer this intramuscular injection on the DigiBete essential videos section.

As young children are less able to communicate their needs, they are at risk of severe hypo. Be reassured that the incidence of this has fallen significantly over the last 20 years and optimal glycaemic control can reduce the risk of severe hypos.

Our aim is to support CYP and families to feel confident recognising and treating hypos so that they have the least impact on everyday life.

Key points to consider

- Prompt treatment can prevent severe hypos
- Make sure there is always a supply of glucose tablets or sugary drinks
- Monitoring blood glucose levels regularly can reduce the risk of hypos
- Encourage children and young people to let their friends know that they have diabetes and know what to do in the event of a hypo
- Wearing some form of identification is a good idea
- Is this a one off event or is there a pattern of low blood glucose levels?
- Try to work out the cause so you can try and prevent hypos in the future
- Monitor more frequently during the next 24 hours following a hypo to prevent a repeat
- Monitor blood glucose and ketone levels 2-4 hourly if hypo and ill
- 2-3 mild hypos per week are not unusual when diabetes is well managed and BG are close to target. **D2: High blood glucose levels (Hyperglycaemia)**

Why do I need to treat high blood glucose levels?

If you do not treat a high blood glucose level you may stay high for several hours. This might make you feel unwell in the short term (thirsty, less able to concentrate, irritable) but if happens frequently can contribute to a rising HbA1c.

Common reasons for high glucose (above 9 mmols) may be:

Mis-match of insulin to food - timing or dose

Missed Insulin

Growth / puberty / hormones/ periods

Sugary foods/ drinks

Reduced activity

Stress / exams

End of honeymoon phase

Illness (see J section: Ketones and diabetes)

Extra insulin may be needed to bring glucose levels back into range.

How do I work out how much correction insulin to give?

If glucose levels are above target, your meter/pump bolus calculator will automatically increase the dose of insulin needed to match both carbohydrate eaten and to bring the glucose level back down to target range.

Please see table below for blood glucose levels and the relevant action and treatment advice, recommended by Leeds Children and Young Peoples Diabetes Team.

BG level mmol/L	Treatment advice	Insulin	
7.0-8.9	BG level above target if done before a meal	Give additional correction insulin if about to eat a meal or snack	By using a pump/meter/app bolus calculator, the dose of insulin will be automatically increased to match both the carbohydrate eaten and bring BG level back down to target range.
9.0-13.9	BG level too high (hyperglycaemia)	Give additional correction dose of insulin	By using a pump/meter bolus calculator, the dose of insulin will be automatically calculated to bring BG back to target range. Check BG 1 hour later if on pump Check BG 2 hours later if on injections Change insulin cannula (if using an insulin pump) if BG does not come down after initial correction
Above 14	BG level too high (hyperglycaemia) & risk of DKA	Check for ketones Give additional correction dose of insulin See 'sick day rules' (pump or injections) section p101	If ketones below 0.6, follow advice above (9.0-13.9 mmols/L) If ketones above 0.6, insulin dose calculated by pump/meter bolus calculator needs to be overridden and increased (see sick day rules section p101) All correction insulin needs to be given by injection Change insulin cannula if using an insulin pump Check BG and ketones in 1 hour

What is 'Active insulin' or 'insulin on board'?

Both are terms which refer to how much insulin is still working from previous insulin injections or boluses. It is a safety feature to prevent over correction of high glucose levels.

Having high glucose levels immediately after meals does not necessarily mean you need more insulin, as the insulin given may still be working to bring the glucose level down. If your pump/meter bolus calculator suggests that you give a reduced amount of correction insulin or no correction insulin, this may be because you have insulin active in your system from a previous bolus.

If you use an insulin pump or bolus advisor meter, these will take active insulin into account every time a correction dose of insulin is calculated. Active insulin is usually set at 3 or 3.5 hours as the majority of the bolus will be used in this time.

If you do not use a bolus advisor meter or insulin pump, **you should not give a correction dose within 2 hours of a previous dose of fast acting insulin.**

High glucose level patterns

If you notice a pattern of always having high glucose levels / correcting at a particular time of the day, the usual dose of insulin affecting that time period may need adjustment. Please upload your pump/meter or send a photo of your glucose diary and give the team a call to discuss.