

Missed dose of insulin

Multiple Daily Injections (MDI)

- If long acting insulin (Lantus / Levemir / Tresiba) is delayed **less** than 4 hours then give usual dose of insulin
- If long acting insulin is delayed **more** than 4 hours give a reduced dose according to the length of time delayed, e.g. if 12 hours late give half the normal dose.
- If Novorapid is delayed for **up to** 1 hour after eating a meal then give a normal insulin dose for only the carbohydrate eaten. Do not give a correction dose. Correct at the next meal time.
- If Novorapid is delayed for longer than 1 hour after eating a meal then check blood glucose (BG) and correct accordingly.

Twice a day regime (using mixed insulins)

- If mixed insulin missed and remembered **less than** 3 hours after usual injection time: give usual dose of insulin now followed by a snack.
- If mixed insulin missed and remembered **more than** 3 hours after usual injection time do not give usual insulin.
- Check BG and give Novorapid as a correction dose. All families should have a correction chart available unless newly diagnosed. If correction chart not available, follow these recommendations:

BG	7 - 10.9 mmol/L	give 1 units Novorapid
	11 - 14.9 mmol/L	give 2 units Novorapid
	15 - 18.9 mmol/L	give 4 units Novorapid
	19 - 23.9 mmol/L	give 6 units Novorapid
	over 24 mmol/L	give 8 units Novorapid

Check BG every 3 hours and expect that glucose levels may be erratic over the next 24 – 48 hours.

Too much insulin given

Multiple Daily Injections (MDI)

- **Too much long acting insulin (Lantus / Levemir / Tresiba) given before bed:**
Eat extra carbohydrate before bed and check blood sugars at 12am, 2am and 4am to detect and treat symptoms of hypoglycaemia
- **Too much Novorapid**
Eat extra carbohydrate according to their normal insulin to carbohydrate ratio (ICR):
Turn on the Expert meter. Go to 'Settings', 'Bolus Advice' and then 'Time Blocks'. Find the appropriate timeblock to find out the insulin to carbohydrate ratio for that time of day for your child / young person (CYP).
- **Lantus / Levemir / Tresiba dose given as Novorapid**
This dose will be much larger than the usual meal dose of Novorapid, so eat extra carbohydrate according to insulin to carbohydrate ratio (ICR) and recheck BG in 2 hours.
Check BG 2 hours and 4 hours later to avoid hypoglycaemia.
Wait 2-3 hours before giving your long-acting insulin and take 10% off the usual dose.

Twice a day regime (using mixed insulins)

- The most common error made is to give the morning dose (usually the larger one) in the evening. In this case, look out for hypos and treat them if they happen. Discourage physical activity and give extra snacks and meals containing carbohydrate.
- Check the blood sugar before bed, at midnight, 2am and 4am to detect and treat symptoms of hypoglycaemia.

Low blood glucose levels (hypoglycaemia)

- Hypoglycaemia in CYP with type 1 diabetes means a BG below 4.0 mmol/L.

If a CYP is having a hypo, the CYP / parent / carer must treat this straight away according to the protocol on the following page.

Signs and symptoms of Hypoglycaemia ('Hypo') vary between people and may change with age. A CYP may show some of the symptoms below, while others may have no symptoms:

<ul style="list-style-type: none">• Pale• Sweating/clammy• Hungry• Tremor• Restlessness	<ul style="list-style-type: none">• Headache• Confusion• Weakness• Glazed expression• Lethargy• Visual/speech disturbances• Seizures• Unconsciousness	<ul style="list-style-type: none">• Irritability• Mood change• Erratic behaviour• Nausea• Combative behaviour
---	--	---

If your CYP is hypo, use their usual fast acting carbohydrate treatment (Lift drink, Lift tablets, Lucozade tablets, Lucozade Sport) and recheck their BG after 15 minutes.

If BG is still below 4 after 15 minutes, repeat hypo remedy and check BG in another 15 minutes.

If BG above 4 after 15 minutes, give the next meal (with insulin) if it is due within the next 30 minutes. If the meal is not due, give a small amount of longer acting carbohydrate (10-15g eg fruit, plain biscuit, milk). If the CYP is on a pump they will not need a longer acting carbohydrate once recovered from their hypo.

If your CYP is able to tolerate fluids by mouth / Glucogel, it is a mild or moderate hypo.

If your CYP is unconscious or fitting, they are having a severe hypo and need emergency care such as Glucagon injection and help from 999.

Giving Glucagon

If parents / carers have been trained on using Glucagon at home and have a Glucagon injection that it is in date:

1. Open orange box
2. Take glass vial and remove orange lid, stand vial on hard surface
3. Remove syringe from box, take off needle cover
4. Insert needle into small circle on the top of vial
5. Push the 1ml water from syringe into vial
6. Keeping needle in the vial, gently mix the water with the powder in the vial until liquid clear
7. Hold the syringe upright with the vial on the end, move needle out of vial slightly so that the tip of the needle always remains in the fluid, gently withdraw the plunger to pull the liquid into the syringe
8. Advise parent that the plunger is locked at the bar code symbol on the syringe so they cannot accidentally pull out and lose dose
9. For children **under** 8 years give 0.5ml this is marked on syringe
10. For children/young people **over** 8 years give 1ml
11. Insert needle fully into outer aspect of thigh and inject dose

High blood glucose levels

Each insulin regime has its own sick day rules

Parents / young people are often concerned if BG levels are high when they don't expect it. The aim is to keep these between 4-7 mmol/L before meals. If the BG is above 14mmol/l, then blood ketones should be checked.

If the CYP is unwell or has blood ketones of 1.0 or above, follow the Sick Day Rules

- High BG levels may be due to having carbohydrate containing food or drink without insulin. They can also be caused by the CYP taking less insulin than they need. Parents can use correction (Novorapid) to reduce the BG and should contact the Diabetes team for further advice.
 - BG and ketones should be checked every 2 hours
 - Stomach ache and headache sometimes come with high BG but any worsening or change in symptoms they should ring the on call team immediately.
 - If high glucose levels are combined with illness or if the CYP is vomiting, see **SICK DAY RULES** and contact the on call team.
-

Ketone testing

Ketones should be checked if a CYP is ill or if they have unexpectedly high BG. If ketones are present, this means that there is not enough insulin around, and the body is breaking down fat. This may be because not enough insulin has been given, or because the body needs extra insulin when sick with an infection.

Blood ketone level

0.1 to 0.9 These are acceptable levels – however if above 0.5 check ketones again after 4 hours to make sure they are not going up.

1.0 to 2.9 Follow the **Sick Day Rules** and take additional rapid acting insulin (NovoRapid).

The dose should be 1 unit of Novorapid for every 10kg of the CYP's weight

Drink plenty of water little and often to rehydrate.

Repeat BG and ketones after 2 hours.

If BG and ketones are not dropping the CYP may need to be admitted to hospital.

3.0 or above Much too high. The CYP is at risk of DKA (diabetic ketoacidosis - a severe illness requiring emergency hospital treatment) and the ketone level must be reduced urgently by giving fast acting insulin (Novorapid) immediately

Drink plenty of water.

The dose should be 2 units of Novorapid for every 10kg of the CYP's weight

Follow the **Sick Day Rules** and contact the diabetes team on-call.

Tips for CYP on pump to stay safe

- Test 4 times a day and more if unwell
- If BG is above 14 mmol/L - check for ketones
- If CYP is unwell, check for ketones (regardless of BG)

The CYP should always carry a spare pen and insulin

- If ketones are between 0.0 and 0.9, follow the Hyperglycaemia guidelines.
- If ketones are 1.0 or more, follow the Sick Day Rules.
- If there is a technical problem with the pump, call the relevant company's helpline.

High blood glucose levels (hyperglycaemia) for CYP on an insulin pump

What is it?

Hyperglycaemia is when the BG level is higher than the target range of between 4 and 7 mmol/l before meals. High BG could be a sign that the body is producing ketones which can make CYP feel unwell, vomit and lead to the development of diabetic ketoacidosis (DKA).

When can it happen?

Pump failure - Although the pump runs many checks each day to ensure it is working, parents need to make sure there is enough insulin in the pump, that the battery is working and the pump is RUNNING

Blockage or disconnection of infusion set or cannula falls out - Remember that the insulin in the pump is rapid-acting insulin so if there is a blockage or disconnection of the tubing or if the cannula has fallen out, the BG will go up quickly.

Cannula site – Cannulas should be changed every 2 or 3 days depending on the type used. Sometimes they do not last quite as long as they should which causes poor or variable absorption of the insulin so they need changing earlier. High BG is a sign that the cannula may need changing sooner than is routine.

Priming new cannulas - When a cannula is replaced, it is very important that the new cannula is primed properly. If not, there will be a period of time when only air is being delivered, not insulin, and this will cause high BG.

Alarms – The pump will alarm if there is a problem, such as an occlusion (or blockage), and to warn that the battery is running low, or the insulin cartridge is running low. If these alarms are ignored, perhaps they happen during the night and are not heard, and the pump then runs out of insulin or the battery fails, the insulin will not be delivered, which will cause high BG. The warning alarms for low battery or low cartridge insulin gives plenty of time to change things if they are responded to quickly.

Air bubbles – It is important to make sure that there are no air bubbles in the insulin cartridge when it is changed. Parents / young people should check for this every day to make sure no air bubbles have appeared. If air bubbles can be seen, they can be primed out. If they are not spotted there will be times when no insulin is being delivered, which will lead to high BG.

Hot days – During the summer the insulin may be especially by the temperature particularly if it is very hot. Not only is the air temperature high, but the insulin is close to the body all the time. If the CYP is very warm, the insulin in the cartridge may be affected by the temperature and so not last as long as usual. This could lead to high BG. It is advisable to change the cartridge more frequently during hot weather.

Bent connector needles – care must be taken when connecting and disconnecting tubing to the cannula. If the needle inside the connector bends, insulin may not be delivered properly.

Inadequate insulin delivered - This could occur if a meal insulin dose is forgotten, or a meal insulin dose is not enough. If the BG is often rising after meals, it may be that the insulin to carbohydrate ratio needs to be reviewed. If the BG are going up in between meals, it may mean that the basal rates need to be reviewed.

If CYP unwell – see Sick Day Rules.