RCH@Home Manual: Blood Glucose Monitoring

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References:


3. DNE_newly_diagnosed[1].docx(Protected view) – Word, sourced from Andrew Boucher DNE (03.11.14)

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1. Blood glucose monitoring

All carbohydrates from food are converted to glucose in the gut. Glucose is a type of sugar. There are different medical conditions that require the child’s blood glucose levels (BGLs) to be regularly monitored at home. Testing the child’s BGL is important to:

- Monitor the amount of glucose in the blood and allow for medication adjustments
- Detect low (hypoglycaemia) or high (hyperglycaemia) blood glucose levels, so treatment can be given if needed
- Monitor BGL during illnesses and exercise and treat if required.

2. Blood glucose meters

An accurate blood glucose meter is essential for management. There is a variety available and you will be taught how to use the one the child you care for has. All meters rely on a drop of blood being placed on or drawn into a blood glucose strip—from which the machine reads the blood glucose level.

3. Finger Lancet

The child will have lancet which is used to obtain a drop of blood that is placed on the strip in the meter. It’s important to remember that the lancet needle should be changed each day.

4. When to test

The amount of blood glucose testing needed varies according to each individual child. Please check the child’s care page on when to test. Most children with diabetes (type 1) require BGL’s at least four times a day. And also,

- When showing signs of low (hypoglycaemia) or high (hyperglycaemia) BGL.
- If the child has been unwell or increased their activity level

5. Performing a test and recording

1. Calibration and set-up of the meter will vary according to the manufacturer’s instructions, which should always be followed. Make sure strips are not past their use-by date.
2. Wash and dry hands, as hand hygiene is important to avoid infection, and also to remove any residue of food that may give a falsely high reading.
3. Slide the blood glucose strip into the blood glucose machine (bar code end in first).
4. Prick the finger on the sides of the tip (see the illustration below). Avoid pricking the tops or the pads of the fingers as repeated pricking in these locations can cause loss of fine touch sensation. Spread the finger pricks around different fingers so thickened areas do not develop. Some children prefer not to use certain fingers (the second or pointer finger).

5. Hold the other end of the blood glucose strip at the finger prick site and allow the blood to be drawn up blood glucose strip. The machine should read the BGL.

6. Record the test result in the blood glucose book, along with any relevant notes (see the example below). This is important to allow patterns to be examined and make other notes about medications, food, activity, and illness which may be affecting the reading. The record book is used to help the family, their doctor and diabetes educator to assess progress and make adjustments to the medication plan.

### Blood Glucose Record

<table>
<thead>
<tr>
<th>Week beginning Monday (data)</th>
<th>Test urine for ketones when sick, or when BGL is greater than 15mmol/l</th>
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<tbody>
<tr>
<td></td>
<td>Insulin types</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
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<tr>
<td>Saturday</td>
<td>4-3</td>
</tr>
<tr>
<td>Sunday</td>
<td>4-3</td>
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</tbody>
</table>
Key: PB = pre breakfast; PL = pre lunch; PD = pre dinner; PBT = pre bed time

Insulin = Types 1.  2.  3.

6. **Target blood glucose level**

The target blood glucose levels for children with diabetes type 1 is between 4-8mmol/l pre main meals. It may be different for other children. Please check with child’s care paeg.

7. **Blood glucose testing and recording**

It is important that carer’s maintain supervision over blood glucose testing and recording. Writing all BGLs in the record book is equally important as it is the only way caregivers, parents or treating team can determine the correct amount of insulin to give.

8. **Trouble shooting blood glucose levels**

When blood glucose levels are unstable, carry out extra monitoring to get a better idea of the day’s readings and allow patterns to be seen. Six to eight blood glucose readings per day are helpful at these times. There are a number of things to think about and check:

- Check the technique of taking BGL. If there is any doubt about the meter, contact the parents for advice.
- Make sure the child is washing their hands before the test.
- Is the food intake variable or uncontrolled?
- Are appropriate adjustments of food and medication being made to cope with sports and exercise?
- Observe to see if the child is unwell with an infection or other illness or stress.

Sometimes the reason for unstable blood glucose levels is not clear and it is a matter of waiting for a pattern to emerge. Contact the parents if you are concerned.

9. **Ketones**

Ketones are produced when the body breaks down fat for energy.

- Ketones are acidic and are dangerous if they build up in the blood as they cause a life threatening condition called Diabetic Ketoacidosis (DKA).
- Ketones occur most commonly when there is not enough insulin in the body.
- The most common causes are missing insulin injections or during illness.
- Ketones can be detected in the urine and blood.
WHEN TO CHECK FOR KETONES:

- When the BGL is greater than or equal to (≥) 15 mmol/L
- Whenever the child is unwell, no matter what the BGL is.

- Urine ketones are positive if a colour change occurs (+, ++ or +++). If so check blood ketones
- Action is needed if blood ketones are ≥ 1.0mmol/L

1. Make sure strips are not past their use-by date.
2. If there is still blood present on the finger from the glucose prick, this can be used, otherwise another finger prick will be needed as per the glucose test (see Section 5)
3. Record the test result in the blood glucose book and let parents know.

10. Hypoglycaemia

Hypoglycaemia occurs when the BGL is too low. It is important to monitor the child and treat hypoglycaemia particularly if the child needs assistance.

10.1 Hypoglycaemia can be caused by:

- Too much insulin
- Vigorous exercise without extra carbohydrate
- Missing or delayed meals
- Not eating all serves of carbohydrate
- Alcohol intake

The target range for BGL’s is between 4.0 mmol/L and 8.0 mmol/L for children with diabetes type 1. The target range for children with other conditions may be different. Check the child’s care page.
10.2 Common signs and symptoms of hypoglycaemia are:

- paleness
- shakiness
- headache
- sweating
- feeling hungry
- dizziness
- heart pounding
- irritability, change in mood
- lack of concentration
- confusion, vagueness
- crying
- weakness

If the BGL is less than 4.0mmol/L (in a child with diabetes type 1) or the lowest acceptable measurement specified on the child specific care page and there are no signs and symptoms of hypoglycaemia, this is still considered to be hypoglycaemia and requires treatment.

Note: The treatment must be taken to the person having the hypo as they may be dizzy or confused.

10.3 Treatment for a mild or moderate hypoglycaemia

A blood glucose test should be done to confirm the hypoglycaemia before treating. Treat the hypo if the blood glucose level is less than 4.0 mmol/L (or as stipulated on the child specific care page).

Do not delay treatment.

**Step 1. Give some high GI carbohydrate (sugar) to raise the BGL quickly**

10 - 15 grams of sugar is required depending weight of your child

- 125 mls of lemonade/juice - ½ metric cup
- 5 - 7 jelly beans - depend on check nutrition panel
- 2 - 4 teaspoons of sugar
- 2-4 teaspoons of honey
The signs and symptoms of a hypo should go away in 5 – 10 minutes. If there is no improvement in signs and symptoms of hypoglycaemia then repeat the sugar serve.

**Step 2. After allowing the sugar to be absorbed give 10 – 15 grams of low GI carbohydrate to keep the blood sugar in the target range.**

- 6 Jatz™/Savoy™ or 4 Salada™ biscuits
- 200mls of milk or 160mls flavoured milk
- 1 apple or banana

If hypoglycaemia occurs immediately before a meal **when insulin is due:**

- Give a high sugar serve
- Wait 15 minutes until they are feeling better
- Recheck the BSL
- Give the normal dose of insulin
- Serve the meal immediately

If hypoglycaemia occurs immediately before a meal or snack

- Give a high sugar serve
- Wait a few minutes 15 minutes until feeling better
- Recheck the BSL
- Serve the meal immediately

10.4 Treatment for severe hypoglycaemia

Glucagon is a hormone that raises the blood glucose level by making the liver release its store of glucose into the bloodstream and may be given by injection.

The child may or may not have this as a treatment and carer’s will be taught according to the child’s needs.

**If not, and the child is displaying signs/symptoms of severe hypoglycaemia, please send for help and phone 000 for an ambulance.**

Otherwise glucagon is given if:

- too drowsy
- uncooperative
- unconscious
- fitting

Do not attempt to give anything by mouth in any of these situations because they may choke.

Place the child on their left side in the coma position to prevent anything from being breathed into the lungs.
Instructions for administering Glucagon:

1. Remove the orange plastic cap from the bottle of white powder (glucagon) and the needle guard from the syringe containing sterile water.
2. Inject all the water into the bottle containing glucagon. No need for shaking as the glucagon will dissolve into the fluid.
3. Without withdrawing the needle turn the bottle upside down.
4. Draw up the solution into the syringe.
5. Give only 0.5ml (half) for children <6 years old and all (1ml) of the solution to children >6 years old.
6. Now inject the glucagon just as you would an insulin injection.

Call an ambulance 000 – the child may need to be assessed in an emergency department

Glucagon may take 5 to 15 minutes to work, therefore don't expect an immediate improvement.

Contact the parents, when able.

10.5 Recovery from Glucagon

Glucagon can cause nausea, vomiting and headache.

Once conscious and able to swallow safely, encourage sugary fluids such as juice or lemonade.

Within the hour it is important to give a low GI carbohydrate, such as bread or milk in order to prevent recurrence of the hypoglycaemia and assist in return to normal eating.

Monitor blood glucose levels every 15 minutes for the first hour then every hour for 4 hours.

If you have had to use glucagon, please contact the Royal Children’s Hospital to discuss further management over next 24 hours.

Blood glucose levels are often elevated following a severe hypo. Any high blood glucose levels after a severe hypo requiring glucagon should not be treated with extra insulin.