Whiston Hospital,
Warrington Road, Prescot,
Merseyside, L35 5DR
Telephone: 0151 426 1600

Southport Hospital
Town Lane, Kew, Southport,
Merseyside, PR8 6PN
Telephone: 01704 547 471

Ormskirk Hospital
Dicconson Way, Wigan Road,
Ormskirk, Lancashire, L39 2AZ
Telephone: 01695 577 111

www.MerseyWestLancs.nhs.uk

NHS
Mersey and West Lancashire Teaching Hospitals
NHS Trust

Management of type 1 diabetes mellitus sick day rules and ketone monitoring

Patient information leaflet

If you need this leaflet in a different language or accessible format please speak to a member of staff who can arrange it for you.

اگر به این بروشور به زبان دیگر یا در قالب دسترس‌پذیر نیاز دارید،
لطفاً با یکی از کارکنان صحبت کنید تا آن را برای شما تهیه کند.

Jeśli niniejsza ulotka ma być dostępna w innym języku lub formacie,
proszę skontaktować się z członkiem personelu, który ją dla Państwa przygotuje.

Dacă aveți nevoie de această broșură într-o altă limbă sau într-un format accesibil,
vă rog să discutați cu un membru al personalului să se ocupe
de acest lucru pentru dumneavoastră

如果您需要本传单的其他语言版本或无障碍格式，请联系工作人员为您安排。

إذا احتجت إلى هذه النشرة بلغة أُخرى، أو بتنسيق
يسهل الوصول إليه، يرجى التحدث إلى أحد الموظفين لترتيب ذلك لك.

Author: Sister
Department: Paediatric diabetes
Document Number: MWL2918
Version: 001
Review Date: 31/10/2028

Note to parents and patients - This guideline should be discussed with your paediatric diabetes team before you use it as in some cases, they may have to adapt it for your individual use. Sickness is an unavoidable part of everyday life. The body's natural response to illness results in higher blood glucose levels due to the release of stress hormones. During illness, you will need more frequent blood glucose monitoring and often more insulin than usual.

What are ketones?

Ketones are acids which can make you feel very sick. They are produced when the body is not getting enough food (glucose), or your body is not able to use glucose due to lack of insulin. If you do not get rid of ketones, you can become dehydrated and eventually develop Diabetic Ketoacidosis (DKA).

How can we measure ketones?

Testing for ketones via finger prick testing is the most accurate way to test for ketones. You will be provided with a meter from the diabetes team (and we recommend that you always have 2 working meters). You will be provided with testing strips at diagnosis from the diabetes team, and further supplies can be obtained on prescription via your GP.

Starvation ketones

Starvation ketones can occur when the body has a shortage of food, often caused by illness, such as diarrhoea or vomiting. In the event of this, the body uses fat for energy because there is not enough glucose. The treatment for this is to often have small amounts of carbohydrates/sugary fluids to eat/drink with a bolus of insulin. If your child is unable to tolerate anything, with levels of ketones, you must attend the emergency department for assessment.

If you require any further information, please telephone and ask for your paediatric diabetes specialist nurse.

The diabetes team are here to support you: if you have any questions contact the diabetes team on:

Ormskirk:

- Paediatric Diabetes Office: 01695 656 766 or 01695 656 867.
- Children's Ward, Ormskirk Hospital: 01695 656 912.

Whiston:

- Whiston Hospital: 0151 430 1404.

Reference

This leaflet is adapted from:

"Patient Advice for Management of Type 1 Diabetes Mellitus during illness in children and young people under 18 years (Sick Day Rules)" by authors: SM Ng, A Soni, JC Agwu, JA Edge, JH Drew, C Moudiotis, NP Wright, M Kershaw, C Gardner, L Connellan, W Assam, endorsed by Association of Children's Diabetes Clinicians (ACDC), British Society for Paediatric Endocrinology and Diabetes (BSPED) and National Children and Young People's Diabetes Network.

Table 1. Management of ketones, sick day rules

Negative ketones less than 0.6mmol/l (blood ketones)	Small to moderate ketones 0.6 – 1.5mmol/l (blood ketones)	Moderate to large ketones greater than 1.5mmol/l (blood ketones)
Give a Correction Dose (CD) to correct high Blood Glucose (BG) in addition to giving normal insulin bolus for carbohydrates eaten.	Give: 10% of your Total Daily Dose (TDD) of insulin as additional fast acting insulin or 0.1 units/kg body weight as additional fast acting insulin	Give: 20% of your Total Daily Dose (TDD) of insulin as additional fast acting insulin or 0.2 units/kg body weight as additional fast acting insulin
Then: Re-check blood glucose (BG) and ketones in two hours (see below).	Then: Monitor fluid intake and ensure you are drinking enough fluids to keep well hydrated. Re-check BG and ketones in two hours (see below).	Then: Monitor fluid intake and ensure you are drinking enough fluids to keep well hydrated. Re-check BG & ketones in two hours (see below).
If your BG is going down that is a good sign but monitor closely throughout the day. If BG is still high or increasing but ketones less than 0.6 mmol/l: Take another correction dose using an insulin pen. If ketones are 0.5 – 1.5mmol/l, follow 2nd column “Small to moderate ketones” If ketones less than 1.5mmol/l, follow the 3rd column “Moderate to large ketones”	If ketones are negative, follow the 1st column “Negative ketones” If BG is still high or increasing but ketones still 0.6–1.5mmol/l: Continue to give 10% of TDD or 0.1 units/kg as additional fast acting insulin every 2 hours using a pen. Give usual boluses for food. Re-check BG and ketones every 2 hours even through the night. If ketones increase to greater than 1.5mmol/l, follow the 3rd column “Moderate to large ketones”	If ketones negative, follow 1st column “Negative ketones” If BG is still high or increasing but ketones have reduced to 0.6–1.5mmol/l, follow 2nd column “Small to moderate ketones” If ketones are still greater than 1.5mmol/l: Give another 20% TDD or 0.2units/kg as additional fast acting insulin every 2 hours using a pen. Give usual boluses for food Once vomiting with high ketones, go to the emergency department.

Sick day rules

1. Never stop insulin. Even if you are eating less than normal, your body needs insulin to use glucose and to get rid of ketones.

2. Check your blood glucose more frequently e.g. every 2 hours including throughout the night.

3. Check for blood ketones. Give additional fast acting insulin every 2 hours if blood glucose is above target (see table page 5).

4. If ketones are present when blood glucose is low, they are called starvation ketones and respond by drinking extra fluids containing sugar. Monitor blood glucose very closely. Extra insulin may be required when blood glucose starts rising.

5. Keep well hydrated by drinking plenty of fluids.

   a. Water, or sugar free fluids are probably most appropriate in many cases where blood glucose levels are normal or high.
   b. If blood glucose levels are low, drinks containing sugar are required, or eat carbohydrates if possible.
   c. Avoid carbonated drinks if possible.

6. Inform the diabetes team early to seek advice. If out of hours, contact the paediatric ward at Ormskirk district general hospital.

Using sick day rules for insulin pump patients

1. The same principles apply for pump patients with regards to glucose testing and fluid intake.

2. In addition, even if unwell and blood glucoses are high, standard checks on the pump should be made for occlusions, disconnection and battery failures.

3. Give correction doses through the pump if blood ketone levels are less than 0.6mmol/l. If one correction dose given via the pump has no effect in 1 hour, repeat the correction dose with an insulin pen.

4. If blood ketones are higher than 0.6mmol/l, give additional fast acting insulin using an insulin pen.

5. When blood glucose levels are rising in an unwell child needing frequent additional insulin doses, think about using higher temporary basal rates.

If blood glucose or ketones remain high, you may need to re-site the pump.

Sick day management when using hybrid close loop systems

Hybrid close loop systems include:

- Dana pump with CAMAPSFX.
- T:slimx2 Control IQ.
- Medtronic 780g.
- Omnipod 5.

1. Same principles apply for hybrid close loop patients with regards to glucose testing and fluid intake.

2. In addition, even if unwell and blood glucoses are high, standard checks on the pump should be made for occlusions, disconnection and battery failures.

3. If blood ketones are below 0.6mmol/l then allow the pump to use the auto correct system to lower blood glucose levels.

4. If blood ketones are above 0.6mmol/l then the pump must be reverted to manual mode and the cannula/pod changed.

5. Give sick day dose via the pen and wait two hours then repeat as necessary (see table 1). Check ketones and if they are back below 0.6mmo/l then the pump can be reverted to the hybrid close loop system.

6. Always wait two hours after giving insulin via the pen and make sure ketones are below 0.6mmol/l before returning to hybrid close loop.