TheMKWay

NHS
Milton Keynes
University Hospital
NHS Foundation Trust

Patient Information

Diabetes department: Information for people living with diabetes on insulin pump therapy – what to expect whilst in hospital

This leaflet has been designed to provide you with information to help you during your hospital stay.

During your time in hospital whether it is a planned or emergency admission you may find your blood glucose is monitored more frequently than you would at home. This is because illness can affect your glucose levels. Usually, it will be checked before meals and before bed.

If you are unable to manage your insulin pump device, your insulin pump will be temporarily removed and kept in a safe place. An insulin infusion (insulin given through a cannula into your vein) or insulin injections will be started.

High blood sugar levels

Sometimes during periods of illness and stress, blood glucose levels can be higher than usual even if you are not eating much. You may need more insulin during this time.

If your blood glucose levels are running higher than usual and you would normally use "sick day rules" (found in this leaflet) to adjust your insulin doses via your insulin pump initially, please inform the staff to record the dose on your drug chart.

Ketones can be produced by periods without food but in patients with diabetes they can be produced when there is a lack of insulin to match your body's requirements. If your blood glucose is elevated (2 consecutive readings of above 13mmol/L or one-off reading of 17mmol/L) ketones can be checked using the same method as a blood glucose check. Ketones above 1.5mmol/l may indicate the need for more insulin.

If you have had elevated ketones during your admission or a condition called Diabetic Ketoacidosis (DKA), this can affect insulin absorption, making insulin pump therapy unreliable.

Symptoms of elevated ketones: Abdominal pain ~ Nausea ~ Vomiting ~ 'Pear drop' smell on breath.

If you use a continuous glucose monitor, you may continue to use this if you are well enough. However, if you are unwell, staff would need to check a capillary glucose from your finger before meals and before bed, or hourly if you need to suspend your pump and are treated with insulin into a vein.

Self-managing your insulin in hospital

You should be supported to self-manage your diabetes as you would at home unless you are not well enough to do so. You should aim for no hypoglycaemia and minimize hyperglycaemia with a glucose target of 6 – 10mmol/l whilst in hospital. You will be required to inform the nurses the exact amount of insulin you delivered via your insulin pump for meals.

Please ensure all needles are disposed of in a sharps bin to protect other patients and staff from needlestick injuries. Your insulin vials will become unusable 28 days after opening. It can be kept outside of the fridge at room temperature in the bedside locker except on extremely hot days.

It is possible to order snacks from the hospital food menu however it is a good idea to bring in a supply from home if you have specific needs/likes. If you would like to speak to the catering team there is a tick box option on the menu.

In- hospital use of hybrid closed loop systems

If you are well and in hospital for a short elective procedure or investigation, you would be supported to continue on the hybrid closed loop system to manage your blood glucose. If you are unwell or on medications such as glucocorticoids which may cause severe insulin resistance and uncontrolled hyperglycaemia, you may be asked to switch your pump to manual mode and manage your blood glucose by increasing your basal rate and your other pump settings.

You may be allowed to use your hybrid closed loop system during surgery provided that you would only miss one meal prior to the procedure and your anaesthetist and diabetes pump team are happy for you to do so with a clear plan in place for this.

Stopping the insulin pump therapy in Hospital

While in hospital if you are unable to self-manage your insulin pump it will be temporarily disconnected. It is important not to cut tubing or disconnect the pump from the tubing as the remaining insulin in the tube may infuse quickly risking hypoglycaemia.

If you need to disconnect the insulin pump, disconnect the cannula from the skin.

Follow the steps below

- Step 1: Calculate your basal rate as mentioned below and take your background insulin (e.g., Levemir, Lantus, Tresiba) using an insulin pen prior to stopping your pump.
- Step 2: Make a record of your current basal and bolus settings.
- Step 3: Remove cannula/detach pump/pod.
- Step 4: Keep your insulin pump somewhere safe and do not turn it off; the amount of insulin “lost” will be minimal. If continuous glucose monitor (CGM) is attached to your insulin pump, consider turning off the alerts.
- Step 5: Make sure you have enough supplies with you when you are returning to your insulin pump.
- Step 6: Ensure when you restart the insulin pump to monitor your BG closely (every 2 to 4 hours initially) and CGM alerts need to be turned back on.
- Step 7: Ensure that you go home with a working ketone meter, ketone strips (available on request) and advice on how to manage elevated ketones (sick day rules).
- Step 8: Ensure you have a plan for who to contact for advice if needed and arrange an outpatient appointment with the diabetes team.

Converting back to injections if pump therapy is suspended

If you need to convert back to injections, please follow this process

- Review your current total basal rate. This can be found on your pump history data.
- Add 20%
- Take this as basal/background insulin once a day or split into two equal doses for morning and bedtime

E.g. Total basal rate = 30 units/day

20% of 30 = 6

30 + 6 = 36

Once daily 36 units/twice daily 18 units morning and 18 units at bedtime

My total daily basal dose_____

Plus 20%_____

Background insulin doses:

Once daily _____

Twice daily____/____

Give the background insulin 1 hour before removing your pump if possible.

Continue to carbohydrate count, inject your usual quick acting insulin 15 minutes before meals using your usual ratios and correct your blood glucose as needed at the same time.

My insulin: carbohydrate ratios _____

My insulin correction factor _____

Insulin pump insertion sites

Lipo's (lipohypertrophy) are abnormal fatty deposits under the skin that can affect the action of insulin. They may make the skin feel lumpy or hard. These can cause variability in blood glucose levels and need to be avoided when inserting your pump cannula. Remember to check your sites regularly.

Low blood glucose (hypo) and treatment

If you have a reading below 4mmol/l this is called a 'hypo' and you may experience the following symptoms:

Shakiness ~ dizziness ~ headache ~ fatigue ~ confusion ~weakness ~ sweaty

Some people do not get symptoms, or get them at readings much lower than 4mmol/l. This is called 'Impaired hypo awareness'. Please let staff know if you do not feel your hypos. If your glucose level is below 4mmol/l you need to take or be given fast acting glucose (15-20g carbohydrate, even if you feel well)

Each ward has a "hypo box" which contains recommended treatments including Lift GlucoJuice or Lift GlucoTabs. Please take the whole juice (60mls) or 4x GlucoTabs. You can use your own hypo treatment providing it contains the correct amount of fast acting carbohydrate.

Your blood glucose will be checked after 15 minutes and when it is above 4mmol/l again you will be offered a small snack of longer acting carbohydrate (Only if on insulin injection therapy). If you are experiencing regular hypo episodes the ward staff will review your medications or refer you to our team.

Sick Day Rules on Insulin Pump Therapy

BLOOD KETONES LESS THAN 1.5 mmol/L
BLOOD GLUCOSE ABOVE 13mmol/l
NOT RESPONDING TO CORRECTIONS/UNWELL

- ☐ Stay in closed loop: The closed loop system will try and cope with raised glucose by increasing your basal and giving corrections
- ☐ Check pump and infusion set for blockages or connectivity and insertion site issues
- ☐ Check bolus calculator for additional corrective boluses if BG is raised, even if you are not eating
- ☐ Drink plenty of sugar free fluids
- ☐ Check sensor glucose matches blood glucose
- ☐ Usual bolus if eating carbohydrates
- ☐ Use the 'boost' option on your pump if on Ypsopump
- ☐ **Check blood glucose and ketones every 2 hours**

If blood ketones < 1.5mmol/l → Stay in closed loop

If blood ketones ≥ 1.5mmol/l → **BLOOD KETONES 1.5 mmol/L OR ABOVE AND BLOOD GLUCOSE ABOVE 13mmol/l**

SEVERE ILLNESS: Exit closed loop mode

- ☐ Potential cannula/Line/Cartridge issue.
- ☐ Check pump and infusion set for blockages or connectivity and insertion site issues
- ☐ Give a bolus via pen device
- ☐ **Change cannula and infusion set/ Pod**
- ☐ Drink at least a litre of sugar free fluids
- ☐ **Check blood glucose and ketones every 2 hours**
- ☐ **Do not restart closed loop**

Calculate TDD (Total Daily Dose) from day before

Ketones 1.5-3mmol/l	Ketones above 3mmol/l
Give 10% of TDD as bolus every 2 hours via insulin pen If eating, give insulin as per Carb ratio (Override the bolus calculator) Start a temporary basal rate of +30% for 4 hours	Give 20% of TDD as bolus every 2 hours via insulin pen If eating, give insulin as per Carb ratio (Override the bolus calculator) Start a temporary basal rate of + 50% for 4 hours

If ketones remain above 1.5 mmol/L consider increasing temporary basal rate further
Or
*Convert to your long and short acting insulin via insulin pen if you suspect any insulin pump failure.
Continue drinking/ eating as carbs can stop the development of starvation ketones if possible.

If blood ketones <1.5mmol/l, before re-entering closed loop you must wait 4 hours after the last manual injecting of quick acting insulin

Diabetes Nurses
01908 995 967
TDSNT@mkuh.nhs.uk

If you have ben trying to address hyperglycaemia for more than 4 hours, please seek help
If you vomit and unable to keep fluids down, you must go to A and E.

****Please do not stop or suspend your pump at any time****

There is a guide at the end of this leaflet for calculating 10% or 20%

Please note that if unwell and you utilize your insulin pump as hybrid closed loop system, it may be best to manage your blood glucose and ketones with your insulin pump in manual mode. You should switch from automated mode to manual mode and follow the sick day rules guidelines above. Once well enough and blood glucose and ketones stabilizes, you can then switch your insulin pump back to automated mode.

Restarting your insulin pump therapy in hospital

If your pump was disconnected for any reason, it can be reconnected once you are well enough to self-manage it and the diabetes team has agreed for you to leave the hospital.

Reconnect your pump and check the settings. You may need to temporarily reduce background insulin infusion rate (reduce to a 70% temporary basal rate for 24hrs) while the basal subcutaneous insulin is still active - increased glucose monitoring may be required. No further subcutaneous insulin doses (using a pen) should be required once your pump is restarted. Re-check your blood glucose 1-2 hours after re-start.

If you utilize your pump as a hybrid closed loop system, it may be best to switch straight to automated mode on the insulin pump and utilize a temporary target (Exercise mode) for at least 12 hours while the basal subcutaneous insulin is still active. You may need to monitor your blood glucose more frequently.

Please review the following questions and if needed ask the Diabetes inpatient team for advice before leaving the hospital.

#	**Questions**	**Answers**
1	Do you feel confident to use your insulin pump device?	Yes/ No
2	Are you confident that your insulin pump is working?	Yes/ No
3	Do you know how to contact the manufacturer of your insulin pump?	Yes/ No
4	Do you have the contact details of the manufacturer of your insulin pump?	Yes/ No
5	Do you know what to do when your insulin pump is not working?	Yes/ No
6	Do you feel confident to adjust your insulin pump settings (i.e. Basal insulin rates, carbohydrate ratios, correction factors, glucose target and active insulin time)?	Yes/ No
7	Do you have a ketone meter at home? Have you read the sick day rules?	Yes/ No

8	Do you have enough consumables and insulin to load your insulin pump? (Cannulas/pods/ cartridges, insulin, batteries, charger)	Yes/ No
9	Do you have an outpatient appointment with the diabetes teams arranged?	Yes/ No
10	Do you have access to long and fast acting insulin injections in case of insulin pump failure at home?	Yes/ No
11	Do you know how to convert back to injections if needed?	Yes/ No

Useful numbers / helplines / websites:

Please let the diabetes team or ward staff know if there are any issues/ queries with your diabetes that we can help you with during your stay.

The Insulin Pump service and the Diabetes Inpatient Specialist Nursing Team are contactable on 01908 995967 or TDSNT@mkuh.nhs.uk (outpatient team) or 01908 996018 (Inpatient team). Alternatively, the Ward staff can contact us on your behalf.

Contact the manufacturer or distributor of your insulin pump for advice if you have any technical problems with the insulin pump device.

Insulin Pump manufacturers/ distributors	**Telephone Numbers**
Medtronic	0192 320 5167
Insulet (Omnipod)	0800 011 6132
Ypsomed	0344 856 7820
Air Liquide (T-Slim x2)	0800 012 1560
Dana (Advanced Therapeutics)	0192 683 3273

Footcare

Please do not walk around the ward with bare feet. Your feet should be checked on admission and any issues reported to the podiatry service, or the diabetes specialist nurses. If you notice any problems or have issues with your feet, please inform the ward staff.

The 10% and 20% ready-reckoners

Use the table below as a guide to help you to calculate 10% or 20% of your Total Daily Dose (TDD).

TDD	10%
15	2
20	2
25	3
30	3
35	4
40	4
45	5
50	5
55	6
60	6
65	7
70	7

TDD	20%
15	3
20	4
25	5
30	6
35	7
40	8
45	9
50	10
55	11
60	12
65	13
70	14

We ask for information about you so that you can receive proper care and treatment. This information remains confidential and is stored securely by the Trust in accordance with the provisions of the Data Protection Act 2018/GDPR. Further guidance can be found within our privacy notice found on our Trust website: www.mkuh.nhs.uk

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Milton Keynes University Hospital NHS Foundation Trust
Standing Way, Eaglestone, Milton Keynes, MK6 5LD

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