

# DIABETES MELLITUS (TYPE 1) INPATIENTS USING INSULIN PUMPS

## PRACTICE GUIDELINE<sup>®</sup>

### DOCUMENT SUMMARY/KEY POINTS

- Patients with Type 1 Diabetes Mellitus (T1DM) who are already wearing an insulin pump may require admission periodically for stabilisation of their diabetes or other unrelated reasons. Understanding how to care for these patients in a ward setting is essential.
- Where a patient with Type 1 Diabetes Mellitus (T1DM) who is already wearing an insulin pump is admitted the endocrine team must be notified.
- On admission the Endocrine team must document the insulin pump settings along with the order for insulin which will be used to refill the pump reservoir every 72 hours. The Endocrine team will review the insulin pump settings daily and document changes when they occur.
- On admission the nursing staff must establish **who is best placed to operate the pump: the patient, parent/carer, or nursing staff.**
- In the absence of parents/carers, nursing staff are responsible for the delivery and/or supervision of the delivery of insulin. The nursing staff must liaise with the Diabetes Educator to ensure that they are familiar with the pump and are able to care for the child using the pump.
- Nursing staff must supervise the patient/parent/carer when insulin is delivered for:
  - carbohydrate intake
  - an insulin dose to correct an elevated BGL
- At the discretion of the Endocrinologist, an IV insulin infusion may be considered an appropriate replacement for insulin pump therapy during admission.
- If blood glucose level (BGL)  $\leq$  4mmol/L (page 5), hypoglycaemia treatment is required and should be managed as per the [Hypoglycaemia Management in Type 1 Diabetes Practice Guideline](#)
- If BGL  $\geq$  15mmol/L (hyperglycaemia), check blood for the presence of ketones and follow the [hyperglycaemia flowchart](#)

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

<b>Approved by:</b>	SCHN Policy, Procedure & Guideline Committee	
<b>Date Effective:</b>	1 <sup>st</sup> July 2017	<b>Review Period:</b> 3 years
<b>Team Leader:</b>	Nurse Manager Diabetes Services	<b>Area/Dept:</b> CHW Endocrinology

## CHANGE SUMMARY

- The Endocrine team must be notified of the admission
- The Endocrine team must review the patient/insulin doses/pump settings daily
- The Endocrine team must document any changes to the insulin doses/pump settings when they occur
- The Endocrine team must document the insulin dose to be used for refilling reservoir every 72 hours
- Nursing staff are to document the BGLs pre and 2 hours post main meals plus 12 midnight and 0300 and the insulin boluses given with carbohydrate containing meals and snacks
- Nursing staff are to supervise all insulin boluses given for meals and snacks if the patient/family are managing the pump whilst an inpatient
- Nursing staff are to enter the BGL and bolus into the insulin pump for the carbohydrate intake at all meals and snacks if patient or family unable/unavailable to manage own pump whilst an inpatient

## READ ACKNOWLEDGEMENT

- All nursing staff involved in caring for a patient using an insulin pump during an admission must read and acknowledge they understand the contents of this document.

## TABLE OF CONTENTS

<b>Introduction</b> .....	<b>4</b>
<b>Patients wearing a Continuous Glucose Monitoring system</b> .....	<b>4</b>
<b>Guidelines</b> .....	<b>5</b>
<b>Treatment of Hypoglycaemia and Hyperglycaemia</b> .....	<b>6</b>
Hypoglycaemia (BGL < 4mmol/L) .....	6
Hyperglycaemia (BGL > 15mmol/L) .....	6
<i>Hyperglycaemia Treatment Flowchart</i> .....	7
Patients on insulin pumps fasting for surgery or other procedures .....	7
<b>Reference</b> .....	<b>7</b>

## Introduction

An increasing number of children and adolescents with Type 1 Diabetes Mellitus (T1DM) are being managed with an insulin pump. Patients with T1DM who are already using an insulin pump may periodically require admission for stabilisation of their diabetes or other unrelated reasons. The pump delivers insulin in two ways:

1. The basal rate is the rate at which the pump automatically delivers insulin continuously 24hrs a day to keep the blood glucose levels (BGL) stable between meals and at night. The basal rate is programmed according to the patient's individual requirements. The background or basal insulin helps to control the glucose released from the liver.
2. The bolus dose is the amount of insulin delivered over a short period of time and is used to cover the carbohydrate in meals and snacks. A correction bolus can also be administered to reduce elevated BGLs. These doses are not automatic and need to be entered into the pump.

## Patients wearing a Continuous Glucose Monitoring system

A continuous glucose monitoring system (CGM) is a small, self-inserted sensing device worn on the body. CGM transmits interstitial glucose levels to an insulin pump screen, or receiver device (eg. smartphone) about current sensor glucose status. Graphs and trend arrows show the direction of glucose values and rate of change, providing users additional information to help with their diabetes management. It is important to note that the sensor measures the interstitial glucose level, not the blood glucose level.

The guidelines for hospitalised patients are:

1. Sensor glucose values via CGM cannot be used for clinical decisions while an inpatient (e.g. insulin administration, dose adjustment and hypoglycaemia management). In these instances, a blood glucose level is required (finger prick) using a standard hospital glucometer. Exceptions to this need to be approved by the endocrinology team.
2. Remove the sensor and transmitter from the patient before Magnetic Resonance Imaging (MRI), Computed Tomography (CT) scan, or high-frequency electrical heat (diathermy) treatment.
3. Remove the sensor and transmitter from the patient prior to surgery. Medical and nursing staff are required to continue blood glucose monitoring (finger prick) using a standard hospital glucometer during surgery to guide clinical decisions.
4. CGM has not been evaluated or approved in persons on dialysis or in critically ill patients. It is not known how different medical conditions or medications common to the critically ill population may affect performance of CGM. Sensor glucose levels may be inaccurate in critically ill patients. Medications containing paracetamol/acetaminophen can give a false high reading and there is limited data about the effect of other medications on CGM accuracy.
5. In some circumstances, following team discussion and with the approval of the treating endocrinologist, CGM may be used in the hospital setting to provide information in

addition to finger prick blood glucose levels. In these situations, the frequency of finger prick blood glucose monitoring should be stated by the treating endocrinologist and the decision to use CGM should be reviewed at least daily and also at the addition of any new medications or change in clinical situation.

## Guidelines

**Important:** On admission, nursing staff must establish who will be responsible and available to manage the pump: the patient, parent/carer or nursing staff. In the absence of parents and carers, nursing staff are required to be responsible for managing the pump. The nursing staff must liaise with the Endocrine team to ensure that they are familiar with the insulin pump and therefore able to care for the child.

### Nursing staff:

- Page the **Endocrine** Team who will document:
  - insulin basal rates,
  - the patient's insulin to carbohydrate ratio and Insulin sensitivity factor
  - the insulin to be used to refill the reservoir every 72 hours
  - Check BGLs frequently; pre and 2 hours post main meals (usually coinciding with a snack) plus 12mn and 0300 and document.
- Ensure that there is insulin in the reservoir, and be aware the reservoir cannula and tubing needs to be changed every 72 hours. The patient/parent/carer will have been taught by the Diabetes educators how to change the cannula and tubing and may have spare supplies available. If stock is not available then sub cutaneous injections should be used to replace the function of insulin pump until supplies are obtained after the endocrine team has written up stat sub cutaneous doses..
- Supervise the patient/parent/carer when BGL is measured and insulin is delivered for carbohydrate intake and/or correction dose

### Nursing care during other procedures whilst an inpatient:

- The insulin pump must be disconnected for X-rays, and CT or MRI scans and not taken into the scan room.
- Insulin pumps should not be disconnected or insulin ceased for more than 2 hours without discussion with the Endocrine team.
- If the patient is Nil by Mouth or planned to be fasting, page the Endocrine registrar for a management plan for the patient. The basal rate and insulin bolus factors should only be adjusted under direction of the team.

## Treatment of Hypoglycaemia and Hyperglycaemia

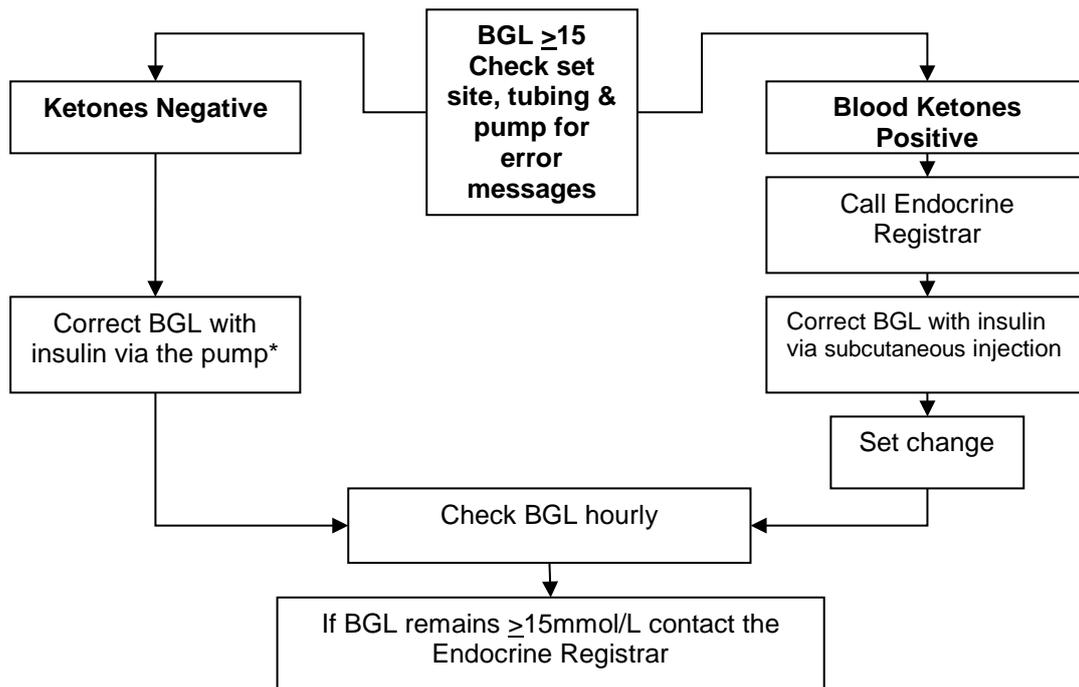
### Hypoglycaemia (BGL $\leq$ 4mmol/L)

- Any BGL  $\leq$  4mmol/L needs to be treated as hypoglycaemia, even if the patient is asymptomatic.
- Treatment of hypoglycaemia in patients with insulin pumps is as per the [Hypoglycaemia Management in Type 1 Diabetes Practice Guideline](#)

### Hyperglycaemia (BGL $\geq$ 15mmol/L)

- Treatment of Hyperglycaemia in patients with insulin pumps is as per the [Diabetes Management & Insulin Administration Practice Guideline](#)
- Check blood for Ketones via ward glucose meter and follow the [flowchart](#) below
  - $\leq$  0.6mmol/L = negative
  - $>$  0.6mmol/L = positive
- Also check the:
  - site for redness, swelling or leaking of insulin
  - tubing for air bubbles, kinks and for the presence of insulin in the syringe
- If there is any concern about the site, the tubing, the pump or the insulin, the set should be changed
- Recheck BGLs hourly. If BGL remains  $\geq$ 15mmol/L contact Endocrine Registrar

### Hyperglycaemia Treatment Flowchart



### Patients on insulin pumps fasting for surgery or other procedures

- The Endocrine team will determine the approach depending on the individual patient and procedure.
- Refer to:
  - [Diabetic Children: Surgery and Fasting - SCH](#)
  - [Fasting and Surgery – Type 1 Diabetes Mellitus \(T1DM\) - CHW](#)

## Reference

1. Caring for Diabetes in Children and Adolescents 3<sup>rd</sup> edition 2010. Ed. Ambler & Cameron

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