



National Policy  National Procedure  National Protocol  National Guideline   
National Clinical Guideline

## HSE National Clinical Guideline: Identification and Management of Hypoglycaemia in Children with Type 1 Diabetes

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<b>Short summary:</b>
The aim of this guideline is to provide clear and standardised guidelines for all staff caring for paediatric patients with type 1 diabetes (T1D) in relation to the recognition and management of hypoglycaemia.
<b>Description:</b>
Hypoglycaemia is the most frequent acute complication of T1D due to either relative insulin excess or illnesses causing nausea, vomiting or diarrhoea and decreased oral intake. Prolonged or recurrent hypoglycaemia, especially when associated with symptoms and signs can cause long term neurological damage or rarely, death. Thus, prompt recognition and treatment are essential

<sup>3</sup> Records details when a document is reviewed, even if no changes are made.

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# NATIONAL CLINICAL GUIDELINE

## TITLE:

### **Identification and Management of Hypoglycaemia in Children with Type 1 Diabetes**

Clinical Design and Innovation

Health Service Executive

Developed by:	The National Clinical Programme for Paediatrics and Neonatology and Paediatric Diabetes	Publication date V1 :	March 2019
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## Contents

1	<b>Aim of Guideline .....</b>	<b>5</b>
2	<b>Purpose and Scope .....</b>	<b>5</b>
3	<b>Background and Introduction .....</b>	<b>5</b>
4	<b>Legislation/other related policies.....</b>	<b>5</b>
5	<b>Glossary of Terms and Definitions.....</b>	<b>6</b>
6	<b>Roles and Responsibilities.....</b>	<b>6</b>
7	<b>Clinical Guideline .....</b>	<b>6</b>
	<b>7.1 Identify the severity of the hypoglycaemia episode:.....</b>	<b>6</b>
	<b>7.2 Immediate management .....</b>	<b>7</b>
7.2.1	<b>Mild:.....</b>	<b>7</b>
7.2.2	<b>Moderate.....</b>	<b>8</b>
7.2.3	<b>Severe .....</b>	<b>8</b>
	<b>7.3 Why did a hypoglycaemic episode occur? .....</b>	<b>9</b>
	<b>7.4 Recurrent hypoglycaemia .....</b>	<b>9</b>
	<b>7.5 Management of hypoglycaemia on CSII .....</b>	<b>9</b>
	<b>7.6 Insulin Administration Safety Alert .....</b>	<b>10</b>
8	<b>Implementation, Revision and Audit .....</b>	<b>10</b>
9	<b>References .....</b>	<b>11</b>
10	<b>Qualifying Statement.....</b>	<b>11</b>
11	<b>Appendix.....</b>	<b>12</b>
	<b>11.1 Appendix 1 Acknowledgements .....</b>	<b>12</b>
	<b>11.2 Appendix 4 Approval Process.....</b>	<b>12</b>

## 1 Aim of Guideline

The aim of this guideline is to provide clear and standardised guidelines for all staff caring for paediatric patients with type 1 diabetes (T1D) in relation to the recognition and management of hypoglycaemia.

## 2 Purpose and Scope

- The purpose of this guideline is to improve the management of hypoglycaemia in **insulin-treated patients**. It applies to children with T1D on insulin therapy with a blood or sensor glucose  $\leq 3.9$  mmol/L
- This guideline is intended for healthcare professionals, particularly those in training, who are working in HSE-funded paediatric and neonatal services. It is designed to guide clinical judgement but not replace it
- In individual cases a healthcare professional may, after careful consideration, decide not to follow a guideline if it is deemed to be in the best interests of the child.

## 3 Background and Introduction

- 3.1 Hypoglycaemia is the most frequent acute complication of T1D either due to relative insulin excess or illnesses causing nausea, vomiting or diarrhoea and decreased oral intake
- 3.2 A blood or sensor glucose value of  $\leq 3.9$  mmol/L is the threshold for initiation of treatment of hypoglycaemia. Children should spend  $< 4\%$  of the time with values in this range
- 3.3 The aim of treatment is to avoid, where possible, blood or sensor glucose values  $< 3.0$  mmol/L which is associated with neuroglycopenia and increased morbidity. Children should spend  $< 1\%$  of the time with values in this range
- 3.4 Prolonged or recurrent hypoglycaemia, especially when associated with symptoms and signs can cause long term neurological damage or rarely, death. Thus, prompt recognition and treatment are essential
- 3.5 Fear of hypoglycaemia can be a barrier to optimal glycaemic control and is associated with significant psychological morbidity

## 4 Legislation/other related policies

[Model of Care for All Children and Young People with Type 1 Diabetes](#)

## 5 Glossary of Terms and Definitions

BG	Blood Glucose
CHO	Carbohydrate
CSII	Continuous Subcutaneous Insulin Infusion (pump therapy)
Hypoglycaemia	For the purpose of this guideline hypoglycaemia is defined as children with diabetes and on insulin therapy with a blood glucose <3.9 mmol/L
NCPPN	National Clinical Programme for Paediatrics and Neonatology

## 6 Roles and Responsibilities

- This guideline should be reviewed by each hospital's senior management team to appropriately plan implementation. This will ensure that the inpatient care of children admitted to their facility is optimised irrespective of location.
- Neonatal diabetes is specialised and a specific tailored management plan should be prescribed for neonates with insulin treated diabetes.

## 7 Clinical Guideline

The goal is to return the blood glucose level to normal (target 5.5 mmol/L) identify cause and plan to prevent recurrence of hypoglycaemia

### 7.1 Identify the severity of the hypoglycaemia episode:

#### 7.1.1 Mild (adrenergic response only)

- tremor
- sweating
- hunger
- palpitations
- pallor

#### 7.1.2 Moderate (plus neuro-glycopenic symptoms)

- headache
- confusion
- irritability

- sleepiness
- weakness
- behavioural change in young children (quietness, tantrums)

**7.1.3 Severe (loss of consciousness)**

- Coma or seizures

**7.2 Immediate management**

**7.2.1 Mild:**

Give glucose drink (not Diet drink) or glucose tablets that will give patient approximately 0.3 g/kg (*10g Carbohydrate for child less than 35 kg child and 15 g for child greater than 35 kg child*) – see **Table 1**

- ✓ Patients using hybrid closed loop systems typically need half of these amounts (5g and 7.5g respectively) see **Table 2**

**Table 1 (MDI and non-hybrid closed loop pumps)**

Drink	To provide <b>10g</b> carbohydrate	To provide <b>15g</b> carbohydrate
<b>Lift Glucose Drink</b> (25g carbs per 100mls)	40ml (2/3 bottle)	60ml (full bottle)
<b>Sugar water</b> (Dissolve 1g table sugar in 1ml cooled boiled water e.g. make up 50mls i.e. 50g sugar in 50mls water in container).Mix on each use. 1ml = 1g carbs.	10ml (1 dessertspoon)	15ml (1 tablespoon)
<b>Apple Juice</b> 11g carbs per 100mls	90ml	140ml
<b>Orange juice</b> 9g carbs per100mls	110ml	165ml
<b>Sweets</b>		
<b>Lift Glucose Tablets</b> (3.7g carbs per tablet)	2 ½ tablets	4 tablets
<b>Dextro Energy</b> (2.97g carbs per tablet)	3 ½ tablets	5 tablets

**Table 2 (Hybrid closed loop pumps)**

Drink	To provide 5g carbohydrate	To provide 7.5g carbohydrate
<b>Lift Glucose Drink</b> (25g carbs per 100mls)	20ml (1/3 bottle)	30ml (1/2 bottle)
<b>Sugar water</b> (Dissolve 1g table sugar in 1ml cooled boiled water e.g. make up 50mls i.e. 50g sugar in 50mls water in container). Mix on each use. 1ml = 1g carbs.	5ml	7.5ml
<b>Apple Juice</b> 11g carbs per 100mls	45ml	70ml
<b>Orange juice</b> 9g carbs per 100mls	55ml	85ml
<b>Sweets</b>		
<b>Lift Glucose Tablets</b> (3.7g carbs per tablet)	1 ½ tablets	2 tablets
<b>Dextro Energy</b> (2.97g carbs per tablet)	1 ½ tablets	2 ½ tablets

7.2.1.1 Re check BG in 15 mins: If recheck BG is still < 4 mmol/L, repeat 7.2.1 and 7.2.1.1

7.2.1.2 Glucogel ( contains 10g carbohydrate) can be very useful in young children who may not agree to take a drink (on command) **but should never be used if patient is unconscious/obtunded due to risk of aspiration**

7.2.1.3 When BG > 4 mmol/L, depending on circumstances, a small snack (10-15g) slower acting CHO MAY be given (e.g. banana, 2 grain crackers, wholegrain bread, milk or fruit) to prevent recurrence of hypoglycaemia (if event is not at a mealtime)

### 7.2.2 Moderate

7.2.2.1 Give Glucogel tube x 1-2 (10g CHO per tube)

**Glucogel should never be used if patient is unconscious/obtunded due to risk of aspiration**

7.2.2.2 Recheck BG after 15 mins and repeat this step if BG is not > 4mmol/L.

When BG > 4 mmol/L, give a snack of approx. 10-15g slower acting CHO (e.g. banana, 2 grain crackers, wholegrain bread, milk or fruit) to prevent recurrence of hypoglycaemia (if event is not at a mealtime)

### 7.2.3 Severe

#### Glucagon

**0.1-0.3 mg/kg to a maximum of 1.0 mg im/sc without delay.**

Weight < 25 kg: ½ vial= 0.5mg

Weight > 25 kg: full vial= 1 mg

7.2.3.1 If IV line in situ (in hospital) give 2 ml/kg 10% glucose over 10 minutes IV

7.2.3.2 May vomit after glucagon in recovery phase

7.2.3.3 An episode of severe hypoglycaemia requiring glucagon requires evaluation in ED

### 7.3 Why did a hypoglycaemic episode occur?

**7.3.1** It is important to identify why a hypoglycaemic episode occurred. Common causes include excess insulin, insufficient carbohydrate consumed, exercise, illness with decreased absorption (gastroenteritis) and in adolescents, alcohol consumption should be considered.

**7.3.2** Evaluate the hypo-awareness of the child and provide tailored re-education if required.

**7.3.3** Insulin dose adjustment may be required. This must be done in conjunction with the diabetes team or local paediatrician. Decrease appropriate insulin dose by approximately 10% next day if hypoglycaemic episode is unexplained

### 7.4 Recurrent hypoglycaemia

**7.4.1** Consider rarer causes:

- ✓ Addison's disease
- ✓ Coeliac disease
- ✓ Alcohol
- ✓ Undisclosed self-administration of insulin

### 7.5 Management of hypoglycaemia on CSII

**7.5.1** Hypoglycaemia may also occur in children using insulin pumps.

**7.5.2** Treatment is with fast acting carbohydrates (as per table 1 / 2) or glucogel as per **7.2.2.1**. and recheck in 15 minutes to ensure blood glucose has normalised

**7.5.3** When using a pump, a follow up slower release carbohydrate snack is **not** generally required but carbohydrate eaten post hypo when BG has returned to the normal range must be bolused for.

**7.5.4** Severe hypoglycaemia with seizure is unusual in children using pumps but should be managed as for all insulin treated children see **7.2.3**

**7.5.5** Pump suspension pending normalisation of BG level may be considered in this unusual scenario.

## 7.6 Insulin Administration Safety Alert

### INSULIN ADMINISTRATION SAFETY ALERT

**INSULIN ERRORS CAN HAVE EXTREMELY SERIOUS CONSEQUENCES**-always act on patient/family/HCP concerns re doses and recheck

- Overdoses can cause severe hypoglycaemia, seizures, coma and even death
- Under dosage can result in diabetic ketoacidosis.

Please **INDEPENDENTLY DOUBLE CHECK** doses at each stage-

- When making up an infusion (an insulin syringe graduated in units to measure insulin must be used)
- When infusing via a pump
- When administering via pen (pens and cartridges are SINGLE PATIENT USE ONLY)

**ALWAYS CHECK PRESCRIPTION:**

- Reconfirm order with the prescriber if unsure/ concerned about the insulin dose
- Avoid abbreviations; insulin should be prescribed in units
- Do not administer an unclear prescription- Prescription **MUST** be rewritten
- Only use an insulin pen or an insulin syringe graduated in units to measure insulin

## 8 Implementation, Revision and Audit

- ✓ Distribution to the REO of each Regional Health Areas (RHA) and senior management team of each acute hospital for implementation through line management in all acute hospitals
- ✓ Distribution to other interested parties and professional bodies
- ✓ The NCPPN Paediatric Diabetes Working group has agreed that this guideline will be reviewed on a **3** yearly basis
- ✓ Regular audit of implementation and impact of this guideline through outcome and process measures is recommended to support continuous quality improvement
- ✓ It is the responsibility of each unit providing care for children with diabetes and intercurrent illness to audit the unit practice regularly in order to ensure that care is being provided in line with guidelines and that any deviations are clinically justified
- ✓ The audit process should be coordinated in each paediatric unit under local paediatric clinical governance and should be taken from a multidisciplinary perspective where appropriate.
- ✓ Where the audit identifies areas for practise improvement, it is the responsibility of each individual unit to implement changes and re-audit to support continuous quality improvement.

## 9 References

International Society for Paediatric and Adolescent Diabetes (2022) ISPAD Clinical Practice Consensus Guidelines 2022. <https://www.ispad.org/resource/chapter-13-sick-day-management.html?>

British Society of Paediatric Endocrinology and Diabetes (2012) BSPED Recommended DKA Guidelines 2012

Irish Medication Safety Network (2020) Best Practice Guidelines for the Safe Use of Insulin in Irish Hospitals <https://imsn.ie/wp-content/uploads/2020/07/insulin-best-practice-March-2020-with-appendices.pdf>

## 10 Qualifying Statement

- These guidelines have been prepared to promote and facilitate standardisation and consistency of practice
- Clinical material offered in this guideline does not replace or remove clinical judgement or the professional care and duty necessary for each child
- Clinical care carried out in accordance with this guideline should be provided within the context of locally available resources and expertise
- This Guideline does not address all elements of standard practice and assumes that individual clinicians are responsible for:
  - ✓ Discussing care with the child, parents/guardians and in an environment that is appropriate and which enables respectful confidential discussion
  - ✓ Advising children, parents/guardians of their choices and ensure informed consent is obtained
  - ✓ Meeting all legislative requirements and maintaining standards of professional conduct
  - ✓ Applying standard precautions and additional precautions, as necessary, when delivering care
  - ✓ Documenting all care in accordance with local and mandatory requirements.

## 11 Appendix

### 11.1 Appendix 1 Acknowledgements

This guideline has been developed by the National Paediatrics and Neonatology Paediatric Diabetes Working Group. The members of this group include medical, nursing and dietetic representatives from paediatric diabetes services. The Diabetes Working Group also wish to thank those who provided input and feedback on draft versions of this guideline throughout development, and those who provided valuable input during the consultation process and revision of the guideline

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### 11.2 Appendix 4 Approval Process

V0 Paediatric Diabetes Working Group	July	2020
V0 Paediatric Clinical Advisory Group, Faculty of Paediatrics, RCPI	August	2020
V0 National Clinical Advisory Group Lead (NCAGL), Dr David Hanlon	September	2020
V0 Approved by the CCO CAG (23.10.2020)	October	2020
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