SETTING	Norfolk and Norwich University Hospitals Foundation Trust
FOR STAFF	Medical and Nursing staff
PATIENTS	Children and young people with diabetes up to 19th birthday

Local diabetes teams need to take on the responsibility of ensuring that any staff in their Trust who are expected to use these guidelines are given training in how to use them.

"treat promptly - don't over treat - individualise to the patient's need"

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1. Associated Documentation

- EoE CYPDN Management of Children & Young People with Diabetes (age >6months-19th birthday) during illness.
- EoE CYPDN Newly Diagnosed Type 1 Diabetes Care Pathway up to 19th birthday. Integrated Care Pathway (ICP) Record for Children & Young People with diabetes with Diabetic Keto-acidosis (up to 18th Birthday) Feb 2017.
- EoE CYPDN 24hr Advice/Escalation Pathway for Children & Young People with Diabetes (up to 19th birthday).
- EoE CYPDN Optimising glycaemic control in Children & Young People with Type 1 diabetes
- Education of Clinical Staff Caring for Children & Young People with Diabetes (up to 19th birthday) in Acute Areas.

1.1 Review

This document will be reviewed by the authors and East of England Children & Young Peoples Guideline Group June 2026 or sooner if new National guidance is published.

1.2 Purpose

The purpose of this guideline is to ensure early recognition of a hypoglycaemic episode and to provide appropriate treatment to ensure a quick recovery to BG/SG level above 4mmol/L.

1.3 Scope

This guideline is to be used to treat hypoglycaemia in CYP living with diabetes cared for in the paediatric areas (inpatient, outpatient and in the community) at Norfolk and Norwich University NHS Trust.

2. Definitions

Blood glucose (BG)	Is measured by a glucometer (either hospital grade, or home device)
Continuous Subcutaneous Insulin Infusion (CSII)	also known as insulin pump therapy, an alternative insulin management option for CYP with type 1 diabetes
Hypoglycaemia	Defined in CYP with diabetes as a BG/SG level less than 4.0mmol/L
HbA1c	HbA1c measures the average blood glucose over the

	past 3 months. Used as a marker of glucose control.
Multiple Daily Injections (MDI)	The standard method of insulin management for children and young people with type 1 diabetes
Sensor glucose (SG)	glucose levels in the interstitial fluid
Time in range (TIR)	A proportion of each day that a person with diabetes spends with glucose readings in each of 3 defined glucose ranges (defined as 3.9mmol/L – 10mmol/L)

3. Duties

- **Acute area staff (medical & nursing staff):** Staff to ensure they have a full understanding of the hypo guideline. Use laminated hypo treatment tables in paediatric hypo box to treat and monitor recovery **OR** follow local protocol.
- **CYP Diabetes Team**: support the acute area staff with education and training for guideline and its use.

4. Key Messages

- Hypoglycaemia is the most common acute complication of type 1 diabetes. It may also occur in type 2 diabetes when treatment includes insulin, GLP-1 or SGLT-2 therapy[1]
- The aim of diabetes management is to maintain glucose levels in line with national glucose targets[2]
- In clinical practice a glucose value of below 4mmol/L is used as the clinical alert or threshold value for initiating hypo treatment in diabetes because of the potential for the glucose to fall further[1&2]
- Due to advancements in technology and funding, glucose sensors are more commonly used for CYP living with diabetes therefore glucose values may be measured by blood glucose or sensor glucose (BG/SG).
- When relying on SG to read a value of below 4mmol/L if CYP not symptomatic of hypo or any doubts of SG value, it is prudent to double check with a BG measurement. **"If in doubt, get your meter out".**
- If SG reading <4mmol/L, confirm with BG.
- The main risk factor for hypo is a mismatch between administered insulin and consumed carbohydrates. Other considerations include: exercise, alcohol intake and undiagnosed co-morbidities such as hypothyroidism.

MANAGEMENT of HYPOGLYCAEMIA for CYP with DIABETES

5. Introduction

Target BG/SG levels for CYP with diabetes are[2]:

- 4-7mmol/L on waking or before a meal
- 5-9mmol/L after meals
- At least 5mmol/L before & when driving[1,2,3,4]
- BG/SG target before bed may differ between CYP

Achieving and maintaining BG/SG levels at the lower end of the target optimal ranges will help CYP achieve the lowest attainable HbA1c and improved TIR.

Hypoglycaemic episodes that occur at particular times of the day forming a pattern should be reviewed and an adjustment in insulin dose may be required. Episodes that are more challenging to treat and may require third party assistance and where a cause cannot be determined should be investigated further.

6. Signs and symptoms of Hypoglycaemia ('Hypo')

These vary between individuals and may change with age. A CYP may exhibit some of the symptoms below, while others may have no symptoms. Signs and symptoms can be classified into 4 groups: autonomic, neuroglycopenic, behavioural and non-specific. (The list is not exhaustive and if you suspect a child/young person is experiencing a hypo their BG/SG MUST still be checked.)

AUTONOMIC	NEUROGLYCOPENIC	BEHAVIOURAL	NON-SPECIFIC
Pale Sweating Clammy Shakiness Tremor Restlessness Palpitations	Poor concentration Headache Confusion Weakness Lethargy Glazed expression Visual or speech disturbances Difficulty hearing Seizures Unconsciousness	Irritability Mood change Erratic behavior Combative behaviour	Hunger Nausea Tiredness Stomach-ache

6.1 Hypoglycaemia while sleeping

Night-time hypos are more common:

- After strenuous activity the afternoon/evening before;
- After a hypo the day before;
- After alcohol has been consumed;
- Or if the CYP is unwell with e.g. diarrhoea & vomiting.

A hypo at night may cause:

- The CYP to wake with symptoms
- Nightmares, feeling sick, a headache in the morning
- BG/SG of less than 4mmol/l before breakfast
- No symptoms at all with the CYP recovering spontaneously

Although not routine an inpatient would require a BG/SG check between midnight and 3am to monitor for nocturnal hypoglycaemia.

7. Treatment of Hypoglycaemia (See treatment tables page 8, 9 & 10)

For hypo management during illness please see EoE CYPDN *Management of CYP with Diabetes (6months-19th birthday) During Illness*.

7.1 Aim

- Do not leave CYP with hypoglycaemia alone.
- Treat promptly.
- Individualise treatment to the CYP's need.
- Restore BG/SG to above 4mmol/L without causing hyperglycaemia (ie. prevent overtreatment of hypo).
  - Manage any high glucose levels after hypos with caution. **A high BG/SG level 2-4hours after a hypo may not need a correction dose of insulin.**

7.2 Treatment

Hypos should be treated with high glucose foods. Hypo treatment with the highest glycaemic index are **highlighted in pink** on the left hand side of the **treatment table on page 8**.

Treatment varies depending on whether the CYP is:

- Conscious, co-operative and able to tolerate oral treatment
- Conscious but unco-operative and refuses oral treatment
- Unconscious / unable to swallow / fitting – **do not attempt to give glucose by mouth**.

The amount of carbohydrate required to treat a hypo will depend on:

- Weight of the CYP,
- Type of insulin therapy eg. MDI or pump/CSII
- Proximity to last insulin dose
- Intensity of recent exercise.

Initial hypo treatment is based on 0.3g/kg of glucose containing treatment which is expected to raise glucose by 3-4mmol/L[1]. However, titration of treatment may be necessary going forward depending on initial hypo level to prevent over treatment of hypo

If CYP is using a glucose sensor, they may have specific additional information from their diabetes team on how to treat a hypo.

7.3 Special Considerations

- Do not omit the next dose of insulin following hypoglycaemia treatment, ensure BG/SG is >4mmol/L and give usual pre-meal insulin.
- If hypo before meal:
  - Check BG/SG
  - Treat hypo and recover BG/SG to >4mmol/L
  - Give insulin for meal and eat immediately (ie. do not wait usual 10-15minutes between giving insulin and starting to eat)

- If the hypoglycaemia occurs twice or more in 24hours, dose adjustment of insulin may be necessary.
- Excessively elevated BG/SG levels following hypo treatment to be discussed with CYP diabetes team.
- CYP on insulin pump therapy generally **do not** require complex carbohydrates following hypoglycaemia treatment using simple carbohydrates unless the CYP is going to be active.
- If CYP is not improving, has protracted vomiting and/or is unable to tolerate oral fluids, hospital admission and IV glucose infusion must be considered.
- If alcohol causes or contributes toward hypoglycaemia, glucagon may be ineffective (as hepatic stores of glycogen may be depleted) and CYP likely to need admission for intravenous glucose.

8. IN HOSPITAL TREATMENT OF HYPOGLYCAEMIA IN CHILDREN & YOUNG PEOPLE WITH DIABETES

Assess	Conscious, co-operative & **ABLE** to tolerate oral treatment	Conscious but unco-operative and **REFUSES** oral treatment	Unconscious or fitting **(or not responded to treatment in amber boxes).**
Signs and Symptoms	Pale, feels wobbly, headache, unsteady, irritable	Combative, poor concentration, confusion, irritable, weakness, drowsy, unsteady, headache, difficulty focusing and speaking	Unconscious, in and out of consciousness, seizures
Treatment	**ADMINISTER FAST ACTING GLUCOSE** See table on page 10 for type and amount	**ADMINISTER FAST ACTING GLUCOSE IN THE FORM OF GLUCOSE GEL (GLUCOSE 40% oral gel) as below:** As per BNFC ▪ <5yrs – ½ tube (5g) ▪ 5-11yrs – 1 tube (10g) ▪ ≥ 12yrs – 1 ½ tube (15g) Administer gel into side of cheek and massage gently from outside to enable absorption	Follow local resus policy eg. danger, response, shout for help and place 2222/999 call, ABCDE assessment, measure glucose to confirm hypo, then: ADMINISTER FAST ACTING GLUCOSE by IV or IM as below: ▪ Gain IV access and give bolus of IV 10% glucose of 2ml/Kg (to a maximum of 5ml/Kg). ▪ If IV access is not achieved quickly, give IM injection of Glucagon: • 1month – 8 years or weight up to 25Kg: 0.5mg (0.5ml = ½ a syringe) • ≥ 9 years or weight ≥ 25Kg: 1mg (1ml = full syringe) If no response within 10 mins IV glucose **MUST** be given – inform/update senior doctor.

		DO NOT give Glucose gel to an unconscious or fitting child/ young person	
Reassess	Wait 15 minutes if using BG, or 20 minutes if using sensor glucose then recheck glucose level. If level still below 4mmol/L, repeat treatment. (BG MUST be above 5mmol/L if young person is driving)	Wait 15 minutes if using BG, or 20 minutes if using sensor glucose then recheck glucose level. If level still below 4mmol/L, repeat treatment. (BG MUST be above 5mmol/L if young person is driving)	Check blood glucose (do not use sensor glucose) after 5 minutes, 15 minutes and then every 30 minutes until BG is stable above 4mmol/L. **If CYP not improving call senior doctor. Consider repeat IV bolus.** If BG above 4mmol/L and CYP is able to tolerate oral fluids offer clear fluids and simple carbohydrates e.g. toast/ plain biscuits.
Good to go!	When blood glucose level is at least 4.0mmol/L (or above 5mmol/L if driving) and patient has recovered, give a long-acting carbohydrate 10-15g snack. E.g. a slice of toast, a medium sized apple, a plain biscuit or a glass of milk (200mls) if it is more than 1-2 hours before the next meal. Long-acting carbohydrate may NOT be necessary following treatment of hypoglycaemia for CYP who use an insulin pump. NOTE: insulin should NEVER be omitted following an episode of hypoglycaemia but dose adjustment may be necessary. INFORM CYP DIABETES TEAM OF ADMISSION		

9. AT HOME TREATMENT OF HYPOGLYCAEMIA IN CHILDREN & YOUNG PEOPLE WITH DIABETES

Assess	Co-operative & **ABLE** to tolerate oral treatment	Unco-operative but conscious and **REFUSES** oral treatment	Unconscious or fitting **(or not responded to treatment in amber boxes).**
Signs and Symptoms	Pale, feels wobbly, headache, unsteady, irritable	Combative, poor concentration, confusion, irritable, weakness, drowsy, unsteady, headache, difficulty focusing and speaking	Unconscious, seizures
Treatment	**ADMINISTER FAST ACTING GLUCOSE** See table on page 10 for type and amount	**ADMINISTER FAST ACTING GLUCOSE IN THE FORM OF GLUCOSE GEL (GLUCOSE 40% oral gel) as below:** ▪ <5yrs – ½ tube (5g) ▪ 5-11yrs – 1 tube (10g) ▪ ≥ 12yrs – 1 ½ tube (15g) Administer gel into side of cheek and massage gently from outside to enable absorption **DO NOT** give Glucose gel to an unconscious or fitting child/ young person	Place CYP on their side. **Call 999** **Check glucose level if able to do so quickly. ADMINISTER GLUCAGON** if it is available and parent/carer is confident to do so as below: **GLUCAGEN Hypokit** • **1month – 8 years or weight upto 25Kg: 0.5mg (0.5ml = ½ a syringe)** • **≥ 9 years or weight ≥ 25Kg: 1mg (1ml = full syringe)** **OGLUO:** • **2-5years, weight up to 25Kg give 0.5mg pen** • **2yrs and over, 25Kg and above, give 1mg pen**

Reassess	Wait 15 minutes then recheck glucose level. If level still below 4mmol/L or if no clinical improvement, repeat treatment. (BG MUST be above 5mmol/L if young person is driving).	Wait 15 minutes then recheck glucose level. If level still below 4mmol/L or if no clinical improvement, repeat treatment. (BG MUST be above 5mmol/L if young person is driving).	Check blood glucose after 5 minutes, 15 minutes and then every 30 minutes until BG is stable above 4mmol/L. **If CYP not improving after 20 mins and ambulance not arrived, give a second Glucagon dose if available.** If BG above 4mmol/L and CYP is able to tolerate oral fluids, offer clear fluids and simple carbohydrates e.g. toast/ plain biscuits. Admit to hospital for observation
Good to go!	When blood glucose level is at least 4.0mmol/L (or above 5mmol/L if driving) and patient has recovered, give a long-acting carbohydrate 10-15g snack. e.g. a slice of toast, a plain biscuit or a glass of milk (200mls) if it is more than 1-2 hours before the next meal. Long-acting carbohydrate is NOT necessary following treatment of hypoglycaemia for CYP who use an insulin pump. NOTE: insulin should NEVER be omitted following an episode of hypoglycaemia but dose adjustment may be necessary.		

10. EXAMPLES OF CARBOHYDRATE (CHO) FOR HYPO TREATMENT

	Conscious but unco-operative and **REFUSES** oral treatment							
WEIGHT UP TO:	**20kg**	**30kg**	**4 50kg**	**10kg**	**20 kg**	**30kg**	**40kg**	**50kg**
g CHO REQUIRED (0.3g/Kg)	6g	9g	1 15g	3g	6g	9g	12g	15g
LIFT GLUCOSE TABLETS 3.7g/tablet	1.5	2.5	3 4					
LIFT GLUCOSE SHOTS 15g/ 60ml	25ml	35ml	5 60ml					
GLUCOGEL 10g CHO/tube	½ tube	1 tube	1 1½ tube	½ tube	½ tube	1 tube	1½ tube	1½ tube
DEXTROSE TABS 3g/tablet	2	3	4 5	Squirt tube content in the side of each cheek evenly and massage gently from outside enabling the glucose to be swallowed and absorbed **DO NOT** give Glucogel to an unconscious or fitting child/ young person				
FRUIT JUICE (11g per 100ml)	60ml	90ml	1 150ml					
LUCOZADE Energy original (8.9g/100ml)	65ml	100ml	1 165ml					
LUCOZADE Sport orange (6.3g/100ml)	95ml	140ml	1 235ml					
COCA COLA (10.6g/100ml)	50ml	90ml	1 140ml					
HARIBO STARMIX 12g/mini pack	½ pack	¾ pack	1 1 ¼ pack					
JELLY BABIES 5g/sweet	1	2	3 3					
SKITTLES 1.1g/sweet	5	8	1 14					

FRUIT PASTILLES 3g/sweet	2	3	4 5						

<u>Always check the labels as carb content may be different, amounts above are just a guide</u>. The most effective hypo treatments (i.e. those with the fastest action) are highlighted pink in the left hand column of the table above. This list is not exhaustive. Use your own judgement, as some listed may present as choking hazard. Please let the CYP use their personal preference if available/appropriate.

11. Monitoring of Compliance

- Audit of care pathway
- Monitor any adverse incidents as per Trust policy

12. References

1. ISPAD Clinical Practice Consensus Guidelines 2022. Abraham M et.al. Assessment and management of hypoglycaemia in children and adolescents with diabetes
2. NICE Clinical Guideline ng 18: Diagnosis and management of Type 1 diabetes in children and young people, 2015 (ng.18).
3. Driver & Vehicle Licensing Agency: www.gov.uk
4. ISPAD Clinical Practice Consensus Guidelines 2018.DiMeglio L, Acerini C et.al. Glyceamic control targets and glucose monitoring for children, adolescents and young adults with diabetes.
5. Battelino T et al. 2019. Clinical Targets for Continuous Glucose Monitoring Data Interpretation: Recommendations From the International Consensus on Time in Range. *Diabetes Care*. 42 (8), pp. 1593-1603.