

Management of Newly Diagnosed Type 1 Diabetes in Children and Young People not in DKA (FPH ONLY)

Key Points

- This guideline is for use at Frimley Park Hospital, as Frimley Park and Wexham Park belong to different diabetes networks
- Type 1 diabetes is the commonest type of diabetes in children
- Diagnosis of type 1 diabetes is based on laboratory measurement of blood glucose and the presence of symptoms such as the 4Ts (Thirst Tired Toilet Thin)
- Measure blood ketones
- Admit all children with newly diagnosed diabetes.
- Start Novorapid based on carbohydrate counting
- Inform Diabetes MDT (multidisciplinary team)
- Commence diabetes structured education on ward

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**This is a controlled document. If you are using a printed copy, check it
against the guidelines site to ensure you are using the latest edition.
Print copies must be destroyed after use.**

Abbreviations

ACR	Albumin Creatinine Ratio
BG	Blood glucose
CGM	Continuous glucose monitor
DKA	Diabetic Ketoacidosis
GAD	Glutamic Acid Decarboxylase
ICR	Insulin Carbohydrate Ratio
ISF	Insulin Sensitivity Factor
TPO	Thyroid Peroxidase
TTO	To Take Out (hospital-prescribed medication for patient to take home)
WHO	World Health Organisation
MDT	Multidisciplinary team

Contents

Abbreviations.....	1
Care of the well child, newly diagnosed with Type 1 Diabetes Mellitus.....	3
Patient group.....	3
Exclusion criteria	3
Introduction	3
Diagnostic Criteria for Diabetes Mellitus in Childhood and Adolescence	3
Symptoms of Diabetes	3
Measure and document the following	4
Management	4
What dose of insulin should be used at diagnosis?	4
How often should the blood glucose levels be checked?	6
Ketone testing	7
What structured Education topics should be covered at Diagnosis and during the first month following diagnosis?	7
Continuous Glucose monitoring ⁴	7
What do you do before discharge?.....	8
What follow up should the child have after initiation of insulin therapy?	8
References.....	9
Appendix A - Discharge Checklist.....	10
Appendix B - Pathway for newly diagnosed child or young person with diabetes.....	12
Full version control record.....	13

Care of the well child, newly diagnosed with Type 1 Diabetes Mellitus

Patient group

This guideline is intended for use in managing children presenting with newly diagnosed diabetes who are well, not acidotic, not significantly dehydrated, and able to tolerate oral rehydration. This guideline can also be used for those who are very mildly acidotic and able to tolerate oral rehydration.

Exclusion criteria

This guideline does not cover the management of children presenting in moderate or severe diabetic ketoacidosis (DKA). For children presenting in DKA the current national BSPED guideline for management of children presenting in diabetic ketoacidosis should be followed¹.

Introduction

- Type 1 (Insulin-Dependent) Diabetes in children is the most common type of diabetes.
- Always accept a GP referral for a child with clinical suspicion of Diabetes and inform the Paediatric Registrar, F1 paediatric ward and diabetes team.
- Consider possibility of Type 2 Diabetes if obese, ethnicity Asian, minimal to no ketonuria and positive family history of Type 2 Diabetes.
- Consider Monogenic diabetes if diagnosis under 1 year of age, beta cell antibodies negative and strong family history of diabetes⁴

Diagnostic Criteria for Diabetes Mellitus in Childhood and Adolescence

WHO Diagnostic criteria for diabetes based on blood glucose measurements **and** symptoms as detailed below².

1. Symptoms of diabetes plus casual plasma glucose concentration ≥ 11.1 mmol/L (200 mg/dl)*.
Casual is defined as any time of day without regard to time since last meal.

or

2. Fasting plasma glucose ≥ 7.0 mmol/l (≥ 126 mg/dl).[†]
Fasting is defined as no caloric intake for at least 8 h.

or

3. 2-hour postload glucose ≥ 11.1 mmol/l (≥ 200 mg/dl) during an OGTT.
The test should be performed as described by WHO (86), using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water or 1.75 g/kg of body weight to a maximum of 75 g (65).

*Corresponding values (mmol/L) are ≥ 10.0 for venous whole blood and ≥ 11.1 for capillary whole blood and

[†] ≥ 6.3 for both venous and capillary whole blood

Symptoms of Diabetes

- Polydipsia, Polyuria, weight loss, excessive tiredness (4Ts - thirsty, toilet, thin, tired) – common
- Vomiting, abdominal pain, Tachypnoea (think Keto-acidosis as this occurs in 20-30% of cases and is an emergency)
- Blurred vision
- Nocturnal enuresis, secondary enuresis
- Irritability, poor school performance
- Vaginal candidiasis

Measure and document the following

- Weight
- Random Blood Glucose, Blood gas and Blood ketones
- **All patients send blood samples to laboratory** for:
 - Random blood glucose, HbA1C (glycated haemoglobin), full blood count, urea & electrolytes, liver function tests, thyroid function tests, TPO antibodies, Coeliac Screen (IgA anti-tissue transglutaminase antibodies), Total Ig A, Islet cell antibodies, GAD antibodies and tyrosine phosphatase related IA-2 antibodies.
- **CYPD 12 years and above**
Please add bloods samples for cholesterol and lipid profile
A urine for ACR (Albumin Creatinine Ratio)

Note: These test requests are available as Paediatric New diabetic Panel on EPIC. Please use this panel to send bloods. Ensure a separate bottle is sent to immunology for coeliac screen.

C peptide: may be useful where diagnosis of type of diabetes is unclear or for research purposes.

Genetics: Consider genetic testing if clinical features, disease behaviour or family history suggests monogenic diabetes.

Management

- Admit all children and young people up to 18 years of age to the paediatric ward, unless there is reasonable concern for the safety of the young person or other children on the ward should they be admitted to a paediatric setting.
- Document history and examination
- Fundoscopy to exclude cataract (approximately 0.7% of children presenting with diabetes have a cataract secondary to metabolic disturbance⁶)
- Allow to eat and drink if tolerated (if vomiting follow the DKA pathway¹)
- Provide newly diagnosed rucksack to the family and TTO bag
- Inform diabetes consultant
- Inform diabetes specialist nurse (mobile 07973704946) and email fhft.paediatricdiabetes@nhs.net
- Inform dietician (01276604053) and order dietician review on EPIC.

The child and family should be seen by paediatric diabetes MDT (multidisciplinary team) within 24 hours of admission or next working day if weekend/bank holiday.

What dose of insulin should be used at diagnosis?

- Under 4 years: Prescribe **long acting insulin** 0.2 units/kg once at night
Insulin Detemir (brand name **Levemir**) Diabetes team to consider splitting dose.
e.g., A 3-year-old, 15kg child will need $15 \times 0.2 = 3$ units of levemir at bedtime
- Over 4 years: Prescribe **long acting insulin** 0.25 units/kg once at night
Degludec (brand name Tresiba)
e.g., A 12-year-old, 40kg child will need $40 \times 0.25 = 10$ units of Degludec at bedtime
- Prescribe **Novorapid**

- The insulin to carbohydrate ratio represents how many grams of carbohydrate are covered by 1 unit of insulin. Given 10-15min premeal.

AGE	Insulin to Carbohydrate Ratios	ISF / Correction dose	Max bolus
<2 yrs	1 :20 grams	1:10 mmol/L (For BG >6 mmol/L)	6 units
2-4yrs	1: 15 grams	1:8 mmol/L (For BG >6 mmol/L)	9 units
5-12 yrs	1: 10 grams	1:5 mmol/L (For BG >6 mmol/L)	12 units
13yrs and above	1: 10 grams	1:3 mmol/L (For BG > 6 mmol/L)	20 units

Extra Insulin Doses

Weight (Kg)	Novorapid dose (units)	
	Ketones 0.6 – 1.5	Ketones Above 1.5
10	+1	+2
20	+2	+4
30	+3	+6
40	+4	+8
50	+5	+10
60	+6	+12
70	+7	+14
80	+8	+16
90	+9	+18

- On top of the dose required premeal, the extra dose of rapid-acting insulin (insulin aspart/Novorapid) if ketones > 0.6mmol/L is shown above. This is based on weight and ketone levels (0.1units/kg if ketones 0.6 – 1.5 and 0.2units/kg if ketones >1.5). See table above for ease:

DO NOT GIVE NOVORAPID INJECTIONS MORE THAN EVERY TWO HOURS WITHOUT DIABETES TEAM ADVICE AS STACKING OF RAPID-ACTING INSULIN CAN LEAD TO HYPOGLYCAEMIA

- All pts must have been shown and use My life app to help with bolus insulin calculations for all subcutaneous insulin administration and the target blood glucose is set at 6mmols.
- ISF (insulin sensitivity factor or correction dose) describes the drop-in blood glucose (BG) level (measured in mmol/l) for one unit of novorapid insulin that is administered.
- Families are taught level 3 carbohydrate counting from diagnosis. Insulin-to-carb ratio (ICR): 1 unit of Insulin needed for a set amount of carbohydrate. For example: if the ICR is 1/20gms – the app advises 1 unit of Novorapid for every 20gms of carbohydrate eaten.
- The mylife app will add the calculations from both ratios based on the blood glucose and carbohydrate amount entered to advise the total Novorapid that should be given. The

app WILL NOT add insulin needed for high ketones which you need to do manually as above:

- Before all food and drink containing carbohydrates:
 1. Calculate the carbohydrate content of the food and drink using the 'Carbs and Cals book'.
 2. Measure the blood glucose level using the Instant meter.
 3. Enter the blood glucose reading and carbohydrate value into the mylife app
 4. If ketones high, calculate Insulin for ketones and ADD to mylife recommended Insulin dose
 5. Give or supervise the insulin dose being given prior to the food or drink
 6. Ensure the carbohydrate value, blood glucose level and insulin dose are documented on the patient's record, including signing the insulin prescription with the time of administration
- The starting dose of total insulin (long acting and rapid acting insulin) is usually 0.5-0.75 units / kg / day. Adolescents and children with high levels of ketosis at diagnosis are likely to need doses at the higher end of this treatment range.
(Encourage patients to adjust their insulin doses based on general trends in their blood glucose levels and support them to do this).
- All subcutaneous insulin injections administered by a healthcare professional should be given using an Autoschild insulin safety needle and Novopen Echo Plus pen. The CYP, where appropriate, should be encouraged to administer their own insulin injections from diagnosis. Where this is not appropriate, the parent/carer should be encouraged to administer the insulin injections from diagnosis.

How often should the blood glucose levels be checked?

- Advise family to test blood glucose **minimum of 5 times a day** (including before breakfast, before lunch, before evening meal, bedtime and one other time e.g., in the middle of night, 2-hour post meal)
- Self-monitoring of blood glucose (SMBG) is essential to aid adjustment of insulin dosages.
- **Target blood glucose levels:**
 - between 4 - 7mmol/L before meals,
 - between 5-9 mmol/L post prandial 2 hours after meal
 - 4-7 mmol/L at waking
 - The ideal target blood glucose for each child may vary with age and stage of puberty. The aim is to achieve blood glucose levels as close to normal as possible whilst avoiding frequent or severe hypoglycaemia.
- All CYP diagnosed with T1DM will be offered a continuous glucose monitor (CGM) before discharge. Where the CGM is in place, the glucose reading from the CGM should be used to inform care decisions, **unless the CYP has symptoms which do not correlate with the CGM reading**, in which case a finger prick glucose level should be checked.

Ketone testing

All children with diabetes need to be taught how to test for **blood ketones** as part of sick day rule advice and be provided with an appropriate ketone meter and ketone testing strips.

Ketone level should be assessed via the measurement of beta-hydroxybutyric acid by capillary blood sample

In a two-centre randomised controlled trial of low risk of bias, including 123 children, adolescents and young adults aged under 22 years, use of blood ketone monitoring resulted in a significant reduction (of about 50%) in the incidence of hospitalisation or emergency assessment⁵.

What structured Education topics should be covered at Diagnosis and during the first month following diagnosis?

We aim that the patient / family complete 8 out of the 12 educational sessions before discharge. If this is not possible, aim to complete within a couple of weeks of discharge:

1. What is diabetes?
2. Practical skills – blood glucose testing, insulin injections and rotating sites
3. Healthy eating and impact of food on glucose excursions
4. Highs and lows
5. Sick day rules
6. DKA (Diabetic Ketoacidosis)
7. Correction doses
8. Carbohydrate counting
9. School
10. Exercise
11. Future complications
12. Travel and lifestyle
13. Advise to have regular oral health reviews as they are at higher risk of periodontitis.⁴
14. Advise that all CYP from 12 years of age will require regular diabetic retinopathy eye screening which is performed every 1-2 years, and that the GP should refer to the eye screening service.
15. Advise to download Digibete app for age-appropriate resources to help with self-management of type 1 diabetes.

Continuous Glucose monitoring ⁴

- Start real-time continuous glucose monitoring (rtCGM) to all children and young people with type 1 diabetes, alongside education to support children and young people and their families and carers to use it.
- Start intermittently scanned continuous glucose monitoring (isCGM, commonly referred to as 'flash') to children and young people with type 1 diabetes aged 4 years and over who are unable to use rtCGM or who express a clear preference for isCGM

What do you do before discharge?

- Ensure discharge checklist is completed before discharge (See Appendix F)
- **Do a discharge summary on the standard newly diagnosed diabetic template on EPIC**
- **Use the smart phrase:**
.paeddiabnewlydiagnosedover4 (use this for children aged 4 yrs and over)
.paeddiabnewlydiagnosedunder4 (use this for children under 4 yrs of age)

Please ensure the letter has the following for GP to prescribe

NovoRapid Solution for injection, 3ml Cartridges 100 units/ml - 1 box 5 Cartridges
Novopen Echo plus x 2 (1 x red pen and 1 x blue pen)
Degludec (Tresiba) 100 units/ml, 3 ml cartridges – 1 box x 5 (4 years old or above)
Levemir 100 units/ml, 3ml cartridges- 1 box x5 (under 4 years)
Instant Test Strips (50) (UK) PIP Code 417-0759 x 6 Boxes
FastClix Lancets (204) (UK) PIP Code: 351-2795 x 4 Boxes
GlucoFix Tech Sensors (50) PIP Code: 416-4141 x 6 boxes
GlucoFix Tech Ketone Sensors (10) PIP Code: 423-8036 x 2 boxes
Glucagon HypoKit x 2 Boxes
Glucogel x 1 box of 3 X 25gram
Sharps bin (Medium) x 2
4mm BD pen needles x 1 box
LIFT JUICE 60mls x 6 bottles
BD Autosheild Safety Needles x 1 box

Prescribe Novorapid, Levemir or Degludec and Glucagon to take home from hospital pharmacy.

What follow up should the child have after initiation of insulin therapy?

- On discharge and for the first 7 days following diagnosis, the family should be able to contact the Diabetes Specialist Team daily if required (face to face, telephone, text, email).
- All children with diabetes mellitus should have access to 24-hour telephone advice
- All school aged children should have a school care plan in place either before or soon after return to school.
- Education and written information should consider the patient's and family/carer's learning needs and language preferences.
- Emotional and psychological support should be offered after diagnosis to patients and their family/carers⁴.
- Outpatients follow up in the MDT clinic with the consultant in 2-4 weeks' time.

Families, children and young people with diabetes benefit greatly from a good start to diabetes care pathway with confident, clear, positive messages, support and advice. Frequent contact with the children's diabetes team is recommended to help manage the changing requirements of diabetes in its early phases. The contacts may be in clinic, home visits or telephone.

References

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3. Association of children's diabetes clinicians (2021) *Care of the well child, newly diagnosed with Type 1 Diabetes Mellitus*. Available at: <https://www.a-c-d-c.org/endorsed-guidelines/> (Accessed: 07 June 2024)
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5. Laffel, L. M. B. *et al.* (2006) 'Sick day management using blood 3-hydroxybutyrate (3-OHB) compared with urine ketone monitoring reduces hospital visits in young people with T1DM: a randomized clinical trial', *Diabetic Medicine*, 23(30), pp. 278-284. Available at: <https://doi.org/10.1111/j.1464-5491.2005.01771.x> (Accessed: 07 June 2024)
6. Lafusco, D. *et al.* (2011) 'Acute juvenile cataract in newly diagnosed type 1 diabetic patients: a description of six cases', *Pediatric Diabetes*, 12(7), pp. 642-648. Available at: <https://doi.org/10.1111/j.1399-5448.2010.00749.x> (Accessed: 07 June 2024)

Appendix A - Discharge Checklist

Subject	Information Given	Date & Sign
Seen by Dietitian		
Seen by Diabetes consultant		
Seen by Psychologist		
Insulin	Name, Storage, Action	
Insulin Injections	When how and where to administer	
Sharps disposal	Sharps bin	
Completed DeApp sessions 1-8		
Blood glucose Meter	Name of meter: - test strips/lancets	
Continuous Glucose Monitor/ Flash Glucose Monitor	What is it? How to use it?	
Blood glucose monitoring and recording	Record book?	
My Life app	Downloaded, set up and taught how to use?	
Hypoglycaemia GlucoGel/GlucaGen HypoKit	Booklet	
Blood test for Ketones	Blood ketone strips When and how to check How to interpret result	
Follow up appointment	When/Where	
Prescriptions	(Speak to Diabetes Nurses Check Guidelines)	
Diabetes UK Medic Alert	Leaflet Leaflet/ Medical information on phone	
Hyperglycaemia	Discussed correction doses-when and how to administer dose	
Illness management	How often to check, when to call for advice, how to correct ketones	
Exercise	How to monitor BG and how to interpret result	
School Management	Education booked Care plan devised	
Disability living allowance application	3 months post diagnosis Diabetes UK guides	
Discussion with siblings & family members		
General holiday management	Travel letter	
Local support groups		
Diabetes Complications	Discussed	
Research		
Downloading	How to download How to review the data once you have downloaded	
Parents contact details		

Evaluation and Consent form for sharing personal data		
Seen by DSN (Diabetes Specialist Nurse)		

Appendix B - Pathway for newly diagnosed child or young person with diabetes

Referral of a child/young person aged 0 – 18 years with suspected or confirmed newly diagnosed Type 1 Diabetes from General Practitioner or Emergency Department

- Urgent referral to on call paediatric team
- Paediatric team to accept all referrals for same day review

Investigations: available on EPIC as **newly diagnosed diabetic panel:**

Lab blood glucose
HbA1c
U&E
Islet cell antibodies (ICA) Glutamic Acid
Decarboxylase (GAD) antibodies
IA-2 antibodies
TPO antibodies
Thyroid function tests (TFTs)
Coeliac screen including total IgA

- Diagnosis of type 1 diabetes is confirmed by combination of: History of polydipsia, polyuria and weight loss AND blood glucose ≥ 11.1 mmol/l
- Do clinical assessment and perform investigations including blood ketones and blood gas

Unwell with signs of DKA
Blood pH < 7.3 or bicarbonate < 15

Well and blood pH > 7.3
and bicarbonate > 15

- Admit & weigh. Follow DKA Protocol and complete integrated care pathway for children and young people with DKA
- Review by middle grade and paediatric consultant
- Commence Levemir (< 4 yr) 0.2 units/kg once a day or Degludec (4 yr and above) 0.25 units/kg once a day

- Admit & weigh. Follow guideline 'Management of newly diagnosed type 1 diabetes in children and young people (not in DKA)'
- Commence Levemir (< 4 yr) 0.2 units/kg once a day or Degludec (4 yr and above) 0.25 units/kg once a day
- Use age banded level 3 carbohydrate counting sheets for novorapid insulin regime

INFORM DIABETES TEAM

Diabetes on call consultant by email/phone & PDSN/ via email
(fhft.paediatricdiabetes@nhs.net) or phone (07973 704946) & dietitian on EPIC

- Commence education with family
- Ask family to download Digibete app and start to access information
- Set up the Myllfe app and use this app for all insulin dose calculations.

- Review by diabetes MDT members (PDSN, dietitian, consultant) within 24 hours or next working day if weekend/bank holiday
- Commence structured education Digibete.
- Commence bolus calculator, CGMS and newly diagnosed discharge check list
- Allocate key worker and where possible meet clinical psychologist
- Ward doctors to do standard newly diagnosed discharge letter (from Epic)

- Daily contact with the family to be offered by the allocated PDSN for the first 7 days, and to offer one home visit
- Inform diabetes administrator to book 1st outpatient appointment with PDSN in 2 weeks

- Further dietetic review within 4 weeks of diagnosis in PDSN/Dietician clinic
- Diabetes MDT clinic appointment with consultant within 6-8 weeks of diagnosis
- Initial introduction and assessment with clinical psychologist at diabetes MDT clinic
- Newly diagnosed diabetic group education session within 6 months of diagnosis

Full version control record

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This guideline has been registered with the Trust. However, clinical guidelines are guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt, contact a senior colleague or expert. Caution is advised when using guidelines after the review date.

This guideline is for use in Frimley Health NHS Foundation Trust hospitals only. Any use outside this location will not be supported by the Trust and will be at the risk of the individual using it.

Version History

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Related Documents

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