ssociation of Children's Diabetes Clinicians

Clinical Guideline

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

SETTING *Insert hospital name*

FOR STAFF Medical and nursing staff

PATIENTS Children with diabetes and their families

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

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 guideline for management of children presenting in diabetic ketoacidosis should be followed[1]

Diagnostic Criteria for Diabetes Mellitus in Childhood and Adolescence

WHO Diagnostic criteria for diabetes based on blood glucose measurements **and** the presence or absence of symptoms as detailed below[2].

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

Investigations to perform at diagnosis

- **Random blood glucose**
- **HbA1c (glycated haemoglobin)**
- **Screening for coeliac disease:** Measure either IgA anti tissue transglutaminase antibodies (tTGA) or IgA anti-endomysial antibody (EMA). There is no evidence to support use of both. Do not carry out anti-gliadin antibody serological tests[5, 6, 7].

  - Measure total IgA
  - The IgA tTGA and IgA EMA serological tests show high levels of sensitivity and specificity in the diagnostic process for coeliac disease if IgA sufficient.
  - Anti-gliadin antibody serological tests show lower levels of sensitivity and specificity than tTGA and EMA.
  - If IgA deficient then use IgGtTGA or EMA as a screening test.

- **Screening for thyroid disease** – Measure both thyroid function tests (TSH) and Thyroid Peroxidase antibodies (TPO).
  - Literature suggests that between 4.2% and 9.6% of individuals will develop thyroid disease – with 39% developing it within 1 year of diagnosis [8-11]
- **Cataract:** Eye screening via simple fundoscopy is appropriate
  - Approximately 0.7% of children presenting with diabetes have a cataract secondary to metabolic disturbance[12].
- **Antibody markers predicting type 1 diabetes:** NICE advises against using Islet Cell Antibodies (ICA)and Glutamic Acid Decarboxylase Autoantibodies (GAD antibodies) to distinguish between Type 1 and other forms of diabetes, but they may be helpful as part of an overall clinical picture.
  - Antibody negative diabetes is not unusual. Reports suggest somewhere between 20 to 30% of children may be antibody negative at diagnosis[3,4]. Islet cell antibodies are more likely to be positive with studies reporting them positive in approximately 80% of children with diabetes[3]. There is significant variation though with age. In children diagnosed under the age of five approximately 10% are antibody negative. At 17yrs this increases to 44%[3] Alternative types of diabetes to type 1 should be considered if the patient is antibody negative and has a strong family history of diabetes.

- **C peptide:** This can be difficult to interpret, but 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[16].

What insulin regimen should be started at diagnosis?

- **Children are likely to benefit from an intensive insulin regimen and support at diagnosis** (either multiple daily insulin injections or continuous subcutaneous insulin infusion (CSII)). However due consideration needs to be given to patient and caregiver preferences.
- For those children / young people starting on multiple daily injections approximately 50% of the total daily dose should be basal insulin analogue (such as insulin glargine or insulin detemir) and 50% given as rapid insulin analogue (e.g.InsulinAspart, insulin Lispro, insulin Glulisine) in 3 divided doses before meals.
- Families should be taught **level 3** carbohydrate counting soon after diagnosis[16].
- For those children requiring conventional mixed insulin regimen (e.g. twice daily Novomix 30 or Humalog mix 25) the total daily dose is the same but two thirds of the total daily dose needs to be given before breakfast and one third before the evening meal. The range of premixed insulin currently available is limited.

- The Diabetes Control and Complication Trial demonstrated that adolescents and adults with type 1 diabetes managed with intensive insulin therapy and support achieved better control when compared to those on conventional insulin therapy[13]

- SEARCH for Diabetes In Youth Study Group examined the impact of insulin regimen intensification on metabolic outcomes (over time) in 1,606 children and young people with type 1 diabetes who had a baseline visit and at least one follow-up. Insulin regimens were divided into five categories. Category 1 (basal-bolus insulin with CSII) was considered the most intensive and category 5 (1-2 insulin injections per day, excluding basal insulin glargine or detemir) was considered the least intensive. Between baseline and most recent follow-up visit, 51.7% of the participants changed to a more intensive regimen, 44.7% had no change in their regimen, and 3.6% changed to a less intensive regimen. Among the youth in the no-change group, 15% were already on CSII at their baseline visit, and 56% were in either insulin regimen category 1 or 2 at baseline, indicating an intensive regimen at baseline. Over time, A1c levels increased significantly in all groups, but A1c levels were significantly lower in the more-intensive group than in the no-change group at the 1-year and 2-year visits ($p<0.05$). And both these groups showed a smaller increase in A1c than did the less-intensive group[14].

What dose of insulin should be used at diagnosis?

- The starting dose of insulin should be 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[16].

How often should the blood glucose levels be checked?

Self-monitoring of blood glucose (SMBG) is essential to aid adjustment of insulin dosages. Advise the family to test blood glucose a **minimum of 5 times a day** (including before breakfast, lunch, supper and bed time)[16].

- One systematic review identified poor quality studies which assessed the effect of frequency of self-monitoring on glycaemic control in people with type 1 diabetes. One non-randomised trial in children and two observational studies in adults reported that more frequent blood glucose monitoring (≥3 tests per day) was associated with improvements in glycaemic control[15]

- **Target blood glucose levels**:
  - between 4 - 7mmol/L before meals[16],
  - between 5-9 mmol/L post prandial 2 hours after meal[16]
  - 4-7 mmol/L at waking
  - >5 mmol/L for driving
  - 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.

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 testing strips[16].
    - There are two methods of monitoring ketone bodies; the measurement of beta-hydroxybutyric acid by capillary blood sample and measurement of acetoacetic acid by urine dipstick test. In a two centre randomised controlled trial (RCT) 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 assessment[17].

Inpatient or outpatient care?

- Both home based (or ambulatory care) and in patient care are safe.
- The decision to offer either should be based on availability of well trained staff to offer safe home based care, time of presentation, individual family circumstances and parental choice.
    - Recent Cochrane review concluded that there is insufficient high quality data to answer the question whether outpatient and /or home based management is better than in patient care[18,19]

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

TOPIC	DATE	DATE	DATE	DATE
What is Diabetes?				
Causes				
Symptoms				
Explanation of Honeymoon Period				
Insulin				
Different types of insulin, action & duration of action				
Dosages				
Use of correction doses				
Storage				
Leaflets				
Injections				
Technique				
Sites/rotation				
Pen/pump device				
Disposal of sharps				
Blood Glucose Monitoring				
Why we test				
How often & when				
Normal range				
When & how to seek advice				
Ketone testing				

Why, how and when to test				
Interpretation of results and actions to take				
When & how to seek advice				
Hypoglycaemia				
What is hypoglycaemia				
Causes/symptoms/prevention				
Management including use of glucose tablets, Glucagon etc.				
Dietary advice				
Healthy eating				
Carbohydrate counting				
Illness Management				
Sick day rules and Diabetic Ketoacidosis prevention				
24hr Telephone contact numbers				
Exercise				
Encouragement of exercise				
Management of exercise with diabetes				
Prescriptions – what is available on the NHS				
Identification				
Medic alert / diabetes card				
Disability Living allowance				
Managing at home and school				
School				
School care plan				
Equipment for school including hypoglycaemia treatment				
Support services including Diabetes UK and JDRF				

Education and written information should be taken into account of 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/carers[16].

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

- On discharge, the family should be offered daily contact (face to face, telephone, text, email or 2 way telecommunication systems using video computer technology) with Diabetes Specialist Team for first 7 days following diagnosis.
- 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
    - 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[19, 20].

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