



Type one diabetes in adults and children

Introduction

In collaboration with the National Institute for Health and Clinical Excellence, welcome to the first in a series of special bulletins featuring an overview of guidance for healthcare professionals. Look out for further publications on a variety of clinical areas relevant to primary care in future issues of Nursing in Practice.

Type 1 diabetes in adults

The NICE guideline on type 1 diabetes was originally published in July 2004. It covers the diagnosis and management of type 1 diabetes in children, young people and adults.

All NICE guidance is regularly updated in line with new developments in the area. The guideline has been reviewed and updated since publication, and was most recently updated in March 2010 to include recommendations on neuropathic pain. A decision on a further review will be published in August 2011.

This guideline deals specifically with type 1 diabetes, which results from the inability of the body to produce sufficient insulin or from its inability to deal with the intake of glucose from the diet.

It is aimed specifically at the diagnosis and management of type 1 diabetes in adults. A separate guideline has been produced for the diagnosis and management of type 1 diabetes in children and young people – this is covered later in this document.

GENERAL ADVICE ON DIABETES CARE STRUCTURE AND PROCESS

Diagnosis

If classical symptoms present, confirm diagnosis by a single laboratory glucose measurement.

If classical symptoms are not present, confirm diagnosis by two laboratory glucose measurements.

HbA1c measurement may support diagnosis. Where a person appears to have type 2 diabetes, consider type 1 diabetes if:

- Ketonuria is detected, or
- Weight loss is marked, or
- The person does not have features of the metabolic syndrome or other contributing illness.

Manage each person as an individual, rather than as a member of any cultural, economic or health-affected group. Consider individual and cultural preferences when following this guideline.

Review the person's individual care plan annually. Modify the care plan according to changes in wishes, circumstances and medical findings, and record the details.

Provide advice to people with type 1 diabetes using a coordinated approach, with professionals working together to deploy a range of skills.

Provide advice on a walk-in/telephone-request basis during working hours and make a helpline available to people with specific diabetes expertise on a 24-hour basis.

Establish diabetes registers to support recall

systems for surveillance of complications and vascular risk, and for quality management. Make people with diabetes aware of support groups and their functions.

MANAGING ADULTS WITH TYPE 1 DIABETES

Managing diabetic ketoacidosis

Professionals managing diabetic ketoacidosis (DKA) should be adequately trained including regular updating, and be familiar with all aspects of its management that are associated with mortality and morbidity. Management of DKA should be in line with local clinical governance.

Use:

- Isotonic saline as primary fluid not given too rapidly.
- Intravenous insulin.
- When plasma glucose concentration has fallen to 10–15 mmol/litre: glucose-containing fluids (not more than 2 litres in 24 hours) with higher rates of insulin infusion than used in other situations (for example, 6 U/hour monitored for effect).
- Early potassium replacement with frequent monitoring.

Dietary management

Offer nutritional information from diagnosis onwards and education programmes that enable people to make optimal choices about the foods they wish to consume.

Discussion topics should include:

- Hyperglycaemic effects of different foods in the context of the insulin preparations chosen to match the person's food choices.

- Effects of consuming different food types and the insulin preparations available to match them.
- Choice of content, timing and amount of snacks taken between meals and at bedtime – modify on the basis of self-monitoring tests.
- Healthy eating to reduce arterial risk (low glycaemic index foods, fruit and vegetables, types and amount of fat).

Physical activity

Advise that physical activity can reduce enhanced arterial risk in the medium and longer term.

Give information (if the person chooses to increase physical activity) on:

- Appropriate intensity and frequency of physical activity.
- Self-monitoring of changed insulin and/or nutritional needs.
- Effect of exercise on blood glucose levels when insulin levels are adequate (risk of hypoglycaemia) or when hypoinsulinaemic (risk of exacerbation of hyperglycaemia).
- Appropriate adjustments of insulin dosage and/or nutritional intake for exercise and for 24 hours afterwards.
- Interactions of exercise and alcohol.

Smoking

Advise young adult non-smokers never to start smoking.

Advise people who smoke on smoking cessation and use of smoking cessation services (where appropriate).

Reinforce messages at least annually in continuing smokers (and at every clinical contact if the person might consider stopping smoking).

Monitoring blood glucose

Clinical monitoring: Measure HbA_{1c} (high precision DCCT-aligned method) every 2–6 months at the time of, or a few days before, consultation.

Communicate the results (as 'A1c' for simplicity) to the person with diabetes. If haemoglobinopathy or haemoglobin turnover are abnormal, use other methods (total glycated haemoglobin estimation, or assessment of glucose profiles).

Avoid fructosamine measurement as a routine.

Consider continuous glucose monitoring systems if:

- There is repeated hyper- or hypoglycaemia at the same time of day, or
- Hypoglycaemia unawareness is unresponsive to conventional insulin dose adjustment.

Self-monitoring: Advise use of self-monitoring as part of an integrated package including:

- Appropriate insulin regimens.
- Other diabetes education.
- Advise use of meters and strips chosen to suit individual needs (but not use of sites other than the fingertips for self-monitoring).

Advise a frequency of self-monitoring depending on:

- Characteristics of an individual's blood glucose control.

- Insulin treatment regimen.
- Personal preference in using the results to achieve the desired lifestyle.

Teach self-monitoring skills close to time of diagnosis and initiation of insulin therapy.

Targets for clinical monitoring:

HbA_{1c} < 7.5 %

If increased arterial risk: HbA_{1c} = 6.5 %.

Advise that any improvement is beneficial, even if target HbA_{1c} levels are not reached (and the greater the improvement, the more the benefit).

Targets for self-monitoring:

Pre-prandial blood glucose level 4.0–7.0 mmol/litre.

Post-prandial blood glucose level < 9.0 mmol/litre.

Targets – points to consider:

With lower HbA_{1c} levels, beware of:
Undetected hypoglycaemia.
Risk of disabling hypoglycaemia.
Risk of hypoglycaemia unawareness.

Insulin therapy

The guidance recommends using multiple insulin injection regimens in adults who prefer them in an integrated package with education, food, skills training and appropriate self-monitoring.

Advise twice-daily insulin regimens (often biphasic pre-mixes; analogues in those prone to hypoglycaemia at night) for those who want them, who find adherence to lunch-time insulin injections difficult and those with learning difficulties who may require assistance.

Meal-time insulin

Use rapid-acting insulin analogues rather than unmodified insulin:

- Where nocturnal or late inter-prandial hypoglycaemia is a problem.
- To avoid need for snacks, while maintaining equivalent blood glucose control.

Basal/nocturnal insulin supply

Use isophane (NPH) insulin or long-acting insulin analogues (insulin glargine) for basal/nocturnal insulin supply (isophane (NPH) insulin given at bedtime, or given twice daily with meal-time insulin analogues).

Use long-acting insulin analogues (insulin glargine) when:

- Nocturnal hypoglycaemia is a problem on isophane (NPH) insulin
- Morning hyperglycaemia on isophane (NPH) insulin results in difficult day-time blood glucose control
- Rapid-acting insulin analogues are used for meal-time blood glucose control.

Advise detailed review of regimens and monitoring for people whose nutritional and physical activity patterns vary considerably from day to day.

Oral glucose-lowering drugs

Avoid the general use of oral glucose-lowering drugs in people with type 1 diabetes.

Insulin delivery

Provide the device (usually injection pen[s]) that allows optimal wellbeing – special devices are useful in some people with special needs.

Injection: into deep subcutaneous fat, using needles of length appropriate to the individual.

Site: usually the abdominal wall (if not a problem) but thigh may give better absorption for isophane (NPH) insulin.

Rotate within a site, but not between sites, for insulin given at one time of day. Monitor injection sites annually, or more often if glucose control problem. Disposal of needles: provide sharps containers and arrangements for their disposal.

Managing hypoglycaemia

Aim for hypoglycaemia avoidance, while maintaining blood glucose control as close to optimum levels as is feasible.

- Self-management will involve taking any available glucose/sucrose-containing substance that can be swallowed.
- If a patient suffers a decreased consciousness level and is unable to take oral treatment safely, give intramuscular glucagon (administered by trained user) or intravenous glucose (administered by a skilled professional).
- If level of consciousness is not improving significantly at 10 minutes, give intravenous glucose.
- Give oral carbohydrate when safe, and ensure continuing observation for risk of relapse.

Blood pressure control

Intervene if:

- Above 135/85 mmHg, or
- Above 130/80 mmHg with abnormal

albumin excretion rate or another one of the features of the metabolic syndrome.

Discuss:

- Needs.
- Intervention levels.
- Likely gains of therapy.
- Negative aspects of therapy.

Use a low-dose thiazide as first line unless abnormal albumin excretion rate. Anticipate need for multiple therapy. Advise on appropriate lifestyle changes.

ONGOING CARE FOR ADULTS WITH TYPE 1 DIABETES

Assessing arterial risk factors annually

Include albumin excretion rate, smoking, blood glucose control, blood pressure, full lipid profile, age, family history of arterial disease, abdominal adiposity.

Do not use arterial risk tables, equations or engines.

Diabetes kidney damage

Annually:

- Assess albumin:creatinine ratio by first-pass morning urine and measure serum creatinine concurrently.

If abnormal surveillance result (> 2.5 mg/mmol for men, > 3.5 mg/mmol for women) confirm result at subsequent clinic visits.

Suspect other renal disease if:

- Particularly high blood pressure.
- Sudden proteinuria.
- Significant haematuria.

- Systemic ill health.
- No progressive retinopathy.

Diabetes eye damage

Assess yearly, or more frequently if indicated, by visual acuity and digital photography after mydriasis with tropicamide.

Foot problems

Annual structured foot surveillance should check for:

- Skin condition.
- Shape and deformity.
- Shoes.
- Impaired sensory nerve function (with 10g monofilament and non-traumatic pain).
- Vascular supply, including peripheral pulses.

Erectile dysfunction

Ask men with type 1 diabetes annually whether erectile dysfunction is an issue.

Offer a trial of a PDE5 inhibitor drug if appropriate. If PDE5 inhibitors are not successful, discuss referral to a service offering other medical and surgical management.

Type 1 diabetes in children and young people

In July 2004, NICE published a clinical guideline on the diagnosis and management of type 1 diabetes in children and young people up to the age of 17.

The guideline is designed to ensure that children and young people with type 1 diabetes are offered an ongoing integrated package of care by a multidisciplinary paediatric diabetes care team.

All NICE guidance is regularly updated in line with new developments in the area. This guideline was updated in June 2009 to include new guidance on screening for other conditions in children and young people with type 1 diabetes.

The recommendation to re-test for coeliac disease at least every three years after diagnosis has also been removed from the guideline, following the publication of a guideline on the recognition and assessment of coeliac disease. The guideline will be reviewed again this August.

DIAGNOSIS

Type 1 diabetes is an autoimmune disease that permanently destroys beta cells in the pancreas, meaning that the body can no longer produce insulin.

Type 1 diabetes can be deadly without regular insulin injections. Within 20 years of diagnosis of type 1 diabetes, nearly all of

those diagnosed have some degree of retinopathy.

The diagnosis of type 1 diabetes in children and young people should be based on the criteria specified in the 2006 World Health Organization report on the diagnosis and classification of diabetes mellitus.

The symptoms and signs of type 1 diabetes include: hyperglycaemia (random blood glucose more than 11 mmol/litre), polyuria, polydipsia and weight loss.

NICE recommends that children and young people with suspected type 1 diabetes are offered same-day referral to a multidisciplinary paediatric diabetes care team that has the competencies needed to confirm diagnosis and to provide immediate care.

Consideration should be given to the possibility of other types of diabetes (such as early-onset type 2 diabetes, other insulin resistance syndromes, maturity-onset diabetes in the young and molecular/enzymatic abnormalities) in children and young people with suspected type 1 diabetes who:

- Have a strong family history of diabetes.
- Are obese at presentation.
- Are of black or Asian origin.
- Have an insulin requirement of less than 0.5 units/kg body weight/day outside a

partial remission phase.

- Have no insulin requirement.
- Rarely or never produce ketone bodies in the urine (ketonuria) during episodes of hyperglycaemia.
- Show evidence of insulin resistance (for example, acanthosis nigricans).
- Have associated features, such as eye disease, deafness, or another systemic illness or syndrome.

Register children and young people with type 1 diabetes onto a population-based, practice-based and/or clinic-based diabetes register.

MANAGEMENT

Children and young people with type 1 diabetes should be offered an ongoing integrated package of care by a multidisciplinary paediatric diabetes care team.

To optimise the effectiveness of care and reduce the risk of complications, the diabetes care team should include members with appropriate training in clinical, educational, dietetic, lifestyle, mental health and foot care aspects of diabetes for children and young people.

It is important to involve children and young people with type 1 diabetes and their families in making decisions about the package of care provided by the diabetes care team.

At the time of diagnosis, children and young people with type 1 diabetes should be offered home-based or inpatient management according to clinical need, family

circumstances and wishes, and residential proximity to inpatient services.

Home-based care with support from the local paediatric diabetes care team (including 24-hour telephone access to advice) is safe and as effective as inpatient initial management.

Children and young people who present with diabetic ketoacidosis should have their diabetic ketoacidosis treated in hospital according to the guidance outlined in the NICE guideline.

PROVIDING ONGOING CARE

Education

Children and young people with type 1 diabetes and their families should be offered timely and ongoing opportunities to access information about the development, management and effects of type 1 diabetes.

The information provided should be accurate and consistent and it should support informed decision-making.

The method of delivering education and content will depend on the individual and should be appropriate for the child's or young person's age, maturity, culture, wishes and existing knowledge within the family.

Particular care should be given to communication and the provision of information when children and young people with type 1 diabetes and/or their parents have special needs, such as those associated with

physical and sensory disabilities, or difficulties in speaking or reading English.

INSULIN REGIMENS

While the insulin regimen should be individualised for each patient, three basic types of insulin regimen can be considered.

1. One, two or three insulin injections per day: these are usually injections of short-acting insulin or rapid-acting insulin analogue mixed with intermediate-acting insulin. The insulin preparations may be mixed by the patient at the time of injection.
2. Multiple daily injection regimen: the person has injections of short-acting insulin or rapid-acting insulin analogue before meals, together with one or more separate daily injections of intermediate-acting insulin or long-acting insulin analogue.
3. Continuous subcutaneous insulin infusion (insulin pump therapy): a programmable pump and insulin storage reservoir that gives a regular or continuous amount of insulin (usually in the form of a rapid-acting insulin analogue or short-acting insulin) by a subcutaneous needle or cannula.

Insulin preparations

Different types of insulin are available for use in the insulin regimens for type 1 diabetes. They work for different lengths of time when injected subcutaneously.

The appropriate insulin with its particular absorption profile should be matched to the person's needs in an attempt to obtain

normal to near-normal blood glucose control.

The main categories of insulin are:

- Rapid-acting insulin analogues: these aim to work like the insulin normally produced to cope with a meal; they have an onset of action of approximately 15 minutes and a duration of action of 2–5 hours.
- Short-acting insulins: these work more slowly than rapid-acting insulin analogues; they have an onset of action of 30–60 minutes and a duration of action of up to 8 hours.
- Intermediate-acting insulins: these have an onset of action of approximately 1–2 hours, maximal effects between 4 and 12 hours and a duration of action of 16–35 hours.
- Long-acting insulin analogues: these can last for a longer period than intermediate-acting insulins; they are normally used once a day and achieve a steady-state level after 2–4 days to produce a constant level of insulin.

NICE recommends offering a choice of insulin delivery systems that takes account of the patient's insulin requirements and personal preferences.

Non-insulin agents (oral antidiabetic drugs)

Children and young people with type 1 diabetes should not be offered acarbose or sulphonylureas in combination with insulin because they may increase the risk of hypoglycaemia without improving glycaemic control.

Metformin in combination with insulin is suitable for use only within research studies because the effectiveness of this combined treatment in improving glycaemic control is uncertain.

Monitoring glycaemic control

Children and young people with type 1 diabetes and their families should be informed that the target for long-term glycaemic control is an HbA1c level of less than 7.5% without frequent disabling hypoglycaemia and that their care package should be designed to attempt to achieve this.

They should be offered testing of their HbA1c levels two to four times per year (more frequent testing may be appropriate if there is concern about poor glycaemic control).

Current HbA1c measurements should be made available in outpatient clinics because their availability can lead to immediate changes in insulin therapy and/or diet and so reduce the need for follow-up appointments.

It is important to stress that aiming to achieve low levels of HbA1c can lead to increased risks of hypoglycaemia and that high levels of HbA1c can lead to increased risks of long-term microvascular complications.

Children and young people with HbA1c levels consistently above 9.5% should be offered additional support by their diabetes care teams to help them improve their glycaemic control because they are at increased risk of developing diabetic ketoacidosis and long-term complications.

Diet

The guideline recommends that children and young people with type 1 diabetes are offered appropriate dietetic support to help optimise body weight and glycaemic control.

This includes information on basic nutritional requirements and the importance of healthy eating in reducing the risk of cardiovascular disease (including foods with a low glycaemic index, fruit and vegetables, and types and amounts of fats).

Exercise

All children and young people, including those with type 1 diabetes, should be encouraged to exercise on a regular basis because this reduces the risks of developing macrovascular disease in the long term.

Children and young people with type 1 diabetes and their families should be informed about the effects of exercise on blood glucose levels and about strategies for preventing exercise-induced hypoglycaemia during and/or after physical activity.

SCREENING FOR COMPLICATIONS AND ASSOCIATED CONDITIONS

Children and young people with type 1 diabetes should be offered screening for:

- Coeliac disease at diagnosis.
- Thyroid disease at diagnosis and annually thereafter until transfer to adult services.
- Retinopathy annually from the age of 12 years.
- Microalbuminuria annually from the age of 12 years.
- Blood pressure annually from the age of 12 years.

Additionally, the guideline recommends an annual foot care review and an investigation of the state of injection sites at every clinic visit.