

Diabetes (type 1 and type 2) in children and young people: diagnosis and management

NICE guideline

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Your responsibility

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

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This guideline partially replaces CG15.

This guideline is the basis of QS125.

Overview

This guideline covers the diagnosis and management of type 1 and type 2 diabetes in children and young people aged under 18. The guideline recommends strict targets for blood glucose control to reduce the long-term risks associated with diabetes.

In November 2016, recommendations 1.2.115 and 1.3.52 were amended to add information on when eye screening should begin. Please note the date label of [2015] is unchanged, as this is when the recommendation was written and the evidence last reviewed. The changes made in November 2016 are clarifications of the 2015 wording, not new advice written in 2016, so do not carry a [2016] date.

Who is it for?

- Healthcare professionals that care for children and young people with diabetes
- Commissioners and providers of diabetes services
- Children and young people with type 1 or type 2 diabetes, and their families and carers.

Introduction

This guideline updates and replaces the sections for children and young people in type 1 diabetes (NICE guideline CG15).

Diabetes is a long-term condition that can have a major impact on the life of a child or young person, as well as their family or carers. In addition to insulin therapy, diabetes management should include education, support and access to psychological services, as detailed in this guideline. Preparations should also be made for the transition from paediatric to adult services, which have a somewhat different model of care and evidence base.

Type 1 diabetes is becoming more common in the UK, and since 2004 type 2 diabetes is also being diagnosed with increasing frequency. The 2013–14 National Diabetes Audit identified 26,500 children and young people with type 1 diabetes and 500 with type 2^[1]. Much of the general care for type 2 diabetes is the same as for type 1 diabetes, although the initial management is different. In addition, the overweight and obesity associated with type 2 diabetes also bring an increased risk of renal complications in particular, and of problems such as hypertension and dyslipidaemia. These differences in management and complications need guidance specific to type 2 diabetes, which is included here for the first time. A variety of genetic conditions (such as maturity-onset diabetes in the young) and other conditions (such as cystic fibrosis-related diabetes) may also lead to diabetes in children and young people, but the care of these diverse conditions is beyond the scope of this guideline.

Since 2004 there have been major changes to the routine management of type 1 diabetes, in an attempt to achieve much stricter targets for blood glucose control to further reduce the long-term risks associated with the condition. This national guidance is the first for children and young people to recommend attempting to reach a glycated haemoglobin (HbA1c) level near the normal range and near normoglycaemia. This tight control may be achieved by intensive insulin management (multiple daily injections or insulin pump therapy) from diagnosis, accompanied by carbohydrate counting. Newer technology such as continuous subcutaneous glucose monitoring may also help children and young people to have better blood glucose control, although this is not currently recommended for all children and young people with type 1 diabetes.

The Guideline Development Group believes that by implementing the strict blood glucose control recommended in this guideline, improvements can be made to diabetes care that reduce the impact of the condition on the future health of children and young people.

Safeguarding children

Remember that child maltreatment:

- is common
- can present anywhere
- may co-exist with other health problems, including diabetes.

See the NICE guideline on [child maltreatment](#) for clinical features that may be associated with maltreatment.

Medicines

The guideline will assume that prescribers will use a medicine's summary of product characteristics to inform decisions made with individual patients.

^[1] [National Paediatric Diabetes Audit report 2013–14.](#)

Patient-centred care

This guideline offers best practice advice on the care of children and young people with diabetes.

Patients and healthcare professionals have rights and responsibilities as set out in the [NHS Constitution for England](#) – all NICE guidance is written to reflect these. Treatment and care should take into account individual needs and preferences. Patients should have the opportunity to make informed decisions about their care and treatment, in partnership with their healthcare professionals. If the patient is under 16, their family or carers should also be given information and support to help the child or young person to make decisions about their treatment. If it is clear that the child or young person fully understands the treatment and does not want their family or carers to be involved, they can give their own consent. Healthcare professionals should follow the [Department of Health's advice on consent](#). If someone does not have capacity to make decisions, healthcare professionals should follow the [code of practice that accompanies the Mental Capacity Act](#) and the supplementary [code of practice on deprivation of liberty safeguards](#).

If a young person is moving between paediatric and adult services, care should be planned and managed according to the best practice guidance described in the Department of Health's [Transition: getting it right for young people](#).

Adult and paediatric healthcare teams should work jointly to provide assessment and services to young people with diabetes. Diabetes management should be reviewed throughout the transition process, and there should be clarity about who is the lead clinician to ensure continuity of care.

Key priorities for implementation

The following recommendations have been identified as priorities for implementation. The full list of recommendations is in [section 1](#).

Education and information for children and young people with diabetes

- Take particular care when communicating with and providing information to children and young people with type 1 and type 2 diabetes if they and/or their family members or carers (as appropriate) have, for example, physical and sensory disabilities, or difficulties speaking or reading English. [2004, amended 2015]

Insulin therapy for children and young people with type 1 diabetes

- Offer children and young people with type 1 diabetes multiple daily injection basal–bolus insulin regimens from diagnosis. If a multiple daily injection regimen is not appropriate for a child or young person with type 1 diabetes, consider continuous subcutaneous insulin infusion (CSII or insulin pump) therapy as recommended in [continuous subcutaneous insulin infusion for the treatment of diabetes mellitus](#) (NICE technology appraisal guidance 151). [new 2015]

Dietary management for children and young people with type 1 diabetes

- Offer level 3 carbohydrate-counting^[2] education from diagnosis to children and young people with type 1 diabetes who are using a multiple daily insulin injection regimen or continuous subcutaneous insulin infusion (CSII or insulin pump) therapy, and to their family members or carers (as appropriate), and repeat the offer at intervals thereafter. [new 2015]

Blood glucose and HbA1c targets and monitoring for children and young people with type 1 diabetes

- Advise children and young people with type 1 diabetes and their family members or carers (as appropriate) to routinely perform at least 5 capillary blood glucose tests per day. [new 2015]
- Offer ongoing real-time continuous glucose monitoring with alarms to children and young people with type 1 diabetes who have:
 - frequent severe hypoglycaemia or
 - impaired awareness of hypoglycaemia associated with adverse consequences (for example, seizures or anxiety) or

- inability to recognise, or communicate about, symptoms of hypoglycaemia (for example, because of cognitive or neurological disabilities). [new 2015]
- Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that an HbA1c target level of 48 mmol/mol (6.5%) or lower is ideal to minimise the risk of long-term complications. [new 2015]

Hyperglycaemia, blood ketone monitoring and intercurrent illness in children and young people with type 1 diabetes

- Offer children and young people with type 1 diabetes blood ketone testing strips and a meter, and advise them and their family members or carers (as appropriate) to test for ketonaemia if they are ill or have hyperglycaemia. [new 2015]

Psychological and social issues in children and young people with diabetes

- Offer children and young people with type 1 and type 2 diabetes and their family members or carers (as appropriate) timely and ongoing access to mental health professionals with an understanding of diabetes because they may experience psychological problems (such as anxiety, depression, behavioural and conduct disorders and family conflict) or psychosocial difficulties that can impact on the management of diabetes and wellbeing. [2004, amended 2015]

Diabetic kidney disease in children and young people with type 2 diabetes

- Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that:
 - using the first urine sample of the day ('early morning urine') to screen for moderately increased albuminuria (ACR 3–30 mg/mmol; 'microalbuminuria') is important, as this reduces the risk of false positive results
 - if moderately increased albuminuria is detected, improving blood glucose control will reduce the risk of this progressing to significant diabetic kidney disease
 - annual monitoring (see [recommendation 1.3.43](#)) is important because, if diabetic kidney disease is found, early treatment will improve the outcome. [new 2015]

Diabetic ketoacidosis

- Measure capillary blood glucose at presentation in children and young people without known diabetes who have increased thirst, polyuria, recent unexplained weight loss or excessive tiredness and any of the following:
 - nausea or vomiting
 - abdominal pain
 - hyperventilation
 - dehydration
 - reduced level of consciousness. [new 2015]

^[2] Level 3 carbohydrate counting is defined as carbohydrate counting with adjustment of insulin dosage according to an insulin:carbohydrate ratio.

1 Recommendations

The following guidance is based on the best available evidence. The [full guideline](#) gives details of the methods and the evidence used to develop the guidance.

The wording used in the recommendations in this guideline (for example, words such as 'offer' and 'consider') denotes the certainty with which the recommendation is made (the strength of the recommendation). See [update information](#) for details.

Blood glucose and plasma glucose

This guideline refers frequently to circulating glucose concentrations as 'blood glucose'. A lot of the evidence linking specific circulating glucose concentrations with particular outcomes uses 'plasma' rather than 'blood' glucose. In addition, patient-held glucose meters and monitoring systems are all calibrated to plasma glucose equivalents. However, the term 'blood glucose monitoring' is in very common use, so in this guideline we use the term 'blood glucose', except when referring to specific concentration values.

1.1 *Diagnosis*

1.1.1 Be aware that the characteristics of type 1 diabetes in children and young people include:

- hyperglycaemia (random plasma glucose more than 11 mmol/litre)
- polyuria
- polydipsia
- weight loss
- excessive tiredness. [2004, amended 2015]

1.1.2 Refer children and young people with suspected type 1 diabetes immediately (on the same day) to a multidisciplinary paediatric diabetes team with the competencies needed to confirm diagnosis and to provide immediate care. [2004, amended 2015]

- 1.1.3 Confirm type 1 diabetes in children and young people using the plasma glucose criteria specified in the World Health Organization's 2006 [report on the diagnosis and classification of diabetes mellitus](#). [2004, amended 2015]
- 1.1.4 When diagnosing diabetes in a child or young person, assume type 1 diabetes unless there are strong indications of type 2 diabetes, monogenic or mitochondrial diabetes (see recommendations 1.1.5 and 1.1.6). [new 2015]
- 1.1.5 Think about the possibility of type 2 diabetes in children and young people with suspected diabetes who:
- have a strong family history of type 2 diabetes
 - are obese at presentation
 - are of black or Asian family origin
 - have no insulin requirement, or have an insulin requirement of less than 0.5 units/kg body weight/day after the partial remission phase
 - show evidence of insulin resistance (for example, acanthosis nigricans). [2004, amended 2015]
- 1.1.6 Think about the possibility of types of diabetes other than types 1 or 2 (such as other insulin resistance syndromes, or monogenic or mitochondrial diabetes) in children and young people with suspected diabetes who have any of the following features:
- diabetes in the first year of life
 - rarely or never develop ketone bodies in the blood (ketonaemia) during episodes of hyperglycaemia
 - associated features, such as optic atrophy, retinitis pigmentosa, deafness, or another systemic illness or syndrome. [2004, amended 2015]
- 1.1.7 Do not measure C-peptide and/or diabetes-specific autoantibody titres at initial presentation to distinguish type 1 diabetes from type 2 diabetes. [new 2015]
- 1.1.8 Consider measuring C-peptide after initial presentation if there is difficulty distinguishing type 1 diabetes from other types of diabetes. Be aware that

C-peptide concentrations have better discriminative value the longer the interval between initial presentation and the test. [new 2015]

- 1.1.9 Perform genetic testing if atypical disease behaviour, clinical characteristics or family history suggest monogenic diabetes. [new 2015]

1.2 *Type 1 diabetes*

Education and information for children and young people with type 1 diabetes

- 1.2.1 Offer children and young people with type 1 diabetes and their family members or carers (as appropriate) a continuing programme of education from diagnosis. Ensure that the programme includes the following core topics:

- insulin therapy, including its aims, how it works, its mode of delivery and dosage adjustment
- blood glucose monitoring, including targets for blood glucose control (blood glucose and HbA1c levels)
- the effects of diet, physical activity and intercurrent illness on blood glucose control
- managing intercurrent illness ('sick-day rules', including monitoring of blood ketones [beta-hydroxybutyrate])
- detecting and managing hypoglycaemia, hyperglycaemia and ketosis. [new 2015]

- 1.2.2 Tailor the education programme to each child or young person with type 1 diabetes and their family members or carers (as appropriate), taking account of issues such as:

- personal preferences
- emotional wellbeing
- age and maturity
- cultural considerations
- existing knowledge
- current and future social circumstances

- life goals. [new 2015]
- 1.2.3 Encourage young people with type 1 diabetes to attend clinic 4 times a year because regular contact is associated with optimal blood glucose control. [2004, amended 2015]
- 1.2.4 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that like others they are advised to have:
- regular dental examinations (see the NICE guideline on [dental recall](#))
 - an eye examination by an optician every 2 years. [2004, amended 2015]
- 1.2.5 Encourage children and young people with type 1 diabetes and their family members or carers (as appropriate) to discuss any concerns and raise any questions they have with their diabetes team. [new 2015]
- 1.2.6 Give children and young people with type 1 diabetes and their family members or carers (as appropriate) information about local and/or national diabetes support groups and organisations, and the potential benefits of membership. Give this information after diagnosis and regularly afterwards. [2004, amended 2015]
- 1.2.7 Encourage children and young people with type 1 diabetes to wear or carry something that identifies them as having type 1 diabetes (for example, a bracelet). [2004]
- 1.2.8 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) how to find information about government disability benefits. [2004, amended 2015]
- 1.2.9 Take particular care when communicating with and providing information to children and young people with type 1 diabetes if they and/or their family members or carers (as appropriate) have, for example, physical and sensory disabilities, or difficulties speaking or reading English. [2004]
- 1.2.10 Children and young people with type 1 diabetes wishing to participate in sports that may have particular risks for people with diabetes should be offered comprehensive advice by their diabetes team. Additional information may be

available from local and/or national support groups and organisations, including sports organisations. [2004, amended 2015]

- 1.2.11 Offer education for children and young people with type 1 diabetes and their family members or carers (as appropriate) about the practical issues related to long-distance travel, such as when best to eat and inject insulin when travelling across time zones. [2004]

Smoking and substance misuse

- 1.2.12 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) about general health problems associated with smoking and in particular the risks of developing vascular complications. [2004]
- 1.2.13 Encourage children and young people with type 1 diabetes not to start smoking. See also the NICE guidelines on [preventing the uptake of smoking by children and young people](#) and [school-based interventions to prevent smoking](#). [2004, amended 2015]
- 1.2.14 Offer smoking cessation programmes to children and young people with type 1 diabetes who smoke. See also the NICE guidelines on [brief interventions and referral for smoking cessation](#), [smoking cessation services](#), [harm reduction approaches to smoking](#), and [smoking cessation in secondary care](#). [2004, amended 2015]
- 1.2.15 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) about the general dangers of substance misuse and the possible effects on blood glucose control. [2004]

Immunisation

- 1.2.16 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that the Department of Health's [Green Book](#) recommends annual immunisation against influenza for children and young people with diabetes over the age of 6 months. [2004]
- 1.2.17 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that the Department of Health's [Green](#)

Book recommends immunisation against pneumococcal infection for children and young people with diabetes who need insulin or oral hypoglycaemic medicines. [2004, amended 2015]

Insulin therapy for children and young people with type 1 diabetes

While the insulin regimen should be individualised for each patient, there are 3 basic types of insulin regimen.

Multiple daily injection basal–bolus insulin regimens: injections of short-acting insulin or rapid-acting insulin analogue before meals, together with 1 or more separate daily injections of intermediate-acting insulin or long-acting insulin analogue.

Continuous subcutaneous insulin infusion (insulin pump therapy): a programmable pump and insulin storage device that gives a regular or continuous amount of insulin (usually a rapid-acting insulin analogue or short-acting insulin) by a subcutaneous needle or cannula.

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.

- 1.2.18 Take into account the personal and family circumstances of the child or young person with type 1 diabetes and discuss their personal preferences with them and their family members or carers (as appropriate) when choosing an insulin regimen. [new 2015]
- 1.2.19 Offer children and young people with type 1 diabetes multiple daily injection basal–bolus insulin regimens from diagnosis. If a multiple daily injection regimen is not appropriate for a child or young person with type 1 diabetes, consider continuous subcutaneous insulin infusion (CSII or insulin pump) therapy as recommended in [continuous subcutaneous insulin infusion for the treatment of diabetes mellitus](#) (NICE technology appraisal guidance 151). [new 2015]
- 1.2.20 Encourage children and young people with type 1 diabetes who are using multiple daily insulin injection regimens and their family members or carers (as appropriate) to adjust the insulin dose if appropriate after each blood glucose measurement. [2004, amended 2015]

- 1.2.21 Explain to children and young people with type 1 diabetes using multiple daily insulin injection regimens and their family members or carers (as appropriate) that injecting rapid-acting insulin analogues before eating (rather than after eating) reduces blood glucose levels after meals and helps to optimise blood glucose control. [2004, amended 2015]
- 1.2.22 Provide all children and young people with type 1 diabetes who are starting continuous subcutaneous insulin infusion (CSII or insulin pump) therapy and their family members or carers (as appropriate) with specific training in its use. Provide ongoing support from a specialist team, particularly in the period immediately after starting continuous subcutaneous insulin infusion. Specialist teams should agree a common core of advice for continuous subcutaneous insulin infusion users. [2004, amended 2015]
- 1.2.23 Encourage children and young people with type 1 diabetes who are using twice-daily injection regimens and their family members or carers (as appropriate) to adjust the insulin dose according to the general trend in pre-meal, bedtime and occasional night-time blood glucose. [2004, amended 2015]
- 1.2.24 Explain to children and young people with newly diagnosed type 1 diabetes and their family members or carers (as appropriate) that they may experience a partial remission phase (a 'honeymoon period') during which a low dosage of insulin (0.5 units/kg body weight/day) may be sufficient to maintain an HbA1c level of less than 48 mmol/mol (6.5%). [2004, amended 2015]
- 1.2.25 Offer children and young people with type 1 diabetes a choice of insulin delivery systems that takes account of their insulin requirements and personal preferences. [2004]
- 1.2.26 Provide children and young people with type 1 diabetes with insulin injection needles that are of an appropriate length for their body fat. [2004, amended 2015]
- 1.2.27 Provide children and young people with type 1 diabetes and their family members or carers (as appropriate) with suitable containers for collecting used needles and other sharps. Arrangements should be available for the suitable

disposal of these containers. See also section 1.1.4 of the NICE guideline on [infection control](#). [new 2015]

- 1.2.28 Offer children and young people with type 1 diabetes a review of injection sites at each clinic visit. [2004, amended 2015]
- 1.2.29 Provide children and young people with type 1 diabetes with rapid-acting insulin analogues for use during intercurrent illness or episodes of hyperglycaemia. [new 2015]
- 1.2.30 If a child or young person with type 1 diabetes does not have optimal blood glucose control (see recommendations 1.2.54 and 1.2.67):
- offer appropriate additional support such as increased contact frequency with their diabetes team, and
 - if necessary, offer an alternative insulin regimen (multiple daily injections, continuous subcutaneous insulin infusion [CSII or insulin pump] therapy or once-, twice- or three-times daily mixed insulin injections). [new 2015]

Oral medicines for children and young people with type 1 diabetes

- 1.2.31 Metformin in combination with insulin is suitable for use only within research studies because the effectiveness of this combined treatment in improving blood glucose control is uncertain. [2004]
- 1.2.32 Do not offer children and young people with type 1 diabetes acarbose or sulphonylureas (glibenclamide, gliclazide, glipizide, tolazamide or glyburide) in combination with insulin because they may increase the risk of hypoglycaemia without improving blood glucose control. [2004, amended 2015]

Dietary management for children and young people with type 1 diabetes

- 1.2.33 Support children and young people with type 1 diabetes and their family members or carers (as appropriate) to develop a good working knowledge of nutrition and how it affects their diabetes. [new 2015]
- 1.2.34 Explain regularly to children and young people with type 1 diabetes and their family members or carers (as appropriate) how healthy eating (including eating

foods with a low glycaemic index, fruit and vegetables, and appropriate types and amounts of fats) can reduce their risk of cardiovascular disease, and support them to adjust their food choices accordingly. [new 2015]

- 1.2.35 Take into account social and cultural considerations when providing advice on dietary management to children and young people with type 1 diabetes. [new 2015]
- 1.2.36 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that children and young people with type 1 diabetes have the same basic nutritional requirements as other children and young people. Children and young people's food should provide sufficient energy and nutrients for optimal growth and development. [2004, amended 2015]
- 1.2.37 Offer level 3 carbohydrate-counting^[3] education from diagnosis to children and young people with type 1 diabetes who are using a multiple daily insulin injection regimen or continuous subcutaneous insulin infusion (CSII or insulin pump) therapy, and to their family members or carers (as appropriate), and repeat the offer at intervals thereafter. [new 2015]
- 1.2.38 Offer children and young people with type 1 diabetes who are changing their insulin regimen, and their family members or carers (as appropriate), dietary advice tailored to the new treatment. [new 2015]
- 1.2.39 Offer children and young people with type 1 diabetes and their family members or carers (as appropriate) education about the practical problems associated with fasting and feasting. [2004, amended 2015]
- 1.2.40 Encourage children and young people with type 1 diabetes and their family members or carers (as appropriate) to discuss the nutritional composition and timing of snacks with their diabetes team. [new 2015]
- 1.2.41 Encourage children and young people with type 1 diabetes to eat at least 5 portions of fruit and vegetables each day. [new 2015]
- 1.2.42 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that a low glycaemic index diet may help to

improve blood glucose control and reduce the risk of hyperglycaemic episodes. [new 2015]

- 1.2.43 Offer children and young people with type 1 diabetes and their family members or carers (as appropriate) advice and education to promote a low glycaemic index diet. [new 2015]
- 1.2.44 Offer children and young people with type 1 diabetes dietetic support to help optimise body weight and blood glucose control. [2004]
- 1.2.45 At each clinic visit for children and young people with type 1 diabetes measure height and weight and plot on an appropriate growth chart. Check for normal growth and/or significant changes in weight because these may reflect changes in blood glucose control. [2004, amended 2015]
- 1.2.46 Provide arrangements for weighing children and young people with type 1 diabetes that respect their privacy. [2004]

Exercise for children and young people with type 1 diabetes

- 1.2.47 Encourage all children and young people, including those with type 1 diabetes, to exercise on a regular basis because this reduces the risks of developing cardiovascular disease in the long term. [2004, amended 2015]
- 1.2.48 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that they can take part in all forms of exercise, provided that appropriate attention is given to changes in insulin and dietary management. [2004]
- 1.2.49 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) about the effects of exercise on blood glucose levels and about strategies for avoiding hypo- or hyperglycaemia during or after physical activity. [2004, amended 2015]
- 1.2.50 Encourage children and young people with type 1 diabetes and their family members or carers (as appropriate) to monitor blood glucose levels before and after exercise so that they can:

- identify when changes in insulin or food intake are necessary
- learn the blood glucose response to different exercise conditions
- be aware of exercise-induced hypoglycaemia
- be aware that hypoglycaemia may occur several hours after prolonged exercise. [2004, amended 2015]

1.2.51 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that additional carbohydrate should be consumed as appropriate to avoid hypoglycaemia and that carbohydrate-based foods should be readily available during and after exercise. [2004]

1.2.52 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that additional carbohydrate should be consumed if plasma glucose levels are less than 7 mmol/litre before exercise is undertaken. [2004, amended 2015]

1.2.53 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that changes in daily exercise patterns may require insulin dose and/or carbohydrate intake to be altered. [2004]

Blood glucose and HbA1c targets and monitoring for children and young people with type 1 diabetes

Blood glucose targets

1.2.54 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that the optimal target ranges for short-term plasma glucose control are:

- fasting plasma glucose level of 4–7 mmol/litre on waking
- a plasma glucose level of 4–7 mmol/litre before meals at other times of the day
- a plasma glucose level of 5–9 mmol/litre after meals
- a plasma glucose level of at least 5 mmol/litre when driving^[4]. [new 2015]

- 1.2.55 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that achieving and maintaining blood glucose levels towards the lower end of the target optimal ranges will help them to achieve the lowest attainable HbA1c. [new 2015]
- 1.2.56 Ensure that children and young people with type 1 diabetes do not experience problematic hypoglycaemia or undue emotional distress when achieving, or attempting to achieve, blood glucose and HbA1c targets. [new 2015]
- 1.2.57 Be aware that there may be conflict between children and young people with type 1 diabetes and their family members or carers about blood glucose and HbA1c targets, and that an agreed compromise may be needed. [new 2015]

Blood glucose monitoring

- 1.2.58 Advise children and young people with type 1 diabetes and their family members or carers (as appropriate) to routinely perform at least 5 capillary blood glucose tests per day. [new 2015]
- 1.2.59 Advise children and young people with type 1 diabetes and their family members or carers (as appropriate) that more frequent testing is often needed (for example with physical activity and during intercurrent illness), and ensure they have enough test strips for this. [new 2015]
- 1.2.60 Offer children and young people with type 1 diabetes and their family members or carers (as appropriate) a choice of equipment for monitoring capillary blood glucose, so they can optimise their blood glucose control in response to adjustment of insulin, diet and exercise. [2004]
- 1.2.61 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that blood glucose levels should be interpreted in the context of the 'whole child', which includes the social, emotional and physical environment. [2004]
- 1.2.62 Offer ongoing real-time continuous glucose monitoring with alarms to children and young people with type 1 diabetes who have:
- frequent severe hypoglycaemia or

- impaired awareness of hypoglycaemia associated with adverse consequences (for example, seizures or anxiety) or
- inability to recognise, or communicate about, symptoms of hypoglycaemia (for example, because of cognitive or neurological disabilities). [new 2015]

1.2.63 Consider ongoing real-time continuous glucose monitoring for:

- neonates, infants and pre-school children
- children and young people who undertake high levels of physical activity (for example, sport at a regional, national or international level)
- children and young people who have comorbidities (for example anorexia nervosa) or who are receiving treatments (for example corticosteroids) that can make blood glucose control difficult. [new 2015]

1.2.64 Consider intermittent (real-time or retrospective) continuous glucose monitoring to help improve blood glucose control in children and young people who continue to have hyperglycaemia despite insulin adjustment and additional support. [new 2015]

HbA1c targets and monitoring

1.2.65 Use methods to measure HbA1c that have been calibrated according to International Federation of Clinical Chemistry (IFCC) standardisation. [new 2015]

1.2.66 Explain the benefits of safely achieving and maintaining the lowest attainable HbA1c to children and young people with type 1 diabetes and their family members or carers (as appropriate). [new 2015]

1.2.67 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that an HbA1c target level of 48 mmol/mol (6.5%) or lower is ideal to minimise the risk of long-term complications. [new 2015]

1.2.68 Explain to children and young people with type 1 diabetes who have an HbA1c level above the ideal target of 48 mmol/mol (6.5%) and their family members or

carers (as appropriate) that any reduction in HbA1c level reduces the risk of long-term complications. [new 2015]

- 1.2.69 Agree an individualised lowest achievable HbA1c target with each child or young person with type 1 diabetes and their family members or carers (as appropriate), taking into account factors such as daily activities, individual life goals, complications, comorbidities and the risk of hypoglycaemia. [new 2015]
- 1.2.70 Support children and young people with type 1 diabetes and their family members or carers (as appropriate) to safely achieve and maintain their individual agreed HbA1c target level. [new 2015]
- 1.2.71 Offer children and young people with type 1 diabetes measurement of their HbA1c level 4 times a year (more frequent testing may be appropriate if there is concern about suboptimal blood glucose control). [2004, amended 2015]
- 1.2.72 Diabetes services should document the proportion of children and young people with type 1 diabetes in a service who achieve an HbA1c level of 53 mmol/mol (7%) or lower. [new 2015]

Hyperglycaemia, blood ketone monitoring and intercurrent illness in children and young people with type 1 diabetes

- 1.2.73 Provide each child and young person with type 1 diabetes and their family members or carers (as appropriate) with clear individualised oral and written advice ('sick-day rules') about managing type 1 diabetes during intercurrent illness or episodes of hyperglycaemia, including:
- monitoring blood glucose
 - monitoring and interpreting blood ketones (beta-hydroxybutyrate)
 - adjusting their insulin regimen
 - food and fluid intake
 - when and where to seek further advice or help.

Revisit the advice with the child or young person and their family members or carers (as appropriate) at least annually. [new 2015]

- 1.2.74 Offer children and young people with type 1 diabetes blood ketone testing strips and a meter, and advise them and their family members or carers (as appropriate) to test for ketonaemia if they are ill or have hyperglycaemia. [new 2015]
- 1.2.75 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that it is important to ensure that blood ketone testing strips are not used after the specified ('use-by') date. [new 2015]

Hypoglycaemia in children and young people with type 1 diabetes

- 1.2.76 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) about strategies for avoiding and managing hypoglycaemia. [2004]
- 1.2.77 Offer education for children and young people with type 1 diabetes, their family members, carers, and schoolteachers about recognising and managing hypoglycaemia. [2004]
- 1.2.78 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that they should always have access to an immediate source of fast-acting glucose and blood glucose monitoring equipment for immediate confirmation and safe management of hypoglycaemia. [2004, amended 2015]
- 1.2.79 Family members or carers and, where appropriate, school nurses and other carers should be trained and equipped to give intramuscular glucagon for severe hypoglycaemia in an emergency. [2004, amended 2015]
- 1.2.80 Immediately treat mild to moderate hypoglycaemia in children and young people with type 1 diabetes as follows.
- Give fast-acting glucose (for example, 10–20 g) by mouth (liquid carbohydrate may be taken more easily than solid).
 - Be aware that fast-acting glucose may need to be given in frequent small amounts, because hypoglycaemia can cause vomiting.

- Recheck blood glucose levels within 15 minutes (fast-acting glucose should raise blood glucose levels within 5–15 minutes) and repeat fast-acting glucose if hypoglycaemia persists.
- As symptoms improve or normoglycaemia is restored, give oral complex long-acting carbohydrate to maintain blood glucose levels, unless the child or young person is:
 - about to have a snack or meal
 - receiving a continuous subcutaneous insulin infusion. [2004, amended 2015]

1.2.81 Treat severe hypoglycaemia in children and young people with type 1 diabetes who are in hospital and in whom rapid intravenous access is possible by giving 10% intravenous glucose. Give a maximum dose of 500 mg/kg body weight (equivalent to a maximum of 5 ml/kg). [2004, amended 2015]

1.2.82 Treat severe hypoglycaemia in children and young people with type 1 diabetes who are not in hospital or who do not have rapid intravenous access available as follows.

- Use intramuscular glucagon or a concentrated oral glucose solution (for example Glucogel). Do not use oral glucose solution if the level of consciousness is reduced as this could be dangerous.
- If using intramuscular glucagon:
 - give children and young people over 8 years old (or who weigh 25 kg or more) 1 mg glucagon.
 - give children under 8 years old (or who weigh less than 25 kg) 500 micrograms of glucagon.
- Seek medical assistance if blood glucose levels do not respond or symptoms persist for more than 10 minutes.
- As symptoms improve or normoglycaemia is restored, and once the child or young person is sufficiently awake, give oral complex long-acting carbohydrate to maintain normal blood glucose levels.
- Recheck the blood glucose repeatedly in children and young people who have persistently reduced consciousness after a severe hypoglycaemic episode, to determine whether further glucose is needed. [2004, amended 2015]

- 1.2.83 Explain to young people with type 1 diabetes the effects of alcohol consumption on blood glucose control, and in particular that there is an increased risk of hypoglycaemia including hypoglycaemia while sleeping. [2004, amended 2015]
- 1.2.84 Explain to young people with type 1 diabetes who drink alcohol that they should:
- eat food containing carbohydrate before and after drinking
 - monitor their blood glucose levels regularly and aim to keep the levels within the recommended range by eating food containing carbohydrate. [2004]
- 1.2.85 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that when alcohol causes or contributes to the development of hypoglycaemia, glucagon may be ineffective in treating the hypoglycaemia and intravenous glucose will be required. [2004]
- 1.2.86 Diabetes teams should consider referring children and young people with type 1 diabetes who have frequent hypoglycaemia and/or recurrent seizures for assessment of cognitive function, particularly if these occur at a young age. [2004]

Difficulties with maintaining optimal blood glucose control in children and young people with type 1 diabetes

- 1.2.87 Think about the possibility of non-adherence to therapy in children and young people with type 1 diabetes who have suboptimal blood glucose control, especially in adolescence. [2004, amended 2015]
- 1.2.88 Be aware that adolescence can be a period of worsening blood glucose control in young people with type 1 diabetes, which may in part be due to non-adherence to therapy. [2004]
- 1.2.89 Raise the issue of non-adherence to therapy with children and young people with type 1 diabetes and their family members or carers (as appropriate) in a sensitive manner. [2004]

- 1.2.90 Be aware of the possible negative psychological impact of setting targets that may be difficult for some children and young people with type 1 diabetes to achieve and maintain. [new 2015]

Surgery for children and young people with type 1 diabetes

- 1.2.91 Offer surgery to children and young people with type 1 diabetes only in centres that have dedicated paediatric facilities for caring for children and young people with diabetes. [2004]
- 1.2.92 All centres caring for children and young people with type 1 diabetes should have written protocols on safe surgery for children and young people. The protocols should be agreed between surgical and anaesthetic staff and the diabetes team. [2004]
- 1.2.93 Ensure that there is careful liaison between surgical, anaesthetic and diabetes teams before children and young people with type 1 diabetes are admitted to hospital for elective surgery and as soon as possible after admission for emergency surgery. [2004, amended 2015]

Psychological and social issues in children and young people with type 1 diabetes

- 1.2.94 Diabetes teams should be aware that children and young people with type 1 diabetes have a greater risk of emotional and behavioural difficulties. [2004, amended 2015]
- 1.2.95 Offer children and young people with type 1 diabetes and their family members or carers (as appropriate) emotional support after diagnosis, which should be tailored to their emotional, social, cultural and age-dependent needs. [2004]
- 1.2.96 Assess the emotional and psychological wellbeing of young people with type 1 diabetes who present with frequent episodes of diabetic ketoacidosis (DKA). [2004, amended 2015]
- 1.2.97 Be aware that a lack of adequate psychosocial support has a negative effect on various outcomes, including blood glucose control in children and young people with type 1 diabetes, and that it can also reduce their self-esteem. [2004, amended 2015]

- 1.2.98 Offer children and young people with type 1 diabetes and their family members or carers (as appropriate) timely and ongoing access to mental health professionals with an understanding of diabetes because they may experience psychological problems (such as anxiety, depression, behavioural and conduct disorders and family conflict) or psychosocial difficulties that can impact on the management of diabetes and wellbeing. [2004, amended 2015]
- 1.2.99 For the treatment of depression and antisocial behaviour and conduct disorders in children and young people with type 1 diabetes see the NICE guidelines on [depression in children and young people](#) and [antisocial behaviour and conduct disorders in children and young people](#). [new 2015]
- 1.2.100 Diabetes teams should have appropriate access to mental health professionals to support them in psychological assessment and the delivery of psychosocial support. [2004]
- 1.2.101 Offer children and young people with type 1 diabetes who have behavioural or conduct disorders, and their family members or carers (as appropriate), access to appropriate mental health professionals. [2004]
- 1.2.102 Offer specific family-based behavioural interventions, such as behavioural family systems therapy, if there are difficulties with diabetes-related family conflict. [new 2015]
- 1.2.103 Consider a programme of behavioural intervention therapy or behavioural techniques for children and young people with type 1 diabetes in whom there are concerns about psychological wellbeing in order to improve:
- health-related quality of life – for example, counselling or cognitive behavioural therapy (CBT), including CBT focused on quality of life
 - adherence to diabetes treatment – for example, motivational interviewing or multisystemic therapy
 - blood glucose control in children and young people with high HbA1c levels (HbA1c above 69 mmol/mol [8.5%]) – for example, multisystemic therapy. [new 2015]
- 1.2.104 Offer screening for anxiety and depression to children and young people with type 1 diabetes who have persistently suboptimal blood glucose control. [2004]

- 1.2.105 Diabetes teams should be aware that children and young people with type 1 diabetes may develop anxiety and/or depression, particularly when difficulties in self-management arise in young people and children who have had type 1 diabetes for a long time. [2004]
- 1.2.106 Refer children and young people with type 1 diabetes and suspected anxiety and/or depression promptly to child mental health professionals. [2004]
- 1.2.107 Diabetes teams should be aware that children and young people with type 1 diabetes, in particular young women, have an increased risk of eating disorders. For more guidance on assessing and managing eating disorders, see the NICE guideline on [eating disorders](#). [2004, amended 2015]
- 1.2.108 Be aware that children and young people with type 1 diabetes who have eating disorders may have associated difficulties with:
- suboptimal blood glucose control (both hyperglycaemia and hypoglycaemia)
 - symptoms of gastroparesis. [2004, amended 2015]
- 1.2.109 For children and young people with type 1 diabetes in whom eating disorders are identified, offer joint management involving their diabetes team and child mental health professionals. [2004, amended 2015]

Monitoring for complications and associated conditions of type 1 diabetes

- 1.2.110 Offer children and young people with type 1 diabetes monitoring for:
- thyroid disease at diagnosis and annually thereafter until transfer to adult services
 - diabetic retinopathy annually from 12 years
 - moderately increased albuminuria (albumin:creatinine ratio [ACR] 3–30 mg/mmol; 'microalbuminuria') to detect diabetic kidney disease, annually from 12 years
 - hypertension annually from 12 years. [new 2015]
- 1.2.111 For guidance on monitoring for coeliac disease in children and young people with type 1 diabetes, see the NICE guideline on [coeliac disease](#). [new 2015]

1.2.112 For guidance on managing foot problems in children and young people with type 1 diabetes, see the NICE guideline on [diabetic foot problems](#). [new 2015]

1.2.113 Be aware of the following rare complications and associated conditions when children and young people with type 1 diabetes attend clinic visits:

- juvenile cataracts
- necrobiosis lipoidica
- Addison's disease. [2004, amended 2015]

1.2.114 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) the importance of annual monitoring from 12 years for diabetic retinopathy and diabetic kidney disease. [new 2015]

Diabetic retinopathy in children and young people with type 1 diabetes

1.2.115 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that:

- monitoring for diabetic retinopathy begins at 12 years (see recommendation 1.2.110) because diabetic retinopathy that needs treatment is extremely rare in children and young people under 12
- background retinopathy is often found through monitoring, and improving blood glucose control will reduce the risk of this progressing to significant diabetic retinopathy
- annual monitoring from 12 years is important because, if significant diabetic retinopathy is found, early treatment will improve the outcome.

GPs should refer children to the local diabetic eye screening programme before they reach 12 years of age. [new 2015]

Diabetic kidney disease in children and young people with type 1 diabetes

1.2.116 Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that:

- monitoring for moderately increased albuminuria (ACR 3–30 mg/mmol; 'microalbuminuria') to detect diabetic kidney disease begins at 12 years (see recommendation 1.2.110) because diabetic kidney disease in children and young people under 12 is extremely rare
- using the first urine sample of the day ('early morning urine') to screen for moderately increased albuminuria is important, as this reduces the risk of false positive results
- if moderately increased albuminuria is detected, improving blood glucose control will reduce the risk of this progressing to significant diabetic kidney disease
- annual monitoring from 12 years is important because, if diabetic kidney disease is found, early treatment will improve the outcome. [new 2015]

1.2.117 Use the first urine sample of the day ('early morning urine') to measure the albumin:creatinine ratio. If the first urine sample of the day is not available, use a random sample, but be aware that this is associated with an increased risk of false positive results. [new 2015]

1.2.118 If the initial albumin:creatinine ratio is above 3 mg/mmol but below 30 mg/mmol, confirm the result by repeating the test on 2 further occasions using first urine samples of the day ('early morning urine') before starting further investigation and therapy. [new 2015]

1.2.119 Investigate further if the initial albumin:creatinine ratio is 30 mg/mmol or more (proteinuria). [new 2015]

1.3 *Type 2 diabetes*

Education and information for children and young people with type 2 diabetes

1.3.1 Offer children and young people with type 2 diabetes and their family members or carers (as appropriate) a continuing programme of education from diagnosis. Ensure that the programme includes the following core topics:

- HbA1c monitoring and targets
- the effects of diet, physical activity, body weight and intercurrent illness on blood glucose control

- the aims of metformin therapy and possible adverse effects
- the complications of type 2 diabetes and how to prevent them. [new 2015]

1.3.2 Tailor the education programme to each child or young person with type 2 diabetes and their family members or carers (as appropriate), taking account of issues such as:

- personal preferences
- emotional wellbeing
- age and maturity
- cultural considerations
- existing knowledge
- current and future social circumstances
- life goals. [new 2015]

1.3.3 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that like others they are advised to have:

- regular dental examinations (see the NICE guideline on [dental recall](#))
- an eye examination by an optician every 2 years. [2004, amended 2015]

1.3.4 Encourage children and young people with type 2 diabetes and their family members or carers (as appropriate) to discuss any concerns and raise any questions they have with their diabetes team. [new 2015]

1.3.5 Give children and young people with type 2 diabetes and their family members or carers (as appropriate) information about local and/or national diabetes support groups and organisations, and the potential benefits of membership. Give this information after diagnosis and regularly afterwards. [2004, amended 2015]

1.3.6 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) how to find information about possible government disability benefits. [2004, amended 2015]

- 1.3.7 Take particular care when communicating with and providing information to children and young people with type 2 diabetes if they and/or their family members or carers (as appropriate) have, for example, physical and sensory disabilities, or difficulties speaking or reading English. [2004, amended 2015]

Smoking and substance misuse

- 1.3.8 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) about general health problems associated with smoking and in particular the risks of developing vascular complications. [2004, amended 2015]
- 1.3.9 Encourage children and young people with type 2 diabetes not to start smoking. See also the NICE guidelines on [preventing the uptake of smoking by children and young people](#) and [school-based interventions to prevent smoking](#). [2004, amended 2015]
- 1.3.10 Offer smoking cessation programmes to children and young people with type 2 diabetes who smoke. See also the NICE guidelines on [brief interventions and referral for smoking cessation](#), [smoking cessation services](#), [harm reduction approaches to smoking](#), and [smoking cessation in secondary care](#). [2004, amended 2015]
- 1.3.11 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) about the general dangers of substance misuse and the possible effects on blood glucose control. [2004, amended 2015]

Immunisation

- 1.3.12 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that the Department of Health's [Green Book](#) recommends annual immunisation against influenza for children and young people with diabetes. [2004, amended 2015]
- 1.3.13 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that the Department of Health's [Green Book](#) recommends immunisation against pneumococcal infection for children and young people with diabetes who need insulin or oral hypoglycaemic medicines. [2004, amended 2015]

Dietary management for children and young people with type 2 diabetes

- 1.3.14 At each contact with a child or young person with type 2 diabetes who is overweight or obese, advise them and their family members or carers (as appropriate) about the benefits of physical activity and weight loss, and provide support towards achieving this. See also the NICE guidelines on [maintaining a healthy weight](#) and [managing obesity](#). [new 2015]
- 1.3.15 Offer children and young people with type 2 diabetes dietetic support to help optimise body weight and blood glucose control. [2004, amended 2015]
- 1.3.16 At each contact with a child or young person with type 2 diabetes, explain to them and their family members or carers (as appropriate) how healthy eating can help to:
- reduce hyperglycaemia
 - reduce cardiovascular risk
 - promote weight loss (see recommendation 1.3.14). [new 2015]
- 1.3.17 Provide dietary advice to children and young people with type 2 diabetes and their family members or carers (as appropriate) in a sensitive manner, taking into account the difficulties that many people encounter with weight reduction, and emphasise the additional advantages of healthy eating for blood glucose control and avoiding complications. [new 2015]
- 1.3.18 Take into account social and cultural considerations when providing advice on dietary management to children and young people with type 2 diabetes. [new 2015]
- 1.3.19 Encourage children and young people with type 2 diabetes to eat at least 5 portions of fruit and vegetables each day. [new 2015]
- 1.3.20 At each clinic visit for children and young people with type 2 diabetes:
- measure height and weight and plot on an appropriate growth chart
 - calculate BMI.

Check for normal growth and/or significant changes in weight because these may reflect changes in blood glucose control. [2004, amended 2015]

- 1.3.21 Provide arrangements for weighing children and young people with type 2 diabetes that respect their privacy. [2004, amended 2015]

Metformin

- 1.3.22 Offer standard-release metformin from diagnosis to children and young people with type 2 diabetes. [new 2015]

HbA1c targets and monitoring for children and young people with type 2 diabetes

- 1.3.23 Use methods to measure HbA1c that have been calibrated according to International Federation of Clinical Chemistry (IFCC) standardisation. [new 2015]
- 1.3.24 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that an HbA1c target level of 48 mmol/mol (6.5%) or lower is ideal to minimise the risk of long-term complications. [new 2015]
- 1.3.25 Explain to children and young people with type 2 diabetes who have an HbA1c level above the ideal target of 48 mmol/mol (6.5%) and their family members or carers (as appropriate) that any reduction in HbA1c level reduces the risk of long-term complications. [new 2015]
- 1.3.26 Explain the benefits of safely achieving and maintaining the lowest attainable HbA1c to children and young people with type 2 diabetes and their family members or carers (as appropriate). [new 2015]
- 1.3.27 Agree an individualised lowest achievable HbA1c target with each child or young person with type 2 diabetes and their family members or carers (as appropriate), taking into account factors such as daily activities, individual life goals, complications and comorbidities. [new 2015]
- 1.3.28 Measure HbA1c levels every 3 months in children and young people with type 2 diabetes. [new 2015]

- 1.3.29 Support children and young people with type 2 diabetes and their family members or carers (as appropriate) to safely achieve and maintain their individual agreed HbA1c target level. [new 2015]
- 1.3.30 Diabetes services should document the proportion of children and young people with type 2 diabetes in a service who achieve an HbA1c level of 53 mmol/mol (7%) or lower. [new 2015]

Surgery for children and young people with type 2 diabetes

- 1.3.31 Offer surgery to children and young people with type 2 diabetes only in centres that have dedicated paediatric facilities for caring for children and young people with diabetes. [2004, amended 2015]
- 1.3.32 All centres caring for children and young people with type 2 diabetes should have written protocols on safe surgery for children and young people. The protocols should be agreed between surgical and anaesthetic staff and the diabetes team. [2004, amended 2015]

Psychological and social issues in children and young people with type 2 diabetes

- 1.3.33 Diabetes teams should be aware that children and young people with type 2 diabetes have a greater risk of emotional and behavioural difficulties. [2004, amended 2015]
- 1.3.34 Offer children and young people with type 2 diabetes and their family members or carers (as appropriate) emotional support after diagnosis, which should be tailored to their emotional, social, cultural and age-dependent needs. [2004, amended 2015]
- 1.3.35 Be aware that children and young people with type 2 diabetes have an increased risk of psychological conditions (for example anxiety, depression, behavioural and conduct disorders) and complex social factors (for example family conflict) that can affect their wellbeing and diabetes management. See also the NICE guidelines on [depression in children and young people](#) and [antisocial behaviour and conduct disorders in children and young people](#). [new 2015]
- 1.3.36 Be aware that a lack of adequate psychosocial support has a negative effect on various outcomes, including blood glucose control in children and young people

with type 2 diabetes, and that it can also reduce their self-esteem. [2004, amended 2015]

- 1.3.37 Offer children and young people with type 2 diabetes and their family members or carers (as appropriate) timely and ongoing access to mental health professionals with an understanding of diabetes because they may experience psychological problems (such as anxiety, depression, behavioural and conduct disorders and family conflict) or psychosocial difficulties that can impact on the management of diabetes and wellbeing. [2004, amended 2015]
- 1.3.38 For the treatment of depression and antisocial behaviour and conduct disorders in children and young people with type 2 diabetes see the NICE guidelines on [depression in children and young people](#) and [antisocial behaviour and conduct disorders in children and young people](#). [new 2015]
- 1.3.39 Diabetes teams should have appropriate access to mental health professionals to support them in psychological assessment and the delivery of psychosocial support. [2004, amended 2015]
- 1.3.40 Offer screening for anxiety and depression to children and young people with type 2 diabetes who have persistently suboptimal blood glucose control. [2004, amended 2015]
- 1.3.41 Refer children and young people with type 2 diabetes and suspected anxiety and/or depression promptly to child mental health professionals. [2004, amended 2015]
- 1.3.42 Ensure that children and young people with type 2 diabetes and their family members or carers (as appropriate) have timely and ongoing access to mental health services when needed. [new 2015]

Monitoring for complications and associated conditions of type 2 diabetes

- 1.3.43 Offer children and young people with type 2 diabetes annual monitoring for:
- hypertension starting at diagnosis
 - dyslipidaemia starting at diagnosis

- diabetic retinopathy from 12 years
- moderately increased albuminuria (albumin:creatinine ratio [ACR] 3–30 mg/mmol; 'microalbuminuria') to detect diabetic kidney disease, starting at diagnosis. [new 2015]

1.3.44 For guidance on managing foot problems in children and young people with type 2 diabetes, see the NICE guideline on [diabetic foot problems](#). [new 2015]

1.3.45 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) the importance of annual monitoring for hypertension, dyslipidaemia, diabetic retinopathy and diabetic kidney disease. [new 2015]

Hypertension in children and young people with type 2 diabetes

1.3.46 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that monitoring (see recommendation 1.3.43) is important because if hypertension is found, early treatment will reduce the risk of complications. [new 2015]

1.3.47 Use a cuff large enough for the child or young person with type 2 diabetes when measuring blood pressure. [new 2015]

1.3.48 If repeated resting measurements are greater than the 95th percentile for age and sex, confirm hypertension using 24-hour ambulatory blood pressure monitoring before starting antihypertensive therapy. [new 2015]

Dyslipidaemia in children and young people with type 2 diabetes

1.3.49 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that monitoring (see recommendation 1.3.43) is important because if dyslipidaemia is found, early treatment will reduce the risk of complications. [new 2015]

1.3.50 When monitoring for dyslipidaemia in children and young people with type 2 diabetes, measure total cholesterol, high-density lipoprotein (HDL) cholesterol, non-HDL cholesterol and triglyceride concentrations. [new 2015]

- 1.3.51 Confirm dyslipidaemia using a repeat sample (fasting or non-fasting) before deciding on further management strategies. [new 2015]

Diabetic retinopathy in children and young people with type 2 diabetes

- 1.3.52 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that:
- background retinopathy is often found through monitoring (see recommendation 1.3.43), and improving blood glucose control will reduce the risk of this progressing to significant diabetic retinopathy
 - annual monitoring from 12 years is important because, if significant diabetic retinopathy is found, early treatment will improve the outcome.

GPs should refer children with type 2 diabetes to local eye screening services on diagnosis. Begin screening at age 12, and perform this as soon as possible (no later than 3 months after referral date or 12th birthday if referred before age 12). [new 2015]

- 1.3.53 Consider referring children and young people with type 2 diabetes who are younger than 12 years to an ophthalmologist for retinal examination if blood glucose control is suboptimal. [new 2015]

Diabetic kidney disease in children and young people with type 2 diabetes

- 1.3.54 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that:
- using the first urine sample of the day ('early morning urine') to screen for moderately increased albuminuria (ACR 3–30 mg/mmol; 'microalbuminuria') is important, as this reduces the risk of false positive results
 - if moderately increased albuminuria is detected, improving blood glucose control will reduce the risk of this progressing to significant diabetic kidney disease
 - annual monitoring (see recommendation 1.3.43) is important because, if diabetic kidney disease is found, early treatment will improve the outcome. [new 2015]
- 1.3.55 Use the first urine sample of the day ('early morning urine') to measure the albumin:creatinine ratio. If the first urine sample of the day is not available, use a

random sample, but be aware that this is associated with an increased risk of false positive results. [new 2015]

- 1.3.56 If the initial albumin:creatinine ratio is above 3 mg/mmol but below 30 mg/mmol, confirm the result by repeating the test on 2 further occasions using first urine samples of the day ('early morning urine') before starting further investigation and therapy. [new 2015]
- 1.3.57 Investigate further if the initial albumin:creatinine ratio is 30 mg/mmol or more (proteinuria). [new 2015]

1.4 *Diabetic ketoacidosis*

Recognition, referral and diagnosis

- 1.4.1 Measure capillary blood glucose at presentation in children and young people without known diabetes who have increased thirst, polyuria, recent unexplained weight loss or excessive tiredness and any of the following:
- nausea or vomiting
 - abdominal pain
 - hyperventilation
 - dehydration
 - reduced level of consciousness. [new 2015]
- 1.4.2 If the plasma glucose level is above 11 mmol/litre in a child or young person without known diabetes, and they have symptoms that suggest diabetic ketoacidosis (DKA) (see recommendation 1.4.1), suspect DKA and immediately send them to a hospital with acute paediatric facilities. [new 2015]
- 1.4.3 Be aware that children and young people taking insulin for diabetes may develop DKA with normal blood glucose levels. [new 2015]
- 1.4.4 Suspect DKA even if the blood glucose is normal in a child or young person with known diabetes and any of following:

- nausea or vomiting
- abdominal pain
- hyperventilation
- dehydration
- reduced level of consciousness. [new 2015]

1.4.5 When DKA is suspected in a child or young person with known diabetes (see recommendation 1.4.4) measure the blood ketones (beta-hydroxybutyrate), using a near-patient method if available. If the level is elevated, immediately send them to a hospital with acute paediatric facilities. [new 2015]

1.4.6 When DKA is suspected in a child or young person with known diabetes (see recommendation 1.4.4) and it is not possible to measure the blood ketones (beta-hydroxybutyrate) using a near-patient method, immediately send them to a hospital with acute paediatric facilities. [new 2015]

1.4.7 If DKA is suspected or confirmed in a child or young person, explain to them and to their family members or carers (as appropriate) that DKA is a serious matter that needs urgent hospital assessment. [new 2015]

1.4.8 When a child or young person with suspected or known DKA arrives at hospital, measure their:

- capillary blood glucose
- capillary blood ketones (beta-hydroxybutyrate) if near-patient testing is available, or urine ketones if it is not
- capillary or venous pH and bicarbonate. [new 2015]

1.4.9 Diagnose DKA in children and young people with diabetes who have:

- acidosis (indicated by blood pH below 7.3 or plasma bicarbonate below 18 mmol/litre) and
- ketonaemia (indicated by blood beta-hydroxybutyrate above 3 mmol/litre) or ketonuria (++) and above on the standard strip marking scale). [new 2015]

- 1.4.10 Diagnose severe DKA in children and young people with DKA who have a blood pH below 7.1. [new 2015]

Initial management of diabetic ketoacidosis

- 1.4.11 Inform the responsible senior clinician once a diagnosis of DKA in a child or young person is made. [new 2015]
- 1.4.12 Explain to the child or young person with DKA and to their family members or carers (as appropriate) about their condition and the care that they may need. [new 2015]
- 1.4.13 When DKA is diagnosed in a child or young person in hospital, record their:
- level of consciousness
 - vital signs (heart rate, blood pressure, temperature, respiratory rate [look for Kussmaul breathing])
 - history of nausea or vomiting
 - clinical evidence of dehydration
 - body weight. [new 2015]
- 1.4.14 When DKA is diagnosed in a child or young person in hospital, measure and record the capillary or venous:
- pH and pCO₂
 - plasma sodium, potassium, urea and creatinine
 - plasma bicarbonate [new 2015]
- 1.4.15 Consider a near-patient blood ketone (beta-hydroxybutyrate) testing method for rapid diagnosis and monitoring of DKA in children and young people in hospital. [new 2015]
- 1.4.16 Children and young people with DKA should be cared for in a facility that can provide the level of monitoring and care for DKA specified in section 1.4 of this guideline. [new 2015]

- 1.4.17 Children and young people with DKA should be cared for with one-to-one nursing either on a high-dependency unit (preferably a paediatric unit), or on a general paediatric ward, if:
- they are younger than 2 years or
 - they have severe DKA (indicated by a blood pH below 7.1). [new 2015]
- 1.4.18 Think about inserting a nasogastric tube if a child or young person with DKA has a reduced level of consciousness and is vomiting, to reduce the risk of aspiration. [new 2015]
- 1.4.19 Seek urgent anaesthetic review and discuss with a paediatric critical care specialist if a child or young person with DKA cannot protect their airway because they have a reduced level of consciousness. [new 2015]
- 1.4.20 Discuss the use of inotropes with a paediatric critical care specialist if a child or young person with DKA is in hypotensive shock. [new 2015]
- 1.4.21 Think about sepsis in a child or young person with DKA who has any of the following:
- fever or hypothermia
 - hypotension
 - refractory acidosis
 - lactic acidosis. [new 2015]

Fluid and insulin therapy

- 1.4.22 Treat DKA with oral fluids and subcutaneous insulin only if the child or young person is alert, not nauseated or vomiting, and not clinically dehydrated. [new 2015]
- 1.4.23 If DKA is treated with oral fluids and subcutaneous insulin, ensure that the child or young person is recovering by monitoring for resolution of ketonaemia and acidosis. [new 2015]

- 1.4.24 Treat DKA with intravenous fluids and intravenous insulin if the child or young person is not alert, is nauseated or vomiting or is clinically dehydrated. [new 2015]
- 1.4.25 Do not give oral fluids to a child or young person who is receiving intravenous fluids for DKA unless ketosis is resolving, they are alert, and they are not nauseated or vomiting. [new 2015]
- 1.4.26 Do not give an intravenous fluid bolus to children and young people with mild or moderate DKA (indicated by a blood pH of 7.1 or above). [new 2015]
- 1.4.27 Do not routinely give an intravenous fluid bolus to a child or young person with severe DKA (indicated by a blood pH below 7.1). [new 2015]
- 1.4.28 Do not give more than one intravenous fluid bolus of 10 ml/kg 0.9% sodium chloride to a child or young person with severe DKA (indicated by a blood pH below 7.1) without discussion with the responsible senior paediatrician. [new 2015]
- 1.4.29 In children and young people with DKA, calculate their total fluid requirement for the first 48 hours by adding the estimated fluid deficit (see recommendation 1.4.30) to the fluid maintenance requirement (see recommendation 1.4.31). [new 2015]
- 1.4.30 When calculating the fluid requirement for children and young people with DKA, assume:
- a 5% fluid deficit in mild to moderate DKA (indicated by a blood pH of 7.1 or above)
 - a 10% fluid deficit in severe DKA (indicated by a blood pH below 7.1). [new 2015]
- 1.4.31 Calculate the maintenance fluid requirement for children and young people with DKA using the following 'reduced volume' rules:
- if they weigh less than 10 kg, give 2 ml/kg/hour
 - if they weigh between 10 and 40 kg, give 1 ml/kg/hour
 - if they weigh more than 40 kg, give a fixed volume of 40 ml/hour.

These are lower than standard fluid maintenance volumes because large fluid volumes are associated with an increased risk of cerebral oedema. [new 2015]

- 1.4.32 Aim to replace the fluid deficit evenly over the first 48 hours in children and young people with DKA, because faster rehydration is associated with an increased risk of cerebral oedema. [new 2015]
- 1.4.33 Use 0.9% sodium chloride without added glucose for both rehydration and maintenance fluid in children and young people with DKA until the plasma glucose concentration is below 14 mmol/litre. [new 2015]
- 1.4.34 Ensure that all fluids (except any initial bolus) administered to children and young people with DKA contain 40 mmol/litre potassium chloride, unless they have renal failure. [new 2015]
- 1.4.35 If more than 20 ml/kg of fluid has been given by intravenous bolus to a child or young person with DKA, subtract any additional bolus volumes from the total fluid calculation for the 48-hour period. [new 2015]
- 1.4.36 Do not give intravenous sodium bicarbonate to children and young people with DKA. [new 2015]
- 1.4.37 Think about inserting a urinary catheter if it is not possible to accurately measure urine output for a child or young person with DKA. [new 2015]
- 1.4.38 Do not give children and young people with DKA additional intravenous fluid to replace urinary losses. [new 2015]
- 1.4.39 Start an intravenous insulin infusion 1–2 hours after beginning intravenous fluid therapy in children and young people with DKA. [new 2015]
- 1.4.40 When treating DKA with intravenous insulin in children and young people, use a soluble insulin infusion at a dosage between 0.05 and 0.1 units/kg/hour. Do not give bolus doses of intravenous insulin. [new 2015]
- 1.4.41 If a child or young person with DKA is using insulin pump therapy, disconnect the pump when starting intravenous insulin therapy. [new 2015]

- 1.4.42 In discussion with a diabetes specialist, think about continuing subcutaneous basal insulin in a child or young person who was using a basal insulin before the onset of DKA. [new 2015]
- 1.4.43 Change fluids to 0.9% sodium chloride with 5% glucose and 40 mmol/litre potassium chloride once the plasma glucose concentration falls below 14 mmol/litre in children and young people with DKA. [new 2015]
- 1.4.44 If during treatment for DKA a child or young person's plasma glucose falls below 6 mmol/litre:
- increase the glucose concentration of the intravenous fluid infusion, and
 - if there is persisting ketosis, continue to give insulin at a dosage of least 0.05 units/kg/hour. [new 2015]
- 1.4.45 If the blood beta-hydroxybutyrate level is not falling within 6–8 hours in a child or young person with DKA, think about increasing the insulin dosage to 0.1 units/kg/hour or greater. [new 2015]
- 1.4.46 Think about stopping intravenous fluid therapy for DKA in a child or young person if ketosis is resolving, they are alert, and they can take oral fluids without nausea or vomiting. [new 2015]
- 1.4.47 Do not change from intravenous insulin to subcutaneous insulin in a child or young person with DKA until ketosis is resolving, they are alert, and they can take oral fluids without nausea or vomiting. [new 2015]
- 1.4.48 Start subcutaneous insulin in a child or young person with DKA at least 30 minutes before stopping intravenous insulin. [new 2015]
- 1.4.49 For a child or young person with DKA who is using insulin pump therapy, restart the pump at least 60 minutes before stopping intravenous insulin. Change the insulin cartridge and infusion set, and insert the cannula into a new subcutaneous site. [new 2015]

Monitoring during therapy

1.4.50 Monitor and record the following at least hourly in children and young people with DKA:

- capillary blood glucose
- vital signs (heart rate, blood pressure, temperature, respiratory rate [look for Kussmaul breathing])
- fluid balance, with fluid input and output charts
- level of consciousness (using the modified Glasgow coma scale). [new 2015]

1.4.51 Monitor and record the level of consciousness (using the modified Glasgow coma scale) and the heart rate (to detect bradycardia) every 30 minutes in:

- children under 2 years with DKA
- children and young people with severe DKA (indicated by a blood pH below 7.1).

This is because these children and young people are at increased risk of cerebral oedema. [new 2015]

1.4.52 Monitor children and young people receiving intravenous therapy for DKA using continuous electrocardiogram (ECG) to detect signs of hypokalaemia, including ST-segment depression and prominent U-waves. [new 2015]

1.4.53 Ensure that healthcare professionals performing the monitoring described in recommendations 1.4.50, 1.4.51 and 1.4.52 know what to look for and when to seek advice. [new 2015]

1.4.54 At 2 hours after starting treatment, and then at least every 4 hours, carry out and record the results of the following blood tests in children and young people with DKA:

- glucose (laboratory measurement)
- blood pH and pCO₂
- plasma sodium, potassium and urea

- beta-hydroxybutyrate. [new 2015]

1.4.55 A doctor involved in the care of the child or young person with DKA should review them face-to-face at diagnosis and then at least every 4 hours, and more frequently if:

- they are aged under 2 years
- they have severe DKA (indicated by a blood pH below 7.1)
- there are any other reasons for special concern. [new 2015]

1.4.56 At each face-to-face review of children and young people with DKA, assess the following:

- clinical status, including vital signs and neurological status
- results of blood investigations
- ECG trace
- cumulative fluid balance record. [new 2015]

1.4.57 Update the child and young person with DKA and their family members or carers (as appropriate) regularly about their progress. [new 2015]

Complications of diabetic ketoacidosis

Cerebral oedema

1.4.58 Immediately assess children and young people with DKA for suspected cerebral oedema if they have any of these early manifestations:

- headache
- agitation or irritability
- unexpected fall in heart rate
- increased blood pressure. [new 2015]

1.4.59 If cerebral oedema is suspected in a child or young person with DKA, treat immediately with the most readily available of mannitol (20%, 0.5–1 g/kg over

10–15 minutes) or hypertonic sodium chloride (2.7% or 3%, 2.5–5 ml/kg over 10–15 minutes). [new 2015]

1.4.60 Immediately treat for cerebral oedema using the most readily available of mannitol (20%, 0.5–1 g/kg over 10–15 minutes) or hypertonic sodium chloride (2.7% or 3%, 2.5–5 ml/kg over 10–15 minutes) if a child or young person with DKA develops any of these signs:

- deterioration in level of consciousness
- abnormalities of breathing pattern, for example respiratory pauses
- oculomotor palsies
- pupillary inequality or dilatation. [new 2015]

1.4.61 After starting treatment for cerebral oedema with mannitol or hypertonic sodium chloride in a child or young person with DKA, immediately seek specialist advice on further management, including which care setting would be best. [new 2015]

Hypokalaemia

1.4.62 If a child or young person with DKA develops hypokalaemia (potassium below 3 mmol/litre):

- think about temporarily suspending the insulin infusion
- discuss hypokalaemia management urgently with a paediatric critical care specialist, because a central venous catheter is needed for intravenous administration of potassium solutions above 40 mmol/litre. [new 2015]

Venous thromboembolic disease

1.4.63 Be aware of the increased risk of venous thromboembolism in children and young people with DKA, especially those with central venous catheters. [new 2015]

Avoiding future episodes of diabetic ketoacidosis

- 1.4.64 After a child or young person with known diabetes has recovered from an episode of DKA, discuss with them and their family members or carers (if appropriate) the factors that may have led to the episode. [new 2015]
- 1.4.65 Think about the possibility of non-adherence to therapy in children and young people with established type 1 diabetes who present with DKA, especially if the DKA is recurrent. [2004, amended 2015]
- 1.4.66 Advise children and young people who have had an episode of DKA and their family members or carers (if appropriate) how to reduce the risk of future episodes. In particular, advise them of the importance of managing intercurrent illnesses. [new 2015]

1.5 Service provision

- 1.5.1 Offer children and young people with diabetes an ongoing integrated package of care provided by a multidisciplinary paediatric diabetes team. To optimise the effectiveness of care and reduce the risk of complications, the diabetes 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. [2004, amended 2015]
- 1.5.2 Offer children and young people with diabetes and their family members or carers (as appropriate) 24-hour access to advice from their diabetes team. [2004, amended 2015]
- 1.5.3 Involve children and young people with diabetes and their family members or carers (as appropriate) in making decisions about the package of care provided by their diabetes team. [2004, amended 2015]
- 1.5.4 At diagnosis, offer children and young people with diabetes home-based or inpatient management according to clinical need, family circumstances and wishes. Explain that home-based care with support from the local paediatric diabetes team (including 24-hour telephone access) is safe and as effective as inpatient initial management. [2004, amended 2015]

- 1.5.5 Offer initial inpatient management to children with diabetes who are aged under 2 years. [2004, amended 2015]
- 1.5.6 Think about initial inpatient management for children and young people with diabetes if there are social or emotional factors that would make home-based management inappropriate, or if they live a long distance from the hospital. [2004, amended 2015]
- 1.5.7 Diabetes teams should liaise regularly with school staff supervising children and young people with type 1 diabetes to provide appropriate diabetes education and practical information. [2004, amended 2015]
- 1.5.8 Record the details of children and young people with diabetes on a population-based, practice-based or clinic-based diabetes register. [2004, amended 2015]

Transition from paediatric to adult care

- 1.5.9 Allow sufficient time for young people with diabetes to familiarise themselves with the practicalities of the transition from paediatric to adult services because this improves clinic attendance. [2004, amended 2015]
 - 1.5.10 Agree specific local protocols for transferring young people with diabetes from paediatric to adult services. [2004, amended 2015]
 - 1.5.11 Base the decision about the age of transfer to the adult service on the young person's physical development and emotional maturity, and local circumstances. [2004, amended 2015]
 - 1.5.12 Ensure that transition from the paediatric service occurs at a time of relative stability in the young person's health and is coordinated with other life transitions. [2004, amended 2015]
 - 1.5.13 Explain to young people with type 1 diabetes who are preparing for transition to adult services that some aspects of diabetes care will change at transition. [2004, amended 2015]
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^[3] Level 3 carbohydrate counting is defined as carbohydrate counting with adjustment of insulin dosage according to an insulin:carbohydrate ratio.

^[4] For further details about driving, see the [DVLA guidance for people with diabetes](#).

2 Research recommendations

The Guideline Development Group has made the following recommendations for research, based on its review of evidence, to improve NICE guidance and patient care in the future. The Guideline Development Group's full set of research recommendations is detailed in the [full guideline](#).

2.1 *Peer-led education programmes for young people with type 1 diabetes*

What is the effectiveness of education programmes in which young people with type 1 diabetes provide training for their peers?

Why this is important

Training delivered by peers is effective both in healthcare and in other settings. This research should evaluate the engagement of the child or young person with type 1 diabetes and their family members or carers (as appropriate), and outcomes for the child or young person. Outcomes could include their success in achieving their target HbA1c level, engagement with diabetes care and management (for example, attendance at clinic), satisfaction with the education programme, and quality of life. The impact on the young person delivering the training should also be evaluated (this could cover the impact on their diabetes care and the psychosocial impact of providing training for their peers). The research should be conducted using quantitative, qualitative and mixed methods.

2.2 *Optimal upper limit and timing for blood glucose measurements after meals for children and young people with type 1 diabetes*

What is the optimal upper limit and timing for blood glucose measurements after meals for children and young people with type 1 diabetes to reach an HbA1c level of 48 mmol/mol (6.5%) without unacceptable hypoglycaemia?

Why this is important

Setting an upper limit for plasma glucose measurements 1–2 hours after meals of less than 8 mmol/litre (rather than the 9 mmol/litre recommended in this guideline) could potentially lead to an improvement in blood glucose control without an unacceptable risk of hypoglycaemia. The evidence reviewed for the guideline did not allow a precise evaluation of the upper limit for the target range, or the timing of blood glucose testing relative to meals. Future research should investigate the HbA1c levels of children and young people with type 1 diabetes who aim for blood glucose measurements after meals slightly lower (to ensure their safety) than 9 mmol/litre, to help

decide whether lowering the upper limit is effective in improving long-term blood glucose control. Outcomes include the child or young person's satisfaction with treatment, their HbA1c levels, rates of hypoglycaemia, the views of their family members or carers (as appropriate), and quality of life.

2.3 *Metformin preparations for children and young people with type 2 diabetes*

What is the long-term comparative clinical and cost effectiveness of different metformin preparations for treating type 2 diabetes in children and young people?

Why this is important

There is high-quality evidence for the clinical and cost effectiveness of metformin as a treatment for type 2 diabetes from diagnosis in children and young people. However, all of the relevant evidence relates to administration in tablet form and using a standard dosage, despite alternative oral preparations (including solutions and extended-release tablets) being available and having potential advantages to the standard preparation. Gastrointestinal disorders (for example, nausea, vomiting, diarrhoea, abdominal pain and loss of appetite) are very common with metformin, especially at the start of treatment, and may be reduced or avoided with alternative preparations. Extended-release tablets and oral solutions may also be easier to swallow, as standard formulation metformin consists of large tablets. Further research would preferably consist of randomised controlled trials. Outcomes should include blood glucose control (preferably using measurement of HbA1c levels) and the child or young person's satisfaction with and adherence to treatment.

2.4 *Dietary advice based on glycaemic index for children and young people with type 1 diabetes from diagnosis*

What is the impact of educating children and young people with type 1 diabetes and their family members or carers (as appropriate) about their glycaemic index from diagnosis?

Why this is important

Very little evidence on the effectiveness of dietary advice based on glycaemic index was identified for inclusion in the guideline review, and the evidence that was identified related mostly to twice-daily insulin regimens. Research is needed to evaluate the effectiveness of teaching children and young people with type 1 diabetes and their family members or carers (as appropriate) about glycaemic index in the context of modern, intensive insulin treatment regimens (insulin pump therapy or multiple daily injections). Important outcomes include success in achieving the target

HbA1c level, blood glucose levels after meals, frequency of hypoglycaemia, quality of life, food choices, and the frequency and timing of insulin administration to lower blood glucose levels after meals.

2.5 *Optimal dosage of intravenous insulin for managing diabetic ketoacidosis in children and young people*

What is the optimal dosage of intravenous insulin for managing diabetic ketoacidosis (DKA) in children and young people?

Why this is important

The evidence reviewed for the guideline did not allow evaluation of the comparative effectiveness and safety of specific dosages of intravenous insulin, such as 0.025, 0.05 and 0.1 units/kg/hour. The only relevant studies conducted to date have been small retrospective cohort studies with fewer than 100 participants. A large, multi-centre randomised controlled trial is needed to undertake a comparative study of different dosages. This is because DKA is relatively uncommon and cerebral oedema (a potential adverse consequence of DKA) is rare, and there is a concern that larger dosages are associated with an increased risk of cerebral oedema. Important outcomes include rate of DKA resolution, incidence of hypoglycaemia and incidence of cerebral oedema.

More information

You can also see this guideline in the NICE pathway on [diabetes in children and young people](#).

To find out what NICE has said on topics related to this guideline, see our web page on [diabetes](#).

See also the guideline committee's discussion and the evidence reviews (in the [full guideline](#)), and information about [how the guideline was developed](#), including details of the committee.

Update information

November 2016: Recommendations 1.2.115 and 1.3.52 have been amended to add information on when eye screening should begin. Please note the date label of [2015] is unchanged, as this is when the recommendation was written and the evidence last reviewed. The changes made in November 2016 are clarifications of the 2015 wording, not new advice written in 2016, so do not carry a [2016] date.

August 2015: This guideline is an update of NICE guideline CG15 (published July 2004) and replaced the guidance for children and young people.

New recommendations have been added for the diagnosis and management of type 1 and type 2 diabetes in children and young people.

Recommendations are marked as [new 2015], [2015], [2004] or [2004, amended 2015]:

- [new 2015] indicates that the evidence has been reviewed and the recommendation has been added or updated
- [2015] indicates that the evidence has been reviewed but no change has been made to the recommended action
- [2004] indicates that the evidence has not been reviewed since 2004
- [2004, amended 2015] indicates that the evidence has not been reviewed since 2004, but either changes have been made to the recommendation wording that change the meaning or NICE has made editorial changes to the original wording to clarify the action to be taken.

Recommendations from NICE guideline CG15 that have been amended

Recommendations are labelled [2004, amended 2015] if the evidence has not been reviewed but:

- changes have been made to the recommendation wording that change the meaning or
- NICE has made editorial changes to the original wording to clarify the action to be taken or
- the recommendation originally only applied to type 1 diabetes in children and young people, but has been included in the section of this guideline on type 2 diabetes as it is applicable to this population.

Recommendation in 2004 guideline	Recommendation in current guideline	Reason for change
<p>The diagnosis of type 1 diabetes in children and young people should be based on the criteria specified in the 1999 World Health Organization report on the diagnosis and classification of diabetes mellitus.^[4]</p> <p>The symptoms and signs of type 1 diabetes include: hyperglycaemia (random blood glucose more than 11 mmol/litre), polyuria, polydipsia and weight loss. (1.1.1.1)</p>	<p>Be aware that the characteristics of type 1 diabetes in children and young people include:</p> <ul style="list-style-type: none"> • hyperglycaemia (random plasma glucose more than 11 mmol/litre) • polyuria • polydipsia • weight loss • excessive tiredness. (1.1.1) <p>Confirm type 1 diabetes in children and young people using the plasma glucose criteria specified in the World Health Organization's 2006 report on the diagnosis and classification of diabetes mellitus. (1.1.3)</p>	<p>The WHO updated their report on the diagnosis and classification of diabetes in 2006.</p> <p>The population has been added to this recommendation for clarification.</p> <p>In addition, this recommendation has been split into 2 recommendations to make it easier to understand.</p> <p>'Symptoms and signs' has been replaced with 'characteristics' as the GDG felt this was a more accurate term for the list of conditions in this recommendation.</p> <p>Excessive tiredness was added at the request of stakeholders commenting on the draft for consultation of the 2015 update as this is a recognised symptom of diabetes.</p> <p>'Plasma glucose' was added to the second recommendation, to make it clear that diagnosis should be confirmed using the WHO plasma glucose criteria and not their HbA1c criteria.</p>

<p>Children and young people with suspected type 1 diabetes should be offered immediate (same day) referral to a multidisciplinary paediatric diabetes care team that has the competencies needed to confirm diagnosis and to provide immediate care. (1.1.1.2)</p>	<p>Refer children and young people with suspected type 1 diabetes immediately (on the same day) to a multidisciplinary paediatric diabetes team with the competencies needed to confirm diagnosis and to provide immediate care. (1.1.2)</p>	<p>The action was changed from 'offer' to 'refer', as the 2012 NICE guidelines manual used to develop this update has a specific definition of the word 'offer' that was not used when the original 2004 guideline was published.</p>
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<p>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:</p> <ul style="list-style-type: none"> • 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 	<p>Think about the possibility of type 2 diabetes in children and young people with suspected diabetes who:</p> <ul style="list-style-type: none"> • have a strong family history of type 2 diabetes • are obese at presentation • are of black or Asian family origin • have no insulin requirement, or have an insulin requirement of less than 0.5 units/kg body weight/day after the partial remission phase • show evidence of insulin resistance (for example, acanthosis nigricans). (1.1.5) <p>Think about the possibility of types of diabetes other than types 1 or 2 (such as other insulin resistance syndromes or monogenic or mitochondrial diabetes) in children and young people with suspected diabetes who</p>	<p>This recommendation has been split into two, as the Guideline Development Group felt that type 2 diabetes should be considered separately from the rarer conditions now that it is covered in this guideline.</p> <p>In addition, not all of the factors listed applied to type 2 diabetes or to the rarer conditions. Because of this, the Guideline Development Group felt that separating them into two lists makes it clearer which factors apply to which condition.</p> <p>In the second recommendation, maturity onset diabetes in the young and molecular/enzymatic abnormalities have been replaced by monogenic diabetes and mitochondrial diabetes to cover diabetes more generally; diabetes in the first year of life has been added to cover neonatal diabetes; the reference to ketone bodies in the urine has been changed to ketone bodies in the blood to mirror the recommendations elsewhere in the guideline; and 'eye disease' has been replaced with 'optic atrophy and retinitis pigmentosa', as the Guideline Development Group felt that 'eye disease' was not specific enough and could be mistaken for diabetic retinopathy.</p>
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<ul style="list-style-type: none"> • show evidence of insulin resistance (for example, acanthosis nigricans) • have associated features, such as eye disease, deafness, or another systemic illness or syndrome. (1.1.1.3) 	<p>have any of the following features:</p> <ul style="list-style-type: none"> • diabetes in the first year of life • rarely or never develop ketone bodies in the blood (ketonaemia) during episodes of hyperglycaemia • associated features, such as optic atrophy, retinitis pigmentosa, deafness, or another systemic illness or syndrome. (1.1.6) 	
<p>Young people with type 1 diabetes should be encouraged to attend clinics on a regular basis (three or four times per year) because regular attendance is associated with good glycaemic control. (1.5.2.1)</p>	<p>Encourage young people with type 1 diabetes to attend clinic 4 times a year because regular contact is associated with optimal blood glucose control. (1.2.3)</p>	<p>The recommended number of contacts has been updated to reflect the Paediatric Diabetes Best Practice Tariff Criteria. In addition, 4 clinic attendances is standard in current clinical practice.</p>

<p>Children and young people with type 1 diabetes and their families should be informed that, as for other children, regular dental examinations^[6] and eye examinations (every 2 years) are recommended. (1.3.5.4)</p>	<p>Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that like others they are advised to have:</p> <ul style="list-style-type: none"> • regular dental examinations (see the NICE guideline on dental recall) • an eye examination by an optician every 2 years. (1.2.4) 	<p>An explanation has been added to the bullet on eye examination to make it clear this refers to standard eye tests rather than retinopathy monitoring. In addition, 'recommended' has been changed to 'advised to have' as part of the editorial changes to make this sentence active.</p>
<p>Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) how to find information about benefits from government disability support. (1.5.1.4)</p>	<p>Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) how to find information about government disability benefits. (1.2.8)</p>	<p>The phrasing has been changed to refer to government disability benefits in general rather than implying that a specific benefit is applicable.</p>

<p>Children and young people with type 1 diabetes wishing to participate in restricted sports (such as scuba diving) should be offered comprehensive advice by their diabetes team. Additional information may be available from local and/or national patient support groups and organisations. (1.2.8.3)</p>	<p>Children and young people with type 1 diabetes wishing to participate in sports that may have particular risks for people with diabetes should be offered comprehensive advice by their diabetes team. Additional information may be available from local and/or national support groups and organisations, including sports organisations. (1.2.10)</p>	<p>The reference to restricted sports has been deleted because this is no longer meaningful. The phrasing has been changed to emphasise that the recommendation is about sports that may have particular risks for people with diabetes, and the specific reference to scuba diving has been deleted. The reference to support organisations has been amended to cover sports organisations as well as patient support organisations.</p>
<p>Encourage children and young people with type 1 diabetes not to start smoking. (1.2.9.5)</p>	<p>Encourage children and young people with type 1 diabetes not to start smoking. See also the NICE guidelines on preventing the uptake of smoking by children and young people and school-based interventions to prevent smoking. (1.2.13)</p>	<p>A reference to related NICE guidance on prevention of smoking in children and young people has been added.</p>

<p>Offer smoking cessation programmes to children and young people with type 1 diabetes who smoke. (1.2.9.6)</p>	<p>Offer smoking cessation programmes to children and young people with type 1 diabetes who smoke. See also the NICE guidelines on brief interventions and referral for smoking cessation, smoking cessation services, harm reduction approaches to smoking, and smoking cessation in secondary care. (1.2.14)</p>	<p>A reference to related NICE guidance on smoking cessation has been added.</p>
<p>Children and young people with type 1 diabetes and their families should be informed that the Department of Health recommends immunisation against pneumococcal infection for children and young people with diabetes over the age of 2 months. (1.2.11.2)</p>	<p>Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that the Department of Health's Green Book recommends immunisation against pneumococcal infection for children and young people with diabetes who need insulin or oral hypoglycaemic medicines. (1.2.17)</p>	<p>This recommendation has been updated to reflect guidance from the Department of Health's Green Book.</p>

<p>Encourage children and young people with type 1 diabetes who are using multiple daily insulin regimens and their family members or carers (as appropriate) to adjust the insulin dose if appropriate after each pre-meal, bedtime and occasional night-time blood glucose measurement. (1.2.6.10)</p>	<p>Encourage children and young people with type 1 diabetes who are using multiple daily insulin injection regimens and their family members or carers (as appropriate) to adjust the insulin dose if appropriate after each blood glucose measurement. (1.2.20)</p>	<p>The reference to the timing of blood glucose measurements has been deleted because the recommendations about blood glucose measurements state the minimum number of times measurements should be made, but not the specific timing of the measurements.</p>
<p>Children and young people with newly diagnosed type 1 diabetes should be informed that they may experience a partial remission phase (or 'honeymoon period') during which a low dosage of insulin (0.5 units/kg body weight/day) may be sufficient to maintain an HbA_{1c} level of less than 7%. (1.1.3.1)</p>	<p>Explain to children and young people with newly diagnosed type 1 diabetes and their family members or carers (as appropriate) that they may experience a partial remission phase (a 'honeymoon period') during which a low dosage of insulin (0.5 units/kg body weight/day) may be sufficient to maintain an HbA_{1c} level of less than 48 mmol/mol (6.5%). (1.2.24)</p>	<p>This recommendation has been expanded to include family members or carers (as appropriate), as they may also be involved in the child or young person's treatment.</p> <p>In addition, the target HbA_{1c} level has been updated to match the new recommendations on HbA_{1c} target levels.</p>

<p>Children and young people with type 1 diabetes using insulin injection regimens should be offered needles that are of an appropriate length for their body fat (short needles are appropriate for children and young people with less body fat; longer needles are appropriate for children and young people with more body fat). (1.2.4.2)</p>	<p>Provide children and young people with type 1 diabetes with insulin injection needles that are of an appropriate length for their body fat. (1.2.26)</p>	<p>The information on what needle length is appropriate for a child has been deleted from this recommendation, as the GDG felt that this was well known and did not need defining in the recommendation.</p>
<p>Children and young people with type 1 diabetes should be offered:</p> <ul style="list-style-type: none"> • annual foot care reviews • investigation of the state of injection sites at each clinic visit. (1.3.5.3) 	<p>Offer children and young people with type 1 diabetes a review of injection sites at each clinic visit. (1.2.28)</p>	<p>The text on foot care has been removed from this recommendation, as it is covered by the new NICE guideline on diabetic foot care.</p>

<p>Children and young people with type 1 diabetes and their families should be informed that they have the same basic nutritional requirements as other children and young people. The food choices of children and young people should provide sufficient energy and nutrients for optimal growth and development, with total daily energy intake being distributed as follows:</p> <ul style="list-style-type: none"> • carbohydrates – more than 50% • protein – 10–15% • fat – 30–35%. <p>The consumption of five portions of fruit and vegetables per day is also recommended. Neonates, infants and pre-school children require individualised dietary assessment to determine their energy needs. (1.2.7.2)</p>	<p>Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that children and young people with type 1 diabetes have the same basic nutritional requirements as other children and young people. Children and young people's food should provide sufficient energy and nutrients for optimal growth and development. (1.2.36)</p>	<p>The text on total daily energy intake distribution and eating 5 portions of fruit and vegetables per day has been removed from this recommendation, as the 2015 recommendation 1.2.41 covers this.</p> <p>In addition, the specific energy intake levels were removed, as these are applicable to all children and not just those with type 1 diabetes.</p>
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<p>Children and young people with type 1 diabetes should have their height and weight measured and plotted on an appropriate growth chart and their body mass index calculated at each clinic visit. The purpose of measuring and plotting height and weight and calculating body mass index is to check for normal growth and/or significant changes in weight because these may reflect changing glycaemic control. (1.3.5.5)</p>	<p>At each clinic visit for children and young people with type 1 diabetes measure height and weight and plot on an appropriate growth chart. Check for normal growth and/or significant changes in weight because these may reflect changes in blood glucose control. (1.2.45)</p>	<p>This recommendation has been heavily edited for clarity, and the second part of the recommendation has been rewritten to make it easier to follow. The reference to measuring BMI has been deleted because it is not necessary to measure this at every clinic visit.</p>
<p>Encourage all children and young people, including those with type 1 diabetes, to exercise on a regular basis because this reduces the risks of developing macrovascular disease in the long term. (1.2.8.1)</p>	<p>Encourage all children and young people, including those with type 1 diabetes, to exercise on a regular basis because this reduces the risks of developing cardiovascular disease in the long term. (1.2.47)</p>	<p>The term macrovascular has been changed to cardiovascular to clarify the meaning.</p>

<p>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. (1.2.8.4)</p>	<p>Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) about the effects of exercise on blood glucose levels and about strategies for avoiding hypo- or hyperglycaemia during or after physical activity. (1.2.49)</p>	<p>The term 'exercise-induced' has been removed from this recommendation, as the GDG felt that the cause of hypoglycaemia did not need stating here. In addition, hyperglycaemia caused by exercise has been added to this recommendation, as this is also a complication that children and young people with type 1 diabetes and their family members or carers (as appropriate) should be aware of.</p> <p>In addition, this recommendation has been expanded to include family members or carers (as appropriate), as they may also be involved in the child or young person's treatment.</p>
<p>Children and young people with type 1 diabetes should be offered testing of their HbA_{1c} levels two to four times per year (more frequent testing may be appropriate if there is concern about poor glycaemic control). (1.2.6.2)</p>	<p>Offer children and young people with type 1 diabetes measurement of their HbA_{1c} level 4 times a year (more frequent testing may be appropriate if there is concern about suboptimal blood glucose control). (1.2.71)</p>	<p>The recommended number of measurements has been updated to reflect the Paediatric Diabetes Best Practice Tariff Criteria. In addition, 4 measurements a year is standard in current clinical practice.</p>

<p>Children and young people with type 1 diabetes, their parents and other carers should be informed that they should always have access to an immediate source of carbohydrate (glucose or sucrose) and blood glucose monitoring equipment for immediate confirmation and safe management of hypoglycaemia. (1.3.1.1)</p>	<p>Explain to children and young people with type 1 diabetes and their family members or carers (as appropriate) that they should always have access to an immediate source of fast-acting glucose and blood glucose monitoring equipment for immediate confirmation and safe management of hypoglycaemia. (1.2.78)</p>	<p>The type of carbohydrate suitable for safe management of hypoglycaemia has been changed from 'glucose or sucrose' to 'fast-acting glucose', as the Guideline Development Group felt this was what was recommended in current practice.</p>
<p>Parents and, where appropriate, school nurses and other carers should have access to glucagon for subcutaneous or intramuscular use in an emergency, especially when there is a high risk of severe hypoglycaemia. (1.3.1.6)</p>	<p>Family members or carers and, where appropriate, school nurses and other carers should be trained and equipped to give intramuscular glucagon for severe hypoglycaemia in an emergency. (1.2.79)</p>	<p>Subcutaneous glucagon has been removed from this recommendation, as the Guideline Development Group did not think this was used in current practice.</p> <p>The recommendation has been reworded to make it clear that intramuscular glucagon would only be given for severe hypoglycaemia.</p> <p>In addition, 'have access' has been replaced with 'trained and equipped', as the GDG felt that this was an important point that was left out of the original recommendation.</p>

<p>Children and young people with mild to moderate hypoglycaemia should be treated as follows.</p> <ul style="list-style-type: none"> • Take immediate action. • The first line of treatment should be the consumption of rapidly absorbed simple carbohydrate (for example, 10–20 g carbohydrate given by mouth). • The simple carbohydrate should raise blood glucose levels within 5–15 minutes. • Carbohydrate given in liquid form may be taken more easily. • It may be appropriate to give small amounts of rapidly absorbed simple carbohydrate frequently because hypoglycaemia may cause vomiting. • As symptoms improve or normoglycaemia is restored additional 	<p>Immediately treat mild to moderate hypoglycaemia in children and young people as follows.</p> <ul style="list-style-type: none"> • Give fast-acting glucose (for example, 10–20 g) by mouth (liquid carbohydrate may be taken more easily than solid). • Be aware that fast-acting glucose may need to be given in frequent small amounts, because hypoglycaemia can cause vomiting. • Recheck blood glucose levels within 15 minutes (fast-acting glucose should raise blood glucose levels within 5–15 minutes) and repeat fast-acting glucose if hypoglycaemia persists. • As symptoms improve or normoglycaemia is restored, give oral complex long-acting carbohydrate to maintain blood glucose 	<p>This recommendation has been reworded and reordered to make it easier to understand.</p> <p>In addition, the type of carbohydrate suitable for safe management of hypoglycaemia has been changed from 'glucose or sucrose' to 'fast-acting glucose', as the Guideline Development Group felt this was what was recommended in current practice. The recommendation also clarifies that administration of fast-acting glucose should be repeated if hypoglycaemia persists.</p>
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<p>complex long-acting carbohydrate should be given orally to maintain blood glucose levels unless a snack or meal is imminent.</p> <ul style="list-style-type: none"> • Additional complex long-acting carbohydrate is not required for children and young people using continuous subcutaneous insulin infusion. • Blood glucose levels should be rechecked within 15 minutes. (1.3.1.4) 	<p>levels, unless the child or young person is:</p> <ul style="list-style-type: none"> - about to have a snack or meal - receiving a continuous subcutaneous insulin infusion. (1.2.80) 	
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<p>Children and young people with severe hypoglycaemia should be treated as follows.</p> <ul style="list-style-type: none"> • In a hospital setting, 10% intravenous glucose should be used when rapid intravenous access is possible (up to 500 mg/kg body weight – 10% glucose is 100 mg/ml). • Outside hospital, or where intravenous access is not practicable, intramuscular glucagon or concentrated oral glucose solution (e.g. Hypostop) may be used. • Children and young people over 8 years old (or body weight more than 25 kg) should be given 1 mg glucagon. • Children under 8 years old (or body weight less than 25 kg) should be given 	<p>Treat severe hypoglycaemia in children and young people with type 1 diabetes who are in hospital and in whom rapid intravenous access is possible by giving 10% intravenous glucose. Give a maximum dose of 500 mg/kg body weight (equivalent to a maximum of 5 ml/kg). (1.2.81)</p> <p>Treat severe hypoglycaemia in children and young people with type 1 diabetes who are not in hospital or who do not have rapid intravenous access available as follows.</p> <ul style="list-style-type: none"> • Use intramuscular glucagon or a concentrated oral glucose solution (for example Glucogel). Do not use oral glucose solution if the level of consciousness is reduced as this could be dangerous. • If using intramuscular glucagon: <ul style="list-style-type: none"> – give children and young people over 8 years old (or 	<p>This recommendation has been reworded, reordered, and split into 2 separate recommendations to make it easier to understand.</p> <p>The dose for children and young people who weigh 25 kg has been added to the recommendation.</p> <p>In addition, the action in the section on intramuscular glucagon and concentrated oral glucose solution has changed from 'may be used' to 'Use'. This is because the Guideline Development Group felt that these 2 were the only standard treatment options rather than 2 options out of several, as was suggested by the original wording.</p> <p>The reference to 'Hypostop' has been changed to 'Glucogel', as the GDG felt that this was the preparation commonly used in clinical practice.</p> <p>A warning on using oral glucose solution in children with reduced levels of consciousness has been added, as the GDG felt that this is being missed in clinical practice. This is an important safety issue and was alluded to in the 2004 recommendation, but it was not made clear that it applied at this stage. It is vitally important that caution is exercised when giving Glucogel at first presentation, as this is the stage at which reduced conscious level is most likely to occur.</p>
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<p>500 micrograms of glucagon.</p> <ul style="list-style-type: none"> • Blood glucose levels should respond within 10 minutes. • As symptoms improve or normoglycaemia is restored, in children and young people who are sufficiently awake, additional complex long-acting carbohydrate should be given orally to maintain blood glucose levels. • Some children and young people may continue to have reduced consciousness for several hours after a severe hypoglycaemic episode, and repeat blood glucose measurements will be required to determine whether further glucose is necessary. • Medical assistance should be sought for children and young 	<p>who weigh 25 kg or more) 1 mg glucagon.</p> <p>– give children under 8 years old (or who weigh less than 25 kg) 500 micrograms of glucagon.</p> <ul style="list-style-type: none"> • Seek medical assistance if blood glucose levels do not respond or symptoms persist for more than 10 minutes. • As symptoms improve or normoglycaemia is restored, and once the child or young person is sufficiently awake, give oral complex long-acting carbohydrate to maintain normal blood glucose levels. • Recheck the blood glucose repeatedly in children and young people who have persistently reduced consciousness after a severe hypoglycaemic episode, to determine whether further 	
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<p>people whose blood glucose levels fail to respond and those in whom symptoms persist for more than 10 minutes. (1.3.1.5)</p>	<p>glucose is needed. (1.2.82)</p>	
<p>Young people with type 1 diabetes should be informed about the specific effects of alcohol consumption on glycaemic control, particularly the risk of (nocturnal) hypoglycaemia. (1.2.9.1)</p>	<p>Explain to young people with type 1 diabetes the effects of alcohol consumption on blood glucose control, and in particular that there is an increased risk of hypoglycaemia including hypoglycaemia while sleeping. (1.2.83)</p>	<p>The term 'nocturnal hypoglycaemia' has been changed to 'hypoglycaemia while sleeping', as the Guideline Development Group did not think the original term was common in clinical practice.</p>
<p>Non-adherence to therapy should be considered in children and young people with type 1 diabetes who have poor glycaemic control, especially in adolescence. (1.4.6.1)</p>	<p>Think about the possibility of non-adherence to therapy in children and young people with type 1 diabetes who have suboptimal blood glucose control, especially in adolescence. (1.2.87)</p>	<p>The action was changed from 'consider' to 'think about', as the 2012 NICE guidelines manual used to develop this update has a specific definition of the word 'consider' that was not used when the original 2004 guideline was published.</p>
<p>Diabetes care teams should be aware that children and young people with type 1 diabetes have a greater risk of emotional and behavioural problems than other children and young people. (1.4.1.1)</p>	<p>Diabetes teams should be aware that children and young people with type 1 diabetes have a greater risk of emotional and behavioural difficulties. (1.2.94)</p>	<p>This recommendation has been amended, as the original suggested that children and young people with type 1 diabetes have a greater risk of emotional and behavioural problems than all other children and young people, which is not the case.</p>

<p>Young people with 'brittle diabetes' (that is, those who present with frequent episodes of diabetic ketoacidosis over a relatively short time) should have their emotional and psychological well-being assessed. (1.4.6.3)</p>	<p>Assess the emotional and psychological wellbeing of young people with type 1 diabetes who present with frequent episodes of diabetic ketoacidosis (DKA). (1.2.96)</p>	<p>The term 'brittle diabetes' has been removed from this recommendation, as the GDG felt that this term was no longer commonly used in clinical practice.</p>
<p>Children and young people with type 1 diabetes and their families should be offered timely and ongoing access to mental health professionals because they may experience psychological disturbances (such as anxiety, depression, behavioural and conduct disorders and family conflict) that can impact on the management of diabetes and well-being. (1.4.7.5)</p>	<p>Offer children and young people with type 1 diabetes and their family members or carers (as appropriate) timely and ongoing access to mental health professionals with an understanding of diabetes because they may experience psychological problems (such as anxiety, depression, behavioural and conduct disorders and family conflict) or psychosocial difficulties that can impact on the management of diabetes and wellbeing. (1.2.98)</p>	<p>The reference to mental health professionals has been amended to clarify that those involved in caring for children and young people with diabetes should be knowledgeable about diabetes. The importance of psychosocial difficulties has also been emphasised by adding this to the recommendation.</p>

<p>Diabetes care teams should be aware that children and young people with type 1 diabetes, in particular young women, have an increased risk of eating disorders. (1.4.3.1)</p>	<p>Diabetes teams should be aware that children and young people with type 1 diabetes, in particular young women, have an increased risk of eating disorders. For more guidance on assessing and managing eating disorders, see the NICE guideline on eating disorders. (1.2.107)</p>	<p>A cross-reference to the NICE guideline on eating disorders has been added for information.</p>
<p>Diabetes care teams should be aware that children and young people with type 1 diabetes who have eating disorders may have associated problems of persistent hyperglycaemia, recurrent hypoglycaemia and/or symptoms associated with gastric paresis. (1.4.3.2)</p>	<p>Be aware that children and young people with type 1 diabetes who have eating disorders may have associated difficulties with:</p> <ul style="list-style-type: none"> • suboptimal blood glucose control (both hyperglycaemia and hypoglycaemia) • symptoms of gastroparesis. (1.2.108) 	<p>The terms 'persistent hyperglycaemia' and 'recurrent hypoglycaemia' have been replaced with the text on poor blood glucose control, covering both hyperglycaemia and hypoglycaemia. This is because the Guideline Development Group felt that these two complications are both indicative of poor blood glucose control, so it would be simpler to use this phrase in the recommendation.</p> <p>In addition, the phrase 'symptoms associated with gastric paresis' has been changed, as the GDG felt that the use of 'associated' made this recommendation vague. 'gastric paresis' has been changed to 'gastroparesis', as this is the term currently used in practice.</p>

<p>Children and young people with type 1 diabetes in whom eating disorders are identified by their diabetes care team should be offered joint management involving their diabetes care team and child mental health professionals. (1.4.3.3)</p>	<p>For children and young people with type 1 diabetes in whom eating disorders are identified, offer joint management involving their diabetes team and child mental health professionals. (1.2.109)</p>	<p>This recommendation has been amended as healthcare professionals outside of the diabetes team (such as GPs) can also identify eating disorders.</p>
<p>Children and young people with type 1 diabetes and their families should be informed that, as for other children, regular dental examinations^[b] and eye examinations (every 2 years) are recommended. (1.3.5.4)</p>	<p>Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that like others they are advised to have:</p> <ul style="list-style-type: none"> • regular dental examinations^[b] • an eye examination by an optician every 2 years. (1.3.3) 	<p>An explanation has been added to the bullet on eye examination to make it clear this refers to standard eye tests rather than retinopathy monitoring. 'recommended' has been changed to 'advised to have' as part of the editorial changes to make this sentence active.</p> <p>In addition, this recommendation originally only applied to type 1 diabetes in children and young people, but has been included in the section of this guideline on type 2 diabetes as it is applicable to this population.</p>

<p>Children and young people with type 1 diabetes and their families should be offered information about the existence of and means of contacting local and/or national diabetes support groups and organisations, and the potential benefits of membership. This should be done in the time following diagnosis and periodically thereafter. (1.5.1.1)</p>	<p>Give children and young people with type 2 diabetes and their family members or carers (as appropriate) information about local and/or national diabetes support groups and organisations, and the potential benefits of membership. Give this information after diagnosis and regularly afterwards. (1.3.5)</p>	<p>NICE has made editorial changes to the original wording to clarify the action to be taken (no change to meaning): a verb has been added, or the verb used has been changed.</p> <p>In addition, this recommendation originally only applied to type 1 diabetes in children and young people, but has been included in the section of this guideline on type 2 diabetes as it is applicable to this population.</p>
<p>Children and young people with type 1 diabetes and their families should be advised how to obtain information about benefits in relation to government disability support. (1.5.1.4)</p>	<p>Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) how to find information about possible government disability benefits. (1.3.6)</p>	<p>The word 'possible' has been added, as the benefits available to children and young people with type 2 diabetes can be different to those available to children and young people with type 1 diabetes.</p> <p>In addition, this recommendation originally only applied to type 1 diabetes in children and young people, but has been included in the section of this guideline on type 2 diabetes as it is applicable to this population.</p>

<p>Children and young people with type 1 diabetes and their families should be informed that the Department of Health recommends annual immunisation against influenza for children and young people with diabetes over the age of 6 months. (1.2.11.1)</p>	<p>Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that the Department of Health's <u>Green Book</u> recommends annual immunisation against influenza for children and young people with diabetes. (1.3.12)</p>	<p>This recommendation originally only applied to type 1 diabetes in children and young people, but has been included in the section of this guideline on type 2 diabetes as it is applicable to this population.</p> <p>In addition, 'over 6 months' has been taken out of this recommendation, as type 2 diabetes normally only occurs in young people or adults, and never in children under 6 months.</p>
<p>Children and young people with type 1 diabetes and their families should be informed that the Department of Health recommends immunisation against pneumococcal infection for children and young people with diabetes over the age of 2 months. (1.2.11.2)</p>	<p>Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that the Department of Health's <u>Green Book</u> recommends immunisation against pneumococcal infection for children and young people with diabetes who need insulin or oral hypoglycaemic medicines. (1.3.13)</p>	<p>This recommendation has been updated to reflect guidance from the Department of Health's <u>Green Book</u>.</p> <p>This recommendation originally only applied to type 1 diabetes in children and young people, but has been included in the section of this guideline on type 2 diabetes as it is applicable to this population.</p> <p>In addition, 'over the age of 2 months' has been taken out of this recommendation, as type 2 diabetes normally only occurs in young people or adults, and never in children under 2 months.</p>

<p>Children and young people with type 1 diabetes should have their height and weight measured and plotted on an appropriate growth chart and their body mass index calculated at each clinic visit. The purpose of measuring and plotting height and weight and calculating body mass index is to check for normal growth and/or significant changes in weight because these may reflect changing glycaemic control. (1.3.5.5)</p>	<p>At each clinic visit for children and young people with type 2 diabetes:</p> <ul style="list-style-type: none"> • measure height and weight and plot on an appropriate growth chart • calculate BMI. <p>Check for normal growth and/or significant changes in weight because these may reflect changes in blood glucose control. (1.3.21)</p>	<p>This recommendation has been heavily edited for clarity, and the second part of the recommendation has been rewritten to make it easier to follow.</p> <p>In addition, this recommendation originally only applied to type 1 diabetes in children and young people, but has been included in the section of this guideline on type 2 diabetes as it is applicable to this population.</p>
<p>Diabetes care teams should be aware that children and young people with type 1 diabetes have a greater risk of emotional and behavioural problems than other children and young people. (1.4.1.1)</p>	<p>Diabetes teams should be aware that children and young people with type 2 diabetes have a greater risk of emotional and behavioural difficulties. (1.3.33)</p>	<p>This recommendation has been amended, as the original suggested that children and young people with diabetes have a greater risk of emotional and behavioural problems than all other children and young people, which is not the case.</p> <p>In addition, this recommendation originally only applied to type 1 diabetes in children and young people, but has been amended to include type 2 diabetes as it is applicable to this population.</p>

<p>Children with type 1 diabetes who are younger than 2 years of age and children and young people who have social or emotional difficulties, or who live a long way from hospital should be offered inpatient initial management. (1.1.2.6)</p>	<p>Offer initial inpatient management to children with diabetes who are aged under 2 years. (1.5.5)</p> <p>Think about initial inpatient management for children and young people with diabetes if there are social or emotional factors that would make home-based management inappropriate, or if they live a long distance from the hospital. (1.5.6)</p>	<p>This recommendation has been split into 2 recommendations to make the differences in care for the 2 populations clearer.</p> <p>In addition, this recommendation originally only applied to type 1 diabetes in children and young people, but has been amended to include type 2 diabetes as it is applicable to this population.</p>
<p>Explain to young people with type 1 diabetes who are preparing for transition to adult services that some aspects of diabetes care will change at transition. The main changes relate to targets for short-term blood glucose control and screening for complications. (1.5.2.7)</p>	<p>Explain to young people with type 1 diabetes who are preparing for transition to adult services that some aspects of diabetes care will change at transition. (1.5.13)</p>	<p>The examples of changes at transition have been deleted because those specified in the 2004 recommendation no longer apply to the same extent and there is now much greater harmony generally between the recommendations for children and young people and those for adults.</p>
	<p>1.2.3, 1.2.30, 1.2.71, 1.2.87, 1.2.104, 1.2.108, 1.3.40</p>	<p>The terms 'good' and 'satisfactory' have been changed to 'optimal' and the term 'poor' has been changed to 'suboptimal' throughout the recommendations to avoid them appearing judgemental.</p>

	1.2.21, 1.2.23	The terms 'preprandial' and 'postprandial' have been changed to 'pre-meal', 'before meals', and 'after meals' when appropriate, as the GDG felt that these terms are simpler and more commonly used.
	1.2.21, 1.2.22, 1.2.23, 1.2.24, 1.2.26, 1.2.40, 1.2.50	These recommendations have been expanded to include family members or carers (as appropriate), as they may also be involved in the child or young person's treatment.
	1.2.6, 1.2.22, 1.2.32, 1.2.93, 1.2.96, 1.2.109, 1.4.64, 1.5.7, 1.5.12	NICE has made editorial changes to the original wording to clarify the action to be taken (no change to meaning): a verb has been added, or the verb used has been changed.
	1.3.3, 1.3.5, 1.3.6, 1.3.7, 1.3.8, 1.3.9, 1.3.10, 1.3.11, 1.3.12, 1.3.13, 1.3.16, 1.3.21, 1.3.22, 1.3.29, 1.3.30, 1.3.31, 1.3.32, 1.3.33, 1.3.34, 1.3.35, 1.3.36, 1.3.37, 1.3.38, 1.3.40, 1.3.41, 1.5.1, 1.5.2, 1.5.3, 1.5.4, 1.5.5, 1.5.6, 1.5.8, 1.5.9, 1.5.10, 1.5.11, 1.5.12	These recommendations originally only applied to type 1 diabetes in children and young people, but have been included in the section of this guideline on type 2 diabetes as they are applicable to this population.
	1.2.52	The term 'blood' has been changed to 'plasma', as this recommendation is referring to a concentration value.
<p>^[a] World Health Organization (1999)</p> <p>^[b] Dental recall: recall interval between routine dental examinations (2004) NICE guideline CG19</p>		

Strength of recommendations

Some recommendations can be made with more certainty than others. The Guideline Development Group makes a recommendation based on the trade-off between the benefits and harms of an intervention, taking into account the quality of the underpinning evidence. For some interventions, the Guideline Development Group is confident that, given the information it has looked at, most patients would choose the intervention. The wording used in the recommendations in this guideline denotes the certainty with which the recommendation is made (the strength of the recommendation).

For all recommendations, NICE expects that there is discussion with the patient about the risks and benefits of the interventions, and their values and preferences. This discussion aims to help them to reach a fully informed decision (see also [patient-centred care](#)).

Interventions that must (or must not) be used

We usually use 'must' or 'must not' only if there is a legal duty to apply the recommendation. Occasionally we use 'must' (or 'must not') if the consequences of not following the recommendation could be extremely serious or potentially life threatening.

Interventions that should (or should not) be used – a 'strong' recommendation

We use 'offer' (and similar words such as 'refer' or 'advise') when we are confident that, for the vast majority of patients, an intervention will do more good than harm, and be cost effective. We use similar forms of words (for example, 'Do not offer...') when we are confident that an intervention will not be of benefit for most patients.

Interventions that could be used

We use 'consider' when we are confident that an intervention will do more good than harm for most patients, and be cost effective, but other options may be similarly cost effective. The choice of intervention, and whether or not to have the intervention at all, is more likely to depend on the patient's values and preferences than for a strong recommendation, and so the healthcare professional should spend more time considering and discussing the options with the patient.

Recommendation wording in guideline updates

NICE began using this approach to denote the strength of recommendations in guidelines that started development after publication of the 2009 version of 'the guidelines manual' (January

2009). This does not apply to any recommendations ending [2004] or [2004, amended 2015] (see 'update information' above for details about how recommendations are labelled). In particular, for recommendations labelled [2004] or [2004, amended 2015] the word 'consider' may not necessarily be used to denote the strength of the recommendation.

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Accreditation

