Diabetes in children and young people (update)

NICE guideline

Draft for consultation, December 2014

If you wish to comment on this version of the guideline, please be aware that all the supporting information and evidence is contained in the full version.

Contents

Introduction

Diabetes is a chronic 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 here and in the original 2004 guideline. Preparations should also be made for the child or young person's transition 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 2012–13 National Diabetes Audit identified 24,000 children and young people in the UK with type 1 diabetes and 450 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 to recommend attempting to achieve a glycosylated haemoglobin (HbA1c) level in 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

[1] National Paediatric Diabetes Audit report 2012–13.

continuous subcutaneous glucose monitoring may also help children and young people to achieve better blood glucose control, although this is not currently recommended for all children and young people with type 1 diabetes.

The guideline development group (GDG) 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.

Medicines recommendations

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

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. 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. Diagnosis and management should be reviewed throughout the transition process, and there should be clarity about who is the lead clinician to ensure continuity of care.

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 shaded in grey and ending 2004 (see 'Update information' box below 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.

Update information

This guidance is an update of NICE guideline CG15 (published July 2004) and will replace the guidance for children.

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

You are invited to comment on the new and updated recommendations in this guideline. These are marked as:

- **[new 2015]** if the evidence has been reviewed and the recommendation has been added or updated
- **[2015]** if the evidence has been reviewed but no change has been made to the recommended action.

You are also invited to comment on recommendations that NICE proposes to delete from the 2004 guideline, because either the evidence has been reviewed and the recommendations have been updated, or NICE has updated other relevant guidance and has replaced the original recommendations. Appendix A sets out these recommendations and includes details of replacement recommendations. Where there is no replacement recommendation, an explanation for the proposed deletion is given.

Recommendations without an evidence review

NICE is piloting a new process for identifying and labelling changes to recommendations that have not undergone an evidence review as part of the update. In this guideline:

- minor editorial changes that do not affect the content of the recommendation have not been highlighted in yellow
- the definition of an 'amended' recommendation has been expanded (see below).

Where recommendations are shaded in grey and end **[2004]**, the evidence has not been reviewed since the original guideline. We will not be able to accept comments on these recommendations.

Where recommendations are shaded in grey and end **[2004, amended 2015]**, the evidence has not been reviewed but either:

- changes have been made to the recommendation wording that change the meaning (for example, because of equalities duties or a change in the availability of medicines, or incorporated guidance has been updated) **or**
- NICE has made editorial changes to the original wording to clarify the action to be taken.

These changes are marked with yellow shading, and explanations of the reasons for the changes are given in appendix A for information. We will not routinely accept comments on these recommendations, but will respond if particular concerns are raised around the proposed amendments.

The original NICE guideline and supporting documents are available here.

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] [1.2.9 and 1.3.7]**

Insulin therapy for children and young people with type 1 diabetes

- Offer children an d young people with type 1 diabetes multiple daily insulin injection regimens from diagnosis. If a multiple daily insulin 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]**

Dietary management for children and young people with type 1 diabetes

- Offer level 3 carbohydrate-counting education from diagnosis to children and young people with type 1 diabetes who are using multiple daily injections or insulin pump therapy, and to their family members or carers (as appropriate), and repeat the offer at intervals thereafter. **[new 2015] [1.2.37]**

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] [1.2.59]**

- Offer ongoing unblinded ('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). **[new 2015] [1.2.63]**

- 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]**

Blood ketone 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 measure blood ketone (beta-hydroxybutyrate) levels during intercurrent illness and episodes of hyperglycaemia. **[new 2015] [1.2.73]**

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 because they may experience psychological problems (such as anxiety, depression, behavioural and conduct disorders and family conflict) that can impact on the management of diabetes and well-being.

  See also the NICE guidelines on depression in children and young people and antisocial behaviour and conduct disorders in children and young people. **[2004, amended 2015] [1.2.97 and 1.3.35]**

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 to screen for low-level albuminuria (microalbuminuria) is important, as this reduces the risk of false positive results
  - if low-level albuminuria (microalbuminuria) is detected, improving blood glucose control will reduce the risk of this progressing to serious diabetic kidney disease
  - annual monitoring (see recommendation 1.3.40) is important because, if diabetic kidney disease is found, early treatment will improve the outcome. **[new 2015] [1.3.50]**

Diabetic ketoacidosis

- Measure capillary blood glucose at presentation in children and young people without known diabetes who have increased thirst or polyuria and any of the following:
  - nausea or vomiting
  - abdominal pain
  - hyperventilation
  - dehydration
  - reduced level of consciousness. **[new 2015] [1.4.1]**

1 Recommendations

The following guidance is based on the best available evidence. The full guideline [hyperlink to be added for final publication] gives details of the methods and the evidence used to develop the guidance.

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 of diabetes

1.1.1 Be aware that the characteristics of type 1 diabetes include:

- hyperglycaemia (random plasma glucose more than 11 mmol/litre)
- polyuria
- polydipsia
- weight loss. **[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 criteria specified in the 2006 World Health Organization 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 or

monogenic 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 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, maturity-onset diabetes in the young and molecular/enzymatic abnormalities) in children and young people with suspected diabetes who have any of the following features:

- rarely or never produce ketone bodies in the urine (ketonuria) during episodes of hyperglycaemia
- have associated features, such as retinitis pigmentosa, deafness, or another systemic illness or syndrome. **[2004, amended 2015]**

1.1.7 Do not measure C-peptide or diabetic-specific antibody titres at initial presentation to distinguish type 1 diabetes from other types of 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 and its mode of delivery
- 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 good 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 or 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 benefits from government disability support. **[2004]**

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 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. **[2004]**

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. **[2004]**

1.2.14 Offer smoking cessation programmes to children and young people with type 1 diabetes who smoke. **[2004]**

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]**

Managing type 1 diabetes in children and young people

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 regimen: injections of short-acting insulin or rapid-acting insulin analogue before meals, together with one or more separate daily injections of intermediate-acting insulin or long-acting insulin analogue.

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 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]**

1.2.19 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]**

1.2.20 Offer children and young people with type 1 diabetes multiple daily insulin injection regimens from diagnosis. If a multiple daily insulin 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]**

1.2.21 Encourage children and young people with type 1 diabetes who are using multiple daily injection 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. **[2004, amended 2015]**

1.2.22 Provide all children and young people with type 1 diabetes who are starting continuous subcutaneous insulin infusion therapy (CSII or insulin pump) 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 type 1 diabetes using multiple daily insulin 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]**

1.2.25 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]**

1.2.26 For pre-school children with type 1 diabetes it may be appropriate to use rapid-acting insulin analogues shortly after eating (rather than before eating) because food intake can be unpredictable. **[2004]**

1.2.27 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]**

1.2.28 Provide children and young people with type 1 diabetes and their family members or carers (as appropriate) with suitable containers for collecting used needles. Arrangements should be available for the suitable disposal of these containers. **[new 2015]**

1.2.29 Offer children and young people with type 1 diabetes a review of injection sites at each clinic visit. **[2004, amended 2015]**

1.2.30 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]**

1.2.31 If a child or young person with type 1 diabetes does not achieve satisfactory blood glucose control:

- 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 using an

insulin pump or once-, twice- or three-times daily mixed insulin injections). **[new 2015]**

Oral medicines for children and young people with type 1 diabetes

1.2.32 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]**

1.2.33 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

1.2.34 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]**

1.2.35 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]**

1.2.36 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 education from diagnosis to children and young people with type 1 diabetes who are using

multiple daily injections 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 or 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
- calculate BMI.

Check for normal growth and/or significant changes in weight because these may reflect changing 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 macrovascular disease in the long term. **[2004]**

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 blood glucose levels are less than 7 mmol/litre before exercise is undertaken. **[2004]**

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]**

Intercurrent illness in children and young people with type 1 diabetes

1.2.54 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 blood ketones (beta-hydroxybutyrate)
- adjusting their insulin regimen
- food and fluid intake
- when 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]**

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

Blood glucose targets

1.2.55 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 blood glucose control are:

- fasting blood glucose level of 4–7 mmol/litre (or 5–7 mmol/litre for young people intending to drive the following morning)
- a blood glucose level of 4–7 mmol/litre before meals
- a blood glucose level of 5–9 mmol/litre after meals. **[new 2015]**

1.2.56 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]**

1.2.57 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]**

1.2.58 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

1.2.59 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]**

1.2.60 Advise children and young people with type 1 diabetes and their family members or carers (as appropriate) that more frequent testing may be needed in some circumstances, for example during intercurrent illness. **[new 2015]**

1.2.61 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]**

1.2.62 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]**

1.2.63 Offer ongoing unblinded (‘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). **[new 2015]**

1.2.64 Consider ongoing unblinded (‘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]**

1.2.65 Consider intermittent (unblinded [‘real-time’] or blinded [‘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

1.2.66 Calibrate HbA1c results according to International Federation of Clinical Chemistry (IFCC) standardisation. **[new 2015]**

1.2.67 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]**

1.2.68 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]**

1.2.69 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]**

1.2.70 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]**

1.2.71 Support children and young people with type 1 diabetes and their family members or carers (as appropriate) to achieve and maintain their individual agreed HbA1c target level. **[new 2015]**

1.2.72 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 poor blood glucose control). **[2004, amended 2015]**

Blood ketone monitoring for children and young people with type 1 diabetes

1.2.73 Advise children and young people with type 1 diabetes and their family members or carers (as appropriate) to measure blood ketone (beta-hydroxybutyrate) levels during intercurrent illness and episodes of hyperglycaemia. **[new 2015]**

1.2.74 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

1.2.75 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]**

1.2.76 Offer education for children and young people with type 1 diabetes, their family members, carers, and schoolteachers about recognising and managing hypoglycaemia. **[2004]**

1.2.77 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]**

1.2.78 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]**

1.2.79 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).
- 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]**

1.2.80 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]**

1.2.81 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 more than 25 kg) 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]**

1.2.82 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]**

1.2.83 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]**

1.2.84 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]**

1.2.85 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 satisfactory blood glucose control in children and young people with type 1 diabetes

1.2.86 Think about the possibility of non-adherence to therapy in children and young people with type 1 diabetes who have poor blood glucose control, especially in adolescence. **[2004, amended 2015]**

1.2.87 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]**

1.2.88 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]**

1.2.89 Be aware of the possible negative psychological impact of setting targets that may be difficult for some children and young people to achieve and maintain. **[new 2015]**

Surgery for children and young people with type 1 diabetes

1.2.90 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]**

1.2.91 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]**

1.2.92 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

1.2.93 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]**

1.2.94 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]**

1.2.95 Assess the emotional and psychological well-being of young people with type 1 diabetes who present with frequent episodes of diabetic ketoacidosis. **[2004, amended 2015]**

1.2.96 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]**

1.2.97 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 because they may experience psychological problems (such as anxiety, depression, behavioural and conduct disorders and family conflict) that can impact on the management of diabetes and well-being.

See also the NICE guidelines on depression in children and young people and antisocial behaviour and conduct disorders in children and young people. **[2004, amended 2015]**

1.2.98 Diabetes teams should have appropriate access to mental health professionals to support them in psychological assessment and the delivery of psychosocial support. **[2004]**

1.2.99 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]**

1.2.100 Offer specific family-based behavioural interventions, such as behavioural family systems therapy, if there are difficulties with diabetes-related family conflict. **[new 2015]**

1.2.101 Consider a programme of behavioural intervention therapy 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 multi-systemic therapy
- glycaemic control in children and young people with high HbA1c levels (HbA1c above 69 mmol/mol (above 8.5%)) - for example, multi-systemic therapy
- self-esteem - for example, support strategies such as mentoring
- depression - for example, motivational interviewing. **[new 2015]**

1.2.102 Offer screening for anxiety and depression to children and young people with type 1 diabetes who have persistently poor blood glucose control. **[2004]**

1.2.103 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]**

1.2.104 Refer children and young people with type 1 diabetes and suspected anxiety and/or depression promptly to child mental health professionals. **[2004]**

1.2.105 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.

See also the NICE guideline on eating disorders. **[2004, amended 2015]**

1.2.106 Be aware that children and young people with type 1 diabetes who have eating disorders may have associated difficulties with:

- poor blood glucose control (both hyperglycaemia and hypoglycaemia)
- symptoms of gastroparesis. **[2004, amended 2015]**

1.2.107 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

1.2.108 Offer children and young people with type 1 diabetes monitoring for:

- coeliac disease at diagnosis
- thyroid disease at diagnosis and annually thereafter until transfer to adult services
- diabetic retinopathy annually from the age of 12 years
- low-level albuminuria (microalbuminuria; to detect diabetic kidney disease) annually from the age of 12 years
- hypertension annually from the age of 12 years.

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]**

1.2.109 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]**

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

Diabetic retinopathy in children and young people with type 1 diabetes

1.2.111 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 the age of 12 years (see recommendation 1.2.108) because diabetic retinopathy that needs treatment is extremely rare in children and young people under 12 years old
- background retinopathy is often found through monitoring, and improving blood glucose control will reduce the risk of this progressing to serious forms of diabetic retinopathy
- annual monitoring from the age of 12 years is important because, if significant diabetic retinopathy is found, early treatment will improve the outcome. **[new 2015]**

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

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

- monitoring for low-level albuminuria (microalbuminuria) to detect diabetic kidney disease begins at the age of 12 years (see recommendation 1.2.108) because diabetic kidney disease in children and young people under 12 years old is extremely rare
- using the first urine sample of the day to screen for low-level albuminuria (microalbuminuria) is important, as this reduces the risk of false positive results
- if low-level albuminuria (microalbuminuria) is detected, improving blood glucose control will reduce the risk of this progressing to serious diabetic kidney disease
- annual monitoring from the age of 12 years is important because, if diabetic kidney disease is found, early treatment will improve the outcome. **[new 2015]**

1.2.113 Use the first urine sample of the day (‘early morning urine’) for the monitoring albumin:creatinine ratio test. 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]**

1.2.114 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]**

1.2.115 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 or 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 benefits from government disability support. **[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. **[2004, amended 2015]**

1.3.10 Offer smoking cessation programmes to children and young people with type 2 diabetes who smoke. **[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]**

Managing type 2 diabetes in children and young people

Metformin

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

Dietary management for children and young people with type 2 diabetes

1.3.15 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 the NICE guideline on obesity). **[new 2015]**

1.3.16 Offer children and young people with type 2 diabetes dietetic support to help optimise body weight and blood glucose control. **[2004, amended 2015]**

1.3.17 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 1.3.15). **[new 2015]**

1.3.18 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]**

1.3.19 Encourage children and young people with type 2 diabetes to eat at least 5 portions of fruit or 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 changing 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]**

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

1.3.22 Calibrate HbA1c results according to International Federation of Clinical Chemistry (IFCC) standardisation. **[new 2015]**

1.3.23 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]**

1.3.24 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]**

1.3.25 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]**

1.3.26 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]**

1.3.27 Measure HbA1c levels every 3 months in children and young people with type 2 diabetes. **[new 2015]**

1.3.28 Support children and young people with type 2 diabetes and their family members or carers (as appropriate) to achieve and maintain their individual agreed HbA1c target level. **[new 2015]**

Surgery for children and young people with type 2 diabetes

1.3.29 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]**

1.3.30 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

1.3.31 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]**

1.3.32 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]**

1.3.33 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]**

1.3.34 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]**

1.3.35 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 because they may experience psychological problems (such as anxiety, depression, behavioural and conduct disorders and family conflict) that can

impact on the management of diabetes and well-being. **[2004, amended 2015]**

1.3.36 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]**

1.3.37 Offer screening for anxiety and depression to children and young people with type 2 diabetes who have persistently poor blood glucose control. **[2004, amended 2015]**

1.3.38 Refer children and young people with type 2 diabetes and suspected anxiety and/or depression promptly to child mental health professionals. **[2004, amended 2015]**

1.3.39 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

1.3.40 Offer children and young people with type 2 diabetes annual monitoring for:

- hypertension starting at diagnosis
- dyslipidaemia starting at diagnosis
- diabetic retinopathy from the age of 12 years
- low-level albuminuria (microalbuminuria; to detect diabetic kidney disease) starting at diagnosis.

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]**

1.3.41 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

1.3.42 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that monitoring (see recommendation 1.3.40) is important because if hypertension is found, early treatment will reduce the risk of complications. **[new 2015]**

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

1.3.44 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

1.3.45 Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) that monitoring (see recommendation 1.3.40) is important because if dyslipidaemia is found, early treatment will reduce the risk of complications. **[new 2015]**

1.3.46 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]**

1.3.47 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

1.3.48 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 1.3.40), and improving blood glucose control will reduce the risk of this progressing to serious forms of diabetic retinopathy
- annual monitoring is important because, if significant diabetic retinopathy is found, early treatment will improve the outcome. **[new 2015]**

1.3.49 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

1.3.50 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 to screen for low-level albuminuria (microalbuminuria) is important, as this reduces the risk of false positive results
- if low-level albuminuria (microalbuminuria) is detected, improving blood glucose control will reduce the risk of this progressing to serious diabetic kidney disease
- annual monitoring (see recommendation 1.3.40) is important because, if diabetic kidney disease is found, early treatment will improve the outcome. **[new 2015]**

1.3.51 Use the first urine sample of the day ('early morning urine') for the monitoring albumin:creatinine ratio test. 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]**

1.3.52 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]**

1.3.53 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 or polyuria 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 children and young people 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 plasma glucose
- capillary blood ketones (beta-hydroxybutyrate) if near-patient testing if 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 either on a high-dependency unit, or on a general paediatric ward with one-to-one nursing, if:

- they are younger than 2 years or
- they have severe DKA (blood pH below 7.1). **[new 2015]**

1.4.18 Think about placing 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 if a child or young person with DKA is unconscious. **[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 Suspect 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 until ketosis is markedly improved (for example, blood beta-hydroxybutyrate concentration below 1 mmol/litre). **[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 give more than one intravenous fluid bolus of 10 ml/kg 0.9% sodium chloride to a child or young person with severe DKA without discussion with the responsible senior paediatrician. **[new 2015]**

1.4.28 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 1.4.29) to the fluid maintenance requirement (see recommendation 1.4.30). **[new 2015]**

1.4.29 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]**

1.4.30 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]**

1.4.31 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]**

1.4.32 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]**

1.4.33 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]**

1.4.34 If more than 20 ml/kg 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]**

1.4.35 Do not give intravenous sodium bicarbonate to children and young people with DKA. **[new 2015]**

1.4.36 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]**

1.4.37 Do not give children and young people with DKA additional intravenous fluid to replace urinary losses. **[new 2015]**

1.4.38 Start an intravenous insulin infusion 1-2 hours after beginning intravenous fluid therapy in children and young people with DKA. **[new 2015]**

1.4.39 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]**

1.4.40 If a child or young person with DKA is using insulin pump therapy, disconnect the pump when starting intravenous insulin therapy. **[new 2015]**

1.4.41 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]**

1.4.42 In discussion with a diabetes specialist, think about continuing subcutaneous basal insulin in a child or young person with DKA who is already using a basal insulin. **[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 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]**

1.4.45 Think about stopping intravenous fluid therapy for DKA in a child or young person if ketosis has resolved (for example, blood beta-

hydroxybutyrate level below 0.6 mmol/litre) and they tolerate oral fluids without nausea or vomiting. **[new 2015]**

1.4.46 Do not change from intravenous insulin to subcutaneous insulin until ketosis has resolved (for example, blood beta-hydroxybutyrate level below 0.6 mmol/litre) and the child or young person with DKA is alert and can eat. **[new 2015]**

1.4.47 Start subcutaneous insulin in a child or young person with DKA at least 30 minutes before stopping intravenous insulin. **[new 2015]**

1.4.48 For a child or young person with DKA who is using insulin pump therapy, restart the pump at least 30 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

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

- capillary plasma 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]**

1.4.50 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 (blood pH below 7.1).

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

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

1.4.52 Ensure that healthcare professionals performing the monitoring described in recommendations 1.4.49, 1.4.50 and 1.4.51) know what to look for and when to seek advice. **[new 2015]**

1.4.53 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]**

1.4.54 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 (blood pH below 7.1)
- there are any other reasons for special concern. **[new 2015]**

1.4.55 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]**

1.4.56 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

1.4.57 Immediately assess a child or young person 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]**

1.4.58 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 saline (2.7% or 3% 2.5-5 ml/kg over 10-15 minutes). **[new 2015]**

1.4.59 Immediately treat for cerebral oedema using the most readily available of mannitol (20% 0.5-1 g/kg over 10-15 minutes) or hypertonic saline (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]**

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

Hypokalaemia

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

- think about temporarily suspending the insulin infusion
- discuss urgently with a 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

1.4.62 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

1.4.63 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]**

1.4.64 Think about the possibility of non-adherence to therapy in children and young people with established type 1 diabetes who present with diabetic ketoacidosis, especially if the diabetic ketoacidosis is recurrent. **[2004, amended 2015]**

1.4.65 Advise a child or young person who has 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 individual'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. The main changes relate to targets for short-term blood glucose control and screening for complications. **[2004]**

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), and satisfaction with the education programme. 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 achieve an HbA1c level of 48 mmol/mol (6.5%) without unacceptable hypoglycaemia?

Why this is important

Setting an upper limit for blood 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 preparations (including extended-release tablets and oral solutions) 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.

3 Other information

3.1 Scope and how this guideline was developed

NICE guidelines are developed in accordance with a scope that defines what the guideline will and will not cover.

How this guideline was developed

NICE commissioned the National Collaborating Centre for Women's and Children's Health to develop this guideline. The Centre established a Guideline Development Group (see section 4), which reviewed the evidence and developed the recommendations.

The methods and processes for developing NICE clinical guidelines are described in The guidelines manual.

3.2 Related NICE guidance

Details are correct at the time of consultation on the guideline (December 2014). Further information is available on the NICE website.

Published

General

- Patient experience in adult NHS services (2012) NICE guidance CG 138
- Medicines adherence (2009) NICE guideline CG76

Condition-specific

- Antisocial behaviour and conduct disorders in children and young people (2013) NICE guideline CG158
- Continuous subcutaneous insulin infusion for the treatment of diabetes mellitus (2008) NICE technology appraisal guidance 151
- Obesity: identification, assessment and management of overweight and obesity in children, young people and adults (2014) NICE guideline CG189
- Depression in children and young people (2005) NICE guideline CG28
- Dental recall: Recall interval between routine dental examinations (2004) NICE guideline CG19
- Eating disorders (2004) NICE guideline CG9

Under development

NICE is developing the following guidance (details available from the NICE website):

- Diabetes in pregnancy (update). NICE guideline (publication expected February 2015).
- Diabetic foot problems (update). NICE guideline (publication expected July 2015).
- Type 1 diabetes (update). NICE guideline (publication expected August 2015).
- Type 2 diabetes (update). NICE guideline (publication expected August 2015).

4 The Guideline Development Group, National Collaborating Centre and NICE project team

4.1 Guideline Development Group

The Guideline Development Group members listed are those for the 2015 update. For the composition of the previous Guideline Development Group, see the full guideline.

Jerry Wales (Chair)
Senior Lecturer in Paediatric Endocrinology, Sheffield University and Honorary Consultant, Sheffield Children's Hospital NHS Foundation Trust (until November 2013); Service Director Paediatric Endocrinology, Lady Cilento Children's Hospital, Brisbane, Australia (from August 2014).

Francesca Annan
Paediatric Diabetes Dietitian and Diabetes Service Lead, Alder Hey Children's NHS Foundation Trust, Liverpool

Jo Dalton
Clinical Nurse Specialist – Paediatric Diabetes, Pump Outreach Team, Royal London Hospital, Bart's Health (until November 2014); Transitional Nurse Specialist – Diabetes, Poole General Hospital, Dorset (from December 2014)

Jaqueline Double
Patient and carer member

Sarah Eaton
GP, York, North Yorkshire

Julie Edge (Chair, DKA subgroup)
Consultant in Paediatric Diabetes, Oxford Children's Hospital

Nikhil Gokani
Patient and carer member

William Lamb

Consultant Paediatrician, Bishop Auckland General Hospital, County Durham (until September 2012); Consultant Paediatric Diabetologist, Great North Children's Hospital, Newcastle upon Tyne (from January 2012)

Carol Metcalfe (member from June 2014)
Lead Paediatric Diabetes Specialist Nurse, East Cheshire NHS Trust, Macclesfield

Claire Pesterfield (member until March 2014)
Lead Paediatric Diabetes Specialist Nurse, Cambridge University Hospitals NHS Foundation Trust

4.2 National Collaborating Centre/ Clinical Guideline Centre for women's and children's health

Sarah Bailey
Research Associate (from August 2013 until June 2014)

Frauke Becker
Research Assistant – Health Economist (from March 2013 until March 2014)

Zosia Beckles
Information Scientist

Rupert Franklin
Project Manager (from September 2013 until June 2014)

Yelan Guo
Research Associate (from October 2013)

Paul Jacklin
Senior Research Fellow – Health Economist

Sadia Janjua
Research Associate (from July 2014)

Juliet Kenny
Project Manager (from May 2012)

Hugh McGuire

Senior Research Fellow (until March 2014)

Paul Mitchell

Research Fellow – Health Economist (from April until August 2014)

Moira Mugglestone

Director (from October 2012)

M Stephen Murphy

Clinical Director for Children's Health

Su Park

Research Assistant (from April until August 2013)

Nitara Prasannan

Research Associate (from March until June 2013)

Wendy Riches

Executive Director (until September 2012)

Grammati Sarri

Senior Research Fellow and Guideline Lead (from October 2014)

Cristina Visintin

Project Manager (until April 2012)

Amy Wang

Research Associate (from June 2014)

Katie Webster

Research Associate (from September 2013)

4.3 NICE project team

Sharon Summers-Ma

Guideline Lead

Phil Alderson

Clinical Adviser

Oliver Bailey

Guideline Commissioning Manager

Besma Nash

Guideline Coordinator

Judith Thornton

Technical Lead

David Glynn

Health Economist

James Hall

Editor

4.4 Declarations of interests

All members of the Guideline Development Group made declarations of interests.

Member	Interest declared	Type of interest	Decision taken
Jerry Wales (Chair)	Non-personal pecuniary interest Sheffield Children's Hospital Foundation Trust clinical research faculty received funding from Merck Sharp & Dohme (MSD) and Parexel via the Medicines for Children Research Network (MCRN) for Jerry Wales's participation in research into the pharmacokinetics of novel medications for type 2 diabetes (both projects yet to start), from Novo Nordisk for Jerry Wales's participation in a Paediatric Investigation Protocol for a new long-acting insulin for type 1 diabetes (historical declaration only, no ongoing interests), and from 9 companies manufacturing medications or equipment for diabetes (Abbott, Bayer, LifeScan [Johnson and Johnson], Lilly, Novo Nordisk, Owen Mumford, Roche, Sanofi, and Ypsomed) to support the Yorkshire Regional Paediatric Diabetes Network meeting 2011 (historical declaration only, no ongoing interests). Personal non-pecuniary interest Member of the British Society for Paediatric Endocrinology and Diabetes (BSPED), Diabetes UK, the European Society for Paediatric Endocrinology (ESPE) and the International Society for Pediatric and Adolescent Diabetes (ISPAD); published and lectured on bariatric surgery in young people; joint chief investigator on a project funded by Diabetes UK but receives no money directly and has no managerial responsibility for the budget.	Non-personal pecuniary interest Personal non-pecuniary interest	Declare and participate

Francesca Annan	Personal pecuniary interest Received funding from Eli Lilly for speaking at the Eli Lilly National Paediatric Diabetes Meeting in May 2014 on topics related to the management of diabetes that were not specific to the scope of the guideline (fat and protein counting and exercise); invited chair at International Diabetes Federation (IDF) World Congress, Dubai 2011 and received funding from Novo Nordisk, Roche and Sanofi towards travel and accommodation expenses; received funding to cover travel and accommodation expenses from the ISPAD to attend and speak as an expert panel member on the management of diabetes at the 40th ISPAD conference in Toronto, Canada in September 2014; invited speaker at the ISPAD annual meeting 2012 and received funding from Roche towards accommodation expenses; invited speaker (on the topic of exercise and diabetes management) at the Juvenile Diabetes Research Foundation (JDRF) 'Type 1 diabetes discovery weekend' and received funding from JDRF towards travel expenses, the conference was supported by industry sponsorship; received educational grant (£250) from Novo Nordisk to cover the cost of ISPAD conference registration fee, the conference was supported by industry sponsorship. Non-personal pecuniary interest Co-applicant for the following Health Technology Assessment (HTA) funded trials: Child and Adolescent Structured Competencies	Personal pecuniary interest Non-personal pecuniary interest Personal non-pecuniary interest	Declare and participate

	Approach to Diabetes Education (CASCADE), randomised controlled trial (RCT) of continuous subcutaneous insulin infusion compared to multiple daily injection regimens in children and young people at diagnosis of type 1 diabetes (Subcutaneous Insulin, Pumps or Injections [SCIPI]); organised an educational meeting on the topic of 'exercise in diabetes'. Funds were received from Novo Nordisk to cover the costs of food and the venue. Francesca Annan did not receive these funds directly. <u>Personal non-pecuniary interest</u> Member of British Dietetic Association, Diabetes Management & Education Group (DMEG), Diabetes UK, ISPAD, Sports Dietitians UK; regular teaching commitments related to nutritional management of diabetes, and exercise and diabetes at University of York, University of Warwick, Coventry University, Birmingham Children's Hospital; contributed to ISPAD guidelines on nutritional management and exercise; wrote articles on exercise and diabetes management and nutritional management of diabetes for Complete Nutrition and Diabetes Care for Children & Young People; presentations at national and international meetings on exercise and diabetes management; reviewed patient information content of Diabetes UK publications and pharmaceutical company literature (Lilly and Roche); chair of Paediatric Sub Group of Diabetes Management and Education Group (a specialist		

	group of The British Dietetic Association) from April 2013; member of the writing group for ISPAD consensus guidelines.		
Jo Dalton	Personal pecuniary interest Current post as paediatric diabetes specialist nurse funded by a diabetes charity within the Royal London Hospital. Personal non-pecuniary interest Member of the guideline development group (GDG) for the 2004 NICE guideline on type 1 diabetes in children and young people; member of the Royal College of Nursing (RCN), ISPAD, Primary Care Diabetes Society (PCDS), professional member of Diabetes UK, attended a study day funded by Medtronic on a topic that is not specific to the guideline scope (continuous subcutaneous insulin infusion therapy); registered for a symposium funded by Novo Nordisk in Leicester on paediatric diabetes in October 2014 but did not attend.	Personal pecuniary interest Personal non-pecuniary interest	Declare and participate
Jacqueline Double	Personal pecuniary interest Honorarium from NHS Diabetes as Chair of national Parent Reference Group; invited speaker at 2 Friends For Life conferences and received free travel and food, the conferences were supported by industry sponsorship; received funding to cover travel expenses to attend a meeting in Australia funded by a number of commercial sources; gave a presentation at an IDF meeting in Melbourne. Travel expenses were paid by the organisation. Personal family interest Husband received funding to	Personal pecuniary interest Personal family interest Personal non-pecuniary interest	Declare and participate

	cover travel expenses from Children with Diabetes (a US not-for-profit organisation) to attend a Family Conference in the USA . Personal non-pecuniary interest Spoke for NHS Technology Adoption Centre (NTAC) and NHS Diabetes; ran workshops on schools, advocacy and mother's emotional needs; member of Diabetes UK and JDRF; director of INPUT (a patient-run organisation that advocates for access to insulin pumps and diabetes technology in the UK) until December 2012; member of UK Children with Diabetes Advocacy Group.		
Sarah Eaton	Non-personal pecuniary interest Member of conference planning team for conferences organised by Diabetes UK and the Universities of York and Huddersfield. The conferences are sponsored by a number of pharmaceutical companies but Sarah Eaton does not receive any funding personally and is not responsible for management of the funds. Personal non-pecuniary interest Attended GP education meetings funded by Ashfield In2 Focus, Bayer Healthcare, Boehringer Ingelheim, HRA Pharma, Napp Pharmaceuticals, Pfizer, Reckit Benckiser; professional member of Diabetes UK, volunteer for Diabetes UK children's care events; member of team (also involving Diabetes UK, University of Huddersfield and University of York) planning a conference on new developments in diabetes management in primary care.	Non-personal pecuniary interest Personal non-pecuniary interest	Declare and participate

Julie Edge (Chair of the DKA subgroup)	Personal pecuniary interest Honoraria for writing on type 1 diabetes for the British National Formulary for Children; honoraria for writing on type 1 diabetes for Practical Diabetes; attended the ISPAD annual meeting in Gothenburg as invited speaker and received expenses (travel, registration, 3 nights' hotel accommodation and one evening meal) from ISPAD; received funding from the IDF to cover the cost of travel and accommodation expenses incurred when attending their meeting in Melbourne; received funding from the Australia Paediatric Society to cover registration and travel expenses to speak on the topic of cerebral oedema in children and young people with DKA at their Diabetes Meeting, the event was funded by a number of commercial sources; received funding from Diabetes UK to cover travel expenses to attend their Diabetes UK conference. Non-personal pecuniary interest Julie Edge holds managerial responsibility for departmental funding from Oxford Medical Diagnostics for a research project on a device not directly linked to any of the topics in the scope, from Aventis, Novo Nordisk, and Roche for sponsorship of educational meetings, and from the British Heart Foundation, Diabetes UK, JDRF, National Institute for Health Research Comprehensive Clinical Research Network (NIHR CCRN) via the Comprehensive Local Research Networks (CLRNs) and Thames Valley Diabetes Research Network (TVRN) for the following research projects	Personal pecuniary interest Non-personal pecuniary interest Personal non-pecuniary interest	Declare and participate but do not chair DKA subgroup discussions related to starting and stopping intravenous insulin therapy during because co-author for the only study identified for inclusion in evidence review

	for which Julie Edge is the local principle investigator: Adolescent Type 1 Diabetes Cardio-Renal Intervention Trial (AdDIT); Diabetes Genome Anatomy Project (DGAP); and studies about insulin for diabetes including an RCT of continuous subcutaneous insulin infusion compared to multiple daily injection regimens in children and young people at diagnosis of type 1 diabetes (SCIPI); holds managerial responsibility for departmental funding from Advanced Therapeutics, Animas/LifeScan (part of Johnson and Johnson), Glucomen, Lilly, Novo Nordisk and Roche for sponsorship of educational meetings in 2013; holds managerial responsibility for departmental funding from Advanced Therapeutics, Aventis, Novo Nordisk and Roche for sponsorship of educational meetings in 2014; received funding from Novo Nordisk to cover travel expenses to attend and speak at a symposium (also funded by Novo Nordisk) in Leicester on paediatric diabetes in October 2014. <u>Personal non-pecuniary interest</u> Involved over many years in research on the management of DKA; lectured and prepared guidelines on DKA; member of Association of Children's Diabetes Clinicians (ACDC), BSPED, Diabetes UK and ISPAD; member of the writing group for ISPAD consensus guidelines; attended a half-day training course organised by Medtronic about continuous intravenous insulin therapy pumps; author of a paper looking at the timing of insulin therapy which was included in		

	the guideline systematic review for the same topic; joint author on a paper looking at the rate of fluid administration which was included in the guideline systematic review for the same topic.		
Nikhil Gokani	Personal pecuniary interest Payment received for systematic reviewing work not directly linked to any of the topics in the guideline scope. Personal non-pecuniary interest Supporting member of Diabetes UK and member of its groups and committees; contingent PhD candidate in public health and law; member of the National Diabetes Audit Partnership Board; member of Royal College of Physicians (RCP) joint specialty committee on endocrinology and diabetes.	Personal pecuniary interest Personal non-pecuniary interest	Declare and participate
William Lamb	Personal pecuniary interest Honoraria from Practical Diabetes for writing an article about adolescent diabetes and from Medtronic Ltd for lecturing on continuous glucose monitoring; honoraria from eMedicine.com (part of Medscape from WebMD) for writing and updating articles about diabetes and DKA; attended an educational meeting organised by Francesca Annan on the topic of exercise in diabetes, the meeting was sponsored by Novo Nordisk and travel expenses were paid by the conference organisers; received payment for medico-legal work (expert testimony and a report) in a case pertaining to paediatric diabetes care that was not specific to the scope of the guideline (neglect); received funding to cover travel expenses to speak at a	Personal pecuniary interest Personal non-pecuniary interest	Declare and participate

	conference on diabetes and exercise, the conference was sponsored by a number of insulin pump manufacturers; received funding from university employer to cover travel expenses to speak at a training course on the use of insulin pumps, the course was sponsored by a number of insulin pump manufacturers. <u>Personal non-pecuniary interest</u> Professional member of Diabetes UK; member of ACDC, BSPED and ISPAD; volunteer for Diabetes UK and JDRF; associate editor of Clinical Diabetes; attended meetings supported by various industry sponsors unknown to William Lamb as part of continuing professional development. Spoke at JDRF 'Type 1 diabetes discovery weekend', the event was supported by industry sponsorship but William Lamb received no funding.		
Carol Metcalfe	<u>Personal pecuniary interest</u> Received funding from Novo Nordisk to attend the Diabetes UK annual Professional Conference in March 2014 and from Eli Lily to attend the Eli Lilly National Paediatric Diabetes Meeting in May 2014; received funding from Roche to cover accommodation costs while attending a study day (also funded by Roche) on a topic that is not specific to the guideline scope (continuous subcutaneous insulin infusion therapy); received funding from Novo Nordisk to cover accommodation expenses while attending a symposium (also funded by Novo Nordisk) in Leicester on paediatric diabetes in October 2014.	Personal pecuniary interest	Declare and participate
Claire Pesterfield	<u>Non-personal pecuniary</u>	Non-personal	Declare and

	interest Addenbrookes Charitable Trust will receive honoraria from Abbott, Animas, Roche and Medtronic for Claire Pesterfield presenting clinical case studies regarding diabetes care and preparing 2 articles for publication (1 about an education event (sports day) for Diabetes Care of Children and Young People and the other about management of neonatal diabetes for Diabetes Management). Personal non-pecuniary interest Volunteer for Diabetes UK; IDF young leader programme mentor; wrote article about parental attitudes to a closed-loop blood glucose trial for Diabetes Technology and Therapeutics (2010); co-founder and director of Team Blood Glucose, a not-for-profit social enterprise that provides peer support and education resources to encourage people with or at risk of diabetes to participate in exercise.	pecuniary interest Personal non-pecuniary interest	participate

Appendix A: Recommendations from NICE clinical guideline 15 (2004) that have been deleted or changed

Recommendations to be deleted

The table shows recommendations from 2004 that NICE proposes deleting in the 2015 update. The right-hand column gives the replacement recommendation, or explains the reason for the deletion if there is no replacement recommendation.

Recommendation in 2004 guideline	Comment
Children and young people who present with diabetic ketoacidosis should have their diabetic ketoacidosis treated in hospital according to the guidance outlined in this document. (1.1.2.5)	This recommendation has been deleted because the new 2015 recommendations on DKA give detailed advice on the need for referral to hospital when DKA is suspected or confirmed, and DKA is always treated in hospital.
Children and young people with type 1 diabetes should be informed that the use of multiple daily insulin injection regimens or continuous subcutaneous insulin infusion (or insulin pump therapy) will not prolong the partial remission phase, although these forms of therapy may be appropriate for optimising glycaemic control, especially in young people. (1.1.3.2)	Replaced by: 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. (1.2.19) Offer children and young people with type 1 diabetes multiple daily insulin injection regimens from diagnosis. If a multiple daily insulin 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). (1.2.20)
Children and young people with newly diagnosed type 1 diabetes should be offered a structured programme of education covering the aims of insulin therapy, delivery of insulin, self-monitoring of blood glucose, the effects of diet, physical activity and intercurrent illness on glycaemic control, and the detection and management of hypoglycaemia. (1.1.4.1)	Replaced by: 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 and its mode of delivery • 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. (1.2.1) 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. (1.2.2)
Children and young people with type 1 diabetes and their families should be offered timely and ongoing opportunities to access information about the development, management and effects of type 1 diabetes. The information provided should be accurate and consistent and it should support informed decision-making. (1.2.1.1)	Replaced by: 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 and its mode of delivery • 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. (1.2.1)
Children and young people with type 1 diabetes and their families should be offered opportunities to discuss particular issues and to ask questions at each clinic visit. (1.2.1.2)	Replaced by: Encourage children and young people with type 1 diabetes and their family members or carers (as appropriate) to discuss any concerns or raise any questions they have with their diabetes team. (1.2.5)

The method of delivering education and content will depend on the individual and should be appropriate for the child's or young person's age, maturity, culture, wishes and existing knowledge within the family. (1.2.1.3)	Replaced by: 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. (1.2.2)
Pre-school and primary school children with type 1 diabetes should be offered the most appropriate individualised regimens to optimise their glycaemic control. (1.2.2.1)	Replaced by: Offer children and young people with type 1 diabetes multiple daily insulin injection regimens from diagnosis. If a multiple daily insulin 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). (1.2.20)
Young people with type 1 diabetes should be offered multiple daily injection regimens to help optimise their glycaemic control. (1.2.2.2)	Replaced by: Offer children and young people with type 1 diabetes multiple daily insulin injection regimens from diagnosis. If a multiple daily insulin 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). (1.2.20)
Multiple daily injection regimens should be offered only as part of a package of care that involves continuing education, dietary management, instruction on the use of insulin delivery systems and blood glucose monitoring, emotional and	The contents of this recommendation are covered by new recommendations throughout the guideline.

behavioural support, and medical, nursing and dietetic expertise in paediatric diabetes, because this improves glycaemic control. (1.2.2.3)	
Children and young people using multiple daily injection regimens should be informed that they may experience an initial increase in the risk of hypoglycaemia and short-term weight gain. (1.2.2.4)	This recommendation has been deleted because the GDG considered that multiple daily injection regimens improve blood glucose control so reference to hypoglycaemia was no longer appropriate. The group did not identify evidence to indicate that weight gain is an important adverse event.
Young people who do not achieve satisfactory glycaemic control with multiple daily injection regimens should be offered additional support and, if appropriate, alternative insulin therapy (once-, twice- or three-times daily mixed insulin regimens or continuous subcutaneous insulin infusion using an insulin pump). (1.2.2.6)	Replaced by: If a child or young person with type 1 diabetes does not achieve satisfactory blood glucose control: • 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 using an insulin pump or once-, twice- or three-times daily mixed insulin injections). (1.2.31)
Young people with type 1 diabetes who have difficulty adhering to multiple daily injection regimens should be offered twice-daily injection regimens. (1.2.2.7)	Replaced by: 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. (1.2.19) Offer children and young people with type 1 diabetes multiple daily insulin injection regimens from diagnosis. If a multiple daily insulin 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). (1.2.20)
Continuous subcutaneous insulin infusion (or insulin pump therapy) is recommended as an option for people	Replaced by: Take into account the personal and

with type 1 diabetes provided that: • multiple-dose insulin therapy (including, where appropriate, the use of insulin glargine) has failed; and • those receiving the treatment have the commitment and competence to use the therapy effectively. (1.2.2.8)	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. (1.2.19) Offer children and young people with type 1 diabetes multiple daily insulin injection regimens from diagnosis. If a multiple daily insulin 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). (1.2.20)
Continuous subcutaneous insulin infusion therapy should be initiated only by a trained specialist team, which should normally comprise a physician with a specialist interest in insulin pump therapy, a diabetes specialist nurse and a dietitian. (1.2.2.9)	Replaced by: Offer children and young people with type 1 diabetes multiple daily insulin injection regimens from diagnosis. If a multiple daily insulin 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). (1.2.20)
Established users of continuous subcutaneous insulin infusion therapy should have their insulin management reviewed by their specialist team so that a decision can be made about whether a trial or a switch to multiple-dose insulin incorporating insulin glargine would be appropriate. (1.2.2.11)	Replaced by: Offer children and young people with type 1 diabetes multiple daily insulin injection regimens from diagnosis. If a multiple daily insulin 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). (1.2.20)
Children and young people with type 1 diabetes should be offered the most appropriate insulin preparations (rapid-acting insulin analogues, short-acting insulins, intermediate-acting insulins,	The part of the recommendation referring to patient information leaflets has been deleted, as the GDG felt that healthcare professionals would be expected to take account of this information regardless. In

long-acting insulin analogues or biphasic insulins) according to their individual needs and the instructions in the patient information leaflet supplied with the product, with the aim of obtaining an HbA1c level of less than 7.5% without frequent disabling hypoglycaemia and maximising quality of life. (1.2.3.1)	addition, the text on HbA1c target levels has been deleted, as this is covered by the new 2015 recommendations on HbA1c target levels. The GDG considered that the remainder of the 2004 recommendation was no longer relevant. There is already a recommendation about providing rapid-acting insulin analogues from the 2004 guideline (1.2.30), and children and young people using multiple daily insulin or mixed insulin regimens would invariably receive specific preparations according their needs.
Children and young people with type 1 diabetes who use insulin preparations containing intermediate-acting insulin should be informed that these preparations should be mixed before use according to the instructions in the patient information leaflet supplied with the product. (1.2.3.4)	This recommendation has been deleted because mixing of insulins by the patient is no longer part of clinical practice.
Children and young people with type 1 diabetes and their families should be informed that the target for long-term glycaemic control is an HbA1c level of less than 7.5% without frequent disabling hypoglycaemia and that their care package should be designed to attempt to achieve this.(1.2.6.1)	Replaced by: 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. (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. (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. (1.2.70) Support children and young people with type 1 diabetes and their family members or carers (as appropriate) to achieve and maintain their individual agreed HbA1c target level. (1.2.71)

Current HbA_{1c} measurements should be made available in outpatient clinics because their availability can lead to immediate changes in insulin therapy and/or diet and so reduce the need for follow-up appointments. (1.2.6.3)	The GDG considered that this recommendation was no longer necessary because it is no longer difficult to get the results of HbA1c tests promptly in practice.
Children and young people with type 1 diabetes and their families should be informed that aiming to achieve low levels of HbA1c can lead to increased risks of hypoglycaemia and that high levels of HbA1c can lead to increased risks of long-term microvascular complications. (1.2.6.4)	Replaced by: 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). (1.2.67)
Children and young people with HbA1c levels consistently above 9.5% should be offered additional support by their diabetes care teams to help them improve their glycaemic control because they are at increased risk of developing diabetic ketoacidosis and long-term complications.(1.2.6.5)	Replaced by: 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. (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. (1.2.69) Support children and young people with type 1 diabetes and their family members or carers (as appropriate) to achieve and maintain their individual agreed HbA1c target level. (1.2.71)
Children and young people with type 1 diabetes should be encouraged to use blood glucose measurements for short-term monitoring of glycaemic control because this is associated with reduced levels of glycated haemoglobin. Urine glucose monitoring is not recommended because it is less effective and is associated with lower patient satisfaction.(1.2.6.6)	Replaced by: 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. (1.2.59)
Children and young people with type 1 diabetes and their families should be informed that the optimal targets for short-term glycaemic control are a pre-prandial blood glucose level of 4–8 mmol/litre and a post-prandial blood glucose level of less than 10 mmol/litre.	Replaced by: 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 blood glucose control are: • fasting blood glucose level of 4–7

(1.2.6.7)	mmol/litre (or 5–7 mmol/litre for young people intending to drive the following morning) • a blood glucose level of 4–7 mmol/litre before meals • a blood glucose level of 5–9 mmol/litre after meals. (1.2.55)
Children and young people with type 1 diabetes and their families should be encouraged to perform frequent blood glucose monitoring as part of a continuing package of care that includes dietary management, continued education and regular contact with their diabetes care teams. (1.2.6.8)	Replaced by: 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. (1.2.59) Advise children and young people with type 1 diabetes and their family members or carers (as appropriate) that more frequent testing may be needed in some circumstances, for example during intercurrent illness. (1.2.60)
Children and young people with type 1 diabetes who are trying to optimise their glycaemic control and/or have intercurrent illness should be encouraged to measure their blood glucose levels more than four times per day.(1.2.6.12)	Replaced by: 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. (1.2.59) Advise children and young people with type 1 diabetes and their family members or carers (as appropriate) that more frequent testing may be needed in some circumstances, for example during intercurrent illness. (1.2.60)
Children and young people with type 1 diabetes who have persistent problems with hypoglycaemia unawareness or repeated hypoglycaemia or hyperglycaemia should be offered continuous glucose monitoring systems. (1.2.6.14)	Replaced by: Offer ongoing unblinded (‘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). (1.2.63) Consider intermittent (unblinded [‘real-time’] or blinded [‘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. (1.2.65)
Children and young people with type 1 diabetes should be offered blood glucose monitors with memories (as opposed to monitors without memories) because these are associated with improved patient satisfaction. (1.2.6.15)	This recommendation has been deleted because blood glucose monitors now routinely have memory functions.
Children and young people with type 1 diabetes should be encouraged to develop a good working knowledge of nutrition and how it affects their diabetes. (1.2.7.3)	Replaced by: 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. (1.2.34)
Children and young people with type 1 diabetes and their families should be informed of the importance of healthy eating in reducing the risk of cardiovascular disease (including foods with a low glycaemic index, fruit and vegetables, and types and amounts of fats), and means of making appropriate nutritional changes in the period after diagnosis and according to need and interest at intervals thereafter. (1.2.7.4)	Replaced by: 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. (1.2.35)
Children and young people with type 1 diabetes should be encouraged to consider eating a bedtime snack. The nutritional composition and timing of all snacks should be discussed with the diabetes care team. (1.2.7.5)	Replaced by: 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 the diabetes team. (1.2.40)
Children and young people using multiple daily injection regimens should be offered education about insulin and dietary management as part of their diabetes care package, to enable them to adjust their insulin dose to reflect their carbohydrate intake. (1.2.7.6)	Replaced by: 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 and its mode of delivery • 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. (1.2.1) Offer level 3 carbohydrate-counting education from diagnosis to children and young people with type 1 diabetes who are using multiple daily injections or insulin pump therapy, and to their family members or carers (as appropriate), and repeat the offer at intervals thereafter. (1.2.37)
Children and young people with type 1 diabetes, their parents and other carers should be informed that exercise should be undertaken with caution if blood glucose levels are greater than 17 mmol/litre in the presence of ketosis. (1.2.8.9)	Replaced by: 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. (1.4.5) 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. (1.4.6)
Young people with type 1 diabetes should be offered alcohol education programmes.(1.2.9.2)	Replaced by: 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 and its mode of delivery • 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. (1.2.1) 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. (1.2.2)
Parents and, where appropriate, school nurses and other carers should be offered education on the administration of glucagon.(1.3.1.7)	This recommendation has been deleted as it was no longer relevant in light of amendments to other recommendations from the 2004 guideline.
Children and young people with diabetic ketoacidosis should be treated according to the guidelines published by the British Society for Paediatric Endocrinology and Diabetes. (1.3.2.1)	This recommendation is no longer necessary as the recognition and management of DKA has now been covered in detail by the 2015 update.
Children and young people with diabetic ketoacidosis should be managed initially in a high-dependency unit or in a high-dependency bed on a children's ward. (1.3.2.2)	Replaced by: 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. (1.4.16) Children and young people with DKA should be cared for either on a high-dependency unit, or on a general paediatric ward with one-to-one nursing, if: • they are younger than 2 years or • they have severe DKA (blood pH below 7.1). (1.4.17)
Children and young people with	Replaced by:

deteriorating consciousness or suspected cerebral oedema and those who are not responding appropriately to treatment should be managed in a paediatric intensive care unit. (1.3.2.3)	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 in section 1.4 of this guideline. (1.4.16) Children and young people with DKA should be cared for either on a high-dependency unit, or on a general paediatric ward with one-to-one nursing, if: • they are younger than 2 years or • they have severe DKA (blood pH below 7.1). (1.4.17)
Children with diabetic ketoacidosis who are younger than 2 years of age should be managed in a paediatric intensive care unit. (1.3.2.4)	Replaced by: 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 in section 1.4 of this guideline. (1.4.16) Children and young people with DKA should be cared for either on a high-dependency unit, or on a general paediatric ward with one-to-one nursing, if: • they are younger than 2 years or • they have severe DKA (blood pH below 7.1). (1.4.17)
Children and young people with a blood pH of less than 7.3 (hydrogen ion concentration of more than 50 nmol/litre), but who are clinically well (with no tachycardia, vomiting, drowsiness, abdominal pain or breathlessness) and less than 5% dehydrated, may respond appropriately to oral rehydration, frequent subcutaneous insulin injections and monitoring of blood glucose. (1.3.2.5)	Replaced by: 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. (1.4.22)
Children and young people with type 1 diabetes and their families should be offered clear guidance and protocols (‘sick-day rules’) for the management of type 1 diabetes during intercurrent illness. (1.3.4.1)	Replaced by: 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 blood ketones (beta-hydroxybutyrate)

	• adjusting their insulin regimen • food and fluid intake • when 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. (1.2.54)
Children and young people with type 1 diabetes should have short-acting insulin or rapid-acting insulin analogues and blood and/or urine ketone testing strips available for use during intercurrent illness. (1.3.4.2)	Replaced by: Provide children and young people with type 1 diabetes with rapid-acting insulin analogues for use during intercurrent illness or episodes of hyperglycaemia. (1.2.30) 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 blood ketones (beta-hydroxybutyrate) • adjusting their insulin regimen • food and fluid intake • when 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. (1.2.54) 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. (1.2.74)
Routine screening for elevated blood lipid levels and/or neurological function is not recommended for children and young people with type 1 diabetes. (1.3.5.2)	The GDG considered that monitoring for dyslipidaemia or neurological function in children and young people with type 1 diabetes is not part of current practice and so a recommendation was unnecessary.
Parents of pre-school children with type 1 diabetes should be informed that persistent hypoglycaemia, in particular in association with seizures, is associated	This recommendation has been deleted because advice on preventing and treating hypoglycaemia was considered more important. Assessment for cognitive

with a small but definite risk of long-term neurocognitive dysfunction.(1.4.4.1)	difficulties is still covered by the following 2004 recommendation: 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. (1.2.85)
Children and young people with type 1 diabetes, especially young people using multiple daily injection regimens, should be offered structured behavioural intervention strategies because these may improve psychological well-being and glycaemic control. (1.4.7.2)	Replaced by: Offer specific family-based behavioural interventions, such as behavioural family systems therapy, if there are difficulties with diabetes-related family conflict. (1.2.100) Consider a programme of behavioural intervention therapy 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 multi-systemic therapy • glycaemic control in children and young people with high HbA1c levels (HbA1c above 69 mmol/mol (above 8.5%)) - for example, multi-systemic therapy • self-esteem - for example, support strategies such as mentoring • depression - for example, motivational interviewing. (1.2.101)
Young people with type 1 diabetes should be offered specific support strategies, such as mentoring and self-monitoring of blood glucose levels supported by problem solving, to improve their self-esteem and glycaemic control. (1.4.7.3)	Replaced by: Consider a programme of behavioural intervention therapy 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 multi-systemic therapy • glycaemic control in children and young people with high HbA1c levels (HbA1c above 69 mmol/mol (above 8.5%)) - for example, multi-systemic therapy • self-esteem - for example, support strategies such as mentoring • depression - for example, motivational interviewing. (1.2.101)
Families of children and young people with type 1 diabetes should be offered specific support strategies (such as behavioural family systems therapy) to reduce diabetes-related conflict between family members. (1.4.7.4)	Replaced by: Offer specific family-based behavioural interventions, such as behavioural family systems therapy, if there are difficulties with diabetes-related family conflict. (1.2.100)
Teaching staff should be informed about the potential effects of type 1 diabetes on cognitive function and educational attainment (1.5.1.3)	This recommendation has been deleted because it was considered more important to assess children and young people at increased risk of cognitive function disorders than to raise concerns about all children and young people with type 1 diabetes. This is covered in the following 2004 recommendation: 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. (1.2.85)

Amended recommendation wording (change to meaning)

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.

These changes are marked with yellow shading.

Recommendation in 2004 guideline	Recommendation in current guideline	Reason for change
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.2 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)	Be aware that the characteristics of type 1 diabetes include: • hyperglycaemia (random plasma glucose more than 11 mmol/litre) • polyuria • polydipsia • weight loss. (1.1.1) Confirm type 1 diabetes in children and young people using the criteria specified in the 2006 World Health Organization report on the diagnosis and classification of diabetes mellitus. (1.1.3)	The WHO updated their report on the diagnosis and classification of diabetes in 2006. In addition, this recommendation has been split into 2 recommendations to make it easier to understand. '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.
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)	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)	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.
Consideration should be given to the possibility of other types of diabetes (such as early-onset type 2 diabetes, other insulin resistance syndromes, maturity-onset diabetes in the young and molecular/enzymatic abnormalities) in children and young people with suspected type 1 diabetes who: • have a strong family history of	Think about the possibility of type 2 diabetes in children and young people with suspected diabetes who: • have a strong family history of 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	This recommendation has been split into two, as the GDG felt that type 2 diabetes should be considered separately from the rarer conditions now that it is covered in this guideline. In addition, not all of the factors listed applied to type 2 diabetes or to the

[2] World Health Organization (1999)

diabetes • are obese at presentation • are of black or Asian origin • have an insulin requirement of less than 0.5 units/kg body weight/day outside a partial remission phase • have no insulin requirement • rarely or never produce ketone bodies in the urine (ketonuria) during episodes of hyperglycaemia • show evidence of insulin resistance (for example, acanthosis nigricans) • have associated features, such as eye disease, deafness, or another systemic illness or syndrome. (1.1.1.3)	remission phase • show evidence of insulin resistance (for example, acanthosis nigricans). (1.1.5) Think about the possibility of types of diabetes other than types 1 or 2 (such as other insulin resistance syndromes, maturity-onset diabetes in the young and molecular/enzymatic abnormalities) in children and young people with suspected diabetes who have any of the following features: • rarely or never produce ketone bodies in the urine (ketonuria) during episodes of hyperglycaemia • have associated features, such as retinitis pigmentosa, deafness, or another systemic illness or syndrome. (1.1.6)	rarer conditions. Because of this, the GDG felt that separating them into two lists makes it clearer which factors apply to which condition. In the second recommendation, 'eye' disease' has been replaced with 'retinitis pigmentosa', as the GDG felt that 'eye disease' was not specific enough and could be mistaken for diabetic retinopathy.
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)	Encourage young people with type 1 diabetes to attend clinic 4 times a year because regular contact is associated with good blood glucose control. (1.2.3)	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.
Children and young people with type 1 diabetes and their families should be informed that, as for	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:	An explanation has been added to the bullet on eye examination to make it clear this

other children, regular dental examinations[3] and eye examinations (every 2 years) are recommended. (1.3.5.4)	• regular dental examinations (see the NICE guideline on dental recall) • an eye examination by an optician every 2 years. (1.2.4)	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.
Children and young people with type 1 diabetes and their families should be informed that the Department of Health[4]**Error! Bookmark not defined.** recommends immunisation against pneumococcal infection for children and young people with diabetes over the age of 2 months. (1.2.11.2)	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)	This recommendation has been updated to reflect guidance from the Department of Health's Green Book.
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)	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%). (1.2.25)	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. In addition, the target HbA1c level has been updated to match the new recommendations on HbA1c target levels.
Children and young people with type 1 diabetes using insulin injection regimens should be offered	Provide children and young people with type 1 diabetes with insulin injection needles that are of an appropriate length for their body fat. (1.2.27)	The information on what needle length is appropriate for a child has been deleted from this

[3] Dental recall: Recall interval between routine dental examinations. NICE clinical guideline 19 (2004).
[4] Salisbury, D. M. and Department of Health, Welsh Office, Scottish Office Department of Health, DHSS (Northern Ireland): 1996. Update for pneumococcal vaccination.

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)		recommendation, as the GDG felt that this was well known and did not need defining in the recommendation.
Children and young people with type 1 diabetes should be offered: • annual foot care reviews • investigation of the state of injection sites at each clinic visit. (1.3.5.3)	Offer children and young people with type 1 diabetes a review of injection sites at each clinic visit. (1.2.29)	The text on foot care has been removed from this recommendation, as it is covered by the new NICE guideline on diabetic foot care.
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: • carbohydrates – more than 50% • protein – 10–15% • fat – 30–35%. 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	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)	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. In addition, the specific energy intake levels were removed, as these are applicable to all children and not just those with type 1 diabetes.

needs. (1.2.7.2)		
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)	At each clinic visit for children and young people with type 1 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 changing blood glucose control. (1.2.45)	This recommendation has been heavily edited for clarity, and the second part of the recommendation has been rewritten to make it easier to follow.
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)	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)	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. 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.
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)	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 poor blood glucose control). (1.2.72)	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.
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)	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. (1.2.77)	The type of carbohydrate suitable for safe management of hypoglycaemia has been changed from 'glucose or sucrose' to 'fast-acting glucose', as the GDG felt this was what was recommended in current practice.
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)	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. (1.2.78)	Subcutaneous glucagon has been removed from this recommendation, as the GDG did not think this was used in current practice. The recommendation has been reworded to make it clear that intramuscular glucagon would only be given for severe hypoglycaemia. 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.
Children and young	Immediately treat mild to moderate	This

people with mild to moderate hypoglycaemia should be treated as follows. • 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 complex long-acting carbohydrate should be given orally to maintain blood glucose levels unless a snack or meal is	hypoglycaemia in children and young people 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). • 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. (1.2.79)	recommendation has been reworded and reordered to make it easier to understand. 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 GDG felt this was what was recommended in current practice.

imminent. • 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)		
Children and young people with severe hypoglycaemia should be treated as follows. • 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	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). (1.2.80) 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 more than 25 kg) 1 mg glucagon. ○ give children under 8 years old (or who weigh less than 25 kg) 500 micrograms	This recommendation has been reworded, reordered, and split into 2 separate recommendations to make it easier to understand. 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 GDG felt that these 2 were the only standard treatment options rather than 2 options out of several, as was suggested by the original wording. The reference to 'Hypostop' has been changed to 'Glucogel', as the GDG felt that this was the preparation commonly used in clinical practice. A warning on using oral glucose solution in children

body weight less than 25 kg) should be given 500 micrograms of glucagon. • 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 people whose blood glucose levels fail to respond and those in whom symptoms persist for more than	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. (1.2.81)	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.

10 minutes. (1.3.1.5)		
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)	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. (1.2.82)	The term 'nocturnal hypoglycaemia' has been changed to 'hypoglycaemia while sleeping', as the GDG did not think the original term was common in clinical practice.
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)	Think about the possibility of non-adherence to therapy in children and young people with type 1 diabetes who have poor blood glucose control, especially in adolescence. (1.2.86)	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.
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)	Diabetes teams should be aware that children and young people with type 1 diabetes have a greater risk of emotional and behavioural difficulties. (1.2.93)	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.
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)	Assess the emotional and psychological well-being of young people with type 1 diabetes who present with frequent episodes of diabetic ketoacidosis. (1.2.95)	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.
Children and young people with type 1	Offer children and young people with type 1 diabetes and their	A cross-reference to the NICE guidelines

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)	family members or carers (as appropriate) timely and ongoing access to mental health professionals because they may experience psychological problems (such as anxiety, depression, behavioural and conduct disorders and family conflict) that can impact on the management of diabetes and well-being. See also the NICE guidelines on depression in children and young people and antisocial behaviour and conduct disorders in children and young people. (1.2.97)	on depression in children and young people and antisocial behaviour and conduct disorders in children and young people has been added for information.
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)	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. See also the NICE guideline on eating disorders. (1.2.105)	A cross-reference to the NICE guideline on eating disorders has been added for information.
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)	Be aware that children and young people with type 1 diabetes who have eating disorders may have associated difficulties with: • poor blood glucose control (both hyperglycaemia and hypoglycaemia) • symptoms of gastroparesis. (1.2.106)	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 GDG 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. 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.
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)	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. (1.2.107)	This recommendation has been amended as healthcare professionals outside of the diabetes team (such as GPs) can also identify eating disorders.
Children and young people with type 1 diabetes and their families should be informed that, as for other children, regular dental examinations[5] and eye examinations (every 2 years) are recommended. (1.3.5.4)	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[6] • an eye examination by an optician every 2 years. (1.3.3)	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. 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

[5] Dental recall: Recall interval between routine dental examinations. NICE clinical guideline 19 (2004).
[6] Dental recall: Recall interval between routine dental examinations (2004) NICE guideline CG19

		population.
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)	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)	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. 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.
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)	Explain to children and young people with type 2 diabetes and their family members or carers (as appropriate) how to find information about possible benefits from government disability support. (1.3.6)	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. 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.
Children and young people with type 1 diabetes and their families should be informed that the	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	These recommendations originally only applied to type 1 diabetes in children

Department of Health[4] recommends annual immunisation against influenza for children and young people with diabetes over the age of 6 months. (1.2.11.1)	recommends annual immunisation against influenza for children and young people with diabetes. (1.3.12)	and young people, but have been included in the section of this guideline on type 2 diabetes as they are applicable to this population. 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.
Children and young people with type 1 diabetes and their families should be informed that the Department of Health**Error! Bookmark not defined.** recommends immunisation against pneumococcal infection for children and young people with diabetes over the age of 2 months. (1.2.11.2)	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. (1.3.13)	This recommendation has been updated to reflect guidance from the Department of Health's Green Book. 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. 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.

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)	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 changing blood glucose control. (1.3.20)	This recommendation has been heavily edited for clarity, and the second part of the recommendation has been rewritten to make it easier to follow. 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.
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)	Diabetes teams should be aware that children and young people with type 2 diabetes have a greater risk of emotional and behavioural difficulties. (1.3.31)	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. 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.
Children with type 1 diabetes who are younger than 2 years of	Offer initial inpatient management to children with diabetes who are aged under 2 years. (1.5.5)	This recommendation has been split into 2

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)	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)	recommendations to make the differences in care for the 2 populations clearer. 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.
	1.2.21, 1.2.23, 1.2.24	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, 1.2.25, 1.2.39, 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, 1.2.33, 1.2.92, 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.
	1.3.7, 1.3.8, 1.3.9, 1.3.10, 1.3.11, 1.3.16, 1.3.21, 1.3.29, 1.3.30, 1.3.32, 1.3.34, 1.3.35, 1.3.36, 1.3.37, 1.3.38, 1.5.1, 1.5.2, 1.5.3,	These recommendations originally only applied to type 1

	1.5.4, 1.5.5, 1.5.6, 1.5.8, 1.5.9, 1.5.10	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.

Changes to recommendation wording for clarification only (no change to meaning)

Recommendation numbers in current guideline	Comment
All recommendations except those labelled **[new 2015]**	Recommendations have been edited into the direct style (in line with current NICE style for recommendations in clinical guidelines) where possible. Yellow highlighting has not been applied to these changes. Where applicable, terminology has been made consistent within the guideline and with terminology that will be used in other updates of NICE guidelines on diabetes (diabetes in pregnancy [publication expected February 2015], type 1 diabetes and type 2 diabetes [publication expected August 2015]) – for example, 'impaired awareness of hypoglycaemia' rather than 'hypoglycaemia unawareness'; 'blood glucose control' rather than 'glycaemic control'.
1.2.9	This recommendation has been updated to use modern disability terminology.
1.2.22	(CSII or insulin pump) is specified for clarity (original wording did not mention insulin pumps).
1.2.97, 1.3.35	The term 'psychological disturbances' has been rephrased to 'psychological problems' to avoid putting a negative emphasis on mental health conditions.
1.2.98, 1.3.36	The term 'assessment of psychological dysfunction' has been rephrased to 'psychological assessment' to avoid putting a negative emphasis on mental health assessment and treatment.
1.2.21, 1.2.22, 1.2.23, 1.2.76, 1.2.79, 1.2.80, 1.2.81, 1.2.87, 1.2.88, 1.2.95	Type 1 diabetes is specified for clarity (original wording had 'diabetes' or did not specify diabetes at all).