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**NATIONAL INSTITUTE FOR HEALTH AND CARE
EXCELLENCE**

Guideline

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

Draft for consultation, September 2020

This guideline covers the diagnosis and management of type 1 and type 2 diabetes in children and young people aged under 18. The 2020 update covers fluid therapy for children and young people with diabetic ketoacidosis.

This guideline will update NICE guideline NG18 (published August 2015).

Who is it for?

- Healthcare professionals
- Commissioners and providers
- Children and young people with type 1 or type 2 diabetes, and their families and carers

What does it include?

This draft guideline contains:

- the draft recommendations
- recommendations for research
- rationale and impact sections that explain why the committee made 2020 recommendations and how they might affect practice
- the guideline context.

Information about how the guideline was developed is on [the guideline's page on the NICE website](#). This includes the evidence reviews, the scope, details of the committee and any declarations of interest.

New and updated recommendations

We have reviewed the evidence on fluid therapy for diabetic ketoacidosis. You are invited to comment on the new and updated recommendations. These are marked as **[2020]**.

You are also invited to comment on recommendations that we propose to delete from the 2015 guideline.

We have not reviewed the evidence for the recommendations shaded in grey, and cannot accept comments on them. In some cases, we have made minor wording changes for clarification.

See [update information](#) for a full explanation of what is being updated.

Full details of the evidence and the committee's discussion on the 2020 recommendations are in [the evidence reviews](#). Evidence for the 2004 and 2015 recommendations is in [the full version of the 2015 guideline](#).

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1 Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in [making decisions about your care](#).

[Making decisions using NICE guidelines](#) explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

2

3 Blood glucose and plasma glucose

4 'Blood glucose' is the more commonly used term. However, a lot of the
5 evidence this guideline is based on uses 'plasma' rather than 'blood' glucose.
6 Also, patient-held glucose meters and monitoring systems are calibrated to
7 plasma glucose equivalents. Because of this, in this guideline we use the term
8 'blood glucose', except when referring to specific concentration values.

9 **1.1 Diagnosis**

10 1.1.1 Be aware that signs of type 1 diabetes in children and young
11 people include:

- 12 • hyperglycaemia (random plasma glucose more than
- 13 11 mmol/litre)
- 14 • polyuria
- 15 • polydipsia
- 16 • weight loss
- 17 • excessive tiredness. **[2004, amended 2015]**

18 1.1.2 Refer children and young people with suspected type 1 diabetes
19 immediately (on the same day) to a multidisciplinary paediatric
20 diabetes team with the competencies needed to confirm diagnosis
21 and provide immediate care. **[2004, amended 2015]**

1 1.1.3 Confirm type 1 diabetes in children and young people using the
2 plasma glucose criteria in [the World Health Organization's 2006](#)
3 [report on the diagnosis and classification of diabetes mellitus](#).
4 **[2004, amended 2015]**

5 1.1.4 When diagnosing diabetes in a child or young person, assume
6 type 1 diabetes unless there are strong indications of
7 type 2 diabetes, monogenic or mitochondrial diabetes. **[2015]**

8 1.1.5 Think about the possibility of type 2 diabetes in children and young
9 people with suspected diabetes who:

- 10 • have a strong family history of type 2 diabetes
- 11 • are obese
- 12 • are of black or Asian family origin
- 13 • do not need insulin, or need less than 0.5 units/kg body
- 14 weight/day after the partial remission phase
- 15 • show evidence of insulin resistance (for example, acanthosis
- 16 nigricans). **[2004, amended 2015]**

17 1.1.6 Think about the possibility of other types of diabetes (not type 1
18 or 2), such as other insulin resistance syndromes, or monogenic or
19 mitochondrial diabetes, in children and young people with
20 suspected diabetes who have any of the following:

- 21 • diabetes in the first year of life
- 22 • rarely or never develop ketones in the blood (ketonaemia) during
- 23 episodes of hyperglycaemia
- 24 • associated features, such as optic atrophy, retinitis pigmentosa,
- 25 deafness, or another systemic illness or syndrome. **[2004,**
- 26 **amended 2015]**

27 1.1.7 Do not measure C-peptide or diabetes-specific autoantibody titres
28 at initial presentation to distinguish type 1 diabetes from
29 type 2 diabetes. **[2015]**

1 1.1.8 Consider measuring C-peptide after initial presentation if needed to
2 distinguish between type 1 diabetes and other types of diabetes.
3 Be aware that C-peptide concentrations have better discriminative
4 value the longer the interval between initial presentation and the
5 test. **[2015]**

6 1.1.9 Perform genetic testing if atypical disease behaviour, clinical
7 characteristics or family history suggest monogenic diabetes.
8 **[2015]**

9 **1.2 Type 1 diabetes**

10 **Education and information**

11 1.2.1 Offer children and young people with type 1 diabetes and their
12 families or carers a continuing programme of education from
13 diagnosis. Include the following core topics:

- 14 • insulin therapy, including its aims, how it works, how to take it,
15 and how to adjust the dosage
- 16 • blood glucose monitoring, including blood glucose and HbA1c
17 targets
- 18 • how diet, physical activity and intercurrent illness effect blood
19 glucose levels
- 20 • managing intercurrent illness ('sick-day rules', including
21 monitoring of blood ketones [beta-hydroxybutyrate])
- 22 • detecting and managing hypoglycaemia, hyperglycaemia and
23 ketosis. **[2015]**

24 1.2.2 Tailor the education programme to each child or young person with
25 type 1 diabetes and their families or carers, taking account of
26 issues such as:

- 27 • personal preferences
- 28 • emotional wellbeing
- 29 • age and maturity

- 1 • cultural considerations
- 2 • existing knowledge
- 3 • current and future social circumstances
- 4 • life goals. **[2015]**

5 1.2.3 Encourage young people with type 1 diabetes to attend clinic
6 4 times a year, and explain that regular contact with the diabetes
7 team will help them maintain optimal blood glucose levels. **[2004,**
8 **amended 2015]**

9 1.2.4 Explain to children and young people with type 1 diabetes and their
10 families or carers that, like people without diabetes, they should
11 have:

- 12 • regular dental examinations (see [the NICE guideline on dental](#)
13 [checks](#))
- 14 • an eye examination by an optician every 2 years. **[2004,**
15 **amended 2015]**

16 1.2.5 Encourage children and young people with type 1 diabetes and
17 their families or carers to discuss any concerns and raise any
18 questions they have with their diabetes team. **[2015]**

19 1.2.6 Give children and young people with type 1 diabetes and their
20 families or carers information about diabetes support groups and
21 organisations, and the potential benefits of membership. Give this
22 information after diagnosis and regularly afterwards. **[2004,**
23 **amended 2015]**

24 1.2.7 Encourage children and young people with type 1 diabetes to wear
25 or carry something that tells people they have type 1 diabetes (for
26 example, a bracelet). **[2004]**

27 1.2.8 Explain to children and young people with type 1 diabetes and their
28 families or carers how to find out about government disability
29 benefits. **[2004, amended 2015]**

1 1.2.9 Take particular care when communicating with children and young
2 people with type 1 diabetes if they or their families or carers have
3 physical or sensory disabilities, or difficulties speaking or reading
4 English. **[2004]**

5 1.2.10 Diabetes teams should offer comprehensive advice to children and
6 young people with type 1 diabetes who want to play sports that
7 have particular risks for people with diabetes. Support groups and
8 organisations (including sports organisations) may be able to
9 provide more information. **[2004, amended 2015]**

10 1.2.11 Offer education for children and young people with type 1 diabetes
11 and their families or carers on the practical issues around
12 long-distance travel, such as when best to eat and inject insulin
13 when travelling across time zones. **[2004]**

14 **Smoking and substance misuse**

15 1.2.12 Encourage children and young people with type 1 diabetes not to
16 start smoking. Explain the general health problems smoking
17 causes, in particular the risks of vascular complications. **[2004,**
18 **amended 2015]**

19 1.2.13 For more guidance on preventing smoking, see also [the NICE](#)
20 [guidelines on preventing the uptake of smoking by children and](#)
21 [young people](#) and [preventing smoking in schools](#). **[2004, amended**
22 **2015]**

23 1.2.14 Offer smoking cessation programmes to children and young people
24 with type 1 diabetes who smoke. See also [the NICE guidelines on](#)
25 [stop smoking interventions and services](#), [harm reduction](#)
26 [approaches to smoking](#) and [smoking cessation in secondary care](#).
27 **[2004, amended 2015]**

1 1.2.15 Explain to children and young people with type 1 diabetes and their
2 families or carers about the general dangers of substance misuse
3 and the possible effects on blood glucose levels. **[2004]**

4 **Immunisation**

5 1.2.16 Explain to children and young people with type 1 diabetes and their
6 families or carers that [the Public Health England Green Book](#)
7 recommends they have:

- 8 • annual immunisation against influenza, starting when they are
9 6 months old.
- 10 • immunisation against pneumococcal infection, if they are taking
11 insulin or oral hypoglycaemic medicines. **[2004, amended 2015]**

12 **Insulin therapy**

13 1.2.17 Discuss the choice of insulin regimen with the child or young
14 person and their family:

- 15 • explain the advantages and disadvantages of the different
16 options
- 17 • discuss their personal circumstances and preferences
- 18 • help them to make an informed decision between the options
19 that are available to them. **[2015]**

20 1.2.18 Offer children and young people with type 1 diabetes a [multiple](#)
21 [daily injection basal-bolus insulin regimen](#) from diagnosis. **[2015]**

22 1.2.19 If a multiple daily insulin injections are not appropriate for a
23 particular child or young person, consider an [insulin pump](#) as
24 recommended in [the NICE technology appraisal guidance on](#)
25 [continuous subcutaneous insulin infusion for the treatment of](#)
26 [diabetes mellitus](#). **[2015]**

27 1.2.20 Encourage children and young people with type 1 diabetes who are
28 having multiple daily insulin injections to adjust the insulin dose if

1 appropriate after each blood glucose measurement. **[2004,**
2 **amended 2015]**

3 1.2.21 Tell children and young people with type 1 diabetes who are having
4 multiple daily insulin injections to inject rapid-acting insulin
5 analogues before eating. Explain that this reduces blood glucose
6 levels after meals and will help them to optimise their blood glucose
7 levels. **[2004, amended 2015]**

8 1.2.22 When children and young people start on an insulin pump, train
9 them and their families and carers how to use it. A specialist team
10 should provide ongoing support. **[2004, amended 2015]**

11 1.2.23 Specialist teams should agree a common core of advice to give
12 insulin pump users. **[2004, amended 2015]**

13 1.2.24 For children and young people with type 1 diabetes who are using
14 [twice-daily injection regimens](#), encourage them to adjust the insulin
15 dose according to the general trend in their pre-meal, bedtime and
16 occasional night-time blood glucose. **[2004, amended 2015]**

17 1.2.25 Explain to children and young people with newly diagnosed
18 type 1 diabetes and their families or carers that:

- 19 • they may have a partial remission phase (a 'honeymoon period')
20 when they start using insulin
- 21 • during this time they may only need a low dosage of insulin
22 (0.5 units/kg body weight/day) to maintain an HbA1c level of less
23 than 48 mmol/mol (6.5%). **[2004, amended 2015]**

24 1.2.26 Offer children and young people with type 1 diabetes a choice of
25 insulin delivery systems. **[2004]**

26 1.2.27 Provide children and young people with type 1 diabetes with insulin
27 injection needles that are the right length for their body fat. **[2004,**
28 **amended 2015]**

1 1.2.28 Provide children and young people with type 1 diabetes and their
2 families or carers with:

- 3
- suitable containers for collecting used needles and other sharps
 - a way to safely get rid of these containers.
- 4

5 See also the [section on safe use and disposal of sharps in the](#)
6 [NICE guideline on infection control](#). [2015]

7 1.2.29 Offer children and young people with type 1 diabetes a review of
8 injection sites at each clinic visit. [2004, amended 2015]

9 1.2.30 Provide children and young people with type 1 diabetes with
10 rapid-acting insulin analogues to use during intercurrent illness or
11 episodes of hyperglycaemia. [2015]

12 1.2.31 If a child or young person with type 1 diabetes does not have
13 optimal blood glucose levels (see [recommendations 1.2.54](#) and
14 [1.2.67](#)):

- 15
- offer additional support, such as more contact with their diabetes
16 team **and**
 - if necessary, offer an alternative insulin regimen (multiple daily
17 injections, an insulin pump, or [once-, twice- or three-times daily](#)
18 [mixed insulin injections](#)). [2015]
- 19

20 Oral medicines

21 1.2.32 Only use metformin in combination with insulin within research
22 studies, because it is uncertain whether this combination improves
23 blood glucose management. [2004]

24 1.2.33 Do not offer children and young people with type 1 diabetes
25 acarbose or sulfonylureas (glibenclamide, gliclazide, glipizide,
26 tobutamide) in combination with insulin, because they may increase
27 the risk of hypoglycaemia without improving blood glucose
28 management. [2004, amended 2015]

1 **Dietary management**

2 1.2.34 Support children and young people with type 1 diabetes and their
3 families or carers to develop a good working knowledge of nutrition
4 and how it affects their diabetes. **[2015]**

5 1.2.35 Discuss healthy eating regularly with children and young people
6 with type 1 diabetes and their families or carers.

- 7 • Explain that this means eating foods with a low glycaemic index,
8 fruit and vegetables, and appropriate types and amounts of fats.
- 9 • Explain that healthy eating can reduce their risk of
10 cardiovascular disease.
- 11 • Support them to adjust their food choices accordingly. **[2015]**

12 1.2.36 Take into account social and cultural considerations when providing
13 advice on diet to children and young people with type 1 diabetes.
14 **[2015]**

15 1.2.37 Explain that children and young people with type 1 diabetes have
16 the same basic nutritional requirements as other children and
17 young people. Their food should provide enough energy and
18 nutrients for their growth and development. **[2004, amended 2015]**

19 1.2.38 For children and young people who are using a multiple daily
20 insulin injection regimen or an insulin pump, offer [level 3](#)
21 [carbohydrate-counting](#) education from diagnosis to them and their
22 families or carers. Repeat this offer regularly. **[2015]**

23 1.2.39 When children and young people with type 1 diabetes change their
24 insulin regimen, offer them and their families or carers dietary
25 advice tailored to the new treatment. **[2015]**

26 1.2.40 Offer children and young people with type 1 diabetes and their
27 families or carers education about the practical problems
28 associated with fasting and feasting. **[2004, amended 2015]**

- 1 1.2.41 Encourage children and young people with type 1 diabetes and
2 their families or carers to discuss the nutritional composition and
3 timing of snacks with their diabetes team. **[2015]**
- 4 1.2.42 Encourage children and young people with type 1 diabetes to eat at
5 least 5 portions of fruit and vegetables each day. **[2015]**
- 6 1.2.43 Explain to children and young people with type 1 diabetes and their
7 families or carers that a low glycaemic index diet may help to
8 improve blood glucose management and reduce the risk of
9 hyperglycaemic episodes. **[2015]**
- 10 1.2.44 Offer children and young people with type 1 diabetes and their
11 families or carers advice and education to help them follow a low
12 glycaemic index diet. **[2015]**
- 13 1.2.45 Offer children and young people with type 1 diabetes dietetic
14 support to help optimise body weight and blood glucose levels.
15 **[2004]**
- 16 1.2.46 At each clinic visit for children and young people with
17 type 1 diabetes, measure their height and weight and plot on an
18 appropriate growth chart. Check for normal growth or significant
19 changes in weight, because these may reflect changes in blood
20 glucose levels. **[2004, amended 2015]**
- 21 1.2.47 Provide arrangements for weighing children and young people with
22 type 1 diabetes that respect their privacy. **[2004]**
- 23 **Exercise**
- 24 1.2.48 Encourage children and young people with type 1 diabetes to
25 exercise on a regular basis, and explain that this reduces their
26 long-term risk of developing cardiovascular disease. **[2004,**
27 **amended 2015]**

1 1.2.49 Explain to children and young people with type 1 diabetes and their
2 families or carers that they can take part in all forms of exercise,
3 provided that appropriate attention is given to changes in insulin
4 and dietary management. **[2004]**

5 1.2.50 Explain to children and young people with type 1 diabetes and their
6 families or carers about:

- 7
- the effects of exercise on blood glucose levels **and**
 - how to avoid hypo- or hyperglycaemia during or after physical activity. **[2004, amended 2015]**
- 8
9

10 1.2.51 Encourage children and young people with type 1 diabetes and
11 their families or carers to monitor blood glucose levels before and
12 after exercise so that they can:

- 13
- identify when changes in insulin or food intake are needed
 - learn how their blood glucose responds to different levels of exercise
 - watch out for exercise-induced hypoglycaemia
 - see how hypoglycaemia can occur several hours after prolonged exercise. **[2004, amended 2015]**
- 14
15
16
17
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19 1.2.52 Explain to children and young people with type 1 diabetes and their
20 families or carers that:

- 21
- they should have extra carbohydrates as needed to avoid hypoglycaemia **and**
 - they should have carbohydrate-based foods available during and after exercise. **[2004]**
- 22
23
24

25 1.2.53 Explain to children and young people with type 1 diabetes and their
26 families or carers that they should have extra carbohydrates if their
27 plasma glucose levels are less than 7 mmol/litre before they
28 exercise. **[2004, amended 2015]**

1 1.2.54 Explain to children and young people with type 1 diabetes and their
2 families or carers that they may need to alter their insulin dose or
3 carbohydrate intake if they change their daily exercise patterns.
4 **[2004]**

5 **Blood glucose and HbA1c targets and monitoring**

6 **Blood glucose targets**

7 1.2.55 Explain to children and young people with type 1 diabetes and their
8 families or carers that the optimal target ranges for short-term
9 plasma glucose management are:

- 10 • fasting plasma glucose level of 4 to 7 mmol/litre on waking
- 11 • a plasma glucose level of 4 to 7 mmol/litre before meals at other
12 times of the day
- 13 • a plasma glucose level of 5 to 9 mmol/litre after meals
- 14 • a plasma glucose level of at least 5 mmol/litre when driving (see
15 the [Driver and Vehicle Licensing Agency \(DVLA\) guidance for](#)
16 [people with diabetes](#) for further details about driving). **[2015]**

17 1.2.56 Explain to children and young people with type 1 diabetes and their
18 families or carers that maintaining blood glucose levels at the lower
19 end of the target ranges will help them achieve the lowest possible
20 HbA1c. **[2015]**

21 1.2.57 If children and young people with type 1 diabetes experience
22 problematic hypoglycaemia or undue emotional distress while
23 attempting to achieve blood glucose and HbA1c targets, discuss
24 changing the targets with them and their families and carers. **[2015]**

25 1.2.58 Be aware that blood glucose and HbA1c targets can cause conflict
26 between children and young people with type 1 diabetes and their
27 families or carers, and they may need to agree a compromise.
28 **[2015]**

1 **Blood glucose monitoring**

2 1.2.59 Advise children and young people with type 1 diabetes and their
3 families or carers to routinely perform at least 5 capillary blood
4 glucose tests per day. **[2015]**

5 1.2.60 Advise children and young people with type 1 diabetes and their
6 families or carers that more frequent testing is often needed (for
7 example with physical activity and during intercurrent illness).
8 Ensure they have enough test strips for this. **[2015]**

9 1.2.61 Offer children and young people with type 1 diabetes and their
10 families or carers a choice of equipment for monitoring capillary
11 blood glucose, so they can optimise their blood glucose
12 management in response to changes in their insulin, diet and
13 exercise. **[2004]**

14 1.2.62 Explain to children and young people with type 1 diabetes and their
15 families or carers that blood glucose levels should be interpreted in
16 the 'whole child' context, which includes the social, emotional and
17 physical environment. **[2004]**

18 1.2.63 Offer ongoing real-time continuous glucose monitoring with alarms
19 to children and young people with type 1 diabetes who:

- 20 • have frequent severe hypoglycaemia **or**
- 21 • have impaired hypoglycaemia awareness that is associated with
22 adverse consequences (for example, seizures or anxiety) **or**
- 23 • cannot recognise or communicate about symptoms of
24 hypoglycaemia (for example, because of cognitive or
25 neurological disabilities). **[2015]**

26 1.2.64 Consider ongoing real-time continuous glucose monitoring for:

- 27 • babies, infants and pre-school children
- 28 • children and young people with high levels of physical activity
29 (for example national-level sport)

- 1 • children and young people who have comorbidities (for example
2 anorexia nervosa), or who are having treatments (for example
3 corticosteroids) that can make blood glucose management
4 difficult. **[2015]**

5 1.2.65 Consider intermittent (real-time or retrospective) continuous
6 glucose monitoring to help improve blood glucose management for
7 children and young people who continue to have hyperglycaemia
8 despite insulin adjustment and additional support. **[2015]**

9 **HbA1c targets and monitoring**

10 1.2.66 Measure HbA1c using methods that have been calibrated
11 according to [International Federation of Clinical Chemistry \(IFCC\)](#)
12 [standardisation](#). **[2015]**

13 1.2.67 Explain the benefits of safely achieving and maintaining the lowest
14 attainable HbA1c to children and young people with type 1 diabetes
15 and their families or carers. **[2015]**

16 1.2.68 Explain to children and young people with type 1 diabetes and their
17 families or carers that an HbA1c target level of 48 mmol/mol (6.5%)
18 or lower will minimise their risk of long-term complications. **[2015]**

19 1.2.69 Explain to children and young people with type 1 diabetes who
20 have an HbA1c level above 48 mmol/mol (6.5%) that any reduction
21 in HbA1c level reduces their risk of long-term complications. **[2015]**

22 1.2.70 Agree an individualised lowest achievable HbA1c target with each
23 child or young person with type 1 diabetes and their families or
24 carers. Take into account factors such as their daily activities,
25 individual life goals, complications, comorbidities and the risk of
26 hypoglycaemia. **[2015]**

27 1.2.71 Support children and young people with type 1 diabetes and their
28 families or carers to safely achieve and maintain their individual
29 agreed HbA1c target level. **[2015]**

1 1.2.72 Measure HbA1c level 4 times a year in children and young people
2 with type 1 diabetes. Think about more frequent testing if they are
3 having difficulty with blood glucose management. **[2004, amended**
4 **2015]**

5 1.2.73 Diabetes services should document the proportion of children and
6 young people with type 1 diabetes who achieve an HbA1c level of
7 53 mmol/mol (7%) or lower. **[2015]**

8 **Hyperglycaemia, blood ketone monitoring and intercurrent illness**

9 1.2.74 Provide children and young people with type 1 diabetes and their
10 families or carers with individualised oral and written advice
11 ('sick-day rules') about managing type 1 diabetes during
12 intercurrent illness or episodes of hyperglycaemia, including:

- 13 • monitoring blood glucose
- 14 • monitoring and interpreting blood ketones
15 (beta-hydroxybutyrate)
- 16 • adjusting their insulin regimen
- 17 • food and fluid intake
- 18 • when and where to get further advice or help.

19
20 Revisit the advice at least annually. **[2015]**

21 1.2.75 Offer children and young people with type 1 diabetes blood ketone
22 testing strips and a meter. Advise them and their families or carers
23 to test for ketonaemia if they are ill or have hyperglycaemia. **[2015]**

24 1.2.76 Explain to children and young people with type 1 diabetes and their
25 families or carers that they should not use blood ketone testing
26 strips after the use-by date. **[2015]**

1 **Hypoglycaemia**

2 1.2.77 Explain to children and young people with type 1 diabetes and their
3 families or carers how they can avoid and manage hypoglycaemia.

4 **[2004]**

5 1.2.78 Offer education for children and young people with type 1 diabetes
6 and their families, carers, and teachers about recognising and
7 managing hypoglycaemia. **[2004]**

8 1.2.79 Explain to children and young people with type 1 diabetes and their
9 families or carers that they should always have access to an
10 immediate source of fast-acting glucose and blood glucose
11 monitoring equipment, so that they can check for hypoglycaemia
12 and manage it safely. **[2004, amended 2015]**

13 1.2.80 Train and equip families, carers, and (if appropriate) school nurses
14 and other carers to give intramuscular glucagon for severe
15 hypoglycaemia in an emergency. **[2004, amended 2015]**

16 1.2.81 Immediately treat mild to moderate hypoglycaemia in children and
17 young people with type 1 diabetes as follows.

- 18
- 19 • Give oral fast-acting glucose (for example, 10 to 20 g) (liquid
20 carbohydrate may be easier to swallow than solid).
 - 21 • Be aware that fast-acting glucose may need to be given in
22 frequent small amounts, because hypoglycaemia can cause
23 vomiting.
 - 24 • Recheck blood glucose levels within 15 minutes (fast-acting
25 glucose should raise blood glucose levels within 5 to
26 15 minutes), and give more fast-acting glucose if they still have
27 hypoglycaemia.
 - 28 • As symptoms improve or blood glucose levels return to normal,
29 give oral complex long-acting carbohydrate to maintain blood
30 glucose levels, unless the child or young person is:
 - about to have a snack or meal

- 1 – having a continuous subcutaneous insulin infusion. **[2004,**
2 **amended 2015]**

3 1.2.82 For children and young people with type 1 diabetes who are in
4 hospital, treat severe hypoglycaemia with 10% intravenous glucose
5 if rapid intravenous access is possible. Give a maximum dose of
6 500 mg/kg body weight (equivalent to a maximum of 5 ml/kg).
7 **[2004, amended 2015]**

8 1.2.83 For children and young people with type 1 diabetes who are not in
9 hospital, or if rapid intravenous access is not possible, treat severe
10 hypoglycaemia as follows.

- 11 • Use intramuscular glucagon or a concentrated oral glucose
12 solution (for example Glucogel). Do not use oral glucose solution
13 if they have reduced consciousness, because this could be
14 dangerous.
- 15 • If using intramuscular glucagon:
16 – give 1 mg glucagon to children and young people who are
17 over 8 years old, or who weigh 25 kg or more.
18 – give 500 micrograms of glucagon to children who are under
19 8 years old, or who weigh less than 25 kg.
- 20 • Seek medical assistance if blood glucose levels do not respond
21 or symptoms continue for more than 10 minutes.
- 22 • As symptoms improve or blood glucose levels return to normal,
23 and once the child or young person is sufficiently awake, give
24 oral complex long-acting carbohydrate to maintain normal blood
25 glucose levels.
- 26 • Recheck blood glucose repeatedly in children and young people
27 who have persistently reduced consciousness after a severe
28 hypoglycaemic episode, to determine whether further glucose is
29 needed. **[2004, amended 2015]**

1 1.2.84 Explain to young people with type 1 diabetes how alcohol affects
2 blood glucose levels, and in particular the increased risk of
3 hypoglycaemia (including hypoglycaemia while sleeping). **[2004,**
4 **amended 2015]**

5 1.2.85 Explain to young people with type 1 diabetes who drink alcohol that
6 they should:

- 7
- eat food containing carbohydrate before and after drinking
 - monitor their blood glucose levels regularly, and aim to keep the
8 levels within the recommended range by eating food containing
9 carbohydrate. **[2004]**
- 10

11 1.2.86 Explain to children and young people with type 1 diabetes and their
12 families or carers that when alcohol causes or contributes to
13 hypoglycaemia, glucagon may be ineffective and they may need
14 intravenous glucose. **[2004]**

15 1.2.87 Diabetes teams should consider referring children and young
16 people with type 1 diabetes for assessment of cognitive function if
17 they have frequent hypoglycaemia or recurrent seizures,
18 particularly if these occur at a young age. **[2004]**

19 **Difficulties with maintaining optimal blood glucose levels**

20 1.2.88 Think about the possibility of non-adherence to therapy in children
21 and young people with type 1 diabetes who have difficulty with
22 blood glucose management, especially in adolescence. **[2004,**
23 **amended 2015]**

24 1.2.89 Be aware that young people with type 1 diabetes can have difficulty
25 with blood glucose management during adolescence, and this may
26 in part be due to non-adherence to therapy. **[2004]**

27 1.2.90 Raise the issue of non-adherence to therapy with children and
28 young people with type 1 diabetes and their families or carers in a
29 sensitive manner. **[2004]**

1 1.2.91 Be aware of the possible negative psychological impact of setting
2 targets that may be difficult for a child or young person with
3 type 1 diabetes to achieve and maintain. **[2015]**

4 **Surgery**

5 1.2.92 Only offer surgery in centres that have dedicated paediatric
6 facilities for children and young people with diabetes. **[2004]**

7 1.2.93 All centres caring for children and young people with
8 type 1 diabetes should have written protocols on safe surgery for
9 children and young people. The protocols should be agreed
10 between surgical and anaesthetic staff and the diabetes team.
11 **[2004]**

12 1.2.94 Surgical, anaesthetic and diabetes teams should discuss care for
13 children and young people with type 1 diabetes before they are
14 admitted to hospital for elective surgery, and as soon as possible
15 after they are admitted for emergency surgery. **[2004, amended**
16 **2015]**

17 **Psychological and social issues**

18 1.2.95 Be aware that children and young people with type 1 diabetes have
19 a greater risk of emotional and behavioural difficulties. **[2004,**
20 **amended 2015]**

21 1.2.96 Offer children and young people with type 1 diabetes and their
22 families or carers emotional support after diagnosis, and tailor this
23 to their emotional, social, cultural and age-dependent needs.
24 **[2004]**

25 1.2.97 Assess the emotional and psychological wellbeing of young people
26 with type 1 diabetes who have frequent episodes of diabetic
27 ketoacidosis (DKA). **[2004, amended 2015]**

- 1 1.2.98 Be aware that a lack of adequate psychosocial support for children
2 and young people with type 1 diabetes has a negative effect on
3 various outcomes (including blood glucose management), and can
4 also reduce their self-esteem. **[2004, amended 2015]**
- 5 1.2.99 Offer children and young people with type 1 diabetes and their
6 families or carers timely and ongoing access to mental health
7 professionals with an understanding of diabetes. This is because
8 they may experience psychological problems (such as anxiety,
9 depression, behavioural and conduct disorders, and family conflict)
10 or psychosocial difficulties that can impact on the management of
11 diabetes and wellbeing. **[2004, amended 2015]**
- 12 1.2.100 See [the NICE guidelines on depression in children and young](#)
13 [people](#) and [antisocial behaviour and conduct disorders in children](#)
14 [and young people](#) for guidance on managing these conditions.
15 **[2015]**
- 16 1.2.101 Diabetes teams should have access to mental health professionals
17 to support them in psychological assessment and providing
18 psychosocial support. **[2004]**
- 19 1.2.102 Offer children and young people with type 1 diabetes who have
20 behavioural or conduct disorders, and their families or carers,
21 access to mental health professionals. **[2004]**
- 22 1.2.103 Offer specific family-based behavioural interventions, such as
23 behavioural family systems therapy, if there are difficulties with
24 diabetes-related family conflict. **[2015]**
- 25 1.2.104 Consider a programme of behavioural intervention therapy or
26 behavioural techniques for children and young people with
27 type 1 diabetes, if there are concerns about their psychological
28 wellbeing. Choose a type of therapy based on what the child or
29 young person needs help with:

- 1 • health-related quality of life – for example, counselling or
- 2 cognitive behavioural therapy (CBT), including CBT focused on
- 3 quality of life
- 4 • adherence to diabetes treatment – for example, motivational
- 5 interviewing or multisystemic therapy
- 6 • blood glucose management if they have high HbA1c levels
- 7 (above 69 mmol/mol [8.5%]) – for example, multisystemic
- 8 therapy. **[2015]**

9 1.2.105 Offer screening for anxiety and depression to children and young
10 people with type 1 diabetes who have persistent difficulty with
11 blood glucose management. **[2004]**

12 1.2.106 Be aware that children and young people with type 1 diabetes may
13 develop anxiety or depression, particularly when they have difficulty
14 with self-management when they have had diabetes for a long
15 time. **[2004]**

16 1.2.107 Refer children and young people with type 1 diabetes and
17 suspected anxiety or depression promptly to child mental health
18 professionals. **[2004]**

19 1.2.108 Be aware that children and young people with type 1 diabetes (in
20 particular young women) have an increased risk of eating
21 disorders. For more guidance on assessing and managing eating
22 disorders, see [the NICE guideline on eating disorders](#). **[2004,**
23 **amended 2015]**

24 1.2.109 Be aware that children and young people with type 1 diabetes and
25 an eating disorder may have associated difficulties with:

- 26 • blood glucose management (both hyperglycaemia and
- 27 hypoglycaemia)
- 28 • symptoms of gastroparesis. **[2004, amended 2015]**

1 1.2.110 For children and young people with type 1 diabetes and an eating
2 disorder, offer joint management involving their diabetes team and
3 child mental health professionals. **[2004, amended 2015]**

4 **Monitoring for complications and associated conditions of**
5 **type 1 diabetes**

6 1.2.111 Offer children and young people with type 1 diabetes monitoring
7 for:

- 8
- 9 • thyroid disease, at diagnosis and then annually until transfer to
10 adult services
 - 11 • moderately increased albuminuria (albumin:creatinine ratio
12 [ACR] 3 to 30 mg/mmol) to detect diabetic kidney disease,
13 annually from 12 years
 - hypertension, annually from 12 years. **[2015]**

14 1.2.112 Refer children and young people with type 1 diabetes for diabetic
15 retinopathy screening from 12 years, in line with the [Public Health
16 England diabetic eye screening programme](#). **[2015]**

17 1.2.113 For guidance on monitoring for coeliac disease in children and
18 young people with type 1 diabetes, see [the NICE guideline on
19 coeliac disease](#). **[2015]**

20 1.2.114 For guidance on managing foot problems in children and young
21 people with type 1 diabetes, see [the NICE guideline on diabetic
22 foot problems](#). **[2015]**

23 1.2.115 Be aware of the following rare complications and associated
24 conditions when children and young people with type 1 diabetes
25 attend clinic visits:

- 26
- 27 • juvenile cataracts
 - necrobiosis lipoidica
 - 28 • Addison's disease. **[2004, amended 2015]**

1 1.2.116 Explain to children and young people with type 1 diabetes and their
2 families or carers the importance of annual monitoring from
3 12 years for diabetic kidney disease. **[2015]**

4 **Diabetic retinopathy**

5 1.2.117 For children and young people with type 1 diabetes who are having
6 eye screening, explain to them and their families or carers that:

- 7 • monitoring for diabetic retinopathy begins at 12 years (see
8 recommendation 1.2.112) because diabetic retinopathy that
9 needs treatment is extremely rare in children and young people
10 under 12
- 11 • annual monitoring from 12 years is important because, if
12 significant diabetic retinopathy is found, early treatment will
13 improve the outcome
- 14 • it will help them to keep their eyes healthy and help to prevent
15 problems with their vision
- 16 • the screening service is effective at identifying problems so that
17 they can be treated early. **[2015]**

18 **Diabetic kidney disease**

19 1.2.118 Explain to children and young people with type 1 diabetes and their
20 families or carers that:

- 21 • monitoring for moderately increased albuminuria (ACR 3 to
22 30 mg/mmol) to detect diabetic kidney disease begins at
23 12 years because diabetic kidney disease in children and young
24 people under 12 is extremely rare
- 25 • using the first urine sample of the day ('early morning urine') to
26 screen for moderately increased albuminuria is important, as this
27 reduces the risk of false positive results
- 28 • if moderately increased albuminuria is detected, improving blood
29 glucose management will reduce the risk of this progressing to
30 significant diabetic kidney disease

- 1 • annual monitoring from 12 years is important because, if they
2 have diabetic kidney disease, early treatment will improve the
3 outcome. **[2015]**

4 1.2.119 Use the first urine sample of the day ('early morning urine') to
5 measure the albumin:creatinine ratio. If the first urine sample of the
6 day is not available, use a random sample, but be aware that this is
7 associated with an increased risk of false positive results. **[2015]**

8 1.2.120 If the initial albumin:creatinine ratio is above 3 mg/mmol but below
9 30 mg/mmol, confirm the result by repeating the test on 2 further
10 occasions using first urine samples of the day ('early morning
11 urine') before starting further investigation and therapy. **[2015]**

12 1.2.121 Investigate further if the initial albumin:creatinine ratio is
13 30 mg/mmol or more (proteinuria). **[2015]**

14 **1.3 Type 2 diabetes**

15 **Education and information**

16 1.3.1 Offer children and young people with type 2 diabetes and their
17 families or carers a continuing programme of education from
18 diagnosis. Include the following core topics:

- 19 • HbA1c monitoring and targets
20 • how diet, physical activity, body weight and intercurrent illness
21 effect blood glucose levels
22 • how metformin can help, and possible adverse effects
23 • the complications of type 2 diabetes and how to prevent them.
24 **[2015]**

25 1.3.2 Tailor the education programme to each child or young person with
26 type 2 diabetes and their families or carers, taking account of
27 issues such as:

- 28 • personal preferences

- 1 • emotional wellbeing
- 2 • age and maturity
- 3 • cultural considerations
- 4 • existing knowledge
- 5 • current and future social circumstances
- 6 • life goals. **[2015]**

7 1.3.3 Explain to children and young people with type 2 diabetes and their
8 families or carers that, like people without diabetes, they should
9 have:

- 10 • regular dental examinations (see [the NICE guideline on dental](#)
11 [checks](#))
- 12 • an eye examination by an optician every 2 years. **[2004,**
13 **amended 2015]**

14 1.3.4 Encourage children and young people with type 2 diabetes and
15 their families or carers to discuss any concerns and raise any
16 questions they have with their diabetes team. **[2015]**

17 1.3.5 Give children and young people with type 2 diabetes and their
18 families or carers information about diabetes support groups and
19 organisations, and the potential benefits of membership. Give this
20 information after diagnosis and regularly afterwards. **[2004,**
21 **amended 2015]**

22 1.3.6 Explain to children and young people with type 2 diabetes and their
23 families or carers how to find out about possible government
24 disability benefits. **[2004, amended 2015]**

25 1.3.7 Take particular care when communicating with children and young
26 people with type 2 diabetes if they or their families or carers have
27 physical and sensory disabilities, or difficulties speaking or reading
28 English. **[2004, amended 2015]**

1 **Smoking and substance misuse**

2 1.3.8 Encourage children and young people with type 2 diabetes not to
3 start smoking. Explain the general health problems smoking
4 causes, in particular the risks of vascular complications. **[2004,**
5 **amended 2015]**

6 1.3.9 For more guidance on preventing smoking, see also [the NICE](#)
7 [guidelines on preventing the uptake of smoking by children and](#)
8 [young people](#) and [preventing smoking in schools](#). **[2004, amended**
9 **2015]**

10 1.3.10 Offer smoking cessation programmes to children and young people
11 with type 2 diabetes who smoke. See also [the NICE guidelines on](#)
12 [stop smoking interventions and services](#), [harm reduction](#)
13 [approaches to smoking](#) and [smoking cessation in secondary care](#).
14 **[2004, amended 2015]**

15 1.3.11 Explain to children and young people with type 2 diabetes and their
16 families or carers about the general dangers of substance misuse
17 and the possible effects on blood glucose levels. **[2004, amended**
18 **2015]**

19 **Immunisation**

20 1.3.12 Explain to children and young people with type 2 diabetes and their
21 families or carers that [the Public Health England Green Book](#)
22 recommends they have:

- 23 • annual immunisation against influenza
- 24 • immunisation against pneumococcal infection, if they are taking
25 insulin or oral hypoglycaemic medicines. **[2004, amended 2015]**

26 **Dietary management**

27 1.3.13 At each contact with a child or young person with type 2 diabetes
28 who is overweight or obese, advise them and their families or
29 carers about the benefits of exercise and weight loss, and provide

1 support towards achieving this. See also [the NICE guidelines on](#)
2 [preventing excess weight gain](#) and [managing obesity](#). **[2015]**

3 1.3.14 Offer children and young people with type 2 diabetes dietetic
4 support to help optimise body weight and blood glucose levels.
5 **[2004, amended 2015]**

6 1.3.15 At each contact with a child or young person with type 2 diabetes,
7 explain to them and their families or carers how healthy eating can
8 help to:

- 9 • reduce hyperglycaemia
- 10 • reduce cardiovascular risk
- 11 • promote weight loss (see recommendation 1.3.13). **[2015]**

12 1.3.16 Provide dietary advice to children and young people with
13 type 2 diabetes and their families or carers in a sensitive manner.
14 Take into account the difficulties that many people have with losing
15 weight, and how healthy eating can also help with blood glucose
16 levels and avoiding complications. **[2015]**

17 1.3.17 Take into account social and cultural considerations when providing
18 dietary advice to children and young people with type 2 diabetes.
19 **[2015]**

20 1.3.18 Encourage children and young people with type 2 diabetes to eat at
21 least 5 portions of fruit and vegetables each day. **[2015]**

22 1.3.19 At each clinic visit for children and young people with
23 type 2 diabetes:

- 24 • measure height and weight and plot on an appropriate growth
25 chart
 - 26 • calculate BMI.
- 27
- 28 Check for normal growth or significant changes in weight,

1 because these may reflect changes in blood glucose levels.

2 **[2004, amended 2015]**

3 1.3.20 Provide arrangements for weighing children and young people with
4 type 2 diabetes that respect their privacy. **[2004, amended 2015]**

5 **Metformin**

6 1.3.21 Offer standard-release metformin from diagnosis to children and
7 young people with type 2 diabetes. **[2015]**

8 **HbA1c targets and monitoring**

9 1.3.22 Measure HbA1c using methods that have been calibrated
10 according to [International Federation of Clinical Chemistry \(IFCC\)](#)
11 [standardisation](#). **[2015]**

12 1.3.23 Explain to children and young people with type 2 diabetes and their
13 families or carers that an HbA1c target level of 48 mmol/mol (6.5%)
14 or lower will minimise their risk of long-term complications. **[2015]**

15 1.3.24 Explain to children and young people with type 2 diabetes who
16 have an HbA1c level above 48 mmol/mol (6.5%) that any reduction
17 in HbA1c level reduces their risk of long-term complications. **[2015]**

18 1.3.25 Explain the benefits of safely achieving and maintaining the lowest
19 attainable HbA1c to children and young people with type 2 diabetes
20 and their families or carers. **[2015]**

21 1.3.26 Agree an individualised lowest achievable HbA1c target with each
22 child or young person with type 2 diabetes and their families or
23 carers. Take into account factors such as their daily activities,
24 individual life goals, complications and comorbidities. **[2015]**

25 1.3.27 Measure HbA1c levels every 3 months in children and young
26 people with type 2 diabetes. **[2015]**

1 1.3.28 Support children and young people with type 2 diabetes and their
2 families or carers to safely achieve and maintain their individual
3 agreed HbA1c target level. **[2015]**

4 1.3.29 Diabetes services should document the proportion of children and
5 young people with type 2 diabetes who achieve an HbA1c level of
6 53 mmol/mol (7%) or lower. **[2015]**

7 **Surgery**

8 1.3.30 Only offer surgery in centres that have dedicated paediatric
9 facilities for children and young people with diabetes. **[2004,**
10 **amended 2015]**

11 1.3.31 All centres caring for children and young people with
12 type 2 diabetes should have written protocols on safe surgery for
13 children and young people. The protocols should be agreed
14 between surgical and anaesthetic staff and the diabetes team.
15 **[2004, amended 2015]**

16 **Psychological and social issues**

17 1.3.32 Be aware that children and young people with type 2 diabetes have
18 a greater risk of emotional and behavioural difficulties. **[2004,**
19 **amended 2015]**

20 1.3.33 Offer children and young people with type 2 diabetes and their
21 families or carers emotional support after diagnosis, and tailor this
22 to their emotional, social, cultural and age-dependent needs. **[2004,**
23 **amended 2015]**

24 1.3.34 Be aware that children and young people with type 2 diabetes have
25 an increased risk of psychological conditions (for example anxiety,
26 depression, behavioural and conduct disorders) and complex social
27 factors (for example family conflict), and these can affect their
28 wellbeing and diabetes management. **[2015]**

- 1 1.3.35 Be aware that a lack of adequate psychosocial support for children
2 and young people with type 2 diabetes has a negative effect on
3 various outcomes (including blood glucose management) and can
4 also reduce their self-esteem. **[2004, amended 2015]**
- 5 1.3.36 Offer children and young people with type 2 diabetes and their
6 families or carers timely and ongoing access to mental health
7 professionals with an understanding of diabetes. This is because
8 they may experience psychological problems (such as anxiety,
9 depression, behavioural and conduct disorders and family conflict)
10 or psychosocial difficulties that can impact on the management of
11 diabetes and wellbeing. **[2004, amended 2015]**
- 12 1.3.37 See [the NICE guidelines on depression in children and young](#)
13 [people](#) and [antisocial behaviour and conduct disorders in children](#)
14 [and young people](#) for guidance on managing these conditions.
15 **[2015]**
- 16 1.3.38 Diabetes teams should have access to mental health professionals
17 to support them in psychological assessment and providing
18 psychosocial support. **[2004, amended 2015]**
- 19 1.3.39 Offer assessment for anxiety and depression to children and young
20 people with type 2 diabetes who have persistent difficulty with
21 blood glucose management. **[2004, amended 2015]**
- 22 1.3.40 Refer children and young people with type 2 diabetes and
23 suspected anxiety or depression promptly to child mental health
24 professionals. **[2004, amended 2015]**
- 25 1.3.41 Ensure that children and young people with type 2 diabetes and
26 their families or carers have timely and ongoing access to mental
27 health services when needed. **[2015]**

1 **Monitoring for complications and associated conditions of**
2 **type 2 diabetes**

3 1.3.42 Offer children and young people with type 2 diabetes annual
4 monitoring for:

- 5 • hypertension starting at diagnosis
- 6 • dyslipidaemia starting at diagnosis
- 7 • moderately increased albuminuria (albumin:creatinine ratio
8 [ACR] 3 to 30 mg/mmol) to detect diabetic kidney disease,
9 starting at diagnosis. **[2015]**

10 1.3.43 Refer children and young people with type 2 diabetes for diabetic
11 retinopathy screening from 12 years, in line with the [Public Health](#)
12 [England diabetic eye screening programme](#). **[2015]**

13 1.3.44 For guidance on managing foot problems in children and young
14 people with type 2 diabetes, see [the NICE guideline on diabetic](#)
15 [foot problems](#). **[2015]**

16 1.3.45 Explain to children and young people with type 2 diabetes and their
17 families or carers the importance of annual monitoring for
18 hypertension, dyslipidaemia and diabetic kidney disease. **[2015]**

19 **Hypertension**

20 1.3.46 Explain to children and young people with type 2 diabetes and their
21 families or carers that monitoring (see recommendation 1.3.42) is
22 important because if they have hypertension, early treatment will
23 reduce their risk of complications. **[2015]**

24 1.3.47 Use a cuff large enough for the child or young person with
25 type 2 diabetes when measuring blood pressure. **[2015]**

26 1.3.48 If repeated resting measurements are greater than the 95th
27 percentile for age and sex, confirm hypertension using 24-hour

1 ambulatory blood pressure monitoring before starting
2 antihypertensive therapy. **[2015]**

3 **Dyslipidaemia**

4 1.3.49 Explain to children and young people with type 2 diabetes and their
5 families or carers that monitoring (see recommendation 1.3.42) is
6 important because if they have dyslipidaemia, early treatment will
7 reduce their risk of complications. **[2015]**

8 1.3.50 When monitoring for dyslipidaemia in children and young people
9 with type 2 diabetes, measure total cholesterol, high-density
10 lipoprotein (HDL) cholesterol, non-HDL cholesterol and triglyceride
11 concentrations. **[2015]**

12 1.3.51 Confirm dyslipidaemia using a repeat sample (fasting or
13 non-fasting) before deciding on further management. **[2015]**

14 **Diabetic retinopathy**

15 1.3.52 For children and young people with type 2 diabetes who are having
16 eye screening, explain to them and their families or carers that:

- 17 • background retinopathy is often found through screening (see
18 recommendation 1.3.43), and improved blood glucose
19 management will reduce the risk of this progressing to significant
20 diabetic retinopathy
- 21 • it will help them to keep their eyes healthy and prevent problems
22 with their vision
- 23 • the screening service is effective at identifying problems so that
24 they can be treated early
- 25 • annual monitoring from 12 years is important because, if
26 significant diabetic retinopathy is found, early treatment will
27 improve the outcome. **[2015]**

28 1.3.53 Consider referring children and young people with type 2 diabetes
29 who are younger than 12 years to an ophthalmologist for retinal

1 examination if they have difficulty with blood glucose management.
2 **[2015]**

3 **Diabetic kidney disease**

4 1.3.54 Explain to children and young people with type 2 diabetes and their
5 families or carers that:

- 6 • using the first urine sample of the day ('early morning urine') to
7 screen for moderately increased albuminuria (ACR 3 to
8 30 mg/mmol) is important, as this reduces the risk of false
9 positive results
- 10 • if moderately increased albuminuria is detected, improving blood
11 glucose management will reduce the risk of this progressing to
12 significant diabetic kidney disease
- 13 • annual monitoring (see recommendation 1.3.42) is important
14 because, if they have diabetic kidney disease, early treatment
15 will improve the outcome. **[2015]**

16 1.3.55 Use the first urine sample of the day ('early morning urine') to
17 measure the albumin:creatinine ratio. If the first urine sample of the
18 day is not available, use a random sample, but be aware that this is
19 associated with an increased risk of false positive results. **[2015]**

20 1.3.56 If the initial albumin:creatinine ratio is above 3 mg/mmol but below
21 30 mg/mmol, confirm the result by repeating the test on 2 further
22 occasions using first urine samples of the day ('early morning
23 urine') before starting further investigation and therapy. **[2015]**

24 1.3.57 Investigate further if the initial albumin:creatinine ratio is
25 30 mg/mmol or more (proteinuria). **[2015]**

26 **1.4 Diabetic ketoacidosis**

1 **Recognition, referral and diagnosis**

2 1.4.1 Measure capillary blood glucose at presentation in children and
3 young people without known diabetes who have:

- 4 • increased thirst, polyuria, recent unexplained weight loss or
5 excessive tiredness **and any of**
- 6 • nausea, vomiting, abdominal pain, hyperventilation, dehydration
7 or reduced level of consciousness. **[2015]**

8 1.4.2 For children or young people without known diabetes who have a
9 plasma glucose level above 11 mmol/litre and symptoms that
10 suggest diabetic ketoacidosis (DKA) (see recommendation 1.4.1),
11 suspect DKA and immediately send them to a hospital with acute
12 paediatric facilities. **[2015]**

13 1.4.3 Be aware that children and young people taking insulin for diabetes
14 may develop DKA with normal blood glucose levels. **[2015]**

15 1.4.4 Suspect DKA even if the blood glucose is normal in a child or
16 young person with known diabetes and any of the following:

- 17 • nausea or vomiting
- 18 • abdominal pain
- 19 • hyperventilation
- 20 • dehydration
- 21 • reduced level of consciousness. **[2015]**

22 1.4.5 When DKA is suspected in a child or young person with known
23 diabetes, measure their blood ketones (beta-hydroxybutyrate),
24 using a near-patient method if available. Immediately send them to
25 a hospital with acute paediatric facilities if:

- 26 • their blood ketones are elevated
- 27 • a near-patient method for measuring their blood ketones is not
28 available. **[2015]**

1 1.4.6 If DKA is suspected or confirmed in a child or young person,
2 explain to them and to their families or carers that DKA is serious
3 and that they need urgent hospital assessment. **[2015]**

4 1.4.7 When a child or young person with suspected or known DKA
5 arrives at hospital, measure their:

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

10 1.4.8 Diagnose DKA in children and young people with diabetes who
11 have:

- 12 • hyperglycaemia (plasma glucose more than 11 mmol/litre) **and**
- 13 • acidosis (indicated by blood pH below 7.3 or plasma bicarbonate
14 below 15 mmol/litre) **and**
- 15 • ketonaemia (indicated by blood beta-hydroxybutyrate above
16 3 mmol/litre) or ketonuria (++ and above on the standard strip
17 marking scale). **[2015]**

18 1.4.9 Diagnose DKA severity as follows:

- 19 • mild DKA if blood pH is below 7.3 or plasma bicarbonate is
20 below 15 mmol/litre
- 21 • moderate DKA if blood pH is below 7.2 or plasma bicarbonate is
22 below 10 mmol/litre
- 23 • severe DKA if blood pH is below 7.1 or plasma bicarbonate is
24 below 5 mmol/litre. **[2015, amended 2020]**

25 **Initial management of diabetic ketoacidosis**

26 1.4.10 Inform the responsible senior clinician when a child or young
27 person is diagnosed with DKA. **[2015]**

1 1.4.11 Explain to the child or young person and their families or carers
2 what DKA is, and what care that they may need. **[2015]**

3 1.4.12 When DKA is diagnosed in a child or young person in hospital,
4 record their:

- 5 • level of consciousness
- 6 • heart rate, blood pressure, temperature, respiratory rate (look for
7 Kussmaul breathing)
- 8 • history of nausea or vomiting
- 9 • clinical evidence of dehydration
- 10 • body weight. **[2015]**

11 1.4.13 When DKA is diagnosed in a child or young person in hospital,
12 measure and record the capillary or venous:

- 13 • pH and pCO₂
- 14 • plasma sodium, potassium, urea and creatinine
- 15 • plasma bicarbonate. **[2015]**

16 1.4.14 Consider a near-patient blood ketone (beta-hydroxybutyrate)
17 testing method for rapid diagnosis and monitoring of DKA in
18 children and young people in hospital. **[2015]**

19 1.4.15 Children and young people with DKA should be cared for in a
20 facility that can provide the level of monitoring and care for DKA
21 specified in section 1.4 of this guideline. **[2015]**

22 1.4.16 Children and young people with DKA should be cared for with
23 one-to-one nursing either on a high-dependency unit (preferably a
24 paediatric unit), or on a general paediatric ward, if:

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

1 1.4.17 Think about inserting a nasogastric tube if a child or young person
2 with DKA has a reduced level of consciousness and is vomiting.

3 **[2015]**

4 1.4.18 Seek urgent anaesthetic review and discuss with a paediatric
5 critical care specialist if a child or young person with DKA cannot
6 protect their airway because they have a reduced level of
7 consciousness. **[2015]**

8 1.4.19 Discuss the use of inotropes with a paediatric critical care specialist
9 if a child or young person with DKA is in hypotensive shock. **[2015]**

10 1.4.20 Think about sepsis in a child or young person with DKA who has
11 any of the following:

- 12 • fever or hypothermia
- 13 • hypotension
- 14 • refractory acidosis
- 15 • lactic acidosis. **[2015]**

16 **Fluid and insulin therapy**

17 1.4.21 Treat DKA with intravenous fluids and intravenous insulin if the
18 child or young person is not alert, is nauseated or vomiting, or is
19 clinically dehydrated. **[2020]**

20 1.4.22 Do not give oral fluids to a child or young person who is receiving
21 intravenous fluids for DKA unless ketosis is resolving, they are
22 alert, and they are not nauseated or vomiting. **[2020]**

23 1.4.23 For children and young people who are hypovolaemic but not in
24 shock:

- 25 • give an initial intravenous bolus of 10 ml/kg 0.9% sodium
26 chloride over 30 minutes
- 27 • only consider giving a second intravenous bolus if needed to
28 improve tissue perfusion

- 1 • discuss with the responsible senior paediatrician before giving
2 more than one intravenous bolus of 10 ml/kg 0.9% sodium
3 chloride to a child or young person with DKA
4 • when calculating the total fluid requirement, exclude these initial
5 bolus volumes from the total. **[2020]**

6 1.4.24 For children and young people who have signs of shock (weak
7 thread pulse, tachycardia, prolonged capillary refill, tachypnoea or
8 hypotension), give an initial intravenous bolus of 20 ml/kg 0.9%
9 sodium chloride as soon as possible. Be aware that shock is rare in
10 children and young people with DKA. **[2020]**

11 1.4.25 Calculate the total fluid requirement for the first 48 hours in children
12 and young people with DKA by adding the estimated fluid deficit to
13 the fluid maintenance requirement:

- 14 • For the fluid deficit:
- 15 – in mild to moderate DKA (blood pH 7.1 or above), assume 5%
 - 16 – dehydration (so a 10 kg child needs 500 ml)
 - 17 – in severe DKA (blood pH below 7.1), assume 10%
 - 18 – dehydration
 - 19 – aim to replace the deficit evenly over the first 48 hours.
- 20 • For the fluid maintenance requirement, use the Holliday–Segar
- 21 formula:
- 22 – give 100 ml/kg for the first 10 kg of weight
 - 23 – give 50 ml/kg for the second 10 kg of weight
 - 24 – give 20 ml/kg for every kg after this
 - 25 – use a maximum weight of 75 kg in the calculation.

26

27 When calculating the total fluid requirement, exclude any

28 initial bolus volumes given. **[2020]**

29 1.4.26 Use 0.9% sodium chloride without added glucose for both
30 rehydration and maintenance fluid in children and young people

1 with DKA, until the plasma glucose concentration is below
2 14 mmol/litre. **[2020]**

3 1.4.27 Include 40 mmol/litre potassium chloride in all fluids (except the
4 initial intravenous boluses) given to children and young people with
5 DKA, unless they have acute kidney injury or their potassium level
6 is above the normal range. **[2020]**

7 1.4.28 For children and young people with potassium levels above the
8 normal range, only add 40 mmol/litre potassium chloride to their
9 intravenous fluids if:

- 10 • their potassium is less than 5.5 mmol/litre **or**
- 11 • they have passed urine. **[2020]**

12 1.4.29 Do not give intravenous sodium bicarbonate to children and young
13 people with DKA unless:

- 14 • they have compromised cardiac contractility, caused by life-
15 threatening hyperkalaemia or severe acidosis **and**
- 16 • you have discussed with the paediatric intensivist. **[2020]**

17
18 1.4.30 Do not give children and young people with DKA additional
19 intravenous fluid to replace urinary losses. **[2015]**

20 1.4.31 Start an intravenous insulin infusion 1 to 2 hours after beginning
21 intravenous fluid therapy in children and young people with DKA. If
22 a child or young person with DKA is using an insulin pump,
23 disconnect the pump when starting intravenous insulin therapy.
24 **[2015]**

25 1.4.32 When treating DKA with intravenous insulin in children and young
26 people, use a soluble insulin infusion at a dosage between 0.05
27 and 0.1 units/kg/hour. Do not give bolus doses of intravenous
28 insulin. **[2015]**

- 1 1.4.33 In discussion with a diabetes specialist, think about continuing
2 subcutaneous basal insulin in a child or young person who was
3 using a basal insulin before DKA started. **[2015]**
- 4 1.4.34 When the plasma glucose concentration falls below 14 mmol/litre in
5 children and young people with DKA, change fluids to 0.9% sodium
6 chloride with 5% glucose and 40 mmol/litre potassium chloride.
7 **[2020]**
- 8 1.4.35 If a child or young person's plasma glucose falls below 6 mmol/litre
9 during DKA treatment:
- 10 • increase the glucose concentration of the intravenous fluid
11 infusion **and**
 - 12 • if they have persisting ketosis, continue to give insulin at a
13 dosage of least 0.05 units/kg/hour. **[2020]**
- 14 1.4.36 If the blood beta-hydroxybutyrate level is not falling within 6 to
15 8 hours in a child or young person with DKA, think about increasing
16 the insulin dosage to 0.1 units/kg/hour or more. **[2015]**
- 17 1.4.37 Think about stopping intravenous fluid therapy for DKA in a child or
18 young person if ketosis is resolving, their pH has reached 7.3, they
19 are alert, and they can take oral fluids without nausea or vomiting.
20 **[2020]**
- 21 1.4.38 Do not change from intravenous insulin to subcutaneous insulin in
22 a child or young person with DKA until ketosis is resolving, they are
23 alert, and they can take oral fluids without nausea or vomiting.
24 **[2015]**
- 25 1.4.39 Start subcutaneous insulin in a child or young person with DKA at
26 least 30 minutes before stopping intravenous insulin. **[2015]**
- 27 1.4.40 For a child or young person with DKA who is using an insulin pump,
28 restart the pump at least 60 minutes before stopping intravenous

1 insulin. Change the insulin cartridge and infusion set, and insert the
2 cannula into a new subcutaneous site. **[2015]**

For a short explanation of why the committee made the 2020 recommendations and how they might affect practice, see the [rationale and impact section on fluid therapy](#).

Full details of the evidence and the committee's discussion are in [evidence review A: diabetes \(type 1 and type 2\) in children and young people: diagnosis and management](#).

3 **Monitoring during therapy**

4 1.4.41 Monitor and record the following at least hourly in children and
5 young people with DKA:

- 6 • capillary blood glucose
- 7 • heart rate, blood pressure, temperature, respiratory rate (look for
8 Kussmaul breathing)
- 9 • fluid balance, with fluid input and output charts
- 10 • level of consciousness (using the modified Glasgow coma
11 scale). **[2015]**

12 1.4.42 Monitor and record the level of consciousness (using the modified
13 Glasgow coma scale) and heart rate (to detect bradycardia) every
14 30 minutes in:

- 15 • children under 2 years with DKA
- 16 • children and young people with severe DKA (blood pH
17 below 7.1).

18
19 This is because these children and young people are at
20 increased risk of cerebral oedema. **[2015]**

21 1.4.43 Monitor children and young people having intravenous therapy for
22 DKA using continuous electrocardiogram (ECG), to detect signs of

1 hypokalaemia (including ST-segment depression and prominent
2 U-waves). **[2015]**

3 1.4.44 Ensure that healthcare professionals performing the monitoring
4 described in recommendations 1.4.41, 1.4.42 and 1.4.43 know
5 what to look for and when to seek advice. **[2015]**

6 1.4.45 At 2 hours after starting treatment, and then at least every 4 hours,
7 carry out and record the results of the following blood tests in
8 children and young people with DKA:

- 9 • glucose (laboratory measurement)
- 10 • blood pH and pCO₂
- 11 • plasma sodium, potassium and urea
- 12 • beta-hydroxybutyrate. **[2015]**

13 1.4.46 A doctor involved in the care of the child or young person with DKA
14 should review them face-to-face at diagnosis and then at least
15 every 4 hours, and more frequently if:

- 16 • they are aged under 2 years
- 17 • they have severe DKA (blood pH below 7.1)
- 18 • there are any other reasons for special concern. **[2015]**

19 1.4.47 At each face-to-face review of children and young people with DKA,
20 assess the following:

- 21 • clinical status, including vital signs and neurological status
- 22 • results of blood investigations
- 23 • ECG trace
- 24 • cumulative fluid balance record. **[2015]**

25 1.4.48 Update the child and young person with DKA and their families or
26 carers regularly about their progress. **[2015]**

1 **Complications of diabetic ketoacidosis**

2 **Cerebral oedema**

3 1.4.49 Immediately assess children and young people with DKA for
4 suspected cerebral oedema if they have any of these early
5 manifestations:

- 6
- 7 • headache
 - 8 • agitation or irritability
 - 9 • unexpected fall in heart rate
 - increased blood pressure. **[2015]**

10 1.4.50 If cerebral oedema is suspected in a child or young person with
11 DKA, start treatment immediately.

12 1.4.51 Start treatment for cerebral oedema immediately in children and
13 young people with DKA and any of these signs:

- 14
- 15 • deterioration in level of consciousness
 - 16 • abnormalities of breathing pattern, for example respiratory
17 pauses
 - 18 • oculomotor palsies
 - pupillary inequality or dilatation. **[2015]**

19 1.4.52 When treating cerebral oedema in children and young people with
20 DKA, use the most readily available of:

- 21
- 22 • mannitol (20%, 0.5 to 1 g/kg over 10 to 15 minutes) **or**
 - 23 • hypertonic sodium chloride (2.7% or 3%, 2.5 to 5 ml/kg over
10 to 15 minutes). **[2015]**

24 1.4.53 After starting treatment for cerebral oedema with mannitol or
25 hypertonic sodium chloride in a child or young person with DKA,
26 immediately seek specialist advice on further management,
27 including which care setting would be best. **[2015]**

1 **Hypokalaemia**

2 1.4.54 If a child or young person with DKA develops hypokalaemia
3 (potassium below 3 mmol/litre):

- 4
- think about temporarily suspending the insulin infusion
 - discuss hypokalaemia management urgently with a paediatric critical care specialist, because a central venous catheter is needed to give intravenous potassium solutions above 40 mmol/litre. **[2015]**
- 8

9 **Venous thromboembolic disease**

10 1.4.55 Be aware of the increased risk of venous thromboembolism in
11 children and young people with DKA, especially if they have a
12 central venous catheter. **[2015]**

13 **Avoiding future episodes of diabetic ketoacidosis**

14 1.4.56 After a child or young person with known diabetes has recovered
15 from an episode of DKA, discuss what may have led to the episode
16 with them and their families or carers. **[2015]**

17 1.4.57 Think about the possibility of non-adherence to therapy in children
18 and young people with established type 1 diabetes who present
19 with DKA, especially if they have had multiple episodes of DKA.
20 **[2004, amended 2015]**

21 1.4.58 Advise children and young people who have had DKA and their
22 families or carers how to reduce the risk of future episodes. In
23 particular, explain the importance of managing intercurrent
24 illnesses. **[2015]**

25 **1.5 Service provision**

26 1.5.1 Offer children and young people with diabetes an ongoing
27 integrated package of care, provided by a multidisciplinary
28 paediatric diabetes team.

- 1 1.5.2 The diabetes team should include members with training in clinical,
2 educational, dietetic, lifestyle, mental health and foot care aspects
3 of diabetes for children and young people. **[2004, amended 2015]**
- 4 1.5.3 Offer children and young people with diabetes and their families or
5 carers 24-hour access to advice from their diabetes team. **[2004,**
6 **amended 2015]**
- 7 1.5.4 Involve children and young people with diabetes and their families
8 or carers in making decisions about the package of care provided
9 by their diabetes team. **[2004, amended 2015]**
- 10 1.5.5 At diagnosis, offer children and young people with diabetes either
11 home-based or inpatient management, depending on their clinical
12 need, family circumstances and preferences. Explain that
13 home-based care with support from the local paediatric diabetes
14 team (including 24-hour telephone access) is safe, and is as
15 effective as initial inpatient management. **[2004, amended 2015]**
- 16 1.5.6 Offer initial inpatient management to children with diabetes who are
17 under 2 years old. **[2004, amended 2015]**
- 18 1.5.7 Think about initial inpatient management for children and young
19 people with diabetes if there are social or emotional factors that
20 would make home-based management inappropriate, or if they live
21 a long way from the hospital. **[2004, amended 2015]**
- 22 1.5.8 Diabetes teams should speak regularly with school staff who look
23 after children and young people with type 1 diabetes, to provide
24 diabetes education and practical information. **[2004, amended**
25 **2015]**
- 26 1.5.9 Record the details of children and young people with diabetes on a
27 population-based, practice-based or clinic-based diabetes register.
28 **[2004, amended 2015]**

1 **Transition from paediatric to adult care**

2 1.5.10 Give young people with diabetes enough time to understand how
3 transition from paediatric to adult services will work, because this
4 improves clinic attendance. **[2004, amended 2015]**

5 1.5.11 Agree specific local protocols for transferring young people with
6 diabetes from paediatric to adult services. **[2004, amended 2015]**

7 1.5.12 Base the decision on when a young person should transfer to the
8 adult service on their physical development and emotional maturity,
9 and on local circumstances. **[2004, amended 2015]**

10 1.5.13 Ensure that transition from the paediatric service occurs at a time of
11 relative stability in the young person's health, and that it is
12 coordinated with other life transitions. **[2004, amended 2015]**

13 1.5.14 Explain to young people with type 1 diabetes who are preparing for
14 transition to adult services that some aspects of diabetes care will
15 change. **[2004, amended 2015]**

16 **Terms used in this guideline**

17 **Insulin pump**

18 Continuous subcutaneous insulin infusion. A programmable pump and insulin
19 storage device that gives a regular or continuous amount of insulin (usually a
20 rapid-acting insulin analogue or short-acting insulin) through a subcutaneous
21 needle or cannula.

22 **Level 3 carbohydrate counting**

23 Carbohydrate counting with adjustment of insulin dosage according to an
24 insulin:carbohydrate ratio.

1 **Multiple daily injection basal-bolus regimen**

2 Injections of short-acting insulin or rapid-acting insulin analogue before meals,
3 together with 1 or more separate daily injections of intermediate-acting insulin
4 or long-acting insulin analogue.

5 **Once-, twice- or three-times daily mixed insulin injections**

6 These are usually injections of short-acting insulin or rapid-acting insulin
7 analogue mixed with intermediate-acting insulin.

8 **Research recommendations**

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

13 **1 Peer-led education programmes for young people with type 1**
14 **diabetes**

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

17 **Why this is important**

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

1 **2 Optimal upper limit and timing for blood glucose measurements**
2 **after meals for children and young people with type 1 diabetes**

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

6 **Why this is important**

7 Setting an upper limit for plasma glucose measurements 1 to 2 hours after
8 meals of less than 8 mmol/litre (rather than the 9 mmol/litre recommended in
9 this guideline) could potentially lead to an improvement in blood glucose
10 management without an unacceptable risk of hypoglycaemia. The evidence
11 reviewed for the guideline did not allow a precise evaluation of the upper limit
12 for the target range, or the timing of blood glucose testing relative to meals.
13 Future research should investigate the HbA1c levels of children and young
14 people with type 1 diabetes who aim for blood glucose measurements after
15 meals slightly lower (to ensure their safety) than 9 mmol/litre, to help decide
16 whether lowering the upper limit is effective in improving long-term blood
17 glucose management. Outcomes include the child or young person's
18 satisfaction with treatment, their HbA1c levels, rates of hypoglycaemia, the
19 views of their family members or carers (as appropriate), and quality of life.

20 **3 Metformin preparations for children and young people with**
21 **type 2 diabetes**

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

25 **Why this is important**

26 There is high-quality evidence for the clinical and cost effectiveness of
27 metformin as a treatment for type 2 diabetes from diagnosis in children and
28 young people. However, all of the relevant evidence relates to administration
29 in tablet form and using a standard dosage, despite alternative oral
30 preparations (including solutions and extended-release tablets) being

1 available and having potential advantages to the standard preparation.
2 Gastrointestinal disorders (for example, nausea, vomiting, diarrhoea,
3 abdominal pain and loss of appetite) are very common with metformin,
4 especially at the start of treatment, and may be reduced or avoided with
5 alternative preparations. Extended-release tablets and oral solutions may also
6 be easier to swallow, as standard formulation metformin consists of large
7 tablets. Further research would preferably consist of randomised controlled
8 trials. Outcomes should include blood glucose management (preferably using
9 measurement of HbA1c levels) and the child or young person's satisfaction
10 with and adherence to treatment.

11 **4 Dietary advice based on glycaemic index for children and young** 12 **people with type 1 diabetes from diagnosis**

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

16 **Why this is important**

17 Very little evidence on the effectiveness of dietary advice based on glycaemic
18 index was identified for inclusion in the guideline review, and the evidence that
19 was identified related mostly to twice-daily insulin regimens. Research is
20 needed to evaluate the effectiveness of teaching children and young people
21 with type 1 diabetes and their family members or carers (as appropriate)
22 about glycaemic index in the context of modern, intensive insulin treatment
23 regimens (insulin pump therapy or multiple daily injections). Important
24 outcomes include success in achieving the target HbA1c level, blood glucose
25 levels after meals, frequency of hypoglycaemia, quality of life, food choices,
26 and the frequency and timing of insulin administration to lower blood glucose
27 levels after meals.

1 **5 Optimal dosage of intravenous insulin for managing diabetic**
2 **ketoacidosis in children and young people**

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

5 **Why this is important**

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

17 **Rationale and impact**

18 These sections briefly explain why the committee made the recommendations
19 and how they might affect practice:

20 **Fluid therapy**

21 [Recommendations 1.4.21 to 1.4.38](#)

22 **Why the committee made the recommendations**

23 **Route of fluid administration**

24 The 2015 recommendations caused some confusion around when to use oral
25 or intravenous fluids. To address this, the committee looked for research
26 evidence that would help them to make clearer recommendations. There was
27 no evidence that compared different routes of administration or different oral

1 fluids for hydration, so the committee updated the recommendations based on
2 their knowledge and experience.

3 **Rate of fluid administration**

4 In the 2015 guideline, the rate of fluid administration in diabetic ketoacidosis
5 (DKA) was restricted because rapid fluid administration was believed to cause
6 cerebral oedema. However, for the 2020 update there was some randomised
7 controlled trial evidence (particularly the PECARN trial) comparing the effect
8 of different DKA protocols on outcomes such as mortality or clinically apparent
9 brain injury. This evidence showed no significant difference between the
10 2 protocols, and it showed that the restrictions on the rate of fluid
11 administration were not needed.

12 In response to this evidence and applying their clinical experience, the
13 committee updated the recommendations to use more rapid fluid
14 administration (including fluid boluses). They also made a separate
15 recommendation for children and young people who are in shock, because
16 this group needs a higher volume of fluids, and they need these fluids to be
17 given more rapidly.

18 **Total fluid requirement**

19 Practice has changed since the 2015 recommendations were made, and there
20 was concern that these 2015 recommendations could result in children and
21 young people receiving less fluid than they need over the first 48-hour period.
22 To address this, the committee updated the recommendation on calculating
23 the fluid maintenance requirement, based on their clinical knowledge and on
24 evidence from the PECARN trial. The Holliday–Segar formula that they
25 recommended is commonly used in practice and has not been shown to
26 cause any adverse events.

27 **Potassium**

28 No evidence was identified on the use of potassium. The committee used their
29 experience and their understanding of the evidence on the pathophysiology of
30 DKA to update the recommendation. They added more detail about how to

1 care for children and young people who have acute kidney injury or potassium
2 levels above normal range. It is essential to add potassium to fluids, because
3 insulin can cause hypokalaemia in this population, which can lead to cardiac
4 arrhythmias and death.

5 **How the recommendations might affect practice**

6 The new recommendations are in line with current practice, and with other
7 clinical guidance (such as [the International Society for Paediatric and](#)
8 [Adolescent Diabetes guideline on DKA and hyperglycemic hyperosmolar state](#);
9 chapter 11).

10 [Return to recommendations](#)

11 **Context**

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

18 Type 1 diabetes is becoming more common in the UK, and since 2004
19 type 2 diabetes is also being diagnosed with increasing frequency. The 2013–
20 14 National Diabetes Audit identified 26,500 children and young people with
21 type 1 diabetes and 500 with type 2 ([National Paediatric Diabetes Audit report](#)
22 [2013–14](#)). Much of the general care for type 2 diabetes is the same as for
23 type 1 diabetes, although the initial management is different. In addition, the
24 overweight and obesity associated with type 2 diabetes also bring an
25 increased risk of renal complications in particular, and of problems such as
26 hypertension and dyslipidaemia. These differences in management and
27 complications need guidance specific to type 2 diabetes, which is included
28 here for the first time. A variety of genetic conditions (such as maturity-onset
29 diabetes in the young) and other conditions (such as cystic fibrosis-related

1 diabetes) may also lead to diabetes in children and young people, but the care
2 of these diverse conditions is beyond the scope of this guideline.

3 This guideline recommends attempting to reach a glycated haemoglobin
4 (HbA1c) level near the normal range and near normoglycaemia. This is to
5 further reduce the long-term risks associated with diabetes. Tight
6 management may be achieved by intensive insulin management (multiple
7 daily injections or insulin pump therapy) from diagnosis, accompanied by
8 carbohydrate counting. Newer technology such as continuous subcutaneous
9 glucose monitoring may also help children and young people to have better
10 blood glucose management, although this is not currently recommended for
11 all children and young people with type 1 diabetes.

12 By implementing the strict blood glucose management recommended in this
13 guideline, improvements can be made to diabetes care that reduce the impact
14 of the condition on the future health of children and young people.

15 **Finding more information and committee details**

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

18 For details of the guideline committee, see the [committee member list](#).

19

1 **Update information**

2 **December 2020**

3 New recommendations have been added on fluid therapy for children and
4 young people with diabetic ketoacidosis. Recommendations are marked
5 **[2020]** if the evidence has been reviewed.

6 Recommendations on diabetic retinopathy have been amended to bring them
7 in line with the diabetic eye screening programme. The evidence for these
8 recommendations has not been reviewed, and they are marked **[2015,**
9 **amended 2020]**.

10 **Recommendations that have been deleted, or changed without an** 11 **evidence review**

12 We propose to delete some recommendations from the 2015 guideline.
13 [Table 1](#) sets out these recommendations and includes details of replacement
14 recommendations. If there is no replacement recommendation, an explanation
15 for the proposed deletion is given.

16 For recommendations shaded in grey and ending **[2015, amended 2020]**, we
17 have made changes that could affect the intent without reviewing the
18 evidence. Yellow shading is used to highlight these changes, and reasons for
19 the changes are given in [table 2](#).

20 For recommendations shaded in grey and ending **[2004], [2015] or [2004,**
21 **amended 2015]** we have not reviewed the evidence. In some cases, minor
22 changes have been made – for example, to update links, or bring the
23 language and style up to date – without changing the intent of the
24 recommendation.

25 See also the [previous NICE guideline and supporting documents](#).

26 **Table 1 Recommendations that have been deleted**

Recommendation in 2015 guideline	Comment
----------------------------------	---------

DRAFT FOR CONSULTATION

1.4.22	This recommendation has been deleted because the committee identified this recommendation to be ambiguous. Replaced by recommendations 1.4.21 and 1.4.22.
1.4.23	This recommendation has been deleted because the committee identified this recommendation to be ambiguous. Replaced by recommendations 1.4.21 and 1.4.22.
1.4.26	This recommendation has been deleted because practice has changed since the 2015 recommendations were made. Replaced by recommendations 1.4.23 and 1.4.25.
1.4.27	This recommendation has been deleted because practice has changed since the 2015 recommendations were made. Replaced by recommendations 1.4.23 and 1.4.25.
1.4.32	This recommendation has been deleted because practice has changed since the 2015 recommendations were made. Replaced by recommendation 1.4.26.
1.4.35	This recommendation has been deleted and replaced with recommendation 1.4.26.
1.4.37	This recommendation has been deleted because the committee highlighted that urinary catheterisation is not commonly used in practice but may be adopted in an intensive care scenario, which is outside the remit of this guideline.

1

1 **Table 2 Amended recommendation wording (change to intent) without**
 2 **an evidence review**

Recommendation in 2015 guideline	Recommendation in current guideline	Reason for change
1.2.115	1.2.116	This recommendation was amended to avoid overlap with the NHS diabetic eye screening programme.
1.4.10	1.4.9	This recommendation was amended to add definitions of mild and moderate diabetic ketoacidosis, in line with the recommendations in the 2020 update.

3

4 **August 2015**

5 This guideline is an update of NICE guideline CG15 (published July 2004) and
 6 replaces it.

7 We have also made some changes without an evidence review:

- 8 • Recommendation 1.1.1 was updated for clarity, and excessive tiredness
 9 was added as a symptom.
- 10 • Recommendations 1.1.5 and 1.1.6 were split into 2 (to differentiate type 2
 11 diabetes from the other types of diabetes), and the terminology was
 12 updated.
- 13 • Recommendation 1.2.3 was amended to reflect the Paediatric Diabetes
 14 Best Practice Tariff Criteria, and current clinical practice.
- 15 • Recommendations 1.2.4, 1.2.8 and 1.2.10 were updated for clarity.
- 16 • Recommendation 1.2.17 was updated to reflect guidance from [the Public](#)
 17 [Health England Green Book](#).

DRAFT FOR CONSULTATION

- 1 • Recommendation 1.2.20 was amended to remove the timing of blood
2 glucose measurements.
- 3 • Recommendation 1.2.24 was amended to use the same to HbA1c target
4 level as the 2015 recommendations.
- 5 • Recommendation 1.2.26 has had information on needle length removed, as
6 this is well known by healthcare professionals.
- 7 • Recommendation 1.2.28 has been amended to take out text on foot care,
8 as this is now covered in [the NICE guideline on diabetic foot care](#).
- 9 • Recommendation 1.2.36 has been amended for clarity.
- 10 • Recommendation 1.2.45 has been amended to remove a reference to
11 measuring BMI, as this is not necessary at every clinic visit.
- 12 • Recommendation 1.2.49 has been amended for clarity, and to cover
13 hyperglycaemia caused by exercise.
- 14 • Recommendation 1.2.71 has been updated so that the number of
15 measurements matches the Paediatric Diabetes Best Practice Tariff
16 Criteria and current clinical practice.
- 17 • Recommendation 1.2.79 has been updated for clarity, and to remove
18 mention of subcutaneous glucagon (because this is not used in current
19 practice).
- 20 • Recommendation 1.2.80 has been amended for clarity.
- 21 • Recommendation 1.2.82 has been updated to include the dose for children
22 and young people who weigh 25 kg, and to include a warning on using oral
23 glucose solution in people with reduced levels of consciousness.
- 24 • Recommendation 1.2.98 has been amended for clarity, and to mention
25 psychosocial difficulties.
- 26 • Recommendations 1.2.108 and 1.2.109 have been amended for clarity.
- 27 • Recommendations from the 2004 guideline in section 1.3 have been
28 expanded (where appropriate) to apply to children and young people with
29 type 2 diabetes.

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