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GUIDELINES

Diagnosis and management of type 1 diabetes in adults: summary of updated NICE guidance

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This is one of a series of BMJ summaries of new guidelines based on the best available evidence; they highlight important recommendations for clinical practice, especially where uncertainty or controversy exists.

Further information about the guidance, a list of members of the guideline development group, and the supporting evidence statements are in the full version on thebmj.com.

Having type 1 diabetes reduces the life expectancy of adults in the United Kingdom by as much as 13 years.[1] Despite incontrovertible evidence that good care reduces the risk of complications such as blindness, renal failure, and premature cardiovascular disease and death,[2] as well as complications of treatment such as severe hypoglycaemia,[3] fewer than 30% of UK adults with type 1 diabetes achieve current national treatment targets for glucose control.[4] The challenges of managing type 1 diabetes do not lessen after the age of 18 years. Since the publication of the 2004 National Institute for Health and Care Excellence (NICE) guideline, new technologies to achieve diabetic control have become available—for example, insulin analogues, new glucose meters, and real time subcutaneous continuous glucose monitoring systems. The recent updated NICE guidance aims to support healthcare professionals and adults with type 1 diabetes to use these technologies optimally and to individualise targets and treatment regimens for greater lifestyle flexibility, with clear advice on education programmes, glucose monitoring, and insulin preparations.

This article summarises the most recent recommendations from NICE on the diagnosis and management of type 1 diabetes in adults.[5]

Recommendations

NICE recommendations are based on systematic reviews of best available evidence and explicit consideration of cost effectiveness. When minimal evidence is available, recommendations are based on the Guideline Development Group's experience and opinion of what constitutes good practice. Evidence levels for the recommendations are in the full version of this article on thebmj.com.

BSIP/SPL

Diagnosis

- Diagnose type 1 diabetes on clinical grounds:
  - Ketosis
  - Rapid weight loss
  - Age of onset below 50 years
  - Body mass index (BMI) below 25
  - Personal or family history of autoimmune disease. (New recommendation.)
- However, do not discount a diagnosis of type 1 diabetes in people aged 50 years or more or those with a BMI of 25 or above. (New recommendation.)
- In any person of any age or BMI presenting with thirst and excessive micturition in whom diabetes is suspected, particularly those with weight loss or nausea, check random blood glucose and blood or urinary ketones. The presence of ketonuria or

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HOW PATIENTS WERE INVOLVED IN THE CREATION OF THIS ARTICLE

Patients were involved at every stage of creating the guideline. Patient groups and individuals contributed to the scoping of the update and at the consultation stage. Lay members were active in the Guideline Development Group, contributing to the formulation of the recommendations summarised here, and were instrumental in setting the new treatment targets.

THE BOTTOM LINE

- Offer all adults with type 1 diabetes a structured education programme in self management of diabetes six to 12 months after diagnosis or, if this was not achieved, at any time that is clinically appropriate and suitable for the person
- Support adults to aim for a target glycated haemoglobin 48 mmol/mol (6.5%) or lower, to minimise risk of vascular complications; ensure that aiming for the target is not accompanied by problematic hypoglycaemia, and support four to 10 daily self monitoring blood tests as routine
- Offer all adults daily basal-bolus insulin injection regimens, with twice daily insulin detemir as basal insulin therapy and rapid acting insulin analogues injected before meals for mealtime insulin "boluses"
- Assess awareness of hypoglycaemia at least annually using a scoring system

SPL

ketonaemia should raise suspicion of type 1 diabetes. Diabetic ketoacidosis (ketonaemia ≥3 mmol/L, or >2+ ketonuria on strip testing; venous bicarbonate <15 mmol/L, or venous pH <7.3, or a combination thereof) is a medical emergency.[6] Lesser degrees of ketosis with hyperglycaemia (>11 mmol/L) will probably also require urgent institution of insulin therapy.

- Consider further investigation (measurement of C peptide or diabetes specific autoimmune antibodies, or both) if there are atypical features (age ≥50 years, BMI ≥25, slow evolution of hyperglycaemia, or long prodrome) or uncertainty exists about the type of diabetes. (New recommendation.)

Education and information

- Offer all adults with type 1 diabetes a structured education programme in the self management of flexible insulin therapy (for example the DAFNE (dose adjustment for normal eating) programme[7]) six to 12 months after diagnosis or at any time that is clinically appropriate and suitable for the person, regardless of duration of type 1 diabetes. Such programmes aim to transfer skills of insulin dose adjustment to the person with diabetes, enabling diabetic control with minimal risk of acute complications of therapy (diabetic ketoacidosis and hypoglycaemia)[8] and long term vascular complications (visual loss, renal failure, nerve damage, and vascular disease),[9] while allowing flexibility of lifestyle and good quality of life.[10] They fulfil the requirements of structured therapeutic education, which include evidence of the programme's efficacy, a written curriculum, delivery

by trained educators, and a quality assurance programme to ensure consistency and regular audit of its outcomes.[11] (New recommendation.)

- Provide an alternative of equal standard for those not able to participate in group education and ensure that this includes the components of structured therapeutic education. (New recommendation.)
- Carry out a formal review of patients' ability to manage their insulin regimen annually, and their need for support from healthcare professionals, including assessment of their achievement of glucose targets, their freedom from problematic hypoglycaemia, and the management of their risk of complications. (Amended recommendation.)

Dietary management and physical activity

- Offer carbohydrate counting training to adults with type 1 diabetes as part of structured education programmes. (New recommendation.)
- Offer dietary advice about matters other than blood glucose control, such as weight control and cardiovascular risk management, as indicated clinically. (New recommendation.)
- Do not advise adults to follow a low glycaemic index diet for blood glucose control. The GDG found no evidence of benefit for glycaemic control, frequency of hypoglycaemia, or quality of life. (New recommendation.)
- Advise adults with type 1 diabetes that physical activity can reduce their increased cardiovascular risk in the medium and longer term.

Blood glucose management

- Measure glycated haemoglobin (HbA_{1c}) every three to six months, or more often if blood glucose control might be changing rapidly, and ensure that the result is available at the time of consultation. (New recommendation.)
- Support adults with type 1 diabetes to aim for a target HbA_{1c} of 48 mmol/mol (6.5%) or lower to minimise the risk of vascular complications. (New recommendation.)
- Agree an individualised target based on daily activities, aspirations, likelihood of complications, comorbidities, occupation, and history of hypoglycaemia. Most adults should be supported to aim for the recommended target, but adjust the numerical value in, for example, frail elderly patients, and those with limited life expectancy or advanced vascular complications. Take care to help people in occupations with a high risk of accidents to avoid hypoglycaemia; this can be achieved by good education and, where indicated, use of newer technologies for insulin delivery and glucose monitoring, although some people may also need the target to be modified. (New recommendation.)
- Ensure that aiming for the target is not accompanied by problematic hypoglycaemia. (New recommendation.)

Self monitoring of blood glucose

- Advise routine monitoring at least four times a day, before each meal and before bed. (New recommendation.)

- Support self monitoring up to 10 times a day and enable more than this if necessitated by the person's lifestyle. (New recommendation.)
- Advise patients to aim for a fasting plasma glucose of 5-7 mmol/L before breakfast; 4-7 mmol/L before meals at other times of day, and, if patients chose to test after meals, 5-9 mmol/L at least 90 minutes after eating. Agree a bedtime target that accounts for the time of the last meal. (New recommendation.)
- Teach self monitoring skills at diagnosis and educate patients to interpret and use the results, reviewing their skills at least annually. (Amended recommendation.)
- Do not recommend routine use of sites other than the fingertips for testing. (Amended recommendation.)
- Do not routinely offer real time continuous glucose monitoring (use of subcutaneous sensors for measuring glucose continuously), but consider it for patients willing to use it at least 70% of the time if they are experiencing problematic hypoglycaemia despite optimised use of insulin (multiple daily injections of insulin or pump therapy) and conventional monitoring. (New recommendation.)

Insulin therapy

- Offer multiple daily insulin injection basal-bolus regimens, rather than twice daily mixed insulin regimens. Such regimens control endogenous glucose production with slow acting insulins ("basal" insulin), to which fast acting insulin "boluses" are added before a meal or snack. In flexible therapy, doses of basal insulin are based on fasting glucose readings and readings made five or more hours after eating; doses for meal insulin are based on the current blood glucose test result and the amount of carbohydrate the patient plans to eat. All doses can be adjusted prospectively, after reviewing the effectiveness of doses taken in the past few days, or to accommodate exercise or other predicted changes in insulin requirement. Bolus doses of fast acting insulin can also be used to correct a glucose reading that is over target.
- Do not offer newly diagnosed patients non-basal-bolus regimens. (New recommendation.)
- Basal-bolus regimens include:
  – Basal insulin to control endogenous glucose production:
    - Offer twice daily insulin detemir as basal insulin therapy (New recommendation.)
    - As an alternative, consider an existing regimen that is delivering agreed glucose targets or once daily glargine or detemir, if the twice daily regimen is not acceptable to the patient
    - Consider other regimens only if the above do not deliver agreed targets (New recommendation.)
    - For guidance on use of continuous subcutaneous insulin ("pump") therapy, refer to the NICE technology appraisal.[12] (New recommendation.)
  – Bolus insulin to cover ingestion of food (primarily carbohydrate):
    - Offer rapid acting insulin analogues injected before meals for mealtime insulin replacement (New recommendation.)
    - Do not advise routine use of rapid acting insulin analogues after meals. Delayed injection increases the risk of high blood glucose immediately after eating (because the glucose from the food is absorbed before the insulin is active) and of late hypoglycaemia (because the insulin continues to act after the food related glucose has gone) (New recommendation.)
    - Respect the wishes of the patient in choosing a rapid acting insulin. (New recommendation.)

Awareness and management of hypoglycaemia

- Assess awareness of hypoglycaemia at least annually, using a scoring system. For example, ask patients to rate their awareness from 1 (always aware of their hypoglycaemia) to 7 (never aware of their hypoglycaemia) and consider a score of 4 or more to indicate impaired awareness with high risk of severe hypoglycaemia.[13]
- Ensure that people with impaired hypoglycaemia awareness receive structured education in flexible insulin therapy using basal-bolus regimens, and offer additional education around avoidance and treatment of hypoglycaemia if needed. (New recommendation.)
- Avoid raising agreed blood glucose targets as a treatment for impaired awareness of hypoglycaemia and reinforce recommended targets if the person prefers lower ones. (New recommendation.)
- First reinforce principles of structured education, then offer "pump" therapy, and then offer real time glucose monitoring if impaired awareness of hypoglycaemia persists. (New recommendation.)

Overcoming barriers

Implementing the recommendations will require adequate resourcing and training of the healthcare workforce to help healthcare professionals and people with diabetes understand the importance of glycaemic control; to deliver the mandated structured education programmes in flexible insulin therapy; to support glucose self monitoring; and to identify and help patients who need additional support, including enhanced techniques of insulin delivery and glucose monitoring (pumps and glucose sensors). The aim is to help people achieve their targets for glycaemic control and thereby reduce long term complications, while avoiding asymptomatic, severe hypoglycaemia, and acute emergencies, while also optimising quality of life. Solutions may include creating skilled teams that can deliver education and psychological support across wide geographical areas, and greater use of communication technology in delivering structured education "refresher" courses and accessing specialist advice on regimen change. More effective monitoring for, and treatment of, risk factors for long term complications also require stronger engagement between primary and specialist care, ideally with access to shared data systems.

CPD/CME

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10-MINUTE CONSULTATION

Assessing the risk of diabetes

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This is part of a series of occasional articles on common problems in primary care. *The BMJ* welcomes contributions from GPs.

A 38 year old South Asian man comes to see you for a medication review. He takes bendroflumethiazide for hypertension, which is well controlled. His last recorded body mass index (BMI) was 29. As part of the review, you decide to discuss his risk of developing diabetes.

What you should cover

This man is at high risk of diabetes because of his ethnicity, his hypertension, and his BMI; in general, obesity accounts for 80-85% of the risk of developing type 2 diabetes. In adults over 40 years, the risk of diabetes is two to three times greater in South Asians than in age matched white people.

- Check if he has any symptoms of diabetes such as tiredness, polyuria, or polydipsia.
- Ask whether any first degree family members have diabetes.
- Discuss what diabetes means to him and whether he has any thoughts about why his risk of diabetes might be high.
- Ask him if it is ok to talk about his weight. If he is agreeable, weigh him and measure his waist circumference. This is recommended by the National Institute for Health and Care Excellence (NICE) for people with a BMI under 35.[1] If he doesn't want to discuss losing weight, remember to be non-judgmental and to advise him that the door is always open if he wants to discuss things in the future.
- Check his perception of his body image by asking how he feels about his weight, and explore his understanding of the correlation between weight and diabetes. People sometimes have a skewed view of what a "normal" weight is. A BMI of 29 falls into the overweight category for European populations but is in the "obese" range for South Asians (table). South Asian men with a waist circumference of 90 cm or more are considered to be overweight and at increased risk of cardiovascular disease.
- Ask about other medical conditions that might increase his risk of developing diabetes. Apart from his hypertension, ask him about cardiovascular disease and mental health problems, which if present, will also raise his risk. Also ask whether he smokes or drinks alcohol. Both can increase the risk of diabetes. In women, it is important to ask about gestational diabetes.

- Remember that certain drugs might increase his risk of diabetes, in particular thiazide diuretics, β blockers, atypical antipsychotics, and steroids; consider substituting bendroflumethiazide with an alternative if possible.
- Ask how he views physical activity and whether there are any barriers to being as active as he would like to be. Enquire about activity levels at work and at home. NICE guidelines advise 30-60 minutes of moderate intensity physical activity (such as fast walking or cycling) on at least five days each week.
- Use a risk calculator to predict his 10 year risk of developing type 2 diabetes. Examples are Qdiabetes (http://qdiabetes.org) and the diabetes risk score (http://riskscore.diabetes.org.uk). You will need to know his weight and height, smoking status, and whether he has a history of cardiovascular disease to use these tools, but fasting glucose and glycated haemoglobin (HBA_{1c}) levels are not needed.

What should you do next?

- Because he is at high risk of diabetes, offer to test him. NICE advises offering a blood test (fasting blood glucose or HBA_{1c}) to check for diabetes in South Asians over 25 years whose BMI is 23 or over.[1]
- Ask how important weight loss is for him and how confident he is that he can succeed.
- If he is keen to lose weight, ask if he has any specific target in mind and any preference on how to proceed, including specific changes. A daily deficit of 600 kcal (2508 kJ) is likely to produce weight loss of 0.5 kg per week. He may consider reducing his intake of saturated fat and refined sugar, and adopting a Mediterranean diet, high in wholegrains and vegetables.
- Encourage him to set himself SMART (specific, measurable, achievable, realistic, and timely) weight loss goals and to include his friends and family in his plans. Consider incorporating physical activity into his daily routine—for example, cycling to work or using stairs rather than the lift. Point out that although exercise will reduce his risk of diabetes (by improving insulin sensitivity) and of cardiovascular disease, it may not be enough to produce weight loss.
- Consider referring him to a local weight loss programme, to a dietitian, or to an "exercise on referral" scheme.
- Consider orlistat for diabetes prevention, but only in conjunction with lifestyle change.
- Angiotensin converting enzyme inhibitors or angiotensin receptor blockers should be the first line treatment for hypertension in a patient of his age, followed by calcium channel antagonists.[1] Bendroflumethiazide may potentially worsen glycaemic control and may be less effective than drugs from other antihypertensive classes.

Body mass index (BMI) reference ranges for Asian, Black African and African-Caribbean populations

Weight category	BMI
Healthy weight	18.5-22.9
Overweight	23–27.5
Obese	>27.5

THE BOTTOM LINE

- Check for risk factors for diabetes, such as South Asian ethnicity, raised body mass index (BMI), and family history
- Use a risk calculator (such as Qdiabetes and the diabetes risk score) to predict 10 year risk of developing type 2 diabetes
- Consider testing for diabetes (using fasting blood glucose or HBA_{1c}) in patients at high risk of diabetes. Consider the possibility of diabetes in South Asians over 25 years who are overweight or obese (BMI ≥23)