Type 2 diabetes risk identification and prevention: NICE public health guidance 38 in practice

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Article points

1. The threshold for diagnosing type 2 diabetes using HbA_{1c} is ≥48 mmol/mol (6.5%).

2. Those with an HbA_{1c} of 42–47 mmol/mol (6.0–6.4%) should be considered at high risk of developing type 2 diabetes.

3. Use fasting plasma glucose or an oral glucose tolerance test to diagnose type 2 diabetes and those at high risk of developing diabetes in those with altered lifespan of red blood cells (World Health Organization guidance).

Key words

- Guidelines
- Prevention
- Type 2 diabetes

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In July 2012, NICE published guidance on "Preventing type 2 diabetes: risk identification and interventions for individuals at high risk". The guidance focuses on identifying individuals over 18 years of age at high risk of developing type 2 diabetes and encouraging them to participate in lifestyle change programmes to prevent or delay diabetes. This article examines the guidance in detail, and aims to put the implications of the guidance for primary care into perspective.

The prevalence of diabetes (diagnosed and undiagnosed) in England in those over 16 years of age in 2010 was 7.4% and this is projected to increase to nearly 10% of the population by 2030. Around 850 000 people in the UK have type 2 diabetes but remain undiagnosed, and historically, around one in seven adults has either impaired fasting glucose (IFG) or impaired glucose tolerance (IGT), making them at high risk of progression to type 2 diabetes. Diabetes can cause serious complications, such as visual impairment, blindness, renal failure and non-traumatic lower limb amputations; people with the condition have a five-fold increased risk of cardiovascular disease and stroke compared with those without diabetes (Diabetes UK, 2012).

Treating type 2 diabetes and its complications costs the NHS £8.8 billion each year in the UK, with indirect costs such as premature deaths, loss of productivity and the need for informal care estimated at an additional £13 billion. If we continue to manage this condition in the current way, these direct and indirect costs are projected to increase to £15.1 billion and £20.5 billion respectively by 2035/36. Therefore it is clear that action is needed now to slow the growth of the condition if we are to have any hope of reducing this significant financial and health burden (Hex et al, 2012).

Historically a fasting plasma glucose (FPG) or an oral glucose tolerance test (OGTT) was used to identify those with IFG, or IGT, respectively. Those with IGT or both IGT and IFG are at increased risk of cardiovascular disease and of developing type 2 diabetes. Major prevention studies such as the Diabetes Prevention Program have demonstrated a more than 50% reduction in progression from IGT to type 2 diabetes over 4 years using an intensive lifestyle programme or lower reductions using drug therapy with metformin (Diabetes Prevention Program Research Group, 2002a).

In 2011, the World Health Organization (WHO) recommended that HbA_{1c} could be used as an alternative to standard glucose measures to diagnose type 2 diabetes among

non-pregnant adults, with a diagnostic threshold of 48 mmol/mol (6.5%). WHO did not provide specific guidance on HbA_{1c} criteria for people at an increased risk of type 2 diabetes (WHO, 2011).

A report from a UK expert group on the implementation of the WHO guidance recommends using HbA_{1c} values between 42 and 47 mmol/mol (6.0–6.4%) to indicate that a person is at high risk of type 2 diabetes (John et al, 2012). The group also recognised that there is a continuum of risk across a range of sub-diabetic HbA_{1c} levels, and that people with an HbA_{1c} below 42 mmol/mol (6.0%) may also be at risk. A recent study has confirmed that those individuals with "impaired glucose regulation" (HbA_{1c}, 42–47 mmol/mol [6.0–6.4%]) have a 15 times higher incidence of type 2 diabetes over 3 years than those with a baseline HbA_{1c} in the normal range at 31 mmol/mol (5%; Chamnan et al, 2011). It is believed that it will be possible to reduce the progression to type 2 diabetes amongst those with impaired glucose regulation using intensive lifestyle interventions, in the same way as was achieved in the intensive lifestyle group with IGT in the prevention studies.

NICE public health guidance on preventing type 2 diabetes

In July 2012, NICE published public health guidance 38: "Preventing type 2 diabetes: risk identification and interventions for individuals at high risk" (NICE, 2012). The guidance focuses on identifying individuals over the age of 18 at high risk of developing type 2 diabetes and encourages them to participate in lifestyle change programmes to prevent or delay diabetes. This guidance complements recommendations published in May 2011 by NICE: "Preventing type 2 diabetes: population and community interventions," which focused on reducing the risk across the whole population (NICE, 2011).

NICE public health guidance applies to England, and is usually disseminated after local review in Northern Ireland and Scotland. It has no formal status in Wales but is regarded as a useful source of information. Unfortunately, there is no mandatory requirement for public health guidance to be funded.

NICE public health guidance 38 makes 20 recommendations, which are summarised in *Table 1*. The recommendations can be used alongside the NHS Health Check programme, the national vascular risk assessment and management programme for people aged 40–74 years.

Table 1. Summary of the 20 recommendations made in NICE public health guidance 38 (NICE, 2012).

Number	Recommendation
1	Risk assessment
2	Encouraging people to have a risk assessment
3	Risk identification (stage 1)
4	Risk identification (stage 2)
5	Matching interventions to risk
6	Reassessing risk
7	Commissioning risk identification and intensive lifestyle-change programmes
8	Quality-assured, intensive lifestyle-change programmes: design and delivery
9	Quality-assured, intensive lifestyle-change programmes: content
10	Quality-assured, intensive lifestyle-change programmes: evaluation
11	Raising awareness of the importance of physical activity
12	Providing tailored advice on physical activity
13	Weight management advice
14	Dietary advice
15	Vulnerable groups: information and services
16	Supporting lifestyle change
17	Intensive lifestyle-change programmes: quality assurance
18	Training and professional development
19	Appropriate use of metformin
20	Appropriate use of orlistat

Who should be assessed?

NICE recommends that all those over the age of 40 who have not already been diagnosed with diabetes (except those who are pregnant) should be offered a diabetes risk assessment. Those aged 25–39 and of South Asian, Chinese, African-Caribbean or black African descent, and other high-risk black and minority ethnic (BME) groups (except pregnant women) should also be encouraged to have a risk assessment. In the UK, type 2 diabetes is more prevalent among BME groups, and people in these groups tend to develop the condition at an earlier age. They also tend to progress from impaired glucose tolerance to diabetes much more quickly (more than twice the rate of White populations). For individuals from these groups with a BMI >23 kg/m^2, a blood test may be appropriate even if they do not score highly on the self-assessment, as the risk assessments may be less predictive in these groups. Adults with conditions that increase the risk of type 2 diabetes are also recommended to have a risk assessment.

Risk assessment and identifying those at high risk

The guidance recommends a two-step approach to identifying those at high risk. In step one, adults should be encouraged to assess their risk of type 2 diabetes using a validated self-assessment questionnaire (paper-based or online), or GP practices can use a computerised risk score based on information already contained in patient records. If they are assessed as high risk, step two recommends that adults should contact their GP or practice nurse for a blood test – either the fasting blood glucose or the HbA$_{1c}$ test – to confirm their level of risk and discuss how to reduce it, or whether they already have type 2 diabetes.

Step 1

The risk assessment can be carried out as follows:

- Using a questionnaire, for example, Diabetes Risk Score available to health professionals (http://www.diabetes.org.uk/Professionals/Risk-score-assessment-tool/) or people can work out their own risk score online at www.diabetes.org.uk/riskscore. Both are based on the Finnish Diabetes Risk Score, validated for UK populations.
- Using a computer-based risk assessment tool in primary care, for example, Cambridge diabetes risk score, Leicester practice score or QDiabetes score.

The guidance recommends that when using a computer-based assessment across a practice population, the 50% of patients at highest risk should be designated as high risk and put through to step 2 and receive a blood test, while the lowest 25% are designated low risk and the middle 25% are designated intermediate risk (see *Table 2*).

Self-assessment questionnaires such as the online Diabetes risk score can be used in a wide variety of settings and this has also been carefully validated. Those with scores of 16 points and above on the Diabetes UK online risk score are recommended to see their primary care team for further assessment and those with scores of 25 or more are designated high risk and recommended to see their GP for a blood test. Unfortunately, Read codes, which would allow accurate recording in electronic records of these assessments, impaired glucose regulation diagnosis, or referral to lifestyle programmes, are not yet available.

Step 2

Step 2 involves those at high risk being offered either an FPG test or an HbA$_{1c}$ blood test. A blood test may also be appropriate for those aged ≥25 years of South Asian or Chinese descent with BMI >23 kg/m^2.

Using the results of the risk assessment and the blood test (where needed) allows people to be divided into four groups (*Table 2*).

The interventions that are recommended by NICE for each group are summarised in *Table 1*, and the key components of each of these interventions are summarised below:

- Brief advice.
  - ❏ Explain that individuals are at low risk (as opposed to no risk).
  - ❏ Discuss their risk factors and lifestyle change to reduce risk.
  - ❏ Offer encouragement and reassurance.
  - ❏ Offer verbal and written information

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about culturally appropriate local services (in a variety of formats and languages).

● Brief intervention.

❏ Explain to individuals that they are at moderate risk and that this risk may increase in future, but that it is possible to reduce their risk.

❏ Discuss their individual risk factors and identify how they may change the modifiable ones.

❏ Offer a brief intervention (in a group or one-to-one) to help them make lifestyle changes; provide information about services that use behaviour-change techniques.

❏ Offer participation in a structured weight-loss programme offering an individual assessment, tailored advice on diet, physical activity and behaviour change if appropriate. Provide information on local programmes.

● Intensive lifestyle-change programme.

❏ Explain to individuals that they are at high risk but will not necessarily progress to type 2 diabetes and that it is possible to reduce their risk.

❏ Discuss their individual risk factors and identify how they may change the modifiable ones using lifestyle changes.

❏ Offer referral to a local, evidence-based,

quality-assured intensive lifestyle-change programme that can provide:

● Small group classes for 10–15 people at high risk of developing type 2 diabetes.

● At least eight meetings over 9–18 months; at least 16 hours' total contact time.

● More intensive support early in the programme; weekly or fortnightly; follow-up sessions 3-monthly for 2 years.

● Link to weight management programmes.

● Evaluate health outcomes at 6- or 12-month intervals.

The prevention studies used similar lifestyle recommendations, and achieved similar efficacy in reducing progression to type 2 diabetes (Pan et al, 1997; Tuomilehto et al, 2001; Diabetes Prevention Program Research Group, 2002a; 2002b). It should be noted that the Finnish diabetes prevention study (Tuomilehto et al, 2001) recommended more than 4 hours' moderate-intensity physical activity per week rather than the 30 minutes daily or 150 minutes weekly recommended by the others.

Extrapolating from those studies, and based on a review of the literature, the guidance offers greater clarity on the lifestyle goals that we should be encouraging all our high-risk individuals to work towards. These are listed below:

Table 2. Risk groups, mode of identification, intervention and reassessment interval.

Risk group	Identified by	Intervention	Reassessment interval
Low risk	Low or intermediate risk score	Brief advice	5 years; with the NHS Health Check programme
Moderate risk	High risk score; FPG <5.5 mmol/L or HbA_{1c} <42 mmol/mol (6%)	Brief intervention	3 years
High risk	FPG 5.5–6.9 mmol/L or HbA_{1c} 42–47 mmol/mol (6–6.4%)	Evidence-based, quality-assured intensive lifestyle-change programme	1-yearly blood test (Review lifestyle changes and BMI or weight check)
Possible type 2 diabetes	FPG ≥7 mmol/L or HbA_{1c} ≥ 48 mmol/mol (6.5%)	Second blood test if asymptomatic (if type 2 diabetes not confirmed, treat as high risk above)	Type 2 diabetes care

FPG=fasting plasma glucose.

● Achieving 150 minutes of moderate-intensity physical activity (for example, brisk walking or housework) per week, accrued in bouts of at least 10 minutes' duration (or 75 minutes of vigorous activity; running, walking briskly uphill) with strength training twice weekly.

● Gradual weight loss, 5–10% per year, to achieve and maintain BMI in a healthy range (BMI 18.5–24.9 kg/m^2 for Caucasians; 18.5–22.9 kg/m^2 for those of South Asian or Chinese descent).

● For those with a BMI above 30 kg/m^2 (27.5 kg/m^2 or more if of South Asian or Chinese descent) offer a structured weight-loss programme as part of, or as a supplement to, the intensive lifestyle programme.

● Education about food types and dietary changes, aiming to:

  ❑ Increase consumption of whole grains, vegetables and other fibre-rich foods.

  ❑ Encourage people to choose foods lower in total and saturated fat such as choosing skimmed or semi-skimmed milk rather than full fat.

  ❑ Help people make informed choices between high-fat and lower-fat foods and cooking methods.

Exercise on prescription schemes available across the UK offer tailored advice on how to increase physical activity, including various types of moderate- and high-intensity activities, but cannot always offer capacity for all who need to attend. Referral to a dietitian for specialist dietary advice is useful but is not easily accessible in some parts of the UK. These options, and opportunistic education by primary healthcare teams will form a starting point for implementing the guidance.

However, it is recommended that everyone diagnosed at high risk of developing type 2 diabetes in the future should have the opportunity to attend a quality-assured, evidence-based intensive lifestyle-change programme in their local area. This will require the commissioning, design, development, implementation and evaluation of such programmes across the UK. Public health teams will need to undertake a needs assessment to estimate the number of places on intensive lifestyle programmes that will be required each year, and to then go out and commission these services. Further details on these aspects are included in the guidance (NICE, 2012). Although the diabetes prevention studies used one-to-one programmes, recent evidence suggests that benefit can be achieved with group sessions involving groups of 10–15 participants (Ali et al, 2012).

These intensive lifestyle programmes will also have a beneficial impact on other chronic diseases such as cardiovascular disease and, once established, can also be used to help some of those people already diagnosed with type 2 diabetes to implement lifestyle changes to improve their glycaemic control and blood pressure.

Realistically, primary care teams will be fully occupied identifying those who need assessment and providing brief advice and brief interventions for those at low and intermediate risk; our role with people at high risk will only be to refer to intensive lifestyle-change programmes commissioned from independent sources and to encourage adherence with these programmes (*Box 1*).

The identification and assessment process is summarised in *Figure 1*.

Drug therapy

The most controversial part of the guidance, which has been widely publicised by the medical press, is the recommendation to use

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Box 1. Key roles for primary care teams.

● Encouraging people to have a risk assessment.

● Risk identification. Stage 1: running computerised searches in patient records to identify the 50% at highest risk and reviewing self-assessment scores. Stage 2: arranging an appropriate blood test.

● Matching interventions to risk and reassessing risk.

● Raising awareness of the importance of physical activity and providing tailored advice.

● Providing weight management advice and dietary advice.

● Providing information and services to vulnerable groups and supporting lifestyle change in this group.

● Prescribing metformin or orlistat within the recommendations.

≥75 years Use risk-assessment tools and questionnaires	**40–74 years** ● Use a validated risk assessment tool or validated self-assessment questionnaire ● Follow NHS Health Check process and protocols where possible	**High-risk groups** ● People aged 25–39 years of South Asian, Chinese, African-Caribbean, black African and other high-risk black and minority ethnic groups ● People with conditions that increase the risk of type 2 diabetes Use risk-assessment tools and questionnaires

STAGE ONE

Consider a blood test for South Asian and Chinese people aged 25 and over with BMI >23 kg/m^2

Low or intermediate risk score	**High risk score**

STAGE TWO

Offer brief advice on: ● The risks of developing diabetes ● The benefits of a healthy lifestyle ● Modifying risk factors	**Offer a blood test** Choose either FPG **or** HbA$_{1c}$ – use as appropriate and according to national quality specifications

Reassess risk at least every 5 years

MODERATE RISK **FPG <5.5 mmol/L or HbA$_{1c}$ <42 mmol/mol (6.0%)** Offer a **brief intervention** to: ● Discuss the risks of developing diabetes ● Help modify individual risk factors ● Offer tailored support services	**HIGH RISK** **FPG 5.5–6.9 mmol/L or HbA$_{1c}$ 42–47 mmol/mol (6.0–6.4%)** Offer an intensive lifestyle change programme to: ● Increase physical activity ● Achieve and maintain weight loss ● Increase dietary fibre, reduce fat intake, particularly saturated fat	**POSSIBLE TYPE 2 DIABETES** **FPG ≥ 7.0 mmol/L or HbA$_{1c}$ ≥ 48 mmol/mol (6.5%)** Carry out a further blood test if asymptomatic, according to national quality specifications, to confirm or reject the presence of diabetes

Reassess risk at least every 3 years

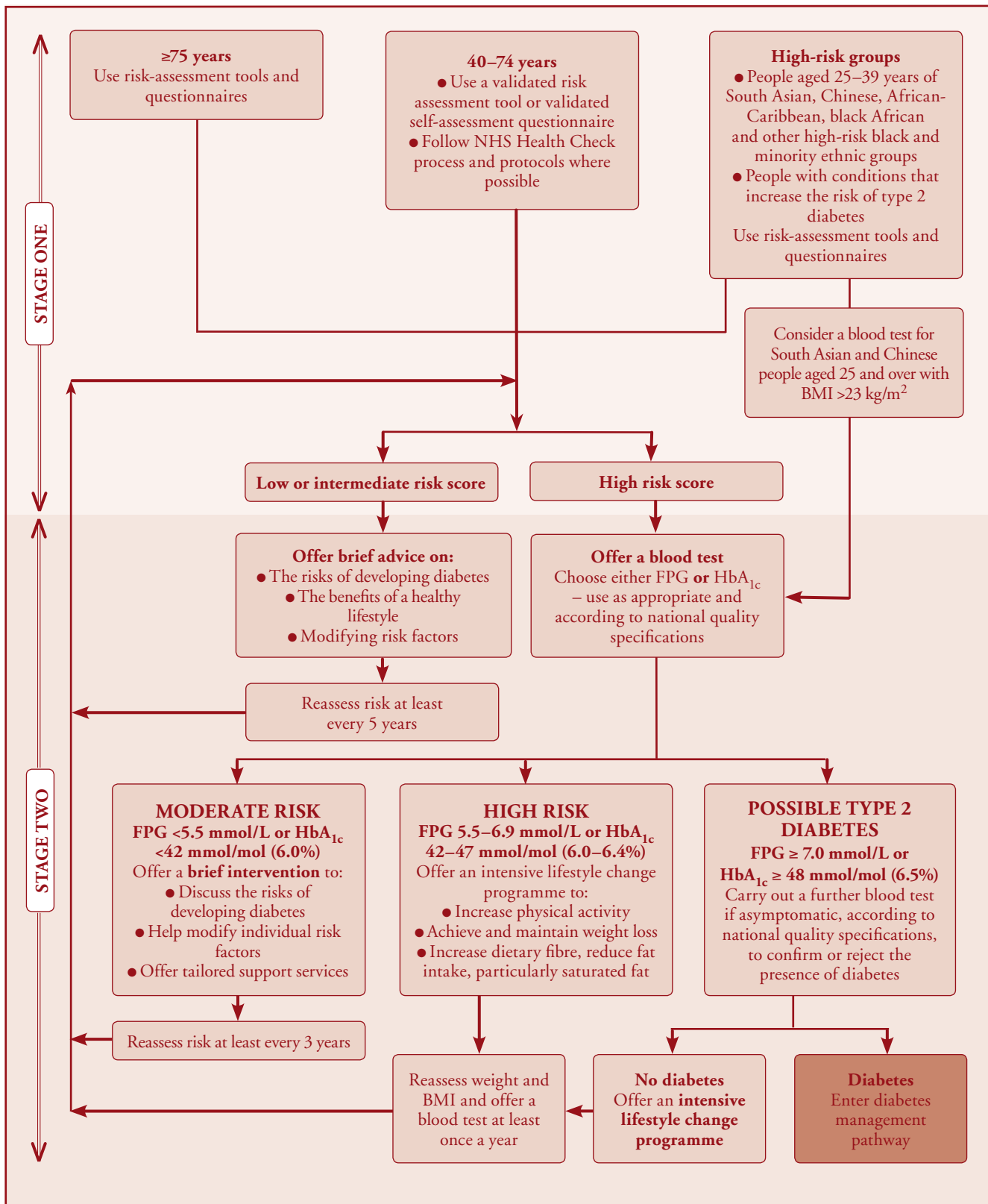| Reassess weight and BMI and offer a blood test at least once a year	**No diabetes** Offer an **intensive lifestyle change programme**	**Diabetes** Enter diabetes management pathway

Figure 1. Flowchart for identifying and managing risk of type 2 diabetes in public health guideline 38 (NICE, 2012). Reproduced with the kind permission of NICE.

"The guidance offers clear, evidence-based recommendations on a two-stage identification process, outlining the intervention appropriate for each level of risk, as well as providing an evidence-based review of what lifestyle interventions are effective"

drug therapies for those high-risk individuals whose risk continues to increase despite evidence-based lifestyle intervention programmes or in those who are unable to participate in such programmes to reduce their risk due to disability or medical problems.

Standard release metformin can be given to support lifestyle change, after explaining that lifestyle change is more effective than drugs at reducing risk of type 2 diabetes. The guidance suggests starting with 500 mg once daily and building up to 1500–2000 mg daily, with blood testing using fasting blood glucose or HbA_{1c} at 3-monthly intervals to check for response. The drug should be stopped if there is no effect on FBG or HbA_{1c}. Metformin is not currently licensed for use in those at high risk of diabetes to prevent progression to type 2 diabetes, and therefore detailed discussion and careful documentation is needed if it is used in this way.

NICE offers clear guidance on criteria for use of orlistat as a treatment for obesity in those with a BMI of 28 kg/m^2 or more (NICE, 2006). Orlistat should be used with a low-fat diet containing not more than 30% daily food energy as fat, distributed across three meals. A weight-loss goal should be agreed upon, and progress reviewed after 12 weeks. A weight loss of 5% should be aimed for, but it should be taken into account that weight loss may be slower in those at risk of type 2 diabetes, as it is in those with type 1 diabetes.

The way forward

The epidemic of type 2 diabetes continues to gather pace in the UK. The diabetes prevention studies and the more recent translational research confirm that the transition from being at risk to having type 2 diabetes can be delayed or prevented. This NICE guidance on preventing type 2 diabetes offers clear, evidence-based recommendations on a two-stage identification process, outlining the intervention appropriate for each level of risk, as well as providing an evidence-based review of what lifestyle interventions are effective, so we can begin immediately to implement these parts of the guidance. Although our role in implementation may look onerous at first glance, we must

remember that for those aged 40–74 years old, the identification will be incorporated in the NHS Health Check programme or similar programmes across the UK nations. The major challenge lies with public health and commissioning groups who must design, develop, implement and evaluate the effectiveness of quality-assured, evidence-based intensive lifestyle-change programmes across the UK. Careful evaluation of outcomes achieved will be vital in fine-tuning programmes and motivating primary care teams and our patients to participate wholeheartedly. ∎

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