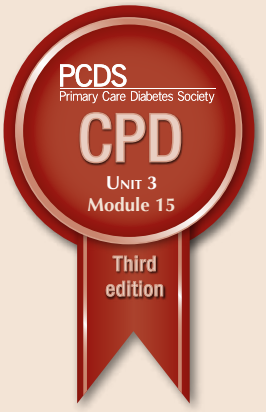

Unit 3 Special care groups

Type 2 diabetes prevention: A guide to management

Joseph Henson, Thomas Yates, Melanie Davies, Kamlesh Khunti

In the continuum of glycaemia between type 2 diabetes and normal glucose control, there exists a condition known as non-diabetic hyperglycaemia (NDH). Individuals with NDH may benefit from timely lifestyle, medical or surgical intervention, and the efficacy of each approach is discussed in this article. Targeting type 2 diabetes prevention through national policies that reduce overall consumption of food and increase levels of physical activity is likely to be the most viable and cost-effective method. That said, solely relying on an individual's adherence to diet and physical activity recommendations may not be enough to delay progression for a large proportion of people at risk. Thus, attention must also be given to recommendations for pharmacological therapy or surgery in order to yield long-term societal benefits. The introduction of the National Diabetes Prevention Programme heralds an exciting time for diabetes prevention and, although real-world translation remains a huge hurdle, it also represents the best opportunity to stem the tide of the diabetes epidemic in England.

Type 2 diabetes affects around 90% of individuals with diabetes, while the remaining 10% mainly have type 1 diabetes or gestational diabetes (GDM; International Diabetes Federation [IDF], 2015). Type 2 diabetes is a condition characterised by hyperglycaemia, resulting from defects in hepatic and peripheral glucose uptake, reduced insulin secretion or both (Gulve, 2008). It progresses from an early, asymptomatic stage with insulin resistance to mild postprandial hyperglycaemia and, eventually, to frank diabetes requiring pharmacological intervention.

On the continuous glucose control spectrum, between type 2 diabetes and normoglycaemia, there is a condition known as non-diabetic hyperglycaemia (NDH; also known as pre-diabetes or impaired glucose regulation). According to the IDF (2006), NDH is a composite of impaired fasting glucose (fasting plasma glucose >6 mmol/L and <7 mmol/L) and/or impaired glucose tolerance (IGT; 2-hour post-challenge plasma glucose ≥7.8 mmol/L and <11.1 mmol/L). More recently, NICE (2012) guidelines have defined diagnoses of NDH and type 2 diabetes based on HbA_{1c} (42–47 mmol/mol [6.0–6.4%] and ≥48 mmol/mol [≥6.5%], respectively).

NDH serves as an important marker for those who are at the greatest risk of developing type 2 diabetes. Such individuals may benefit from timely lifestyle changes, medication or surgical intervention. In this article, the efficacy of each of these approaches is discussed.

Online learning

Visit diabetesonthenet.com/cpd to gain a certificate of continuing professional development for participating in this module.

See page 135

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Learning objectives

After reading this article, the participant should be able to:

1. Identify the risk factors and understand how to screen for type 2 diabetes.
2. Describe strategies for health promotion and effective interventions to reduce the risk of developing type 2 diabetes.
3. Describe how to identify people with non-diabetic hyperglycaemia and the recommended clinical options to reduce the risk of developing type 2 diabetes.

Key words

- Non-diabetic hyperglycaemia
- Pre-diabetes
- Prevention
- Type 2 diabetes

Authors

Author details can be found on page 134.

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Table 1. Design and results of national type 2 diabetes prevention trials.

Trial (reference) and study duration	Study participants	Intervention(s)	Control	Diabetes relative risk (95% CI)*	Legacy
Finnish Diabetes Prevention Study (Lindström et al, 2003) 3 years	*n*=522; overweight with impaired glucose tolerance. 67% women	Tailored, detailed advice on diet, weight reduction and exercise	Limited advice on diet and exercise	0.4 (0.3–0.7)	After 13 years, the HR during the post-intervention follow-up was 0.67 (95% CI, 0.48–0.95). Participants in the intervention group maintained lower absolute levels of body weight, fasting and 2-hour plasma glucose, and a healthier diet. Adherence to lifestyle changes during the intervention period predicted greater risk reduction during the follow-up (Lindström et al, 2013)
US Diabetes Prevention Program (Knowler et al, 2002) Average=2.8 years	*n*=3234; impaired glucose tolerance, age ≥25 years, minimum BMI 24 kg/m^2 (22 kg/m^2 in Asians). 68% men, 54.7% white	Intensive programme of lifestyle modification	Standard lifestyle advice	0.4 (0.3–0.5)	Over a 10-year follow-up, diabetes incidence in the lifestyle group was reduced by 34% (95% CI, 24–42%) compared with placebo (Diabetes Prevention Program Research Group, 2009)
Indian Diabetes Prevention Programme (Ramachandran et al, 2006) 3 years	*n*=531; native Asian Indians with impaired glucose tolerance, age 35–55 years. 21% women	Advice on a healthy diet and regular physical activity	Routine advice	0.7 (0.6–0.8)	Results anticipated
Da Qing Study, China (Pan et al, 1997) 6 years	*n*=530; Chinese with impaired glucose tolerance, age >25 years. 47% women	Diet group: individual and group counselling. Exercise group: increase daily exercise. Diet and exercise group: both interventions	Routine advice	Diet: 0.7 (0.4–0.9) Exercise: 0.5 (0.2–0.9) Diet and exercise: 0.6 (0.3–0.9)	At 20 years' follow-up, the HR was 0.57 (95% CI, 0.41–0.81) in the pooled intervention groups compared with controls. The average annual incidence of diabetes was 7% for intervention recipients vs 11% in controls. The 20-year cumulative incidence was 80% in intervention recipients and 93% in controls (Li et al, 2008)

*Relative risk of incident type 2 diabetes in the intervention vs control groups.
CI=confidence interval; HR=hazard ratio.

Evidence from prevention and translational studies so far

The evidence base for the prevention of type 2 diabetes has developed rapidly over the last two decades, from efficacy trials through to real-world translational studies. Previously, lifestyle interventions have been shown to be effective at slowing the progression from NDH to type 2 diabetes.

Efficacy trials conducted in the US, Finland, India and China have consistently demonstrated that lifestyle interventions reduce the relative risk of type 2 diabetes by 30–60% in people with IGT (Gillies et al, 2007; *Table 1*). Importantly, such programmes have also been shown to yield benefits well after cessation of the intervention. The success of such prevention programmes is largely underpinned by reductions in body weight and increasing levels of physical activity.

Nevertheless, the challenge remains to implement the systematic translational research gained from epidemiological and experimental studies into real-world diabetes prevention trials. Clinical trials have shown what is possible, but not what is feasible or scalable in a primary care or community setting. This discrepancy is often referred to as the "translational gap".

Early work has shown success at bridging this gap. A recent systematic review and meta-analysis (including 36 studies; Public Health England [PHE], 2015a) demonstrated that DPPs specifically aiming to translate the findings from large-scale efficacy trials into routine care reduce progression to type 2 diabetes by an average of 26%, compared to usual care. Unsurprisingly, the more intensive interventions were deemed to be more effective, particularly those following traditional DPP models, such as the Finnish and US DPPs (Tuomilehto et al, 2001; Knowler et al, 2002).

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Box 1. Guideline recommendations for intervention content (Dunkley et al, 2014).

1. Aim to promote changes in both diet and physical activity.
2. Use established, well-defined behaviour change techniques (e.g. specific goal setting, relapse prevention, self-monitoring, motivational interviewing, prompting self-talk, prompting practice, individual tailoring, time management).
3. Work with participants to engage social support for the planned behaviour change (i.e. engage important others such as family, friends and colleagues).
4. Maximise the frequency or number of contacts with participants (within the resources available).
5. Use a coherent set of "self-regulatory" intervention techniques, such as specific goal setting (ideally with coping planning; i.e. "relapse prevention"), prompting self-monitoring, providing feedback on performance, problem-solving and review of behavioural goals.
6. Use a group size of 10–15 people. This recommendation is designed to balance cost and effectiveness, rather than to be an exact specified range.
7. Provide at least 16 hours of contact time over the first 18 months.
8. Ensure programmes adopt a person-centred, empathy-building approach.
9. Allow time between sessions, spreading them over a period of 9–18 months.
10. Provide information that raises awareness of the benefits of lifestyle change and the types of changes needed.
11. Explore and reinforce participants' reasons for wanting to change and their confidence around making changes.
12. Gradually build participants' confidence (self-efficacy) by starting with achievable and sustainable short-term goals and setting of graded tasks.

This has recently been demonstrated in the UK with the Let's Prevent Diabetes programme (Davies et al, 2016). This structured education intervention was developed to meet the need for an evidence-based DPP that adheres to NICE recommendations and has the capacity to be implemented within the NHS. It was a 6-hour structured group education session that encouraged self-management of NDH, with 3-hour refresher sessions at 12 and 24 months after the initial session (Gray et al, 2012). Over the 3 years, 131 participants developed type 2 diabetes (67 in standard care vs 64 in the intervention group) and there was a non-significant 26% reduced risk of developing type 2 diabetes in the intervention arm, with statistically significant improvements in HbA_{1c}, LDL-cholesterol, psychosocial wellbeing, sedentary time and step count (Davies et al, 2016).

Further analysis also demonstrated that participants who attended the initial session and at least one refresher session were 62% less likely to develop type 2 diabetes compared to those in the standard care arm (hazard ratio [HR], 0.38; 95% confidence interval [CI], 0.24–0.62). This improved to an 88% lower likelihood of developing type 2 diabetes in participants who attended all of the sessions (HR, 0.12; 95% CI 0.05–0.28; Gray et al, 2016). This shows that engagement and retention within a lifestyle programme are critical components for success.

Although translational studies have been largely successful on the whole, there remains great variation in their effectiveness. The results appear to be largely dependent upon adherence to guidelines, intervention content and delivery (Dunkley et al, 2014; see next section and *Box 1*).

Cost-effectiveness

Clearly, financial implications are a potential barrier to widespread dissemination and implementation of DPPs. A systematic review conducted in 2010 identified eight studies of lifestyle and medication therapy to prevent type 2 diabetes in high-risk individuals (Li et al, 2010). The authors concluded that these measures were typically very cost-effective, with a median cost per quality-adjusted life-year (QALY) gained of US $1500 (£1280).

Most prominently, the US DPP and its Outcomes Study (DPPOS) have demonstrated that intensive lifestyle intervention can prevent type 2 diabetes in high-risk adults for at least 10 years after randomisation if participants adhere to their randomised treatments, and that the interventions are extremely cost-effective or even cost-saving (Diabetes Prevention Program Research Group, 2012). NICE (2012) has also demonstrated the cost-effectiveness of risk assessment and intervention in a younger South Asian cohort (aged 25–39 years), which may also be cost-saving.

More recently, the cost-effectiveness of the Let's Prevent Diabetes programme has been estimated within a primary care context, using QALYs as the main outcome measure. The intervention was found to result in a net gain of 0.046 QALYs over 3 years at an overall cost of £168 per patient (Leal et al, 2017). Although these differences were

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not statistically significant compared to standard care, when the modest cost and effect differences are jointly considered, there is a high probability (86%) that the intervention will be cost-effective.

NICE guidelines and their implications for primary care

The evidence in favour of DPPs has helped to establish the case for implementing programmes within routine care pathways. In the UK, this was first recognised with the NHS Health Check programme in 2008, which sought to screen all adults between 45–70 years of age for vascular disease and treat high-risk individuals. As such, NICE (2012) formally developed and published new guidance for diabetes prevention (PH38), providing specific guidance for identifying and referring high-risk individuals to prevention programmes.

Risk identification

For risk identification, NICE recommends a two-stage process for the general population: a risk assessment, using a tool validated in UK populations, followed by a venous blood test (fasting plasma glucose or HbA_{1c}) if deemed necessary (*Figure 1*; NICE, 2012). The following groups should be encouraged to have a risk assessment:

- People aged ≥40 years (except pregnant women, for whom results will not be accurate).
- People aged 25–39 years and of South Asian, Chinese, African-Caribbean or Black African ethnic origin (if not pregnant).
- Adults with pre-existing conditions that increase the risk of type 2 diabetes.

The Leicester Diabetes Risk Score is one of several self-assessment scores recommended by NICE and takes into account age, waist circumference, sex, BMI, ethnicity, family history of diabetes and antihypertensive medication (Gray et al, 2010). A score of 0–6 points is deemed low risk, 7–15 points increased risk, 16–24 points moderate risk and ≥25 points high risk.

If a computer-based risk assessment tool is not available, healthcare professionals should complete a practice-based risk assessment, such as the Cambridge diabetes risk score, the QDiabetes risk calculator, the Leicester Practice Risk Score or FINDRISC (NICE, 2012).

Following the first stage of the process, individuals with a high risk score should be offered a venous blood test to identify possible type 2 diabetes. Individuals with a fasting plasma glucose of 5.5–6.9 mmol/L or an HbA_{1c} of 42–47 mmol/mol (6.0–6.4%) should be offered referral to a local, evidence-based, intensive lifestyle change programme, with repeat blood, weight and BMI measurements performed at least once per year. For those individuals deemed to be at low or moderate risk (fasting plasma glucose

Links to practice-based risk assessments

QDiabetes risk calculator
www.qdiabetes.org

Leicester Practice Risk Score:
http://leicesterdiabetescentre.org.uk/The-Leicester-Diabetes-Risk-Score

Links to self-assessments

Leicester Diabetes Risk Score:
www.riskscore.diabetes.org.uk

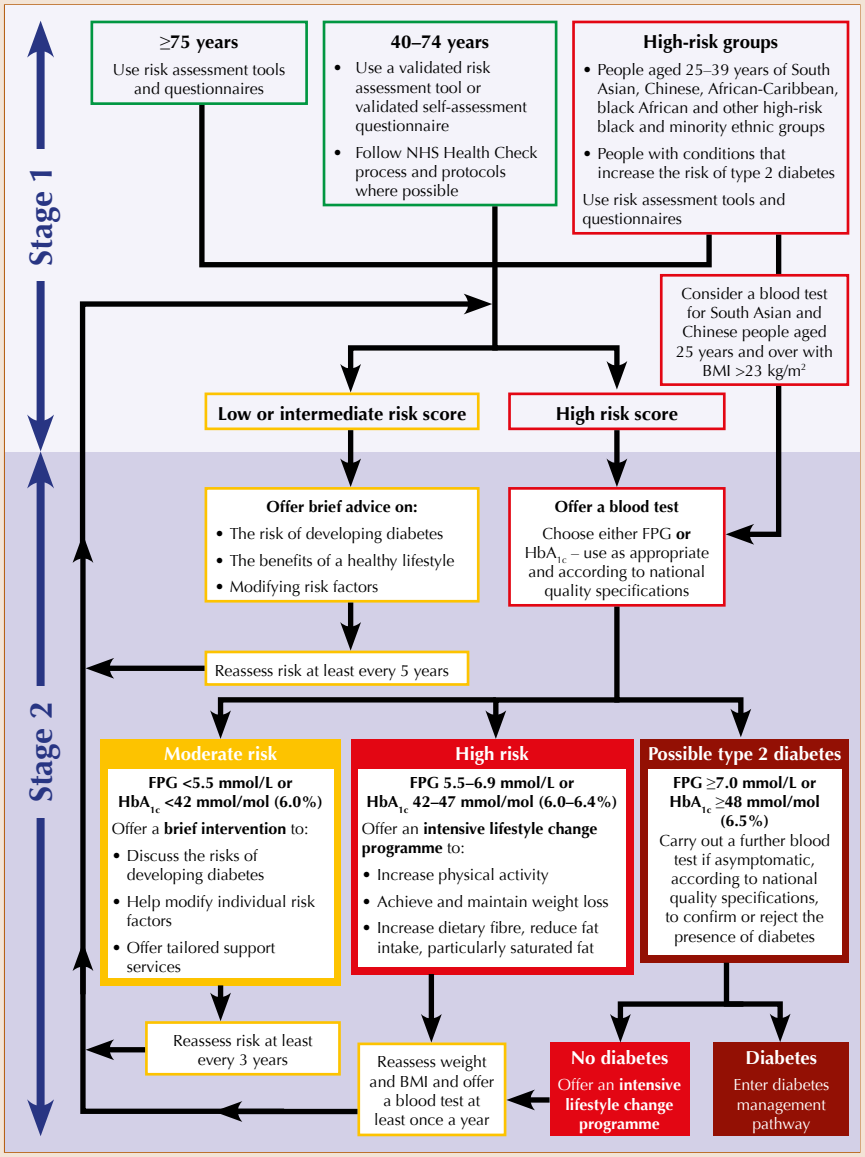

Figure 1. Two-stage process for the identifying type 2 diabetes risk in the general population. Adapted from NICE (2012).

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Recommended advice to give to people at moderate risk of type 2 diabetes (NICE, 2012)

For people with **moderate risk** (high risk score but FPG <5.5 mmol/L or HbA_{1c} <42 mmol/mol [6.0%]:

- Discuss their risk factors, identify which ones can be modified and discuss how they can achieve this with lifestyle change.
- Offer brief lifestyle intervention: give information about services that use evidence-based behaviour change techniques (e.g. walking programmes, slimming clubs or structured weight loss programmes).
- Discuss whether they would like to join a structured weight loss programme. Signpost to local programmes that offer this support.

Recommended advice to give to people at high risk of type 2 diabetes (NICE, 2012)

For people with **high risk** (high risk score and an FPG of 5.5–6.9 mmol/L or an HbA_{1c} of 42–47 mmol/mol [6.0–6.4%]):

- Discuss their risk factors, identify which ones can be modified and discuss how they can achieve this with lifestyle change.
- Offer referral to a local, evidence-based, quality-assured intensive lifestyle change programme. This should use established behaviour change techniques and promote:
  - At least 150 minutes of exercise per week.
  - Gradual weight loss to reach and maintain a healthy BMI.
  - Increased consumption of foods high in dietary fibre.
  - Reduced total and saturated fat intake.

<5.5 mmol/L or HbA_{1c} <42 mmol/mol [6.0%]), the guidance recommends a brief consultation to explain the current low-risk status and provide advice on risk reduction, with a reassessment at least every 5 years (NICE, 2012).

Many commissioning groups in England have integrated the key parts of this identification guidance into their NHS Health Checks, either employing targeted blood testing for individuals deemed to be at high risk or universally carrying out HbA_{1c} tests on all individuals receiving a health check where the population risk is deemed to be particularly high (e.g. in regions with large South Asian communities).

Referral to diabetes prevention

This kind of staged screening provides individuals with a more accurate assessment of their risk of diabetes and individualised care regarding their risk factors. In addition, it is important that adequate advice and support is harnessed to encourage appropriate lifestyle. NICE (2012) recommends that common guidance should include supporting behaviour change; achieving and maintaining a healthy weight; engaging in the recommended levels of physical activity (at least 30 minutes of moderate activity on ≥5 days a week); and cultural appropriateness, with a particular focus upon adults aged 18–74 who belong to black and minority ethnic and/or low-socioeconomic-status groups.

At present, primary care carries the overall responsibility for risk assessment and subsequent intervention in the UK. Risk assessment tools are inexpensive, relatively quick and easy to use. However, general practices may need to offer additional appointments to provide blood tests for people who are assessed as high risk but are not eligible for the NHS Health Check programme. In theory, in the long term, risk stratification and screening should reduce healthcare demands.

The NHS Diabetes Prevention Programme

Following the launch of the NHS Health Check programme and publication of the NICE diabetes prevention guidance, NHS England (2014) published the *Five Year Forward View*, which listed the top five priorities for the NHS in England (PHE, 2014). The publication provided the framework to develop a national policy and commitment for diabetes prevention, which was announced through the initiation of the Healthier You: NHS Diabetes Prevention Programme (NHS DPP) in 2014. The NHS DPP is the first ever national prevention programme and is operationalised and centrally funded through NHS England, which commissions a framework of providers to deliver lifestyle prevention programmes nationally.

The content and structure of the NHS DPP was shaped by two key publications, which highlighted that around 5 million people in England are at high risk of developing type 2 diabetes, and that prevention programmes can be successful in preventing 26% of high-risk individuals developing type 2 diabetes (PHE, 2015a; 2015b). As such, the ultimate aim of the NHS DPP is to reduce the 4 million people in England who are otherwise expected to have type 2 diabetes by 2025.

The NHS DPP was piloted in 2015 across seven demonstrator sites in England (equating to ~1.8 million individuals) to explore optimisation of delivery and efficacy, while also establishing the fundamentals, such as referral pathways. The feasibility of nationally procuring a lifestyle modification service or establishing a national framework contract for such services was also explored. Experiences from these initiatives served to guide the first wave of the programme, which started in 2016, covering 27 sites and initially targeting up to 20 000 people at a high risk of developing type 2 diabetes. Each site carries out its own commissioning process, allowing each provider on the NHS DPP framework to submit a tender; this ensures that providers with the best strategy for the population at each site can be selected, allowing flexibility and optimisation of delivery. National rollout, with as many as 100 000 referrals each year, is expected by 2020.

A case study for the East Midlands site is presented in *Appendix 1*, available in the online version of this article.

Core standards

Regardless of the provider, programmes run through the NHS DPP have to adhere to a set

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of core standards based on NICE guidance and informed by commissioned reviews of the evidence (PHE 2015a; 2015b). Briefly, the programme must include a minimum of 13 sessions and 16 hours of contact time over at least 9 months (NHS DPP Programme Support Team, 2016). Support, group and one-to-one sessions typically last 1–2 hours, with an emphasis on weight loss, physical activity and diet. Eligible individuals include those with NDH (HbA_{1c} 42–47 mmol/mol [6.0–6.4%] or fasting plasma glucose 5.5–6.9 mmol/L) as well as other risk factors, such as polycystic ovary syndrome, history of GDM or schizophrenia.

Participants are identified through a variety of sources, which vary according to local care pathways. However, there are three primary mechanisms for referral (*Figure 2*):

- Those who have already been identified as having an elevated HbA_{1c} (or fasting plasma glucose) through their GP.
- Through the NHS Health Check programme.
- Opportunistic assessment and diagnosis of NDH as part of routine care.

It is envisaged that the NHS DPP and NHS Health Check programmes will run in parallel, particularly given the overlap in behaviour change support and treatment of newly identified risk factors or comorbidities, through integration with routine clinical provision in general practice.

Diabetes prevention: what works?

Intensive lifestyle therapy

Weight loss is known to enhance insulin sensitivity, reduce the workload on beta-cells, improve glucose tolerance in people with NDH and reduce progression from IGT to type 2 diabetes. A 5% reduction in body weight, which equates to a ~30% improvement in whole-body insulin sensitivity (Kitabchi et al, 2005), decreases the conversion rate of IGT to type 2 diabetes by 56% (Knowler et al, 2002). Moreover, a recent systematic review of 53 studies evaluating 66 different lifestyle intervention programmes demonstrated that, compared with usual care, diet and physical activity promotion programmes reduced type 2 diabetes incidence, body weight and fasting blood glucose, while also improving other cardiometabolic risk factors (Balk et al, 2015).

Potential new prevention strategies have also been explored, targeting sedentary behaviour (Wilmot et al, 2012; Henson et al, 2016a; 2016b), high-intensity interval training (Jelleyman et al, 2015) and consumption of sugar-sweetened beverages (Imamura et al, 2016). However, much of the work is still in its infancy and long-term data through randomised controlled trials are currently lacking.

Drug therapies

Lifestyle behaviour change to reduce the progression from NDH to type 2 diabetes

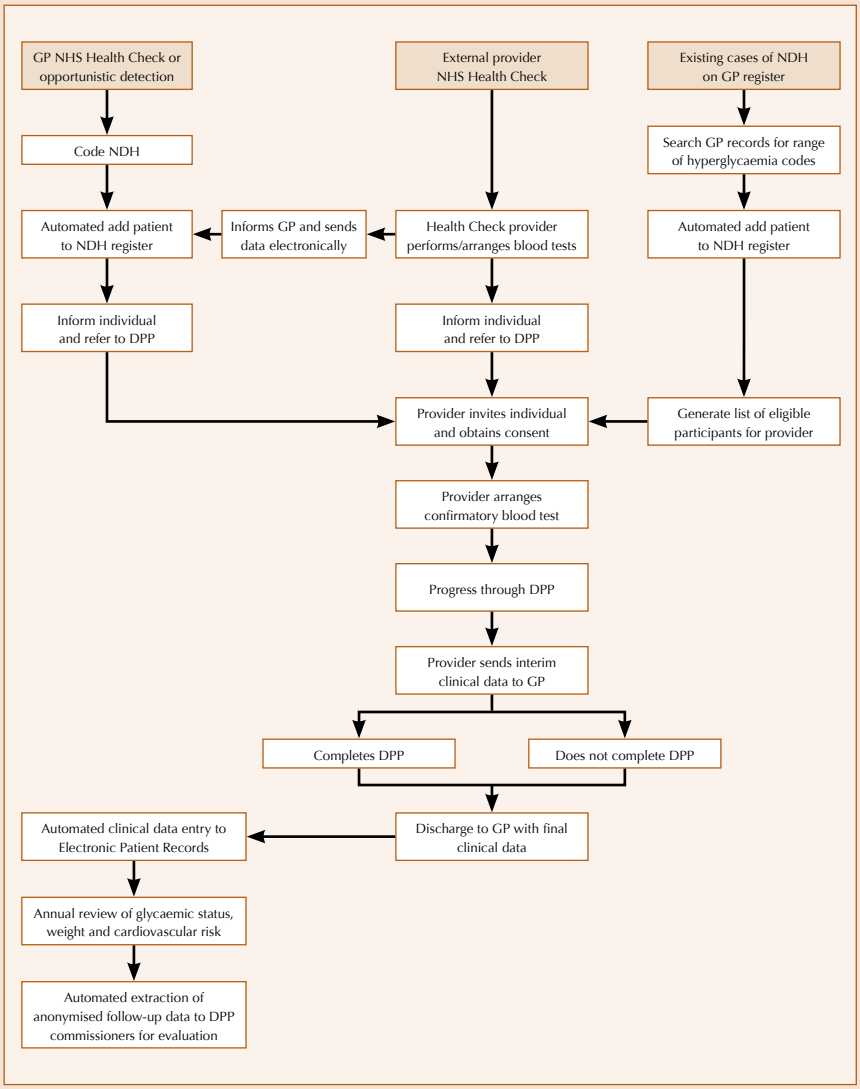

Figure 2. NHS Diabetes Prevention Programme Referral Pathway. Adapted from NHS DPP: Primary Care Toolkit (NHS DPP Programme Support Team, 2016)

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Page points

1. Metformin is currently the only antidiabetes agent recommended by NICE to reduce the progression from non-diabetic hyperglycaemia (NDH) to type 2 diabetes.
2. People who show worsening hyperglycaemia despite participation in an intensive lifestyle intervention and those who cannot participate are most likely to benefit.
3. Bariatric surgery is highly effective in preventing type 2 diabetes in obese people, particularly in those with NDH.
4. However, the benefits need to be weighed against the risks and side effects of the surgery and the life-long dietary changes required. On a population level, surgery is unlikely to be the solution to the obesity crisis.

remains challenging. In response, preventive pharmacotherapy has been proposed as an addition to lifestyle modification. To date, metformin is the only drug recommended by both NICE (2012) and the American Diabetes Association (2016) for use in adults at high risk of type 2 diabetes (e.g. those with a history of GDM and those who are very obese [BMI ≥35 kg/m^2]). Individuals who still show progression towards type 2 diabetes despite participation in an intensive lifestyle change programme are likely to yield the greatest benefit. This also extends to people who are unable to take part in a lifestyle change programme because of an underlying disability or for other medical reasons.

As preventive monotherapy, only metformin has been studied for longer than 3 years, and reductions in diabetes incidence have generally dissipated after discontinuation (Kahn and Davidson, 2014). That said, evidence from randomised controlled trials has also shown the potential of various other pharmacological therapies to prevent the progression to type 2 diabetes in people with NDH. For example, in a recent randomised, double-blind trial, liraglutide 3 mg/day restored normoglycaemia in 66% of people with NDH, compared with 36% of placebo recipients, after 3 years (le Roux et al, 2017). However, such agents are costly, and all require further study in the NDH population over a longer period of time. The benefits of pharmacotherapy also need to be weighed up against the side effects (Kahn and Davidson, 2014; RISE Consortium, 2014).

Considering the supporting evidence, safety and cost, metformin appears to be the best drug to reduce the incidence of diabetes, but success requires adherence to long-term treatment, which may be problematic. One possibility is a combination of lifestyle and pharmacological interventions. A recent study that added metformin in a step-wise manner to lifestyle education was shown to be an effective method for preventing or delaying diabetes in South Asian adults with NDH (relative risk reduction, 32%; Weber et al, 2016).

Bariatric surgery

Interest in the potential of metabolic surgery has grown over the past decade, fuelled by experimental evidence showing that rearrangements of GI anatomy can directly affect glucose homeostasis (Buchwald et al, 2009; Knop and Taylor, 2013).

The use of bariatric surgery in the prevention of type 2 diabetes in severely obese people has been investigated in the seminal Swedish Obese Subjects study, the first long-term, prospective trial providing information about the effects of surgically induced weight loss on the incidence of diabetes (Carlsson et al, 2012). A total of 1658 Swedish people were followed for 15 years after receiving bariatric surgery and compared with matched obese people who did not undergo surgery. Bariatric surgery reduced the relative risk of developing type 2 diabetes by 96%, 84% and 78% after 2, 10 and 15 years, respectively.

Interestingly, baseline BMI was not predictive of efficacy. Conversely, compared with normal fasting glucose levels, impaired fasting glucose at baseline was associated with a greater effect. The number needed to treat in order to prevent one diabetes case over 10 years was 1.3 in patients with NDH, compared with 7.0 in patients with normal fasting glucose (Carlsson et al, 2012).

The efficacy of bariatric surgery is impressive, especially when compared with diabetes prevention trials of lifestyle modification. However, these findings should be interpreted with a degree of caution. Caveats, including the practicality of bariatric surgery, the risk of major surgery and the long-term dietary changes required, should be considered carefully. Furthermore, the long-term outcomes are unknown.

Fundamentally, large public health problems such as the burden of type 2 diabetes are unlikely to be solved or reversed through surgical interventions, no matter how impressive the individual outcomes are. On a population level, even small non-surgical changes to the distribution of body weight can have a large benefit. For example, a 1% decrease in BMI across the whole population (roughly equal to a weight loss of 1 kg per person) would avoid between 179 000 and 202 000 incident cases of type 2 diabetes, around 122 000 cases of CVD and 32 000–33 000 cases of cancer over the next 20 years in the UK (Wang et al, 2011).

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Practical implementation of diabetes prevention at practice, CCG and Local Authority levels

The rapidly changing landscape for the provision of diabetes prevention has several implications for primary care. In order to support the NHS DPP and diabetes prevention in general, primary care is being asked to identify and code individuals at high risk of developing type 2 diabetes. Clearly, in the longer term, the early identification and subsequent reduction in the incidence of type 2 diabetes has the potential to reduce the clinical workload arising from the complications of the condition. In the shorter term, however, finding new individuals with NDH may actually increase practice workload.

In order to facilitate the integration of the NHS DPP with other initiatives, providers support much of the extra burden for delivery. A region-specific DPP provider works alongside Clinical Commissioning Groups (CCGs), directors of Public Health, Local Authorities and allied healthcare professionals, with oversight from regional clinical leads to streamline the referral process. Examples include discussing with practices how to standardise searches of practice records to identify individuals who have NDH, and how to minimise the data entry requirements for referral and agree a process of direct referral from providers of the NHS Health Check.

Following any referral from primary care, the provider will make contact with the individual in order to invite them onto the programme. The Healthier You service complements other pathways and existing local provisions are available to participants, such as Tier 2 weight management services (WMS), smoking cessation and NHS Choices. More than two thirds of people eligible for the NHS DPP will also have a BMI greater than 25 kg/m^2, so there will be cross-over with WMS. Where individuals are eligible for both Tier 2 WMS and the NHS DPP, it is suggested that they are prioritised for the NHS DPP, as this will offer an intensive and targeted intervention with specifically designed content for individuals at high risk of developing type 2 diabetes.

All of this highlights the complexity of assimilating several initiatives, and it is clear that true integration requires simultaneous change in numerous aspects of care, with a strategy that considers the wider picture.

Prevention strategies across the UK

The other UK nations employ their own type 2 diabetes prevention strategies. For example, in Scotland, the Diabetes Action Plan provides an opportunity for the diabetes community to work together to share best practice, support and deliver high-quality care. Amongst other priorities, the plan promotes a stronger emphasis on screening and prevention of diabetes (Scottish Government, 2010).

Similarly, NHS Wales has outlined national initiatives for the prevention of diabetes, which are focused around reducing weight, healthy eating and increasing physical activity. More specifically, Local Health Boards implement the All Wales Obesity Pathway as well as performance measures to prevent diabetes, as outlined in the Public Health Outcomes Framework, which was developed in the context of other national strategies and frameworks (NHS Wales, 2016).

In 2016, Northern Ireland initiated The Diabetes Strategic Framework and Implementation Plan, which sets out the strategic direction for diabetes and diabetes prevention services over the next 10 years (Department of Health Northern Ireland, 2016). They also use the Let's Prevent programme (Gray et al, 2012) within their Trusts.

The Republic of Ireland aims to launch its National Clinical Programme for Diabetes, which includes an emphasis on prevention, towards the end of 2017 (Health Service Executive, 2017). Moreover, the Walking Away from Diabetes programme is also offered in various locations. This is a 3-hour structured education programme for those with NDH, designed to target knowledge and perception of diabetes risk, and to help participants increase their physical activity levels within their own environments (Yates et al, 2012).

Other resources and higher-Tier services: what to do when there is no prevention programme

Although the NHS DPP offers national provision, not everyone in England will have access within

Read more online

Improving quality: The impact of formal impaired glucose regulation reviews in the primary care setting

Nicola Milne and Abdullah Ali discuss the impact of formal consultations providing lifestyle advice and interventions on outcomes for people with non-diabetic hyperglycaemia.

Diabetes & Primary Care **17**: 121–4

Available at:
https://is.gd/igrclinics

CPD module

Core aspects of care: Clinical presentations and diagnosis of diabetes

The latest evidence and recommendations on diagnosing diabetes and its various clinical presentations.

Diabetes & Primary Care **17**: 36–43

Available at:
https://is.gd/cpddiagnosis

CPD+

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"The introduction of the NHS Diabetes Prevention Programme heralds an exciting time for diabetes prevention, and although real-world translation remains a huge hurdle, it also represents the best opportunity to stem the tide of the UK diabetes epidemic."

the next phase of implementation. Even without a bespoke preventive framework funded through the NHS DPP or individual CCG-led initiatives, there is still much that general practice can achieve, however. For example, individuals with a high risk of diabetes can be identified and referred to appropriate Tier 2 services for related risk factors (i.e. obesity), given brief counselling on a healthy lifestyle, signposted to local council-run physical activity initiatives and be treated for related cardiovascular risk. Such interventions (delivered in groups or individually) can be initiated by GPs, nurses, healthcare assistants and professionals in the community. Individuals will undoubtedly have different motivations and different barriers to change, so support needs to be person-centred, holistic and responsive to individual needs (NICE, 2012).

In order to facilitate such changes, signposting to local services (which are often separate from general practice) can also provide high-risk individuals with a wide range of options, such as walking schemes, discounted gym access and cooking classes. Involving representatives from local councils in existing primary care forums, such as Protected Learning Time meetings, can help healthcare professionals gain knowledge of the resources available within their locality.

Conclusion

Targeting type 2 diabetes prevention through national policies that reduce food consumption and increase levels of physical activity is likely to be the most viable and cost-effective method, whilst continuing to experiment with novel approaches to behaviour modification. That said, solely relying on an individual's adherence to diet and physical activity recommendations may not be enough to delay progression for a large proportion of the at-risk population. Thus, attention must also be given to recommendations for pharmacological therapy or surgery in order to yield long-term societal benefits, whilst considering potential side-effects. Still, the introduction of the NHS DPP heralds an exciting time for diabetes prevention, and although real-world translation remains a huge hurdle, it also represents the best opportunity to stem the tide of the diabetes epidemic in England. ■

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Online CPD activity

Visit www.diabetesonthenet.com/cpd to record your answers and gain a certificate of participation

Participants should read the preceding article before answering the multiple choice questions below. There is ONE correct answer to each question. After submitting your answers online, you will be immediately notified of your score. A pass mark of 70% is required to obtain a certificate of successful participation; however, it is possible to take the test a maximum of three times. A short explanation of the correct answer is provided. Before accessing your certificate, you will be given the opportunity to evaluate the activity and reflect on the module, stating how you will use what you have learnt in practice. The CPD centre keeps a record of your CPD activities and provides the option to add items to an action plan, which will help you to collate evidence for your annual appraisal.

1. Approximately how many people in England are **ESTIMATED** to be at **HIGH RISK** of developing type 2 diabetes? Select **ONE** option only.

   A. 500 000
   B. 1 000 000
   C. 2 500 000
   D. 5 000 000
   E. 10 000 000

2. Which **ONE** of the following results is **DIAGNOSTIC** of non-diabetic hyperglycaemia (NDH)? Select **ONE** option only.

   A. Fasting plasma glucose 6.9 mmol/L
   B. HbA_{1c} 40 mmol/mol (5.8%)
   C. Random blood glucose 9.5 mmol/L
   D. Two-hour post-challenge blood glucose 12 mmol/L
   E. Urinalysis ++ glucose

3. According to NICE PH38 guidance, the use of a diabetes risk assessment score is **INAPPROPRIATE** for which **ONE** of the following? Select **ONE** option only.

   A. A 25-year-old Chinese woman
   B. A 36-year-old pregnant South Asian woman
   C. A 39-year-old African-Caribbean man
   D. A 42-year-old Caucasian man
   E. A 46-year-old African woman with polycystic ovarian syndrome

4. A 54-year-old Caucasian man has a blood pressure of 130/80 mmHg and a BMI of 35 kg/m^2. He has no family history of diabetes and takes no regular medication. What **ADDITIONAL** information is required to calculate his Leicester Diabetes Risk Score? Select **ONE** option only.

   A. Cholesterol level
   B. Postcode
   C. Smoking history
   D. Waist measurement
   E. Weekly exercise

5. When discussing lifestyle changes for a person regarded as at risk of developing diabetes, what is the **MINIMUM** recommended total amount of time per week of moderate physical activity? Select **ONE** option only.

   A. 100 minutes
   B. 150 minutes
   C. 200 minutes
   D. 250 minutes
   E. 300 minutes

6. A 56-year-old man is assessed as being at high risk of developing type 2 diabetes. According to current evidence, which **SINGLE** medication is **MOST** likely to reduce his likelihood of progression to type 2 diabetes? Select **ONE** option only.

   A. Acarbose
   B. Liraglutide
   C. Metformin
   D. Orlistat
   E. Pioglitazone

7. According to the Swedish Obese Subjects study, for obese people with NDH undergoing bariatric surgery, what was the approximate NNT (number needed to treat) to **PREVENT** one case of type 2 diabetes over 10 years? Select **ONE** option only.

   A. 1
   B. 5
   C. 10
   D. 50
   E. 100

8. A 50-year-old man of South Asian ethnic origin is being opportunistically screened for risk of developing type 2 diabetes. According to NICE, what is the BMI threshold **ABOVE WHICH** a screening blood test is recommended **WITHOUT** an initial risk stratification score? Select **ONE** option only.

   A. 20 kg/m^2
   B. 23 kg/m^2
   C. 25 kg/m^2
   D. 27 kg/m^2
   E. 30 kg/m^2

9. A 76-year-old asymptomatic man has a high diabetes risk score. His screening HbA_{1c} is 50 mmol/mol (6.7%). Which is the **SINGLE MOST** appropriate next management step? Select **ONE** option only.

   A. Code a diagnosis of type 2 diabetes
   B. Reassess his risk in 1 year
   C. Refer him to an intensive lifestyle change programme
   D. Repeat the HbA_{1c} test
   E. Start an antidiabetes agent

10. A 49-year-old woman has a high diabetes risk stratification score. Her screening HbA_{1c} is 40 mmol/mol (5.8%). According to NICE guidance, what is the **MINIMUM** recommended frequency of diabetes risk stratification reassessment for her? Select **ONE** option only.

    A. Every 6 months
    B. Annually
    C. Every 18 months
    D. Every 2 years
    E. Every 3 years

Appendix 1. NHS Diabetes Prevention Programme East Midlands case study.

The programme was rolled out in Summer 2016 across Nottinghamshire, Northamptonshire and Leicestershire by Ingeus, in partnership with the Leicester Diabetes Centre and under the coordination of the East Midlands Clinical Networks and Senate working with local Clinical Commissioning Groups (CCGs). The first phase of the Healthier You NHS DPP started within the CCGs in Nottingham City, Leicester City, Leicestershire and Rutland on 22 July 2016. The CCGs in Nottinghamshire County and Northamptonshire joined the programme in August.

By the end of March 2017, 4136 referrals to the NHS DPP had been received in the East Midlands:

- Nottinghamshire (six CCGs) – 1544 referrals
- Leicestershire (three CCGs) – 1941 referrals
- Northamptonshire (two CCGs) – 651 referrals

Uptake and retention rates to the programme are detailed below:

Core session attendance	
Session 1	83%
Session 2	77%
Session 3	75%
Session 4	76%

Maintenance session attendance	
Session 5	71%
Session 6	68%
Session 7	68%
Session 8	81%

On a national level, demonstrator sites have an uptake of ~60%. Data from two of the demonstrator sites show that there has been an overall weight change of –2.5 kg over 6–12 months. At the follow-up sessions, 75% of individuals had lost weight, with the average weight loss being 3.2 kg.