Healthcare Improvement Scotland | SIGN Evidence-based clinical guidelines

SIGN 172

Prevention and remission of type 2 diabetes

A national clinical guideline

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NHS SCOTLAND

Key to recommendations

This guideline has been produced by adopting and adapting recommendations from other high-quality guidelines (see section 8.1). The majority of recommendations are from National Institute for Health and Care Excellence (NICE) guideline PH38 Type 2 diabetes: prevention in people at high risk (published 2012, updated 2017, revalidated 2018) and NICE guideline CG246: Overweight and obesity management (published 2025). The types of recommendations included are:

R **Evidence-based recommendation** – formulated by the original guideline developers after a systematic review of the evidence.

✓ **Good practice point** – recommended best practice based on the clinical experience of the SIGN guideline development group.

Contents

1 Introduction

1.1 The need for a guideline

Type 2 diabetes occurs when the body no longer produces enough insulin to regulate blood glucose levels or has developed resistance to the insulin that is produced. Owing to recent scientific breakthroughs,[1,2] type 2 diabetes is no longer seen as a progressive and irreversible disease. We now know that prevention and remission are possible with clinically effective interventions, notably weight loss. This provides a powerful tool to address the rising trajectory of type 2 diabetes incidence and related ill health in Scotland. Remission of type 2 diabetes is only one aspect; prevention will reduce the number of people in Scotland developing the condition in the first place.

The number of people being diagnosed with type 2 diabetes is increasing every year. Currently, there are almost 300,000 people living in Scotland with type 2 diabetes, with new diagnoses in excess of 20,000 in 2022.[3] In England, 12% of the adult population (5.1 million) have prediabetes. If extrapolated to Scotland the estimate is around 500,000.[4] The number of people living with type 2 diabetes in Scotland increased by a third between 2011 and 2021.[5] Taking into account projected population changes over the next 20 years, Public Health Scotland estimates that the number of people living with diabetes in Scotland will increase by 36% by 2044.[5] The average age at which people are diagnosed is also decreasing, and is associated with a poorer prognosis. A diagnosis of type 2 diabetes at age 40 reduces life expectancy by around 10 years, driven by the increased risk of cardiovascular disease (CVD).[6]

The annual economic cost to Scotland of type 2 diabetes is estimated at £2.37 billion taking into account loss of productivity as a result of impaired health, direct healthcare costs and investment to mitigate the impact of obesity.[7] The cost to the NHS in Scotland of diabetes treatment alone is estimated at £1.6 billion (around 10% of total health expenditure).[7] Without further efforts to prevent type 2 diabetes and improve care for people with diabetes, these figures are predicted to grow.[7]

1.1.1 Social determinants of health

Type 2 diabetes does not affect our population equally. In Scotland, people living in the most deprived communities having a 77% greater chance of developing diabetes than those in the most affluent areas. The short-term mortality risk from type 2 diabetes is higher among those living in more deprived areas, with the impact on disability-adjusted life years in these communities also 2.5 times greater.[8] Uptake and completion of structured education and weight-management programmes is poorer in the most deprived areas (Scottish Index of Multiple Deprivation (SIMD) areas 1 and 2) despite around 50% of all referrals originating from people living in those areas.[9]

Many of the factors that drive type 2 diabetes risk cannot be controlled by the individual. These social determinants of health are the social, cultural, political, economic and environmental conditions into which people are born, grow up, live, work and age, and their access to power, decision making, money and resources that shape the conditions of their daily life. The social determinants of health influence a person's opportunity to be healthy, their risk of illness, health behaviours and healthy life expectancy. Health inequities result from the uneven distribution of these social determinants.[10] These have a significant impact on the ability to prevent and manage type 2 diabetes effectively.

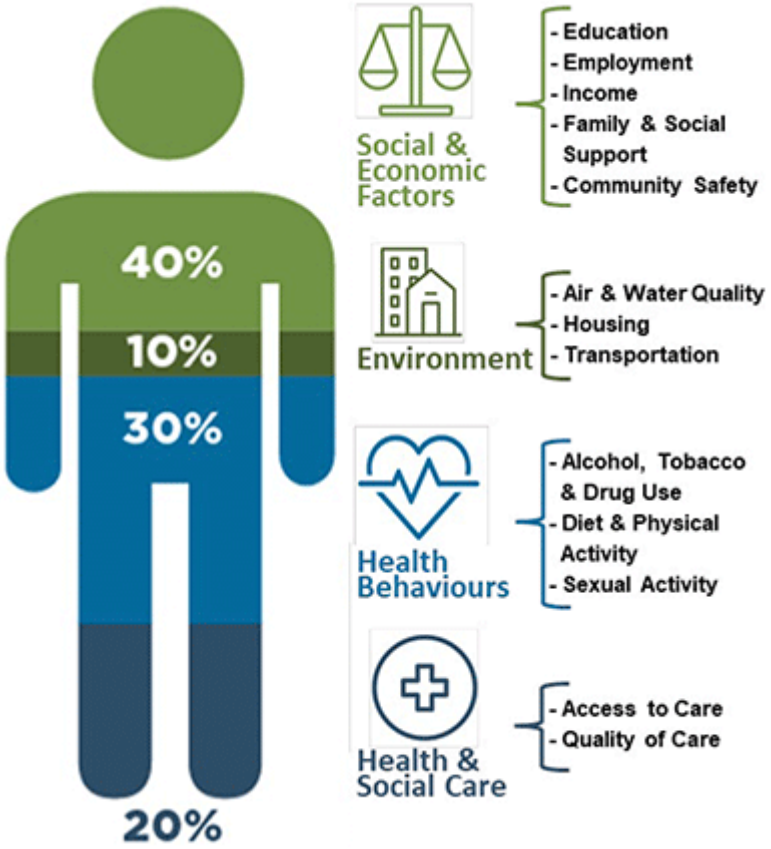


Figure 1: The social determinants of health (adapted by Scottish Government)[11] from The University of Wisconsin Population Health Institute,[12] Booske et al, 2010[13] and the King's Fund[14]

At the individual level, non-modifiable risk markers such as increased age, ethnicity and genetic predisposition contribute to a person's overall likelihood of developing type 2 diabetes. Even though some people may feel healthy, they can still be at risk of developing the condition.

At the time of type 2 diabetes diagnosis, people from minority ethnic populations, particularly those of South Asian ethnicity, in the United Kingdom (UK) are, on average, younger, have a lower body mass index (BMI), and higher haemoglobin A1c (HbA1c) levels than white or European populations (see Tables 1 and 2).[15-24]

Table 1: Average age range at diagnosis of type 2 diabetes in the UK[15-22,24]

Ethnicity	Mean age range (years)[16-21,24]	Median age range (years)[15, 22]	Number of studies (participants)
White or European	54.6–63.4	65.0–67.0	9 (646,378)
South Asian	46.0–53.0	55.0–67.0	9 (49,811)
Black or African-Caribbean	48.0–55.8	54.0–68.0	8 (22,064)
Chinese	56.7	60	2 (704)
Arab	n/a	56	1 (143)

Table 2: Mean BMI cut-offs for overweight and classes of obesity in the UK

Ethnicity	BMI cut-off 25kg/m^2 (overweight)[15]	BMI cut-off 30kg/m^2 (class 1 obesity)[15,22,23]	BMI cut-off 35 kg/m^2 (class 2 obesity)[23]
White or European	25.0	30.0	35.0
South Asian	19.2[a]	23.3–25.2[a]	Female 25.7[b] Male 27.1
Black or African-Caribbean	23.4	25.9–28.1	Female 29.0 Male 39.3
Chinese	22.2	24.6–26.9	Female 27.1 Male 28.3
Arab	22.1	26.6	Not included

[a] Indian, Pakistani, Bangladeshi, Nepali, Sri Lankan, and Tamil.
[b] Indian, Pakistani and Bangladeshi.

In Scotland 87% of people with type 2 diabetes are living with overweight or obesity, with 67% of the overall Scottish adult population living with a BMI over 25 kg/m^2.[25]

While healthcare professionals are unable to change the social determinants of health or non-modifiable risk factors, there is an opportunity to support some people to live healthier lives, in ways appropriate to their circumstances which might include weight loss.

1.1.2 Current provision

Current provision of weight management services for the prevention and treatment of type 2 diabetes differs across NHS boards. This includes variation in the type of programmes that are offered, duration and follow up, healthcare professionals involved in delivery, eligibility and access criteria for those services and where and how the services are delivered. Digitally enabled care for people with diabetes has rapidly increased and this will feature permanently in future delivery models, particularly as the needs of a growing number of people are sought.

This evidence-based guideline has the potential to improve and standardise the approach to identifying people at the highest risk of developing type 2 diabetes and ensure that programmes targeting type 2 diabetes prevention are more likely to be effective. There is also the potential to ensure more equitable access to services for people at high risk of, and living with, type 2 diabetes.

1.2 Underlying principles

1.2.1 Person-centred communication

A positive patient experience in healthcare communications leads to better health outcomes and enhanced clinical effectiveness. Communication of the recommendations in this guideline should be underpinned by best practice delivered through person-centred conversations. Healthcare professionals should adopt a collaborative, tailored and trauma-informed approach, recognising the person's individual and social context and resources. Positive interactions are likely to improve psychological wellbeing and be more effective in developing knowledge, skills and confidence to support behaviour change. These include communicating potentially difficult information about increased risk and avoiding stigma. Training resources to support person-centred conversations that respect the impact of lived experience of trauma are available:

- Having Realistic Conversations | Turas | Learn (nhs.scot)
- Module 1: Good conversations and empathy | Right Decisions (scot.nhs.uk)
- Trauma – national trauma transformation programme | NHS Education (scot.nhs.uk)

While lifestyle changes, especially weight loss, are a core part of the recommendations made in this guideline, it is important to consider when additional caution may be required in providing advice to minimise the risk of unintended harms. It is essential to ask permission before starting any discussions linked to overweight, obesity and central adiposity.[26] The stigma associated with living with obesity can be distressing for many people and can impact outcomes. It is essential that all healthcare professionals have an awareness and understanding of this and undertake suitable training on how to practice in a non-stigmatising way. Weight stigma, bias and discrimination can cause considerable harm including compromised psychosocial wellbeing, depressed mood, increased metabolic risk factors and lower self-esteem.[27] Public Health Scotland host a weight stigma learning hub, that is free to access, for all health professionals (see section 6.2.3).

1.2.2 People with suspected eating disorder

Additional caution is recommended in conversations with those who have, have had, or are suspected of having, an eating disorder of any kind. Weight-loss attempts may be contraindicated and may exacerbate or maintain the condition.[28] Prevalence of eating disorders in people living with overweight or obesity and in those at increased risk of, or with a diagnosis of, type 2 diabetes is unclear. Studies have shown that adults with binge eating disorder (BED) have a higher prevalence of type 2 diabetes.[29] People with lived experience have reported that their diabetes was diagnosed prior to their eating disorder being formally

diagnosed, despite having lived with an eating disorder for decades.[30]

People with both type 2 diabetes and an eating disorder are likely to need treatment for their eating disorder first, with the most appropriate service for this varying depending on local pathways in each health board. Weight-management services with specialist psychology resource can support treatment of binge eating difficulties, including BED, when this is picked up as part of the assessment process. However, there can often be a significant wait for an assessment. Consider local referral pathways, waiting times and the person's preferences when deciding between a referral to weight-management services, eating disorder services or mental health services.

1.3 Remit of the guideline

1.3.1 Overall objectives

This guideline provides recommendations based on current evidence for best practice in the prevention, early detection and early non-pharmacological and pharmacological treatment to reduce the risk of type 2 diabetes. It covers adults who are:

- at risk of developing type 2 diabetes
- clinically diagnosed with prediabetes, impaired glucose tolerance, impaired fasting hyperglycaemia or previous gestational diabetes
- recently diagnosed with type 2 diabetes.

It excludes children and the not-at-risk general population.

Management of type 1 diabetes (see SIGN 116 and SIGN 170) and the pharmacological treatment of people with type 2 diabetes (see SIGN 154) are not covered.

Further advice on the management of people with diabetes in pregnancy is available in SIGN 171.

1.3.2 Target users of the guideline

This guideline will be of interest to healthcare professionals in primary care, weight management services, psychology, maternal health and diabetes specialist clinics. It will also be of interest to those working in a wider community setting supporting comprehensive weight-management services, such as at leisure centres, community centres, workplaces and faith centres.

1.3.3 Lived-experience perspective

People with lived experience may have different perspectives on healthcare processes and outcomes from those of healthcare professionals. The involvement of people with lived experience in guideline development is therefore important to ensure that guidelines reflect their needs and concerns and address issues that matter to them.

Common concerns raised by groups and organisations as part of this process included:

- ensuring that conversations are person centred and sensitive
- the need for timely information, support and advice
- practical implications of being at risk of type 2 diabetes
- the mental health of people who have been diagnosed with type 2 diabetes
- the way people care for themselves before and after diagnosis is connected to quality of life.

1.3.4 Patient version

A plain language version of this guideline is available.

1.3.5 Equality

An equality impact assessment for the development of this guideline is available in the supporting material section for this guideline on the SIGN website, https://www.sign.ac.uk/our-guidelines/type-2-diabetes-prevention/

1.4 Statement of intent

This guideline is not intended to be construed or to serve as a standard of care. Standards of care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge and technology advance and patterns of care evolve. Adherence to guideline recommendations will not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results.

The ultimate judgement must be made by the appropriate healthcare professional(s) responsible for clinical decisions regarding a particular clinical procedure or treatment plan. This judgement should only be arrived at through a process of shared decision making with the patient, covering the diagnostic and treatment choices available. It is advised, however, that significant departures from the national guideline or any local guidelines derived from it should be documented in the patient's medical records at the time the relevant decision is taken.

1.4.1 Influence of financial and other interests

It is recognised that financial or academic interests may have an influence on the interpretation of evidence from clinical studies.

It is not possible to completely eliminate any possible bias from these sources, nor even to quantify the degree of bias with any certainty. SIGN requires that all those involved in the work of guideline development should declare all financial and academic interests, whether direct or indirect, annually for as long as they are actively working with the organisation. By being explicit about the influences to which contributors are subjected, SIGN acknowledges the risk of bias and makes it possible for guideline users or reviewers to assess for themselves how likely it is that the conclusions and guideline recommendations are based on a biased interpretation of the evidence.

Signed declarations of interests are retained by the SIGN Executive and are available on request.

1.4.2 Prescribing of licensed medicines outwith their marketing authorisation

Recommendations within this guideline are based on the best clinical evidence. Some recommendations may be for medicines prescribed outwith the marketing authorisation also known as product licence. This is known as 'off-label' use.

Medicines may be prescribed 'off label' in the following circumstances:

- for an indication not specified within the marketing authorisation
- for administration via a different route
- for administration of a different dose
- for a different patient population.

An unlicensed medicine is a medicine which does not have marketing authorisation for medicinal use in humans.

Generally, 'off-label' prescribing of medicines becomes necessary if the clinical need cannot be met by licensed medicines within the marketing authorisation. Such use should be supported by appropriate evidence and experience.[31]

"Prescribing medicines outside the conditions of their marketing authorisation alters (and probably increases) the prescribers' professional responsibility and potential liability."[31]

The General Medical Council (GMC) recommends that when prescribing a medicine 'off label,' doctors should:[32]

- be satisfied that there is no suitably licensed medicine that will meet the patient's need
- be satisfied that there is sufficient evidence or experience of using the medicine to show its safety and efficacy
- take responsibility for prescribing the medicine and for overseeing the patient's care, including monitoring the effects of the medicine, and any follow-up treatment, or ensure that arrangements are made for another suitable doctor to do so
- make a clear, accurate and legible record of all medicines prescribed and, when not following common practice, the reasons for prescribing an unlicensed medicine.

Non-medical and medical prescribers should ensure that they are familiar with the legislative framework and the Royal Pharmaceutical Society's Competency Framework for all Prescribers.[33]

Prior to any prescribing, the licensing status of a medication should be checked in the Summary of Product Characteristics (SmPc) (www.medicines.org.uk). The prescriber must be competent, operate within the professional code of ethics of their statutory bodies and the prescribing practices of their employers.[34]

1.4.3 Health technology assessment advice for NHSScotland

Specialist teams within Healthcare Improvement Scotland issue a range of advice that focuses on the safe and effective use of medicines and technologies in NHSScotland.

The Scottish Medicines Consortium (SMC) provides advice to NHS boards and their Area Drug and Therapeutics Committees about the status of all newly licensed medicines, all new formulations of existing medicines and new indications for established products. NHSScotland should take account of this advice and ensure that medicines accepted for use are made available to meet clinical need where appropriate.

The Scottish Health Technologies Group (SHTG) provides advice to NHSScotland on the use of new and existing health technologies (excluding medicines), likely to have significant implications for people's care.

2 Identifying people at high risk of type 2 diabetes

Some people have an increased risk of developing type 2 diabetes. These include people with CVD, hypertension, obesity, stroke, non-alcoholic fatty liver disease, polycystic ovary syndrome (PCOS), a history of gestational diabetes, mental health conditions and people with learning disabilities. Those attending emergency departments, emergency medical admissions units, vascular and renal surgery units and ophthalmology departments may also be at high risk.[35]

Prediabetes is defined clinically as an HbA1c level of 42–47 mmol/mol (6.0–6.4%) or a fasting plasma glucose (FPG) level of 6.1–6.9 mmol/L.[36] Prediabetes is more than just dysglycaemia; it is associated with an increased risk of all-cause death and CVD in both the general population and in those with established atherosclerotic CVD.[37] Risk of death in those with prediabetes, even when glucose levels are normalised, remains higher for those with obesity and lower for those who are physically active.[38]

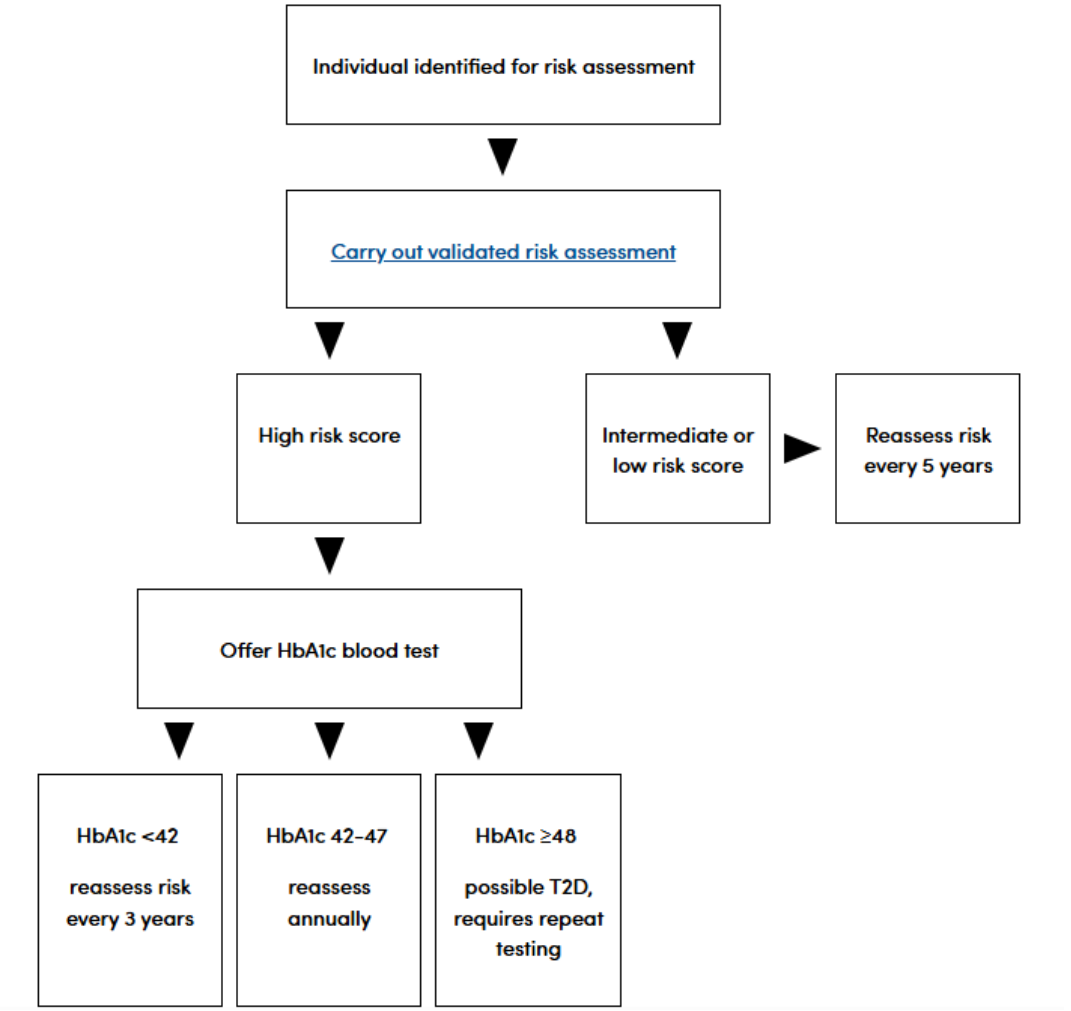
The recommendations in this section are adapted from sections 1.1–1.3 of the National Institute for Health and Care Excellence (NICE) public health guideline (PH) 38: Type 2 diabetes: prevention in people at high risk.[35] These recommendations follow a two-stage strategy to identify people at high risk of type 2 diabetes (or those with undiagnosed type 2 diabetes): risk assessment and subsequent blood testing for those with a high risk score. Whole population-level screening for type 2 diabetes is not recommended. In 2019 the UK National Screening Committee concluded that there is no evidence that population-level screening is more beneficial than not screening. For this reason, we recommend that approaches to risk assessment are targeted.

Encouraging more people to take a risk assessment and testing may add pressure on services, so support from a variety of access points in primary care and the potential for new approaches, such as home testing kits is needed (see section 7.1.4)

Advice for testing for diabetes in women with PCOS is available from NICE.[39]

Further information on risk assessment and follow up for cardiometabolic disease in people with psychosis or schizophrenia is available in the Positive Cardiometabolic Health Resource.[40]

Figure 2: Risk identification and HbA1c testing



2.1 Risk assessment

Risk assessment, alongside clinical judgement, can identify people who are at high risk of developing type 2 diabetes. The assessment may consider risk factors such as age, BMI, waist circumference, ethnicity, previous gestational diabetes and steroid or antipsychotic drug treatment. Validated computer-based self-assessment tools, like QDIABETES-18 or Diabetes UK's Know Your Risk, allow people to estimate risk without a blood test. These specific risk-assessment tools can be highlighted primarily by general practitioners (GP) and primary care nurses but also by a range of healthcare professionals in a variety of settings, including pharmacists, optometrists, occupational health nurses, and staff involved in the care of vulnerable groups.

People should not be excluded from any risk assessment on the basis of age alone.

The principle of informed consent requires healthcare professionals to fully inform patients of the consequences of any assessment or test.

Information on the implications of being at high risk and the consequences of developing the condition can be found on the Diabetes UK website. People at any level of risk can be signposted towards reliable trusted sources of support (see section 6.2).

R **Primary care healthcare professionals should implement a two-stage strategy to identify people at high risk of type 2 diabetes** (and those with undiagnosed type 2 diabetes)**.**

- **Firstly, a risk assessment should be offered.**
- **Secondly, for those with high risk scores, a blood test should be offered to investigate if they have type 2 diabetes or prediabetes.**

R **Encourage people in the following groups to have a risk assessment:**

• all adults aged 40 and above

• people aged 25 and above of South Asian, Chinese, African-Caribbean, Black, African and other high-risk Black and minority ethnic groups,

• adults with conditions associated with an increase the risk of type 2 diabetes.

✓ When raising the issue of risk with individuals, adopt a person-centred conversation approach underpinned by professional education and support.

R **Where risk assessment is conducted by health professionals in NHS settings outside general practice** (for example, in community pharmacies) **and the person is scored as high risk, the professionals involved should work to ensure the results are shared with the person and their GP practice (**with permission**).**

R **Primary care providers should record risk assessments that score as high risk to ensure appropriate follow up and continuity of care, with consent from the individual.**

✓ Robust approaches to follow up and recording (with permission) should be applied in point-of-care pharmacy testing and home blood testing.

2.2 Testing for prediabetes

People identified with known risk factors associated with the development of type 2 diabetes should be followed up with further diagnostic tests. The aim of the blood test is to check if the person has type 2 diabetes or to confirm their level of risk of progression to type 2 diabetes and discuss how to reduce it.

An HbA1c test measures the amount of glycated haemoglobin in venous blood. As individuals do not need to fast, and the test gives an average blood glucose over the previous 2–3 months, it is the preferred test. An HbA1c level of 42–47 mmol/mol (6.0–6.4%) indicates prediabetes.[36]

Plasma or capillary blood taken after a fast of 8–10 hours is tested in an FPG test. An FPG of 6.1–6.9 mmol/L is diagnostic of prediabetes.[36]

The 2-hour oral glucose tolerance test (OGTT) assesses the body's ability to process a large amount of glucose. Following a fast of 8–10 hours a baseline FPG test is carried out. Then the patient is given 75 g of glucose in a solution. A second blood sample is taken 2 hours later and glucose is measured again to assess how well the patient handled the glucose load.

Blood tests should be carried out by accredited methods either within laboratories or by point-of-care testing methodologies. All methods should be monitored appropriately, and clinical governance procedures should be in place to assure the validity of the results produced. These processes must include adequate training of operators and the performance of regular quality control processes.

When interpreting results, it is important to consider other clinical conditions and medicines that may cause transient hyperglycaemia, such as long-term high-dose steroid therapy. Consideration should also be given to people with haemoglobinopathies and anaemia, in whom the measurement of HbA1c may not be accurate or may need adjusted.

The following recommendations are from sections 1.4, 1.5 and 1.6 of NICE PH38: Type 2 diabetes: prevention in people at high risk.[35]

R **Trained healthcare professionals should offer and follow up with venous blood tests** (HbA1c or fasting plasma glucose) **to adults with high risk scores.**

✓ In pregnant women an oral glucose tolerance test is acceptable as initial identification.

✓ Primary care consultations are important opportunities to identify individuals at elevated risk and an opportunity to make a shared decision on whether or not a diagnostic test is indicated.

✓ People should be fully informed about the blood test and possible implications before consenting. It is vital that robust decision and intervention pathways are available and explained to patients when test results are discussed.

R **For people with possible type 2 diabetes** (HbA1c of 48 mmol/mol (6.5%) or above, or fasting plasma glucose of 7.0 mmol/L or above, but no symptoms of type 2 diabetes) **carry out a second blood test within 3 to 6 months of the original test. If type 2 diabetes is not confirmed, offer them a referral to a local, quality-assured, intensive treatment programme for prediabetes.**

R **Offer people with a high risk score and HbA1c of 42 –47 mmol/mol** (6.0–6.4%) **or fasting plasma glucose of 6.1–6.9 mmol/L a blood test at least once a year** (preferably using the same type of test)**. This includes people without symptoms of type 2 diabetes whose:**

- **first blood test measured an HbA1c of 48 mmol/mol** (6.5%) **or greater, or fasting plasma glucose at 7.0 mmol/L or above, but**
- **second blood test did not confirm a diagnosis of type 2 diabetes.**

2.2.1 Clinical coding

Record keeping supports following up and reassessing risk. As part of the system of record keeping and recall, the clinical coding is essential. Following a more uniform approach nationally to primary care coding of those known to be at high risk of developing type 2 diabetes is suggested.

✓ Primary care providers should consider maintaining a register of patients with prediabetes and annually review and record their weight and risk factors. If the patient has comorbid cardiometabolic conditions these checks could be captured in the same annual review.

✓ On diagnosis, use a single Read code for prediabetes (C11y5 – pre-diabetes), which is inclusive of prediabetes, impaired glucose tolerance, impaired fasting glycaemia and non-diabetic hyperglycaemia. In Vision use #C11y5 to locate the correct code.

The additional recall code should be used to ensure patients with prediabetes are followed up appropriately (66Az. - high risk of diabetes annual review).

2.2.2 Testing after gestational diabetes mellitus

Clinical cut-offs for defining individuals at high risk of developing type 2 diabetes differ slightly for those who have had gestational diabetes mellitus (GDM). The following recommendations are from SIGN 171: Management of diabetes in pregnancy and are based on evidence in the post-GDM population. They should not be applied to the general population.

R **Advise women who were diagnosed with gestational diabetes and who have tested postnatally with an HbA1c level below 39 mmol/mol** (5.7%) **or a fasting plasma glucose below 6.0 mmol/L that they have a low probability of having diabetes at present, and they:**

- **should continue to follow the lifestyle advice** (including weight management, diet and exercise) **given after the birth**
- **will need an annual test to check that their blood glucose levels are normal.**

R **Advise women who were diagnosed with gestational diabetes and who have tested postnatally with an HbA1c level between 39 and 47 mmol/mol** (5.7% and 6.4%) **or a fasting plasma glucose between 6.0 and 6.9 mmol/L that they are at high risk of developing type 2 diabetes, and offer them advice, guidance and interventions.**

R **Advise women who were diagnosed with gestational diabetes and who have tested postnatally with an HbA1c level of 48 mmol/mol** (6.5%) **or a fasting plasma glucose of 7.0 mmol/L or above that they have type 2 diabetes and refer them for further care.**

2.3 Reassessing risk

The following recommendations are from sections 1.6 of NICE PH38: Type 2 diabetes: prevention in people at high risk.[35]

R **Offer a reassessment based on the level of risk. Use clinical judgement to determine when someone might need to be reassessed more frequently, based on their combination of risk factors.**

R **Offer to reassess people with a high risk score, but with an HbA1c less than 42 mmol/mol** (6.0%) **or a fasting plasma glucose less than 6.1 mmol/L or, every 3 years.**

R **Offer to reassess people with a low or intermediate risk score every 5 years using a validated risk-assessment tool.**

3 Preventing progression from prediabetes to type 2 diabetes

Following a diagnosis of prediabetes (HbA1c level of 42–47 mmol/mol (6.0–6.4%) or an FPG level of 6.1–6.9 mmol/L) it may be possible to prevent or delay progression to type 2 diabetes by addressing modifiable risk factors.

Personalised assessment and advice tailored to the individual that takes into consideration their needs, preferences and social determinants of health (see section 1.1) are key. Evidence-based behavioural changes may be very challenging for some people, for example, their social and financial circumstances may make certain eating patterns or food choices difficult. An individual's circumstances could change, so this tailored approach is appropriate at any point of contact throughout an individual's prevention journey. Goal setting is therefore an ongoing process.

This section focuses on the content and delivery of type 2 diabetes prevention programmes. A type 2 diabetes prevention programme is an evidence-based, quality-assured programme that incorporates dietary change guidance with energy restrictions and physical activity, underpinned by behaviour change. The aim is to achieve a healthy weight and maintain this in the long term.

The recommendations are adapted from sections 1.7–1.14 of NICE PH38: Type 2 diabetes: prevention in people at high risk.[35] Recommendations were identified for self management, lifestyle, diet, weight management, physical activity and behaviour change. No recommendations were identified for standalone education interventions or psychological wellbeing interventions. People at increased risk for cardiovascular disease and hypertension, lipids and smoking status should be assessed and managed as part of holistic care. While the following risk factors are not covered in the recommendations, advice, signposting or referral to relevant services should be given to people on smoking, alcohol and sleep.

R **In those with risk factors, reassess the individual's risk factors at least once a year, and review any changes in behaviour or social circumstances or any practical lifestyle changes people at high risk have made. Use the review to help reinforce engagement in reducing modifiable risk behaviours. The review could also provide an opportunity to discuss any barriers and to help motivate people to restart any positive behaviours that may have lapsed.**

R **Tailor consultation to consider systemic, structural and socioeconomic factors.**

R **For people with a diagnosis of prediabetes** (a high risk score and an HbA1c of 42–47 mmol/mol (6.0–6.4%) or a fasting plasma glucose of 6.1–6.9 mmol/l)**:**

- **Tell them they have prediabetes but that this does not necessarily mean they will progress to type 2 diabetes. Explain how their risk can be reduced. Briefly discuss their particular risk factors, identify which ones can be modified and discuss how they can achieve this.**
- **Offer them referral to evidence-based, quality-assured programmes which include behaviour change, support on diet, physical activity and the wider social determinants of health.**

Signpost them to access additional information, support and services from reliable sources (see section 6.2)**.**

3.1 Components of an effective type 2 diabetes prevention programme

The following recommendations are from section 1.9 of NICE PH38: Type 2 diabetes: prevention in people at high risk.[35]

R **Lifestyle behaviour-change programmes should offer ongoing tailored advice, support and encouragement to help people:**

- **lose weight towards a healthier body weight**
- **eat regularly, and develop and maintain healthy eating behaviours**

undertake at least a level of physical activity that is in line with government recommendations.

3.1.1 Supporting behavioural change

R **Use defined behaviour-change techniques, including:**

- **Providing information: check and build on what individuals already know about healthy behaviours that help to achieve and maintain a healthy weight.**
- **Exploring and enhancing individuals' motivation about behaviour change and their confidence about making changes.**
- **Goal setting: identify what positive long-term outcomes people want, and help them to set short-term goals related to a specific eating behaviour or physical activity to achieve this.**
- **Action planning: support individuals to develop a plan focusing on a specific eating behaviour or physical activity they intend to change, including when, where and how they will do this.**
- **Coping plans and relapse prevention: support individuals to identify and problem-solve barriers to maintaining healthful eating habits and physical activity. The aim is to review progress, adjust goals and move towards long-term, sustainable healthy habits.**

✓ Incorporate psychological wellbeing support into all aspects of prevention and early management of type 2 diabetes.

Psychological support for people on a type 2 diabetes prevention programme can help explore and overcome barriers to success. Specific behaviour-change techniques are defined in Online Tools for Behaviour Change.[41] Training in the use of health behaviour-change techniques is delivered by the NHS Education for Scotland (NES) Motivation, Action and Prompts (MAP) programme: Behaviour change for health | NHS Education for Scotland

3.1.2 Diet and weight management

People living with overweight or obesity are at increased risk of developing prediabetes and type 2 diabetes.[35] Dietary guidance including healthful eating and weight management can impact on the prevention and remission of type 2 diabetes alongside improving glycaemic control, reducing the risk of complications and improving quality of life and life expectancy.[42] No single diet or weight-management approach is recommended as the superior choice for the prevention of type 2 diabetes. The key aspects are about acceptability and sustainability for the individual.

Dietary guidance should promote self management and always consider an individual's treatment goals as well as practical challenges, values, cultural appropriateness, preferences, social circumstances and income.

In addition to BMI, waist circumference and waist-to-height ratio can be used to measure overweight and obesity.[26]

Public Health Scotland standards for weight management set out standards for targeted

lifestyle weight management interventions (Tier 2) and specialist services to manage complex cases (Tier 3). Pharmacological therapies may be used at any stage in the model (see section 4). NHS boards should take account of these standards and the pathways of care outlined in the Framework for the prevention, early detection and early intervention of type 2 diabetes (see Figure 3).[42,43]

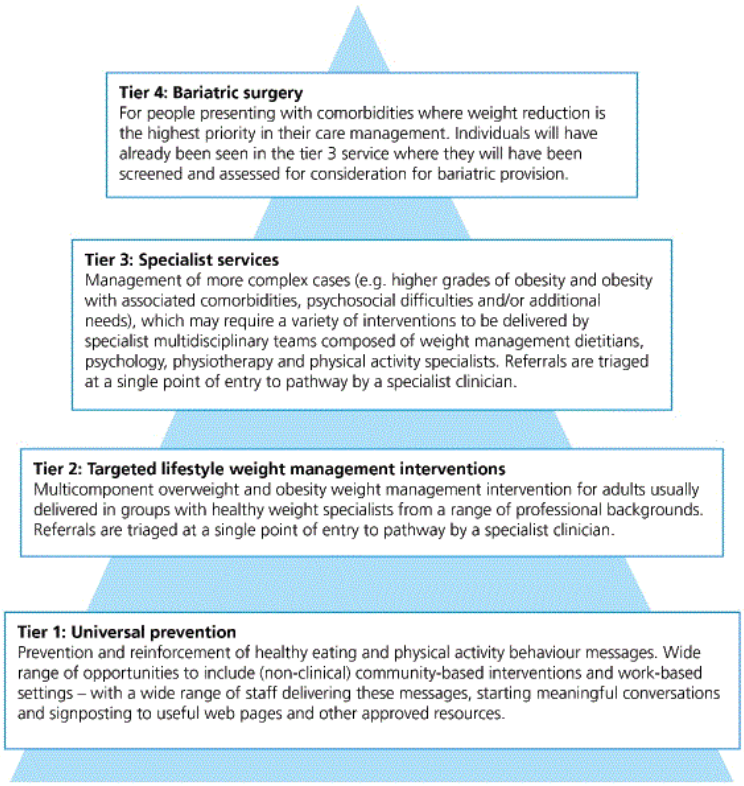
The Standards for weight management include the following criteria for weight-management services:[42]

• include both tier 2 and tier 3 services as described by the tiered approach to prevention and management of overweight and obesity for adults (see Figure 3).(Essential)

• adopt the following referral criteria: BMI:

- Services should make provisions so that adults with a BMI ≥30 kg/m^2 are eligible for referral to weight-management services. (Essential)
- Where there is capacity, adults with a BMI ≥25 kg/m^2 should be able to access the service. (Desirable)
- Lower eligibility criteria should be applied for black African, African-Caribbean and Asian groups. Individuals from these groups are at an increased risk of conditions such as type 2 diabetes at a lower BMI. BMI ≥23 kg/m^2 indicates increased risk and BMI ≥27.5 kg/m^2 indicates high risk. (Essential)
- Services should make provisions so that adults with a BMI ≥25 kg/m^2 who are at moderate and high risk (as identified through risk stratification) of developing type 2 diabetes are eligible for referral to weight-management services. (Essential)
- In cases where BMI entry criteria differs from national guidance, NHS boards must offer clear justifications for doing so.[42]

Figure 3: Tiered approach to prevention and management of overweight and obesity for adults



Reprinted with permission from Public Health Scotland, Standards for the delivery of tier 2 and tier 3 weight-management services for adults in Scotland 2019.[42]

A range of foods and dietary patterns are suitable for weight management (see Diabetes UK and the UK Government's Eatwell guide). The focus is on including vegetables, whole fruits, wholegrains, beans, pulses, nut and seeds and non-hydrogenated fats and oils, and

reducing highly processed meats and high-fat products, sodium, sugary foods and refined grains.

The recommendations are adapted from sections 1.13–1.14 of NICE PH38: Type 2 diabetes: prevention in people at high risk.[35]

R **Encourage people to:**

- **increase their consumption of wholegrains, vegetables and other foods that are high in dietary fibre**
- **reduce the total amount of fat in their diet**
- **eat less saturated fat.**

R **Advise and encourage people living with overweight and obesity to reduce their weight by reducing their calorie intake. Explain that losing 5–10% of their weight is a realistic initial target that would help reduce their risk of type 2 diabetes and also lead to other significant health benefits.**

The following recommendation is based on the expert opinion of the guideline development group.

R **Offer people with prediabetes or type 2 diabetes a structured weight-loss programme, in line with Public Health Scotland standards for weight management.**

3.1.3 Physical activity

The UK Chief Medical Officers' physical activity guidelines outline the weekly minimum recommendation for adults, with a clear distinction between 'moderate' and 'vigorous' physical activity. As with other components of the prevention programme, if this aspect is not being achieved then a personalised approach that finds out more about the barriers and takes personal circumstances and physical ability into consideration will help to establish what is most achievable for the individual. Physical activity does not necessarily mean exercise; daily physical household tasks, for example, can also contribute to health improvements.

R **Routinely discuss the individual's level of physical activity. Where someone is not meeting the recommended minimum, explore the barriers to this. Explain that even small increases in physical activity, such as reducing sedentary behaviour, will be beneficial and can act as a basis for future improvements.**

✓ Use a validated tool, such as the Scottish Physical Activity Screening Questionnaire (SCOT-PASQ), to assess the individual's level of physical activity. This can be remeasured frequently to assess progress.

✓ In shared decision-making discussions about someone's options for physical activity, be sensitive to any individual barriers such as health conditions, physical disabilities or eating disorders (see SIGN 164: Eating disorders).

R **Consider referring people who want structured or supervised exercise to an exercise referral scheme or supervised exercise sessions.**

3.2 Delivering an effective diabetes prevention programme

The effectiveness of a diabetes prevention programme relies as much on its delivery as its content. The following recommendations are adapted from sections 1.5 and 1.8 of NICE PH38: Type 2 diabetes: prevention in people at high risk.[35]

R **When planning local or national services to deliver evidence-based, quality-assured programmes where the availability of places is limited, prioritise people with an HbA1c of 44–47 mmol/mol** (6.2–6.4%) **or a fasting plasma glucose of 6.5-6.9 mmol/L.**

R **Provide specially designed and quality-assured intensive lifestyle-change programmes for groups of people at high risk of developing type 2 diabetes.**

R **Involve the target community** (including community leaders) **in planning the design and delivery of the programme to ensure it is sensitive and flexible to the needs, abilities and cultural or religious norms of the community. For example, the programme should offer practical learning opportunities, particularly for those who have difficulties with communication or literacy or whose first language is not English.**

R **Ensure programmes are delivered by practitioners with relevant knowledge and skills who have received externally accredited training. Where relevant expertise is lacking, involve health professionals and specialists** (such as dietitians and health psychologists) **in the design and delivery of services.**

R **Ensure programmes adopt a person-centred, empathy-building approach. This includes finding ways to help participants make changes by understanding their beliefs, needs and preferences. It also involves building their confidence and self efficacy over time.**

R **Ensure programme components are delivered in a logical progression. For example, discussion of the risks and potential benefits of lifestyle change; exploration of someone's motivation to change; action planning; self monitoring and self regulation.**

R **Ensure groups meet at least eight times over a period of 9 to 18 months. Participants should have at least 16 hours of contact time either within a group, on a one-to-one basis or using a mixture of both approaches.**

R **Offer more intensive support at the start of the programme by delivering core sessions frequently** (for example, weekly or fortnightly)**. Reduce the frequency of sessions over time to encourage more independent lifestyle management.**

R **Allow time between sessions for participants to make changes to their lifestyle and to reflect on and learn from their experiences. Also allow time during sessions for them to share this learning with the group.**

R **Deliver programmes in a range of venues such as workplaces, leisure, community and faith centres, and outpatient departments and clinics. Run them at different times, including during evenings and at weekends, to ensure they are as accessible as possible.**

SHTG found that digitally delivered type 2 diabetes prevention programmes were as effective as traditional in-person programmes.[44] The programmes assessed delivered information, advice and support using a combination of digital technologies, such as smartphone apps, websites, videoconferencing, asynchronous communications and wearable devices such as smartwatches.

R **Accredited, certified technology-assisted type 2 diabetes prevention programmes should be considered as part of a standard menu of options for delivery.**

✓ Consider the use of technology-assisted type 2 diabetes prevention programmes, with culturally competent educational content, available in a range of languages, with interpretation services available for people whose first language is not English.

R **As part of the programme, offer referral to, or seek advice from, people with specialist training where necessary. For example, refer someone to a dietitian for assessment and specialist dietary advice if required.**

R **Following the initial intervention, offer follow-up sessions at 3-month intervals usually up to 12–15 months, and thereafter at appropriate intervals according to clinical need. The aim is to reinforce behaviour change and to provide ongoing support. Larger group sizes may be feasible for these maintenance sessions, depending on service provision and individual's needs.**

R **Link the programmes with ongoing weight management and other prevention initiatives that help people to change their diet or become more physically active.**

✓ Consider onward referral to services, such as community link workers, where the individual has wider support needs.

✓ Support patients with ongoing lifestyle changes by signposting to appropriate resources (see section 6.2).

3.3 Self management

Referral to weight-management services or to a type 2 diabetes prevention programme might not be the most appropriate route for everyone. Self-monitoring techniques can support an individual to increase their physical activity (using a smart watch or step counter, for example) and to lose weight (by weighing themselves or measuring their waist circumference), as well as support other aspects of health such as improving sleep. People should be signposted to appropriate resources (see section 6.2).

R **Individuals should be encouraged to use self-monitoring techniques. Discuss with and support them to review their progress towards achieving their goals, identify and find ways to solve problems and then revise their goals and action plans, where necessary. The aim is to encourage them to develop confidence in their own self-management skills.**

4 Pharmacological interventions to prevent type 2 diabetes

Interventions designed to improve diet and physical activity and reduce excess body weight and ectopic fat remain the cornerstone of treatment for type 2 diabetes risk reduction (see section 3). Recent developments in obesity pharmacotherapy create new possibilities for using these medications as an adjunct to diet and physical activity for the prevention of type 2 diabetes.

There are a number of digital weight-management technologies, available online or via an app, that can support prescribing and monitoring weight-management medicine.[45]

✓ Consider the use of digital technologies to enable more people to access appropriate support for pharmacological interventions to prevent the development or progression of their prediabetes.

The following recommendation, adapted from NICE PH38: Type 2 diabetes: prevention in people at high risk, applies when prescribing any of the medicines in this section.

R **Encourage individuals to adopt a healthful diet and be as active as possible. Where appropriate, emphasise the added health and social benefits of physical activity.**

4.1 Incretin-based therapies

Incretin-based therapies demonstrate the potential to treat obesity and type 2 diabetes and reduce cardiovascular disease risk.[46-48]

These medicines are licensed in the treatment of people living with obesity for use as an adjunct to a reduced-calorie diet and increased physical activity. Clinical trials demonstrated that when used alongside non-pharmacological therapies, incretin-based therapies were more effective for weight loss than non-pharmacological therapies alone.[49,50]

4.1.1 Glucagon-like peptide-1 receptor agonists

GLP-1 RAs mimic the GLP-1 hormone naturally produced in the body. They act by increasing insulin secretion, suppressing glucagon secretion, delaying gastric emptying so increasing satiety and acting via the central nervous system to reduce hunger and appetite. They can therefore be used to achieve and sustain weight loss for the prevention of type 2 diabetes.

Liraglutide (Saxenda) is accepted for restricted use by the SMC as an adjunct to a reduced-calorie diet and increased physical activity for weight management in adults.

The SMC restriction is people with BMI of ≥35 kg/m^2 * with:

- Non-diabetic hyperglycaemia (prediabetes) at high risk of type 2 diabetes which is defined as having either:
    - fasting plasma glucose level of 5.5–6.9 mmol/L or
    - HbA1c of 6.0–6.4% (42–47 mmol/mol), and
- High risk of cardiovascular disease (CVD):
    - total cholesterol >5mmol/L, or
    - high-density lipoprotein (HDL) <1.0mmol/L for men and <1.3mmol/L for women, or
    - systolic blood pressure (SBP) >140mmHg

Patients should be treated in a specialist weight management service.

Semaglutide (Wegovy) is accepted for restricted use by the SMC as an adjunct to a reduced-calorie diet and increased physical activity for weight management, including weight loss and weight maintenance, in adults.

The SMC restriction is people with BMI of ≥30kg/m2* in the presence of at least one weight-related comorbidity. Patients should be treated in a specialist weight management service.

*For both liraglutide and semaglutide, the SMC restriction notes that a lower BMI cut-off may be more appropriate for those from minority ethnic groups known to be at equivalent risk of the consequences of obesity at a lower BMI than the white population (see section 1.1.1).

R **Liraglutide should be considered as an adjunct to a reduced-calorie diet and increased physical activity for weight management in adults with a BMI ≥35 kg/m^2 with prediabetes** (or lower for people from minority ethnic groups at increased risk of diabetes**). Patients should be treated within a specialist weight management service.**

R **Semaglutide should be considered as an adjunct to a reduced-calorie diet and increased physical activity for weight management in adults with a BMI 30 kg/m^2 with prediabetes** (or lower for people from minority ethnic groups at increased risk of diabetes**). Patients should be treated in a specialist weight management service.**

The Scottish Government has issued a statement to NHS boards on a phased approach to implementation of the SMC advice (see section 7.1.4).

4.1.2 Glucose-dependent insulinotropic polypeptide dual receptor agonists

Glucose-dependent insulinotropic polypeptide dual receptor agonists (GLP-1/GIP RAs) are the most recent type of anti-obesity medicine to be approved for restricted use in Scotland.

Tirzepatide is accepted for restricted use by the SMC as an adjunct to a reduced-calorie diet and increased physical activity for weight management. The SMC restriction is: for use in adults with BMI ≥30 kg/m2* and at least one weight-related comorbidity (including prediabetes).[51]

*A lower BMI cut-off may be more appropriate for those from minority ethnic groups known to be at equivalent risk of the consequences of obesity at a lower BMI than the white population (see section 1.1.1).

R **Tirzepatide should be considered as an adjunct to a reduced-calorie diet and increased physical activity for weight management in adults with prediabetes or type 2 diabetes with a BMI ≥30 kg/m^2** (or lower for people from minority ethnic groups at increased risk of diabetes**)**

The Scottish Government has issued a statement to NHS boards on a phased approach to implementation of the SMC advice (see Section 7.1.4).

4.2 Metformin

Metformin is a glucose-lowering drug which has been shown to prevent progression from prediabetes to type 2 diabetes. It is not indicated for weight management.

The following recommendation on metformin are adapted from section 1.19 of NICE PH38: Type 2 diabetes: prevention in people at high risk.[35]

R **Use clinical judgement on whether** (and when) **to offer metformin to support lifestyle change for people whose HbA1c or fasting plasma glucose blood test results have deteriorated if:**

- **this has happened despite their participation in intensive lifestyle-change programmes or**
- **they are unable to participate in an intensive lifestyle-change programme particularly if they have a BMI greater than 35.**

R **Start with a low dose** (for example, 500 mg once daily) **and then increase gradually as tolerated, to 1,500 to 2,000 mg daily. If the person is intolerant of standard metformin consider using modified-release metformin.**

✓ Check the person's renal function before starting treatment with metformin, and then annually (more often if they are older or if deterioration is suspected).

R **Long-term use of metformin may be associated with biochemical vitamin B12 deficiency; consider annual review of vitamin B12 levels in metformin-treated individuals, especially in those with anaemia or peripheral neuropathy.**

✓ Individuals should be advised to withhold metformin if they have nausea, vomiting or dehydration (using Medication Sick Day guidance).

4.3 Orlistat

Some people may not tolerate GLP-1 RAs or GLP-1/GIP RAs. Orlistat, a medication for managing weight by preventing the absorption of fat, may be more appropriate for them. NICE advise that orlistat therapy should only continue beyond 3 months if the person has lost at least 5% of their initial body weight since starting drug treatment.[26]

The following recommendation is adapted from section 1.20 of NICE PH38: Type 2 diabetes: prevention in people at high risk,.[35]

R **Use clinical judgement on whether to offer orlistat to people with a BMI of 28 kg/m^2 or more, as part of an overall plan for managing obesity. Take into account the person's risk and the level of weight loss and lifestyle change required to reduce this risk.**

5 Achieving remission

5.1 Non-pharmacological approaches

Early in the course of type 2 diabetes, it is possible for some people to achieve remission from the condition through weight loss. Remission is defined as HbA1c remaining below 48 mmol/mol or 6.5% for at least 3 months, without diabetes medication.[52] Achieving remission reduces complications from type 2 diabetes and allows people to experience a greater quality of life.

Remission of type 2 diabetes is directly related to the amount of weight lost, with clinical trial data showing that the vast majority (85%) of trial participants who lost more than 15 kg achieved remission.[53]

The following is adapted from recommendation 5 (page 759) of Diabetes Canada clinical practice guideline on remission of type 2 diabetes.[53]

> **R** **Low-calorie (~800 to 850 kcal/day) diets with meal replacement products for 3 to 5 months aimed at achieving >15 kg body weight loss, followed by structured food reintroduction and increased physical activity for weight-loss maintenance, and with behavioural support, should be considered for type 2 diabetes remission in non-pregnant adults.**

The combination of weight loss and optimisation of lifestyle interventions is the primary intervention. Low-calorie diet, which has been well researched, is only one method of weight loss; other methods may be more appropriate. More research is required on the contribution of physical activity (which offers other physical and mental health benefits) to remission.

Behavioural and psychological support underpins delivery of a structured programme. Be aware of other conditions (such as eating disorders, see SIGN 164: Eating disorders) and screen and assess appropriately before the commencement of intensive weight-management programmes such as these.[42]

The aim is to achieve remission as soon as possible after diagnosis. Many people can achieve remission without a structured evidence-based programme if signposted to effective methods of weight loss. However, the additional support and professional input may be more beneficial for some. It is critical to understand individual motivations and social and personal circumstances, including other clinical conditions and access to services.

It is important to support individuals who enter a structured programme but do not achieve remission by emphasising the multiple benefits gained through clinically significant weight loss. This includes the positive effects of metabolic recovery; reduced blood pressure, blood lipids, polypharmacy, and quality of life gained. Any weight loss should be considered a successful outcome. Equally, the importance of weight loss should be emphasised to individuals who do not wish to participate in a structured NHS programme.

Health boards across the NHS in Scotland currently deliver the Counterweight Plus structured type 2 diabetes remission programme, which was implemented as part of the Framework for the prevention, early detection and early intervention of type 2 diabetes and underpinned by guidance in the Public Health Scotland standards for weight management.[42,43]

A review by SHTG found that interim results from studies and large-scale pilots of digital-delivered programmes (with asynchronous messaging, educational content and health tracking) in NHS England suggest that both digital and in-person programmes can lead to similar levels of weight loss and remission and that type 2 diabetes programmes are cost effective to the NHS. Digital programmes have the potential to provide wider access to treatment and be more convenient to those particiipating.[54]

Maintaining weight loss is critical to sustain remission.

✓ Use standards for the delivery of tier 2 and tier 3 weight-management services for adults as a basis for design and delivery of structured weight-management programmes that include type 2 diabetes remission programmes (see Figure 3, section 3.1.2).

✓ Liaise with the primary care provider and local diabetes teams as appropriate to adjust both glucose-lowering and blood pressure-lowering medication as part of the medicines management protocol in a type 2 diabetes remission programme.

✓ Upon achieving remission, ensure the patient is coded in primary care systems correctly as being in remission of type 2 diabetes (Read code C10P1 Type II diabetes mellitus in remission). Patients should remain on the diabetes register for annual review, so retain the original type 2 diabetes code (C10F.). Do not use the code 'diabetes resolved'. It is reserved only for misdiagnosis or diabetes due to a secondary factor that has since been removed, such as acute steroid use.

5.2 Bariatric and metabolic surgery

Bariatric and metabolic surgery (BMS), also referred to as weight-loss surgery, aims to help people lose significant weight by reducing the size of their stomach and altering gut hormones to make them feel less hungry and full more quickly.

The recommendations in this section are adapted from sections 1.10 and 1.11 of NICE guideline 246: Overweight and obesity management.[26]

R **Offer adults referral for multidisciplinary team assessment to ascertain if bariatric and metabolic surgery is suitable if they:**

- **have prediabetes or type 2 diabetes**
- **have received optimal non-surgical weight-management treatment**
- **have a BMI greater than 35 kg/m^2, or 32.5 kg/m^2 where heritage includes South Asian, Chinese, other Asian, Middle Eastern, Black African, African-Caribbean or Arab family background**
- **agree to the necessary long-term follow up after surgery** (for example, lifelong annual reviews)**.**

R **Carry out a comprehensive, multidisciplinary assessment for bariatric and metabolic surgery based on the individual's needs. Ensure the multidisciplinary team within a specialist weight-management service includes or has access to health and social care professionals who have expertise in conducting medical, nutritional, psychological and surgical assessments in people living with obesity and type 2 diabetes and are able to assess whether surgery is suitable.**

R **Patient care should be optimised while waiting for surgery in the tier 4 bariatric and metabolic surgery pathway** (see Figure 3)**. Optimisation could include pharmacological treatments to maintain or reduce weight.**

✓ Explain to the patient that they will need long-term follow-up care after bariatric and metabolic surgery. This should include:

- lifelong annual checks to monitor diabetes status, even if remission is achieved
- preventing post-surgery complications
- education on life after surgery
- understanding the need to continue lifelong dietary restraint to optimise nutritional intake with reduced energy consumption.

6 Provision of information

This section reflects the issues likely to be of most concern to patients and their carers. These points are provided for use by health professionals when discussing prevention or remission of type 2 diabetes with patients and carers and in guiding the development of locally produced information materials.

6.1 Publications from SIGN

SIGN plain language versions of guidelines are documents that present recommendations and their rationales, originally developed for healthcare professionals, in a form that is more easily understood and used by patients and the public. They are intended to:

- help patients and carers understand what the latest evidence supports around diagnosis, treatment and self care
- empower patients to participate fully in decisions around management of their condition in discussion with healthcare professionals
- highlight for patients where there are areas of uncertainty.

A plain language version of this guideline is available here.

Other SIGN plain language booklets that may be relevant are:

- Preventing cardiovascular disease
- Management of diabetes in pregnancy.

6.2 Sources of further information

6.2.1 Diabetes-specific sources

Association of British Clinical Diabetologists

https://abcd.care/

The Association of British Clinical Diabetologists is the national organisation of consultant physicians and specialist registrars working in the UK who specialise in diabetes mellitus. It promotes awareness of and interest in diabetes and diabetes care both locally and nationally and provides information resources to support the delivery of high-quality care.

Diabetes Scotland/Diabetes UK
Helpline: 0141 212 8710, Monday to Friday, 9am–6pm
www.diabetes.org.uk/in_your_area/scotland
X (formerly Twitter): @DiabetesScot

Diabetes Scotland provides a wide range of information on diabetes including leaflets, fact sheets, details of support groups and advice on all aspects of diabetes. They have produced the following booklets:

Your guide to type 2 diabetes
What to expect if you have type 2 diabetes

Understanding your risk of type 2 diabetes – Diabetes UK booklet

Diabetes UK has a booklet available with more information to help people understand their diabetes at shop.diabetes.org.uk/collections/information-for-you/products/understanding-your-risk-booklet

6.2.2 Weight-management resources

British Dietetic Association

https://www.bda.uk.com

The British Dietetic Association provides advice for professional dietitians, and has a series of food facts leaflets on topics such as type 2 diabetes, portion sizes, carbohydrates, glycaemic index, what and how to see a dietitian.

Diabetes UK: portions guide, food labelling and weight-loss planner

https://www.diabetes.org.uk/guide-to-diabetes/enjoy-food/eating-with-diabetes/whats-your-healthy-weight/lose-weight

NHS Lose Weight

https://www.nhs.uk/better-health/lose-weight/

This website provides a range of advice on healthful eating and getting active, including links to apps to support physical activity.

6.2.3 Other national sources

NHS 24
Tel: 111
www.nhs24.scot

NHS 24 is an online and out-of-hours phone service providing the Scottish people with access to health advice and information 24 hours a day, 365 days a year.

NHS Inform
Tel: 0800 224 488
www.nhsinform.scot
www.nhsinform.scot/illnesses-and-conditions/diabetes/diabetes/

This is the national health and care information service for Scotland. It includes information and links to resources and to support people with diabetes.

Public Health Scotland
Challenging weight stigma learning hub
https://learning.publichealthscotland.scot/course/view.php?id=622#section-0

This online learning course for healthcare professionals describes what weight stigma means and the effects it can have. The course introduces approaches that address weight stigma and improve outcomes for individuals with higher weight and provides advice on how to have person-centred conversations about higher weight and behaviour change. It is aimed at health and social care staff, and those working in communications, policy, leisure and third sector settings.

Breathing Space
Tel: 0800 83 85 87 (Monday to Thursday, 6pm to 2am, Friday to Monday, 6pm to 6am)
www.breathingspace.scot

Breathing Space is a free and confidential phone and webchat service for anyone in Scotland over the age of 16 who may be feeling down or experiencing depression and needs someone to talk to.

British Heart Foundation
Tel: 0300 330 3311
www.bhf.org.uk

The British Heart Foundation provides a telephone information service for people looking for information on health issues to do with the heart, as well as providing a range of information on its website.

Chest, Heart and Stroke Scotland
Tel: 0131 225 6963
www.chss.org.uk

Chest, Heart and Stroke Scotland aims to improve the quality of life of people affected by chest, heart and stroke illnesses by offering information, advice and support in the community. It produces leaflets on the links between diabetes, heart disease and stroke.

Driver and Vehicle Licensing Agency (DVLA)
www.gov.uk/diabetes-driving

The DVLA is an executive agency of the UK Government Department for Transport. It is responsible for issuing driving licences and vehicle registration certificates, and also recording driver endorsements, disqualifications and medical conditions. People who use insulin to control their diabetes for more than 3 months are required to inform DVLA.

6.3 Checklist for provision of information

This section gives examples of the information patients and carers may find helpful at the key stages of the patient journey. Advice should be provided in a format suitable to the person's learning needs.

The checklist was designed by members of the guideline development group based on their experience and their understanding of the evidence base. The checklist is neither exhaustive nor exclusive.

People who are at risk of developing type 2 diabetes

Prediagnosis discussions

- Discuss with the person what they can do to reduce the risk of developing type 2 diabetes.
- Make people aware that type 2 diabetes increases the risk of other health conditions, such as cardiovascular disease, but that changes in diet and lifestyle, stopping smoking, along with regular check ups for blood pressure and cholesterol, can help to reduce the risk.
- Patients can be overwhelmed when this news is delivered; equally, they may have no understanding of the disease. Provide written information on follow-up care or treatment.

Self management

- Signpost patients to organisations that can offer further support and information (see section 6.2).

- Provide information on how to do a risk assessment and local groups that can provide support for interventions to prevent type 2 diabetes.

Pharmacological management

- Discuss the possibility of anti-obesity medicines (if they are available and the patient is eligible) as a preventative treatment for type 2 diabetes.

People who have recently been diagnosed with type 2 diabetes

Postdiagnosis discussions

- Discuss with the patient how diagnosis is a huge change in lifestyle, with implications for changes in diet and physical activity.
- Discuss the mental health impact of diagnosis.
- As families and carers are also living with diabetes, it is important to include them in some of these discussions so they can support the patients with diabetes. They make up the comprehensive support network that is needed.
- Patients and their families should be encouraged to participate in open conversations.
- Encourage patients and families to ask questions, especially if they do not fully understand.
- Ask patients how they feel about the information they are receiving.
- Allocate more time for this discussion after diagnosis.
- There is a need to acknowledge and allow for the impact of comorbidities in people with type 2 diabetes.
- Discuss the impact of type 2 diabetes on other conditions.
- Discuss treatment options.
- If considering a pharmacological therapy, discuss the effectiveness and side effect.
- Encourage patients to speak to their community pharmacist about their medication, as they can provide ongoing information and advice.

Information provision

- Provide a range of further information when a diagnosis of prediabetes or type 2 diabetes is made, to suit the person's individual needs.
- Signpost to reliable sources of support and information (see section 6.2).

Employment issues

- Encourage patients to speak to their employers about their needs at work, for example, breaks to manage insulin levels, lunch breaks at the correct times.
- Employers need to have a general understanding of the condition so that support can be given and allowances made for the needs of someone living with type 2 diabetes.

Driving

- Signpost to the guidance from the DVLA for people with diabetes.

7 Implementing the guideline

This section provides advice on the resource implications associated with implementing the key clinical recommendations, and advice on audit as a tool to aid implementation.

7.1 Implementation strategy

Implementation of national clinical guidelines is the responsibility of each NHS board, including Health and Social Care Partnerships, and is an essential part of clinical governance. Mechanisms should be in place to review care provided against the guideline recommendations. The reasons for any differences should be assessed and addressed where appropriate. Local arrangements should then be made to implement the national guideline in primary and community care, weight management and type 2 diabetes prevention services, and secondary care.

7.1.1 Policy landscape

There is a national framework for type 2 diabetes prevention, early detection and early intervention, published in 2018, with the aim of supporting health boards to implement and enhance the following pathways of care that relate directly to this guideline:[43]

- type 2 diabetes prevention programmes
- tier 2 and tier 3 adult weight-management programmes
- gestational diabetes and type 2 diabetes prevention programmes
- type 2 diabetes remission programmes.

The Scottish Government has committed to support health boards to provide evidence-based programmes as detailed in this guideline. Progress is monitored by local oversight groups at board level as well as a national oversight group at the Scottish Government.

Audit tools designed around guideline recommendations can assist in this process.

7.1.2 Inequalities

Central to the implementation of this guideline and underpinning all approaches to design and delivery of services should be the commitment to address the health inequalities well documented in people with type 2 diabetes and obesity. Scottish Government has asked all health boards to undertake an equality impact assessment (EQIA) on all of the pathways within the framework and develop subsequent plans to address inequalities gaps. For example, this could be in the development of culturally-intelligent resources for people whose first language is not English, or the design of a weight-management programme for those with an intellectual disability. The guideline group encourages health boards to share their experiences, knowledge and resources developed through this process. Support and training is also available from Public Health Scotland for health boards in the development of their EQIAs.

7.1.3 Data and outcomes

Current outcomes are measured using the core national dataset for weight management and type 2 diabetes prevention and remission, which can be accessed on the NES platform TURAS, with annual analysis of data undertaken by Public Health Scotland.[9] Using a core dataset enables national trends to develop over time that can inform continuous improvement. NHS-board level reporting means metrics, such as the number of patients referred and completing type 2 diabetes prevention programmes, and their subsequent outcomes, can be seen.

7.1.4 Primary care

Consultation on this guideline raised concerns about the capacity in primary care to manage any potential increase in testing or diagnosis arising from increased risk assessment. This was acknowledged by the guideline group, with the understanding that primary care resourcing was outwith the remit of the guideline. The emerging developments in point-of-care testing in community pharmacies and the future ability to use home testing kits for HbA1c may offer possible solutions to the testing capacity pressures, together with investment in weight management, and type 2 diabetes prevention and remission programmes.

The implementation of Community Treatment and Care (CTAC) services can support the impact of increased testing. CTAC services are designed and configured around local population need and include basic disease data collection (eg blood pressure) and chronic disease monitoring. Learning for implementation is available from (https://ihub.scot/improvement-programmes/primary-care/community-treatment-and-care/about-community-treatment-and-care/)

The Scottish Government has published a national consensus statement with criteria for the prioritisation of use of GLP-1 RAs/GIP RAs in the treatment of people with obesity in NHS Scotland. It recommends that health boards adopt a phased introduction, initially for adults living with severe obesity and related cardiometabolic conditions. As part of the phased introduction, the consensus statement sets an initial eligibility threshold of BMI ≥38 kg/m^2 in the presence of at least one obesity-related health condition. By initially implementing a higher threshold, this will support health boards to embed appropriate care pathways and facilitate a gradual and more manageable progression towards the SMC criteria.

7.1.5 Digital innovation

Given the projected increase in type 2 diabetes prevalence over the next 20 years, it is clear that the current care model will be unlikely to meet the needs of our population.[5] NHS England has successfully implemented several digital programmes for type 2 diabetes prevention and remission.[55] Collaborative working with the Centre for Sustainable Delivery at the Golden Jubilee hospital, who host the accelerated national innovation adoption (ANIA) programme, provides healthcare professionals and policy leads with a route to design and implement digital programmes at scale, on a Once for Scotland basis. This capability would support the widespread implementation of these guidelines into practice.

7.1.6 Professional education

Consultation on this guideline highlighted the need for robust professional education on obesity and type 2 diabetes prevention and the guideline development group agreed that this is a key component of guideline implementation. As part of the implementation of this guideline there is an opportunity to prioritise the development of a national professional education programme on obesity or weight management.

7.1.7 Quality improvement methodologies

Quality improvement methodologies can be used locally to implement the guidelines. The Quality Improvement Journey contains generic advice and tools to use quality improvement methods to support local implementation. NES also delivers the Scottish Improvement Leaders programme and Scottish Quality and Safety Fellowship programme to develop individuals to lead local implementation projects to improve the quality of care.

8 Guideline development

8.1 Methodology

This guideline has been produced using methodology to adopt and adapt recommendations from other high-quality guidelines.

A systematic search was carried out to identify guidelines published between 2019 and 2023, which were selected against the following criteria:

- research questions aligned to the remit of this guideline, and
- an evidence review that included primary literature.

Final screening was conducted by selecting the guidelines that scored highly (over 75%) when assessed using the items for rigour of development and editorial independence in the Appraisal of Guidelines Research and Evaluation (AGREE II) tool.

All relevant recommendations matching the key questions were extracted and themed. A final set of recommendations was shortlisted based on provision of non-overlapping advice. Recommendations from UK-based guidelines and more recently published guidelines were prioritised.

Using a modified Delphi approach, a multidisciplinary guideline development group addressed each recommendation to consider whether it could be adopted verbatim or adapted, based on:

- the applicability of the recommendation to NHSScotland, for example, alignment with SMC advice, financial, human and other resource implications
- the impact of the recommendation on people and carers with lived experience in Scotland, and issues identified in the EQIA.

Where a recommendation was evidence based but not considered applicable, the recommendation was not included, or the text was revised to better reflect Scottish practice. Changes were discussed and agreed by the guideline development group. No additional review for primary evidence was conducted.

Details of the evidence review and evidence-to-decision making for the original recommendations are available from the source guidelines. Explanations for any adaptations to the original recommendations are provided in the summary of adaptations, published on the SIGN website.

SIGN acknowledges and thanks NICE and Diabetes Canada for their generous agreement to use their guidelines as the basis of this work.

8.2 Recommendations for research

The guideline development group identified the following areas where there was insufficient research to support an evidence-based recommendation:

- development time from prediabetes to type 2 diabetes for different cohorts of patients and how this might help inform more intelligent risk stratification
- more specific predictors for the development of type 2 diabetes in those at risk to enable more targeted interventions
- the effectiveness of automating a type 2 diabetes risk-assessment tool via patient record systems (eg Vision) in reducing variation in care or access to testing
- the effectiveness of non-dietary interventions and risk factors, such as smoking, for prevention and remission of type 2 diabetes
- the effectiveness of psychological wellbeing support interventions for prevention,

early management and remission of type 2 diabetes

- the role of physical activity in the remission of type 2 diabetes
- the minimum and maximum ages at which BMS will help achieve remission of type 2 diabetes
- the association between duration of type 2 diabetes and benefit from BMS
- health benefits of reducing diabetes medication after surgery even if remission is not achieved
- validation of holistic tools for assessment of an individual's suitability for BMS
- the long-term complications of BMS.

8.3 Review and updating

This guideline was issued in 2024 and will be considered for review in three years. The review history, and any updates to the guideline in the interim period, will be noted in the update report, which is available in the supporting material section for this guideline on the SIGN website: **www.sign.ac.uk**

Comments on new evidence that would update this guideline are welcome and should be sent to sign@sign.ac.uk

9 Stakeholder involvement in the guideline

9.1 Introduction

SIGN is a collaborative network of clinicians, other healthcare professionals and patient organisations and is part of Healthcare Improvement Scotland. SIGN guidelines are developed by multidisciplinary groups of practising healthcare professionals using a standard methodology. The methodology used to develop this guideline is detailed in section 9.1. Further details of SIGN methodology is available at **www.sign.ac.uk**

9.2 The guideline development group

Ms Laurie Eyles (Chair)	Professional Adviser, Scottish Government/Dietetic Service Lead, NHS Lothian
Ms Kerry Aitken	Clinical Lead Dietitian, NHS Fife
Dr Kashif Ali	GP Principal and Primary Care Lead Diabetes Managed Clinical Network, NHS Greater Glasgow and Clyde
Dr James Boyle	Consultant in Diabetes, Glasgow Royal Infirmary
Dr Ruth Campbell	Consultant Dietitian in Public Health Nutrition, NHS Ayrshire and Arran
Dr Davina Chauhan	Clinical Psychologist, NHS Lothian
Mrs Alison Diamond	Diabetes/Obesity Specialist Dietitian
Dr Ian Godber	Consultant Clinical Scientist, NHS Greater Glasgow and Clyde
Ms Alison Grant	Voluntary Organisation Representative, Diabetes Scotland, Glasgow
Dr Nauman Jadoon	Acting Consultant Physician and Endocrinologist/SIGN Council Member, Royal Alexandra Hospital, Paisley
Professor Mike Lean	Professor of Human Nutrition and Consultant Physician, Glasgow Royal Infirmary
Mrs Jenny Marr	Person with lived experience
Dr Emily Moffat	Health Psychologist, NHS Grampian
Mr Chris Myles	Lived Experience Representative
Ms Carolyn Oxenham	Diabetes Prevention Programme Manager, NHS Ayrshire and Arran
Dr Andrew Radley	Consultant in Public Health, NHS Tayside
Ms Ailsa Stein	Programme Manager, SIGN
Professor Calum Sutherland	Professor of Molecular Medicine, University of Dundee
Professor Vivien Swanson	Professor of Health Psychology, University of Stirling
Ms Catriona Vernal	Programme Manager, SIGN

The membership of the guideline development group was confirmed following consultation with the member organisations of SIGN. All members of the guideline development group made declarations of interest. A register of interests is available in the supporting material section for this guideline at www.sign.ac.uk

Guideline development and literature review expertise, support and facilitation were provided by SIGN Executive and Healthcare Improvement Scotland staff. All members of the SIGN Executive make yearly declarations of interest. A register of interests is available on request from the SIGN Executive.

Karen Graham	Patient and Public Involvement Advisor
Aimie Littleallan	Project Officer
Gaynor Rattray	Guideline Co-ordinator

9.3 Consultation and peer review

A report of the consultation and peer review comments and responses is available in the supporting material section for this guideline on the SIGN website. All expert referees and other contributors made declarations of interest.

9.3.1 Specialist review

This guideline was also reviewed in draft form by the following independent expert referees, who were asked to comment primarily on the feasibility of implementing the recommendations in the guideline. The guideline group addresses every comment made by an external reviewer and must justify any disagreement with the reviewers' comments.

SIGN is very grateful to all of these experts for their contribution to the guideline.

Ms Anna Bell-Higgs	Counterweight NHS Implementation and Training Lead
Ms Mandy Christie	Lived experience representative, Dundee
Dr Hannah Dale	Health Psychologist, NHS Tayside andHead of Programme for Health Improvement Psychology Services, NHS Education for Scotland
Dr Kevin Fernando	General Practitioner, NHS Lothian
Ms Jennifer Hynes	Type 2 Diabetes Early Intervention Lead, NHS Forth Valley
Professor Brian Kennon	Professor and Consultant Diabetes and Endocrinology, NHS Greater Glasgow and Clyde and Specialty Adviser to Chief Medical Office, and National Lead Diabetes, Scottish Diabetes Group
Ms Dorothy Kirkwood	Lived experience representative, Bellshill
Mr Andrew G Robertson	Consultant Bariatric Surgeon, NHS Lothian and British Obesity and Metabolic Surgery Society Council Member,
Mr Andrew Steele	Senior Pharmacist for Medicine, NHS Fife
Ms Jacqueline Walker	Dietetic Clinical Lead, NHS Grampian and Professional Adviser, Scottish Government
Professor Sarah Wild	Professor of Epidemiology, University of Edinburgh and Honorary Consultant in Public Health, NHS Lothian and Public Health Scotland

9.3.2 Public consultation

The draft guideline was also available on the SIGN website for a month to allow all interested parties to comment. The response to consultation comments is available in the consultation report on the SIGN website, www.sign.ac.uk

9.3.3 SIGN editorial group

As a final quality control check, the guideline is reviewed by an editorial group comprising the relevant specialty representatives on SIGN Council to ensure that the specialist reviewers' comments have been addressed adequately and that any risk of bias in the guideline development process as a whole has been minimised. The editorial group for this guideline was as follows. All members of SIGN Council make yearly declarations of interest. A register of interests is available on the SIGN Council page of the SIGN website, www.sign.ac.uk

Dr Heather Connolly	British Psychological Society
Dr Roberta James	SIGN Programme Lead; Co-Editor
Dr James Morton	Royal College of General Practitioners
Ms Debbie Provan	Allied Health Professions Federation Scotland
Dr Safia Qureshi	Director of Evidence and Digital, Healthcare Improvement Scotland

Professor Angela Timoney	Chair of SIGN; Co-Editor

Abbreviations

ANIA	Accelerated National Innovation Adoption
BED	binge eating disorder
BMI	body mass index
BMS	bariatric and metabolic surgery
CTAC	community treatment and care
CVD	cardiovascular disease
EQIA	equality impact assessment
FPG	fasting plasma glucose
GDM	gestational diabetes mellitus
GIP	glucose-dependent insulinotropic polypeptide
GLP-1/GIP RA	glucose-dependent insulinotropic polypeptide dual receptor agonists
GLP-1 RA	glucagon-like peptide-1 receptor agonist
GMC	General Medical Council
GP	general practitioner
HbA1c	haemoglobin A1c/glycated haemoglobin
MAP	Motivation, Action and Prompts
NES	NHS Education for Scotland
NICE	National Institute for Health and Care Excellence
OGTT	oral glucose tolerance test
PCOS	polycystic ovary syndrome
PH	public health
SHTG	Scottish Health Technologies Group
SIGN	Scottish Intercollegiate Guidelines Network
SIMD	Scottish Index of Multiple Deprivation
SMC	Scottish Medicines Consortium
SmPc	Summary of Product Characteristics
UK	United Kingdom

Annex 1
Key questions addressed in this guideline

This guideline is based on a series of structured key questions that define the target population, the intervention, diagnostic test, or exposure under investigation, the comparison(s) used and the outcomes used to measure efficacy, effectiveness, or risk. These questions form the basis of the systematic literature search.

Guideline section	Key question
2.1	1. How can we identify those at increased risk of developing type 2 diabetes?
2.2	2. What diagnostic tests should be used for identifying prediabetes or diabetes in adults identified as being at increased risk of developing type 2 diabetes?
3	3. What non-pharmacological interventions have been shown to prevent or delay progression to type 2 diabetes in individuals at high risk of developing type 2 diabetes?
4	4. What pharmacological interventions have been shown to prevent or delay progression to type 2 diabetes in individuals at high risk of developing type 2 diabetes?
5.1	5. What non-pharmacological interventions have been successful in achieving remission of type 2 diabetes?
5.2	6. What evidence is there that bariatric surgery is successful in achieving remission of type 2 diabetes?

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