

Prevention and remission of type 2 diabetes

A national clinical guideline

Peer review draft for consultation, April 2024

Key to recommendations

This guideline has been produced using methodology to adopt and adapt recommendations from other high-quality guidelines (see *section 9.1*). The majority of recommendations are adapted from National Institute for Health and Care Excellence (NICE) PH38 Type 2 diabetes: prevention in people at high risk (published 2012, updated 2017, revalidated 2018) and CG189 Obesity: identification, assessment and management (published 2014, updated 2023). The types of guidance included are:

- R** | **Evidence-based recommendation** – formulated after a systematic review of the evidence.

 - ✓ | **Good practice point** – recommended best practice based on the clinical experience of the guideline development group.
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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 level 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 intensive 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 annual new diagnoses in excess of 20,000 in 2022.³ In addition to those living with known type 2 diabetes, Diabetes UK estimate that 500,000 adults in Scotland are at high risk of developing the condition. The rate of growth in the number of people living with type 2 diabetes in Scotland between 2011 and 2021 has been 32%, a figure that is likely to increase further over the next decade. Taking into account projected population changes over the next 20 years, population health loss due to diabetes and kidney diseases in Scotland is estimated by Public Health Scotland to increase by 28% by 2043.⁴ The average age at which people are being diagnosed is also becoming younger, which leads to a poorer prognosis. A diagnosis of type 2 diabetes reduces life expectancy by around 10 years, driven by the increased risk of cardiovascular disease (CVD).

The annual economic cost to Scotland of type 2 diabetes is estimated at £2.37 billion (⁵ and forthcoming), taking into account loss of productivity due to impaired health, direct healthcare costs and investment to mitigate the impact of obesity. The cost to the NHS in Scotland of diabetes treatment alone is estimated at £1.6 billion (around 10% of total health expenditure). A further 32% growth in this condition can therefore be seen as a major risk to the long-term financial sustainability of NHSScotland.

Type 2 diabetes does not affect our population equally. Diabetes is a key driver of health inequalities in Scotland, with people living in the most deprived communities having a 77% greater chance of developing the disease 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.

Many of the factors that drive type 2 diabetes risk cannot be controlled by the individual. The social determinants of health are the social, cultural, political, economic and environmental conditions in which people are born, grow up, live, work and age, and their access to power, decision-making, money and resources that give rise to these conditions of 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.⁶ These have a significant impact on our ability to prevent and manage type 2 diabetes effectively.

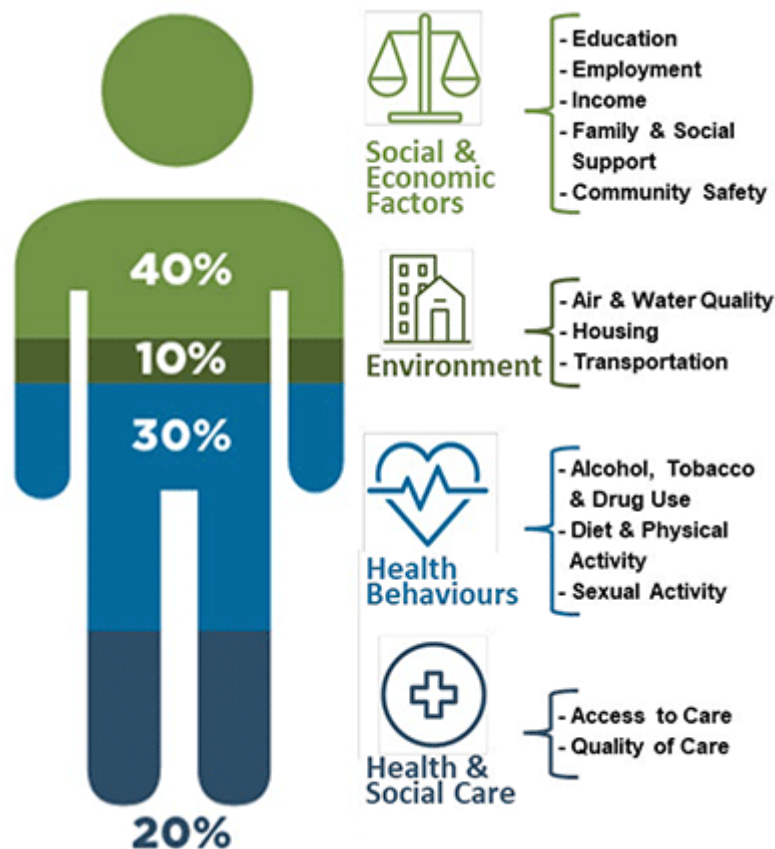


Figure 1.1. The social determinants of health (adapted by Scottish Government from Booske et al., 2010⁷ and [King's Fund – A Vision for Population Health](#)).

At the individual level, non-modifiable risk factors 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 disease.

We know that people living with obesity and overweight are more likely to develop type 2 diabetes than those with a BMI in the healthy weight range. This is reflected in the Scottish demographics, with 87% of people with type 2 diabetes living with overweight and obesity.³

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 in the area of diabetes has rapidly increased following the pandemic, and this has the potential to feature permanently in delivery models.

This evidence-based guidance 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

A positive patient experience in healthcare communications leads to better health outcomes and enhanced clinical effectiveness. Communication of recommendations in this guideline should be underpinned by best practice and person-centred approaches. 'Good

conversations' adopt a collaborative, tailored and trauma-informed approach, recognising the person's individual and social context and resources. Positive interactions are likely to be more effective in developing knowledge, skills and confidence to support behaviour change. These include communicating potentially difficult information regarding increased risk and avoiding stigma.

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 treatment of type 2 diabetes. It includes those at risk of developing type 2 diabetes due to age, ethnicity, weight and family history, and those clinically diagnosed with prediabetes, impaired glucose tolerance, impaired fasting hyperglycaemia or previous gestational diabetes. It also includes those recently diagnosed with type 2 diabetes. It excludes children and the not-at-risk general population. Issues relating to type 1 diabetes (see SIGN 116 and 170) and the pharmacological treatment of type 2 diabetes (see SIGN 154) are not covered.

1.3.2 Target users of the guideline

This guideline will be of interest to healthcare professionals in primary care, weight management, 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 patient version of this guideline will be developed following publication of this document.

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, www.sign.ac.uk

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 has been 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 copies of declaration of interests forms are retained by the SIGN Executive and are available on request from the SIGN Executive.

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 (MA) 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 MA 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.⁸

"Prescribing medicines outside the conditions of their marketing authorisation alters (and probably increases) the prescribers' professional responsibility and potential liability".⁸

The General Medical Council (GMC) recommends that when prescribing a medicine 'off label', doctors should:⁹

- 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](#).¹⁰

Prior to any prescribing, the licensing status of a medication should be checked in the summary of product characteristics (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.¹¹

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.

DRAFT

2 Key recommendations

The following recommendations were highlighted by the guideline development group as the key clinical recommendations that should be prioritised for implementation.

[This section will be completed after consultation.]

3 Identifying people at high risk of type 2 diabetes

Particular conditions can increase the risk of type 2 diabetes. These include cardiovascular disease, hypertension, obesity, stroke, polycystic ovary syndrome, previous gestational diabetes and mental health problems. People aged older than 40 years and people of South Asian, Chinese, African-Caribbean, black African descent are also at increased risk. Steroids and antipsychotic drugs can also increase the risk of type 2 diabetes.

Prediabetes is defined clinically as a fasting plasma glucose level of 5.5 to 6.9 mmol/l or an HbA1c level of 42 to 47 mmol/mol (6.0 to 6.4%). Prediabetes indicates elevated risks for type 2 diabetes and coronary heart disease.

The recommendations in this section are adapted from sections 1.1–1.3 of NICE PH38 (2012).¹² 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. This approach avoids the need for wider population screening. The [UK National Screening Committee](#) does not recommend whole-population-level screening for type 2 diabetes because there is no evidence of benefit.



Figure 1: risk identification and testing for prediabetes

3.1 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, family history, gestational diabetes and steroid or antipsychotic drug treatment. Validated computer-based self-assessment tools, including Diabetes UK's [Know Your Risk](#) tool, allow people to estimate their risk without a blood test. These specific risk assessment tools can be highlighted primarily by GPs but also by a range of healthcare professionals in a variety of settings, including pharmacists, opticians, occupational health nurses, and staff involved in the care of vulnerable groups. In addition, 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. However, people at any level of risk can be signposted towards reliable trusted sources of support (see *section 7.2*).

- 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). First, a risk assessment should be offered. Second, for those with high risk scores, a blood test should be offered to confirm whether people have type 2 diabetes or prediabetes.**
- R** | **Encourage the following to have a risk assessment:**
 - all eligible adults aged 40 and above, except pregnant women
 - people aged 25 to 39 of South Asian, Chinese, African-Caribbean, black African and other high-risk black and minority ethnic groups, except pregnant women
 - adults with conditions that increase the risk of type 2 diabetes.
- ✓ | Good conversations – underpinned by professional education and support– are critical when raising the issue of risk with individuals.

Record-keeping supports following up and reassessing risk.

- R** | **Where risk assessment is conducted by health professionals in NHS venues outside general practice (for example, in community pharmacies) and the individual scores at high risk, the professionals involved should ensure the results are shared with the individual and their GP practice or added to the person's health record by the professional. and that a diagnostic blood test is offered.**
- R** | **GP practices should record risk assessments that score at high risk to ensure appropriate follow-up and continuity of care, with consent from the individual.**
- R** | **Where self-assessment is offered in community venues, health professionals and community practitioners in those venues should ensure people with a high risk score can have a confirmatory blood test and an informed discussion on how to manage their risk. Those at high risk should have blood test arranged at their GP practice or appropriate primary care provider.**
- ✓ | Newer approaches are emerging with community pharmacy point-of-care testing and home blood testing.
- ✓ | GP practices should maintain a register for patients with prediabetes and annually review their weight and risk factors.

- ✓ | Code individuals accurately on diagnosis of prediabetes or type 2 diabetes (see X – annex of relevant codes).

3.2 Testing for prediabetes

Identification of those patients with known risk factors associated with the development of type 2 diabetes can be followed up with further diagnostic tests. Testing in those at high risk is an important step in preventing progression to type 2 diabetes. The aim of the blood test is to check if the individual has type 2 diabetes or to confirm their level of risk of progression to type 2 diabetes and discuss how to reduce it.

Plasma or capillary blood taken after a fast of 8–10 hours is tested in a fasting plasma glucose (FPG) test. An FPG of 5.5 to 6.9 mmol/l indicates high risk of developing type 2 diabetes.

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 to 47 mmol/mol [6.0 to 6.4%] indicates prediabetes.

While HbA1c may be the recommended test, there are circumstances where FPG may be considered preferable, as it is a more cost-effective test. Consideration should also be made individuals with haemoglobinopathies and anaemia, in whom the measurement of HbA1c may not be accurate.

The 2-hour oral glucose tolerance test (OGTT) assesses the body's ability to process a large amount of glucose. The patient is given as a drink 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 then 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 (POCT) 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 the adequate training of operators and the performance of regular quality control processes.

When interpreting results, it is important to consider other clinical conditions and drug therapies which may cause transient hyperglycaemia, such as long-term high-dose steroid therapy.

The following recommendations are adapted from sections 1.4, 1.5 and 1.6 of NICE PH38 (2012).¹²

- R** | **Trained healthcare professionals should offer and follow up venous blood tests (fasting plasma glucose or HbA1c) to adults with high risk scores.**
- ✓ | In pregnant women an oral glucose tolerance test is acceptable as initial identification.
- ✓ | Consider a blood test for those aged 25 and over of South Asian, Chinese, African-Caribbean or black African descent whose body mass index (BMI) is greater than 23 kg/m².
- ✓ | GP consultations are important opportunities to identify individuals at elevated risk and to make a shared decision on whether or not a diagnostic test is indicated.

- ✓ Individuals 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 (fasting plasma glucose of 7.0 mmol/l or above, or HbA1c of 48 mmol/mol [6.5%] or above, but no symptoms of type 2 diabetes):
- Carry out a second blood test within 3 months of the original test. If type 2 diabetes is not confirmed, offer them a referral to a local, quality assured, intensive lifestyle-change programme for prediabetes.
- R** Offer people with a history of gestational diabetes or a high risk score and fasting plasma glucose of 5.5 to 6.9 mmol/l or HbA1c of 42 to 47 mmol/mol [6.0 to 6.4%] 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 fasting plasma glucose at 7.0 mmol/l or above, or an HbA1c of 48 mmol/mol (6.5%) or greater, but
 - whose second blood test did not confirm a diagnosis of type 2 diabetes.

Chapter 4 provides recommendations for those diagnosed with prediabetes.

3.3 Reassessing risk

- 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 (such as their BMI, relevant illnesses or conditions, ethnicity and age).
- R** Offer to reassess people with a high risk score, but with a fasting plasma glucose less than 5.5 mmol/l or HbA1c less than 42 mmol/mol [6.0%]), every 3 years.
- R** Offer to reassess people with a low or intermediate risk score every 5 years using a validated risk-assessment tool.

4 Preventing progression from prediabetes to type 2 diabetes

Upon receiving a diagnosis of prediabetes (a fasting plasma glucose level of 5.5 to 6.9 mmol/l or an HbA1c level of 42 to 47 mmol/mol (6.0 to 6.4%)) 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 not be feasible 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, not just at referral.

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 PH38.¹² Recommendations were identified on self-management, lifestyle, diet, weight management, physical activity and behaviour change. No recommendations were identified for education interventions or psychological wellbeing interventions. Other risk factors that are not included are 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 to help motivate people to 'restart'.

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

R For people with a diagnosis of prediabetes (a high risk score and fasting plasma glucose of 5.5–6.9 mmol/l or HbA1c of 42 to 47 mmol/mol [6.0 to 6.4%]):

- Tell the person they are currently at high risk but that this does not necessarily mean they will progress to type 2 diabetes. Explain that the 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 individuals to access additional information, support and services from reliable sources (see section 7.2).

4.1 Components of an effective diabetes prevention programme

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

- undertake at least a level of physical activity that is in line with government recommendations
- gradually lose weight towards a healthy body weight
- encourage regular eating, developing and maintaining healthy eating behaviours.

4.1.1 Supporting behaviour change

R Use defined behaviour-change techniques, including:

- **Provide information:** check and build on what individuals already know about healthy behaviours that help to achieve and maintain a healthy weight.
- **Explore and enhance 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 or physical activity behaviour to achieve this.
- **Action planning:** support individuals to develop a plan focusing on a physical activity or eating behaviour 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 healthy physical activity and eating habits. 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 can help explore and overcome barriers to success on a type 2 diabetes prevention programme. Specific behaviour change techniques are defined in [Online Tools for Behaviour Change](#).¹³

4.1.2 Diet and weight management

People living with overweight or obesity are at increased risk of developing prediabetes and type 2 diabetes. Dietary guidance including healthy eating, nutrition therapy and weight management can impact on prevention and remission of type 2 diabetes alongside improving glycaemic control, reducing the risk of complications and potentially improving quality of life and life expectancy.

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

A range of foods and dietary patterns that are suitable for weight management (see [Diabetes UK](#) and the UK Government's [Eatwell plate](#)) are encouraged. 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.

Dietary fats should ideally come from fish- and plant-based monounsaturated and polyunsaturated fats such as oily fish, nuts, seeds, avocado and pure vegetable oils.

Protein intake recommendations depend on various factors including weight status, age and other conditions, but, in general, 10–20% of total energy intake will be protein from a variety of sources including dairy and dairy substitutes, legumes, eggs, fish, poultry and lean meats, and saturated fat intakes kept within recommended levels.

A variety of weight loss dietary regimes can be adhered to but neither high nor low carbohydrate (ketogenic) diets are recommended. A wide range of naturally high-fibre carbohydrates are encouraged as part of overall balanced diet (see the [Eatwell plate](#)). Low glycaemic index or low glycaemic load diets can be recommended when fibre, protein, saturated fat and sugar recommendations are being adhered to.

- 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 gradually 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.**
- R** **Offer people with a BMI of 30 kg/m² or more (27.5 kg/m² or more if heritage includes South Asian, Chinese, other Asian, Middle Eastern, Black African or African-Caribbean family background) a structured weight-loss programme. Or, if more appropriate, offer them a referral to a dietitian or another appropriately trained health professional.**

The [Public Health Scotland Standards for the delivery of tier 2 and tier 3 weight management services in Scotland](#) provide more information on referral criteria for weight management services in Scotland.

4.1.3 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.
- ✓ Be mindful of other conditions, such as eating disorders (see *SIGN 164*).
- R** **Consider referring people who want structured or supervised exercise to an exercise referral scheme or supervised exercise sessions.**

4.2 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.

- R** When commissioning local or national services to deliver evidence-based, quality-assured programmes where the availability of places is limited, prioritise people with a fasting plasma glucose of 6.5 to 6.9 mmol/l or HbA1c of 44 to 47 mmol/mol [6.2 to 6.4%].
- R** Provide specially designed and quality-assured intensive lifestyle-change programmes for groups of 10 to 15 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 local people. 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 (see recommendations 1.18.1 to 1.18.5). 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 gradual 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 gradual 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.

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

The Scottish Health Technologies Group (SHTG) found that digitally delivered type 2 diabetes prevention programmes were as effective as traditional in-person programmes within a group setting. {Scottish Health Technologies Group (SHTG), 2023 #23}

- R** **Based on individual preference and circumstance, certified technology-assisted diabetes prevention programs may be effective in preventing type 2 diabetes and should be considered.**
- ✓ Consider onward referral to services such as link workers.
- ✓ Psychological wellbeing services can support individuals if their mental health is a barrier to achieving lifestyle changes.
- ✓ Support patients with ongoing lifestyle changes by signposting to appropriate resources (see section 7.2)

4.3 Self-management

Weight management services might not be the most appropriate route for some people, while others might prefer not to be referred to a type 2 diabetes prevention programme. Self-monitoring techniques can support an individual to increase their physical activity (using a 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. Individuals can be signposted to appropriate resources (see section 7.2).

- 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.**

5 Drug treatments to prevent type 2 diabetes

Interventions designed to improve diet and physical activity and reduce weight remain the cornerstone of treatment for type 2 diabetes risk reduction (see section 4). Recent scientific developments in obesity pharmacotherapy therefore create new possibilities for using these medications in conjunction with diet and physical activity for the prevention of type 2 diabetes.

The following recommendation, adapted from NICE PH38 (2012), applies when prescribing any of the drugs in this section.

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

5.1 Incretin-based therapies

Newly developed incretin-based therapies demonstrate significant potential to effectively treat obesity, type 2 diabetes and reduce cardiovascular disease risk.¹⁴⁻¹⁶

It is important to note that these medications are licensed for use as an adjunct to a reduced-calorie diet and increased physical activity. Clinical trials demonstrated that when used in conjunction with non-pharmacological therapies, incretin-based therapies were more effective than when used alone.^{17,18}

5.1.1 Glucagon-like peptide-1 receptor agonists

Glucagon-like peptide-1 receptor agonists (GLP-1 RAs) mimic the GLP-1 hormone naturally produced in the body, 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 are therefore an effective medication to achieve and sustain weight loss for 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 with an initial BMI of ≥ 30 kg/m² or ≥ 27 to < 30 kg/m² in the presence of prediabetes or type 2 diabetes.

[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 with an initial BMI of ≥ 30 kg/m² or ≥ 27 to < 30 kg/m² in the presence of at least one weight-related comorbidity.

R | **Liraglutide or semaglutide should be considered as an adjunct to a reduced-calorie diet and increased physical activity for weight management in adults with prediabetes.**

A consensus statement for NHSScotland advises that these medications do not need to be restricted to use within specialist weight management services. The trial conditions for GLP-1 RA medications were not within specialist services, and the key elements delivered were evidence-based dietary and physical activity advice. Provided these conditions are met then these medications can be prescribed in primary, community and secondary care settings outwith weight management services.

5.1.2 Glucose-dependent insulinotropic polypeptide dual receptor agonists (GLP-1/GIP RAs)

GLP-1/GIP RAs are the most recent class of anti-obesity medications to be approved for

use in Scotland.

[SMC recommendation anticipated for tirzepatide for weight management]

5.2 Metformin

Metformin improves insulin resistance and is therefore a common treatment for type 2 diabetes. Metformin may also be suitable for individuals with prediabetes who have a lower BMI to prevent progression to type 2 diabetes.

Considerations specific to metformin include the patient's renal function and vitamin B12 levels.

The following recommendation on metformin is adapted from section 1.19 of NICE PH38.¹²

- 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** Check the person's renal function before starting treatment with metformin, and then twice yearly (more often if they are older or if deterioration is suspected).
- R** Prescribe metformin for 6 to 12 months initially. Monitor the person's fasting plasma glucose or HbA1c levels at 3-month intervals and stop the drug if no effect is seen.
- 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

The study on which this recommendation is based used standard-release metformin. Some standard- or modified-release metformin products have since extended their marketing authorisations to include reducing the risk or delaying the onset of type 2 diabetes in adults who are at high risk and are progressing towards type 2 diabetes despite intensive lifestyle change for 3 to 6 months.

5.3 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 fats, may be more appropriate for these individuals.

The following recommendation is adapted from section 1.20 of NICE PH38.¹²

- R** Use clinical judgement on whether to offer orlistat to people with a BMI of 28 kg/m² 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.

6 Achieving remission

6.1 Non-pharmacological approaches

Early in the course of type 2 diabetes, it is possible to reverse the disease through weight loss. Remission is defined as HbA1c remaining below 48mmol/mol or 6.5% for at least three months, without diabetes medication (Diabetes UK, the American Diabetes Association and the European Association for the Study of Diabetes). Achieving remission reduces complications from type 2 diabetes and allows people to experience a greater quality of life.

As a relatively new area of study, evidence on remission is limited. The cornerstone is the 2016 DiRECT (Diabetes Remission Clinical Trial), which used a structured intensive weight management programme focused on calorie-restricted diet and delivered in primary care clinics. After a year, almost half (46%) of participants with type 2 diabetes who received a very-low-calorie diet were in remission, compared with 4% of those who received standard care. Remission was directly related to the amount of weight lost, with the remission rate rising to 86% in persons losing ≥ 15 kg at 1 year. After 2 years, 36% of persons with type 2 diabetes remained in remission compared with 3% who received standard care.

The following is adapted from recommendation 5 (page 759) of Diabetes Canada clinical practice guideline on remission of type 2 diabetes ¹⁹.

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, may induce type 2 diabetes remission in non-pregnant adults.**

The combination of weight loss and 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. Similarly, health behaviour change approaches that do not have weight loss as a primary goal may be more appropriate.

Behavioural/psychological support underpins delivery of a formal programme; be aware of other conditions (such as eating disorders, see SIGN 164).

The aim is to achieve remission as soon as possible after diagnosis. Many people can achieve remission without a formal evidence-based programme (signpost to effective methods of weight loss); however, it may help some. It is critical to understand individual motivations and social and personal circumstances, including comorbidities and access to services.

It is important to support individuals who enter a formal programme but do not achieve remission by emphasising the positive steps taken and benefits gained. Any reduction in 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 programme.

Maintaining weight loss is critical for remission. Younger patients may need to sustain weight loss to maintain remission.

- ✓ Signpost individuals to guidance on weight loss and behavioural support.
- ✓ Good practice guidelines for tier 3 weight management services (x-ref).

- ✓ Liaise with GP and/or local diabetes team as appropriate to adjust both glucose-lowering and blood pressure lowering medication.

SHTG found no published clinical or cost effectiveness evidence for a digitally delivered (video-conferencing and mobile apps) type 2 diabetes remission programme in Scotland.²⁰ The review found that current trials suggest that both digital and in-person programmes can lead to similar levels of weight loss and remission.

6.2 Bariatric surgery

Bariatric surgery, also referred to as weight loss surgery, aims to help people lose significant weight by changing the size of their stomach or how it works, making them feel less hungry and full more quickly.

The recommendations in this section are adapted from sections 1.10 and 1.11 of NICE CG189.²¹

- R Offer referral to adults for multidisciplinary team assessment to ascertain if bariatric surgery, with the necessary long-term follow up, is suitable if they:**
- are being managed to treat or prevent type 2 diabetes
 - have been through optimal non-surgical weight management
 - have a BMI greater than 35 kg/m², or 32.5 kg/m² where heritage includes South Asian, Chinese, other Asian, Middle Eastern, Black African or African-Caribbean family background
 - agree to the necessary long-term follow-up after surgery (for example, lifelong annual reviews).

As an individual's BMI can fluctuate over time, the BMI cut-off should not be considered absolute. Similarly, the benefits can extend to those with a BMI <35. A validated tool can support holistic assessment.

- ✓ Relevant specialists should consider using a validated holistic tool to assess an individual's suitability for bariatric surgery.

Value specific information regarding evidence of process of assessment for bariatric surgery and composition of the multidisciplinary team.

- R Carry out a comprehensive, multidisciplinary assessment for bariatric 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 surgery pathway. Optimisation could include drug treatments to maintain or reduce weight.**

- ✓ Explain to the patient that they should expect long-term follow-up care after bariatric 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.

7 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.

7.1 Publications from SIGN

SIGN patient versions of guidelines are documents that 'translate' guideline recommendations and their rationales, originally developed for healthcare professionals, into 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 patient version of this guideline will be developed following publication of this document.

7.2 Sources of further information

7.2.1 Diabetes-specific sources

Association of British Clinical Diabetologists

<https://abcd.care/>

The Association of British Clinical Diabetologists (ABCD) 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.

<https://abcd.care/dtn/diabetes-tech-pregnancy>

Sitting within ABCD, the Diabetes Technology Network UK supports UK healthcare professionals who are involved in the delivery of technologies that are designed to improve the lives of people living with diabetes. The Network has developed a series of educational modules on use of diabetes technology in pregnancy.

Joint British Diabetes Societies for Inpatient Care Group

<https://abcd.care/jbds-ip>

The Joint British Diabetes Societies for Inpatient Care (JBDS-IP) group was created in 2008 to 'deliver a set of diabetes inpatient guidelines and proposed standards of care within secondary care organisations', with the overall aim of improving inpatient diabetes care through the development and use of high-quality evidence-based guidelines, and through better inpatient care pathways. The JBDS-IP group was created and supported by Diabetes UK, ABCD and the Diabetes Inpatient Specialist Nurse UK group, and works with NHS England, Trend (Training Research and Education for Nurses in Diabetes) Diabetes and other professional organisations.

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](https://twitter.com/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. The Diabetes UK [Learning Zone](#) offers videos, quizzes and interactive tools for managing diabetes day-to-day which are tailored for each individual.

My Diabetes My Way

www.mydiabetesmyway.scot.nhs.uk

X (formerly Twitter): [@MyDiabetesMyWay](https://twitter.com/MyDiabetesMyWay)

My Diabetes My Way is NHSScotland's interactive diabetes website which helps to support people who have diabetes and their family and friends.

7.2.2 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

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 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 good 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 need someone to talk to.

British Heart Foundation

Tel: 0300 330 3311

www.bhf.org.uk

X (formerly Twitter): [@TheBHF](https://twitter.com/TheBHF)

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 (CHSS)

Tel: 0131 225 6963

www.chss.org.uk

X (formerly Twitter): [@CHSScotland](https://twitter.com/CHSScotland)

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.

Citizens Advice Scotland

www.cas.org.uk

X (formerly Twitter): [@CitAdviceScot](https://twitter.com/CitAdviceScot)

Citizens advice bureaux are local independent charities that provide free, confidential and impartial advice.

Driver and Vehicle Licensing Agency (DVLA)

www.gov.uk/diabetes-driving

X (formerly Twitter): [@DVLAgovuk](https://twitter.com/DVLAgovuk)

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.

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

7.3 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. 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

Pre-diagnosis discussions

- Discuss with patients about what they can do to stop themselves developing type 2 diabetes. Early intervention can give patients a choice and options for preventing type 2 diabetes.
- How this information is delivered is important. Make people aware that type 2 diabetes is serious and increases the risk of other health conditions, but there is something you can do about it. Patients can be overwhelmed when this news is delivered; equally, they may have no understanding of the disease. It is important that a pathway is available for follow-up care/treatment.
- The possibility of remission should be discussed if the patient chooses to, for example, improve their diet and lifestyle.

- The possibility of weight-loss injections (if they are available) as a preventative treatment for type 2 diabetes should be discussed.
- If a patient decides not to do anything to limit the risk of developing type 2 diabetes, is there more support available down the line? Is there a cut-off date for prediagnostic care?

Self-management

- Where can people go for more information?
- While in recovery from the pandemic, it can be difficult to have conversations with healthcare professionals. There needs to be more access to be able to ask these questions.

Other resources/where information should be presented

- Include Diabetes UK helpline and forum as resources for people both before and after diagnosis.
- Add other credible sources of information for people who have difficulty reaching their GP practice.
- Include information in appointment letters, as people are likely to take in information from these letters.
- Information on local opportunities for risk assessment and the benefits of preventing type 2 diabetes can be offered in a variety of formats and tailored for different groups and communities.

People who have recently been diagnosed with type 2 diabetes

Post-diagnosis 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's important to include them in some of these discussions as they are there to 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.
- Explain that there is an element of cognitive behavioural therapy in changing lifestyle.
- Change the dynamic of the relationship between the patient and healthcare professional ('it's OK to ask').
- 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.
- Is there more support the healthcare professional can give to patients?
- 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.
- There should be a discussion around treatment options.
- Some people are treated with drugs after diagnosis, and these options should be discussed.
- The effectiveness and side effects of drug treatments should be discussed.
- Patients should be encouraged to speak to their community pharmacist about their medication, as they can provide ongoing information/advice.

Patients are sometimes left to find their own information

- A range of further information should be provided when a diagnosis of prediabetes or type 2 diabetes is given.
- Not everyone takes in information the same (language/ability etc).
- Previously, some people have had to ask their own questions rather than information being available.

- Some materials are not fit for purpose.
- There is an overall responsibility, but also a personal responsibility, to ensure people receive this information.
- Patients can be signposted to various resources.
- Keep in mind the diverse range of patients and the different needs/backgrounds of different groups of people.

Employment issues

- Encourage patients to speak to their employers about their needs at work – breaks to manage insulin levels, lunch breaks at the correct times, etc.
- Encourage the awareness of employers surrounding sick days, hospital appointments, etc.
- 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.
- Is there a need for organisational policies surrounding diabetes in the way that there are policies around menopause?
- If so, should these policies aim to cover both prevention and post-diagnosis (lifestyle changes, noticing increased risk factors at work)?

Driving

- Signpost the [guidance from the DVLA for people with diabetes](#).
- Consider at what point to alert patients that insurances will be impacted by a diabetes diagnosis. (including pre diabetes)

7.4 Useful resources

The following resources are available for free from Diabetes UK:

- [Your guide to type 2 diabetes](#) (PDF)
- [What to expect if you have type 2 diabetes](#) (PDF)

8 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.

8.1 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 individual hospitals, units and practices.

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. NHS Education for Scotland 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.

Implementation of this guideline will be encouraged and supported by SIGN. The implementation strategy for this guideline encompasses the following tools and activities.

[To be completed after consultation]

8.2 Resource implications of key recommendations

No recommendations are considered likely to reach the £5 million threshold which warrants resource impact analysis.

9 Guideline development

9.1 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 and 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 [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 Scottish Medicines Consortium (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 equality impact assessment.

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. Further details are available on the supporting information for this guideline at www.sign.ac.uk

Details of the evidence review and evidence-to-decision making for the original recommendations are available from X. Explanations for any adaptations to the original recommendations are provided in sections X–X.

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

9.2 Recommendations for research

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

- the minimum and maximum ages at which bariatric surgery will help achieve remission of type 2 diabetes
- the association between duration of type 2 diabetes and benefit from bariatric surgery
- health benefits of reducing diabetes medication after surgery rather than achieving remission
- the effectiveness of automating a risk assessment tool via patient record systems in reducing variation in care or access to testing
- how long before type 2 diabetes develops in those with prediabetes

- predictors for the development of type 2 diabetes in those at risk
- non-dietary interventions and risk factors, such as smoking, for prevention and remission
- psychological wellbeing support interventions for prevention, early management and remission.

9.3 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

10 Stakeholder involvement

10.1 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 methodologies are available at www.sign.ac.uk

10.2 The guideline development group

| | |
|--|--|
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| Ms Kerry Aitken | <i>Clinical Lead Dietitian, NHS Fife</i> |
| Dr Kashif Ali | <i>GP Principal and Primary Care Lead Diabetes MCN, NHS GG&C</i> |
| Dr James Boyle | <i>Consultant in Diabetes, Glasgow Royal Infirmary</i> |
| Dr Ruth Campbell | <i>Consultant Dietitian in Public Health Nutrition, NHS Ayrshire and Arran</i> |
| Dr Davina Chauhan | <i>Clinical Psychologist, NHS Lothian</i> |
| Mrs Alison Diamond | <i>Diabetes/Obesity specialist Dietitian</i> |
| Dr Ian Godber | <i>Consultant Clinical Scientist, NHS GG&C</i> |
| Ms Alison Grant | <i>Voluntary Organisation Representative, Diabetes Scotland, Glasgow</i> |
| Dr Nauman Jadoon | <i>Specialty Registrar/SIGN Council ECP Member, Queen Elizabeth University Hospital, Glasgow</i> |
| Professor Mike Lean | <i>Physician, University of Glasgow</i> |
| Mrs Jenny Marr | <i>Person with Lived Experience</i> |
| Dr Emily Moffat | <i>Health Psychologist, NHS Grampian</i> |
| Mr Chris Myles | <i>Lived Experience Representative</i> |
| Ms Carolyn Oxenham | <i>Diabetes Prevention Programme Manager, NHS Ayrshire & Arran</i> |
| Dr Andrew Radley | <i>Consultant in Public Health, NHS Tayside / GPhC</i> |
| Professor Calum Sutherland | <i>Professor of Molecular Medicine, University of Dundee</i> |
| Professor Vivien Swanson | <i>Professor of Health Psychology, University of Stirling</i> |
| Ms Catriona Vernal | <i>Programme Manager, SIGN</i> |

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 | <i>Patient and Public Involvement Advisor</i> |
| Aimie Littleallan | <i>Project Officer</i> |
| Gaynor Rattray | <i>Guideline Co-ordinator</i> |

10.3 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 and further details of these are available on request from the SIGN Executive.

10.3.1 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.

| | |
|-----------------------------------|---|
| Dr Ewen Bell | <i>Consultant Clinical Biochemist, NHS Dumfries and Galloway</i> |
| Ms Anna Bell-Higgs | <i>Counterweight NHS Implementation & Training Lead</i> |
| Ms Mandy Christie | <i>Lived experience</i> |
| Dr Hannah Dale | <i>Health Psychologist/Head of Programme for Health Improvement</i> |
| | <i>Psychology Services, NES</i> |
| Dr Kevin Fernando | <i>GP, NHS Lothian</i> |
| Ms Jennifer Hynes | <i>Type 2 diabetes prevention dietitian, NHS Forth Valley</i> |
| Dr Bhautesh Jani | <i>GP/University of Glasgow</i> |
| Professor Brian Kennon | <i>NHS GGC and National Diabetes Clinical Lead</i> |
| Ms Dorothy Kirkwood | <i>Lived experience</i> |
| Mr Peter Lamb | <i>Consultant Bariatric Surgeon, NHS Lothian</i> |
| Mr Philip Newland-Jones | <i>Consultant Pharmacist for Diabetes and Endocrinology</i> |
| Professor Rebecca Reynolds | <i>Professor of Metabolic Medicine, University of Edinburgh</i> |
| Mr Andrew Robertson | <i>Consultant Bariatric Surgeon, NHS Lothian</i> |
| Ms Eve Smyth | <i>Lived experience</i> |
| Mr Andrew Steele | <i>Pharmacist</i> |
| Dr Elspeth Strang | <i>Professional Adviser, Primary Care and GP, NHS GGC&C</i> |
| Ms Jacqueline Walker | <i>Dietetic Clinical Lead, NHS Grampian and Professional Adviser, Scottish Government</i> |
| Professor Sarah Wild | <i>Professor of Epidemiology, University of Edinburgh</i> |

10.3.2 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

10.3.3 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 Roberta James | <i>SIGN Programme Lead; Co-Editor</i> |
| Professor Angela Timoney | <i>Chair of SIGN; Co-Editor</i> |
| Dr Safia Qureshi | <i>Director of Evidence, Healthcare Improvement Scotland</i> |

Abbreviations

| | |
|-----------------|---|
| BMI | body mass index |
| DiRECT | Diabetes Remission Clinical Trial |
| FPG | fasting plasma glucose |
| GIP | glucose-dependent insulintropic polypeptide |
| GLP-1 RA | glucagon-like peptide-1 receptor agonist |
| GP | general practitioner |
| HbA1c | haemoglobin A1c |
| NICE | National Institute for Health and Care Excellence |
| OGTT | oral glucose tolerance test |
| POCT | point-of-care testing |
| SHTG | Scottish Health Technologies Group |
| SIGN | Scottish Intercollegiate Guidelines Network |
| SMC | Scottish Medicines Consortium |

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.

| <i>Guideline section</i> | Key question |
|--------------------------|---|
| 3.1 | 1. How can we identify those at increased risk of developing type 2 diabetes? |
| 3.2 | 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? |
| 4 | 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? |
| 5 | 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? |
| 6.1 | 5. What non-pharmacological interventions have been successful in achieving remission of type 2 diabetes? |
| 6.2 | 6. What evidence is there that bariatric surgery is successful in achieving remission of type 2 diabetes? |

References

- 1 Astbury NM, Aveyard, P., Nickless, A., et al. Doctor Referral of Overweight People to Low Energy total diet replacement Treatment (DROPLET): pragmatic randomised controlled trial. *BMJ* 2018;362:k3760.
- 2 Lean MEJ, Leslie, W.S., Barnes, A.C., et al. Primary care-led weight management for remission of type 2 diabetes (DiRECT): an open-label, cluster-randomised trial. *The Lancet* 2018;391(10120):541-51.
- 3 Group SD. Scottish Diabetes Survey 2022. 2023. Available from url: <https://www.diabetesinscotland.org.uk/wp-content/uploads/2023/10/Scottish-Diabetes-Survey-2022.pdf>
- 4 Scotland PH. Scottish Burden of Disease study. 2022. Available from url: <https://www.scotpho.org.uk/media/2178/sbod-forecasting-briefing-english-november2022.pdf>
- 5 Diabetes Scotland. State of the Nation 2015: The Age of Diabetes. 2015. Available from url: <https://diabetes-resources-production.s3-eu-west-1.amazonaws.com/diabetes-storage/migration/pdf/SOTN%2520Diabetes.pdf>
- 6 World Health Organization. Health Promotion Glossary of Terms 2021. 2021. Available from url: <https://www.who.int/publications/i/item/9789240038349>
- 7 Booske B, Athens, J., Kindig, D., Remington, P. Different perspectives for assigning weights to wider determinants of health [online]. 2010;
- 8 The British National Formulary. Guidance on prescribing.
- 9 General Medical Council (GMC). Good practice in prescribing and managing medicines and devices. 2021;
- 10 Society RP. A Competency Framework for all Prescribers. 2021;
- 11 Medicines and Healthcare products Regulatory Agency. Off label use or unlicensed medicines: prescribers' responsibilities. *Drug Safety Update* 2009;2(9).
- 12 National Institute for Health and Care Excellence (NICE). PH38 - Type 2 diabetes: prevention in people at high risk.; 2012. Available from url: <https://www.nice.org.uk/guidance/ph38>
- 13 University College London. Online tools for behaviour change.
- 14 McDermid E. A quick guide to the STEP trials. 2023;
- 15 Rosenstock J, Wysham, C., Frias, J.P., et al. Efficacy and safety of a novel dual GIP and GLP-1 receptor agonist tirzepatide in patients with type 2 diabetes (SURPASS-1): a double-blind, randomised, phase 3 trial. *The Lancet* 2021;398(10295):143-55.
- 16 Ryan DH, Lingvay, I., Colhoun, H.M., et al. Semaglutide effects on cardiovascular outcomes in people with overweight or obesity (SELECT) rationale and design. *American Heart Journal* 2020;229:61-9.
- 17 Scottish Medicines Consortium. Liraglutide (Saxenda). 2022;
- 18 Consortium SM. Semaglutide (Wegovy). 2023;
- 19 MacKay D, Chan, C., Dasgupta, K., et al., on behalf of the Diabetes Canada Clinical Practice Guidelines Steering Committee,. Remission of type 2 diabetes. *Canadian Journal of Diabetes* 2022;46:753-61.
- 20 Scottish Health Technologies Group (SHTG). A review of the clinical and cost effectiveness evidence for a digital type 2 diabetes remission programme in Scotland. 2023. Available from url: <https://shtg.scot/our-advice/a-review-of-the-clinical-and-cost-effectiveness-evidence-for-a-digital-type-2-diabetes-remission-programme-in-scotland/>
- 21 National Institute for Health and Care Excellence (NICE). CG189 - Obesity: identification, assessment and management.; 2014.
22. Scottish Health Technologies Group (SHTG). Digital prevention programme for people at risk of developing type 2 diabetes. 2023. Available from url: <https://shtg.scot/our-advice/digital-prevention-programme-for-people-at-risk-of-developing-type-2-diabetes/>