# NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

# Guideline

## Type 2 diabetes in adults: management

## Draft for consultation, August 2025

**This update covers** medicines for type 2 diabetes in adults (aged 18 and over).

This guideline will update NICE guideline NG28 (published December 2015).

See the medicines section for the new recommendations.

### Who is it for?

- Healthcare professionals
- Commissioners and providers
- Adults with type 2 diabetes, their families and carers

### What does it include?

- the recommendations
- recommendations for research
- rationale and impact sections that explain why the committee made the 2022 and 2025 recommendations and how they might affect practice
- the guideline context.

Information about how the update was developed is on the guideline's webpage. This includes the evidence reviews, the scope, details of the committee and any declarations of interest.

**New and updated recommendations**

See update information for a full explanation of what is being updated.

We have updated the recommendations on medicines, based on a review of the evidence. You are invited to comment on these recommendations. These are marked **[2025]**.

We have also amended some recommendations without reviewing the evidence. You are invited to comment on these changes (shaded in yellow). These are marked **[2009, amended 2025]**, **[2015, amended 2025]** and **[2022, amended 2025]**.

We have not reviewed the evidence or amended the recommendations shaded in grey, and we cannot accept comments on them. These are marked **[2009]**, **[2015]**, **[2021]**, **[2022]**, **[2009, amended 2015]**, **[2009, amended 2020]**, and **[2015, amended 2022]**)

Full details of the evidence and the committee's discussion on the 2025 recommendations are in the 2025 evidence reviews.

Evidence for the 2022 recommendations is in the 2022 evidence reviews.

Evidence for the 2009 and 2015 recommendations is in the 2015 full guideline.

# Contents

# Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in NICE's information on making decisions about your care.

Making decisions using NICE guidelines explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

Healthcare professionals should follow our general guidelines for people delivering care:

- Patient experience in adult NHS services
- Shared decision making
- Medicines adherence
- Medicines optimisation
- Multimorbidity
- Decision making and mental capacity.

See the medicines section for the new recommendations.

## 1.1 Individualised care

1.1.1 Adopt an individualised approach to diabetes care that is tailored to the needs and circumstances of adults with type 2 diabetes, taking into account their personal preferences, comorbidities and risks from polypharmacy, and their likelihood of benefiting from long-term interventions. Such an approach is especially important in the context of multimorbidity. **[2015, amended 2022]**

1.1.2 Reassess the person's needs and circumstances at each review and think about whether to stop any medicines that are not effective. **[2015]**

1.1.3 Take into account any disabilities, including visual impairment, when planning and delivering care for adults with type 2 diabetes. **[2015]**

1.1.4 For discussions about overweight and obesity, see the NICE guideline on overweight and obesity management. In particular, see:

- the section on general principles of care
- recommendation 1.11.3 on addressing the drivers of overweight and obesity. **[2025]**

1.1.5 For further guidance on collaborative care, blood glucose management and insulin use for people with diabetes and an eating disorder, see the section on diabetes in the NICE guideline on eating disorders. **[2025]**

## 1.2 Education

1.2.1 Offer structured education to adults with type 2 diabetes and their family members or carers (as appropriate) at the time of diagnosis, with annual reinforcement and review. Explain to people that structured education is an integral part of diabetes care. **[2009]**

1.2.2 Ensure that any structured education programme for adults with type 2 diabetes:

- is evidence-based, and suits the needs of the person
- has specific aims and learning objectives, and supports the person and their family members and carers to develop attitudes, beliefs, knowledge and skills to self-manage diabetes
- has a structured curriculum that is theory driven, evidence-based and resource-effective, has supporting materials and is written down
- is delivered by trained educators who:
  - have an understanding of educational theory appropriate to the age and needs of the person

  - are trained and competent to deliver the principles and content of the programme
- is quality assured, and reviewed by trained, competent, independent assessors who measure it against criteria that ensure consistency
- has outcomes that are audited regularly. **[2015]**

1.2.3 Ensure that education programmes for adults with type 2 diabetes provide the necessary resources to support the educators, and that educators are properly trained and given time to develop and maintain their skills. **[2009]**

1.2.4 Offer adults with type 2 diabetes group education programmes as the preferred option. Provide an alternative of equal standard for people who are unable or prefer not to take part in group education. **[2009]**

1.2.5 Ensure that education programmes for adults with type 2 diabetes meet the cultural, linguistic, cognitive and literacy needs of people in the local area. **[2009]**

1.2.6 Ensure that all members of the diabetes healthcare team are familiar with the education programmes available locally for adults with type 2 diabetes, and that these programmes are integrated with the rest of the care pathway. **[2009]**

1.2.7 Ensure that adults with type 2 diabetes and their family members and carers (as appropriate) have the opportunity to contribute to the design and provision of local education programmes for adults with type 2 diabetes. **[2009]**

## 1.3 Dietary advice

1.3.1 Provide individualised and ongoing nutritional advice from a healthcare professional with specific expertise and competencies in nutrition. **[2009]**

1.3.2 Provide dietary advice in a form sensitive to the person's needs, culture and beliefs, being sensitive to their willingness to change and the effects on their quality of life. **[2009]**

1.3.3 Encourage adults with type 2 diabetes to follow the same healthy eating advice as the general population, which includes:

- eating high-fibre, low-glycaemic-index sources of carbohydrate, such as fruit, vegetables, wholegrains and pulses
- choosing low-fat dairy products
- eating oily fish
- controlling their intake of saturated and trans fatty acids. **[2009]**

1.3.4 For recommendations on low-energy and very-low-energy diets for the management of type 2 diabetes, see:

- the NICE guideline on overweight and obesity management
- the NHS Type 2 diabetes Path to Remission Programme. **[2025]**

1.3.5 Integrate dietary advice with a personalised diabetes management plan, including other aspects of healthy living such as increasing physical activity and losing weight. **[2009, amended 2025]**

1.3.6 For adults with type 2 diabetes who are living with overweight, discuss and agree an initial body weight loss target of 5% to 10%. Remember that a small amount of weight loss may still be beneficial, and a larger amount will have advantageous metabolic impact in the long term. **[2009]**

1.3.7 Individualise recommendations for carbohydrate and alcohol intake, and meal patterns. Make reducing the risk of hypoglycaemia a particular aim for people using insulin or an insulin secretagogue. **[2009]**

1.3.8 Advise adults with type 2 diabetes that they can substitute a limited amount of sucrose-containing foods for other carbohydrate in the

meal plan but should take care to avoid excess energy intake. **[2009]**

1.3.9 Discourage adults with type 2 diabetes from using foods marketed specifically for people with diabetes. **[2009]**

1.3.10 When adults with type 2 diabetes are admitted as inpatients to hospital or any other care setting, implement a meal planning system that provides consistency in the carbohydrate content of meals and snacks. **[2009]**

1.3.11 For recommendations on wellbeing advice, see the NICE guidelines on overweight and obesity management, physical activity and tobacco. **[2015, amended 2025]**

## 1.4 Bariatric surgery

1.4.1 For recommendations on bariatric surgery for people with recent-onset type 2 diabetes, see the section on surgical interventions in the NICE guideline on overweight and obesity management. **[2015]**

## 1.5 Diagnosing and managing hypertension

The recommendations on diagnosing and managing hypertension have been removed. For recommendations on hypertension in people with type 2 diabetes, see the NICE guideline on hypertension in adults. Diagnosis, treatment and monitoring of hypertension is broadly the same for people with type 2 diabetes as for other people. When a different approach is needed for people with type 2 diabetes, this is specified in the hypertension guideline.

## 1.6 Antiplatelet therapy

1.6.1 Do not offer antiplatelet therapy (aspirin or clopidogrel) to adults with type 2 diabetes without cardiovascular disease. **[2015]**

1.6.2 For guidance on the primary and secondary prevention of cardiovascular disease in adults with type 2 diabetes, see the NICE guidelines on cardiovascular disease and acute coronary syndromes. **[2015]**

## 1.7 Blood glucose management

### HbA1c measurement and targets

#### Measurement

1.7.1 Measure HbA1c levels in adults with type 2 diabetes every:

- 3 to 6 months (tailored to individual needs) until HbA1c is stable on unchanging therapy
- 6 months once the HbA1c level and blood glucose lowering therapy are stable. **[2015]**

1.7.2 Measure HbA1c using methods calibrated according to International Federation of Clinical Chemistry (IFCC) standardisation. **[2015]**

1.7.3 If HbA1c monitoring is invalid because of disturbed erythrocyte turnover or abnormal haemoglobin type, estimate trends in blood glucose control using one of the following:

- quality-controlled plasma glucose profiles
- total glycated haemoglobin estimation (if abnormal haemoglobins)
- fructosamine estimation. **[2015]**

1.7.4 Investigate unexplained discrepancies between HbA1c and other glucose measurements. Seek advice from a team with specialist expertise in diabetes or clinical biochemistry. **[2015]**

#### Targets

NICE has produced a patient decision aid on agreeing HbA1c targets, which also covers factors to weigh up when discussing HbA1c targets with patients.

1.7.5 Discuss and agree an individual HbA1c target with adults with type 2 diabetes (see recommendations 1.7.6 to 1.7.10). Encourage them to reach their target and maintain it, unless any resulting adverse effects (including hypoglycaemia), or their efforts to

achieve their target impair their quality of life. Think about using the NICE patient decision aid on weighing up HbA1c targets to support these discussions. **[2015, amended 2022]**

1.7.6 Offer advice on healthy living, and medicines, to support adults with type 2 diabetes to reach and maintain their HbA1c target (see the sections on dietary advice, bariatric surgery, and medicines). For more information about supporting adherence, see the NICE guideline on medicines adherence. **[2015, amended 2025]**

1.7.7 For adults whose type 2 diabetes is managed either by healthy living and diet, or healthy living and diet combined with an initial medication regimen that is not associated with hypoglycaemia (see the section on initial medicines), support them to aim for an HbA1c level of 48 mmol/mol (6.5%). For adults on a medicine associated with hypoglycaemia, support them to aim for an HbA1c level of 53 mmol/mol (7.0%). **[2015, amended 2025]**

1.7.8 In adults with type 2 diabetes, if HbA1c levels are not adequately controlled by the initial medication regimen and rise to 58 mmol/mol (7.5%) or higher:

- reinforce advice about diet, healthy living and adherence to medicines **and**
- support the person to aim for an HbA1c level of 53 mmol/mol (7.0%) **and**
- intensify medicines. **[2015, amended 2025]**

1.7.9 Consider relaxing the target HbA1c level (see recommendations 1.7.7 and 1.7.8 and NICE's patient decision aid) on a case-by-case basis and in discussion with adults with type 2 diabetes, with particular consideration for people who are older or frailer, if:

- they are unlikely to achieve longer-term risk-reduction benefits, for example, people with a reduced life expectancy

- tight blood glucose control would put them at high risk if they developed hypoglycaemia, for example, if they are at risk of falling, they have impaired awareness of hypoglycaemia, or they drive or operate machinery as part of their job
- intensive management would not be appropriate, for example if they have significant comorbidities. **[2015, amended 2022]**

1.7.10 If adults with type 2 diabetes reach an HbA1c level that is lower than their target and they are not experiencing hypoglycaemia, encourage them to maintain it. Be aware that there are other possible reasons for a low HbA1c level, for example deteriorating renal function or sudden weight loss. **[2015]**

1.7.11 For guidance on HbA1c targets in pregnancy, see the NICE guideline on diabetes in pregnancy. **[2015]**

### Self-monitoring of capillary blood glucose

These recommendations relate to self-monitoring by capillary blood glucose monitoring.

1.7.12 Take the Driver and Vehicle Licensing Agency (DVLA)'s Assessing fitness to drive: a guide for medical professionals into account when offering self-monitoring of capillary blood glucose levels for adults with type 2 diabetes. **[2015, amended 2022]**

1.7.13 Do not routinely offer self-monitoring of capillary blood glucose levels for adults with type 2 diabetes unless:

- the person is on insulin **or**
- there is evidence of hypoglycaemic episodes **or**
- the person is on oral medication that may increase their risk of hypoglycaemia while driving or operating machinery **or**
- the person is pregnant or is planning to become pregnant (see the NICE guideline on diabetes in pregnancy). **[2015, amended 2022]**

1.7.14 Consider short-term self-monitoring of capillary blood glucose levels in adults with type 2 diabetes, reviewing treatment as necessary:

- when starting treatment with oral or intravenous corticosteroids **or**
- to confirm suspected hypoglycaemia. **[2015, amended 2022]**

1.7.15 Be aware that adults with type 2 diabetes who have acute intercurrent illness are at risk of worsening hyperglycaemia. Review treatment as necessary. **[2015]**

1.7.16 If adults with type 2 diabetes are self-monitoring their capillary blood glucose levels, carry out a structured assessment at least annually. The assessment should include:

- the person's self-monitoring skills
- the quality and frequency of testing
- checking that the person knows how to interpret the blood glucose results and what action to take
- the impact on the person's quality of life
- the continued benefit to the person
- the equipment used. **[2015, amended 2022]**

### Continuous glucose monitoring

1.7.17 Offer intermittently scanned continuous glucose monitoring (isCGM, commonly referred to as 'flash') to adults with type 2 diabetes on multiple daily insulin injections if any of the following apply:

- they have recurrent hypoglycaemia or severe hypoglycaemia
- they have impaired hypoglycaemia awareness
- they have a condition or disability (including a learning disability or cognitive impairment) that means they cannot self-monitor their blood glucose by capillary blood glucose monitoring but could use an isCGM device (or have it scanned for them)

- they would otherwise be advised to self-measure at least 8 times a day.

For guidance on continuous glucose monitoring (CGM) for pregnant women, see the NICE guideline on diabetes in pregnancy. **[2022]**

1.7.18 Offer isCGM to adults with insulin-treated type 2 diabetes who would otherwise need help from a care worker or healthcare professional to monitor their blood glucose. **[2022]**

1.7.19 Consider real-time continuous glucose monitoring (rtCGM) as an alternative to isCGM for adults with insulin-treated type 2 diabetes if it is available for the same or lower cost. **[2022]**

1.7.20 CGM should be provided by a team with expertise in its use, as part of supporting people to self-manage their diabetes. **[2022]**

1.7.21 Advise adults with type 2 diabetes who are using CGM that they will still need to take capillary blood glucose measurements (although they can do this less often). Explain that is because:

- they will need to use capillary blood glucose measurements to check the accuracy of their CGM device
- they will need capillary blood glucose monitoring as a back-up (for example when their blood glucose levels are changing quickly or if the device stops working).

Provide them with enough test strips to take capillary blood glucose measurements as needed. **[2022]**

1.7.22 If a person is offered rtCGM or isCGM but cannot or does not want to use any of these devices, offer capillary blood glucose monitoring. **[2022]**

1.7.23 Ensure CGM is part of the education provided to adults with type 2 diabetes who are using it (see the section on education). **[2022]**

1.7.24 Monitor and review the person's use of CGM as part of reviewing their diabetes care plan (see the section on individualised care). **[2022]**

1.7.25 If there are concerns about the way a person is using the CGM device:

- ask if they are having problems using their device
- look at ways to address any problems and concerns to improve their use of the device, including further education and emotional and psychological support. **[2022]**

1.7.26 Commissioners, providers and healthcare professionals should address inequalities in CGM access and uptake by:

- monitoring who is using CGM
- identifying groups who are eligible but who have a lower uptake
- making plans to engage with these groups to encourage them to consider CGM. **[2022]**

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on continuous glucose monitoring.

Full details of the evidence and the committee's discussion are in evidence review C: continuous glucose monitoring in adults with type 2 diabetes.

## 1.8 Medicines

Recommendations in this section that cover dipeptidyl peptidase-4 (DPP-4) inhibitors, glucagon-like peptide-1 (GLP-1) receptor agonists, sulfonylureas and sodium–glucose cotransporter-2 (SGLT-2) inhibitors refer to each of these groups of medicines at class level unless otherwise stated.

## Involving people in medicine discussions

NICE has produced a visual summary that provides an overview of the recommendations and additional information to support medicine choice up to the point at which a person starts insulin-based treatment.

1.8.1 Discuss the benefits and risks of each drug treatment option with adults with type 2 diabetes, and support them to make an informed decision about their treatment. Take into account the effectiveness of each medicine in terms of:

- metabolic response and
- cardiovascular and renal protection. **[2015, amended 2025]**

See the NICE guideline on shared decision making and the section on safety of medicines for diabetes before and during pregnancy in the NICE guideline on diabetes in pregnancy.

1.8.2 If a person has more than one comorbidity (for example atherosclerotic cardiovascular disease and obesity), make a shared decision with them about which comorbidity to prioritise when choosing medicines. **[2025]**

1.8.3 When discussing GLP-1 receptor agonists with women, trans men and non-binary people of childbearing potential, tell them:

- what MHRA guidance says about the use of GLP-1 medicines in pregnancy
- weight loss may improve fertility
- effective contraception must be used while taking the medicine and
- that they want to become pregnant they should continue to use contraception for a period after stopping the medication (see MHRA guidance on GLP-1 medicines for weight loss and diabetes for specific length of time). **[2025]**

1.8.4 Use non-judgemental language in all medication discussions to support people with starting and adhering to treatment. **[2025]**

For a short explanation of why the committee made these 2025 recommendations and how they might affect practice, see the rationale and impact section on involving people in medicine discussions.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

## Hyperglycaemia

1.8.5 If an adult with type 2 diabetes has symptoms of hyperglycaemia, consider insulin (see the section on insulin-based treatments) or a sulfonylurea, and review treatment when blood glucose is within the targets set for the person. **[2015]**

## Sick day rules

February 2025: follow the Medicines and Healthcare products Regulatory Agency (MHRA)'s safety advice on monitoring ketones during SGLT-2 inhibitor treatment interruption.

1.8.6 Give clear sick day rules in each person's individualised treatment plan. Depending on the person's needs and the medicines they are taking, these rules may need to specify:

- whether medication should change (and how) if the person is unwell or is having surgery
- whether any treatments should be stopped if there is a risk of dehydration, vomiting and diarrhoea (relevant for metformin, SGLT-2 inhibitors, and GLP-1 receptor agonists)
- how to adjust insulin doses
- how to restart medication after recovery. **[2025]**

For a short explanation of why the committee made this recommendation and how it might affect practice, see the rationale and impact section on sick day rules.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

## Assessing risk before starting medicines

1.8.7 Assess the person's current cardiovascular and renal status, and risk of developing cardiovascular disease in the future. **[2022, amended 2025]**

1.8.8 If frailty is a concern, assess for it before starting medicines.

See the recommendations on how to assess frailty in NICE's guideline on clinically assessing and managing multimorbidity. **[2025]**

For a short explanation of why the committee made these 2025 recommendations and how they might affect practice, see the rationale and impact section on assessing risk before starting medicines.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

## Initial medicines

See the visual summary for an overview of the recommendations and additional information to support medicine choice up to the point at which a person starts insulin-based treatment.

In this guideline, SGLT-2 inhibitors and GLP-1 receptor agonists are recommended as much for their cardiovascular benefits as for their glycaemic benefits (unless otherwise specified).

Healthcare professionals should also refer to the summary of product characteristics for individual medicines for contraindications and

precautions to take in pregnancy and for women, trans men and non-binary people of childbearing potential.

**People with type 2 diabetes and no significant comorbidity**

1.8.9 For adults with type 2 diabetes, offer:

- metformin, and
- an SGLT-2 inhibitor . **[2025]**

1.8.10 Consider modified-release metformin for adults with type 2 diabetes when they or their healthcare professional have concerns about adherence to standard-release metformin therapy. **[2025]**

1.8.11 If metformin is contraindicated or not tolerated, offer monotherapy with an SGLT-2 inhibitor. **[2025]**

For a short explanation of why the committee made these 2025 recommendations and how they might affect practice, see the rationale and impact section on initial medicines for people with type 2 diabetes and no significant comorbidity.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

**People with heart failure**

1.8.12 For adults with type 2 diabetes and heart failure offer:

- metformin, and
- an SGLT-2 inhibitor. **[2025]**

1.8.13 Consider modified-release metformin for adults with type 2 diabetes when they or their healthcare professional have concerns about adherence to standard-release metformin therapy. **[2025]**

1.8.14 If metformin is contraindicated or not tolerated, offer monotherapy with an SGLT-2 inhibitor. **[2025]**

> For a short explanation of why the committee made these 2025 recommendations and how they might affect practice, see the rationale and impact section on initial medicines for people with type 2 diabetes and heart failure.
>
> Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

**People with atherosclerotic cardiovascular disease**

1.8.15 For adults with type 2 diabetes and atherosclerotic cardiovascular disease, offer:

- metformin, and
- an SGLT-2 inhibitor, and
- subcutaneous semaglutide. **[2025]**

1.8.16 Consider modified-release metformin for adults with type 2 diabetes when they or their healthcare professional have concerns about adherence to standard-release metformin. **[2025]**

1.8.17 If metformin is contraindicated or not tolerated, offer:

- an SGLT-2 inhibitor, and
- subcutaneous semaglutide. **[2025]**

> For a short explanation of why the committee made these 2025 recommendations and how they might affect practice, see the rationale and impact section on initial medicines for people with type 2 diabetes and atherosclerotic cardiovascular disease.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

**People with early onset type 2 diabetes**

1.8.18 For adults with early onset type 2 diabetes:

- Offer metformin and an SGLT-2 inhibitor.
- Consider adding a GLP-1 receptor agonist. **[2025]**

1.8.19 Consider modified-release metformin for adults with type 2 diabetes when they or their healthcare professional have concerns about adherence to standard-release metformin therapy. **[2025]**

1.8.20 If metformin is contraindicated or not tolerated:

- Offer an SGLT-2 inhibitor.
- Consider adding a GLP-1 receptor agonist. **[2025]**

For a short explanation of why the committee made these 2025 recommendations and how they might affect practice, see the rationale and impact section on initial medicines for people with early onset type 2 diabetes.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

**People living with obesity**

1.8.21 For adults with type 2 diabetes who are living with obesity, offer:

- metformin and
- an SGLT-2 inhibitor. **[2025]**

1.8.22 Consider modified-release metformin for adults with type 2 diabetes when they or their healthcare professional have concerns about adherence to standard-release metformin therapy. **[2025]**

1.8.23 If metformin is contraindicated or not tolerated, offer monotherapy with an SGLT-2 inhibitor. **[2025]**

> For a short explanation of why the committee made these 2025 recommendations and how they might affect practice, see the rationale and impact section on initial medicines for people with type 2 diabetes who are living with obesity.
>
> Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

**People with chronic kidney disease**

> Medicines vary in their contraindications and precautions for use in people with renal impairment. See NICE's information on prescribing medicines and refer to the summary of product characteristics for individual products.

1.8.24 For adults with type 2 diabetes and an estimated glomerular filtration rate (eGFR) above 30 ml/min/1.73 $m^2$:

- Offer metformin and either dapagliflozin or empagliflozin.
- If metformin is contraindicated or not tolerated, offer either dapagliflozin or empagliflozin alone. **[2025]**

1.8.25 Consider modified-release metformin for adults with type 2 diabetes when they or their healthcare professional have concerns about adherence to standard-release metformin therapy. **[2025]**

1.8.26 For adults with type 2 diabetes and an eGFR of 20 ml/min/1.73 $m^2$ and up to 30 ml/min/1.73 $m^2$, offer either dapagliflozin or empagliflozin alone. **[2025]**

1.8.27 For adults with type 2 diabetes and an eGFR below 20 ml/min/1.73 $m^2$, consider a DPP-4 inhibitor. **[2025]**

1.8.28 If a DPP-4 inhibitor is contraindicated, not tolerated or not effective, consider:

- pioglitazone or
- an insulin-based treatment. **[2025]**

1.8.29 For guidance on managing other aspects of kidney disease in adults with type 2 diabetes, see the NICE guideline on chronic kidney disease. **[2015]**

For a short explanation of why the committee made these 2025 recommendations and how they might affect practice, see the rationale and impact section on initial medicines for people with type 2 diabetes and chronic kidney disease.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

**People with frailty**

1.8.30 For adults with type 2 diabetes who have a level of frailty that places them at risk of adverse events from SGLT-2 inhibitors:

- consider metformin alone
- if metformin is contraindicated or not tolerated, consider a DPP-4 inhibitor. **[2025]**

1.8.31 Consider modified-release metformin for adults with type 2 diabetes when they or their healthcare professional have concerns about adherence to standard-release metformin therapy. **[2025]**

1.8.32 Consider reviewing the person's overall diabetes treatment plan to ensure that they are taking the smallest effective number of medications, at the lowest effective dosage.

For further guidance on making a treatment plan for people with frailty (including when associated with multimorbidity), see NICE's guidelines on clinically assessing and managing multimorbidity, medicines optimisation and shared decision making. **[2025]**

> For a short explanation of why the committee made these 2025 recommendations and how they might affect practice, see the rationale and impact section on initial medicines for people with type 2 diabetes and frailty
>
> Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

## How to introduce medicines

1.8.33 Introduce medicines in a stepwise manner, checking for tolerability and effectiveness of each medicine. **[2015]**

1.8.34 When an adult with type 2 diabetes starts initial therapy with metformin and one or more other medicines:

- introduce the medicines one at a time, starting with metformin and checking tolerability
- if using an SGLT-2 inhibitor, start this as soon as metformin tolerability is confirmed
- if using a GLP-1 receptor agonist, start this as soon as the SGLT-2 inhibitor tolerability is confirmed. **[2022, amended 2025]**

### Preventing diabetic ketoacidosis when taking SGLT-2 inhibitors

1.8.35 Before starting an SGLT-2 inhibitor, check whether the person may be at increased risk of diabetic ketoacidosis (DKA), for example if they:

- have had a previous episode of DKA
- are unwell with intercurrent illness

- are following a very low carbohydrate or ketogenic diet. **[2022]**

1.8.36 Address modifiable risks of DKA before starting an SGLT-2 inhibitor. For example, people who are following a very low carbohydrate or ketogenic diet may need to delay treatment until they have changed their diet. **[2022]**

1.8.37 Advise adults with type 2 diabetes who are taking an SGLT-2 inhibitor that a very low carbohydrate or ketogenic diet would increase their risk of DKA and so:

- they should speak with their healthcare professional before starting such a diet, and
- their SGLT-2 inhibitor treatment may need to be suspended for the duration of the diet. **[2022]**

For a short explanation of why the committee made these 2022 recommendations and how they might affect practice, see the rationale and impact section on how to introduce medicines.

Full details of the evidence and the committee's discussion are in evidence review B: pharmacological therapies with cardiovascular and other benefits in people with type 2 diabetes.

### Reviewing medicines

1.8.38 When reviewing treatments, discuss all changes with the person with type 2 diabetes. See the recommendations on involving people in medicine discussions. **[2022, amended 2025]**

1.8.39 Optimise their current treatment regimen before changing treatments, taking into account factors such as:

- adverse effects
- adherence to, and management of existing medicines
- the need to revisit advice about diet and self-management
- prescribed doses and formulations. **[2022, amended 2025]**

### Reviewing metformin

1.8.40 For adults with type 2 diabetes who are taking standard-release metformin:

- If it is effective and tolerated, continue.
- If it is not tolerated, offer modified-release metformin. **[2025]**

For a short explanation of why the committee made this recommendation and how it might affect practice, see the rationale and impact section on reviewing medicines.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

### Reviewing other medicines

1.8.41 If the person has reached their glycaemic and weight targets, consider continuing any medicines that have contributed to this. **[2025]**

1.8.42 Consider continuing SGLT-2 inhibitors for their cardiovascular or renal benefits, even if they do not help the person reach their glycaemic or weight targets. **[2025]**

1.8.43 Stop GLP-1 receptor agonists if:

- they do not help the person reach their glycaemic or weight targets, and
- the person does not have atherosclerotic cardiovascular disease or early onset type 2 diabetes. **[2025]**

1.8.44 Take into account adverse effects from combining medicines (for example hypoglycaemia). **[2022, amended 2025]**

1.8.45 Do not offer a GLP-1 receptor agonist and a DPP-4 inhibitor together to treat type 2 diabetes. **[2025]**

For a short explanation of why the committee made these 2025 recommendations and how they might affect practice, see the rationale and impact section on reviewing medicines.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

## Treatment options if further medicines are needed

In this guideline, SGLT-2 inhibitors and GLP-1 receptor agonists are recommended as much for their cardiovascular benefits as for their glycaemic benefits (unless otherwise specified).

Healthcare professionals should also see the summary of product characteristics for individual medicines for contraindications and precautions to take in pregnancy and for women, trans men and non-binary people of childbearing potential.

See the visual summary for an overview of the recommendations and additional information to support medicine choice up to the point at which a person starts insulin-based treatment.

### People with type 2 diabetes and no significant comorbidity

1.8.46 For adults with type 2 diabetes who need further medicines to reach their glycaemic targets:

- add a DPP-4 inhibitor to their current treatment
- if this is contraindicated, not tolerated or is not effective, offer:
  - a sulfonylurea or
  - pioglitazone or
  - an insulin-based treatment (see the section on insulin-based treatments). **[2025]**

For a short explanation of why the committee made this recommendation and how they might affect practice, see the rationale and impact section on treatment options if further medicines are needed for people with no significant comorbidity.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

**People with heart failure**

1.8.47 Consider adding subcutaneous semaglutide for adults with type 2 diabetes and heart failure who need further medicines to reach their weight management targets, if:

- they are living with obesity
- there are no concerns about frailty that may increase the risk of adverse events with the medicine
- they have a preserved ejection fraction. **[2025]**

1.8.48 For adults with type 2 diabetes and heart failure who need further medicines to reach their glycaemic targets, add:

- a sulfonylurea or
- an insulin-based treatment (see the section on insulin-based treatments). **[2025]**

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on treatment options if further medicines are needed for people with type 2 diabetes and heart failure.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

### People with atherosclerotic cardiovascular disease

1.8.49 If an adult with type 2 diabetes develops atherosclerotic cardiovascular disease after starting initial treatment, add subcutaneous semaglutide to their current treatment. **[2025]**

1.8.50 For adults with type 2 diabetes and atherosclerotic cardiovascular disease who need further medicines to reach their glycaemic targets, add:

- a sulfonylurea or
- pioglitazone or
- an insulin-based treatment (see the section on insulin-based treatments). **[2025]**

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on treatment options if further medicines are needed for people with atherosclerotic cardiovascular disease.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

### People with early onset type 2 diabetes

1.8.51 For adults with early onset type 2 diabetes who need further medicines to reach their glycaemic targets, consider adding a GLP-1 receptor agonist. **[2025]**

1.8.52 For adults with early onset type 2 diabetes who need further medicines to reach their glycaemic targets who are taking a GLP-1 receptor agonist, add:

- a sulfonylurea or
- pioglitazone or
- an insulin-based treatment (see the section on insulin-based treatments). **[2025]**

1.8.53 For adults with early onset type 2 diabetes who need further medicines to reach their glycaemic targets where a GLP-1 receptor agonist is contraindicated, not tolerated or is not appropriate:

- add a DPP-4 inhibitor to their current treatment
- if this is contraindicated, not tolerated or is not effective, offer:
  - a sulfonylurea or
  - pioglitazone or
  - an insulin-based treatment (see the section on insulin-based treatments). **[2025]**

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on treatment options if further medicines are needed for people with early onset type 2 diabetes.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

**People living with obesity**

1.8.54 Consider adding a GLP-1 receptor agonist for adults with type 2 diabetes who are living with obesity, if:

- they have been taking initial therapy for at least 3 months and
- further medicines are needed to reach their glycaemic targets and
- they are not already taking a GLP-1 receptor agonist. **[2025]**

1.8.55 For adults with type 2 diabetes who are living with obesity and need further medicines to reach their glycaemic targets who are taking a GLP-1 receptor agonist, add:

- a sulfonylurea or
- pioglitazone or

- an insulin-based treatment (see the section on insulin-based treatments). **[2025]**

1.8.56 For adults with type 2 diabetes who are living with obesity and need further medicines to reach their glycaemic targets where a GLP-1 receptor agonist is contraindicated, not tolerated, not appropriate or not effective:

- add a DPP-4 inhibitor to their current treatment
- if this is contraindicated, not tolerated or is not effective, offer:
  - a sulfonylurea or
  - pioglitazone or
  - an insulin-based treatment (see the section on insulin-based treatments). **[2025]**

1.8.57 Tirzepatide is recommended as an option in NICE technology appraisal guidance for some adults with type 2 diabetes when it is insufficiently controlled. For full details, see the guidance on tirzepatide (TA924, 2023). **[2025]**

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on treatment options if further medicines are needed for people with type 2 diabetes living with obesity.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

**People with chronic kidney disease**

Medicines vary in their contraindications and precautions for use in people with renal impairment. See NICE's information on prescribing medicines and refer to the summary of product characteristics for individual products.

1.8.58 For adults with type 2 diabetes and chronic kidney disease who need further medicines to reach their glycaemic targets:

- consider adding a DPP-4 inhibitor
- if they are already taking a DPP-4 inhibitor or if a DPP-4 inhibitor is contraindicated, not tolerated or is not effective, consider adding:
  - pioglitazone or
  - a sulfonylurea (if their eGFR is above 30 ml/min/1.73 $m^2$) or
  - an insulin-based treatment. **[2025]**

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on treatment options if further medicines are needed for people with type 2 diabetes and chronic kidney disease.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

**People with frailty**

1.8.59 For adults with type 2 diabetes who have a level of frailty that places them at risk of adverse events from SGLT-2 inhibitors, are currently having monotherapy and need further medicines to manage their symptoms and reach their glycaemic targets:

- consider adding a DPP-4 inhibitor
- if they are already taking a DPP-4 inhibitor or if a DPP-4 inhibitor is contraindicated, not tolerated or is not effective, consider adding:
  - pioglitazone or
  - a sulfonylurea or
  - an insulin-based treatment (see the section on insulin-based treatments). **[2025]**

1.8.60 When choosing a treatment with the person, take into account that sulfonylureas and insulin-based treatments can increase the risk of hypoglycaemia and falls. **[2025]**

For a short explanation of why the committee made these recommendations and how they might affect practice, see the rationale and impact section on treatment options if further medicines are needed for people with type 2 diabetes and frailty.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

### Insulin-based treatments

1.8.61 Provide a structured education programme to adults with type 2 diabetes starting insulin therapy. The programme should include:

- injection technique, including rotating injection sites and avoiding repeated injections at the same point within sites
- self-monitoring
- dose titration to target levels
- dietary advice
- the DVLA's Assessing fitness to drive: a guide for medical professionals
- managing hypoglycaemia
- managing acute changes in plasma glucose control
- support from a healthcare professional trained in insulin therapy.

**[2015, amended 2025]**

1.8.62 When initiating insulin for adults with type 2 diabetes:

- continue to offer metformin to people already taking it
- stop any other medicines being used solely to manage hyperglycaemia

- discuss with the person the risks and benefits of continuing medicines for other benefits such as cardiovascular protection or weight management. **[2015, amended 2025]**

> For a short explanation of why the committee made the 2025 amendments to the recommendations on biosimilars and how they might affect practice, see the rationale and impact section on insulin-based treatments.

**Choosing a type of insulin**

1.8.63 Offer basal insulin as the initial insulin therapy to adults with type 2 diabetes. **[2015, amended 2025]**

1.8.64 Consider combining basal and short acting insulin as the initial insulin therapy for adults with type 2 diabetes, especially if the person's HbA1c is 75 mmol/mol (9.0%) or higher. This should be injected either separately or as a pre-mixed (biphasic) preparation. **[2015, amended 2025]**

> For a short explanation of why the committee made the 2025 amendments to the recommendations on biosimilars and how they might affect practice, see the rationale and impact section on insulin-based treatments.

**Choosing a preparation**

1.8.65 Make a shared decision with the person on the choice of basal insulin preparation, based on considerations that are specific to them, including whether:

- the person needs help from a carer or healthcare professional to inject insulin **or**
- there is a particular concern about nocturnal hypoglycaemia **or**
- the person has a strong preference for once-daily injections.

When multiple basal insulin types (including biosimilars) and regimens meet the person's needs, choose the one with the lowest acquisition cost. **[2015, amended 2025]**

1.8.66 Consider pre-mixed preparations that include short-acting insulin analogues rather than including short-acting human insulin preparations, if:

- the person prefers injecting insulin immediately before a meal or
- hypoglycaemia is a problem or
- blood glucose levels rise markedly after meals. **[2015, amended 2025]**

> For a short explanation of why the committee made the 2025 amendments to the recommendations on biosimilars and how they might affect practice, see the rationale and impact section on insulin-based treatments.

**Reviews**

1.8.67 At each review, check whether adults with type 2 diabetes who are on a basal insulin regimen need short-acting insulin before meals (or a pre-mixed [biphasic] insulin preparation). **[2015, amended 2025]**

1.8.68 At each review, check whether adults with type 2 diabetes who are on pre-mixed (biphasic) insulin need a further injection of short-acting insulin before meals or a change to a basal-bolus regimen with basal insulin, if their blood glucose level remains outside their agreed targets. **[2015, amended 2025]**

> For a short explanation of why the committee made the 2025 amendments to the recommendations on biosimilars and how they might affect practice, see the rationale and impact section on insulin-based treatments.

1.8.69 Follow the MHRA's guidance on minimising the risk of medication error with high strength, fixed combination and biosimilar insulin products, including its advice for healthcare professionals when starting treatment with a biosimilar. **[2021]**

1.8.70 When people are already using an insulin for which a lower cost biosimilar is available:

- Discuss with the person the possibility of switching to the biosimilar.
- Make a shared decision about it with them. **[2021]**

For a short explanation of why the committee made the 2021 recommendations on biosimilars and how they might affect practice, see the rationale and impact section on long-acting insulin.

### Insulin delivery

1.8.71 For guidance on insulin delivery for adults with type 2 diabetes, see the section on insulin injection delivery in the NICE guideline on type 1 diabetes. **[2015]**

## 1.9 Managing complications

### Periodontitis

1.9.1 Advise adults with type 2 diabetes at their annual review that:

- they are at higher risk of periodontitis
- if they get periodontitis, managing it can improve their blood glucose control and can reduce their risk of hyperglycaemia. **[2022]**

1.9.2 Advise adults with type 2 diabetes to have regular oral health reviews (their oral healthcare or dental team will tell them how often, in line with the NICE guideline on dental checks: intervals between oral health reviews). **[2022]**

1.9.3 For guidance for oral healthcare and dental teams on how to provide oral health advice, see the NICE guideline on oral health promotion. **[2022]**

1.9.4 For adults with type 2 diabetes who have been diagnosed with periodontitis by an oral healthcare or dental team, offer dental appointments to manage and treat their periodontitis (at a frequency based on their oral health needs). **[2022]**

For a short explanation of why the committee made these recommendations, see the rationale and impact section on periodontitis.

Full details of the evidence and the committee's discussion are in evidence review D: periodontitis.

## Gastroparesis

1.9.5 Think about a diagnosis of gastroparesis in adults with type 2 diabetes who have erratic blood glucose control or unexplained gastric bloating or vomiting, taking into account possible alternative diagnoses. **[2009, amended 2015]**

1.9.6 For adults with type 2 diabetes who have vomiting caused by gastroparesis, explain that:

- there is no strong evidence that any available antiemetic therapy is effective
- some people have had benefit with domperidone, erythromycin or metoclopramide
- the strongest evidence for effectiveness is for domperidone, but prescribers must take into account its safety profile, in particular its cardiac risk and potential interactions with other medicines. **[2015]**

  In December 2015, the use of erythromycin was off-label. See NICE's information on prescribing medicines.

1.9.7 To treat vomiting caused by gastroparesis in adults with type 2 diabetes:

- consider alternating the use of erythromycin and metoclopramide
- consider domperidone only in exceptional circumstances (if domperidone is the only effective treatment) and in accordance with MHRA guidance on domperidone. **[2015]**

In December 2015, the use of erythromycin was off-label. See NICE's information on prescribing medicines.

1.9.8 If gastroparesis is suspected, consider referring adults with type 2 diabetes to specialist services if:

- the differential diagnosis is in doubt **or**
- the person has persistent or severe vomiting. **[2009]**

### Painful diabetic neuropathy

1.9.9 For guidance on managing painful diabetic peripheral neuropathy in adults with type 2 diabetes, see the NICE guideline on neuropathic pain in adults. **[2015]**

### Autonomic neuropathy

1.9.10 Think about the possibility of contributory sympathetic nervous system damage in adults with type 2 diabetes who lose the warning signs of hypoglycaemia. **[2009, amended 2015]**

1.9.11 Think about the possibility of autonomic neuropathy affecting the gut in adults with type 2 diabetes who have unexplained diarrhoea that happens particularly at night. **[2009, amended 2015]**

1.9.12 For adults with type 2 diabetes and autonomic neuropathy who are taking tricyclic antidepressants and antihypertensive medicines, be aware of the increased likelihood of side effects such as orthostatic hypotension. For guidance on safe prescribing of antidepressants and managing withdrawal, see NICE's guideline on medicines associated with dependence or withdrawal symptoms. **[2009]**

1.9.13 For adults with type 2 diabetes who have unexplained bladder-emptying problems, investigate the possibility of autonomic neuropathy affecting the bladder. **[2009]**

1.9.14 In managing autonomic neuropathy symptoms, include specific interventions indicated by the manifestations (for example, for abnormal sweating or nocturnal diarrhoea). **[2009]**

### Diabetic foot problems

1.9.15 For guidance on preventing and managing foot problems in adults with type 2 diabetes, see the NICE guideline on diabetic foot problems. **[2015]**

### Erectile dysfunction

1.9.16 As part of the type 2 diabetes annual review, offer to discuss erectile dysfunction (if relevant). **[2015]**

1.9.17 Assess, educate and support people with type 2 diabetes who have problematic erectile dysfunction, addressing contributory factors such as cardiovascular disease as well as possible treatment options. **[2015]**

1.9.18 Consider a phosphodiesterase-5 inhibitor to treat problematic erectile dysfunction in people with type 2 diabetes. Initially choose the drug with the lowest acquisition cost and take into account any contraindications. **[2015]**

1.9.19 After discussion, refer people with type 2 diabetes to a service offering other medical, surgical or psychological management of erectile dysfunction if treatment (including a phosphodiesterase-5 inhibitor, as appropriate) has been unsuccessful. **[2015]**

### Eye disease

1.9.20 When adults are diagnosed with type 2 diabetes, refer them immediately to the local eye screening service. **[2009, amended 2020]**

1.9.21 Encourage adults to attend eye screening, and explain that it will help them to keep their eyes healthy and help to prevent problems with their vision. Explain that the screening service is effective at identifying problems so that they can be treated early. **[2009]**

1.9.22 Arrange emergency review by an ophthalmologist for:

- sudden loss of vision
- rubeosis iridis
- pre-retinal or vitreous haemorrhage
- retinal detachment. **[2009]**

1.9.23 Refer to an ophthalmologist in accordance with the UK National Screening Committee criteria and timelines for any large sudden unexplained drop in visual acuity. **[2009, amended 2020]**

For guidance on managing and monitoring diabetic retinopathy in people under the care of hospital eye services, see NICE's guideline on diabetic retinopathy.

# Terms used in this guideline

This section defines terms that have been used in a particular way for this guideline. For other definitions, see the NICE glossary and the Think Local, Act Personal Care and Support Jargon Buster.

## Atherosclerotic cardiovascular disease

Cardiovascular disease caused by a hardening of arteries by a buildup of fats, cholesterol and other substances. This includes coronary artery disease, cerebrovascular disease and peripheral arterial disease.

## Continuous glucose monitoring

This covers both real-time continuous glucose monitoring (rtCGM) and intermittently scanned continuous glucose monitoring (isCGM, commonly referred to as 'flash').

A continuous glucose monitor is a device that measures blood glucose levels and sends the readings to a display device or smartphone.

## Early onset type 2 diabetes

Diagnosed before age 40.

## High cardiovascular risk

Either:

- an estimated 10-year risk of cardiovascular disease of 10% or more, based on a full formal risk assessment, or
- early onset type 2 diabetes.

## Multiple daily injections

Two or more daily insulin injections, which could either be a basal-bolus regimen or more than one daily insulin injection.

## Periodontitis

A chronic inflammatory gum disease that destroys the supporting tissues of the teeth (the periodontium).

Gingivitis is a milder form of periodontal disease than periodontitis. However, gingivitis still causes inflammation in the gum, and if not treated it can lead to periodontitis.

## Severe hypoglycaemia

Episodes of hypoglycaemia that require assistance from another person to treat.

## Recurrent hypoglycaemia

Frequent events of hypoglycaemia that occur each week or month and have an impact on quality of life.

### Very low carbohydrate and ketogenic diets

A very low carbohydrate diet has 20 to 50 grams per day of carbohydrate or less than 10% of a 2000 kcal/day diet. A ketogenic diet is a very low carbohydrate, high fat diet that is designed to induce ketosis.

# Recommendations for research

The guideline committee has made the following recommendations for research.

## Key recommendations for research

### 1 Treatment strategy for people with type 2 diabetes and frailty

For people with type 2 diabetes and frailty, what is the clinical and cost effectiveness of different treatment strategies compared with usual care? **[2025]**

> For a short explanation of why the committee made this recommendation for research, see the rationale section on initial medicines for people with type 2 diabetes and frailty.
>
> Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

### 2 Access to SGLT-2 inhibitors

How can prescribing and access to SGLT-2 inhibitors be improved for people with type 2 diabetes from the most deprived groups?

- What factors influence healthcare professionals' decisions about prescribing SGLT-2 inhibitors to adults with and without early onset type 2 diabetes?
- What are the most effective and cost-effective methods to increase access and uptake of SGLT-2 inhibitors for people with and without early onset type 2 diabetes who are underserved in the current service? **[2025]**

For a short explanation of why the committee made this recommendation for research, see the rationale section on initial medicines.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

### 3 Treatments for people with early-onset type 2 diabetes

What is the clinical and cost-effectiveness of GLP-1 receptor agonists with SGLT-2 inhibitors compared to SGLT-2 inhibitors alone and to placebo alone for people with early-onset type 2 diabetes who are taking metformin? **[2025]**

For a short explanation of why the committee made this recommendation for research, see the rationale section on initial medicines for people with early onset type 2 diabetes.

Full details of the evidence and the committee's discussion are in evidence review E: initial management and evidence review F: subsequent management.

### 4 The effects of stopping or switching medicines to control blood glucose levels

In adults with type 2 diabetes, what are the effects of stopping and/or switching medicines to control blood glucose levels, and what criteria should inform the decision? **[2015]**

#### Why this is important

There is a lack of evidence on the effects of stopping and/or switching medicines to control blood glucose levels. The current practice of 'stopping rules' is typically motivated by either inadequate blood glucose control (rising HbA1c levels) or intolerable side effects. There is limited understanding of the short- and long-term effects of stopping a therapy and switching to another in terms of diabetes control (HbA1c levels), hypoglycaemic risk, weight gain, and cardiovascular morbidity and mortality. In addition, there is limited understanding of how quickly consideration should be given to stopping and

switching to another medicine and, if stopping and switching may be needed, what the optimal sequencing is of medicines. Randomised controlled trials examining these different issues would help to improve diabetes care.

### 5 Self-monitoring of blood glucose levels

What is the optimal frequency for self-monitoring of blood glucose in adults with type 2 diabetes? **[2015]**

**Why this is important**

There is limited evidence in relation to the long-term effects (at least 5 years) of blood glucose lowering therapies, particularly newer agents in terms of efficacy and adverse events (for example, cardiovascular outcomes). Randomised controlled trials and prospective longitudinal studies are needed to better understand the long-term efficacy and safety issues surrounding these medicines.

## Other recommendations for research

### 6 Using routinely collected real-world data to assess the effectiveness of continuous glucose monitoring

Based on routinely collected real-world data, what is the effectiveness and cost effectiveness of CGM devices to improve glycaemic control in adults with type 2 diabetes? **[2022]**

For a short explanation of why the committee made this recommendation and how it might affect practice, see the rationale section on continuous glucose monitoring.

Full details of the evidence and the committee's discussion are in evidence review C: continuous glucose monitoring in adults with type 2 diabetes.

# Rationale and impact

These sections briefly explain why the committee made the recommendations and how they might affect practice.

## Continuous glucose monitoring

Recommendations 1.7.17 to 1.7.26

### Why the committee made the recommendations

The committee discussed how continuous glucose monitoring (CGM) could potentially be useful for many people with type 2 diabetes. They were aware of examples from current practice in which adults who have insulin-treated type 2 diabetes and use intermittently scanned CGM (isCGM) have had good outcomes. Because of the additional cost associated with CGM and the large number of adults with type 2 diabetes, the committee used both the evidence and their clinical experience to decide who would gain the most benefit from using CGM.

There was evidence that isCGM was cost effective for adults with type 2 diabetes using insulin, but no evidence for populations not using insulin, so the committee agreed to restrict their recommendations to adults using insulin.

People who have recurrent or severe hypoglycaemic events were identified as one of the groups likely to benefit most from isCGM, because hypoglycaemic events were considered to be one of the most important and concerning outcomes for adults with type 2 diabetes who are using insulin. The committee decided that the number of hypoglycaemic events was a more effective indicator of someone who would benefit from isCGM than specific HbA1c target values, because target values can vary between people. The evidence also indicated minimal effects of isCGM on HbA1c values.

The committee agreed that people with impaired hypoglycaemic awareness would also benefit from isCGM. However, they did not recommend specific methods for assessing impaired hypoglycaemic awareness. This is because validated methods for assessing impaired hypoglycaemic awareness in people with type 2 diabetes (such as the GOLD or Clarke scores) are not always available in primary care.

People who use insulin and have a condition or disability that restricts their ability to self-monitor blood glucose levels should also be offered isCGM. This

is because having access to isCGM means they will no longer have to rely on others to monitor their diabetes, potentially increasing their independence.

People who need help from a care worker or other healthcare professional to administer their insulin injections should also be offered isCGM, even if they only use once-daily insulin injections. isCGM will help care workers to record a person's blood glucose levels quickly. And for people who have multiple home care visits per day, blood glucose levels can be recorded at each visit. This will help them to adjust their insulin levels to reduce the risk of hypoglycaemic events between home visits. It may also reduce the number of hospital admissions for this group.

The committee discussed how short-term use of isCGM may still be useful for some people. It may help people to understand when they have hypoglycaemic episodes, which would help them to develop a more effective treatment plan.

There was no evidence that rtCGM was cost effective for people with type 2 diabetes, so the committee agreed it could not be recommended for all adults with type 2 diabetes (whether or not they used insulin). They noted, however, that prices of rtCGM have reduced over the past few years, and if this continues to happen there may come a time when it is no more expensive than isCGM. At this point, rtCGM would be an appropriate alternative for people who meet the criteria for isCGM.

The committee did not make a recommendation on using specific devices because CGM technologies are changing very quickly and this recommendation would soon be out of date. Local healthcare services are better placed to assess which devices are evidence-based and suitable for use at any given time.

The committee discussed how self-monitoring of blood glucose should still take place, albeit less frequently, even when a person is using CGM. The ability to self-monitor blood glucose levels allows people to ensure the accuracy of the CGM device. The committee also recommended keeping

capillary blood glucose monitoring as a back-up for situations such as when the technology fails.

The committee decided to highlight that CGM should be provided by a team who have expertise in its use. To ensure that CGM is effective, healthcare professionals need to have the skills to interpret and communicate the data effectively. As well as healthcare professionals having a clear understanding of CGM, it is also crucial that people with type 2 diabetes who are using CGM have education about the technology. This will increase the likelihood that people will scan and report the results frequently, allowing people to understand and manage their diabetes effectively.

Although many people will choose CGM if offered, there are some people who either cannot be offered it or do not want to use it. Because it is still important for these people to monitor their blood glucose levels, the committee made a recommendation to reinforce the importance of offering capillary blood glucose monitoring instead.

The committee did not make a recommendation on how long CGM should be used because there was no evidence on this, and they did not want to stop people accessing CGM for short periods if they and their healthcare professional thought they could benefit from this. Using CGM for a short period of time may help some people to understand when they have hypoglycaemic episodes, thereby helping them to develop a more effective treatment plan.

Despite the positive recommendations on CGM, the committee were concerned that existing health inequalities may still lead to lower uptake of CGM in some groups of people. To address this, the committee made a recommendation outlining actions for commissioners, providers and healthcare professionals.

The committee highlighted the importance of routinely reviewing a person's use of CGM. This will establish whether it is providing clinical benefits and whether the monitor is being used correctly. Making people aware that their

use of CGM will be continually reviewed is important so they know it is not a guaranteed long-term option.

The committee also made a recommendation for research on using routinely collected real-world data to assess the effectiveness and cost effectiveness of CGM. They agreed that this has the potential to show the direct effects of the technology used by people with type 2 diabetes instead of interpreting it through the results of clinical trials. Increased monitoring of routine healthcare data including registries and audits would ensure that findings from a broader population are captured.

### How the recommendations might affect practice

The recommendations are likely to increase the number of adults with type 2 diabetes who are offered CGM, particularly those who have issues with hypoglycaemia. This will have associated cost implications:

- It may save the NHS time, because healthcare professionals do not have to meet people who are using CGM as often as people who use capillary blood glucose monitoring.
- There should be fewer hypoglycaemic events to manage.

The committee did not expect a significant resource impact related to education and monitoring for the CGM devices.

Return to recommendations

## Involving people in medicine discussions

Recommendations 1.8.2 to 1.8.4

### Why the committee made the recommendations

The language healthcare professionals use can have a big impact. People with type 2 diabetes can experience a lot of stigma in medication discussions, even when healthcare professionals are not doing this intentionally. People can also struggle with stereotypes about diabetes and weight. This can lead to them feeling blame, shame and guilt, which can have a significant impact on their wellbeing. Stigma and stereotypes can also make it difficult for people to

start or continue taking medication. The committee's experience was that this is quite common. So it's really important that particular efforts are being made to get the words right in conversations about medication. More guidance on communication for healthcare professionals can be found in NHS England's guide to language and diabetes.

The committee noted that there is a particular risk for women, trans men and non-binary people of childbearing potential in this group who take GLP-1 receptor agonists. The committee agreed that the effects of the medicine can lead to improved fertility. MHRA guidance recommends that GLP-1 receptor agonists should not be taken during pregnancy because there is not enough safety data to know whether doing this can cause harm. It also recommended that all people of childbearing potential should take steps to ensure they do not become pregnant while taking a GLP-1 receptor agonist or for a duration after taking it that depends on the specific medicine the person takes. The committee noted this was particularly important for people with early onset type 2 diabetes due to their age and recommendations to consider GLP-1 receptor agonists for this group.

Return to recommendations

## Sick day rules

Recommendation 1.8.6

### Why the committee made the recommendation

Sick day rules are common in diabetes care, but in the committee's experience there are inconsistencies in practice. In particular, the committee have seen issues with people having medications stopped but not started again. The recommendation will improve consistency and quality of care in this area.

### How the recommendation might affect practice

Including sick day rules in people's treatment plans may help avoid delays in providing the right medication and treating any underlying illness. This may

reduce the chance of adverse events or shorten hospital stays (or avoid the need for a stay altogether), which would reduce costs.

Return to recommendation

## Assessing risk before starting medicines

Recommendations 1.8.7 and 1.8.8

### Why the committee made the recommendations

#### Assessing cardiovascular status

The committee agreed it was important to assess people's cardiovascular status and risk to help determine which treatments are suitable for them. They used a definition for the established cardiovascular disease group (adults with type 2 diabetes and chronic heart failure or established atherosclerotic cardiovascular disease) that reflected the people included in all the clinical trials and modelled as a subgroup in the economic model.

#### Assessing frailty

Adverse treatment effects and polypharmacy are a particular concern for people with frailty. The committee did not review the evidence on specific criteria that should trigger a frailty assessment, so healthcare professionals will need to use clinical judgement for this.

Return to recommendations

## Initial medicines

### People with type 2 diabetes and no significant comorbidities

Recommendations 1.8.9 to 1.8.11

### Why the committee made the recommendations

#### Metformin and SGLT-2 inhibitors

There is a significant body of evidence showing that type 2 diabetes management should aim at holistic health improvements (in particular, cardiovascular and renal protection), rather than just HbA1c targets.

Overall, network and pairwise meta-analyses comparing antidiabetic therapies showed that therapy combining metformin with an SGLT-2-inhibitor was more clinically effective at reducing cardiovascular events than:

- any other therapy combining metformin with 1 other medicine, and
- metformin alone.

No evidence was identified for people with type 2 diabetes and a low risk of cardiovascular disease. Cardiovascular risk rises with age, and even without any other risk factors QRISK3 classes people with type 2 diabetes as at high cardiovascular risk at age 52 (for men) and age 60 (for women). Therefore, while there is a younger group who are not currently at high risk of cardiovascular disease, they still have an increased lifetime risk and they will all move into the high-risk group as they age. As therapy combining metformin with an SGLT-2 inhibitor is the most clinically effective option for reducing the risk of adverse cardiovascular events, the committee recommended this as the standard initial treatment.

**Standard compared to modified-release metformin**

There was limited evidence comparing standard-release and modified-release metformin. Therefore, the committee agreed that there was insufficient evidence to inform a decision to recommend modified-release metformin first and so they recommended standard-release metformin first. This was because, when compared with standard-release metformin, modified-release metformin:

- has similar clinical effectiveness on HbA1c and weight reduction
- has similar safety results for hypoglycaemia and
- was more expensive than standard-release metformin.

Standard-release metformin can be preferable for people with difficulty swallowing because it can be crushed while modified-release metformin cannot.

However, the committee also agreed that modified-release metformin may be a preferable option for some people. This included people:

- who will find it difficult to take tablets at consistent times across the day (for example, shift workers)
- taking multiple tablets across the day - while standard release metformin is taken in multiple doses a day, modified-release metformin is taken once daily: this could help them to schedule medicine at a convenient time
- who find it difficult to consistently take medicine (for example, people with dementia).

The committee agreed that this should be addressed in a conversation between the person and the healthcare professional when prescribing the medication.

**Medicines for people who cannot take metformin**

The trial evidence showed that SGLT-2 inhibitors reduced cardiovascular events compared with placebo when metformin was the background therapy. The committee agreed that this benefit of using SGLT-2 inhibitors would also be seen in people with contraindications to metformin, even though the evidence was limited for this group. Therefore, as the committee wanted people with diabetes to continue to gain the cardiovascular benefits seen in the evidence, they recommended that when people have a contraindication to metformin, they should have monotherapy with an SGLT-2 inhibitor.

**Recommendation for research**

The committee were presented with real world evidence that showed that SGLT-2 inhibitors are under-prescribed, particularly to women and older people, and to people from some ethnic backgrounds and with higher levels of deprivation when sex and age are accounted for. They agreed that further research is needed to understand the reasons behind this, and they made a recommendation for research on improving access to SGLT-2 inhibitors.

**How the recommendations might affect practice**

**Metformin**

The recommendations about the use of metformin should not reflect a change in current practice.

**SGLT-2 inhibitors**

SGLT-2 inhibitors were recommended by NICE in 2022. They were recommended for:

- all people with chronic heart failure
- all people with atherosclerotic cardiovascular disease
- some people at high risk of developing cardiovascular disease.

Recommendations for SGLT-2 inhibitors for people with chronic kidney disease were previously made through different guidance but are not expected to reflect a significant change in practice.

However, real-world evidence (2025) shows that SGLT-2 inhibitors are under-prescribed throughout the UK. The 2025 recommendations may increase the number of people who are offered SGLT-2 inhibitors, which will increase prescribing costs. But broader access to SGLT-2 inhibitors may also result in long-term drug costs being partially offset by fewer people needing treatment for atherosclerotic cardiovascular disease.

Based on these recommendations, people at low risk of developing cardiovascular disease can access SGLT-2 inhibitors. The committee do not believe this to be a large group and so the impact of this is likely to be minimal.

**Number of appointments related to these medicines**

The recommendations are not expected to lead to an increase in the number of appointments required because:

- SGLT-2 inhibitors can be prescribed at the same time as metformin, with a plan for starting medicines sequentially
- the cardiovascular and renal benefits of SGLT-2 inhibitors will reduce the number of appointments needed to treat atherosclerotic cardiovascular disease, established heart failure and chronic kidney disease.

Return to recommendations

## People with heart failure

Recommendations 1.8.12 to 1.8.14

### Why the committee made the recommendations

#### Metformin and SGLT-2 inhibitors

There is a significant body of evidence showing that type 2 diabetes management should aim at holistic health improvements (in particular, cardiovascular and renal protection), rather than just HbA1c targets.

Overall, network and pairwise meta-analyses comparing antidiabetic therapies showed that therapy combining metformin with an SGLT-2 inhibitor was more clinically effective at reducing cardiovascular events than:

- any other therapy combining metformin with 1 other medicine, and
- metformin alone.

There was limited evidence for people with type 2 diabetes and heart failure. However, for people with type 2 diabetes who are at high risk of developing cardiovascular disease, there was strong evidence that SGLT-2 inhibitors reduced the number of hospitalisations due to heart failure.

#### Standard compared to modified-release metformin

There was limited evidence comparing standard-release and modified-release metformin. Based on this evidence, the committee agreed that standard-release metformin should be recommended first. This was because, when compared with standard-release metformin, modified-release metformin:

- has similar clinical effectiveness on HbA1c and weight
- has similar safety results for hypoglycaemia and
- was more expensive than standard-release metformin.

Standard-release metformin can be preferable for people with difficulty swallowing because it can be crushed while modified-release metformin cannot.

However, the committee also agreed that modified-release metformin may be a preferable option for some people. This included people:

- who will find it difficult to take tablets at consistent times across the day (for example, shift workers)
- taking multiple tablets across the day - while standard release metformin is taken in multiple doses a day, modified-release metformin is taken once daily: this could help them to schedule medicine at a convenient time
- who find it difficult to consistently take medicine (for example, people with dementia).

The committee agreed that this should be addressed in a conversation between the person and the healthcare professional when prescribing the medication.

**Medicines for people who cannot take metformin**

The trial evidence showed that SGLT-2 inhibitors reduced cardiovascular events compared with placebo when metformin was the background therapy. The committee agreed that this benefit of using SGLT-2 inhibitors would also be seen in people with contraindications to metformin, even though the evidence was limited for this group. Therefore, as the committee wanted people with diabetes to continue to gain the cardiovascular benefits seen in the evidence, they recommended that when people have a contraindication to metformin, they should have monotherapy with an SGLT-2 inhibitor.

**How the recommendations might affect practice**

**Metformin**

The recommendations about the use of metformin should not reflect a change in current practice.

**SGLT-2 inhibitors**

SGLT-2 inhibitors were recommended by NICE in 2022. They were recommended for:

- all people with chronic heart failure
- some people at high risk of developing cardiovascular disease.

However, real-world evidence shows that SGLT-2 inhibitors are under-prescribed throughout the UK. The recommendations may increase the

number of people who are offered SGLT-2 inhibitors, which will increase prescribing costs. But the long-term drug cost associated with broader access to SGLT-2 inhibitors may be partially offset if it results in fewer people needing treatment for atherosclerotic cardiovascular disease or hospitalisation for heart failure.

**Number of appointments related to these medicines**

The recommendations are not expected to lead to an increase in the number of appointments required because:

- SGLT-2 inhibitors can be prescribed at the same time as metformin, with a plan for starting medicines sequentially
- the cardiovascular and renal benefits of SGLT-2 inhibitors will reduce the number of appointments needed to treat atherosclerotic cardiovascular disease, established heart failure and chronic kidney disease.

Return to recommendations

## People with atherosclerotic cardiovascular disease

Recommendations 1.8.15 to 1.8.17

**Why the committee made the recommendations**

**Metformin and SGLT-2 inhibitors**

There is a significant body of evidence showing that type 2 diabetes management should aim at holistic health improvements (in particular, cardiovascular and renal protection), rather than just HbA1c targets.

Overall, network and pairwise meta-analyses comparing antidiabetic therapies showed that therapy combining metformin with an SGLT-2 inhibitor was more clinically effective at reducing cardiovascular events than:

- any other therapy combining metformin with 1 other medicine, and
- metformin alone.

Data on health inequalities showed that people living in the most deprived areas experience the greatest benefits for their health from SGLT-2 inhibitors.

The committee believe this is an important reason for ensuring universal access to SGLT-2 inhibitors.

**Standard compared to modified-release metformin**

There was limited evidence comparing standard-release and modified-release metformin. Based on this evidence, the committee agreed that standard-release metformin should be recommended first. This was because, when compared with standard-release metformin, modified-release metformin:

- has similar clinical effectiveness on HbA1c and weight
- has similar safety results for hypoglycaemia and
- was more expensive than standard-release metformin.

Standard-release metformin can be preferable for people with difficulty swallowing because it can be crushed while modified-release metformin cannot.

However, the committee also agreed that modified-release metformin may be a preferable option for some people. This included people:

- who will find it difficult to take tablets at consistent times across the day (for example, shift workers)
- taking multiple tablets across the day - while standard release metformin is taken in multiple doses a day, modified-release metformin is taken once daily: this could help them to schedule medicine at a convenient time
- who find it difficult to consistently take medicine (for example, people with dementia).

The committee agreed that this should be addressed in a conversation between the person and the healthcare professional when prescribing the medication.

**Medicines for people who cannot take metformin**

The trial evidence showed that SGLT-2 inhibitors reduced cardiovascular events compared with placebo when metformin was the background therapy. The committee agreed that this benefit of using SGLT-2 inhibitors would also be seen in people with contraindications to metformin, even though the

evidence was limited for this group. Therefore, as the committee wanted people with diabetes to continue to gain the cardiovascular benefits seen in the evidence, they recommended that when people have a contraindication to metformin, they should have monotherapy with an SGLT-2 inhibitor.

**Subcutaneous semaglutide**

Evidence showed that subcutaneous semaglutide was the only cost-effective GLP-1 receptor agonist. This evidence was based on clinical benefits identified in a population that included a large proportion of people with atherosclerotic cardiovascular disease (ASCVD) but also some people who did not have ASCVD but were at high risk of it (because they had type 2 diabetes). The committee agreed that evidence from this mixed population indirectly applied because of the large proportion of people in the group who did have ASCVD.

Subcutaneous semaglutide also had the best clinical results. Evidence showed that it made a clinically important reduction to the person's:

- risk of major adverse cardiovascular events
- HbA1c and
- weight.

The results for these outcomes were precise, which means that there is very little uncertainty about them. Other GLP-1 receptor agonists did not achieve this. As a result, the committee agreed to specifically recommend subcutaneous semaglutide rather than any other GLP-1 receptor agonist.

The committee noted that there are potential serious side effects with GLP-1 receptor agonists and a potential for misuse. However, they did not make a recommendation on monitoring because it is covered by an MHRA drug safety update.

The committee made the decision to recommend this medicine in combination with metformin and an SGLT-2 inhibitor based on:

- evidence they had from pooled analysis
- their own clinical experience.

The evidence in the pooled network meta-analysis came from a review that looked at the cost and clinical effectiveness of adding subsequent therapies to previous treatment. It showed clinical benefits from GLP-1 receptor agonists, but most studies in the evidence review did not give separate results based on the number or type of other treatments received. A small number of studies specifically included triple therapy combining GLP-1 receptor agonists, SGLT-2 inhibitors and metformin. When compared in health economic evaluation, adding subcutaneous semaglutide to an SGLT-2 inhibitor and metformin was cost effective.

The evidence for combination therapy with metformin and SGLT-2 inhibitors showed that the cardiovascular benefits came from the SGLT-2 inhibitors alone. This was clear because people receiving metformin and placebo did not get the same benefits. When compared with placebo in clinical trials, GLP-1 receptor agonists also showed cardiovascular benefits regardless of other treatment received. Because of this, the committee agreed that people with atherosclerotic cardiovascular disease should receive therapy combining an SGLT-2 inhibitor and subcutaneous semaglutide if metformin is contraindicated or not tolerated.

**How the recommendations might affect practice**

**Metformin**

The recommendations about the use of metformin should not reflect a change in current practice.

**SGLT-2 inhibitors**

SGLT-2 inhibitors were recommended by NICE in 2022. They were recommended for:

- all people with atherosclerotic cardiovascular disease
- some people at high risk of developing cardiovascular disease.

However, real-world evidence shows that SGLT-2 inhibitors are under-prescribed throughout the UK. The recommendations may increase the number of people who are offered SGLT-2 inhibitors, which will increase prescribing costs. But broader access to SGLT-2 inhibitors may also result in

long-term drug costs being partially offset by fewer people needing treatment for atherosclerotic cardiovascular disease.

People at low risk of developing cardiovascular disease can access SGLT-2 inhibitors through these recommendations. The committee do not believe this to be a large group and so the impact of this is likely to be minimal.

**GLP-1 receptor agonists**

Subcutaneous semaglutide is a GLP-1 receptor agonist. GLP-1 receptor agonists were previously reserved for later treatment phases. Recommending these for some people as part of initial therapy will increase costs. Taking GLP-1 receptor agonists will mean that DPP-4 inhibitor use will reduce. Early intervention could lead to weight loss, leading to better long term prognosis, which, if maintained, will reduce needs for both long-term treatment and later stage treatments (such as insulin).

**Number of appointments related to these medicines**

The recommendations are not expected to lead to an increase in the number of appointments required because:

- SGLT-2 inhibitors can be prescribed at the same time as metformin, with a plan for starting medicines sequentially
- the cardiovascular and renal benefits of SGLT-2 inhibitors will reduce the number of appointments needed to treat atherosclerotic cardiovascular disease, established heart failure and chronic kidney disease
- the cardiovascular benefits of GLP-1 receptor agonists will reduce the number of appointments needed to treat atherosclerotic cardiovascular disease and established heart failure.

Return to recommendations

## People with early onset type 2 diabetes

Recommendations 1.8.18 to 1.8.20

## Why the committee made the recommendations

### Limitations, risk and health inequalities

No clinical evidence on anti-diabetic treatments was identified for people with early onset type 2 diabetes. Strong clinical evidence for people whose diabetes did not have an early onset showed that SGLT-2 inhibitors and GLP-1 receptor agonists reduce the risk of cardiovascular events and lead to weight loss. Based on their experience, the committee agreed that people with early onset type 2 diabetes:

- have a very high lifetime risk of cardiovascular and renal complications, and of dying from them, and
- are more likely to be living with obesity.

Early intensive treatment can provide benefits by preventing these future negative outcomes.

The health economic evidence for this population was highly uncertain. The committee concluded this was because of:

- the absence of evidence from clinical trials focusing solely on people with early onset diabetes
- the trial that informed the model including some people but not a substantial number of people with early onset type 2 diabetes and
- the short time horizon for evaluating the benefits of the treatment, which comparably disadvantages this group where the benefits are likely seen much further in the future.

Data on health inequalities showed that people living in the most deprived areas experience the greatest benefits for their health from SGLT-2 inhibitors. The committee believe this is an important reason for ensuring universal access to SGLT-2 inhibitors.

### Metformin and SGLT-2 inhibitors

There is a significant body of evidence showing that type 2 diabetes management should aim at holistic health improvements (in particular, cardiovascular and renal protection), rather than just HbA1c targets.

Overall, network and pairwise meta-analyses comparing antidiabetic therapies for people with late onset type 2 diabetes showed that therapy combining metformin with an SGLT-2 inhibitor was more clinically effective at reducing cardiovascular events than:

- any other therapy combining metformin with 1 other medicine, and
- metformin alone.

**Standard compared to modified-release metformin**

There was limited evidence comparing standard-release and modified-release metformin. Based on this evidence, the committee agreed that standard-release metformin should be recommended first. This was because, when compared with standard-release metformin, modified-release metformin:

- has similar clinical effectiveness on HbA1c and weight
- has similar safety results for hypoglycaemia and
- was more expensive than standard-release metformin.

Standard-release metformin can be preferable for people with difficulty swallowing because it can be crushed while modified-release metformin cannot.

However, the committee also agreed that modified-release metformin may be a preferable option for some people. This included people:

- who will find it difficult to take tablets at consistent times across the day (for example: shift workers)
- taking multiple tablets across the day - while standard release metformin is taken in multiple doses a day, modified-release metformin is taken once daily: this could help them to schedule medicine at a convenient time
- who find it difficult to consistently take medicine (for example: people with dementia).

The committee agreed that this should be addressed in a conversation between the person and the healthcare professional when prescribing the medication.

**Medicines for people who cannot take metformin**

The trial evidence showed that SGLT-2 inhibitors reduced cardiovascular events compared with placebo when metformin was the background therapy. The committee agreed that this benefit of using SGLT-2 inhibitors would also be seen in people with contraindications to metformin, even though the evidence was limited for this group. Therefore, as the committee wanted people with diabetes to continue to gain the cardiovascular benefits seen in the evidence, they recommended that when people have a contraindication to metformin, they should have monotherapy with an SGLT-2 inhibitor.

**GLP-1 receptor agonists**

Given the relatively small size of the group of people with early onset type 2 diabetes, the health inequalities that this group would face if they did not receive treatment early, and the challenges in identifying appropriate data, the committee agreed that GLP-1 receptor agonists should be considered in addition to metformin and SGLT-2 inhibitors for people in this group. The committee also made a recommendation for research on treatments for people with early onset diabetes.

The committee noted that there are potential serious side effects with GLP-1 receptor agonists and a potential for misuse. However, they did not make a recommendation on monitoring because it is covered by an MHRA drug safety update.

The committee made the decision to recommend these medicines in combination with metformin and an SGLT-2 inhibitor based on:

- evidence they had from pooled analysis
- their own clinical experience.

The evidence in the pooled network meta-analysis came from a review that looked at the cost and clinical effectiveness of adding subsequent therapies to previous treatment. It showed benefits from GLP-1 receptor agonists, but most studies in the evidence review did not give separate results based on the number or type of other treatments received. A small number of studies specifically included triple therapy combining GLP-1 receptor agonists, SGLT-2 inhibitors and metformin. When compared in health economic evaluation,

adding a GLP-1 receptor agonist to an SGLT-2 inhibitor and metformin was cost effective.

The evidence for combination therapy with metformin and SGLT-2 inhibitors showed that the cardiovascular benefits came from the SGLT-2 inhibitors alone. This was clear because the people receiving metformin and placebo did not get the same benefits. When compared with placebo in clinical trials, GLP-1 receptor agonists also showed cardiovascular benefits regardless of other treatment received. Because of this, the committee agreed that people with early onset diabetes should receive an SGLT-2 inhibitor and consider a GLP-1 receptor agonist if metformin is contraindicated or not tolerated.

**How the recommendations might affect practice**

**Metformin**

The recommendations about the use of metformin should not reflect a change in current practice.

**SGLT-2 inhibitors**

SGLT-2 inhibitors were recommended by NICE in 2022 for some people at high risk of developing cardiovascular disease.

However, real-world evidence shows that SGLT-2 inhibitors are under-prescribed throughout the UK. The recommendations may increase the number of people who are offered SGLT-2 inhibitors, which will increase prescribing costs. But broader access to SGLT-2 inhibitors may also result in long-term drug costs being partially offset by fewer people needing treatment for atherosclerotic cardiovascular disease, especially in this population when taking a long term time perspective.

**GLP-1 receptor agonists**

GLP-1 receptor agonists were previously reserved for later treatment phases. Recommending these for some people as part of initial therapy will increase costs. Taking GLP-1 receptor agonists will mean that DPP-4 inhibitor use will reduce. Early intervention could lead to weight loss, leading to better long term prognosis, which, if maintained, will reduce needs for both long-term treatment and later stage treatments (such as insulin).

**Number of appointments related to these medicines**

The recommendations are not expected to lead to an increase in the number of appointments required because:

- SGLT-2 inhibitors can be prescribed at the same time as metformin, with a plan for starting medicines sequentially
- the cardiovascular and renal benefits of SGLT-2 inhibitors will reduce the number of appointments needed to treat atherosclerotic cardiovascular disease, established heart failure and chronic kidney disease
- the cardiovascular benefits of GLP-1 receptor agonists will reduce the number of appointments needed to treat atherosclerotic cardiovascular disease and established heart failure.

Return to recommendations

## People living with obesity

Recommendations 1.8.21 to 1.8.23

**Why the committee made the recommendations**

The evidence comparing antidiabetic therapies included people living with obesity. However, in most studies it was not possible to separate out this group from the larger study population and identify specific effects for people living with obesity.

Given the limitations of the evidence for people living with obesity, the committee recommended the same medicines for this group as for other people with type 2 diabetes and no other specific comorbidities. For the wider population, therapy with metformin and an SGLT-2 inhibitor was more clinically effective at reducing cardiovascular events than:

- any other therapy combining metformin with 1 other medicine, and
- metformin alone.

SGLT-2 inhibitors were cost-effective and there was evidence to show that people in the most deprived groups (with index of multiple deprivation quintiles of 1 and 2) experienced greater net benefits when increasing the uptake of SGLT-2 inhibitors. Therefore, the committee agreed that recommending

SGLT-2 inhibitors to all people in this population would help to address health inequalities.

### How the recommendations might affect practice

#### Metformin

The recommendations about the use of metformin should not reflect a change in current practice.

#### SGLT-2 inhibitors

SGLT-2 inhibitors were recommended by NICE in 2022. They were recommended for some people at high risk of developing cardiovascular disease.

However, real-world evidence shows that SGLT-2 inhibitors are under-prescribed throughout the UK. The recommendations may increase the number of people who are offered SGLT-2 inhibitors, which will increase prescribing costs. But broader access to SGLT-2 inhibitors may also result in long-term drug costs being partially offset by fewer people needing treatment for atherosclerotic cardiovascular disease.

#### Number of appointments related to these medicines

The recommendations are not expected to lead to an increase in the number of appointments required because:

- SGLT-2 inhibitors can be prescribed at the same time as metformin, with a plan for starting medicines sequentially
- the cardiovascular and renal benefits of SGLT-2 will reduce the number of appointments needed to treat atherosclerotic cardiovascular disease, established heart failure, and chronic kidney disease.

Return to recommendations

## People with chronic kidney disease

Recommendations 1.8.24 to 1.8.28

## Why the committee made the recommendations

### eGFR above 30 ml/min/1.73 $m^2$

Little evidence was identified specifically for people with chronic kidney disease. However, the committee agreed that people with an eGFR above 30 ml/min/1.73 $m^2$ should see the same benefits from diabetes medicines as people without chronic kidney disease. In the health economic analysis, metformin and SGLT-2 inhibitors were less costly and more effective than other medicines.

### eGFR above 20 ml/min/1.73 $m^2$ and up to 30 ml/min/1.73 $m^2$

People with an eGFR below 30 ml/min/1.73 $m^2$ cannot take metformin. However, the committee agreed that people with an eGFR above 20 ml/min/1.73 $m^2$ could still be offered an SGLT-2 inhibitor to reduce the risk of developing cardiovascular events from type 2 diabetes. The committee recommended dapagliflozin and empagliflozin because these are the two SGLT-2 inhibitors that are licensed for use in this population.

### eGFR below 20 ml/min/1.73 $m^2$

DPP-4 inhibitors are effective at reducing HbA1c and have fewer adverse effects than other comparable options. If DPP-4 inhibitors are contraindicated, not tolerated or not effective for people with an eGFR below 20 ml/min/1.73 $m^2$, then in the committee's experience the best option is either pioglitazone or an insulin-based treatment. The committee acknowledged that a sulfonylurea could increase the risk of hypoglycaemia as renal impairment increases, so would not be a good option for this group.

## How the recommendations might affect practice

### Metformin

The recommendations about the use of metformin should not reflect a change in current practice.

### SGLT-2 inhibitors

The recommendations about the use of SGLT-2 inhibitors should not reflect a change in current practice.

### DPP-4 inhibitors, pioglitazone and insulin

The recommendation about the use of DPP-4 inhibitors, pioglitazone and insulin should not reflect a change in current practice.

Return to recommendations

## People with frailty

Recommendations 1.8.30 to 1.8.32

### Why the committee made the recommendations

Because of concerns about adverse effects and polypharmacy, the committee agreed that SGLT-2 inhibitors may not be appropriate for some people with clinically significant frailty and type 2 diabetes.

There was no specific evidence for people with frailty, so the committee could not recommend a particular method of assessment or cutoff for prescribing SGLT-2 inhibitors. The decision would need to be made based on clinical judgement, taking into account the needs of each person.

The committee recommended medicines for this group based on:

- their own expertise
- common medicine contraindications in this group
- their knowledge of which medicines were likely to have the most manageable side effects.

### How the recommendations might affect practice

#### Metformin

The recommendations about the use of metformin should not reflect a change in current practice.

#### DPP-4 inhibitors

The recommendations about the use of DPP-4 inhibitors should not reflect a change in current practice.

Return to recommendations

## How to introduce medicines

Recommendations 1.8.34 to 1.8.37

### Why the committee made the recommendations

When starting first-line therapy with metformin and other medicines, the committee noted the importance of introducing the drugs sequentially. This enables any side effects and intolerances from the first drug to be identified before the second drug is introduced. In line with current practice, the committee recommended starting with metformin and then adding the SGLT-2 inhibitor without delay once metformin tolerability is established, to avoid people remaining on metformin alone for prolonged periods.

#### Preventing diabetic ketoacidosis when taking SGLT-2 inhibitors

The committee noted some particularly important safety considerations to take into account before an adult with type 2 diabetes starts on an SGLT-2 inhibitor. In the committee's experience there have been multiple instances of avoidable diabetes ketoacidosis (DKA) resulting in hospital admission. The committee highlighted some factors that might put someone at higher risk of DKA, but the list is not intended to be exhaustive. Addressing modifiable risk factors before starting an SGLT-2 inhibitor could reduce the risk of DKA and make the drug safer for the person with type 2 diabetes.

The committee were aware that adults with type 2 diabetes who are living with overweight or obesity may wish to try a ketogenic diet to reverse or reduce the severity of their diabetes or induce remission. However, the committee agreed, based on their experience, that there may be an increased risk of DKA associated with SGLT-2 inhibitors and such diets. It is important to tell people about these risks and to advise them to discuss any planned change to a very low carbohydrate or ketogenic diet with their healthcare professional first.

### How the recommendations might affect practice

The recommendations are not expected to significantly increase consultation time or be a change in practice because these should already form part of the prescribing process. Checking that the person is not at increased risk of DKA

when they are prescribed an SGLT-2 inhibitor should help reduce the number of people who experience DKA and thereby reduce unnecessary hospital admissions.

Return to recommendations

## Reviewing medicines

Recommendations 1.8.38 to 1.8.45

### Why the committee made the recommendations

The committee agreed that when changes to treatment are being considered it is important to review existing treatment options first. Stopping medications that have not worked, for example, in controlling blood glucose or weight loss, and optimising current treatments may remove the need to prescribe additional medicines. In particular, there might be reasons, such as problems with adherence or adverse effects, that might make existing treatments less effective or ineffective. Addressing these might mean that adding a new drug is unnecessary.

In the committee's experience, some people have their medications stopped after they reach their glycaemic and weight targets. This can lead to their HbA1c levels and weight rising again. Often, it would be better for the person to keep taking medications that have helped them reach their glycaemic and weight targets, to prevent future problems. There was no evidence on which groups would most benefit from this, so the decision would need to be based on clinical judgement and the preferences of the person with type 2 diabetes.

SGLT-2 inhibitors are a good treatment option for most people and provide cardiovascular and renal protection that cannot be measured by tests. Therefore, the committee agreed that these should be continued even if they do not help the person reach their glycaemic and weight targets.

However, the committee acknowledged that the decision is more complicated for GLP-1 receptor agonists. For people with atherosclerotic cardiovascular disease or early onset type 2 diabetes, these medicines are being used to prevent cardiovascular events. For these groups, continuing GLP-1 receptor

agonists can provide benefits even if they do not help the person reach their glycaemic and weight targets. For people who do not have atherosclerotic cardiovascular disease or early onset type 2 diabetes, GLP-1 receptor agonists are being used to reach glycaemic targets, so they should be treated like any other medication and stopped if they are not effective for this purpose.

The list of factors to think about as part of optimisation is not exhaustive but includes those that the committee thought were particularly important. The committee agreed that it is important to revisit advice about diet and healthy living because part of this discussion is to ensure the person is supported with both non-pharmacological and pharmacological interventions to improve their current health and prognosis.

### People already on standard-release metformin

There was no evidence identified in the review to show that modified-release metformin was more effective than standard-release metformin, and no evidence that it would be more cost effective for people who are satisfied with the treatment.

## How the recommendations might affect practice

The recommendations will lead to people taking SGLT-2 inhibitors and GLP-1 receptor agonists for longer. This will increase costs initially. However, the long-term protective benefits of these medicines will reduce the need to treat future cardiovascular and renal problems, which will lead to cost savings. Otherwise, the recommendations are not expected to change current practice significantly.

The 2022 recommendations about reviewing medicines are not expected to be a change in practice or to need substantial additional resources because these conversations should already take place.

Return to recommendations

# Treatment options if further medicines are needed

## People with type 2 diabetes and no significant comorbidities

Recommendation 1.8.46

### Why the committee made the recommendations

Most of the evidence used an additive strategy (where additional treatment was provided) rather than a switching strategy (where one treatment was stopped, and another treatment was started). This appeared to provide effective results. The committee agreed that this is likely to be effective for most people.

### DPP-4 inhibitors

Evidence was available for individual population groups: people with heart failure, chronic kidney disease and at higher risk of developing cardiovascular disease. Based on this evidence, and their own clinical and lived experience, the committee recommended that a DPP-4 inhibitor should be the first choice for people who need further medicines. The DPP-4 inhibitors all have similar clinical efficacy, and no particular medicine was more cost effective than the others.

### Sulfonylureas or pioglitazone

If a DPP-4 inhibitor is not effective or tolerated, then a sulfonylurea or pioglitazone should be considered. The evidence showed that these both reduced HbA1c. However, there was also limited evidence indicating that they both had a potential for adverse effects:

- sulfonylureas and insulin-based therapies might increase hypoglycaemic events and weight gain
- pioglitazone might worsen cardiovascular outcomes and should be avoided for people with heart failure.

### Insulin-based treatments

Evidence showed that insulin-based treatments are less effective than most other antidiabetic therapies at reducing harm from adverse events. There are two main scenarios when insulin is an effective treatment:

- managing acute hyperglycaemia
- managing long-term worsening hyperglycaemia that does not respond to other treatments.

However, in the committee's experience insulin may also be a good option for people who cannot tolerate more effective medicines. Therefore, they recommended insulin alongside other options for people who cannot tolerate DPP-4 inhibitors.

**Not cumulating a DPP-4 inhibitor and a GLP-1 agonist**

Based on their own experience, the committee agreed that a GLP-1 receptor agonist and a DPP-4 inhibitor should not be prescribed together. The two medicines have a similar mechanism of action, as they act on different parts of the GLP-1 pathway. Because of this, it is unlikely that combining the medications provides any additional effect and so it is unlikely to be clinically or cost effective.

**How the recommendations might affect practice**

These recommendations are likely to be a change from current practice, with wider access to therapies with more recent evidence of clinical and cost effectiveness.

The recommendations on DPP-4 inhibitors, sulfonylureas, pioglitazone and insulin do not reflect a significant change in current practice and are unlikely to increase resource use. DPP-4 inhibitors do vary in price, but the default assumption is that services will use the medicine with the lowest acquisition cost (in the absence of patient-specific factors).

Return to recommendation

## People with heart failure

Recommendations 1.8.47 to 1.8.48

## Why the committee made the recommendations

### Subcutaneous semaglutide

There was limited, very low quality evidence on subcutaneous semaglutide in people with type 2 diabetes and heart failure. This evidence came from a single small study. The committee noted that studies covering people with heart failure but not type 2 diabetes showed that subcutaneous semaglutide had important benefits in:

- reducing the number of heart failure events
- lowering weight and
- improving quality of life.

In addition, health economic modelling showed that subcutaneous semaglutide was a cost-effective option for people with type 2 diabetes and heart failure. The values used as inputs for the model were determined from those measured in people with type 2 diabetes at high risk of cardiovascular disease. However, the committee agreed that these values were applicable, because a proportion of the people included in the studies also had heart failure and benefits were also observed in people with heart failure but not type 2 diabetes.

Late in producing the guideline, the developers noted that a new study (STEP-HFpEF DM) had been published after the cut-off search for the guideline. This study covers a large group of people with type 2 diabetes and heart failure and therefore brings direct evidence for this population. On looking at the results, the committee agreed that they confirmed the findings from the indirect evidence they'd considered so far for this population. Guideline development time was insufficient to integrate this study into the evidence review before consultation, so it will be added during consultation instead.

The committee recommended considering subcutaneous semaglutide for people living with obesity and heart failure with preserved ejection fraction because:

- the evidence for subcutaneous semaglutide is largely for people living with obesity and heart failure with preserved ejection fraction
- people living with underweight or frailty could be harmed by the treatment
- given the uncertainty in the evidence, healthcare professionals should use clinical judgement to consider whether the treatment is appropriate for each person.

They agreed that this should be offered if further medicines are needed due to the uncertainty in the evidence.

**Sulfonylureas**

Sulfonylureas are recommended for people who need further treatment because the evidence showed that they reduced HbA1c based on the evidence for people at high risk of cardiovascular disease. However, there was also limited evidence indicating that they had a potential for adverse effects as sulfonylureas and insulin-based therapies might increase hypoglycaemic events and weight gain. Healthcare professionals are advised to consider this when choosing treatments.

**Insulin-based treatments**

Evidence showed that insulin-based treatments are less effective than most other antidiabetic therapies at reducing harm from adverse events. There are two main scenarios for which insulin is an effective treatment:

- managing acute hyperglycaemia
- managing long-term worsening hyperglycaemia that does not respond to other treatments.

However, in the committee's experience, insulin may also be a good option for people who cannot tolerate other medicines. Therefore, they recommended insulin alongside sulfonylureas for people who need further medicines to reach their glycaemic targets.

**How the recommendations might affect practice**

These recommendations are likely to be a change from current practice, with wider access to therapies with more recent evidence of clinical and cost effectiveness.

### GLP-1 receptor agonists

Subcutaneous semaglutide is a GLP-1 receptor agonist. GLP-1 receptor agonists were previously recommended after triple therapy with metformin and 2 other oral medicines was not effective, tolerated or contraindicated. Therefore, recommending the treatment as triple therapy after taking metformin and 1 oral drug (an SGLT-2 inhibitor) may lead to increases in costs. The committee agreed this will likely reduce over time, because the weight loss and cardiovascular benefits of GLP-1 receptor agonists will reduce the number of appointments needed to treat atherosclerotic cardiovascular disease. Taking GLP-1 receptor agonists will mean that DPP-4 inhibitor use will reduce. Early intervention could lead to weight loss and so to better long term prognosis, which, if maintained, will reduce:

- long-term treatment requirements
- need for later stage treatments (such as insulin) and
- downstream treatment costs.

### DPP-4 inhibitors, sulfonylureas, pioglitazone and insulin

The recommendations on DPP-4 inhibitors, sulfonylureas, pioglitazone and insulin do not reflect a significant change in current practice and are unlikely to increase resource use. There may be cost savings if people are no longer prescribed GLP-1 receptor agonists and DPP-4 inhibitors together. DPP-4 inhibitors do vary in price, but the default assumption is that services will use the medicine with the lowest acquisition cost (in the absence of patient-specific factors). The use of more intensive earlier treatment may lead to a reduction in the use of insulin, which may offset costs long term.

Return to recommendations

## People with atherosclerotic cardiovascular disease

Recommendations 1.8.49 and 1.8.50

### Why the committee made the recommendations

#### Subcutaneous semaglutide for people who develop atherosclerotic cardiovascular disease after starting treatment

Subcutaneous semaglutide was recommended for people who develop atherosclerotic cardiovascular disease after starting treatment because evidence showed that this medicine:

- reduces the risk of cardiovascular events
- helps with weight loss
- is cost effective.

The evidence showed subcutaneous semaglutide was the most cost effective and clinically effective in terms of cardiovascular and renal protection, and weight reduction.

#### Sulfonylureas and pioglitazone

Sulfonylureas and pioglitazone are recommended for people who need further treatment because the evidence showed that these both reduced HbA1c. However, there was also limited evidence indicating that they both had a potential for adverse effects:

- sulfonylureas and insulin-based therapies might increase hypoglycaemic events and weight gain
- pioglitazone might worsen cardiovascular outcomes and should be avoided for people with heart failure.

#### Insulin-based treatments

Evidence showed that insulin-based treatments are less effective than most other antidiabetic therapies at reducing harm from adverse events. There are two main scenarios in which insulin is an effective treatment:

- managing acute hyperglycaemia
- managing long-term worsening hyperglycaemia that does not respond to other treatments.

However, in the committee's experience, insulin may also be a good option for people who cannot tolerate other medicines. Therefore, they recommended

insulin alongside other options for people who need further medicines to reach their glycaemic targets.

### How the recommendations might affect practice

These recommendations are likely to be a change from current practice, with wider access to therapies with more recent evidence of clinical and cost effectiveness.

### GLP-1 receptor agonists

Subcutaneous semaglutide is a GLP-1 receptor agonist. GLP-1 receptor agonists were previously recommended after triple therapy with metformin and 2 other oral medicines was not effective, tolerated or contraindicated. Therefore, recommending the treatment as triple therapy after taking metformin and 1 oral drug (an SGLT-2 inhibitor) may lead to increases in costs. The committee agreed this will likely reduce over time, because the weight loss and cardiovascular benefits of GLP-1 receptor agonists will reduce the number of appointments needed to treat atherosclerotic cardiovascular disease. Taking GLP-1 receptor agonists will mean that DPP-4 inhibitor use will reduce. Early intervention could lead to weight loss and so to better long-term prognosis, which, if maintained, will reduce:

- long-term treatment requirements
- need for later stage treatments (such as insulin) and
- downstream treatment costs.

### Sulfonylureas, pioglitazone and insulin

The recommendations on sulfonylureas, pioglitazone and insulin do not reflect a significant change in current practice and are unlikely to increase resource use. The use of more intensive earlier treatment may lead to a reduction in the use of insulin, which may offset costs long term.

Return to recommendations

## People with early onset type 2 diabetes

Recommendations 1.8.51 to 1.8.53

### Why the committee made the recommendations

#### GLP-1 receptor agonists

No clinical evidence on anti-diabetic treatments was identified for people with early onset type 2 diabetes. Strong clinical evidence for people whose diabetes did not have an early onset showed that GLP-1 receptor agonists reduce the risk of cardiovascular events and lead to weight loss. Based on their experience, the committee agreed that people with early onset type 2 diabetes:

- have a very high lifetime risk of cardiovascular and renal complications, and of dying from them, and
- are more likely to be living with obesity.

Taking this into account, they agreed that starting GLP-1 receptor agonist treatment as subsequent therapy was likely the most appropriate treatment if it was not started as initial therapy because this would help to reduce weight and long-term cardiovascular, renal and glycaemic complications better than other medications.

#### DPP-4 inhibitors (for people not taking a GLP-1 agonist)

Evidence was not available for people with early onset type 2 diabetes but was available for people with later onset type 2 diabetes. Based on this evidence, and their own clinical and lived experience, the committee recommended that a DPP-4 inhibitor should be a choice for people who need further medicines where a GLP-1 receptor agonist is not appropriate. The DPP-4 inhibitors all have similar clinical efficacy, and no particular medicine was more cost effective than the others.

#### Sulfonylureas and pioglitazone

The committee recommended sulfonylureas and pioglitazone in this group based on their own experience, and by extrapolating the evidence from other groups covered in this guideline (which showed that these medicines reduced HbA1c). However, there was also limited evidence for these other groups that showed a potential for adverse effects:

- sulfonylureas and insulin-based therapies might increase hypoglycaemic events and weight gain
- pioglitazone might worsen cardiovascular outcomes and should be avoided for people with heart failure.

**Insulin-based treatments**

For insulin-based treatments, the evidence for other populations showed that they are less effective than most other antidiabetic therapies at reducing harm from adverse events. There are two main scenarios when insulin is an effective treatment:

- managing acute hyperglycaemia
- managing long-term worsening hyperglycaemia that does not respond to other treatments.

However, in the committee's experience insulin may also be a good option for people who cannot tolerate other medicines. Therefore, they recommended insulin alongside other options for people who need further medicines to reach their glycaemic targets.

**How the recommendations might affect practice**

These recommendations are likely to be a change from current practice, with wider access to therapies with more recent evidence of clinical and cost effectiveness.

**GLP-1 receptor agonists**

GLP-1 receptor agonists were previously recommended after triple therapy with metformin and 2 other oral medicines was not effective, tolerated or contraindicated. Therefore, recommending the treatment as triple therapy after taking metformin and 1 oral drug (an SGLT-2 inhibitor) may lead to increases in costs. The committee agreed this will likely reduce over time, because the weight loss and cardiovascular benefits of GLP-1 receptor agonists will reduce the number of appointments needed to treat atherosclerotic cardiovascular disease. Taking GLP-1 receptor agonists will mean that DPP-4 inhibitor use will reduce. Early intervention could lead to

weight loss and so to better long term prognosis, which, if maintained, will reduce:

- long-term treatment requirements and
- need for later stage treatments (such as insulin).

**DPP-4 inhibitors, sulfonylureas, pioglitazone and insulin**

The recommendations on DPP-4 inhibitors, sulfonylureas, pioglitazone and insulin do not reflect a significant change in current practice and are unlikely to increase resource use. There may be cost savings if people are no longer prescribed GLP-1 receptor agonists and DPP-4 inhibitors together. DPP-4 inhibitors do vary in price, but the default assumption is that services will use the medicine with the lowest acquisition cost (in the absence of patient-specific factors). The use of more intensive earlier treatment may lead to a reduction in the use of insulin, which may offset costs long term.

Return to recommendations

## People living with obesity

Recommendations 1.8.54 and 1.8.57

### Why the committee made the recommendations

**GLP-1 receptor agonists**

Evidence showed that no GLP-1 receptor agonist reached the cost-effectiveness threshold in the base-case analysis for people living with obesity. However, the committee considered sensitivity analyses where the price for liraglutide reduced further following the expiration of the medicine's patent in November 2024. It became cost-effective when the price reduced by 35%. Given this, they agreed that there was potential for GLP-1 receptor agonists to be cost effective under specific circumstances.

GLP-1 receptor agonists should only be added after at least 3 months of initial therapy, so that the effect of the initial therapy on the person's glycaemic and weight targets can be assessed and taken into account when deciding whether additional treatment is needed. The committee agreed that the

medicine should be continued as long as it has benefits in reducing HbA1c or weight for the person.

**Sulfonylureas and pioglitazone**

The committee recommended sulfonylureas and pioglitazone in this group based on their own experience, and by extrapolating the evidence from other groups covered in this guideline (which showed that these medicines reduced HbA1c). However, there was also limited evidence for these other groups that showed a potential for adverse effects:

- sulfonylureas and insulin-based therapies might increase hypoglycaemic events and weight gain
- pioglitazone might worsen cardiovascular outcomes and should be avoided for people with heart failure.

**Insulin-based treatments**

Evidence on insulin-based treatments for other populations showed that these treatments are less effective than most other antidiabetic therapies at reducing harm from adverse events. There are two main scenarios when insulin is an effective treatment:

- managing acute hyperglycaemia
- managing long-term worsening hyperglycaemia that does not respond to other treatments.

However, in the committee's experience insulin may also be a good option for people who cannot tolerate other medicines. Therefore, they recommended insulin alongside other options for people who need further medicines to reach their glycaemic targets.

**How the recommendations might affect practice**

These recommendations are likely to be a change from current practice, with wider access to therapies with more recent evidence of clinical and cost effectiveness.

**GLP-1 receptor agonists**

GLP-1 receptor agonists were previously recommended after triple therapy with metformin and 2 other oral medicines was not effective, tolerated or contraindicated. Therefore, recommending the treatment as triple therapy after taking metformin and 1 oral drug (an SGLT-2 inhibitor) may lead to increases in costs. The committee agreed this will likely reduce over time, because the weight loss and cardiovascular benefits of GLP-1 receptor agonists will reduce the number of appointments needed to treat atherosclerotic cardiovascular disease. Taking GLP-1 receptor agonists will mean that DPP-4 inhibitor use will reduce. Early intervention could lead to weight loss and so to better long-term prognosis, which, if maintained, will reduce:

- long-term treatment requirements and
- need for later stage treatments (such as insulin).

**DPP-4 inhibitors, sulfonylureas, pioglitazone and insulin**

The recommendations on DPP-4 inhibitors, sulfonylureas, pioglitazone and insulin do not reflect a significant change in current practice and are unlikely to increase resource use. There may be cost savings if people are no longer prescribed GLP-1 receptor agonists and DPP-4 inhibitors together. DPP-4 inhibitors do vary in price, but the default assumption is that services will use the medicine with the lowest acquisition cost (in the absence of patient-specific factors). The use of more intensive earlier treatment may lead to a reduction in the use of insulin, which may offset costs long term.

Return to recommendations

## People with chronic kidney disease

Recommendation 1.8.58

**Why the committee made the recommendation**

The committee made a recommendation for this group based on their knowledge and experience, because the clinical evidence was very limited.

DPP-4 inhibitors are effective at reducing HbA1c and have fewer adverse effects than other comparable options. If DPP-4 inhibitors are contraindicated,

not tolerated or not effective, then in the committee's experience the best option is either pioglitazone, a sulfonylurea, or an insulin-based treatment.

### How the recommendations might affect practice

The recommendations on DPP-4 inhibitors, sulfonylureas, pioglitazone and insulin do not reflect a significant change in current practice and are unlikely to increase resource use. There may be cost savings if people are no longer prescribed GLP-1 receptor agonists and DPP-4 inhibitors together. DPP-4 inhibitors do vary in price, but the default assumption is that services will use the medicine with the lowest acquisition cost (in the absence of patient-specific factors).

Return to recommendation

## People with frailty

Recommendations 1.8.59 and 1.8.60

### Why the committee made the recommendations

There was no evidence on outcomes for people with frailty. Using their knowledge from clinical practice, the committee recommended that, in this group, the aim of treatment should primarily be to control symptoms.

If initial therapy does not achieve the treatment goals, a DPP-4 inhibitor can reduce HbA1c with limited adverse effects.

Pioglitazone, sulfonylureas and insulin-based treatments are recommended as alternatives based on the committee's experience. The committee did not recommend one treatment over the other because of the lack of evidence and the diverse needs of people with frailty.

Because of the lack of evidence, the committee made a recommendation for research in this area.

### How the recommendations might affect practice

The recommendations on DPP-4 inhibitors, sulfonylureas, pioglitazone and insulin do not reflect a significant change in current practice and are unlikely to increase resource use. There may be cost savings if people are no longer

prescribed GLP-1 receptor agonists and DPP-4 inhibitors together. DPP-4 inhibitors do vary in price, but the default assumption is that services will use the medicine with the lowest acquisition cost (in the absence of patient-specific factors).

Return to recommendations

## Insulin-based treatments

Recommendations 1.8.61 to 1.8.68

### Why the committee made the recommendations

In 2025, the insulin-based treatment recommendations underwent a pragmatic refresh in the context of the withdrawal of insulin products and known insulin brand shortages. Based on the committee's clinical experience and consensus, this refresh acknowledges the increased use of analogue insulin. The committee agreed that:

- different insulin therapies may be more useful for different people dependent on their symptoms (for example: if there is a risk of nocturnal hypoglycaemia, a longer acting basal insulin might be more suitable) and
- the added flexibility of recommending broad drug classes rather than specific insulins will support people with diabetes and healthcare professionals to choose the most suitable treatment.

Return to recommendations

### Long-acting insulin

Recommendations 1.8.69 and 1.8.70

Biosimilars have the potential to offer the NHS considerable cost savings. To gain approval for use, biosimilar medicines have to be shown to be safe and as effective as the original reference medicine, and have the same quality. Based on this, the committee noted it was appropriate, when starting a new prescription of an insulin for which a biosimilar is available, to use the one with the lowest cost.

In addition, people may be using an insulin for which a lower cost biosimilar is available. In such cases, the committee recommended discussing with people the possibility of switching to the biosimilar. This could happen at the person's routine review. They also agreed that switching to the biosimilar should be carefully planned, taking into consideration the dose-switching protocols, monitoring and the person's concerns about switching from their existing regimen, and a shared decision reached. Healthcare professionals should also refer to the summary of product characteristics for further information when considering switching to biosimilars.

### How the recommendations might affect practice

The effect of the 2025 updates to the recommendations on current practice is uncertain. There may be a decrease in insulin use generally due to the use of other medications.

Return to recommendations

## Periodontitis

Recommendations 1.9.1 to 1.9.4

### Why the committee made the recommendations

The evidence showed that people with diabetes are at increased risk of periodontitis, and that non-surgical periodontal treatment can improve diabetes control. However, in the committee’s experience, people with diabetes are often unaware of this and may not be having regular oral health reviews. To address this, the committee recommended routinely discussing the risk of periodontitis at annual reviews, alongside eye disease and foot problems.

The evidence also showed that periodontal treatment is cost effective for people with type 2 diabetes, assuming improvements in HbA1c are maintained. This was tested with health economic modelling in a range of different scenarios. There were some scenarios where periodontal treatment was not cost effective, but the committee did not think these scenarios reflected real-world practice.

## How the recommendations might affect practice

For oral healthcare professionals, the long-term impact of the recommendations is uncertain. The recommendations specify that people should follow existing NICE guidelines on oral health. However, the recommendations may also increase awareness of periodontitis, leading to a possible short-term increase in the number of oral health reviews. Any increase in the number of oral health reviews will potentially impact on services, as NHS dental services already have capacity issues.

A short-term increase in the number of oral health reviews will also lead to a short-term increase in costs. However, there is likely to be a larger long-term reduction in costs from the improvement to oral health and diabetes control.

Oral healthcare and dental teams will need clear advice on what they need to do for people with diabetes. They will need clear care pathways to improve quality of care and service delivery, in line with the NHS England commissioning standard on dental care for people with diabetes.

Many people do not have regular oral health reviews, even if they are eligible for free NHS dental care. People are eligible for free dental care if they are:

- pregnant
- mothers with babies under 1 year old
- on low income benefits, or under 20 and dependent on someone who is receiving low income benefits
- having treatment in an NHS hospital by the hospital dentist.

The recommendations may encourage more people with diabetes to have regular oral health reviews. Combined with proactive engagement and enhanced support for people with diabetes, this may broaden access to dental and oral healthcare and help to reduce oral health inequalities.

Return to recommendations

# Context

Type 2 diabetes is a chronic metabolic condition characterised by insulin resistance (that is, the body's inability to effectively use insulin) and insufficient pancreatic insulin production, resulting in high blood glucose levels (hyperglycaemia). Type 2 diabetes is commonly associated with obesity, physical inactivity, raised blood pressure, periodontitis, disturbed blood lipid levels and a tendency to develop thrombosis, and is therefore recognised to have an increased cardiovascular risk. It is associated with long-term microvascular and macrovascular complications, together with reduced quality of life and life expectancy.

Type 2 diabetes is more common in people of African, African–Caribbean and South Asian family background. It can occur in all age groups and is increasingly being diagnosed in adolescents and young adults.

Multiple vascular risk factors and wide-ranging complications make diabetes care complex and time consuming, and many areas of healthcare services must be involved for optimal management. The need for healthy living, and the complexities and possible side effects of therapy, make structured education and self-management important aspects of diabetes care.

This guideline contains recommendations for managing type 2 diabetes in adults, and focuses on education, dietary advice, managing cardiovascular risk, managing blood glucose levels, and identifying and managing long-term complications. The guideline does not cover diagnosis, secondary diabetes, type 1 diabetes in adults, diabetes in pregnancy or diabetes in children and young people.

# Finding more information and committee details

To find NICE guidance on related topics, including guidance in development, see the NICE topic page on diabetes.

For details of the guideline committee see the committee member list.

# Update information

**August 2025:** We have reviewed the evidence on medicines for people with type 2 diabetes, and made new recommendations. These are marked **[2025]**.

We have also amended some recommendations without reviewing the evidence:

- Some recommendations have been amended to align them with the new medicines recommendations.
- We have amended recommendations 1.7.7 and 1.7.8 on HbA1c targets, to bring them in line with the new medicine recommendations. They now refer to an 'initial medication regimen' rather than a 'single drug'. These changes are shaded yellow.
- We have updated terminology throughout the guideline so that recommendations now refer to 'living with overweight' rather than 'being overweight' and to 'healthy living' rather than 'lifestyle'. These changes are shaded yellow.

These amended recommendations are marked **[2009, amended 2025]**, **[2015, amended 2025]** and **[2022, amended 2025]**.

Recommendations that have not been reviewed or changed are marked **[2009]**, **[2015]**, **[2021]**, **[2022]**, **[2009, amended 2015]**, **[2009, amended 2020]** or **[2015, amended 2022]**). We cannot accept comments on these recommendations.

**Recommendations that have been deleted, or changed without an evidence review**

We propose to delete some recommendations from the 2022 guideline. Table 1 sets out these recommendations and includes details of replacement recommendations. If there is no replacement recommendation, an explanation for the proposed deletion is given.

For recommendations shaded in grey and ending **[2009, amended 2025]**, **[2015, amended 2025]** and **[2022, amended 2025]**, we have made changes

that could affect the intent without reviewing the evidence. Reasons for the changes are given in table 2.

**Table 1 Recommendations that have been deleted**

| Recommendation in 2022 guideline | Comment |
|---|---|
| Offer standard-release metformin as first-line drug treatment to adults with type 2 diabetes. **[2015]** (1.7.3). | Replaced by:<br>For adults with type 2 diabetes, offer:<br>• metformin, and<br>• an SGLT-2 inhibitor. **[2025]** (1.8.9). |
| Based on the cardiovascular risk assessment for the person with type 2 diabetes:<br>• If they have chronic heart failure or established atherosclerotic cardiovascular disease, offer an SGLT2 inhibitor with proven cardiovascular benefit in addition to metformin.<br>• If they are at high risk of developing cardiovascular disease, consider an SGLT-2 inhibitor with proven cardiovascular benefit in addition to metformin. **[2022]** (1.7.5). | Replaced by:<br>For adults with type 2 diabetes, offer with:<br>• metformin, and<br>• an SGLT-2 inhibitor. **[2025]** (1.8.9).<br><br>For adults with type 2 diabetes and atherosclerotic cardiovascular disease, offer triple therapy with:<br>• metformin, and<br>• an SGLT-2 inhibitor, and<br>• subcutaneous semaglutide. **[2025]** (1.8.15). |
| Gradually increase the dose of standard-release metformin over several weeks to minimise the risk of gastrointestinal side effects in adults with type 2 diabetes. **[2015]** (1.7.7). | This recommendation has been deleted because this guidance is provided in the British National Formulary (BNF). |
| For first-line drug treatment in adults with type 2 diabetes, if metformin is contraindicated or not tolerated:<br>• If they have chronic heart failure or established atherosclerotic cardiovascular disease, offer an SGLT2 inhibitor with proven cardiovascular benefit.<br>• If they are at high risk of developing cardiovascular disease, consider an SGLT2 inhibitor with proven cardiovascular benefit. **[2022]** (1.7.9). | Replaced by:<br>If metformin is contraindicated or not tolerated, offer monotherapy with an SGLT-2 inhibitor. **[2025]** (1.8.11).<br><br>If metformin is contraindicated or not tolerated, offer :<br>• an SGLT-2 inhibitor, and<br>• subcutaneous semaglutide. **[2025]** (1.8.17). |
| For first-line drug treatment in adults with type 2 diabetes, if metformin is contraindicated or not tolerated and if they are not in either of the groups in recommendation 1.7.9, consider: | This recommendation has been deleted because all groups that are not specified in another recommendation are included in recommendation 1.8.9. |

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| • a DPP-4 inhibitor **or**<br>• pioglitazone **or**<br>• a sulfonylurea **or**<br>• an SGLT2 inhibitor for people who meet the criteria in NICE's technology appraisal guidance on canagliflozin, dapagliflozin and empagliflozin as monotherapies or ertugliflozin as monotherapy or with metformin for treating type 2 diabetes. **[2015, amended 2022]** (1.7.10). | |
| For adults with type 2 diabetes who start taking an SGLT2 inhibitor before they are 40 because they have an elevated lifetime risk of cardiovascular disease, do not stop the SGLT2 inhibitor when they turn 40 even if their QRISK2 score is below 10%. Only stop the SGLT2 inhibitor if the person's circumstances have changed and the SGLT2 inhibitor is no longer appropriate. **[2022]** (1.7.15). | This recommendation has been deleted because<br>• people with early onset type 2 diabetes should now be offered triple therapy that goes beyond this<br>• SGLT-2 inhibitors are recommended for almost everyone so the 2022 recommendation is less relevant. |
| For adults with type 2 diabetes at any stage after they have started first-line treatment:<br>• If they have or develop chronic heart failure or established atherosclerotic cardiovascular disease, offer an SGLT2 inhibitor with proven cardiovascular benefit in addition to current treatment or replace an existing drug with the SGLT2 inhibitor.<br>• If they are or become at high risk of developing cardiovascular disease, consider adding an SGLT2 inhibitor with proven cardiovascular benefit to current treatment or replacing an existing drug with the SGLT2 inhibitor.<br><br>Take into account the person's current treatment regimen and preferences and make a shared decision about switching treatments or adding an SGLT2 inhibitor, as appropriate (also see recommendations 1.7.12 and 1.7.13 on starting an SGLT2 inhibitor). **[2022]** | This recommendation has been deleted because SGLT-2 inhibitors are recommended as initial therapy for everyone who would be eligible to use them. |

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| In February 2022, using ertugliflozin to reduce cardiovascular risk when blood glucose is well controlled was off-label. See NICE's information on prescribing medicines. (1.7.16). | |
| For adults with type 2 diabetes, if monotherapy has not continued to control HbA1c to below the person's individually agreed threshold for further intervention, consider adding:<br>• a DPP-4 inhibitor **or**<br>• pioglitazone **or**<br>• a sulfonylurea **or**<br>• an SGLT2 inhibitor for people who meet the criteria in NICE's technology appraisal guidance on canagliflozin in combination therapy, ertugliflozin as monotherapy or with metformin, or dapagliflozin or empagliflozin in combination therapy. **[2015, amended 2022]** (1.7.18). | This recommendation has been deleted because most people are not offered monotherapy.<br><br>This has in part been replaced by:<br>For adults with type 2 diabetes who need further medicines to reach their glycaemic targets:<br>• add a DPP-4 inhibitor to their current treatment<br>• if this is contraindicated, not tolerated or is not effective, offer:<br>– a sulfonylurea or<br>– pioglitazone or<br>– an insulin-based treatment (see the section on insulin-based treatments). **[2025]** (1.8.46). |
| For adults with type 2 diabetes, if dual therapy with metformin and another oral drug has not continued to control HbA1c to below the person's individually agreed threshold for further intervention consider either:<br>• triple therapy by adding a DPP-4 inhibitor, pioglitazone or a sulfonylurea or an SGLT2 inhibitor for people who meet the criteria in NICE's technology appraisal guidance on canagliflozin in combination therapy, dapagliflozin in triple therapy, empagliflozin in combination therapy, or ertugliflozin with metformin and a dipeptidyl peptidase-4 inhibitor **or**<br>• starting insulin-based treatment (see the section on insulin-based treatments). **[2015, amended 2022]** (1.7.19). | Replaced by:<br>For adults with type 2 diabetes who need further medicines to reach their glycaemic targets:<br>• add a DPP-4 inhibitor to their current treatment<br>• if this is contraindicated, not tolerated or is not effective, offer:<br>– a sulfonylurea or<br>– pioglitazone or<br>– an insulin-based treatment (see the section on insulin-based treatments). **[2025]** (1.8.46). |
| In adults with type 2 diabetes, if metformin is contraindicated or not tolerated and dual therapy with 2 oral drugs has not continued to control HbA1c to below the person's individually agreed threshold for intervention, consider insulin-based treatment (see the section on insulin-based treatments). **[2015, amended 2022]** (1.7.20). | This recommendation has been deleted because insulin is now included alongside other options for treatment escalation. |

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| If triple therapy with metformin and 2 other oral drugs is not effective, not tolerated or contraindicated, consider triple therapy by switching one drug for a GLP-1 mimetic for adults with type 2 diabetes who:<br>• have a body mass index (BMI) of 35 kg/m$^2$ or higher (adjust accordingly for people from Black, Asian and other minority ethnic groups) **and** specific psychological or other medical problems associated with obesity **or**<br>• have a BMI lower than 35 kg/m$^2$ **and:**<br>– for whom insulin therapy would have significant occupational implications **or**<br>– weight loss would benefit other significant obesity-related comorbidities. **[2015, amended 2022]** (1.7.21). | This recommendation has been deleted because:<br>• GLP-1 receptor agonists are offered as initial therapy for people with atherosclerotic cardiovascular disease and considered for people with early onset type 2 diabetes<br>• a new recommendation considers GLP-1 receptor agonists as second-line treatment for people with heart failure and people living with obesity:<br><br>Consider adding subcutaneous semaglutide for adults with type 2 diabetes and heart failure who need further medicines to reach their weight management targets, if:<br>• they are living with obesity<br>• there are no concerns about frailty that may increase the risk of adverse events with the medicine<br>• they have a preserved ejection fraction. **[2025]** (1.8.47)<br><br>Consider adding semaglutide for adults with type 2 diabetes who are living with obesity, if:<br>• they have been taking initial therapy for at least 3 months and<br>• further medicines are needed to reach their glycaemic targets and<br>• they are not already taking a GLP-1 receptor agonist. **[2025]** (1.8.54). |
| Only continue GLP-1 mimetic therapy if the adult with type 2 diabetes has had a beneficial metabolic response (a reduction of at least 11 mmol/mol [1.0%] in HbA1c and weight loss of at least 3% of initial body weight in 6 months). **[2015]** (1.7.22). | This recommendation has been deleted because:<br>• for people receiving GLP-1 receptor agonists for cardiovascular protection, the committee agreed they should be continued regardless of HbA1c and weight response<br>• for people taking semaglutide who are living with obesity, this has been covered in another recommendation:<br><br>Stop GLP-1 receptor agonists if:<br>• they do not help the person reach their glycaemic or weight targets, and<br>• the person does not have atherosclerotic cardiovascular |

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| | disease or early onset type 2 diabetes. **[2025]** (1.8.43). |
| For adults with type 2 diabetes, only offer combination therapy with a GLP-1 mimetic and insulin along with specialist care advice and ongoing support from a consultant-led multidisciplinary team. **[2015]** (1.7.23). | This recommendation has been deleted because the committee agreed that this could be started without specialist input. |
| Consider switching to insulin detemir or insulin glargine from NPH insulin in adults with type 2 diabetes:<br>• who do not reach their target HbA1c because of significant hypoglycaemia **or**<br>• who experience significant hypoglycaemia on NPH insulin irrespective of the level of HbA1c reached **or**<br>• who cannot use the device needed to inject NPH insulin but could administer their own insulin safely and accurately if a switch to one of the long-acting insulin analogues was made **or**<br>• who need help from a carer or healthcare professional to administer insulin injections and for whom switching to one of the long-acting insulin analogues would reduce the number of daily injections. **[2015]** (1.7.27) | This recommendation has been deleted following a pragmatic refresh of the insulin-based treatments which has resulted in class-based recommendations for bolus insulins. |
| For adults with type 2 diabetes and CKD who are taking an ARB or an ACE inhibitor (titrated to the highest licensed dose that they can tolerate), offer an SGLT2 inhibitor (in addition to the ARB or ACE inhibitor) if:<br>• ACR is over 30 mg/mmol **and**<br>• they meet the criteria in the marketing authorisation (including relevant estimated glomerular filtration rate [eGFR] thresholds).<br><br>In November 2021, not all SGLT2 inhibitors were licensed for this indication. See NICE's information on prescribing medicines. **[2021]** (1.8.18).<br><br>For adults with type 2 diabetes and CKD who are taking an ARB or an ACE | These recommendations have been deleted because people with chronic kidney disease who are eligible for an SGLT-2 inhibitor (with an eGFR of 20 ml/min/1.73 $m^2$ and above) are discussed in the new medicines recommendations. |

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| inhibitor (titrated to the highest licensed dose that they can tolerate), consider an SGLT2 inhibitor (in addition to the ARB or ACE inhibitor) if:<br>• ACR is between 3 and 30 mg/mmol **and**<br>• they meet the criteria in the marketing authorisation (including relevant eGFR thresholds).<br><br>In November 2021, not all SGLT2 inhibitors were licensed for this indication. See NICE's information on prescribing medicines. **[2021]** (1.8.19). | |

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2 **Table 2 Amended recommendation wording (change to intent) without**

3 **an evidence review**

| Recommendation in 2022 guideline | Recommendation in current guideline | Reason for change |
|---|---|---|
| Discuss with adults with type 2 diabetes the benefits and risks of drug treatment and the options available. Base the choice of drug treatments on:<br>• the person's individual clinical circumstances, for example comorbidities, contraindications, weight, and risks from polypharmacy<br>• the person's individual preferences and needs<br>• the effectiveness of the drug treatments in terms of metabolic response and cardiovascular and renal protection<br>• safety and tolerability of the drug treatment<br>• monitoring requirements<br>• the licensed indications or combinations available<br>• cost (if 2 drugs in the same class are appropriate, choose the option with the lowest acquisition cost). **[2015**, **amended 2022]** (1.7.1) | Discuss the benefits and risks of each drug treatment option with adults with type 2 diabetes, and support them to make an informed decision about their treatment. Take into account the effectiveness of each medicine in terms of:<br>• metabolic response and<br>• cardiovascular and renal protection. **[2015, amended 2025]**<br>See the NICE guideline on shared decision making and the section on safety of medicines for diabetes before and during pregnancy in the NICE guideline on diabetes in pregnancy. (1.8.1). | Most of the information in this recommendation is now covered in more detail in other NICE guidelines. |
| Assess the person's cardiovascular status and risk to determine whether | Assess the person's current cardiovascular | To add renal status and simplify |

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| they have chronic heart failure or established atherosclerotic cardiovascular disease or are at high risk of developing cardiovascular disease.<br><br>See the recommendations on using risk scores and QRISK2 to assess cardiovascular disease risk in adults with type 2 diabetes in NICE's guideline on cardiovascular disease: risk assessment and reduction, including lipid modification. **[2022]** (1.7.4). | and renal status, and risk of developing cardiovascular disease in the future. **[2022, amended 2025]** (1.8.7). | the wording.<br><br>The cross-reference to the NICE's guideline on assessing and reducing risk of cardiovascular disease was removed because there is no difference in treatment with antidiabetic medication between people at high and low cardiovascular risk. |
| When starting an adult with type 2 diabetes on dual therapy with metformin and an SGLT2 inhibitor as first-line therapy, introduce the drugs sequentially, starting with metformin and checking tolerability. Start the SGLT2 inhibitor as soon as metformin tolerability is confirmed. **[2022]** (1.7.6). | When an adult with type 2 diabetes starts initial therapy with metformin and one or more other medicines:<br>• introduce the medicines one at a time, starting with metformin and checking tolerability<br>• if using an SGLT-2 inhibitor, start this as soon as metformin tolerability is confirmed<br>• if using a GLP-1 receptor agonist, start this as soon as the SGLT-2 inhibitor tolerability is confirmed. **[2022, amended 2025]** (1.8.34). | Amended to take account of change to medicine pathway. |
| When reviewing or considering changing treatments for adults with type 2 diabetes, think about and discuss the following with the person:<br>• how to optimise their current treatment regimen before thinking about changing treatments, taking into account factors such as:<br>– adverse effects<br>– adherence to existing medicines | When reviewing treatments, discuss all changes with the person with type 2 diabetes. See the recommendations on involving people in medicine discussions. **[2022, amended 2025]** (1.8.38).<br>Optimise their current treatment regimen | We have split the original into multiple recommendations to make it easier to read. |

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| – the need to revisit advice about diet and lifestyle<br>– prescribed doses and formulations<br>• stopping medicines that have had no impact on glycaemic control or weight, unless there is an additional clinical benefit, such as cardiovascular or renal protection, from continued treatment (see the note below on off-label use)<br>• whether switching rather than adding drugs could be effective<br>• the considerations about treatment choice in recommendation 1.7.1. **[2022]**.<br><br>In February 2022, using ertugliflozin to reduce cardiovascular risk when blood glucose is well controlled was off-label. See NICE's information on prescribing medicines.<br><br>Also see the recommendations on medication review in the NICE guideline on medicines optimisation and on reviewing medicines and supporting adherence in the NICE guideline on medicines adherence. (1.7.14). | before changing treatments, taking into account factors such as:<br>• adverse effects<br>• adherence to, and management of existing medicines<br>• the need to revisit advice about diet and self-management<br>• prescribed doses and formulations. **[2022, amended 2025]** (1.8.39).<br>Take into account adverse effects from combining medicines (for example hypoglycaemia). **[2022, amended 2025]** (1.8.44). | |
| For adults with type 2 diabetes starting insulin therapy, provide a structured programme using active insulin dose titration that encompasses:<br><br>• injection technique, including rotating injection sites and | Provide a structured education programme to adults with type 2 diabetes starting insulin therapy. The programme should include:<br>• injection technique, including rotating injection sites and avoiding repeated injections at the same point within sites<br>• self-monitoring<br>• dose titration to target levels<br>• dietary advice<br>• the DVLA's Assessing fitness to drive: a guide for | To simplify the wording. |

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| avoiding repeated injections at the same point within sites<br>• continuing telephone support<br>• self-monitoring<br>• dose titration to target levels<br>• dietary advice<br>• the DVLA's Assessing fitness to drive: a guide for medical professionals<br>• managing hypoglycaemia<br>• managing acute changes in plasma glucose control<br>• support from an appropriately trained and experienced healthcare professional. **[2015]** (1.7.24) | medical professionals<br>• managing hypoglycaemia<br>• managing acute changes in plasma glucose control<br>• support from a healthcare professional trained in insulin therapy. **[2015, amended 2025]** (1.8.61) | |
| For adults with type 2 diabetes starting insulin therapy, continue to offer metformin for people without contraindications or intolerance. Review the continued need for other blood glucose lowering therapies. **[2015]** (1.7.25) | When initiating insulin for adults with type 2 diabetes:<br>• continue to offer metformin to people already taking it<br>• stop any other medicines being used solely to manage hyperglycaemia<br>• discuss with the person the risks and benefits of continuing medicines for other benefits such as cardiovascular protection or weight management. **[2015, amended 2025]** (1.8.62) | To simplify the wording and split into bullet points to make it easier to read. |
| Start insulin therapy for adults with type 2 diabetes from a choice of the following insulin types and regimens:<br>• Offer neutral protamine Hagedorn (NPH) insulin injected once or twice daily according to need.<br>• Consider starting both NPH and short-acting insulin (particularly if the person's HbA1c is 75 mmol/mol [9.0%] or higher), administered either:<br>– separately **or** | **Choosing a type of insulin**<br>Offer basal insulin as the initial insulin therapy to adults with type 2 diabetes. **[2015, amended 2025]** (1.8.63)<br><br>Consider combining basal and short acting insulin as the initial insulin therapy for adults with type 2 diabetes, | The insulin-based treatment recommendations underwent a pragmatic refresh in the context of the withdrawal of insulin products and known insulin brand shortages.<br>Additionally, we have split the original into multiple |

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| – as a pre-mixed (biphasic) human insulin preparation.<br>• Consider, as an alternative to NPH insulin, using insulin detemir or insulin glargine if:<br>– the person needs help from a carer or healthcare professional to inject insulin, and use of insulin detemir or insulin glargine would reduce the frequency of injections from twice to once daily **or**<br>– the person's lifestyle is restricted by recurrent symptomatic hypoglycaemic episodes **or**<br>– the person would otherwise need twice-daily NPH insulin injections in combination with oral glucose-lowering drugs.<br>• Consider pre-mixed (biphasic) preparations that include short-acting insulin analogues, rather than pre-mixed (biphasic) preparations that include short-acting human insulin preparations, if:<br>– the person prefers injecting insulin immediately before a meal **or**<br>– hypoglycaemia is a problem **or**<br>– blood glucose levels rise markedly after meals. **[2015]** (1.7.26) | especially if the person's HbA1c is 75 mmol/mol (9.0%) or higher. This should be injected either separately or as a pre-mixed (biphasic) preparation. **[2015, amended 2025]** (1.8.64)<br><br>**Choosing a** preparation<br>Make a shared decision with the person on the choice of basal insulin preparation, based on considerations that are specific to them, including whether:<br>• the person needs help from a carer or healthcare professional to inject insulin **or**<br>• there is a particular concern about nocturnal hypoglycaemia **or**<br>• the person has a strong preference for once-daily injections.<br><br>When multiple basal insulin types (including biosimilars) and regimens meet the person's needs, choose the one with the lowest acquisition cost. **[2015, amended 2025]** (1.8.65)<br><br>Consider pre-mixed preparations that include short-acting insulin analogues rather than including short-acting human insulin preparations, if:<br>• the person prefers injecting insulin | recommendations to make it easier to read. |

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| | immediately before a meal **or**<br>• hypoglycaemia is a problem **or**<br>• blood glucose levels rise markedly after meals. **[2015, amended 2025]** (1.8.66) | |
| Monitor adults with type 2 diabetes who are on a basal insulin regimen (NPH insulin, insulin detemir or insulin glargine) for the need for short-acting insulin before meals (or a pre-mixed [biphasic] insulin preparation). **[2015]** (1.7.28) | At each review, check whether adults with type 2 diabetes who are on a basal insulin regimen need short-acting insulin before meals (or a pre-mixed [biphasic] insulin preparation). **[2015, amended 2025]** (1.8.67) | The insulin-based treatment recommendations underwent a pragmatic refresh in the context of the withdrawal of insulin products and known insulin brand shortages. |
| Monitor adults with type 2 diabetes who are on pre-mixed (biphasic) insulin for the need for a further injection of short-acting insulin before meals or for a change to a basal-bolus regimen with NPH insulin or insulin detemir or insulin glargine, if blood glucose control remains inadequate. **[2015]** (1.7.29) | At each review, check whether adults with type 2 diabetes who are on pre-mixed (biphasic) insulin need a further injection of short-acting insulin before meals or a change to a basal-bolus regimen with basal insulin, if their blood glucose level remains outside their agreed targets. **[2015, amended 2025]** (1.8.67) | The insulin-based treatment recommendations underwent a pragmatic refresh in the context of the withdrawal of insulin products and known insulin brand shortages. |
| When starting an insulin for which a biosimilar is available, use the product with the lowest acquisition cost. **[2021]** (1.7.30) | Make a shared decision with the person on the choice of basal insulin preparation, based on considerations that are specific to them, including whether:<br>• the person needs help from a carer or healthcare professional to inject insulin **or**<br>• there is a particular concern about | The insulin-based treatment recommendations underwent a pragmatic refresh in the context of the withdrawal of insulin products and known insulin brand shortages. |

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| | nocturnal hypoglycaemia **or**<br>• the person has a strong preference for once-daily injections.<br>When multiple basal insulin types (including biosimilars) and regimens meet the person's needs, choose the one with the lowest acquisition cost. **[2015, amended 2025]** (1.8.65) | |
| Ensure the risk of medication errors with insulins is minimised by following the Medicines and Healthcare products Regulatory Agency (MHRA) guidance on minimising the risk of medication error with high strength, fixed combination and biosimilar insulin products, which includes advice for healthcare professionals when starting treatment with a biosimilar. **[2021]** (1.7.31) | Follow the MHRA's guidance on minimising the risk of medication error with high strength, fixed combination and biosimilar insulin products, including its advice for healthcare professionals when starting treatment with a biosimilar. **[2021]** (1.8.69) | To simplify the wording |

**June 2022:** We reviewed evidence on periodontitis in people with type 2 diabetes, and made new recommendations. These recommendations are marked **[2022]**.

**March 2022:** We reviewed the evidence on continuous glucose monitoring for adults with type 2 diabetes. These recommendations are marked **[2022]**.

We also made one change without an evidence review: in the section on self-monitoring of capillary blood glucose, the word 'capillary' has been added to the heading and recommendations, to make it clear that recommendations apply to adults who are using capillary blood glucose monitoring rather than CGM. These recommendations are marked **[2015, amended 2022]**.

Recommendations are marked to show when they last had an evidence review, for example **[2009]** or **[2015]**. In some cases, minor changes have been made to the wording to bring the language and style up to date, without changing the meaning.

We also added a cross-reference to NICE's technology appraisal guidance on dapagliflozin for treating chronic kidney disease in the section on managing complications.

**February 2022:** We reviewed the evidence and made new recommendations on drug treatment for adults with type 2 diabetes. These recommendations are marked **[2022]**.

We also made some changes without an evidence review:

- We have replaced 'individually agreed threshold for intensification' throughout with 'individually agreed threshold for further intervention' for clarity. (Intensification was also removed from recommendation for research 3).
- In recommendation 1.1.1 we have removed 'because of reduced life expectancy'.

These recommendations are marked [**2015, amended 2022**].

**December 2020:** We amended recommendations 1.9.21 and 1.9.24 to bring them in line with the diabetic eye screening programme. The evidence for these recommendations has not been reviewed, and they are marked **[2009, amended 2020]**.

**August 2019:** The recommendations in section 1.5 on diagnosing and managing hypertension have been removed because diagnosis, treatment and monitoring of hypertension is broadly the same for people with type 2 diabetes as for other people (see the NICE guideline on hypertension in adults). When a different approach is needed for people with type 2 diabetes, this is specified in the hypertension guideline.

**December 2015:** We updated and replaced NICE guideline CG87 (published May 2009) and NICE technology appraisal guidance 203 and 248. We made a change without an evidence review. The recommendation on the treatment of gastroparesis was replaced by recommendations from the NICE guideline on type 1 diabetes. This change is labelled **[2015]**.

## Minor changes since publication

**August 2024:** We added a link to NICE's guideline on diabetic retinopathy in the section on managing complications.

**August 2022:** We updated the visual summary following stakeholder feedback. See the tables on summary of first-line medicines and on summary of medicines for further treatment.

**May 2022:** We added a link to NICE's guideline on medicines associated with dependence or withdrawal symptoms in the section on autonomic neuropathy.

**December 2019:** Relationships to the NICE guideline on hypertension were clarified, and a link was added to the decision aid on choice of medicine to control blood glucose. We added a link to the patient decision aid and user guide about taking a second medicine to control blood glucose.

**June 2018:** Recommendation 1.4.1 was added to provide a link to NICE's advice on bariatric surgery.