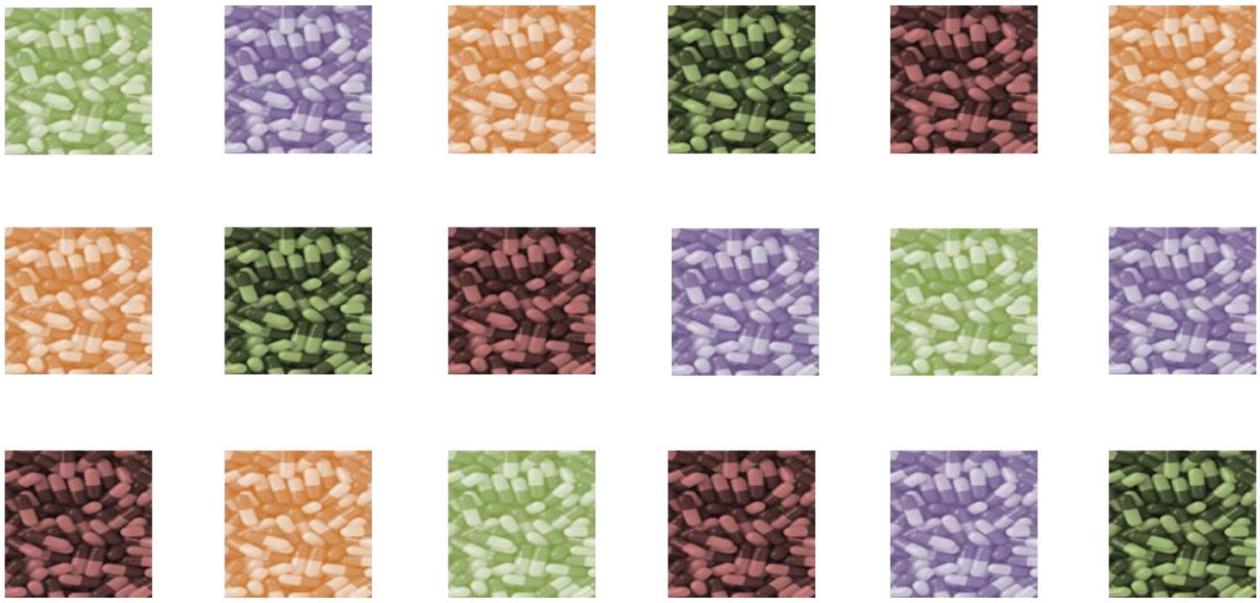
Quality Prescribing Strategy for Type 2 Diabetes Mellitus

A Guide for Improvement 2024-2027

January 2024

Scottish Government
Riaghaltas na h-Alba



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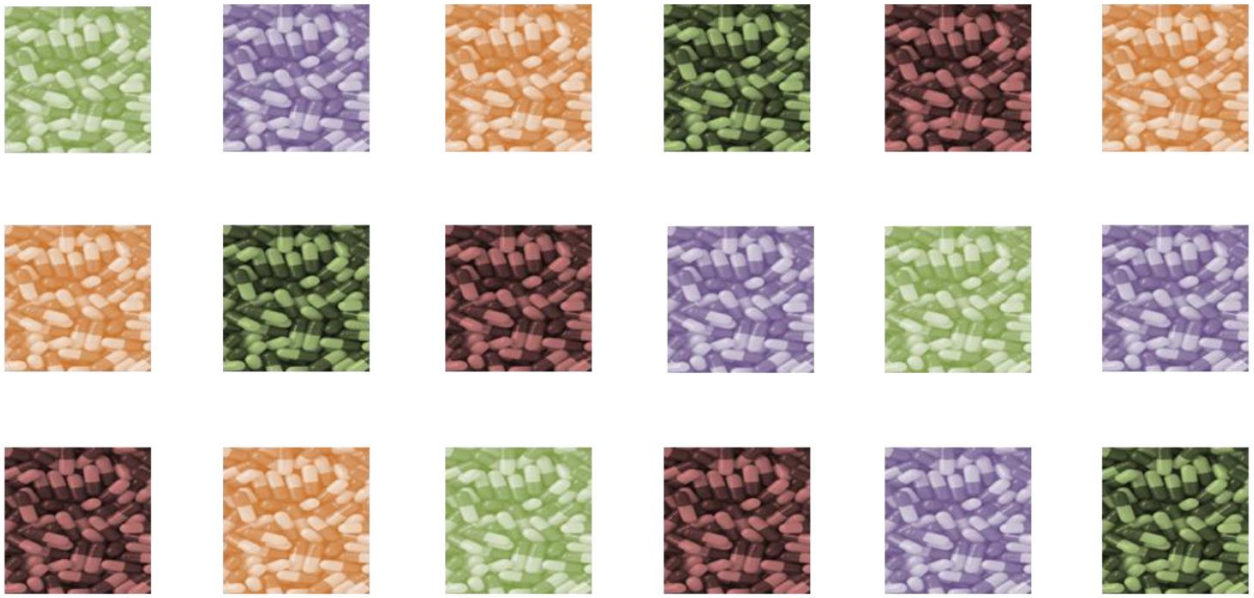

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Clinical foreword

Populations are ageing and many people with type 2 diabetes mellitus (T2DM) live with multiple long-term conditions and often prescribed treatments to manage conditions such as cardiovascular or renal disease. It is therefore necessary to ensure the most effective treatment for the individual, alongside a need to consider the place of non-pharmacological approaches to management.

An important principle in improving the care of people with T2DM is to consider their role in shared decision-making and adopting a person-centred approach when considering prescribing choices. It is central to our approach in Scotland that we are providing kind and individualised care to those with T2DM.

We are delighted to present the third edition of the Quality Prescribing Strategy for Type 2 Diabetes Mellitus. Since the publication of the last strategy the prevalence of the condition has increased by 18.8%, from 4.8% of the Scottish population to 5.7%. In addition, there are newer classes of medicines available and increasing evidence for their use. These medicines have benefit for other comorbidities such as atherosclerotic cardiovascular disease, heart failure and chronic kidney disease, all factors that need to be considered in making prescribing choices. This guide is welcomed as an opportunity to further improve the care provided to those with type 2 diabetes. It highlights the importance of addressing health inequalities, lifestyle management and climate and sustainability challenges. The recommendations are aimed at clinicians across the multidisciplinary team, NHS heath boards and GP clusters, and designed to continue the improvement in provision of care.

This third edition has been developed by the collaborative efforts of a multidisciplinary team of clinicians, academics, experts by experience, patient groups and policy makers from across Scotland, from Scottish Government and NHS Scotland, who are already delivering diabetes reviews to improve the outcomes for people with type 2 diabetes. To ensure outcomes from medication are optimised, and prescribing is appropriate and safe, the 7-Steps medication review process provides a clear structure for both the **initiation** of new and the **review** of existing treatments, and places an emphasis on ‘what matters to the individual’?

It is recognised that many people in Scotland benefit from pharmaceutical care of diabetes and that polypharmacy is common and a significant challenge. This guide aims to maximise that benefit and ensure safe, appropriate care.

The 7-Steps review process provides a framework for this, considering:

1. **Aim:** what matters to the person?
2. **Need**: identify essential medication.
3. **Need:** any unnecessary medication?
4. **Effectiveness**: are therapeutic objectives met?
5. **Safety:** any ADRs/ side effects or a risk of them?

6. **Sustainability**: cost-effective and environmentally sustainable
7. **Person-centred**: is the person willing and able to take drug therapy as intended?

We are extremely grateful to all those who contributed to the working group and to the review and development of the guide.

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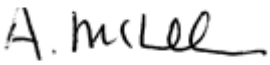

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Executive summary

Diabetes presents a major challenge for those with the condition and the National Health Service (NHS) in Scotland. The number of people with diabetes continues to grow with 1 in 17 adults in Scotland now living with diabetes, the majority of which is type 2 Diabetes Mellitus (T2DM). The prevalence of age-standardised diabetes in 2020 was higher among those living in the most deprived quintile (10%) compared with those living in the least deprived quintile (4%), showing significant variation associated with deprivation. T2DM is chronic in nature and associated with multiple morbidities and reduced life expectancy.

This guidance is designed to keep the person with diabetes at the centre of their treatment and disease management. The individual, their families and their carers should be actively involved with their treatment and care decisions at all stages. The first step in T2DM management is to make diet and lifestyle changes, as remission is possible if people are given the right intervention within six years of diagnosis. Due to the chronic and progressive nature of T2DM, it is often treated with multiple medicines (polypharmacy) to control not only blood glucose but to treat comorbidities such as diabetic kidney disease, cardiovascular disease (CVD) and neuropathic pain. People prescribed treatment for T2DM should have regular diet, lifestyle and medication reviews to ensure effective use of medicines, optimise outcomes and minimise harm. At the centre of this approach is using “What matters to you?”, a person-centred approach to reviewing treatment, as part of the 7-Steps medication review process.

This quality prescribing guide is intended to support clinicians across the multidisciplinary team and people with T2DM in shared decision-making and the effective use of medicines, applying the principles of value-based healthcare and Realistic Medicine.[9]

SIGN 116 and 154[1] were published in 2010 (updated 2017) and in 2017 respectively. Since then, there have been numerous studies supporting the use of newer therapies. The expert working group considered these and the recently published NICE guidance (NG28),[2] and recommend the use of sodium-glucose co-transporter-2 inhibitor (SGLT-2i) and glucagon-like peptide 1 receptor agonist (GLP-1RA) therapies, for the treatment of those with cardiovascular and renal disease and for consideration for those at higher cardiovascular risk. The group acknowledges the increased incidence of euglycaemic diabetic ketoacidosis (eDKA) with SGLT-2i and has provided additional advice to support appropriate prescribing of these agents and minimise the risk of harm in their use.

To support this work, a suite of safety and medication effectiveness data indicators have been developed with a multiprofessional and expert by experience group.

These indicators will enable benchmarking at Health Board and GP practice level to drive quality improvement through reducing unwarranted variation in prescribing practice.

Acknowledgements

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Contents

Guidance Summary

- Type 2 Diabetes Mellitus (T2DM) treatment should focus on diet and lifestyle interventions at every stage of the person's journey, from newly diagnosed to complex care, as the need for increased medication can be reduced through weight reduction and dietary change.
- Prevention is better than treatment and so lifestyle and dietary interventions should be supported at all stages, both from a national policy perspective and individual support.
- Remission is possible through weight loss and dietary changes supported by local care pathways, including dietitians (section 4).
- If pharmacological treatment is needed, the risks and benefits of treatment should be discussed with the individual to enable shared decision-making, taking a person centred approach and using the 7-step review process. Continued effectiveness of treatment and targets should also be regularly reviewed.
- Metformin remains the first choice for the pharmacological treatment of T2DM (unless contraindicated or not tolerated) (section 5). Table 6 provides a summary of medication characteristics for treatment of T2DM.
- Comorbidities must be considered, especially atherosclerotic cardiovascular disease (ASCVD), heart failure (HF) and chronic kidney disease (CKD). Newer therapies [sodium-glucose co-transporter-2 inhibitor (SGLT-2i) and glucagon-like peptide 1 receptor agonist (GLP-1RA)] have positive outcomes for people with T2DM independent of glycaemic control (section 6). See Figure 7 for treatment algorithm, and Table 8 for management of CKD.
- There is an increased incidence of euglycaemic diabetic ketoacidosis (eDKA) with SGLT-2i and additional advice is provided to support appropriate prescribing of these agents and minimise the risk of harm in their use.
- Insulin may be required by some individuals with T2DM, usually if other pharmacological therapy is no longer effective (section 7).
- Polypharmacy is common in the treatment of T2DM. A polypharmacy review (following the 7-Steps approach) should ensure optimal management of T2DM and any other co-existing conditions. This should include addressing lifestyle factors and considering the most appropriate medication and dose for the individual, with regular reviews for continued effectiveness (section 2).
- Self-monitoring of blood glucose is recommended for a limited group of people. Use of intermittently scanned or continuous glucose monitoring is increasing, and guidance continues to change to reflect this (section 8).
- For people living with frailty and for older people, the benefits of intensive treatment of T2DM should be balanced against the risk of potential hypoglycaemia and the consequences of falls, fractures and hospitalisation. Less stringent HbA1c targets may be appropriate for the frail and older person, in

agreement with the individual. Section 9 provides advice for managing T2DM in those with varying levels of frailty.

- There is higher incidence of depression and mental health conditions in people with T2DM, which can lead to poorer outcomes for both conditions, and they should not be managed in isolation (section 10).
- The prevalence of diabetes in 2020 was higher among those living in the most deprived quintile (10%) compared with those in the least deprived quintile (4%).
- Healthcare and prescribing have an environmental impact, which should be minimised wherever possible (section 2 and Figure 3).
- A person with T2DM should receive the appropriate treatment for their condition through regular reviews and shared decision-making. Regular review of medicines and care outcomes guards against clinical inertia.

1. Why is this quality prescribing guidance needed?

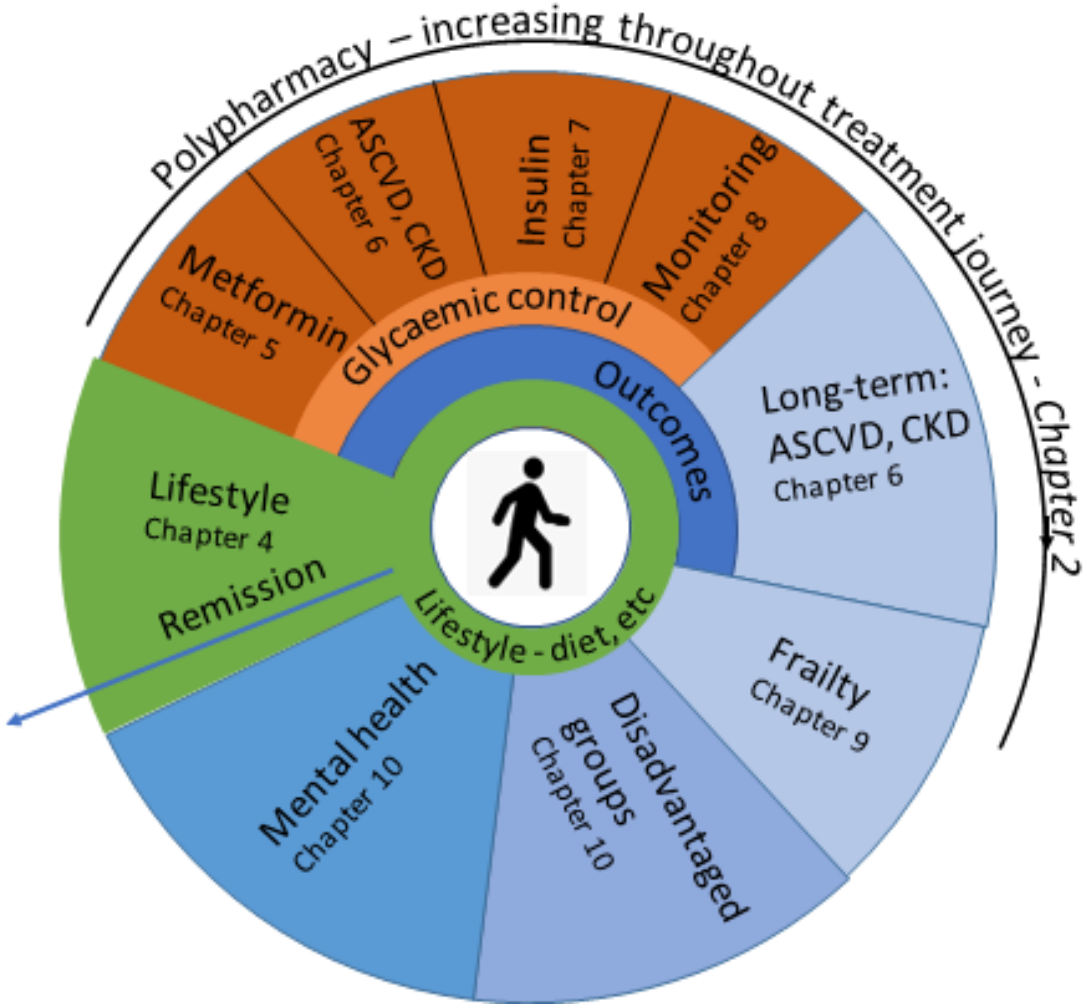
The purpose of this guide is to promote high quality prescribing in T2DM focusing on safe, person-centred care with shared decision-making throughout the process. A target HbA1c should be discussed with the person and individualised to them, taking account of lifestyle, frailty, comorbidities and medication side effects. This is especially important as decreasing elevated HbA1c levels reduces the risk of long-term complications.

In addition, this guide will raise awareness of the non-pharmaceutical management options for T2DM, provide information to monitor and review the multiple agents used to treat T2DM, and explore variation across Scotland. The scope includes adults with T2DM only.

This document does not replace current clinical guidance and should be read alongside SIGN 116 and 154.[1] The expert working group considered the increasing evidence for newer therapies, sodium-glucose co-transporter-2 inhibitor (SGLT-2i*) and glucagon-like peptide 1 receptor agonist (GLP-1RA), since publication of the SIGN guidance and the inclusion of these therapies in other national guidelines (such as NICE[2] and ADA[3]). The expert working group considered the place of these therapies in NHS Scotland, recommending their use (section 6).

This guidance provides additional information, such as prescribing safety and effectiveness indicators and guidance regarding the place of newer therapies in treatment, taking a person-centred approach, through the various stages of the disease process.

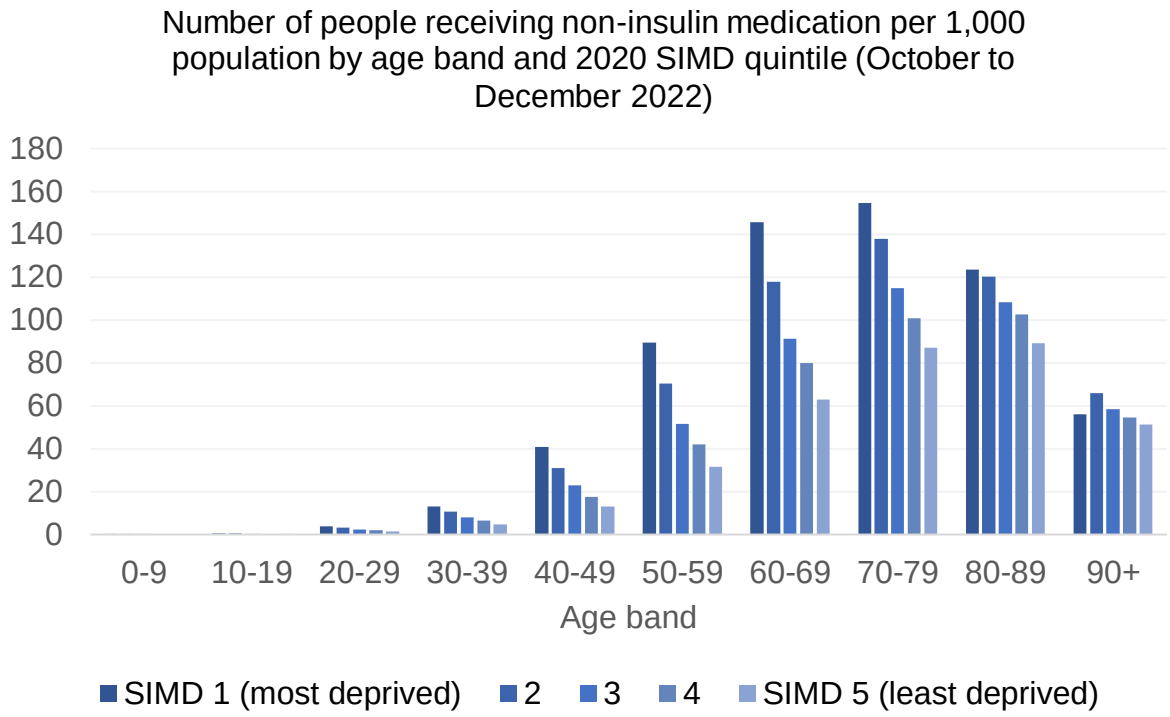
Figure 1: Journey through the management of T2DM



Diabetes in Scotland

The prevalence of age-standardised diabetes in 2020 was higher among those living in the most deprived quintile (10%) compared with those living in the least deprived quintile (4%). This pattern was evident for both women and men and has been consistent across previous Scottish Health Survey years[4] (see Chart 1).

Chart 1: Prevalence of diabetes in Scotland (age and deprivation comparison)



National policies and guidance

The Diabetes Improvement Plan (2021-2026)[5] reflects the importance of reducing health inequalities as priority four – Equity of Access. It aims to reduce the impact of deprivation and ethnicity on diabetes care and outcomes. It is recognised that there is a complex relationship between mental health problems, diabetes, raised BMI and those vulnerable to health inequalities. Therefore, these factors should be considered when planning the delivery of services.

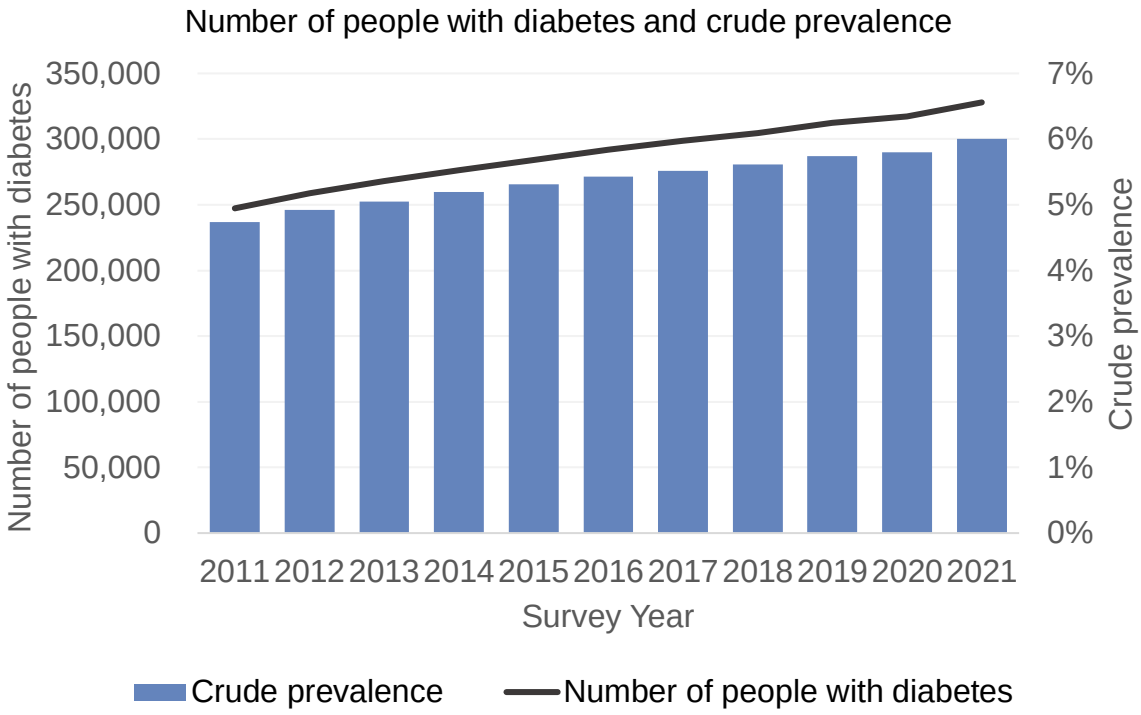
In 2018, the Scottish Government published two key documents to help address the impact of T2DM on the health of the nation; The Scottish Government's Diet and Healthy Weight Delivery Plan,[6] and The Scottish Government T2DM prevention, early detection and early intervention framework.[7] The overall aim is to reduce people's risk of developing T2DM and, for those diagnosed, support remission where possible and the avoidance of diabetes-related complications.

The Effective Prescribing and Therapeutics Division's Polypharmacy Guide and Realistic Medicine promote best practice and effective use of medicines to address an individual's needs. This maximises the therapeutic effectiveness of treatment and minimises the risk of medication associated harm, using the most cost-effective and sustainable options. Placing the person or carer at the centre of the journey promotes shared decision-making and individualised care.

Incidence and prevalence

At the end of 2020 there were 327,927 people with known diabetes in Scotland recorded on Scottish Care Information-Diabetes (SCI-Diabetes), which represents a crude prevalence of 6.0% of the population of all ages (5,463,300). The full report is available on Diabetes in Scotland's website.[10.]

Chart 2: Diabetes prevalence over time



The increase in reported prevalence is influenced by numerous factors, including:

- demographic change - diabetes is more prevalent in older age groups, so increasing numbers of older people will increase the prevalence of diabetes
- improved survival – related to improvements in treatment and care of all medical conditions
- earlier diagnosis, including those in younger age groups
- rising obesity levels - having a body mass index (BMI) in the overweight or obese range (BMI >25 and >30 respectively) is the most significant modifiable risk factor for developing T2DM

Prescribing for people with T2DM

For people with T2DM evidence indicates that as well as addressing glycaemic control, there should be a focus on preventing cardiovascular and renal disease. Therefore, there is an expected increase in use of medicines with cardiovascular and renal benefits, with a reduction in use of drugs without evidence of benefit beyond glycaemic control.

High quality prescribing involves:

- shared decision-making to identify the appropriate therapies for the individual which includes risks and benefits
- review of dosage and side effects
- consideration of when a treatment is no longer effective and should be stopped

Clinicians can assess the impact of therapeutic interventions through monitoring glycaemic control or recorded weight, using the SCI-diabetes prescribing timeline tool. A trial of stopping a medicine, with careful monitoring, should be considered when there are doubts regarding the continued benefit to the person. It is also recognised that there will be individuals who require different treatments to those outlined in the guide.

There is a wide variation in glycaemic control in Scotland (information available from SCI DC). While there are times that some individuals will require an individualised target higher than the recommended value e.g. frailty, there may be a large number of people that would benefit from a medication and lifestyle review to optimise outcomes.

Benefits of the guide to individuals with T2DM

This guidance promotes a focus on diabetes prescribing with:

- structured person-centred review of the appropriateness, efficacy, and tolerability of treatment, utilising the 7-Steps approach to medication reviews; and
- consideration and support for non-pharmaceutical management to reduce medication burden.

The positive impact felt by people from their diabetes medicines is acknowledged, although meaningful patient orientated outcome data is not readily available at this stage. Individuals with T2DM also benefit from peer support, available from a variety of groups.

> "I was very isolated because I had taken early retirement. I blamed myself for my diabetes and felt ashamed about it. During the pandemic, I had to shield and had little social contact. However, after contacting the Diabetes Scotland Volunteer Support Coordinator, I joined a weekly peer support Zoom call. The group was welcoming and provided a "lifeline" for me, helping me to understand diabetes better and accept my condition. The peer support has brought me company and laughter and I feel part of a community and less lonely." (Janice, diagnosed with T2DM nine years ago (and living with other conditions)).

In line with international evidence, there is a general shift away from a single disease approach to person-centred care in the context of multimorbidity. It is therefore important to consider this document in the broader context of polypharmacy guidance and a holistic approach to care.

It must be accepted that guidelines are written to provide general advice and therefore a person-centred approach to review will allow for the complexities of multimorbidity.

The benefits of guidance to clinicians

This guidance provides a practical toolkit and examples of high-quality approaches to prescribing in T2DM. It includes case studies (section 13), process for review (section 2) and links to additional resources to identify those requiring review of therapy (sections 12 and 14). The guidance will be incorporated into the Polypharmacy: Managing Medicines app to allow easy access for clinicians to the guidance, alongside resources and shared decision-making tools for use in daily practice.

People with diabetes report a range of experiences at diagnosis, highlighting the need for person-centred care and a holistic approach to management. The following quotes are from people with lived experience of T2DM in Diabetes: my information, my support,[11] produced by The Health and Social Care Alliance Scotland.

> "The GP was very thorough. I got much help and guidance from the Practice Nurse. I get regular checks and discussions and am invited to raise questions at any time. I use 'My Diabetes My Way' to check on results and to check progress… I feel that I am well supported – given the current pressures on the Health Service."

> "I was told, 'you have diabetes, and it is all because of what you put in your mouth'… I left his surgery in tears and was comforted by the reception staff who were very kind… This was an awful way to be told you have any illness."

The benefits to organisations / Health Boards

Included in the guide is a suite of data indicators that can help focus resources on areas that will benefit from review (see section 12 and 14). Case studies provide examples of how to implement quality improvements prescribing in diabetes, using a person-centred approach (section 13).

Previous guidance considered variation between boards with regards to prevalence, cost and improvements in HbA1c. However newer agents can affect longer term outcomes, independent of HbA1c values, and therefore comparisons using the previous parameters are inadequate to show the whole system effect.

Diabetes prescribing accounts for 11.8% of the total medicines spend in primary care in Scotland (for the year to end March 2022). Table 1 below shows the relative spend on diabetes medicines and classes. Boards should reflect on the relative split of this spend, considering therapies which have less evidence and/or effectiveness.

Additionally due to the complications of T2DM and comorbidities, prescribing costs are attributable to management of hypertension, dyslipidaemia, diabetic neuropathy and others. People with diabetes have a significant impact on hospital resources (accounting for a greater proportion of beds) with more frequent emergency admissions and longer stays.[12] Additionally individuals with T2DM, accounting for age, require twice as much support as those without T2DM.

Therefore, the reduction in whole system costs of managing secondary comorbidities and complications will outweigh any short-term increase in medicines costs.

Table 1: Relative spend on diabetes medicines and classes (financial year ending March 2022)

Medication and Devices used in Diabetes **Total Spend**	**Section**	**Section Spend**	**Class of Diabetes Medication and Devices**	**Spend**
£142,322,223	Insulins	£34,109,276	Short-acting insulins	£13,875,219
			Intermediate and long-acting insulins	£20,234,057
	Antidiabetic drugs	£70,157,783	Sulfonylureas	£1,970,483
			Metformin	£6,953,361
			DPP-4 inhibitors	£11,222,683
			Pioglitazones	£260,691
			GLP1 analogues	£21,115,564
			SGLT2 inhibitors	£28,607,278
			Other	£27,723
	Treatment of hypoglycaemia	£569,314	Glucose	£355,791
			Glucagon	£213,523
	Diagnostic and testing	£37,485,849	Blood glucose testing strips	£10,470,113
			Interstitial fluid sensors	£25,573,648
			Other	£1,442,088

Total GP Practice prescribing costs for 2022/23 were £1,179,885,584, diabetes reimbursement costs made up 12.1% of this.

2. How can we reduce harm from polypharmacy?

By ensuring the right person receives the right treatment for their condition with the appropriate clinician, harm from polypharmacy can be reduced. This is achieved through regular medication review and shared decision-making, considering all medicines prescribed, including those bought by the person and any traditional and complementary therapies.

Appropriate polypharmacy[8] is present, when:

a. all drugs are prescribed for the purpose of achieving specific therapeutic objectives that have been agreed with the individual;
b. therapeutic objectives are being achieved or there is a reasonable chance they will be achieved in the future;
c. medication therapy has been optimised to minimise the risk of adverse drug reactions (ADRs); and,
d. the individual is motivated and able to take all medicines as intended.

Inappropriate polypharmacy is present, when one or more drugs are prescribed that are not or no longer needed, either because:

a. there is no evidence-based indication, the indication has expired, or the dose is unnecessarily high;
b. one or more medicines fail to achieve the therapeutic objectives they are intended to achieve;
c. one, or the combination of several medicines drugs cause inacceptable adverse drug reactions (ADRs), or put the individual at an unacceptably high risk of such ADRs; or
d. the person is unable or not willing to take one or more medicines as intended.

Polypharmacy in diabetes

Polypharmacy is common for those living with T2DM. In addition to management of hyperglycaemia, there is often the prevalence of comorbidities including:

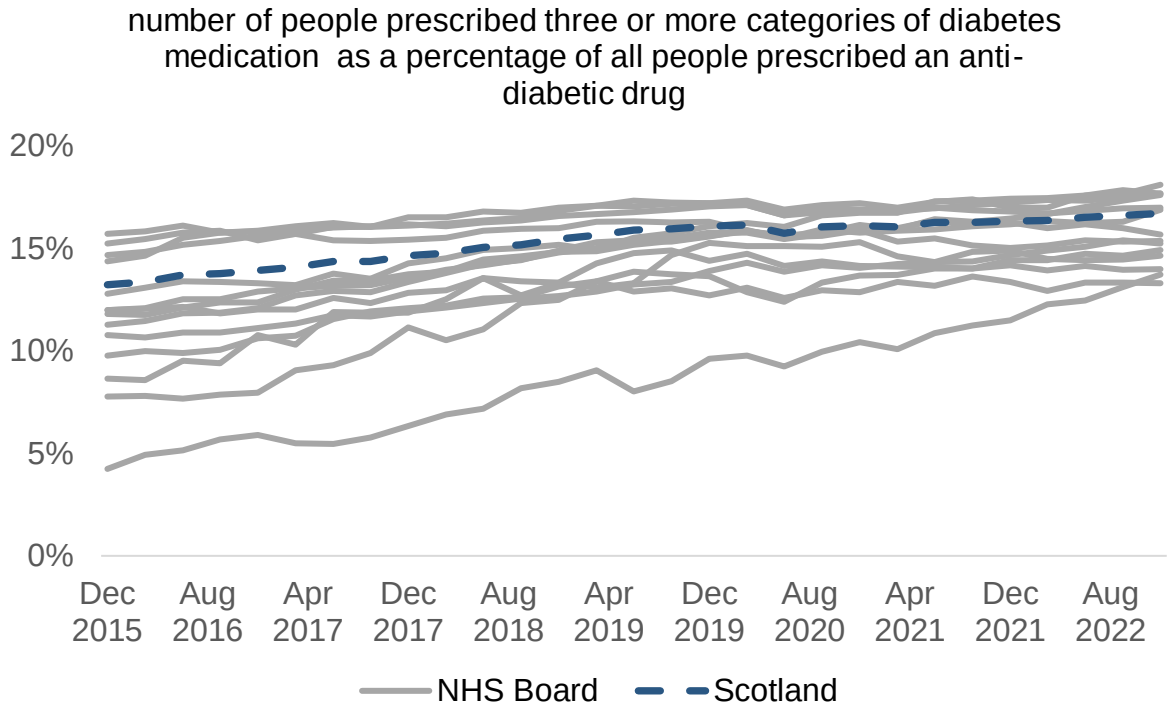
- atherosclerotic cardiovascular disease (ASCVD)
- chronic kidney disease (CKD)
- heart failure (HF)
- depression

National Therapeutic Indicator

Polypharmacy in diabetes: Number of people prescribed three or more categories of diabetes medication as a percentage of all people prescribed an anti-diabetic drug.

Chart 3 below shows the increasing trend of people being prescribed multiple medicines for diabetes. While this prescribing will very often be appropriate polypharmacy, the chart serves to demonstrate the quantity of medicines prescribed.

Chart 3: Polypharmacy in diabetes



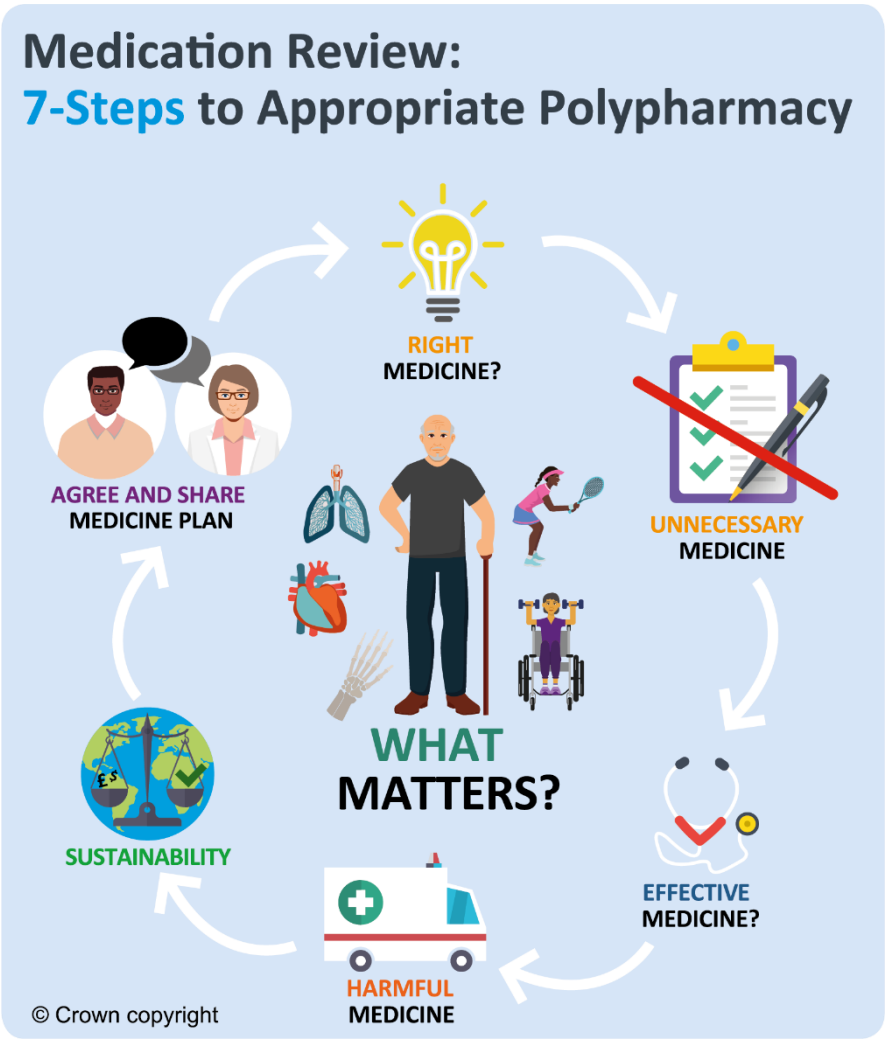
Variation between national Health Boards is reducing. Boards should consider their position in this data and the steps required to ensure that polypharmacy in diabetes is appropriate. More information and details are available in section 12 and 14, and on the Public Health Scotland website.

A polypharmacy review (following the 7-Steps approach) should ensure optimal management of T2DM and other conditions. It should include addressing aggravating lifestyle factors and consideration of the most appropriate medication at the right dose, with regular review. The following 7-Steps are intended as a guide to structure the review process.

Step 1: Aim: What matters to the patient?
Step 2: Need: Identify essential drug therapy.
Step 3: Need: Does the patient take unnecessary drug therapy?
Step 4: Effectiveness: Are therapeutic objectives being achieved?
Step 5: Safety: Is the patient at risk of ADRs or suffers actual ADRs?
Step 6: Sustainability: Is therapy cost-effective and environmentally sustainable?
Step 7: Person-centred: Is the person willing and able to take therapy as intended?

The 7-Steps to appropriate polypharmacy demonstrate that the review process is not in fact a linear single event, but cyclical, requiring regular repeat and review (see Figure 2 below). The circle is centred on what matters to the individual, ensuring they are provided with the right information, tools and resources to make informed decisions about their medicines and treatment options. It should be used at both initiation and review of medicines.

Figure 2: The 7-Steps medication review cycle



See Table 2 below for an overview of key considerations at each step for an individual with T2DM.

Table 2: 7-Steps medication review process

Steps	Process	Person specific issues to address
1. **Aims** What matters to the individual about their condition(s)?	**Review diagnoses and consider:** • therapeutic objectives of drug therapy • management of existing health problems • prevention of future health issues, including lifestyle advice	• to prevent long-term diabetes complications • is there co-existing cardiovascular or renal disease? • maintain good mental health
2. **Need** Identify essential drug therapy	**Identify essential drugs (not to be stopped without specialist advice*)** • drugs that have essential replacement functions Drugs to prevent rapid symptomatic decline * with advice from healthcare professional with specialist interest	• insulin • sulfonylurea for immediate management of hyperosmolar symptoms
3. Does the individual take unnecessary drug therapy?	**Identify and review the continued need for drugs** • what is medication for? • with temporary indications • with higher than usual maintenance doses • with limited benefit/evidence for use • with limited benefit in the person under review (see Drug efficacy & applicability (NNT) table)	• SU for immediate reduction of symptomatic hyperglycaemia • SU for long term use; pioglitazone and gliptins less effective than other sub-classes • co-prescribing of DPP-4i and GLP-1RA not appropriate, stop DPP-4i.

4. **Effectiveness** Are therapeutic objectives being achieved?	**Identify the need for adding/intensifying drug therapy to achieve therapeutic objectives** • to achieve symptom control • to achieve biochemical/clinical targets • to prevent disease progression/exacerbation • is there a more appropriate medication to achieve goals?	• consider target dependent on other factors, e.g., frailty? • SGLT-2i and GLP-1RA have positive ASCVD and CKD outcome data • if co-existing ASCVD or CKD, SGLT-2i or GLP-1RA may be more appropriate than gliptin or pioglitazone.
5. **Safety** Does the individual have or is at risk of ADR/ Side effects? Does the person know what to do if they're ill?	**Identify individual safety risks by checking for** • appropriate individual targets • drug-disease interactions • drug-drug interactions (see ADR table) • monitoring mechanisms for high-risk drugs • risk of accidental overdosing **Identify adverse drug effects by checking for** • specific symptoms/laboratory markers • cumulative adverse drug effects (see ADR table) • drugs used to treat side effects caused by other drugs **Medication Sick Day guidance**	• if frail, is HbA1c less than 48mmol/mol. Reduce therapy • check renal function and dose adjust where necessary, e.g., metformin reduce dose if eGFR <45ml/min and stop if eGFR <30ml/min • women of child-bearing age – metformin and insulin are suitable in pregnancy but others are not. Individuals should be made aware of this. • temporarily stop SGLT-2i, metformin and SU during dehydration illness
6. **Sustainability** Is drug therapy cost-effective and environmentally sustainable?	**Identify unnecessarily costly drug therapy by** • considering more cost-effective alternatives, safety, convenience - **Consider the environmental impact of** • inhaler use • single use plastics • medicines waste • water pollution	• metformin modified release less cost effective than standard release, but appropriate if previous gastrointestinal intolerance. • if insulin therapy required, are reusable pens and cartridges suitable, rather than disposable pens?

7. **Person-centredness** Is the person willing and able to take drug therapy as intended?	**Does the person understand the outcomes of the review?** • Consider teach-back **Ensure drug therapy changes are tailored to individual's preferences. Consider** • is the medication in a form they can take? • is the dosing schedule convenient? • what assistance is needed? • are they able to take medicines as intended? **Agree and communicate plan** • discuss and agree with the individual/carer/welfare proxy therapeutic objectives and treatment priorities • include lifestyle and holistic management goals • inform relevant health and social care providers of changes in treatments across the transitions of care
Key concepts in this case • … • ...	

See case studies for examples of applying the 7-Steps medication review process.

Environmental impact of polypharmacy and healthcare

The healthcare industry is increasingly asked to account for the negative environmental impact generated through providing medical care.

In Scotland, every ten days a 10-tonne truck of medicines waste (from community and hospital pharmacies) is transported for incineration. There are associated costs for incineration; travel costs and the environment impact (see Figure 3 below) and in addition, direct costs of unused medication.

There are many factors which contribute to medicines waste and a Department of Health and Social Care report in September 2021[13] showed that overprescribing is commonplace. Evidence is limited, but the review estimates that it is possible that at

least 10% of the total number of prescription items in primary care need not have been issued.

This guidance supports reducing inappropriate prescribing through review of medication for those with long term health conditions. This includes promoting person-centred decision-making; providing guidance and support for clinicians and suggesting alternatives to medicines, where appropriate, such as physical, social activities and lifestyle change.

Figure 3: Annual cost of managing medicines waste in Scotland

The Royal Pharmaceutical Society policy, '[Pharmacy's role in climate action and sustainable healthcare]',[14] identifies medicines as contributing 25% of carbon emissions in the NHS.

This can be reduced by:

- improving prescribing and medicines use
- tackling medicines waste
- preventing ill health
- improving infrastructure and ways of working

With regular medication reviews to address inappropriate polypharmacy in T2DM (and other comorbidities), the environmental impact can be reduced. Small changes can have an impact, such as considering the use of re-useable insulin pens and cartridges rather than pre-filled pens, which can have a lower CO2 footprint as well

as reducing plastic waste. The RCGP[15] has identified that prescribing accounts for over 60% of general practice's carbon footprint.

The Sustainable Markets Initiative (SMI) established in 2020 identify seven levers to reduce carbon emissions in care pathways. Those that relate to diabetes include.[16]

1. Preventing disease onset – dietary and lifestyle management to prevent and manage T2DM
2. Diagnosing early – to treat earlier and prevent long-term complications
3. Optimising disease management – utilising newer therapies has positive long-term outcomes and reduces incidence of ASCVD, CKD and HF – see example below
4. Improving the efficiency of interventions – as above
5. Delivering care remotely or closer to home when appropriate – digital innovations
6. Using lower-emission treatments – re-usable insulin pens

It is estimated that an individual with T2DM and late-stage CKD, requiring dialysis several times per week, will have associated carbon emissions 70 times of someone managed with insulin, and 200 times those managed with oral hypoglycaemic therapies.

Of 100 individuals with pre-diabetes, 15% will develop cardiovascular or renal disease, accounting for 50% of the carbon emissions of this group.

Therefore prevention of and effective management of T2DM will have a positive environmental impact alongside potential reduction in healthcare utilisation.

Pharmaceuticals in wastewater

The Royal Pharmaceutical Society's Sustainability Policies also point to the occurrence of pharmaceuticals in the environment. Every oral dose of a medicine taken is either excreted unchanged or converted to a metabolite with 30-100% entering our wastewater system which cannot currently remove all traces. The occurrence of pharmaceuticals in the environment is of global concern, and there is already evidence that they can affect aquatic wildlife, increase microbial resistance and enter the human food chain.

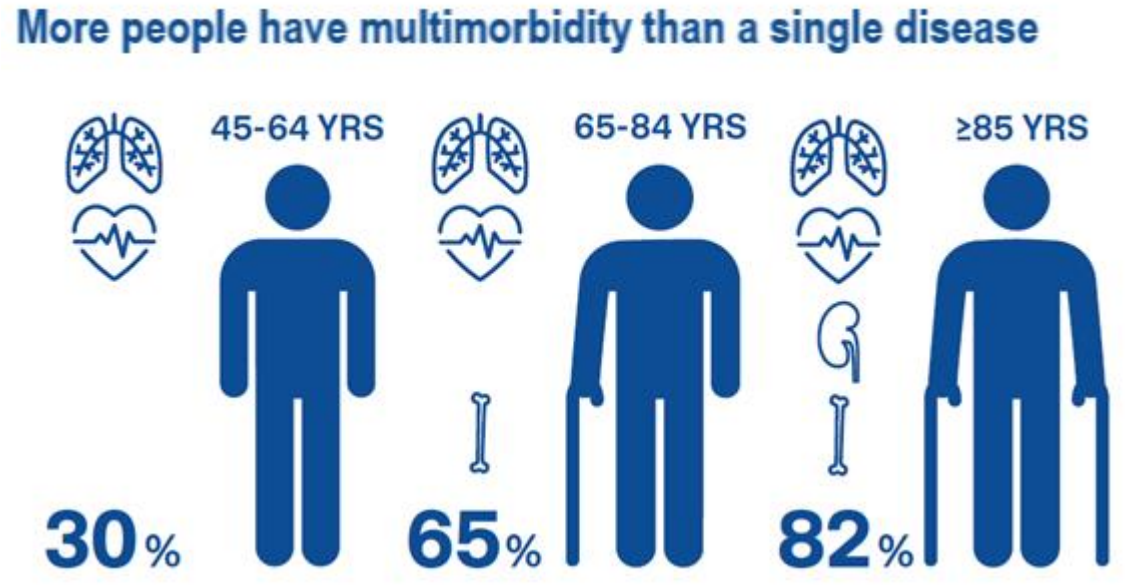
Evidence has already identified metformin and sitagliptin in waterways across the world, and further studies are needed identify the wider environmental impact of other anti-diabetic medication. These two examples highlight the importance of preventing diabetes and that all prescribing and review of medication should consider environmental impact and sustainability.[17,18,19,20]

3. What to consider when individualising a care plan using a person-centred approach

Multimorbidity (with polypharmacy)

Multimorbidity is defined by the World Health Organization as the co-occurrence of two or more chronic medical conditions in one person.[21] Multimorbidity increases markedly with age. In a Scottish study, multimorbidity was prevalent in 81.5% of individuals aged 85 years and over, with a mean number of 3.62 morbidities[22] (see Figure 4).

Figure 4: Multimorbidity in Scotland (courtesy of SIMPATHY)



The most prevalent chronic conditions in primary care were hypertension (33.5%), hyperlipidemia (33.0%), and depression (18.7%).[23] The presence of multiple long-term conditions results in a combined negative effect on physical and mental health, and can affect a person's quality of life, limiting daily activities and reducing mobility.[24]

The over 60-year-old population uses nearly three times more medicines as the general population, with adherence to long-term medication ranging between 25-70%.[25]

The major predictors of risk of experiencing medication-related harm[26] are age, number of long-term conditions and number of medications taken. People with multiple long-term conditions utilise primary care services twice as much, and are three times as likely to be hospitalised, than those without multiple long-term conditions.[8,26] This carries with it a large economic burden[27] for health care services.

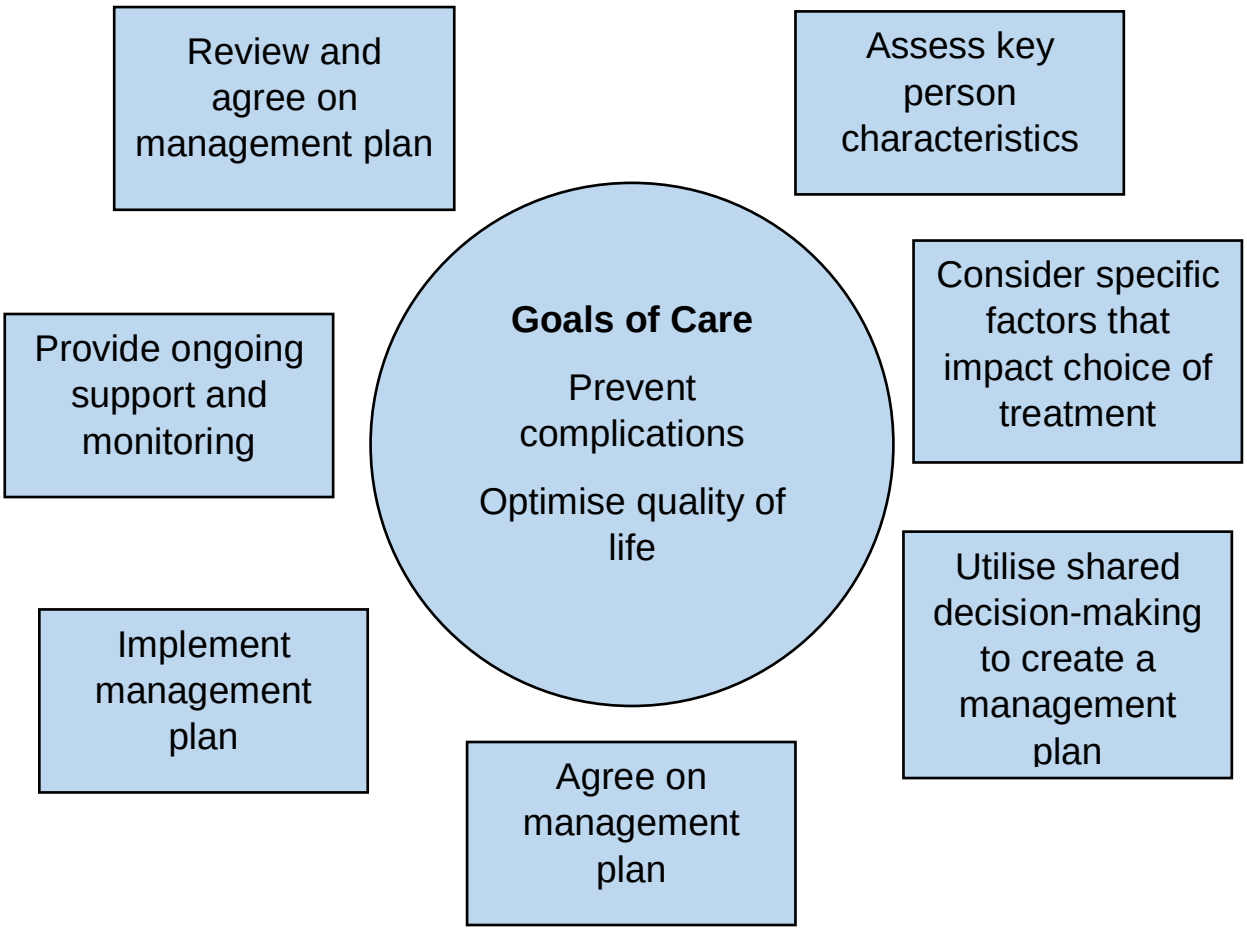
Care should be person-centred and coordinated to ensure the greatest possible individual outcomes. This is most achievable when there is integrated care approach that places the individual at the centre. Scottish Government has various work streams driving the improvement in person-centred care at national, board and patient level including Person-centred Care,[28] Polypharmacy Guidance[8] and Realistic Medicine.[9]

Person-centred care

The person should be at the centre of every consultation, to ensure a holistic approach to care. There are several models of care which can be adopted, e.g. House of Care.[29]

The decision cycle for person-centred glycaemic management in T2DM[3] summarised below in Figure 5. This based on a full version produced by the American Diabetes Association and European Association for the Study of Diabetes.

Figure 5: Decision cycle for management of T2DM



Each section should be viewed with the person at the centre of decision-making. Focusing on the whole person alongside their medication during the review will ensure the person remains central in the decision-making process and is not a passive recipient of care. This in turn encourages self-care and an understanding of how their condition/s impacts on their life.

This multifaceted approach is in line with Scottish Government's Realistic Medicine Approach to care. The medication algorithm allows individualised choice and firmly focuses on the evidence from long-term outcome trials and the benefits seen with newer agents (section 6), asking clinicians to decide at an early stage whether a person will gain from these benefits independent of HbA1c. The person-centred 7-Steps medication review process can be used at initiation and review of medication to support shared decision-making throughout the process.

Benefits of improved glycaemic control

Hyperglycaemia is central to development and progression of microvascular and macrovascular disease.

The epidemiological analysis of the UK Prospective Diabetes Study (UKPDS)[30] demonstrated a strong relationship between diabetes complications including mortality and blood glucose levels (see Table 3).

Table 3: HbA1c reduction by 11mmol/mol (1%)

End point	Percentage reduction
Microvascular complications	37%
Any endpoint or death related to diabetes	21%
Diabetes-related mortality	21%
Myocardial infarction	14%

Factors which may lead to loss of adequate glycaemic control

When creating and reviewing individual care plans, the following factors should be considered that may lead to loss of adequate glycaemic control:

- lifestyle and diet
- raised BMI
- medication non-adherence
- depression
- musculoskeletal injury or worsening arthritis
- competing illnesses perceived as more important by the individual
- social stress/anxiety at home or at work
- substance misuse
- infections

- use of medications (such as corticosteroids, certain depression medications [paroxetine], mood stabilisers, or atypical antipsychotics) that elevate weight or glucose
- other endocrinopathies such as Cushing's disease

Individualisation of glycaemic control

Good glycaemic control is valuable in promoting fewer complications in patients with T2DM, but good individualised glycaemic control is a based on an appreciation of the below factors:

- life expectancy
- disease duration
- important comorbidities, including frailty
- established vascular complications
- patient preference
- resources and support system

Figure 6: Individualisation of treatment aims

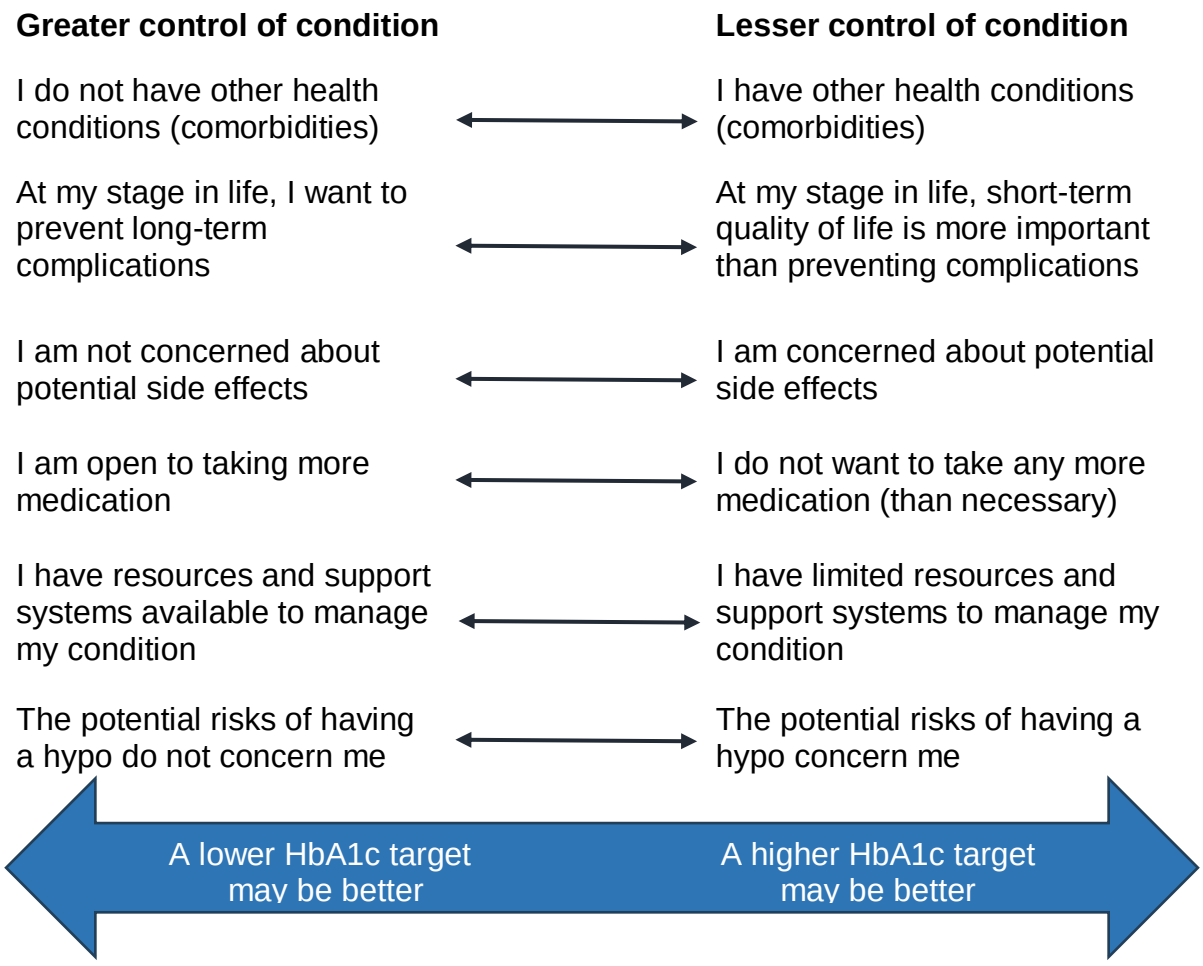


Figure 6 (based on ADA[31] and NICE,[2] and supported by SIGN 154[1]) shows characteristics and considerations that individuals and clinicians can consider together to assess "what matters to me" (step 1 of the 7-Steps medicine review process) when determining individual glycaemic control.

People with T2DM should consider their options for controlling their blood glucose in order to reduce the long-term risks of diabetes.

Table 4 illustrates an alternative individualised approach to diabetes care should be adopted that is tailored to the needs and circumstances of people with T2DM, accounting for personal preferences.

Table 4: ABCD approach to diabetes care

A	Age	Less stringent HbA1c targets with increasing frailty.
B	Body weight	Be aware of which drugs affect body weight. • weight neutral – metformin and DPP-4i (gliptins) • weight gain – insulins, pioglitazone, sulfonylureas • weight loss – SGLT-2i* and GLP-1RA.
C	Complications	Co-incident complications will impact drug selection e.g., patient with eGFR< 30ml/min/1.73m^2 should avoid metformin.
D	Duration	• The shorter the disease duration, the greater the cardiovascular protection offered by strict glycaemic control. • Once disease duration is 10-12 years, the beneficial effects of strict glycaemic control may be lost or reversed.

Reassess the individual's needs and circumstances at each review and consider discontinuing any medicines that are not effective in line with polypharmacy guidance.

4. Lifestyle interventions and when remission is a realistic aim for someone with type 2 diabetes mellitus (T2DM)

Lifestyle intervention

Lifestyle management is a fundamental aspect of diabetes care and includes:

- diabetes self-management education and support
- weight management intervention and support
- nutritional advice
- promoting physical activity
- smoking cessation counselling
- psychosocial care

Weight loss can delay the onset of T2DM[32] and can lead to remission.[33]

Clinicians should help individuals understand the impact excess body weight has on T2DM and medications prescribed. They should discuss prioritising diet and lifestyle interventions at diagnosis and each subsequent review. Individuals may require referral to structured education programmes, diet and lifestyle support and weight management services.

People whose diagnosis is doubtful, or individuals presenting with significant weight loss/osmotic symptoms, should be discussed with the local acute diabetes specialist team.

Achieving remission of T2DM

The criteria for remission of T2DM was agreed in 2021[34] by an international group of diabetes experts to standardise and simplify the criteria across the UK, Europe and the USA.

A person with T2DM is in remission if:

- they have had an HbA1c level below 48mmol/mol (6.5%) for a least three months; **and**
- they have not taken any medications to manage their blood glucose levels during this time.

Why is it important to offer and support remission?

Supporting remission achievement is important to:

- improve a person's health and wellbeing
- motivate the individual to continue to strive for freedom from diabetes and remain in remission
- reduce the burden of T2DM on their lives from:
    - medications, NHS appointments
    - complications of diabetes
    - cost of holiday and life insurance
- reduce prescribing and risk of long-term complications, reducing the disease and medication benefit for both the individual and wider NHS
- improved environmental sustainability - reduced medicines usage (with their associated production and supply) reduces the carbon footprint from medicines use.

Early data from the NHS England remission programme shows participants on average lose 7.2kg (over one stone) after one month, and 13.4kg (over two stone) after three months. New data also shows that people on the remission programme, who are eating and drinking the low-calorie alternatives, not only lose weight but maintain the weight loss. This is a significant step forward and comes after trials showed that around half of people who had similar weight loss were able to achieve remission of their T2DM after one year.[35]

What is a remission intervention?

It is a two-year intensive weight-loss programme delivered by specialist dietitians – with psychology support for those who need it. The intervention involves three key stages outlined in Table 5.

Table 5: 2-year weight loss programme		
Stage 1	Stage 2	Stage 3
12 weeks: Total diet replacement	12 weeks: Food reintroduction	18 months: Weight-loss maintenance
• Low energy diet of shakes and soups • Goal setting and obstacle management • Support to deal with social situations • Fortnightly appointments with a dietitian	• Gradual reduction of shakes and soups as meals are reintroduced • Ongoing support to achieve weight goals • Meal and exercise planning • Fortnightly appointments with a dietitian	• Future weight management planning • Ongoing support to achieve weight goals • Strategies to form positive habits and maintain lifestyle changes for the future • Monthly appointments with a dietitian

This evidence based dietetic remission intervention is available across all Scottish health boards.

See case study 1.

Who can be offered remission?

Patients who have been diagnosed with T2DM in the past six years and meet all of the following criteria should be offered the remission intervention:

- 18-65 years old
- Body mass index BMI
  - 25 or above (ethnic minorities)
  - 27 or above (White Caucasian)
- Currently not prescribed insulin
- Recent HbA1c (within the last 12 months) were:
  - above 48mmol/mol if not taking any diabetes medication; or
  - above 43mmol/mol if taking diabetes medication

How to access the remission programme?

Contact the local Nutrition and Dietetic Department for information on how to refer into remission programmes.

What monitoring is required for remission?

Dietitians leading the intervention will advise on specific monitoring to meet individual's needs. The following are routinely measured:

- HbA1c
- blood pressure
- body weight/weight loss

Note:
Some GLP-1RA are licensed for weight management. These preparations have Scottish Medicines Consortium (SMC) restrictions regarding treatment threshold (BMI and HbA1c levels, accounting for ethnicity), and are currently used in combination with structured weight management programmes. Whilst weight management is integral to the prevention and management of T2DM, recommendations for these agents in individuals without a diagnosis of T2DM are beyond the scope of this guidance.

List 1 Lifestyle support resources

- My Diabetes My Way is an interactive website to help support those with diabetes and their friends and families. This e-learning course aims to give you the information you need about what type 2 diabetes is, what it might mean for your health and what you can do to manage it. The topic list (to the right) will give you an idea of all the information covered in this course.

- NHS Inform provides health information that anyone living in or visiting Scotland can trust. NHS contains detailed information on diabetes.

- The Association of UK Dietitians has produced a Type 2 Diabetes food fact sheet.

- Diabetes UK provides a range of information on its website. Some of this information is available in different languages, large print, Braille, British Sign Language, easy read and audio.

- Diabetes UK has produced a guide on improving care for people with diabetes and a learning difficulty.

- Diabetes UK has produced an easy read guide on what to do when you have type 2 diabetes.

5. Is Metformin always the first line prescribed therapy?

Metformin as a first line oral treatment option[1]

Metformin is the first line option unless there are contra-indications (see BNF).
The aim of treatment is to reduce HbA1c to an agreed target level in order to reduce long term complications from T2DM (refer to Table 3 for benefits of long-term HbA1c reduction).

Benefits:

- Metformin is effective, safe, inexpensive and may reduce risk of cardiovascular events and death.[36]
- Compared with sulfonylureas, metformin as first-line therapy has beneficial effects on HbA1C, weight and cardiovascular mortality and has reduced risk of hypoglycaemia.[37]

Many of the recent cardiovascular outcome trials compared new therapies added to metformin and not as first line options.

Side effects include:

- Gastrointestinal symptoms such as diarrhoea. This can be minimised by gradual increase of the dose when titrating to the dose required. A trial of metformin modified-release preparations could be considered according to local formulary guidance.
- Association with vitamin B_{12} deficiency. This suggests that periodic testing of vitamin B_{12} levels should be considered in metformin-treated patients, especially in those with anaemia or peripheral neuropathy.[38]

Prescribing notes:

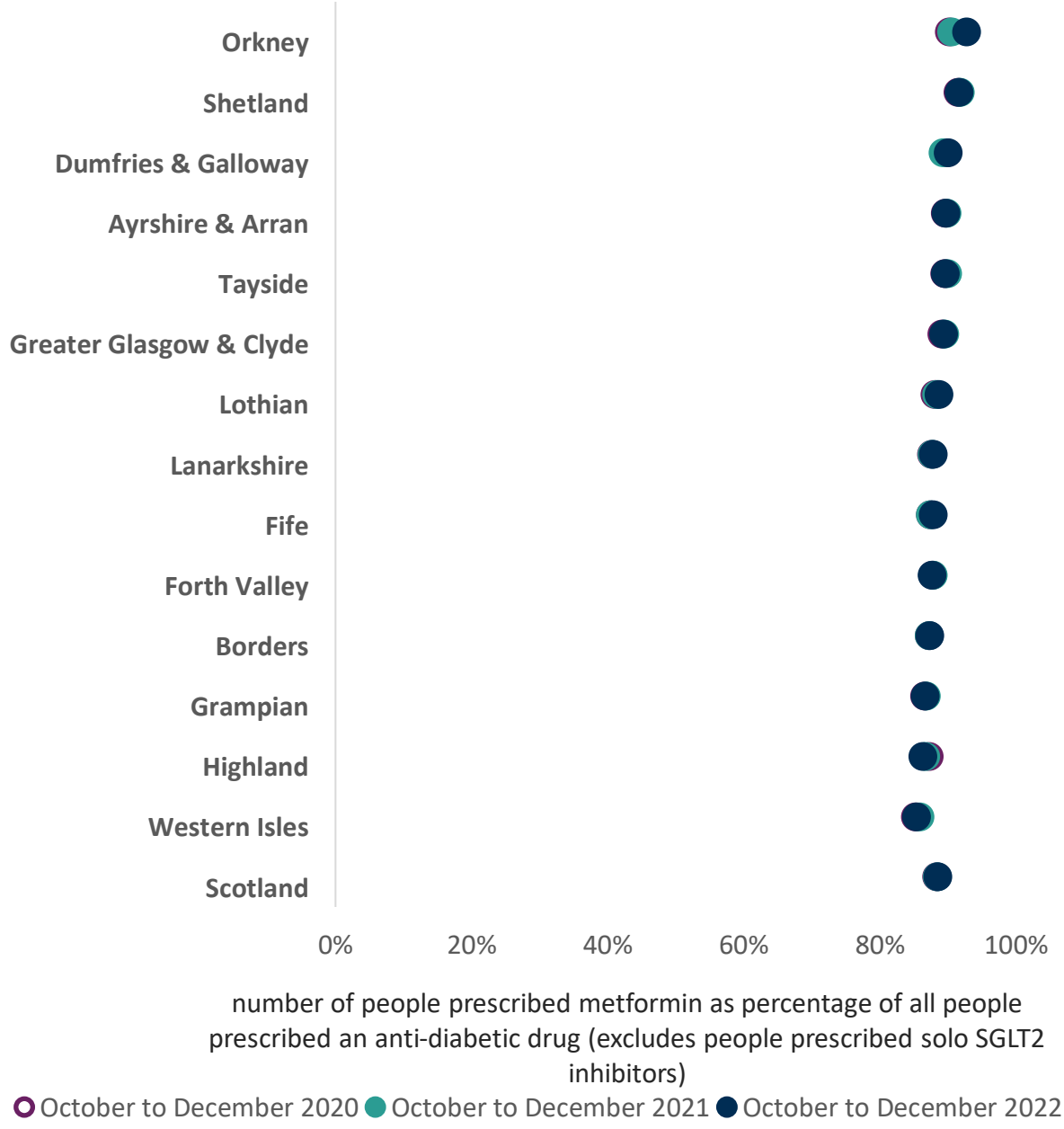
- Metformin may be safely used in people with estimated glomerular filtration rate (eGFR) greater than 30 ml/min/1.73m^2 (dose adjustments required if eGFR less than 45ml/min).
    - Note that the BNF recommends exceptions to the use of eGFR include toxic drugs, in elderly patients and in patients at extremes of muscle mass, where calculation of creatinine clearance (CrCl) is recommended.[39]
- Individuals should be advised to withhold metformin in cases of nausea, vomiting or dehydration (using Medication Sick Day guidance).
- If metformin has been withheld due to acute kidney injury/ inter-current illness, it can safely be restarted if the renal impairment has resolved.

National Therapeutic Indicator

Metformin: number of people prescribed metformin as a percentage of all people prescribed an anti-diabetic medication.

This indicator (see Chart 4) should have a high percentage, as there are limited contra-indications for its use, and clinicians, GP clusters and boards should consider how their levels can be increased to ensure individuals are receiving evidence-based therapies.

Chart 4: Percentage of people prescribed metformin (as a percentage of all people prescribed an anti-diabetic medication)



When metformin is contra-indicated or not tolerated, the following factors should be considered, similar to those for second choices (see section 6 for more information). When assessing an individual, it is good practice to establish whether the individual:

- has any existing atherosclerotic cardiovascular disease (ASCVD)
- has a very high risk of developing ASCVD (left ventricular hypertrophy (LVH) or aged >55 years and has carotid, coronary or peripheral artery stenosis >50%)
- has symptomatic heart failure
- needs to avoid or minimise the risk of hypoglycaemia (e.g. occupation, driving)
- needs to minimise weight gain

If HbA1c remains above the agreed treatment target for the individual, the following should be considered:

- optimising the dose of the current medication
- adding a drug of a different class
- stopping drugs that were ineffective and did not lead to a measurable improvement in HbA1c; and
- considering drug-specific and individual factors when selecting which anti-hyperglycaemic treatments to use
- reviewing and adjusting every three to six months in discussion with the person living with T2DM

See Table 6 for a summary of the benefits and cautions for anti-diabetic therapies, based on ADA[40] and ABCD.[41]

Prescribers should familiarise themselves with the prescribing indications and contra-indications of individual agents, as these may vary within drug classes as well as interactions listed in the BNF and/or the Electronic Medicines Compendium, before initiating therapies in line with local formularies.

Table 6: Summary of medication characteristics for the treatment of T2DM

Based on ADA[40], ABCD[41]

Drug/ therapeutic class	Efficacy	Risk of hypo-glycaemia	Weight Change	CV Effects		Renal Effects	
				ASCVD	HF	Progression of DKD	Dosing/Use in CKD
Metformin	High (11 mmol/ mol)	No	Neutral/ modest loss	Potential benefit	Neutral	Neutral	Reduce/ stop
SGLT-2i	High (9-11 mmol/ mol)	No	Loss	Benefit	Benefit	Benefit	Adjust dose. Less glucose-lowering efficacy if eGFR <45 ml/min/1.73 m^2
GLP-1RA	High (9-11 mmol/ mol)	No	Loss	Benefit/ neutral	Neutral	Benefit	Adjust dose for some
DPP-4i/ Gliptins	Moderate (6-9 mmol/ mol)	No	Neutral	Neutral	Neutral Caution^	Neutral	Adjust dose for some
Pioglitazone	High (11 mmol/ mol)	No	Gain	Potential benefit	Increased risk	Neutral	No adjustment
Sulfonyl-ureas	High (11 mmol/ mol)	Yes	Gain	Neutral	Neutral	Neutral	Adjust dose for some

^ see individual SPC for variation within class

	Additional information	Use in frailty
Metformin	• GI side effects common • Risk of vitamin B12 deficiency • Medication sick day guidance	Use with caution if previous episode of acute kidney injury
SGLT-2i	• be aware of risk of DKA/eDKA - stop prior to surgery, risk with low carbohydrate diet • increased risk for volume depletion, hypotension • increased frequency of genitourinary infections (very rarely Fournier's gangrene). • Medication sick day guidance	Increased risk for volume depletion

GLP-1RA	• GI side effects common • Injection site reactions • Pancreatitis reported– discontinue if suspected	Once weekly injectable formulations available
DPP-4i/ Gliptins	• Pancreatitis reported – discontinue if suspected. • Do not prescribe with GLP-1RA.	Caution in congestive heart failure NYHA class III and IV
Pioglitazone	• Risk of fluid retention and congestive heart failure • Risk of bone fractures and bladder cancer	
Sulfonylureas	• Medication sick day guidance	Avoid if inconsistent eating patterns

6. Why is it important to consider ASCVD, CKD and HF risk?

Comorbidities must be considered, especially atherosclerotic cardiovascular disease (ASCVD), heart failure (HF) and chronic kidney disease (CKD) which can increase mortality. Newer therapies have positive outcomes for people with diabetes and these comorbidities, thus reducing the long-term complications and associated personal and financial costs.

With the increasing evidence of positive long-term outcomes independent of glycaemic control from the newer agents, the expert working group considered the place of sodium-glucose co-transporter-2 inhibitor (SGLT-2i*) and glucagon-like peptide 1 receptor agonist (GLP-1RA) in therapy, recommending their use in NHS Scotland, considering:

- increasing evidence of positive long-term outcomes independent of glycaemic control
- incorporation of SGLT-2i and GLP-1RA into guidelines from the American Diabetes Association (ADA), the European Association for the Study of Diabetes (EASD)[3] and more recently NICE 28[2]
- duration of time since publication of SIGN 154,[1] and
- prescribing in frailty (section 9)
- licensed indication

People with T2DM with high risk of, or established atherosclerotic cardiovascular disease (ASCVD) and heart failure

Established atherosclerotic cardiovascular disease (ASCVD), heart failure (HF) or chronic kidney disease (CKD) are important indications for use of the newer therapies of SGLT-2i and GLP-1RA. There is good evidence from large randomised clinical trials that people with a history of ASCVD, CKD and/or HF benefit from glucose-lowering treatment with SGLT-2i* and GLP-1RA.[42,3] A recent population-wide study showed that more than 70% of people with T2DM in Scotland currently on non-pharmacological/ lifestyle management, or metformin monotherapy, have ASCVD, CKD or HF[43] (see NTIs section 14). Trial evidence is readily available online and more continues to emerge.

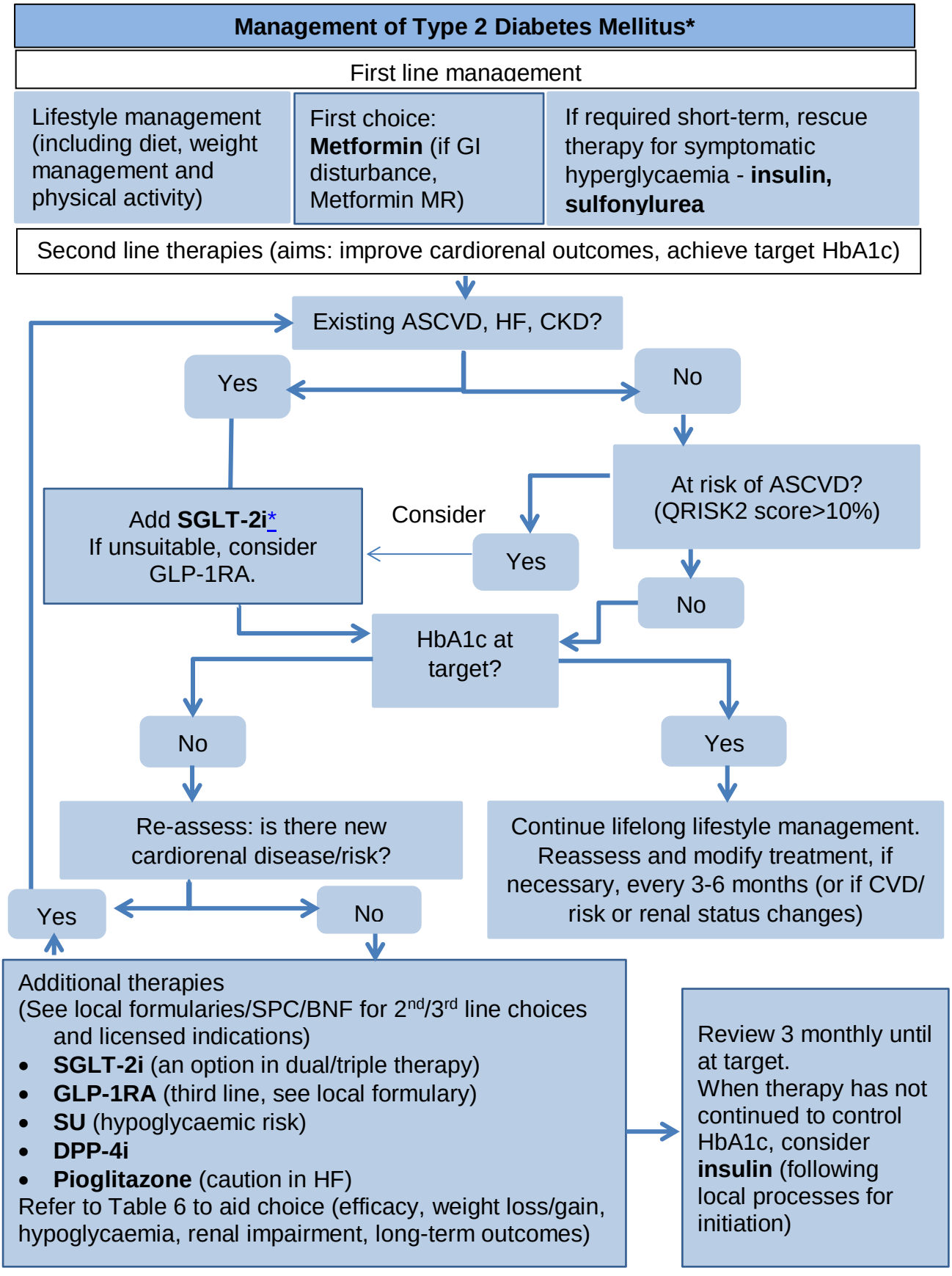
See Figure 7 – Summary algorithm of prescribing choices in T2DM, based on ADA and EASD[3], and NICE[2] recommendations.

Cardiovascular disease and risk factors

Cardiovascular disease risk is an important factor to consider for those with T2DM. Treatment selection for hyperglycaemia should consider whether a person has:

- established ASCVD (ischaemic heart disease, stroke); or
- cardiovascular risk factors of:
    - QRISK2 more than 10% in adults aged 40 and over (or other validated tool); or
    - a clinically assessed elevated lifetime risk of cardiovascular disease (defined as the presence of one or more of the below cardiovascular risk factors in someone under 40).
        - hypertension;
        - dyslipidaemia;
        - smoking;
        - obesity; or
        - family history (in a first-degree relative) of premature cardiovascular disease.[44]

Figure 7: Management of Type 2 Diabetes Mellitus



Definitions: ASCVD: MI, stroke, any revascularisation procedure, CVD (including transient ischaemic attack, unstable angina, coronary artery disease, amputation) HF: chronic heart failure (excluding acute) CKD: <60ml/min with ACR >30mg/mmol *Based on NICE NG28, ADA/EASD and SIGN	Abbreviations: SGLT-2i: sodium-glucose co-transporter-2 inhibitor GLP-1RA: glucagon-like peptide 1 receptor agonist DPP-4i: dipeptidyl peptidase-4 inhibitor SU: sulfonylurea	Increased risk of eDKA with SGLT-2i See MHRA Drug Safety Update April 2016 [47], March 2020 [48] See section 6 *

Any modifiable risk factors for ASCVD (hypertension, hyperlipidaemia, smoking, obesity) should be addressed. For useful links to lifestyle information see List 1.

Prescribing choices

1. Metformin remains first line.
2. SGLT-2i should be prescribed for individuals with established ASCVD,[43] heart failure or chronic kidney disease. Individuals at high risk who have not yet developed these complications may also benefit.
3. A shared decision-making approach is recommended, considering:
    - beneficial effects e.g. weight loss, extent of glucose-lowering efficacy
    - adverse effects e.g. in relation to the degree of hyperglycaemia, or the risk of hypoglycaemia; DKA
    - preferences e.g. route of administration, oral verses injectable, frequency of administration, daily or weekly

SGLT-2i contra-indications/cautions:

- people 75 years and older are at increased risk of volume depletion
- not recommended for initiation when eGFR is <15 ml/min/1.73m^2
- have less glucose-lowering efficacy with eGFR <45 ml/min/1.73m^2
- should be avoided in those with:
    - factors predisposing to DKA/eDKA
        - pancreatic insufficiency
        - drug or alcohol misuse disorder
        - a low/ultra-low carbohydrate or keto diet
        - excessive alcohol consumption
    - frequent bacterial urinary tract infections or genitourinary yeast infections
    - low bone density or high risk for falls/fractures
    - current foot ulceration.

Increased incidence of euglycaemic diabetic ketoacidosis

With increasing use of SGLT-2i, there has been an increased incidence of eDKA in addition to DKA. Therefore the MHRA[45] has issued the following advice:

- use SGLT-2i with caution in those with risk factors for DKA, (including a low beta cell reserve, conditions leading to restricted food intake or severe dehydration, sudden reduction in insulin, increased insulin requirements due to acute illness, surgery or alcohol misuse), and discuss these risk factors with individuals
- test for raised ketones in individuals with signs and symptoms of DKA, even if glucose levels are near-normal
- discontinue treatment if DKA is suspected or diagnosed
- do not restart treatment with any SGLT-2i in those who experienced DKA during use, unless another cause for DKA was identified and resolved
- during and after surgery or during acute serious illness:
  - interrupt sodium-glucose co-transporter 2 (SGLT2) inhibitor treatment in patients who are hospitalised for major surgical procedures or acute serious medical illnesses
  - monitor ketones during this period – measurement of blood ketone levels is preferred to urine
  - restart treatment with the SGLT2 inhibitor once ketone values are normal and the patient's condition has stabilised.

Furthermore emerging advice[46,47] regarding the period of treatment interruption is:

- For three days prior to planned surgery (four days if prescribed ertugliflozin), (or immediately if unplanned surgery) and for a further three days after surgery
- During acute illness, e.g. diarrhoea, vomiting (see sick day guidance)

Individuals considering an SGLT-2i should be advised about the risks of eDKA associated with a low/ultra-low carbohydrate or keto diet.

See Case Study 3.

Due to the different licences for SGLT-2i* (and GLP-1RA), prescribers should familiarise themselves with the indications and contra-indications as well as interactions listed in the BNF and/or the Electronic Medicines Compendium before initiating therapies. Where there is no difference between drugs within a class, the most cost-effective drug should be chosen, and NHS boards should consider their formulary choices.

The recent NICE[2] guideline 'Type 2 Diabetes in adults: management' supports the introduction of SGLT-2i* as first-line therapy with metformin, if the individual has chronic heart failure or established atherosclerotic cardiovascular disease. These drugs should be started sequentially, with metformin first, then once tolerability is established, the SGLT-2i* can be started.

Cardiovascular disease and risk should be reviewed regularly and may require a change/addition to therapy. See Figure 7.

People with T2DM and chronic kidney disease (CKD)

T2DM is a risk factor for developing CKD and therefore monitoring for CKD should be part of the annual review. Frequency of monitoring is dependent on the classification and stage of CKD.

Classification of CKD[48] is based on a combination of glomerular filtration rate (GFR) and albumin to creatinine ratio (ACR). The risk of adverse outcomes increases as CKD category decreases (GFR) or as ACR increases. This happens independently but with greater risk if both are present (see Table 7).

Table 7: Risk of adverse outcomes with reducing GFR and increasing ACR

GFR	**ACR category A1**: less than 3 mg/mmol	**ACR category A2:** 3 - 30 mg/mmol	**ACR category A3**: over 30 mg/mmol
G1: normal and high ≥90 ml/min/1.73m^2	Low risk	Moderate risk	High risk
G2: mild 60 - 89 ml/min/1.73m^2	Low risk	Moderate risk	High risk
G3a: mild to moderate 45 - 59 ml/min/1.73m^2	Moderate risk	High risk	Very high risk
G3b: moderate to severe 30 - 44 ml/ min/1.73m^2	High risk	Very high risk	Very high risk
G4: severe 15 - 29 ml/min/1.73m^2	Very high risk	Very high risk	Very high risk
G5: kidney failure <15 ml/min/1.73m^2	Very high risk	Very high risk	Very high risk

Key: Low risk | Moderate risk | High risk | Very high risk

Prescribing choices

Table 8 outlines prescribing choices for people with CKD.

Table 8: Treatment choices in CKD

Treatment options	**ACR category A1**: normal to mildly increased (less than 3 mg/mmol)	**ACR category A2:** moderately increased (3 to 30 mg/mmol)	**ACR category A3**: severely increased (over 30 mg/mmol)
ACEI/ARB to highest tolerated dose	No	Yes	Yes
SGLT-2i (dependent on licence) in addition to ACEi/ARB	No	Consider	Offer

Offer an ARB or an ACE inhibitor if ACR is 3mg/mmol or more (titrated to the highest licensed dose that the individual can tolerate). This is a lower ACR threshold than for those without diabetes.

If the ACR is between 3-30mg/mmol, consider offering an SGLT-2i* (dependent on licence) in addition to the highest tolerated dose of ACEi or ARB.

If the ACR is over 30mg/mmol, offer an SGLT-2i* (dependent on licence) in addition to the highest tolerated dose of ACEi or ARB.

N.B. Consider the appropriateness of therapy with other factors such as increasing frailty, due to risks of side-effects, e.g. hypotension and falls, against time to realise benefit of therapy.

See case study 4.

Other medication for the treatment of T2DM in CKD

Consider dose reduction in response to reducing renal function in:

- Metformin;
- SGLT-2i*;
- GLP-1RA;
- DPP-4i; and
- ACEi, ARBs, diuretics and NSAIDs.

Note that people treated with medication that can affect kidney function during acute dehydrating illness (with or without existing renal disease) should be issued with Medication sick day guidance to prevent acute kidney injury.

National Therapeutic Indicator

Individuals with T2DM and existing atherosclerotic cardiovascular disease (ASCVD) who may benefit from treatment with SGLT-2i and/ or GLP-1RA.

This indicator (see Chart 5) should have a high level of SGLT-2i and/or GLP-1RA prescribing, indicating good practice, with suitable patients receiving appropriate medication.

Chart 5: Individuals with T2DM prescribed a SGLT-2i/GLP-1RA and existing therapy suggestive of atherosclerotic cardiovascular disease (ASCVD)

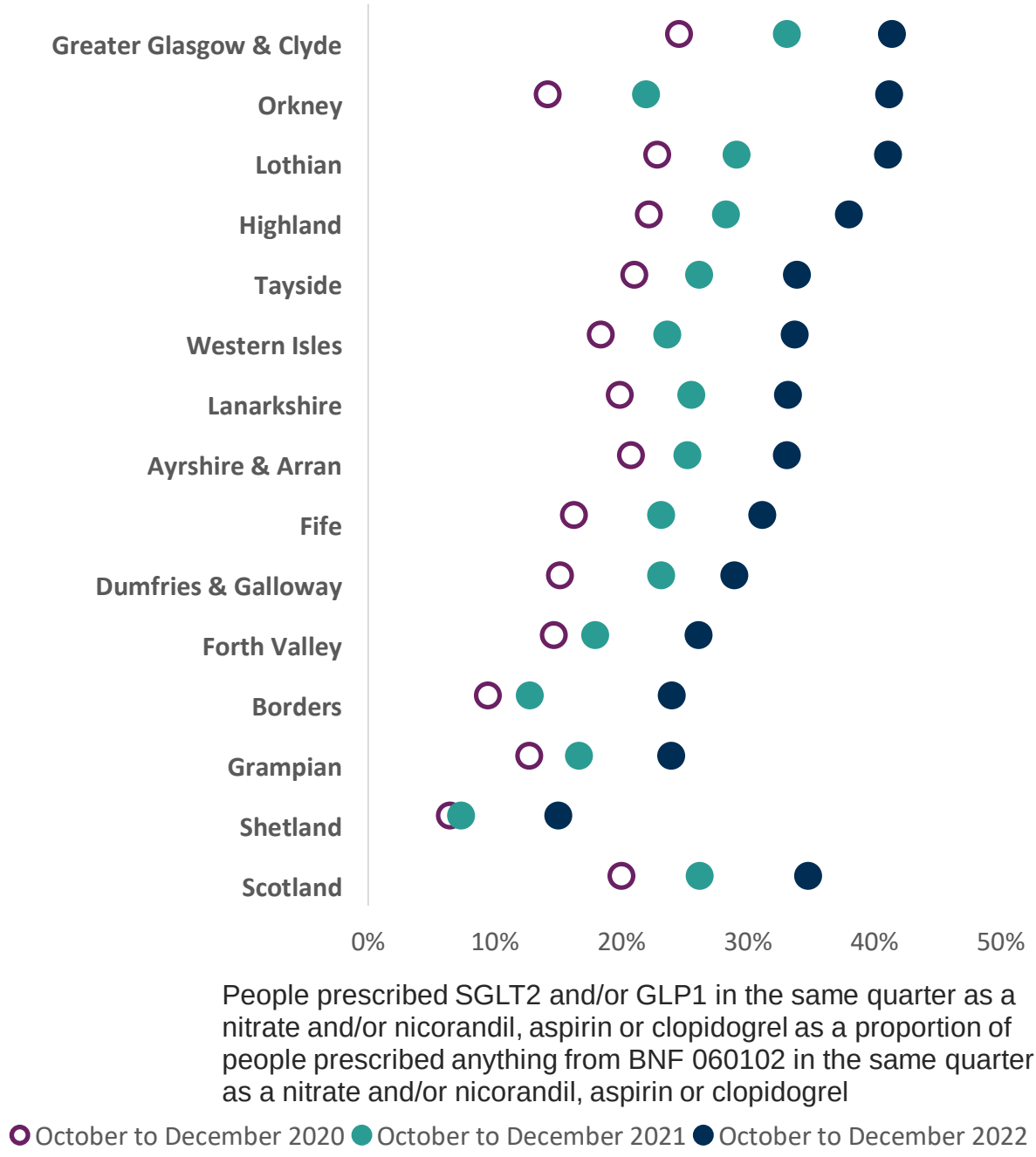


Chart 5 identifies individuals prescribed SGLT-2i and/or GLP-1RA in the same quarter as a nitrate and/or nicorandil, aspirin or clopidogrel as a proportion of people prescribed anything from BNF 060102 in the same quarter as a nitrate and/or nicorandil, aspirin or clopidogrel. This surrogate marker indicates there is a proportion of those with T2DM who may benefit from treatment with SGLT-2i or GLP-1RA, irrespective of glycaemic control.

Although the indicator is limited to ASCVD, there will be others with chronic heart failure (cHF) and CKD, who would similarly benefit.

The Scottish Therapeutics Utility (STU) tool available in all GP practices enables identification of those with T2DM and ASCVD, cHF and/or CKD (see section 12).

Due to the change in prescribing guidance, clinicians should identify individuals who would benefit from prescribing of SGLT-2i* or GLP-1RA. These include people:

- with T2DM and existing CVD and cHF;
- at high risk of CVD; and
- with T2DM and chronic kidney disease, based on eGFR and elevated ACR values.

These identified individuals should have all prescribed medicines reviewed to ensure their doses are appropriate for the degree of renal impairment.

People with T2DM with no ASCVD, HF, CKD

There will be individuals with T2DM, who are not at risk of or do not have ASCVD, cHF or CKD. For those individuals consider:

- whether weight loss or minimising risk of hypoglycaemia is a priority for the individual
- where weight loss or minimising weight gain is a priority, SGLT-2i* and GLP-1RA remain appropriate therapies in line with local guidance
- where minimising the risk of hypoglycaemia is a priority, GLP-1RA, SGLT-2i* and DPP-4i are suitable second line therapies
- DPP-4i and sulfonylureas are also acceptable second line therapies either used alone or in combination, considering the following:
  - the degree of hyperglycaemia (sulfonylureas more efficacious in the short term)
  - potential adverse effects (e.g. DPP-4i's are not associated with a risk of hypoglycaemia or weight gain)
  - sulfonylureas may have particular benefit in steroid-induced diabetes and in individuals with normal or low BMI and T2DM (Type 1 diabetes must be excluded in such individuals)

Other agents (e.g. thiazolidinediones, acarbose) are now rarely used in treatment.

See case study 2.

Ongoing review for all with T2DM

At each review consider:

- lifestyle and diet advice (see List 1 for resources), reinforced with an assessment of the individual's current risk factors.
- an assessment of cardiovascular and renal risk with:
  - blood pressure
  - lipids and
  - smoking status
- glycaemic control

These should all be treated in line with respective treatment targets.

Review 3-6 months after initiating therapy or amending treatment. A significant proportion of individuals with T2DM continue to have sub-optimal diabetes and cardiovascular management. While ensuring timely review can be challenging, it is important to guard against clinical inertia and the long-term sequelae of suboptimal management (see Figure 7).

7. When to consider insulin therapy in type 2 diabetes mellitus?

Insulin is required by some people for treatment of T2DM, usually if other pharmacological therapy is no longer effective. Often this can be because of prolonged excess insulin secretion as a result of insulin resistance. It is not necessarily due to a failure of the individual to comply with their diet and/or treatment regimen.

Red flags for people requiring insulin urgently. These are:

- weight loss without dietary restriction;
- marked symptoms of hyperglycaemia despite increased diabetes treatment; or
- if self-glucose monitoring, continued high blood sugars despite increased diabetes treatment.

Insulin regimens should be adapted to the person considering lifestyle factors, carbohydrate counting and individual choice, with appropriate targets for glycaemic control. There are often psychological barriers to insulin therapy, and these should be considered. Other diabetes treatments should be reviewed and discontinued where appropriate, but metformin, if tolerated, should always be continued.

Human isophane insulin is recommended as the first-choice regimen. Long-acting insulin analogues should not be considered unless the patient experiences recurrent episodes of hypoglycaemia, or requires assistance with insulin injection. For most people with T2DM, long-acting insulin analogues offer no significant benefit over human isophane insulin and are more expensive. For a full list of insulins available in the UK see Insulins in the UK list.

Insulin therapy in order of increasing complexity:

1. Once or twice daily intermediate (NPH) human insulin
2. Once daily long-acting insulin analogue
3. Once or twice daily mixed human insulin (normally 25 or 30% quick acting insulin)
4. Once or twice daily intermediate human; or once daily long-acting insulin analogue, with once daily quick acting human insulin taken before main meals (basal plus regimen)
5. Once daily long-acting insulin analogue with pre-prandial quick acting insulin (basal bolus or multiple daily injection).

8. Which individuals with T2DM should have glucose monitoring?

Blood glucose monitoring

Self-management by regular blood glucose monitoring is not routinely recommended in people with T2DM[1] as it does not significantly improve glycaemic control, health-related quality of life, or hypoglycaemia rates.

However, self-monitoring of blood glucose is recommended for those who:

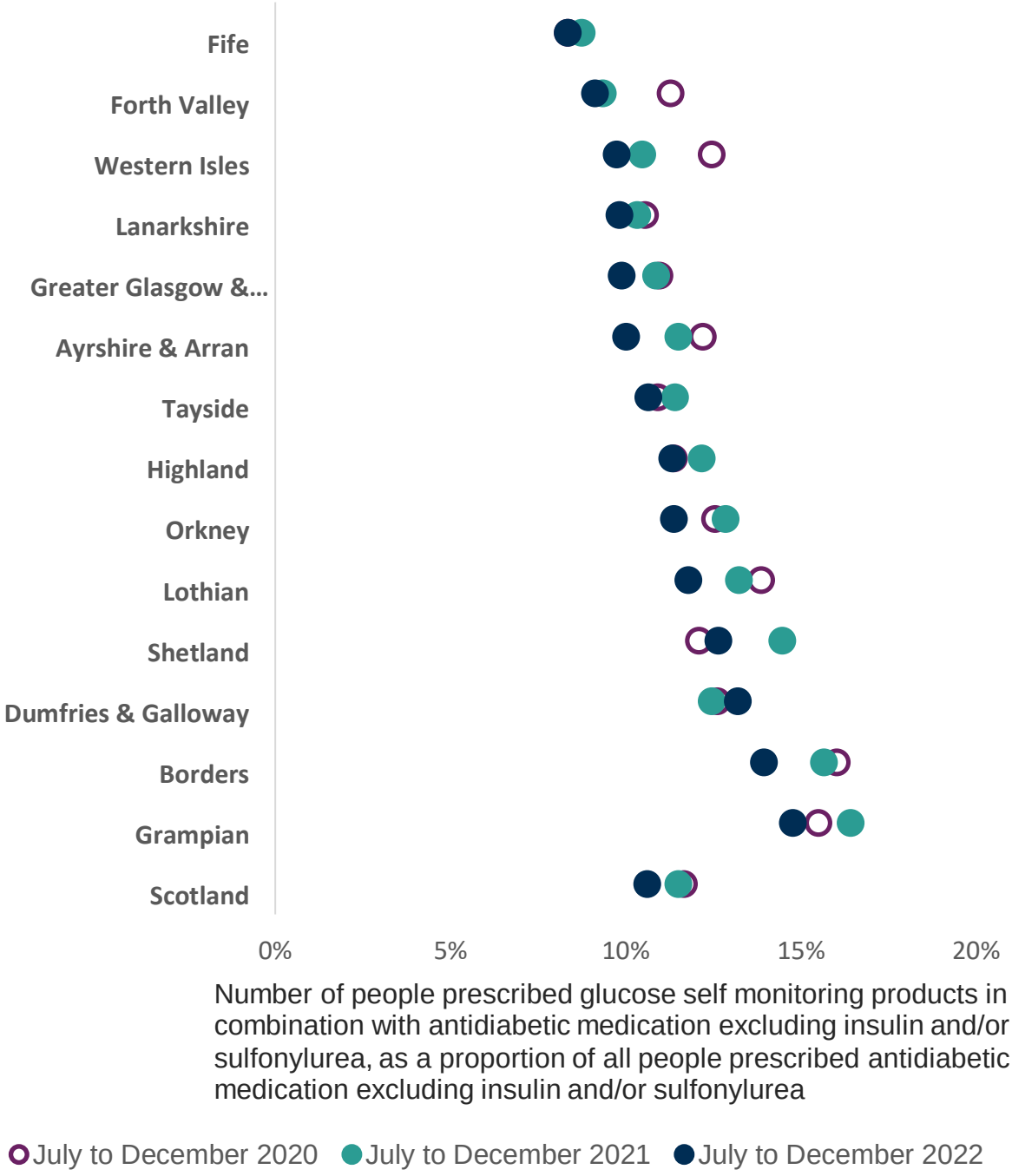
- are on insulin
- have had prior hypoglycaemic episodes
- drive or operate machinery and use oral medications, such as sulfonylureas, that increase their risk of hypoglycaemia (see DVLA guidance)
- are pregnant, or planning to become pregnant, or
- those undergoing significant changes in pharmacotherapy, e.g. on high dose oral steroids or oral hypoglycaemic agents such as sulfonylureas that require dose adjustment.

National Therapeutic Indicator

Proportion of those prescribed glucose self-monitoring products in combination with antidiabetic medication excluding insulin and/or sulfonylurea, as a proportion of all people prescribed antidiabetic medication excluding insulin and/or sulfonylurea.

This indicator (Chart 6) should have a low value, because self-monitoring glucose (SMG) is not generally recommended in management of T2DM, unless therapy includes insulin and/or sulfonylureas.

Chart 6: Proportion of individuals prescribed SMG, potentially unnecessarily



For those who require self-monitoring of blood glucose, there is no evidence to suggest greater clinical benefit from using more expensive test strips over less costly ones and therefore NHS Boards should select appropriate formulary products.

The Scottish Therapeutic Utility (STU) supports the NTI's and has prescribing indicators that can be used to identify individuals with T2DM at GP practice level who would benefit from review.

Intermittently Scanned (Flash) Glucose Monitoring

The Scottish Health Technologies Group (SHTG) advice[49] in 2018 recommended the availability of flash glucose monitoring for individuals with diabetes who are actively engaged in the management of their condition and who intensively manage their disease with multiple daily insulin injections or insulin pump therapy, with some restrictions. NICE define multiple daily injections as 'two or more daily insulin injections, which could either be a basal-bolus regimen or more than one daily insulin injection.'

NICE guidance[2] supports the pre-existing guidance from SHTG and recommends offering intermittently scanned continuous glucose monitoring (isCGM), commonly referred to as 'flash' glucose monitoring, to adults with T2DM on multiple daily insulin injections if any of the following situations apply:

- recurrent hypoglycaemia or severe hypoglycaemia
- impaired hypoglycaemia awareness
- a condition or disability (including learning disability or cognitive impairment) where the individual cannot self-monitor blood glucose using capillary blood glucose monitoring but could use an isCGM device (or have it scanned for them)
- would otherwise be advised to self-measure at least eight times a day (SHTG recommend at least six times per day)

Additionally, adults with insulin-treated type 2 diabetes who would otherwise need help from a care worker or healthcare professional to monitor their blood glucose, should be offered isCGM.

Good practice point:
Those prescribed flash glucose monitors only require two sensors per 28 days (26 within a year). If the sensors become detached or are faulty, people should contact the manufacturer directly for replacements. It is good practice to utilise prescribing data to identify patients who may be over-ordering and/or put in place mechanisms to prevent this, such as annual serial prescription for 26 sensors, to reduce inappropriate prescribing and associated costs.

For all individuals requiring glucose monitoring there should be a documented plan outlining frequency and duration of testing, along with what to do with results. Most people require diabetes assessments every three to six months and this should be tailored according to the individual needs to improve care. Use of diabetes digital resources to support self-management are recommended, such as My Diabetes My Way (see List 1 for further resources).

Blood ketone testing in T2DM

- People with Type 1 diabetes (insulin dependent) will test for ketones if their blood glucose levels are significantly high to alert to the risk of ketoacidosis
- Blood ketone testing in T2DM is not normally necessary and individuals are not routinely provided with self-monitoring equipment
- However due to the risk of eDKA, if a person displays symptoms of DKA (including rapid weight loss, nausea or vomiting, abdominal pain, fast and deep breathing, sleepiness, a sweet smell to the breath, a sweet or metallic taste in the mouth, or a different odour to urine or sweat) ketone testing should occur [45,46]
- Clinicians should be aware of this recommendation and have access to the necessary equipment

9. What are the goals in managing T2DM in frailty and older adults?

The benefits of intensive treatment of T2DM should be balanced against the risk of potential hypoglycaemia and the consequence of falls, fractures and hospitalisation.

A frailty assessment should be a routine component of a diabetes review for all older adults, considering comorbidities, dementia or limited life expectancy.

Benefits of intensive treatment of T2DM:

- Reduce incidence of complications (Polypharmacy Guidance[8]);
- symptomatic hyperglycaemia control (avoidance of polyuria, dehydration, fatigue and renal insufficiency); and
- avoidance of osmotic symptoms and reduced symptomatic hyperglycaemia.

Frailty in the older adult and associated risks:

- accelerated ageing process and muscle loss with frailty[50]
- increased likelihood of hypoglycaemia due to lack of sensory awareness and increased vulnerability to its consequences, including falls, fractures and hospitalisation; and
- comorbidities such as CKD which may require dose adjustment.

A number of international guidelines on the management of diabetes in the older and/or frailer adult have been published, with recommendations based on consensus opinion.[50] This expert working group, together with a review by the polypharmacy short life working group, recommend an assessment of frailty taking a person-centred approach and using the Rockwood Clinical Frailty Scale (CFS) [51] to set individualised glycaemic targets. Any targets set should also take into consideration patient safety and the balance of risk and benefit of intensive treatment. In patients with a higher level of frailty tight blood glucose levels may not be appropriate, and a more appropriate target should be set with the individual. This may result in medicines reduced or stopped where they are causing more harmful side effects than the potential for long-term benefits.

Actions to be considered:

- Timely medication review and deprescribing are key components in the management of people with frailty, depending on level of frailty and HbA1c levels. The 7-Steps approach as described in the Scottish Government Polypharmacy Guidance is recommended
- Treatment goals should be individualised with care planning reflecting the older and/or frailer person's functional status, comorbidities and life expectancy (see Figure 6 in section 3)
- Review of drug choices in the frail older adult with diabetes should take account of potential side-effects including polydipsia, weight loss and candidiasis in addition to hypoglycaemia risk and declining renal function (Table 8)
- Simplify, switch or de-escalate therapies that may induce hypoglycaemia, such as sulfonylureas (as below) and shorter-acting insulins
- See Table 6 in section 6 for further information on prescribing options

See case study 5.

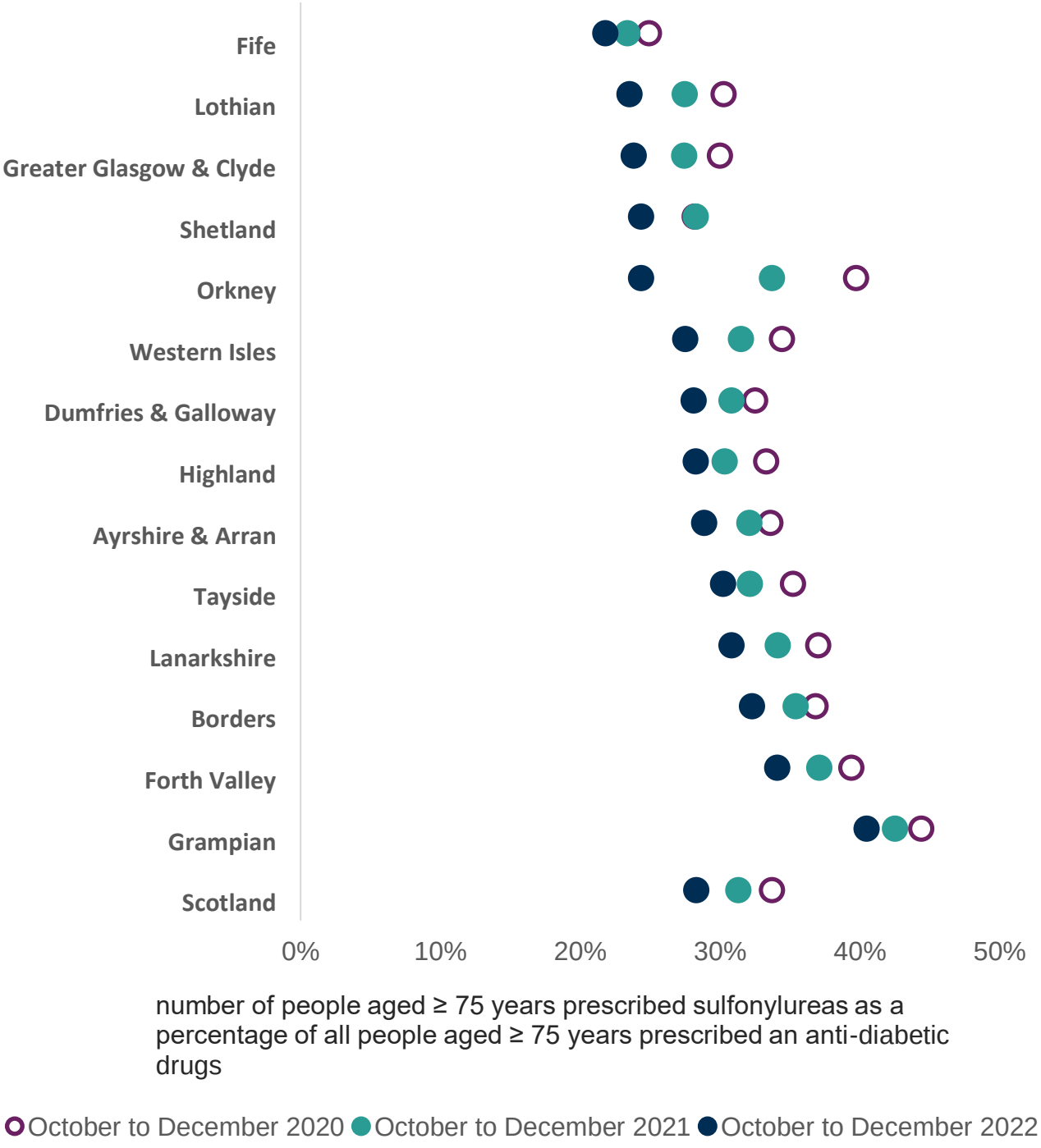
National Therapeutic Indicator

Number of people aged ≥ 75 years prescribed sulfonylureas as a percentage of all people aged ≥ 75 years prescribed an anti-diabetic drug

There should be a low percentage of those aged 75 years or older prescribed sulfonylureas (SU).

This indicator (Chart 7) continues to show that there are high levels of SU prescribing in those aged 75 years or over. Although this has reduced, current data shows that across Scotland a significant proportion of those aged 75 years or over are still being prescribed an SU, increasing the risk of hypoglycaemia, falls and hospitalisation. Other therapies are available with long term outcome data and lower risk of hypoglycaemia that may be more appropriate.

Chart 7: Prescribing of sulfonylureas in those aged 75 years or over



10. What are the priorities in those with T2DM and mental illness?

Taking a holistic person-centred approach is a priority in the treatment of individuals with T2DM and mental illness, due to the high prevalence of these co-existing conditions. Poor emotional wellbeing is common in people with diabetes and a barrier to improved glycaemic control. This may be improved through combining effective approaches for alleviating depression, anxiety and distress with tailored interventions designed to improve self-management and glycaemic control.

Effects of T2DM and mental health disorders:

It is well recognised that individuals with both diabetes and mental health disorders have an increased risk of:

- poorer medication adherence;[52]
- decreased compliance with diabetes self-care; and
- are at higher risk of complications associated with diabetes.[53]

> "I've had depression most of my life, so things affect that. But people don't realise the impact of other health conditions on depression." (Person with lived experience, from Diabetes; my information, my support)[11]

People with diabetes are more likely to experience mental health difficulties than people without diabetes, and those with pre-existing mental health problems can find managing diabetes an additional emotional burden. Anxiety and depression can make diabetes self-management more challenging, partly because they reduce energy levels and motivation; thereby increasing the gap between actual and best possible self-management behaviours and resulting in poorer diabetes control.[54]

Furthermore, many people with serious mental illness[55] live in areas that are socio-economically deprived and are more likely to smoke, misuse alcohol or drugs, and take less physical activity. The culmination of factors results in a significantly increased risk of premature mortality for this population, largely due to cardiovascular disease.[56]

Further associations between T2DM and mental health conditions are shown below.

Depression

Identifying common mental health problems in people with diabetes presents a significant challenge. This is partly because the symptoms of anxiety and depression are often similar to those of chronic diseases, and only a minority of people with anxiety and depression seek treatment.

The prevalence of depression in T2DM is approximately twice that found in the general population.[57] Depression can be in response to a diagnosis of diabetes, due to:

- considerable lifestyle and treatment demands on patients; and
- potentially debilitating complications and a reduced life expectancy.

The prevalence data:

- Clinically relevant depressive symptoms[58] among individuals with T2DM are approximately 30%, with the prevalence of major depressive disorder (MDD) around 10%, double that of those without a chronic medical illness
- Individuals with depression have an approximately 60% increased risk of developing T2DM
- The prognosis for comorbid depression and diabetes is worse than when each illness occurs separately
- Episodes of MDD in individuals with diabetes are also likely to last longer and have a higher chance of recurrence compared with individuals without diabetes[58]

Other mental health illnesses

There is a higher prevalence of T2DM in people with severe mental illness and there is further increased risk of developing diabetes following the initiation of antipsychotic drugs.[59] This is particularly significant in those treated with atypical antipsychotics such as olanzapine, risperidone and quetiapine where over one in ten people taking these medications develop T2DM, in addition to being at higher risk of other metabolic disorders such as weight gain, dyslipidaemia and hypertension.[60]

Actions to be taken:

The Quality Prescribing Guidance for Antidepressants provides guidance on the management of depression and anxiety, with additional recommendations specific to those with T2DM below.

- Individuals with T2DM should be regularly assessed for the presence of depressive and anxiety symptoms in addition to other mental health disorders using validated tools. The PHQ9 questionnaire is commonly used in primary care,

and has been validated for those with diabetes.[61] GAD-7 assessment questionnaire can be used for assessment of anxiety.

- A holistic approach in the management of T2DM should be employed, as the entire spectrum of mental health disorders can influence diabetes-related outcomes.
    - Treatment modalities should be incorporated into primary care and self-management education interventions, to facilitate adaptation to diabetes and reduce diabetes-related distress.
    - To improve outcomes in this patient group, some of the methods that may be used are:
        - motivational interventions
        - stress management strategies
        - coping skills training
        - family therapy
        - collaborative case management
        - social prescribing options e.g. yoga, peer support, with information from community link workers
    - Individuals taking psychiatric medications, particularly atypical antipsychotics, should be encouraged to access regular screening of metabolic parameters such as blood pressure, weight, lipid profile and HbA1c to reduce future cardiovascular risk.

Services often struggle to deliver well-structured combined care with limited access to support from a psychiatrist or psychologist with experience in diabetes. Through Mental Health in Scotland: Improving the Physical Health and Well Being of those Experiencing Mental Illness,[62] the Scottish Government has committed to provide regular physical health checks for people with severe and enduring mental illness.

11. How to improve outcomes in disadvantaged groups

The 2019 Scottish Health Survey highlights inequalities in the prevalence of doctor diagnosed diabetes in Scotland.[4]

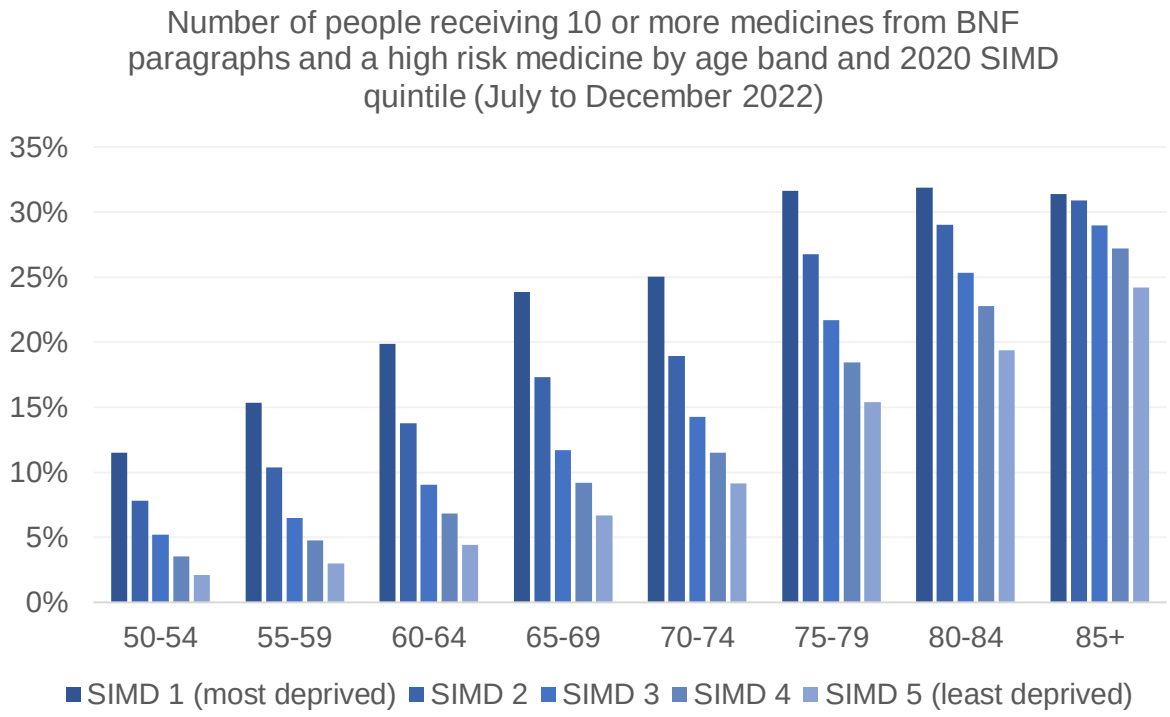
- Men are more likely to be living with diabetes than women (7% versus 4%, respectively)
- Those living in areas of higher deprivation are disproportionately affected (10% in most deprived quintile verses 4% in least deprived quintile), see Figure 2 in section 1.

Socio-economic inequalities in prevalence have increased progressively since 2003. Compared to those living in areas of lower deprivation, people with diabetes living in areas of higher deprivation in Scotland were more likely to develop fatal or critical care unit-treated COVID-19.[63] In the UK, T2DM is approximately 3-5 times higher in ethnic minority groups.[64]

- It is estimated that by 80 years old, 40-50% of South Asian and African Caribbean men and women will have T2DM.[65]
- These groups are significantly more likely to be diagnosed before the age of 40.[66]

It is also important to note that people from deprived communities take more medicines than those from less deprived communities and therefore the medication treatment burden for these individuals is higher. Chart 8 shows comparison of medication burden across age groups, by level of deprivation.

Chart 8: Medication burden comparison for age and deprivation



Inequity in access to care and treatment

A number of cultural barriers have been identified that impact on minority ethnic groups accessing diabetes services, which will include regular review of prescribing and monitoring.[67] These include:

- strong adherence to cultural norms
- religious beliefs
- linguistic diversity/language barriers
- health literacy levels
- low accessibility of culturally appropriate service and
- 'low concordance with western professional advice'[67]

Service design - improving equity of care and outcomes for disadvantaged groups

The design and delivery of T2DM services can advance equity and inclusion for those most disadvantaged. As reported in Diabetes: my information, my support, digital access may not be suitable for all.

> "Variable access to the internet and weak telephone signal mean that I can have difficulty in getting online or using a video call. The question of alternatives to digital access have to be available for

those in digital poverty." (Person with lived experience, from Diabetes; my information, my support)[11]

The following table outlines approaches that can support improved care and outcomes for disadvantaged groups.

Table 9: Approaches to support improved care and outcomes for disadvantaged groups

Approach	Principle	Actions
Human Rights Based Approach (HRBA)	Adapted from Scottish Human Rights Commission Aligns to the values of realistic medicine and person-centred care	Service design targeted at the people who need it most, through • **P**articipation • **A**ccountability • **N**on-discrimination • **E**mpowerment • **L**egality
Cultural competency	Understanding the key issues relating to culture that influence the access to and experiences of care.	Health workers should gain culturally competent knowledge of different cultures. Information should be available in individuals' first language to support their treatment Discussion of medication taking during Ramadan. Consider adaptations to ethnic foods to empower patients to adopt healthy lifestyles rather than to abandon familiar foods.
Trauma-informed service design[68]	Traumatic events are more frequently experienced by people in low socio-economic groups and from black and minority ethnic communities.	Everyone in the Scottish workforce has a role to play in understanding and responding to people affected by trauma. Some will be specialists/enhanced workers, but all should be informed or skilled to respond to those affected by trauma.
Co-designed services	Co-designed services are more likely to be acceptable to both providers and end users,	Ensuring underrepresented and disproportionately affected groups are part of this process and development.

	and therefore adopted and sustained.	
Digital inclusion	In line with the Digital Health and Care Strategy[69] Availability of digital services, such as My Diabetes My Way will undoubtedly improve service access, engagement and self-management.	Include individuals at the heart of digital transformation of services. Ensure the infrastructure exists in Health Boards to digitize services.
Others		• Impact assessments • Links to wider determinants of health

12. Using data to drive change

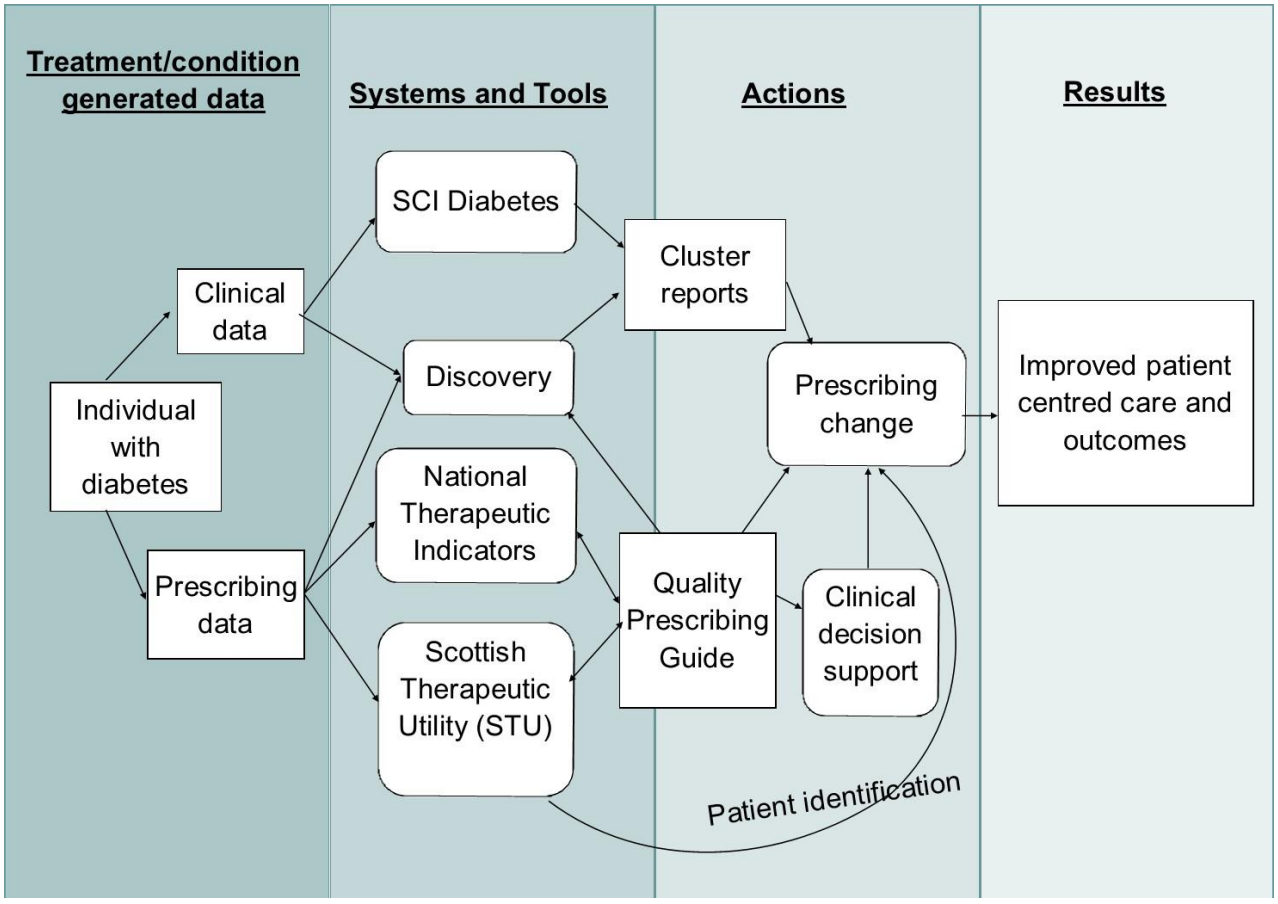
This section aims to introduce the relevant data sources and tools used in prescribing for T2DM and how these can be used to drive improvements in individual patient care.

Healthcare delivery produces a large amount of data which can be used to identify areas of unwarranted variation and drive improvements in healthcare at an individual and organisational level.

Understanding this data and how these systems and tools interact can be challenging, especially where care of the individual is the key. However, tools for aggregate data visualisation, benchmarking and patient identification are available from a number of different sources.

Figure 8 below outlines how data can be gathered from a range of sources and used to improve patient care.

Figure 8: Diagram representing how data can be used to improve outcomes.



The tables below outline the systems and resources available to monitor and utilise data, and how to use them.

Table 10: National Therapeutic Indicators (NTIs)

System/resource	National Therapeutic Indicators (NTIs)
What is it?	An indicator of clinical practice. National Therapeutic Indicators (NTIs), use prescription data to provide a measure of prescribing activity in specified therapeutic areas for comparison across NHS Boards, Health and Social Care Partnerships (HSCPs), GP clusters and GP practices.
Who can access/use?	National Therapeutic Indicators are online with open access to anyone.
Why? What for?	NTIs benchmark prescribing across set parameters (usually defined by expert working groups to identify areas for improvement within a particular area). Data is presented in a variety of ways. Examining variation over time can indicate where improvements in prescribing can be made. Indicator detail provides further detail and suggested actions.

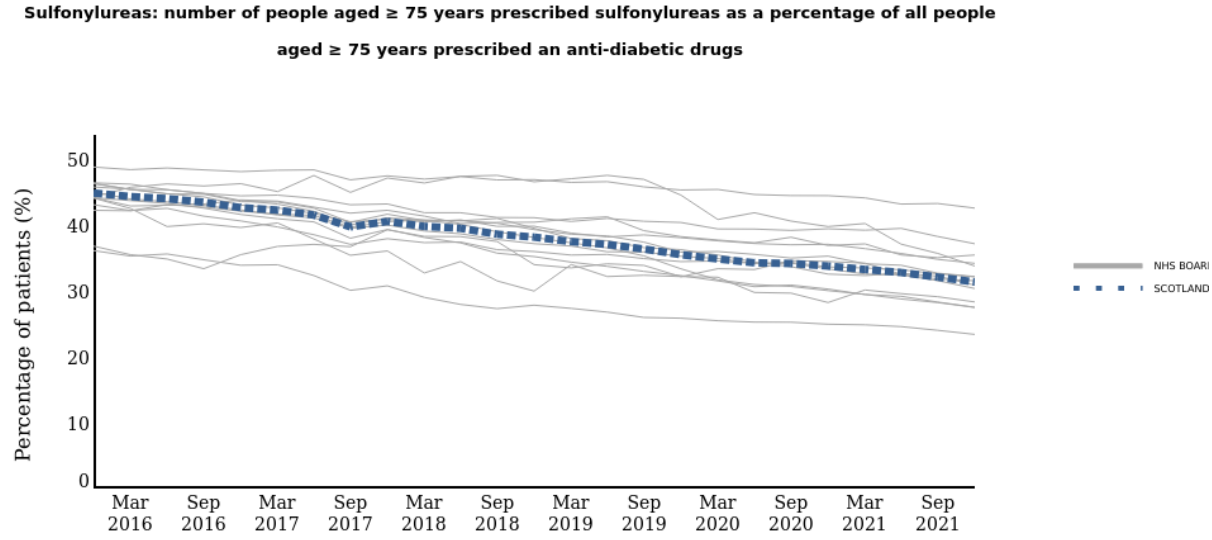
Example

Both charts below show a reduction over time in the quantity of sulfonylureas, but Chart 10 shows clearly to NHS boards where review of prescribing may be required in comparison with the Scottish average.

Prescribers can then identify individuals who may require a change to their current medication using the Scottish Therapeutics Utility (STU) at an individual practice level. This allows changes to be made in the individuals clinical record.

Chart 9: Number of people aged 75 years or over prescribed sulfonylureas as a percentage of all people aged 75 years prescribed an anti-diabetic drug

Chart 10: Sulfonylureas: Number of people aged 75 or over prescribed sulfonylureas as a percentage of all people aged 75 years or over prescribed an anti-diabetic drug



Source: Prescribing Information System Scotland, PHS, NSS.

Table 11: Scottish Therapeutics Utility (STU)

System/resource	Scottish Therapeutics Utility (STU)
What is it?	A system to identify individuals in general practice, according to a set of pre-defined parameters, such as prescribing and clinical data (including read coding). STU focuses on identifying people to improve prescribing practice and improve medication safety.
Who can access/use?	GP practice staff only. Instructions and download information is available at: EScro Home Page.
Why? What for?	STU was developed to improve safety, optimise efficiency and reduce avoidable waste (processes and costs), particularly in relation to repeat prescribing. The utility allows users to interrogate their prescribing data in real time and provides graphs to identify trends in repeat prescribing. STU includes reports which identify areas of high risk prescribing. This supports clinicians in reviewing individuals at risk to determine if prescribing is necessary and how the risk can be reduced.

Example

The diabetes indicators (developed from the NTIs and prescribing guide) highlight the number of people in each indicator. From each indicator title, the names of individuals are shown and their precribing record summarised below.

STU has the facility to open the patient record to allow changes directly in EMIS or Vision. Sample database screenshot below.

Figure 9: Screenshot from Scottish Therapeutics Utility (STU)

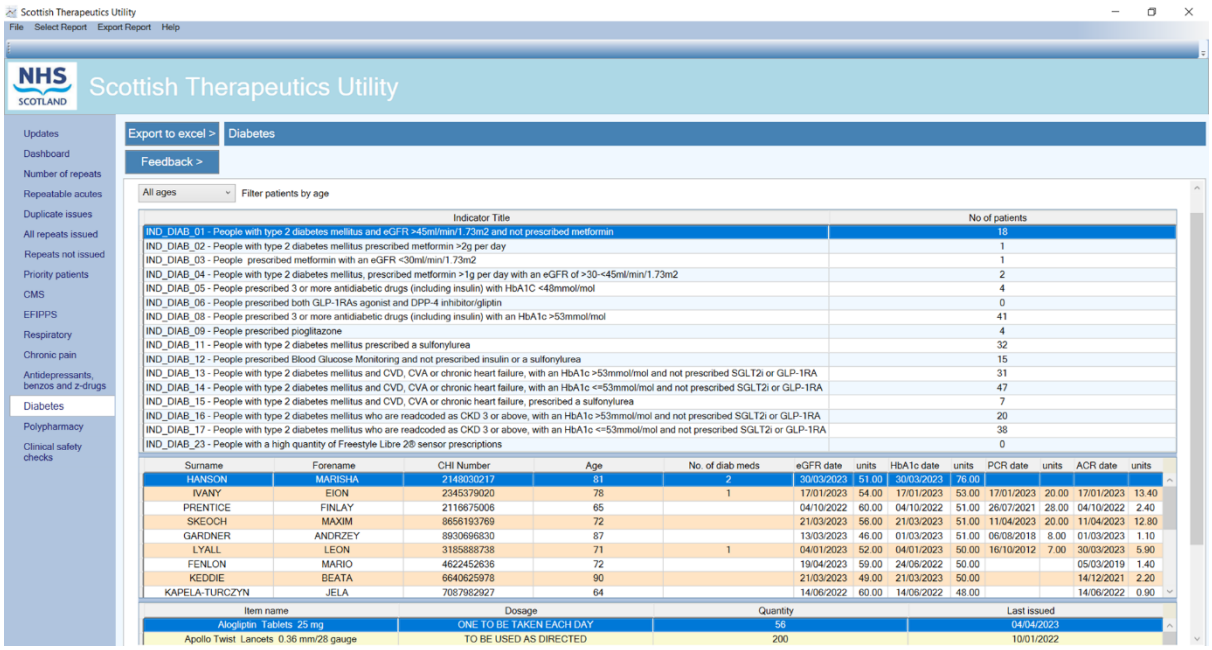


Table 12: Discovery

System/resource	Discovery
What is it?	Discovery is an information system that provides approved users from the Scottish Government, Health Boards, local authorities and Health & Social Care Partnerships with access to a range of comparative healthcare information to support performance and quality improvement across Health & Social Care in Scotland. There is a prescribing dashboard, including measures including: Polypharmacy, Primary and Secondary Care Expenditure and Secondary Care Use of Medicines (HMUD).
Who can access/use?	NHS Staff (including Board staff, GPs), Public Health Scotland (PHS) and Scottish Government. There are different security levels. Level 1 allows access to Board level data. Level 2 allows access to general practice level data.
Why? What for?	Discovery provides comparative and benchmarking information to underpin service planning and delivery.

Example

The example below is from the Polypharmacy dashboard:

Figure 10: Screenshot from Discovery showing Polypharmacy dashboard

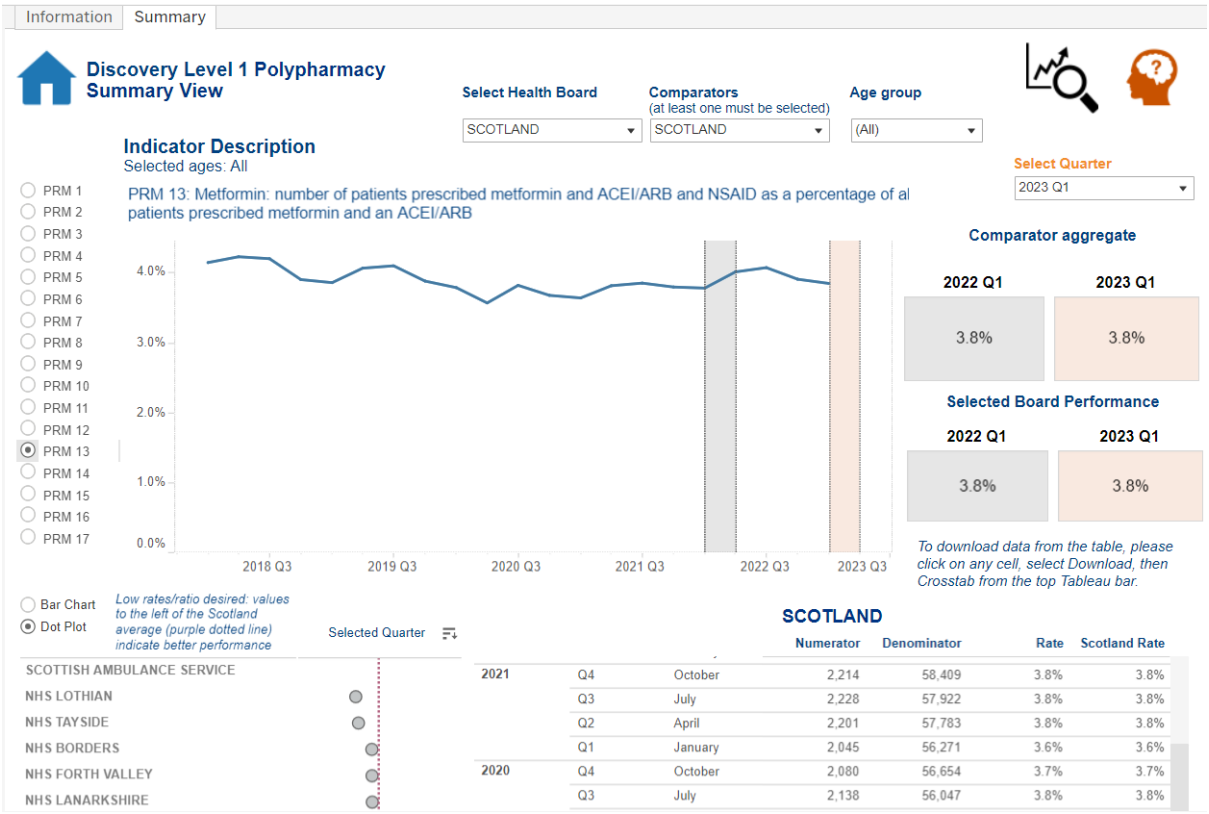
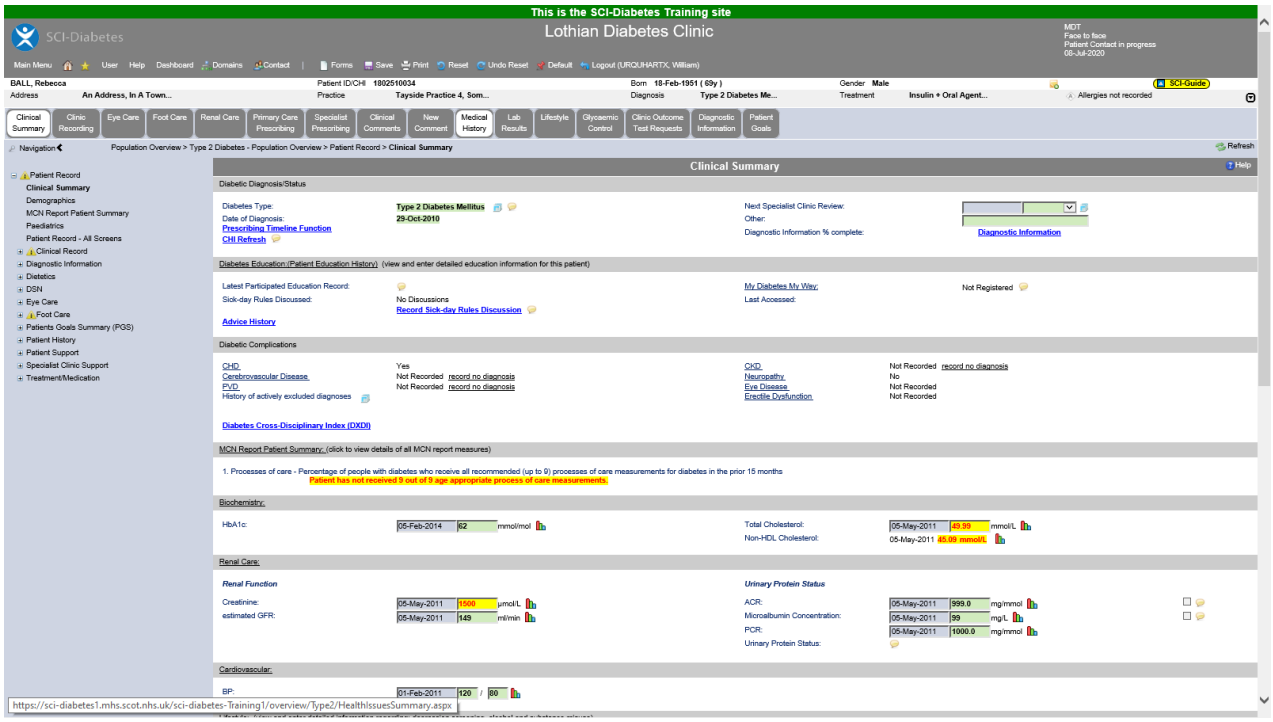


Table 13: SCI-Diabetes

System/resource	SCI-Diabetes
What is it?	SCI-Diabetes is the national clinical system for supporting Diabetes Care within NHS Scotland.
Who can access/use?	NHS Staff including NHS Board staff and GPs. SCI-Diabetes provides a single Diabetes system for NHS Scotland. Users are aligned to 'Domains', which are cohorts of patients under the care of a particular clinic or service. Patients and users can be aligned to multiple domains. Access to the application is managed by administrators within each NHS Board.
Why? What for?	SCI-Diabetes delivers a shared electronic record for use by all involved in the provision of diabetes care. SCI-Diabetes provides modules of multi-speciality input for Diabetes care from: • Primary Care (Complementary to the GP System) • Adult Hospital Clinicians • Paediatrics – Including Transitional care • Diabetic Specialist Nursing • Dietitians • Podiatry SCI-Diabetes also provides support for: • service Improvement • local reporting and national reporting • research

Example

Figure 11: SCI-Diabetes Clinical Summary page



13. Case studies

The following case studies illustrate different aspects of reviewing management of people with T2DM

Case study 1: Remission of Type 2 Diabetes

Case summary
Background (age, sex, occupation, baseline function)
• 57 years old • Male • Self-employed taxi driver
History of presentation/ reason for review
• Referral to Weight Management Service from GP. • Reports that “drank and ate too much in his 20’s” but active in his job. Since becoming a taxi driver and quitting smoking his weight increased. Works 12-hour shifts five to six days a week, leaving little time for physical activity. • Tried commercial slimming clubs in the past but regained weight once stopped attending. • Reports overeating in response to stress. • Does no cooking at home – meals are mostly on the go, grabbing convenience foods whilst driving.
Current medical history and relevant comorbidities
• T2DM diagnosed 3 years ago • Essential hypertension • Gastro-oesophageal reflux disease (GORD) • Depressive disorder • Family history of CVD and T2DM with a family member requiring an amputation due to peripheral vascular disease • High stress levels during the COVID-19 pandemic and lack of income
Current medication and drug allergies (include OTC preparation and herbal remedies)
• Candesartan 8mg tablets - one tablet daily • Metformin 500mg tablets - two tablets twice daily • Sildenafil 100mg tablets - one tablet daily as required • Trazadone 50mg capsules - one capsule at night
Lifestyle and current Function (inc. frailty score for >65yrs) alcohol/ smoking/ diet/ physical activity
• Alcohol – social drinker • Ex-smoker • Physical activity level low – struggles to walk any distance without pain

“What matters to me” (patient ideas, concerns and expectations of treatment)
• His aims are to put his Type 2 Diabetes into remission, stop his medications and improve his mobility and quality of life.
Results e.g. biochemistry, other relevant investigations or monitoring
• Height 1.85m • Weight 148.6 kg • BMI 43.4 kg/m2 • HbA1c 67mmol/mol. • Blood pressure normal range on antihypertensive medication • LDL cholesterol 3.3 mmol/L
Most recent relevant consultations

• Attended a few appointments with team psychologist prior to starting the intervention. Discussed concerns around eating behaviours including boredom / comfort eating and high stress levels.
• Placed on the NHS Scotland/Counterweight Plus Remission Programme - total diet replacement (TDR) – 800 calorie per day soups and shakes diet (4/day) for an initial 12 weeks. Fortnightly appointments with the specialist dietitian for treatment through the program.
• Metformin and candesartan stopped on day 1 of the intervention as per the agreed medical management protocol.
• 31kg weight lost at the end of 12 weeks of TDR – blood glucose, weight and blood pressure checked every 2 weeks at appointments with the dietitian.
• After 12 weeks of TDR, food was slowly reintroduced
• A further 13kg was lost over the 12 weeks on the food reintroduction stage
• BP medications were reintroduced due to a rebound increase in resting BP, at half the dosage at the start of the intervention.
• At 6 months:
  • Appointments monthly
  • Weight loss was 29% of body weight, 10 inches lost from waist
  • Metformin stopped, BP medication dosage halved.
  • Patient was jogging multiple times per week – 5km distances
  • HbA1c had reduced from 65 to 46 mmol/mol – now in remission.
• Progressing with second year of weight loss maintenance in the type 2 diabetes remission program, including monthly appointments with dietitian.
• Maintaining lifestyle changes and continuing to regularly monitor measurements
  o Wife attended a cooking class and supports with planning and cooking meals
  o Takes meals with him in his taxi instead of buying food on the go, also helps with cooking evening meal

- Has progressed from being unable to walk round block to regularly running 5km distances.

- Current medications:
  - Candesartan 4 mg OD
  - Trazadone 50 mg
- Current measurements:
  - Weight: 99.9 kg
  - BMI: 29.2 kg/m^2
  - Total weight loss: 32.7%
  - HbA1c 36 mmol/mol
  - Cholesterol: 2.7 mmol/l
  - Remains in remission

Steps	Process	Person specific issues to address
1. **Aims** What matters to the individual about their condition(s)?	**Review diagnoses and consider:** • Therapeutic objectives of drug therapy • Management of existing health problems • Prevention of future health issues, including lifestyle advice	• Reduce medication • Keep diabetes in remission
2. **Need** Identify essential drug therapy	**Identify essential drugs (not to be stopped without specialist advice*)** • Drugs that have essential replacement functions • Drugs to prevent rapid symptomatic decline * with advice from healthcare professional with specialist interest	• Continue on candesartan. BP has improved with weight loss, but not enough to stop
3. Does the individual take unnecessary drug therapy?	**Identify and review the continued need for drugs** • what is medication for? • with temporary indications • with higher than usual maintenance doses • with limited benefit/evidence for use • with limited benefit in the person under review (see Drug efficacy & applicability (NNT) table)	• No, but candesartan and metformin to be stopped during TDR.
4. **Effectiveness** Are therapeutic objectives being achieved?	**Identify the need for adding/intensifying drug therapy to achieve therapeutic objectives** • to achieve symptom control • to achieve biochemical/clinical targets • to prevent disease progression/exacerbation • is there a more appropriate medication to achieve goals?	• None required. BP within target range.

5. **Safety** Does the individual have or is at risk of ADR/ Side effects? Does the person know what to do if they're ill?	**Identify individual safety risks by checking for** • appropriate individual targets • drug-disease interactions • drug-drug interactions (see ADR table) • monitoring mechanisms for high-risk drugs • risk of accidental overdosing **Identify adverse drug effects by checking for** • specific symptoms/laboratory markers • cumulative adverse drug effects (see ADR table) • drugs used to treat side effects caused by other drugs **Medication Sick Day guidance**	• Candesartan and metformin should both be temporarily stopped (if these need to be reinstated).
6. **Sustainability** Is drug therapy cost-effective and environmentally sustainable?	**Identify unnecessarily costly drug therapy by** • considering more cost-effective alternatives, safety, convenience - **Consider the environmental impact of** • inhaler use • single use plastics • medicines waste • water pollution	• None - prescribing in keeping with current formulary recommendations • Patient advised to dispose of medicines through community pharmacy • Advised patient to only order what is needed, do not stockpile medicines
7. **Person-centredness** Is the person willing and able to take drug therapy as intended?	**Does the person understand the outcomes of the review?** • Consider teach-back **Ensure drug therapy changes are tailored to individual's preferences. Consider** • is the medication in a form they can take? • is the dosing schedule convenient? • what assistance is needed? • are they able to take medicines as intended? **Agree and communicate plan** • discuss and agree with the individual/carer/welfare proxy	• If HbA1c increases consider review and introduce diabetic medications.

	therapeutic objectives and treatment priorities • include lifestyle and holistic management goals • inform relevant health and social care providers of changes in treatments across the transitions of care

Key concepts in this case

- Lifestyle and dietary changes enabled remission of diabetes and stopping medication.
- Mood, self-confidence, self-esteem and relationships have all improved through a combination of more physical activity and mobility, remission of long-term condition and reduction in medications/doctors' appointments.

Case study 2: Multimorbidity, polypharmacy and symptomatic diabetes

Case summary

Background (age, sex, occupation, baseline function)

- 85-year-old
- Male

History of presentation/ reason for review

- Rising HbA1c and reporting osmotic symptoms

Current medical history and relevant comorbidities

- Type 2 diabetes mellitus – 18 years ago
- Ischaemic heart disease – 11 years ago
- Hypertension – 17 years ago
- Bilateral diabetic retinopathy – 6 years ago
- Chronic Kidney Disease Stage 3 – 5 years ago
- Autoimmune gastritis – 5 years ago
- Macrocytic anaemia – 5 years ago
- Pernicious anaemia – 5 years ago
- Albuminurea – 2 years ago

Current Medication and drug allergies (include OTC preparation and Herbal remedies)

- Aspirin dispersible 75mg tablets - one tablet daily
- Bisoprolol 2.5mg tablets - one tablet daily
- Ferrous fumarate 322mg tablets - one tablet twice daily
- Folic acid 5mg tablets - one tablet daily
- Gliclazide 80 mg tablets - two tablets twice daily
- GlucoRx Nexus test strips - use as directed
- Glyceryl trinitrate 400mcg sublingual spray - use when required
- Hydroxocobalamin 1mg IM injection - once every 3 months
- Linagliptin 5mg tablets - one tablet daily
- Losartan 50mg tablets - one tablet daily
- Metformin 500mg tablets - two tablets twice daily
- Omeprazole 20mg capsules - one capsule daily
- Simvastatin 40mg tablets - one tablet night

Drug Allergies:

- SGLT-2i previously not tolerated due to recurrent balanitis

Lifestyle and current function (inc. frailty score for >65yrs) alcohol/ smoking/ diet/ physical activity
• Rockwood score 4 (vulnerable) • Lives alone, daughter visits daily • Wife died in 2021 (dementia) - he was her main carer • Continues to drive (short distances) • Eating more than normal and has put on weight • Attends diabetic retinopathy screening • Attends podiatrist regularly
"What matters to me" (patient ideas, concerns and expectations of treatment)
• Wishes he didn't need to take so many medications but organises and fills a compliance aid himself • Often forgets to take his dose of statin at night • Struggles to check blood glucose so doesn't undertake home blood glucose monitoring, however test strips on repeat and issued regularly • Tired and not going out much – feels "a bit lost since his wife died"
Results e.g. biochemistry, other relevant investigations or monitoring
• Creatinine 127 micromol/L and eGFR = 47 ml/min • Weight 117kg; height 182cm; BMI 35.32 • Calculated creatinine clearance 49 ml/min (IBW 77kg) • Urine albumin 18mg/ml, urine creatinine 2.5 mmol/l, ACR 7.2mg/mmol • No urinary protein detected • Recent LFTs normal, FBC stable (Hb 123 g/l), folate > 20ug/l • Last 3 blood pressures 130/63mmHg, 118/62mmHg, 128/62mmHg • Serum cholesterol 3.9mmol/l, ratio 3.5, triglycerides 3.0 mmol/l • Hba1c 97mmol/mol (3 months previously was 75mmol/mol)
Most recent relevant consultations
• HbA1c was 75mmol/mol 3 months ago and gliclazide was increased. New blood glucose monitor and test strips were issued. • Recent leg wound/ulcer - dressed and treated by practice nurse

Steps	Process	Person specific issues to address
1. **Aims** What matters to the individual about their condition(s)?	**Review diagnoses and consider:** • Therapeutic objectives of drug therapy • Management of existing health problems • Prevention of future health issues, including lifestyle advice	• Simplify and reduce medication burden • Minimise symptoms and improve quality of life, e.g. reduce isolation, and improve mood as feeling “a bit lost” • Reduce risk of adverse effects from drugs
2. **Need** Identify essential drug therapy	**Identify essential drugs (not to be stopped without specialist advice*)** • Drugs that have essential replacement functions • Drugs to prevent rapid symptomatic decline * with advice from healthcare professional with specialist interest	• Although not considered essential, there is a valid indication for antidiabetic medication: diabetes symptom control
3. Does the individual take unnecessary drug therapy?	**Identify and review the continued need for drugs** • what is medication for? • with temporary indications • with higher than usual maintenance doses • with limited benefit/evidence for use • with limited benefit in the person under review (see Drug efficacy & applicability (NNT) table)	• Folic acid 5mg can be stopped as no longer deficient in folate
4. **Effectiveness** Are therapeutic objectives being achieved?	**Identify the need for adding/intensifying drug therapy to achieve therapeutic objectives** • to achieve symptom control • to achieve biochemical/clinical targets • to prevent disease progression/exacerbation • is there a more appropriate medication to achieve goals?	• Diabetes poorly controlled despite 3 antidiabetics. Takes linagliptin, which is less effective than other options which also have positive cardiovascular outcomes • Secondary CVD prevention: likely to derive macrovascular benefit from tight glycaemic control; is on statin and BP within target range
5. **Safety**	**Identify individual safety risks by checking for** • appropriate individual targets • drug-disease interactions	• Risk of hypoglycaemia due to renal impairment and on sulfonylurea – reduce and stop gliclazide

Does the individual have or is at risk of ADR/ Side effects? Does the person know what to do if they're ill?	• drug-drug interactions (see ADR table) • monitoring mechanisms for high-risk drugs • risk of accidental overdosing **Identify adverse drug effects by checking for** • specific symptoms/laboratory markers • cumulative adverse drug effects (see ADR table) • drugs used to treat side effects caused by other drugs **Medication Sick Day guidance**	• Risk of acute kidney injury (losartan, metformin and CKD) especially if acutely unwell. Sick day guidance – check awareness.
6. Sustainability Is drug therapy cost-effective and environmentally sustainable?	**Identify unnecessarily costly drug therapy by** • considering more cost-effective alternatives, safety, convenience **Consider the environmental impact of** • inhaler use • single use plastics • medicines waste • water pollution	• None - prescribing in keeping with current formulary recommendations • Patient advised to dispose of medicines through community pharmacy • Advised patient to only order what is needed, do not stockpile medicines
7. Person-centredness Is the person willing and able to take drug therapy as intended?	**Does the person understand the outcomes of the review?** • Consider teach-back **Ensure drug therapy changes are tailored to individual's preferences. Consider** • is the medication in a form they can take? • is the dosing schedule convenient? • what assistance is needed? • are they able to take medicines as intended? **Agree and communicate plan** • discuss and agree with the individual/carer/welfare proxy therapeutic objectives and treatment priorities • include lifestyle and holistic management goals	• Discuss commencing once weekly injectable therapy with GLP-1RA and stopping linagliptin and also reducing and stopping gliclazide. Daughter happy to help with this as patient would prefer to inject subcutaneously into upper arm. Oral formulation available if preferred. • Secondary CVD prevention – discussion around importance of weight reduction along with good control of BP, HbA1c and cholesterol. Change to atorvastatin in the morning. Provide support for lifestyle change where appropriate e.g., referral to Weight Management Service.

	• inform relevant health and social care providers of changes in treatments across the transitions of care	• Check patient's understanding of how to best monitor glycaemic control through HbA1c testing and address that there is no need to routinely undertake SBGM. Remove test strips from repeats. • Encourage attendance at local befriending groups, Men's Shed, etc to reduce social isolation since his wife died

Key concepts in this case

- Lifestyle management
- Polypharmacy, not limited to treatment of diabetes
- Symptomatic control required.

Case study 3: Diabetes, SGLT-2i* and managing adverse effects

Case summary
Background (age, sex, occupation, baseline function)
• 52 years old • Female
History of presentation/ reason for review
• Annual diabetic review
Current medical history and relevant comorbidities
• Type 2 diabetes mellitus – 3 years ago • Established ASCVD • Essential hypertension - 2 years ago • Ischaemic heart disease – 2 years ago • Coronary artery stenting of two vessel disease 2 years ago
Current medication and drug allergies (include OTC preparation and herbal remedies)
• Atorvastatin 40mg tablets – one tablet at night • Clopidogrel 75mg tablets – one tablet daily • Lisinopril 20mg tablets – one tablet daily • Metformin 500mg tablets – one tablet twice daily
Lifestyle and current function (inc. frailty score for >65yrs) alcohol/ smoking/ diet/ physical activity
• Smokes 10 cigarettes per day
"What matters to me" (patient ideas, concerns and expectations of treatment)
"I want to be on the right medicine for my heart"
Results e.g. biochemistry, other relevant investigations or monitoring
• Weight 92kg; height 1.7m; BMI 32.4 kg/m2 • Creatinine 55 micromol/l, eGFR>60 • Urine albumin 3mg/ml, urine creatinine 9.1mmol/l, ACR 0.3mg/mmol • HbA1c 51mmol/mol • BP 126/78mmHg
Current issues
• Smoking cessation advice and referral made • HbA1c above recommended target of 48 mmol/mol • Would benefit from commencing an SGLT-2i* – both from glycaemic and ASCVD point of view • Empagliflozin 10mg once daily commenced • Counselled on side effects

- Medication sick day guidance reiterated and personalised medication list updated via Manage Medicines app/website.
- Four weeks after commencement presents with symptomatic genital thrush
- Clotrimazole ‘combi pack’ prescribed
- Initial improvement in thrush, but after 2 weeks has recurred
- Fluconazole 150mg dose prescribed
- ‘Genital washing’ instructions given
- Option of more prolonged course of fluconazole, if thrush recurs – 150mg every 72 hours for 3 doses, then 150mg once weekly for 6 months

Steps	Process	Person specific issues to address
1. **Aims** What matters to the individual about their condition(s)?	**Review diagnoses and consider:** • Therapeutic objectives of drug therapy • Management of existing health problems • Prevention of future health issues, including lifestyle advice	• Appropriate treatment of cardiovascular disease - “I want to be on the right medicine for my heart”
2. **Need** Identify essential drug therapy	**Identify essential drugs (not to be stopped without specialist advice*)** • Drugs that have essential replacement functions • Drugs to prevent rapid symptomatic decline * with advice from healthcare professional with specialist interest	• Although not considered essential, there is a valid indication for all medication
3. Does the individual take unnecessary drug therapy?	**Identify and review the continued need for drugs** • what is medication for? • with temporary indications • with higher than usual maintenance doses • with limited benefit/evidence for use • with limited benefit in the person under review (see Drug efficacy & applicability (NNT) table)	• None are unnecessary
4. **Effectiveness** Are therapeutic objectives being achieved?	**Identify the need for adding/intensifying drug therapy to achieve therapeutic objectives** • to achieve symptom control • to achieve biochemical/clinical targets • to prevent disease progression/exacerbation • is there a more appropriate medication to achieve goals?	• HbA1c 51mmol/mol (above recommended target of 48 mmol/mol) • Existing ASCVD – SGLT-2i* indicated– both from glycaemic and ASCVD point of view

5.
Safety
 	
Does the individual have or is at risk of ADR/ Side effects?
 	
Does the person know what to do if they're ill?
	Identify individual safety risks by checking for
	• appropriate individual targets
	• drug-disease interactions
	• drug-drug interactions (see ADR table)
	• monitoring mechanisms for high-risk drugs
	• risk of accidental overdosing
	Identify adverse drug effects by checking for
	• specific symptoms/laboratory markers
	• cumulative adverse drug effects (see ADR table)
	• drugs used to treat side effects caused by other drugs
	
	Medication Sick Day guidance
		• Counselled on risks of side-effects:
		  ○ the signs and symptoms of DKA, and advise to seek immediate medical advice if they develop any of these symptoms
		  ○ increased risk of genital infections
		  ○ avoid low carbohydrate diets
		Sick Day guidance
		• Temporarily stop metformin, lisinopril and empagliflozin

6. **Sustainability** Is drug therapy cost-effective and environmentally sustainable?	**Identify unnecessarily costly drug therapy by** • considering more cost-effective alternatives, safety, convenience **Consider the environmental impact of** • inhaler use • single use plastics • medicines waste • water pollution	• None - prescribing in keeping with current formulary recommendations • Patient advised to dispose of medicines through community pharmacy • Advised patient to only order what is needed, do not stockpile medicines
7. **Person-centredness** Is the person willing and able to take drug therapy as intended?	**Does the person understand the outcomes of the review?** • Consider teach-back **Ensure drug therapy changes are tailored to individual's preferences. Consider** • is the medication in a form they can take? • is the dosing schedule convenient? • what assistance is needed? • are they able to take medicines as intended? **Agree and communicate plan** • discuss and agree with the individual/carer/welfare proxy	• Smoking cessation advice and referral made • Empagliflozin 10mg once daily commenced • Note: 4 weeks after commencement presents with symptomatic genital thrush • Clotrimazole 'combi pack' prescribed • Initial improvement in thrush, but after 2 weeks has recurred • Fluconazole 150mg dose prescribed • 'Genital washing' instructions given

	therapeutic objectives and treatment priorities • include lifestyle and holistic management goals • inform relevant health and social care providers of changes in treatments across the transitions of care

Key concepts in this case

- Established ASCVD indicates additional therapy of SGLT-2i, independent of glycaemic control
- SGLT-2i* have known side effect profile
- Requirement to counsel patient accordingly
- Manage side-effects
- Use of simple instructions to minimise side-effects using “genital washing” leaflet (as developed by NHS Lothian, see https://www.lothiansexualhealth.scot/can-this-be-dealt-with-at-a-pharmacy/genital-hygiene/).
- Reiterate sick day guidance and include SGLT-2i

Case study 4: Diabetes, polypharmacy and chronic kidney disease

Case summary
Background (age, sex, occupation, baseline function)
• 59-year-old male, works in family business. • Lives with wife who does all the cooking.
History of presentation/ reason for review
• Annual diabetes review
Current medical history and relevant comorbidities
• Type 2 diabetes mellitus – 10 years ago • CKD stage 3B–1 year ago • Microalbuminuria – 4 years ago
Current medication and drug allergies (include OTC preparation and herbal remedies)
• Atorvastatin 20mg tablets – one tablet daily • Gliclazide 80mg tablets – one tablet daily • Metformin 500mg tablets – one tablet twice daily • Ramipril 10mg capsules – one capsule daily
Lifestyle and current function (inc. frailty score for >65yrs) alcohol/ smoking/ diet/ physical activity
• Non-smoker • Minimal alcohol • Diet can be improved • Plays golf three times weekly
“What matters to me” (patient ideas, concerns and expectations of treatment)
Concerned with reduced kidney function and diabetes control
Results e.g. biochemistry, other relevant investigations or monitoring
• Weight 95kg, BMI 32 • Blood pressure 136/84mmHg • eGFR 41ml/min • ACR 10mg/mmol • LFTs normal • Serum cholesterol 3.6mmol/l, Triglycerides 1.9 mmol/l • HbA1c 72mmol/mol • Foot screen- low risk • Retinal screen- mild retinopathy
Most recent relevant consultations
Had U&Es checked six months previously. eGFR stable.

Steps	Process	Person specific issues to address

1.
Aims
 	
What matters to the individual about their condition(s)?
	Review diagnoses and consider:
	• Therapeutic objectives of drug therapy
	• Management of existing health problems
	• Prevention of future health issues, including lifestyle advice
		• Patient is concerned about his kidney condition and diabetes control.
		• Treatment objectives:
		  ○ Stabilise CKD
		  ○ Improve diabetes control
		  ○ Improve blood pressure

2. **Need** Identify essential drug therapy	**Identify essential drugs (not to be stopped without specialist advice*)** • Drugs that have essential replacement functions • Drugs to prevent rapid symptomatic decline * with advice from healthcare professional with specialist interest	• Although not considered essential, there is a valid indication for all medication
3. Does the individual take unnecessary drug therapy?	**Identify and review the continued need for drugs** • what is medication for? • with temporary indications • with higher than usual maintenance doses • with limited benefit/evidence for use • with limited benefit in the person under review (see Drug efficacy & applicability (NNT) table)	• None considered unnecessary

4.
Effectiveness
 	
Are therapeutic objectives being achieved?
	Identify the need for adding/intensifying drug therapy to achieve therapeutic objectives
	• to achieve symptom control
	• to achieve biochemical/clinical targets
	• to prevent disease progression/exacerbation
	• is there a more appropriate medication to achieve goals?
		• To achieve symptom control
		  ○ CKD management: initiate SGLT-2i* to delay the progression of CKD.
		• BP control: BP slightly above target.
		  ○ Already on ramipril 10mg daily.
		  ○ Check BP after initiation of SGLT-2i.
		• HbA1c is above target and BMI is 32.
		  ○ Check adherence.
		  ○ Add in 3rd line hypoglycaemic agent

		(GLP-1RA). NB: SGLT-2i don't exert their glucose-lowering effects in eGFR<45ml/min

5. Safety
 	
Does the individual have or is at risk of ADR/ Side effects?
 	
Does the person know what to do if they're ill?
	Identify individual safety risks by checking for
	• appropriate individual targets
	• drug-disease interactions
	• drug-drug interactions (see ADR table)
	• monitoring mechanisms for high-risk drugs
	• risk of accidental overdosing
	Identify adverse drug effects by checking for
	• specific symptoms/laboratory markers
	• cumulative adverse drug effects (see ADR table)
	• drugs used to treat side effects caused by other drugs
	
	Medication Sick Day guidance
		• SGLT-2i:
		  ○ DKA symptoms*; check awareness
		  ○ Raise awareness of thrush/UTI
		• GLP-1RA: raise awareness of GI ADRs and symptoms of pancreatitis
		• To monitor blood glucose and if below <4.0mmol/l, to stop gliclazide.
		
		Sick Day guidance
		• Risk of acute kidney injury (ramipril, metformin and CKD)

6. Sustainability Is drug therapy cost-effective and environmentally sustainable?	**Identify unnecessarily costly drug therapy by** • considering more cost-effective alternatives, safety, convenience **Consider the environmental impact of** • inhaler use • single use plastics • medicines waste • water pollution	• None - prescribing in keeping with current formulary recommendations • Patient advised to dispose of medicines through community pharmacy • Advised patient to only order what is needed, do not stockpile medicines

7.
Person-centredness
 	
Is the person willing and able to take drug therapy as intended?
	Does the person understand the outcomes of the review?
	• Consider teach-back
	
	Ensure drug therapy changes are tailored to individual's preferences. Consider
	• is the medication in a form they can take?
	• is the dosing schedule convenient?
	• what assistance is needed?
	• are they able to take medicines as intended?
	
	Agree and communicate plan
	• discuss and agree with the individual/carer/welfare proxy therapeutic objectives and treatment priorities
	• include lifestyle and holistic management goals
	• inform relevant health and social care providers of changes in treatments across the transitions of care
		• Delay progression of CKD:
		  ○ Discuss that the addition of an SGLT-2i* will delay CKD progression and may have beneficial effect on BP control.
		  ○ eGFR to be monitored at least 6 monthly.
		  ○ Follow up patient 1-2 weeks post SGLT-2i initiation to check adherence, ADRs and BP.
		• BP control:
		  ○ Discuss if BP still above target after initiation of SGLT-2i, then additional antihypertensive treatment will be added.
		• Diabetes management:
		  ○ Once patient is stabilised on the SGLT-2i (1-2 weeks post initiation), initiate GLP-1RA-
		  ○ Check patient understands how to inject GLP-1RA pen correctly and dosing frequency.
		  ○ Follow up patient post initiation at week 1 months 3 and 6. And then every 3-6 months thereafter.
		• Non medication intervention: refer patient to a dietician. With patient's permission, wife is to attend also.

Key concepts in this case

Prescribing for people with comorbidities: CKD

- management of CKD in type 2 diabetes
- tight blood pressure control
- tight glycaemic control

Case study 5: Diabetes and frailty

Case summary
Background (age, sex, occupation, baseline function)
• 65 years old • Male • Mild frailty (assessed two months previously) Rockwood 5
History of presentation/ reason for review
• Annual diabetic review
Current medical history and relevant comorbidities
• Transient ischaemic attack (9 and 15 years previously) • Type 2 diabetes mellitus – 14 years ago • Essential hypertension - 21 years ago • Ischaemic heart disease – 31 years ago • Angina pectoris • Acute myocardial infarction • Family history of IHD (noted 14 years ago)
Current medication and drug allergies (include OTC preparation and herbal remedies)
• Alogliptin 25mg tablets – one tablet daily • Bendroflumethiazide 2.5mg tablets – one tablet daily • Citalopram 20mg tablets – one tablet daily • Clopidogrel 75mg tablets – one tablet daily • Furosemide 20mg tablets – one tablet daily • Irbesartan 300mg tablets – one tablet daily • Lercanidipine 10mg tablets – one tablet daily • Metformin 500mg tablets – one tablet twice daily • Simvastatin 40mg tablets – one tablet at night
Lifestyle and current function (inc. frailty score for >65yrs) alcohol/ smoking/ diet/ physical activity
• Frailty – mild • Lives with wife, who does all the housework, preparing meals and shopping • Mobilises with walking aid • House on two levels, and requires help with stairs • Eats a varied diet • Weight stable • Attends local optician

“What matters to me” (patient ideas, concerns and expectations of treatment)
• Although pharmacy manages supply of his medication (all on serial prescription) he is reluctant to take medication. “Can I stop any?” • Often forgets lunchtime dose of metformin.
Results e.g. biochemistry, other relevant investigations or monitoring
• Creatinine 101, eGFR>60 • Weight 84.8kg; height 1.8m; BMI 26.17 • Calculated creatinine clearance 69 ml/min (IBW 75.3kg) • Urine albumin 3mg/ml, urine creatinine 9.1mmol/l, ACR 0.3mg/mmol • Recent LFTs, FBC normal • Last 3 blood pressures: 130/80mmHg, 126/78mmHg, 127/75mmHg • Serum cholesterol 4.3mmol/l, ratio 3.5 • HbA1c 51mmol/mol
Most recent relevant consultations
• Diabetic monitoring before annual review • Limited contact with practice due to COVID restrictions • Received all flu and COVID vaccines

Steps	Process	Person specific issues to address
1. **Aims** What matters to the individual about their condition(s)?	**Review diagnoses and consider:** • Therapeutic objectives of drug therapy • Management of existing health problems • Prevention of future health issues, including lifestyle advice	• Simplify medication – “take less tablets” • Maintain limited mobility
2. **Need** Identify essential drug therapy	**Identify essential drugs (not to be stopped without specialist advice*)** • Drugs that have essential replacement functions • Drugs to prevent rapid symptomatic decline * with advice from healthcare professional with specialist interest	• None considered essential
3. Does the individual take unnecessary drug therapy?	**Identify and review the continued need for drugs** • what is medication for? • with temporary indications • with higher than usual maintenance doses • with limited benefit/evidence for use • with limited benefit in the person under review (see Drug efficacy & applicability (NNT) table)	• Citalopram – started 4 years ago, no indication if ongoing need, although higher incidence of depression in diabetes. • Furosemide 20mg potentially unnecessary, if lercanidipine is causing swollen ankles
4. **Effectiveness** Are therapeutic objectives being achieved?	**Identify the need for adding/intensifying drug therapy to achieve therapeutic objectives** • to achieve symptom control • to achieve biochemical/clinical targets • to prevent disease progression/exacerbation • is there a more appropriate medication to achieve goals?	• BP within target range, occasionally lightheaded but attributed to limited mobility. On triple therapy so review which most appropriate to reduce and stop. • Diabetes well controlled, mild frailty potentially at risk of hypoglycaemia and complications. However takes alogliptin, which is less effective than other options which have positive cardiovascular outcomes, such as SGLT-2i*.

5. **Safety** Does the individual have or is at risk of ADR/ Side effects? Does the person know what to do if they're ill?	**Identify individual safety risks by checking for** • appropriate individual targets • drug-disease interactions • drug-drug interactions (see ADR table) • monitoring mechanisms for high-risk drugs • risk of accidental overdosing **Identify adverse drug effects by checking for** • specific symptoms/laboratory markers • cumulative adverse drug effects (see ADR table) • drugs used to treat side effects caused by other drugs **Medication Sick Day guidance**	• Risk of falls due to anti-diabetic medicines and anti-hypertensives • Increased risk of acute kidney injury due to combination of diuretics and metformin, especially if acutely unwell. • Sick day guidance – withhold bendroflumethiazide, furosemide, irbesartan and metformin with dehydrating illness
6. **Sustainability** Is drug therapy cost-effective and environmentally sustainable?	**Identify unnecessarily costly drug therapy by** • considering more cost-effective alternatives, safety, convenience - **Consider the environmental impact of** • inhaler use • single use plastics - • medicines waste • water pollution	• None - prescribing in keeping with current formulary recommendations • Patient advised to dispose of medicines through community pharmacy • Advised patient to only order what is needed, do not stockpile medicines
7. **Person-centredness** Is the person willing and able to take drug therapy as intended?	**Does the person understand the outcomes of the review?** • Consider teach-back **Ensure drug therapy changes are tailored to individual's preferences. Consider** • is the medication in a form they can take? • is the dosing schedule convenient? • what assistance is needed? • are they able to take medicines as intended? **Agree and communicate plan** • discuss and agree with the individual/carer/welfare proxy	• BP at target and lightheaded – stop lercanidipine as may also be contributing to swollen ankles • Diabetic control good, often forgets metformin dose at lunchtime. Reduce dose to 500mg twice daily. Future steps: • If swollen ankles resolve, stop furosemide. • Substitute alogliptin for SGLT-2i*, due to ASCVD (and renal) benefits. • Discuss potential reduction of citalopram, if no symptoms.

	therapeutic objectives and treatment priorities • include lifestyle and holistic management goals • inform relevant health and social care providers of changes in treatments across the transitions of care

Key concepts in this case

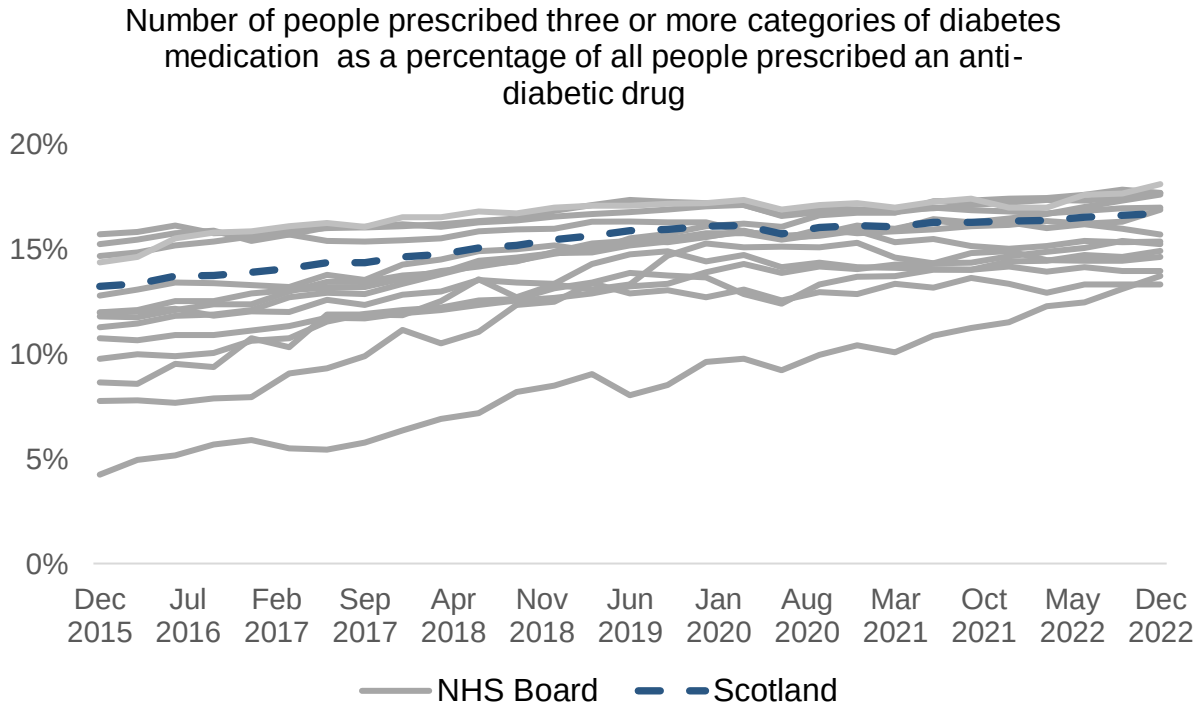
- Falls risk
- Mild frailty
- Tight blood pressure control
- Tight diabetic control
- Less suitable medication with comorbidities
- Consider most appropriate anti-diabetic medication
- Duration of treatment course (antidepressant)
- Unnecessary medicine – furosemide

14. National Therapeutic Indicators

National Therapeutic Indicators (NTIs), use prescription data to provide a measure of prescribing activity in specified therapeutic areas and a comparison across NHS Boards, Health and Social Care Partnerships (HSCPs), GP clusters and GP practices. The online tool shows a number of NTIs across varying localities.[70]

Polypharmacy in Diabetes (see section 2)
This NTI highlights individuals prescribed three or more categories of anti-diabetic drugs. These patients may also be prescribed additional medication for other comorbidities, further increasing the risks associated with polypharmacy.

Chart 11: Polypharmacy in Diabetes



- Polypharmacy can be appropriate, ensuring that people with diabetes achieve target HbA1c levels.
- Polypharmacy can also be inappropriate either;
    - due to over treatment, e.g., increasing risks of hypoglycaemia and falls;
    - ineffective polypharmacy resulting in increased risks of adverse effects, but no benefit in treatment outcomes.
- The various categories of anti-diabetic medication have differing effects on glycaemic control and therefore those less effective in achieving the target HbA1c should be reviewed.
- Polypharmacy increases the risk of adverse drug reactions.
- The 7-Steps medication review process should be used during medicine reviews.

- Prescribers should work with patients to develop an understanding of the importance of self-management and the successful achievement of goals. This will include aspects such as Medication sick day guidance and lifestyle changes.

Action required by NHS boards/clusters/practices:

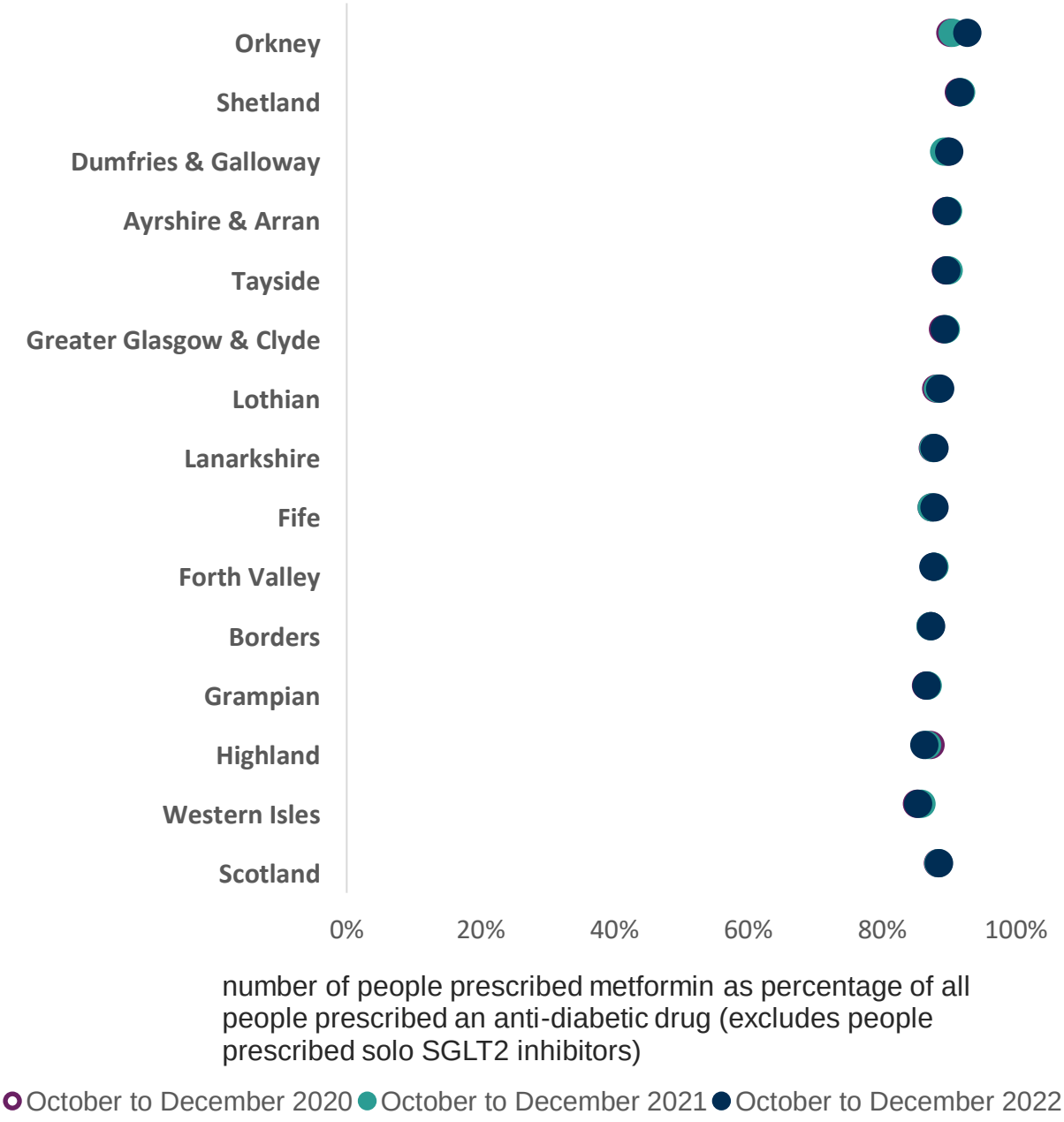
- It is currently possible to identify people on triple therapy in GP practice and it is recognised that many people with T2DM will require triple therapy for disease control. However, the risks associated with this increase with age/frailty and comorbidity.
- GP Clusters and practices can review their data with others in the board and consider what quality improvement projects may be suitable based on available data.
- Identify individuals who are:
    - prescribed more anti-diabetic medication than required to meet target glycaemic control and reduce therapy
    - Safety issue: no evidence to support co-prescribing of DPP-4i/gliptins and GLP-1RA and this should be avoided. Action to stop gliptin
    - within target HbA1c range but prescribed medication with less efficacy– stop less/ ineffective therapies
    - not at target HbA1c despite polypharmacy. Action change in therapy to achieve target glycaemic control, especially less efficacious medication. Prioritise younger individuals for more aggressive treatment
    - prescribed selected anti-diabetic medication less suitable/contra-indicated for comorbidities and prescribe suitable alternative
- NHS Boards should review formulary treatment algorithms.
- Utilise clinical decision support tools to aid prescribers in treatment choices including Manage Medicines app/website.
- Review people with dual diagnosis of T2DM, depression and poor glycaemic control.

Metformin as percentage of all people prescribed an anti-diabetic drug (see section 5)

Metformin remains first line treatment for majority of patients. This NTI should have a high percentage for this indicator.

- Metformin should be prescribed first line unless there is a contraindication (eGFR<30ml/min, or lactic acidosis) or true intolerance (which can be reduced by prescribing sustained release preparations).
- There should be a high percentage of patients who are prescribed metformin.

Chart 12: Metformin as percentage of all people prescribed an anti-diabetic drug



Action required by NHS boards/clusters/practices:

- NHS Boards/MCNs/Prescribing groups should review their data in comparison to other boards to determine areas of unwarranted variation.
- GP Clusters and practices can review their data with other practices or cluster regions to show variation in their prescribing practices.
- Identify missing individuals: Clusters and practices should identify those who are suitable for metformin but not currently prescribed this. Prioritise younger individuals for more aggressive treatment.

- Safety consideration: Ensure appropriate dosage in line with renal function, e.g. metformin dose should be reduced if eGFR falls below 45 and stopped if eGFR<30.

Medication should be reviewed in line with the 7-Steps.

Individuals with Type 2 diabetes and existing atherosclerotic cardiovascular disease (ASCVD) who may benefit from treatment with SGLT-2i and/ or GLP-1RA. (see Section 6)

This indicator should have a high level of SGLT-2i and/or GLP-1RA prescribing, indicating good practice, with suitable patients receiving appropriate medication.

- These medicines have positive evidence for cardiovascular and renal outcomes and additional indications for use – ASCVD, HF, CKD – (independent of glycaemic control).
- Due to these comorbidities, there may be individuals with T2DM who may benefit from these therapies, especially if glycaemic control not at target.
- A higher level of SGLT-2i and/or GLP-1RA indicates good practice, with suitable patients receiving appropriate medication.
- Prioritise younger individuals for more aggressive treatment.

N.B. PIS prescribing data is unable to directly identify those with a read code diagnosis of ASCVD, chronic HF or CKD. Therefore, a surrogate marker of those co-prescribed nicorandil and/or GTN/ISMN for ASCVD is utilised.

The NTI identifies individuals prescribed SGLT-2i and/or GLP-1RA in the same quarter as a nitrate and/or nicorandil, aspirin or clopidogrel, as a proportion of people prescribed anything from BNF 060102 in the same quarter as a nitrate and/or nicorandil, aspirin or clopidogrel. This surrogate marker indicates there is a proportion of those with T2DM who may benefit from treatment with SGLT-2i* or GLP-1RA, irrespective of glycaemic control.

Chart 13: Individuals prescribed SGLT-2I and/or GLP-1RA in the same quarter as existing drug therapy suggestive of ASCVD

GP Clusters should identify practices which are lower users of SGLT-2i/GLP-1RA and consider if there may be unwarranted variation.

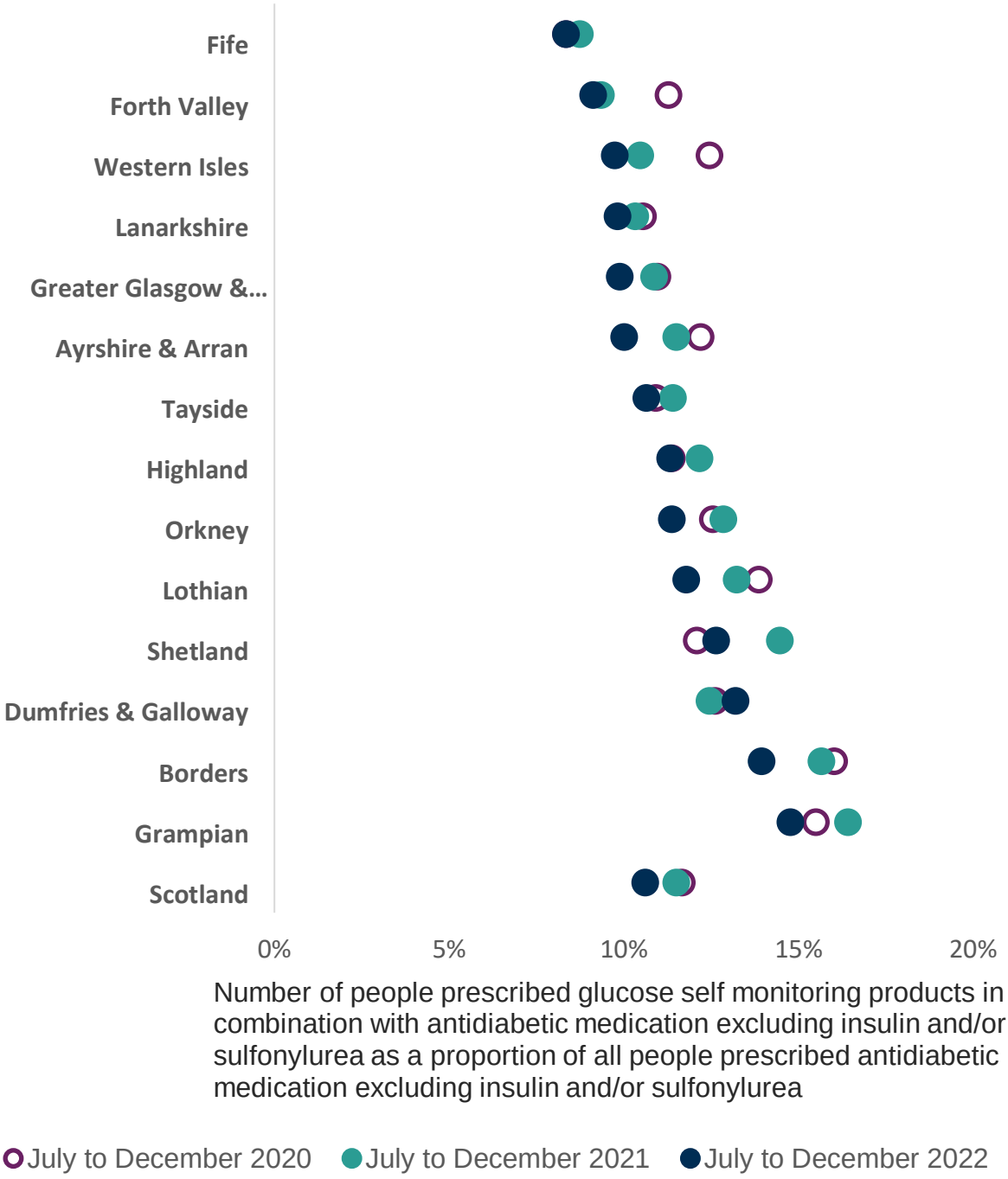
Action required by NHS boards/clusters/practices:

- Identify individuals who would benefit from prescribing of SGLT-2i* or GLP-1RA:
  - Individuals with T2DM with existing CVD but not prescribed SGLT-2i*/GLP-1RA.

    - Individuals with T2DM with high ASSIGN/QRISK2 score not on SGLT-2i*/GLP-1RA.
    - Individuals with T2DM with renal disease, based on (eGFR and) ACR values – identified individuals should have all meds reviewed to ensure doses appropriate for degree of renal impairment. NB it is acknowledged that many people will not have an ACR recorded and therefore to aid identification of suitability for SGLT-2i*/GLP-1RA prescribing, screening with eGFR may be required initially, with an ACR recorded thereafter.
- Target younger individuals with T2DM as priority candidates for more aggressive treatment.
- Boards to review formularies/treatment algorithms to ensure prescribing in line with current guidance.
- The 7-Steps medication review process should be used.

Self-monitoring of glucose: proportion of people prescribed glucose self-monitoring products in combination with antidiabetic medication excluding insulin and/or sulfonylurea, as a proportion of all people prescribed antidiabetic medication excluding insulin and/or sulfonylurea (see section 8).

Chart 14: Self-monitoring of glucose



Self-Monitoring Glucose (SMG) is not generally recommended in management of type 2 diabetes.

This indicator should have a low value.

Do not routinely offer SMG for adults with type 2 diabetes unless the person is prescribed insulin, there is evidence of hypoglycaemic episodes, the person is on

oral medication that may increase their risk of hypoglycaemia while driving or operating machinery, the person is pregnant or is planning to become pregnant.

Action required by NHS boards/clusters/practices:

- SMG should be prescribed in line with local MCN guidance and formulary recommendations. There is no evidence to suggest greater clinical benefit is achieved by using more expensive test strips over the less costly ones and therefore NHS Boards should select appropriate formulary products.
- GP Clusters and practices should review their data with others in the board and down to practice level, considering practices with higher level of SMG prescribing.
- Identify individuals prescribed SMG and review to ensure if ongoing use is required.

Number of people aged ≥ 75 years prescribed sulfonylureas as a percentage of all people aged ≥ 75 years prescribed an anti-diabetic drug (see Section 9).

This current indicator continues to show that there are high levels of SU prescribing in those aged 75 years or over.

A low percentage in this indicator would indicate alignment with current best practice prescribing guidance.

Although this has reduced, most recent data shows that across Scotland there is a significant proportion over those aged 75 years or over are still being prescribed an SU, increasing their risks of hypo glycaemia and subsequent falls and hospitalisation.

Chart 15: Prescribing of sulfonylureas in those aged 75 years or over

Action required by NHS boards/clusters/practices:

- GP Clusters and practices can review their data in comparison to other board regions to determine areas of unwarranted variation.
- GP Clusters and practices can review their data with others in the board down to individual practice level, considering practices with higher percentage of SU prescribing and why these may be outliers in prescribing.
- Other therapies are available with long term outcome data and lower risk of hypoglycaemia that may be more appropriate.

Abbreviations

ACEi	angiotensin converting enzyme inhibitor
ADA	American Diabetes Association
ACR	Urine albumin to creatinine ratio
ADR	adverse drug reactions
ARB	angiotensin receptor blocker
ASCVD	atherosclerotic cardiovascular disease (e.g. angina, myocardial infarction, stroke)
BMI	Body Mass Index
BNF	British National Formulary
CFS	Clinical Frailty Scale
CKD	chronic kidney disease
CrCl	creatinine clearance
CVD	cardiovascular disease
DKA	diabetic ketoacidosis
DPP-4i	dipeptidyl peptidase-4 inhibitor, e.g., alogliptin, linagliptin, sitagliptin, saxagliptin, vildagliptin
DSMES	diabetes self-management education and support
EASD	European Association for the Study of Diabetes
eDKA	euglycaemic diabetic ketoacidosis
eGFR	estimated glomerular filtration rate
FGM	flash glucose monitor
GLP-1RA	glucagon-like peptide 1 receptor agonist, e.g., dulaglutide, exenatide, liraglutide, lixisenatide, and semaglutide
HbA1c	glycated haemoglobin
(c)HF	(chronic) heart failure
LVH	left ventricular hypertrophy
MACE	major adverse cardiovascular events
MDD	major depressive disorder
MHRA	Medicines and Healthcare products Regulatory Agency
NICE	National Institute for Health and Clinical Excellence
SG	Scottish Government
SGLT-2i	sodium-glucose co-transporter-2 inhibitor, e.g. canagliflozin, dapagliflozin, empagliflozin
SIMD	Scottish Index of Multiple Deprivation
SMG	self-monitoring glucose
SU	sulfonylurea
TZD	thiazolidinediones e.g. pioglitazone

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