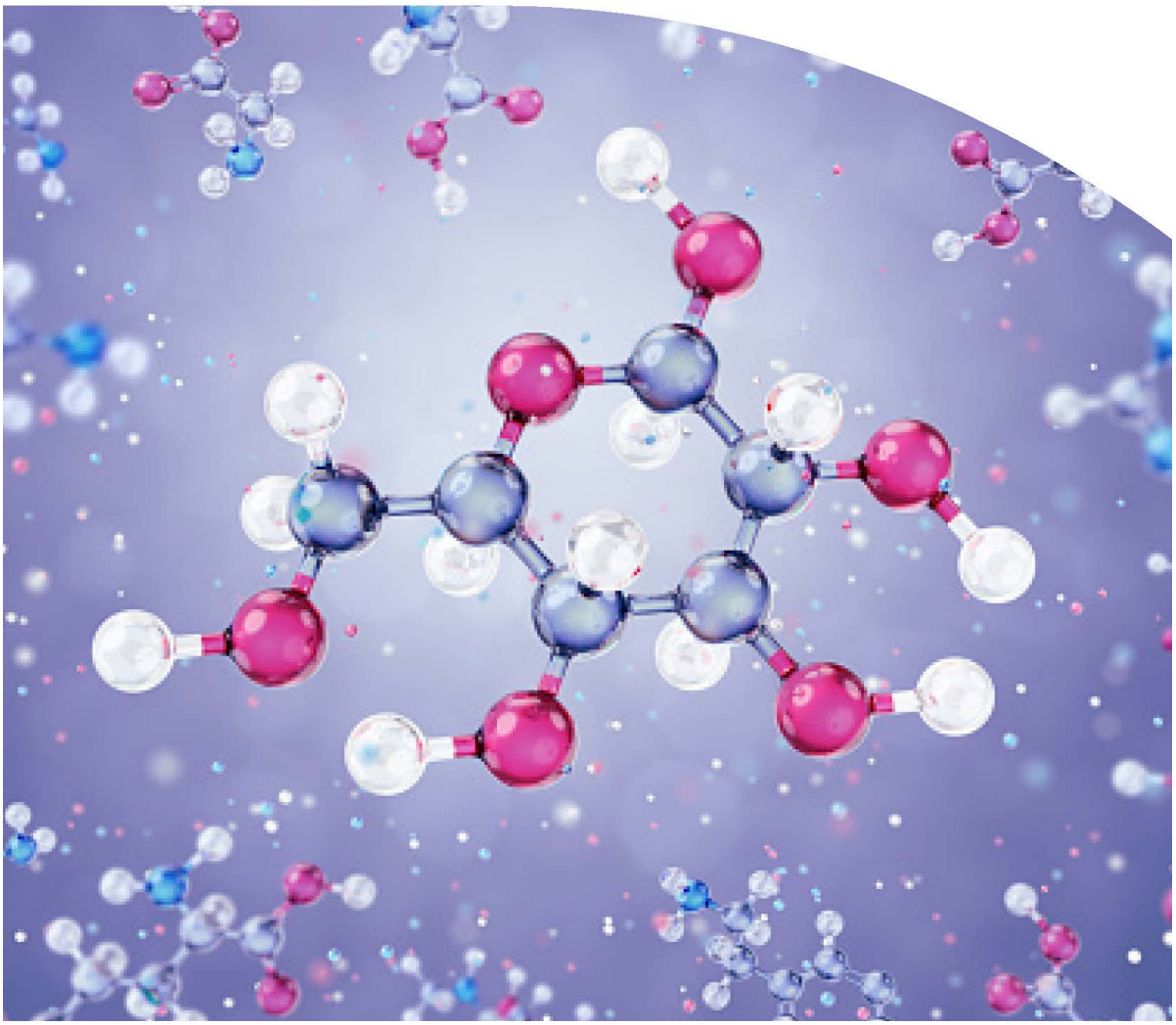
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Management of type 2 diabetes:

A handbook for general practice



Last updated: 29 10 2026

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Table of abbreviations

13vPCV	13-valent pneumococcal conjugate vaccine
23vPPV	23-valent pneumococcal polysaccharide vaccine
1hPG	One-hour plasma glucose
2hPG	Two-hour plasma glucose
ABI	Ankle–brachial pressure index
ACE	Angiotensin-converting enzyme
ACEi	Angiotensin-converting enzyme inhibitor
ACR	Albumin-to-creatinine ratio
ADA	American Diabetes Association
ADEA	Australian Diabetes Educators Association
ADIPS	Australian Diabetes in Pregnancy Society
ADS	Australian Diabetes Society
AGP	Ambulatory glucose profile
AIHW	Australian Institute of Health and Welfare

APD	Accredited practising dietitian
ARB	Angiotensin receptor blocker
AUSDRISK	Australian type 2 diabetes risk assessment tool
BGL	Blood glucose level
BMI	Body mass index
BP	Blood pressure
CCM	Chronic care model
CDE	Credentialled diabetes educator
CGM	Continuous glucose monitoring
CKD	Chronic kidney disease
CrCl	Creatinine clearance
CSII	Continuous subcutaneous insulin infusion
CVD	Cardiovascular disease
DDS	Diabetes Distress Scale
DiRECT	Diabetes Remission Clinical Trial
DKA	Diabetic ketoacidosis
DOAC	Direct oral anticoagulant

DPP-4i	Dipeptidyl peptidase-4 inhibitor
DR	Diabetes-related retinopathy
eGDM	Early gestational diabetes
dTpa	Diphtheria-tetanus-acellular pertussis
eGFR	Estimated glomerular filtration rate
FBG	Fasting blood glucose
FlashGM	Flash glucose monitoring
FPG	Fasting plasma glucose
FITTER	Forum for Injection Technique and Therapy Expert Recommendations
GAD	Glutamic acid decarboxylase
G-CSF	Granulocyte colony-stimulating factor
GDM	Gestational diabetes
GI	Glycaemic index
GLP-1	Glucagon-like peptide-1
GLP-1RA	Glucagon-like peptide-1 receptor agonist
GP	General practitioner
GPMP	GP management plan

HAPO	Hyperglycemia and Adverse Pregnancy Outcome study
HbA1c	Glycated haemoglobin
HDL-C	High-density lipoprotein cholesterol
HHS	Hyperosmolar hyperglycaemic state
HIV	Human immunodeficiency virus
IA-2	Insulinoma antigen-2
ICHOM	International Consortium for Health Outcomes Measurement
IDSA	Infectious Diseases Society of America
IFCC	International Federation of Clinical Chemistry
IFG	Impaired fasting glucose
IGT	Impaired glucose tolerance
IUCD	Intrauterine contraceptive device
IWGDF	International Working Group on Diabetic Foot
LADA	Latent autoimmune diabetes of adults
LAGB	Laparoscopic adjustable gastric banding
LDL-C	Low-density lipoprotein cholesterol
MBS	Medicare Benefits Schedule

MI	Myocardial infarction
MALFD	Metabolic-associated fatty liver disease
NACCHO	National Aboriginal Community Controlled Health Organisation
NDSS	National Diabetes Services Scheme
NHMRC	National Health and Medical Research Council
NICE	National Institute for Health and Care Excellence
NSAID	Non-steroidal anti-inflammatory drug
OGTT	Oral glucose tolerance test
OSA	Obstructive sleep apnoea
Overt DIP	Overt diabetes in pregnancy
PAD	Peripheral arterial disease
PAID	Problem Areas in Diabetes
PBS	Pharmaceutical Benefits Scheme
PCSK9	Proprotein convertase subtilisin/kexin type 9
PHN	Primary health network
PHQ-2	Patient Health Questionnaire-2

PHQ-9	Patient Health Questionnaire-9
PMOS	Polyendocrine metabolic ovarian syndrome
POGTT	Pregnancy oral glucose tolerance test
QEBR	Qualified evidence-based recommendation
RACGP	The Royal Australian College of General Practitioners
RBG	Random blood glucose
RCT	Randomised controlled trial
RPE	Rate of perceived exertion
RR	Relative risk
RSV	Respiratory syncytial virus
SGLT2	Sodium–glucose cotransporter 2
SGLT2i	Sodium–glucose cotransporter 2 inhibitor
SIGN	Scottish Intercollegiate Guidelines Network
SINBAD	Site, Ischaemia, Neuropathy, Bacterial infection, Area, Depth
SMBG	Self-monitoring of blood glucose
SNAP	Smoking, nutrition, alcohol, physical activity
TBI	Toe–brachial index
TGA	Therapeutic Goods Administration

TZD	Thiazolidinedione
UACR	Urine albumin-to-creatinine ratio
VEGF	Vascular endothelial growth factor
VLED	Very-low-energy diet

Introduction

Diabetes is a national health priority. The Australian National Diabetes Strategy 2021–2030 (https://www.health.gov.au/resources/publications/australian-national-diabetes-strategy-2021-2030?language=en) , released by the Australian Government in November 2021, has been developed in consultation with key stakeholders and people with diabetes.[1] It outlines a 'roadmap' to address diabetes in Australia. Implementation of these priorities will impact primary care across a range of outcomes, along with the inevitable burden of rising numbers of people affected by diabetes and those at risk of developing this disease.

Almost 1.5 million Australians with diabetes have registered with the National Diabetes Services Scheme (NDSS), with more than 85% having type 2 diabetes.[2] The number of people with type 2 diabetes is growing, most likely the result of rising overweight and obesity rates, lifestyle and dietary changes and an ageing population. If trends continue, the number of people in Australia diagnosed with diabetes may increase to 3.6 million by 2050.[3]

General practice plays a central role in the early identification and optimal management of people with type 2 diabetes, which can significantly reduce the risk of coronary artery disease, stroke, kidney failure, limb amputations and vision loss associated with the condition. General practice maintains a primary role from identifying those at risk, right through to caring for patients at the end of life. These guidelines give up-to-date, evidence-based information tailored for general practice to support general practitioners (GPs) and their teams in providing high-quality clinical management tools.

In developing the 2024 edition of *Management of type 2 diabetes: A handbook for general practice*, The Royal Australian College of General Practitioners (RACGP) has focused on factors relevant to current Australian clinical practice. The RACGP has used the skills and knowledge of your general practice peers who have an interest in diabetes management and are members of the RACGP Specific Interests Diabetes Network.

This publication has been produced in accordance with the rules and processes outlined in the RACGP's conflicts of interest policy (https://www.racgp.org.au/the-racgp/governance/organisational-policies/conflict-of-interest) .

This edition represents 25 years of a successful relationship between the RACGP and Diabetes Australia. We acknowledge the support and contributions of the experts, writers, reviewers (listed under 'Acknowledgements (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/supplementary-material/acknowledgements) ') and RACGP staff in the development of these guidelines.

How to use this handbook

This handbook has been designed to provide pragmatic, evidence-based recommendations for use in general practice, and adopts the most recent recommendations from organisations including Diabetes Canada, the American Diabetes Association (ADA) and other relevant sources.

The table of recommendations include the reference or source and the grade of each recommendation. In cases where graded recommendations are not available or current, the expert advisory group has considered the results of systematic reviews and primary research studies to formulate the overall recommendation. A 'consensus-based recommendation' denotes a recommendation that was formulated in the absence of high-quality evidence; the RACGP Diabetes Handbook expert advisory group reached a consensus expert opinion to include the point in the resource.

In each section, where possible, information is presented as:

- recommendations
- clinical context (or what you need to know)
- in practice (or what you can do).

Implementation and the importance of person-centred care

When addressing the recommendations in this handbook to provide care needs for people living with diabetes, implementation of person-centred care is essential. Management that follows this principle incorporates an individual's experience of care and treats them as partners in their own healthcare.[5]

In practice, this means providing care that is 'respectful of and responsive to individual patient preferences, needs and values, and ensures that patient values guide all clinical decisions'.[6] As a result, the person with diabetes is more likely to engage actively in self-management and achieve optimal health outcomes.[7]

Patients and their carers should be offered a structured, evidence-based education program at the time of diagnosis, with an annual update and review.[8] Providing education to people with diabetes about their condition and its treatment, including education to support self-management, is an integral part of diabetes care.[9,10] More information is available from Diabetes Australia (https://www.diabetesaustralia.com.au/) and Australian Diabetes Educators Association (ADEA) ADEA has developed a person-centred care toolkit (https://www.ndss.com.au/about-diabetes/resource s/find-a-resource/person-centred-care-toolkit/) to support health care professionals.

For examples of a structured, person-centred care plan, refer to the section 'Assessment of the patient with type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/assessment-of-the-person-with-type-2-diabetes)'. Evidence-based, structured self-management training programs are available through the National Diabetes Services Scheme (NDSS) (https://www.ndss.com.au/) . Note that although many of the assessments discussed in this handbook are performed informally during a routine consultation, systems should be developed within the practice to allow appropriate assessment, review and

management of individual patients. These are discussed in an article by Borg et al. (2019)[11] and on the International Consortium for Health Outcomes Measurement (ICHOM) (https://www.ichom.org/portfolio/diabetes/) website.

Supporting Aboriginal and Torres Strait Islander people

Information specific to Aboriginal and Torres Strait Islander people is highlighted throughout the text. GPs are also encouraged to refer to the type 2 diabetes topic in the National Aboriginal Community Controlled Health Organisation (NACCHO)–RACGP National guide to preventive healthcare for Aboriginal and Torres Strait Islander people (https://www.racgp.org.au/national-guide) , which includes strengths-based practical recommendations to support the prevention of type 2 diabetes.

Recommendations in some areas of diabetes care are different for Aboriginal and Torres Strait Islander people. It is therefore important to identify, record and report the Aboriginal and Torres Strait Islander status of patients.

The RACGP has a position paper (https://www.racgp.org.au/the-racgp/faculties/atsi/position-statements/identification-of-aboriginal-and-torres-strait-isl) outlining the processes of identification.

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Type 2 diabetes: Goals for optimum management

The following tables list goals for the optimum management for all people with type 2 diabetes. For guidance on specific assessment intervals, advice and arrangements, refer to the relevant sections of this handbook.

Individual goals	
Encourage all people with type 2 diabetes to approach/reach these goals	
Diet	Advise individual dietary reviews Refer to 'Lifestyle interventions for the management of type 2 diabetes: Diet (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/lifestyle-interventions-for-the-management-of-type/diet) '
BMI	Advise a goal of 5–10% weight loss for people who are overweight or obese with type 2 diabetes Refer to 'Weight management interventions for type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/weight-management-interventions-for-type-2-diabete) '
Physical activity	Children and adolescents: Aim for at least 60 min/day of moderate to vigorous physical activity, plus muscle- and bone-strengthening activities at least three days per week Adults: Aim for 150 minutes of aerobic activity, plus two to three sessions of resistance exercise (to a total of ≥60 minutes), per week Refer to 'Lifestyle interventions for the management of type 2 diabetes: Physical activity (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/lifestyle-interventions-for-the-management-of-type/physical-activity) '

Cigarette consumption	Zero per day Refer to 'Lifestyle interventions for the management of type 2 diabetes: Smoking cessation (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/lifestyle-interventions-for-the-management-of-type/smoking-cessation) '
Alcohol consumption	No more than 10 standard drinks per week and four on any one day Refer to 'Lifestyle interventions for the management of type 2 diabetes: Alcohol consumption (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/lifestyle-interventions-for-the-management-of-type/alcohol-consumption) '
Blood glucose monitoring	Advise 4–7 mmol/L fasting and 5–10 mmol/L postprandial blood glucose levels SMBG is recommended for patients with type 2 diabetes who are using sulfonylureas and/or insulin. Education should be provided regarding the frequency and timing of insulin dose based on SMBG For people not on insulin, the need for and frequency of SMBG should be individualised, depending on the type of glucose-lowering medications, level of glycaemic management and risk of hypoglycaemia, as an aid to self-management SMBG is recommended in pregnancy complicated with diabetes or gestational diabetes SMBG is also recommended for people with hyperglycaemia arising from intercurrent illness (see ADEA clinical guidelines for sick days (https://www.adea.com.au/resources/standards-position-statements-and-other-resources/adea-clinical-guidelines/)). It may be helpful in haemoglobinopathies or other conditions where HbA1c measurements may be unreliable

ADEA, Australian Diabetes Educators Association; BMI, body mass index; HbA1c, glycated haemoglobin; SMBG, self-monitoring of blood glucose.

Clinical management goals

Treatment targets for people with type 2 diabetes include the following. For a comprehensive list of assessments and screening intervals, refer to 'Assessment of the patient with type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/assessment-of-the-person-with-type-2-diabetes)'.	
HbA1c	Target needs individualisation according to patient circumstances Generally ≤7% (53 mmol/mol)
Lipids	Initiation of pharmacotherapy in primary prevention is dependent on the assessment of absolute CVD risk (refer to the Australian CVD risk calculator (https://www.cvdcheck.org.au/calculator) , which assess multiple risk factors and summates risk rather than using individual parameters). Once therapy is initiated, Australian guideline-specified targets should be used as a guide to treatment. For secondary prevention, treatment to target an LDL cholesterol reduction of ≥50% from baseline and an LDL cholesterol goal of <1.4mmol/L
Blood pressure	Treatment targets should be individualised and monitored for side effects from medications used to lower blood pressure Lower blood pressure targets may be considered for younger people and for secondary prevention in those at high risk of stroke The target for people with diabetes and CKD remains <130/80 mmHg. However, ≤140/90 mmHg is still considered a general target (see the Heart Foundation's 2016 Guideline for the diagnosis and management of hypertension in adults (https://assets.contentstack.io/v3/assets/blt8a393bb3b76c0ede/bltbf3d36e10b48f01f/65b0963ea933e532ae0286de/01_Hypertension-guideline-2016_WEB.pdf))
Urine albumin excretion	UACR: • Women: <3.5 mg/mmol • Men: <2.5 mg/mmol Timed overnight collection: <20 µg/min; spot collection: <20 mg/L

Vaccination	Recommended immunisations: influenza, pneumococcus, dTpa, COVID-19, RSV (age >60 years) Consider: hepatitis B (if travelling), herpes zoster Consult the Australian immunisation handbook (https://immunisationhandbook.health.gov.au/contents/vaccine-preventable-diseases) for specific advice

CKD, chronic kidney disease; CVD, cardiovascular disease; dTpa, diphtheria-tetanus-acellular pertussis; HbA1c, glycated haemoglobin; LDL, low-density lipoprotein; RSV, respiratory syncytial virus; UACR, urine albumin-to-creatinine ratio.

Change history

21/08/2025

Vaccination section updated: RSV (age >60 years) is now listed as 'Recommended immunisations' in line with the Australian immunisation handbook. Previously, it was listed under 'Consider'.

About the RACGP

The RACGP is Australia's largest professional general practice organisation and represents urban and rural general practitioners (GPs), representing more than 50,000 members working in or towards a career in general practice.

The RACGP is responsible for defining the nature of the general practice discipline, setting the standards and curriculum for education and training, maintaining the standards for high-quality clinical practice and supporting GPs in their pursuit of excellence in patient care and community service. We offer our members access to a vast suite of clinical resources, business support tools and education programs, and are proud to advocate for the general practice profession on behalf of all GPs.

The RACGP advocates and promotes high-quality diabetes management and care through:

- regular articles in the Australian Journal of General Practice (https://www1.racgp.org.au/ajgp/home) ((https://www1.racgp.org.au/ajgp/home) AJGP (https://www1.racgp.org.au/ajgp/home)) (https://www1.racgp.org.au/ajgp/home) , the most widely read peer-reviewed general practice journal in Australia
- online general practice education provided by gplearning (https://www.racgp.org.au/education/professional-development/online-learning/gplearning) , the RACGP's online learning portal
- advocacy on key issues related to diabetes management
- partnership with Diabetes Australia in the production of this handbook
- giving members access to an extensive library collection, with many items available electronically
- the following flagship publications:
    - Guidelines for preventive activities in general practice (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/preventive-activities-in-general-practice/about-the-red-book) (Red Book) (https://www.racgp.org.au/clinical-resources/clinical-guidelines/guidelines-by-topic/preventive-health/red-book)
    - Putting prevention into practice: Guidelines for the implementation of prevention in the general practice setting (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/green-book) (Green Book) (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/green-book)
    - Smoking, nutrition, alcohol, physical activity (SNAP): A population health guide to behavioural risk factors in general practice (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/snap)
    - National guide to preventive healthcare for Aboriginal and Torres Strait Islander people (https://www.racgp.org.au/national-guide) .

About Diabetes Australia

Diabetes Australia is the national body for all people living with diabetes and those at risk, dedicated to reducing the incidence and impact of diabetes on people, health systems and society.

Diabetes Australia works with people living with or at risk of diabetes, their families and carers, health professionals, researchers, funders, other diabetes organisations and the community to positively change people's lives.

Diabetes Australia combines national voice and leadership with local communities and engagement in pursuit of a bold ambition – a future where diabetes can do no harm.

Diabetes Australia key focus areas:

- **Champion** – listen to the diabetes community to amplify their voice and champion the diabetes cause to drive change.
- **Change** – focus efforts on advocating and delivering on priorities that have the biggest impact on changing people's lives and the health system.
- **Connect** – collaborate locally, nationally and internationally; connect people with lived experience of diabetes and health and other care professionals with research and evidence to support change.
- **Care** – a trusted diabetes services provider, developing and delivering support, coordinated care, locally and nationally, in partnership with other diabetes organisations to change people's lives.
- **Cure** – lead the agenda, grow funding for and commission research and data to build the evidence for change to prevent, treat and cure diabetes.

Working with general practice

Diabetes Australia undertakes a range of initiatives to inform general practitioners and other health professionals in the field of diabetes management, ensuring that the latest information on the optimum care for people with diabetes and the latest developments in diabetes management is available to frontline healthcare providers. Diabetes Australia strives to improve and coordinate healthcare services and systems across the continuum of care.

The National Diabetes Services Scheme

Diabetes Australia administers the National Diabetes Services Scheme (https://www.ndss.com.au/) (NDSS) on behalf of the Australian Government. The NDSS aims to enhance the capacity of people with diabetes to understand and self-manage their life with diabetes, and provides access to services, support and subsidised diabetes products.

Updates in this edition

Published November 2024

This updated edition of Management of type 2 diabetes: A handbook for general practice (Diabetes Handbook) contains new sections on the following topics:

- Remission of Type 2 diabetes
- Weight management interventions for type 2 diabetes (previously a subsection of 'Lifestyle interventions for the management of type 2 diabetes')
- Sleep and diabetes (a subsection under 'Managing risks and other impacts of diabetes')
- Disability, dementia, cognitive decline and hearing impairment (a subsection under 'Managing risks and other impacts of diabetes')

Significant updates to existing sections include:

- Early-onset type 2 diabetes
    - updated information on early-onset type 2 diabetes
- Medical management of glycaemia
    - updated information on newer therapeutic agents, such as combined glucose-dependent insulinotropic polypeptide (GIP)/glucagon-like peptide-1 receptor agonists (GLP-1RA)
- Use of technology in type 2 diabetes management
    - updated information on technology for type 2 diabetes management
- Complications
    - type 2 diabetes and cardiovascular risk – incorporation of the updated cardiovascular disease risk assessment tool and updates on the cardiovascular effects of sodium–glucose cotransporter 2 inhibitors (SGLT2i) and GLP-1RAs
    - diabetes-related eye disease – updates on rapid reductions in glycated haemoglobin and risks of advancing existing retinopathy
    - updates on the management of chronic kidney disease in people with diabetes
- Type 2 diabetes and mental health
    - updates on the management of diabetes and mental health
- Managing risks and other impacts of type 2 diabetes
    - vaccination advice updates, including respiratory syncytial virus
    - preoperative medication advice, including SGLT2i and GLP-1RAs

Post-publication changes

Key changes to the Diabetes handbook since its release in November 2024

01/08/2025

Gestational Diabetes

Content has been updated to align with ADIPS 2025 Consensus Recommendations for the Screening, Diagnosis and Classification of Gestational Diabetes, which provides updated diagnostic glucose thresholds for GDM and clarifies approaches to early pregnancy screening for women with risk factors for hyperglycaemia in pregnancy.

21/08/2025

Type 2 diabetes: Goals for optimum management

Vaccination section updated: RSV (age >60 years) is now listed as ‘Recommended immunisations’ in line with the Australian immunisation handbook. Previously, it was listed under ‘Consider’.

Summary of recommendations

Defining and diagnosing type 2 diabetes

Recommendation	Grade	References	Recommended as of:
General population of normal risk Assessing the risk of diabetes is recommended every 3 years for those in the general population aged >40 years without specific risk factors. Use a validated screening tool to assess the risk of diabetes, such as the Australian type 2 diabetes risk assessment tool (https://www.health.gov.au/resources/apps-and-tools/the-australian-type-2-diabetes-risk-assessment-tool-ausdrisk) (AUSDRISK).	Conditionally recommended	1	14/11/2024

Aboriginal and Torres Strait Islander people All adults aged 18 years and over should be screened on an opportunistic basis and/or annually. 1. Measure fasting blood glucose (FBG) or glycated haemoglobin (HbA1c): A laboratory test is preferable, but fingerprick testing is an alternative. If an FBG is impractical, perform a random (non-fasting) venous test or an HbA1c (which is not affected by fasting status). 2. Perform an oral glucose tolerance test (OGTT) in those with equivocal results (FBG 5.5–6.9 mmol/L, or random glucose 5.5–11.0 mmol/L*). Children/adolescents with the following additional risk factors should be screened** from the age of 10 years (or at the onset of puberty, whichever occurs first): • overweight or obesity (body mass index*** [BMI] ≥85th or ≥95th percentile, respectively, and/or waist circumference to height ratio >0.5) • maternal history of diabetes or gestational diabetes (GDM) • first-degree relative with type 2 diabetes • signs of insulin resistance (acanthosis nigricans) • other conditions associated with obesity and metabolic syndrome (eg dyslipidaemia, polyendocrine metabolic ovarian syndrome [PMOS]) • use of psychotropic medication. *Impaired fasting glucose (IFG) = fasting glucose 6.1–6.9 mmol/L; impaired glucose tolerance (IGT) = non fasting glucose ≥7.8 to <11.0 mmol/L.	Recommended (Strong)	2	14/11/2024

**Repeat annually if HbA1c <5.7%; repeat in six months if HbA1c 5.7–6.4%. ***BMI should be calculated using age- and gender-appropriate calculator/percentile growth charts.			

High-risk population* In asymptomatic adults at high risk* of developing type 2 diabetes, screen using fasting blood glucose (FBG) or glycated haemoglobin (HbA1c) every 3 years (every 12 months for people with impaired glucose tolerance [IGT] and impaired fasting glucose [IFG]**) *Adults at high risk of developing type 2 diabetes include people with any one of the following: • overweight or obesity and age ≥40 years • overweight or obesity, age 18–40 years and hypertension • overweight or obesity, age 18–40 years and clinical evidence of insulin resistance (acanthosis nigricans, dyslipidaemia) • a first-degree relative with type 2 diabetes • a history of a cardiovascular event (eg acute myocardial infarction, angina, peripheral vascular disease or stroke) • certain ethnicities (Aboriginal and Torres Strait Islander***, South Asian, South-east Asian, North African, Latin American, Middle Eastern, Māori or Pacific Islander people [includes individuals of mixed ethnicity]) • a history of GDM • PMOS • taking antipsychotic medication. An AUSDRISK score ≥12 also indicates high risk. **IFG = fasting glucose 6.1–6.9 mmol/L; IGT = non fasting glucose ≥7.8 to <11.0 mmol/L. ***Aboriginal and Torres Strait Islander people refer to recommendation above	Conditionally recommended	1	14/11/2024

Individuals with impaired glucose metabolism, defined by fasting glucose, OGTT or HbA1c should be screened: • with FBG or HbA1c* • every 12 months. *If impaired glucose metabolism was diagnosed only on the two-hour plasma glucose of the OGTT, consider using the OGTT for subsequent screenings.	B C	3, 4	14/11/2024

References

1. The Royal Australian College of General Practitioners (RACGP). Guidelines for preventive activities in general practice.10th edn. RACGP, 2024 (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/guidelines-for-preventive-activities-in-general-pr/preamble/introduction) . [Accessed 4 September 2024].
2. National Aboriginal Community Controlled Health Organisation and The Royal Australian College of General Practitioners (RACGP). National guide to preventive healthcare for Aboriginal and Torres Strait Islander people. 4th edn. RACGP, 2024.
3. Colagiuri S, Davies D, Girgis S, Colagiuri R. National evidence based guideline for case detection and diagnosis of type 2 diabetes. Diabetes Australia and the National Health and Medical Research Council, 2009.
4. Bell K, Shaw JE, Maple-Brown L, et al. A position statement on screening and management of prediabetes in adults in primary care in Australia. Diabetes Res Clin Pract 2020;164:108188. doi: 10.1016/j.diabres.2020.108188.

Remission of type 2 diabetes

Recommendation	Grade	References	Recommended as of:
Intensive lifestyle changes, including weight loss, may achieve diabetes remission (defined as glycated haemoglobin [HbA1c] levels remaining below 6.5% [48 mmol/mol] for at least three months in the absence of glucose-lowering medications). *Consensus-based recommendation formulated by the RACGP Diabetes Expert Advisory Group.	Consensus*		14/11/2024

Low-calorie (800–850 kcal/day)** diets with meal replacement products for three to five months aimed at achieving >15-kg body weight loss, followed by structured food reintroduction and increased physical activity for weight loss maintenance, should be recommended as an option to potentially induce type 2 diabetes remission to selected non-pregnant adults with a body mass index (BMI) between 27 and 45 kg/m2, type 2 diabetes duration <6 years, HbA1c <12% and not using insulin. **3,344–3,553 kJ/day. To convert from calories (kcal) to kilojoule (kJ), multiple calories by 4.18 (1 calorie = 4.18 kJ).	A, Level 1A	1	14/11/2024
Bariatric surgery*** should be recommended to non-pregnant adults with type 2 diabetes and a BMI ≥35 kg/m2 as an option to potentially induce type 2 diabetes remission. ***Metabolic surgery; refer to 'Weight management interventions for type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/gestational-diabetes) ', which explains the different types of surgeries.	A, Level 1A	1	14/11/2024
If type 2 diabetes remission criteria are met, HbA1c (or, if HbA1c unreliable, fasting plasma glucose or an oral glucose tolerance test) should be performed at a minimum interval of every six months to assess persistence of diabetes remission or relapse of diabetes.	D, Consensus	1	14/11/2024

References

1. MacKay D, Chan C, Dasgupta K, et al. Remission of type 2 diabetes: Diabetes Canada clinical practice guidelines expert working group. Can J Diabetes 2022;46(8):753–761.e8. doi: 10.1016/j.jcjd.2022.10.004.

Preventing progression to type 2 diabetes

Recommendation	Grade	References	Recommended as of:
People with impaired glucose tolerance (IGT) or impaired fasting glucose (IFG) should be referred to lifestyle intervention programs to: • achieve and maintain a 7% reduction in weight • achieve a moderate-intensity physical activity to at least 150 minutes per week	A	1	14/11/2024
People with glycated haemoglobin (HbA1c) 6.0–6.4% may also benefit from a structured weight loss and exercise program to reduce their risk of developing type 2 diabetes	D, Consensus	2	14/11/2024

References

1. American Diabetes Association Professional Practice Committee. 3. Prevention or delay of diabetes and associated comorbidities: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S43–51. doi: 10.2337/dc24-S003.
2. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada. Can J Diabetes 2018;42(Suppl 1):S1–326.

Early-onset type 2 diabetes

Recommendation	Grade	References	Recommended as of:
For people aged 18–30 years with early-onset type 2 diabetes, due to the complexity of management and higher risk of complications, consider timely referral to an endocrinologist or non-general practitioner specialist with an interest in diabetes through a shared care arrangement.	Consensus	1	14/11/2024

References

1. Wong J, Ross GP, Zoungas S, et al. Management of type 2 diabetes in young adults aged 18–30 years: ADS/ADEA/APEG consensus statement. Med J Aust 2022;216(8):422–29. doi: 10.5694/mja2.51482.

Lifestyle interventions for the management of type 2 diabetes - Physical activity

Recommendation	Grade	References	Recommended as of:
Counsel youth with type 2 diabetes to engage in 60 min/day or more of moderate- or vigorous-intensity aerobic activity, with vigorous muscle-strengthening and bone-strengthening activities at least three days/ week. Sedentary behaviours, especially prolonged screen time, should be avoided.	B	1,2	14/11/2024
Counsel most adults with type 2 diabetes to engage in 150 minutes or more of moderate- to vigorous-intensity aerobic activity per week, spread over at least three days/week, with no more than two consecutive days without activity. Shorter durations (minimum 75 min/week) of vigorous-intensity or interval training may be sufficient for younger and more physically fit individuals.	B	2	14/11/2024
For all people with diabetes, evaluate baseline physical activity and time spent in sedentary behaviour.	B	2	14/11/2024
Counsel that prolonged sitting should be interrupted every 30 minutes for blood glucose benefits.	C	2	14/11/2024

Recommend flexibility training and balance training two to three times/week for older adults with diabetes. Yoga and tai chi may be included based on individual preferences to increase flexibility, muscular strength, and balance.	C	2	14/11/2024

References

1. Huerta-Uribe N, Ramírez-Vélez R, Izquierdo M, García-Hermoso A. Association between physical activity, sedentary behavior and physical fitness and glycated hemoglobin in youth with type 1 diabetes: A systematic review and meta-analysis. Sports Med 2023;53(1):111–23. doi: 10.1007/s40279-022-01741-9.
2. American Diabetes Association Professional Practice Committee. 5. Facilitating positive health behaviors and well-being to improve health outcomes: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S77–110. doi: 10.2337/dc24-S005.

Lifestyle interventions for the management of type 2 diabetes - Smoking cessation

Recommendation	Grade	References	Recommended as of:
All people who smoke should be offered brief advice and medications to quit smoking	Recommended (Strong)	1	14/11/2024

References

1. The Royal Australian College of General Practitioners (RACGP). Supporting smoking cessation: A guide for health professionals. 2nd edn. RACGP, 2019 (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/supporting-smoking-cessation) . [Accessed 6 September 2024].

Lifestyle interventions for the management of type 2 diabetes - Alcohol consumption

Recommendation	Grade	References	Recommended as of:

People with diabetes drink no more than 10 standard drinks per week	B	1, 2	14/11/2024

References

1. Conigrave KM, Ali RL, Armstrong R, Chikritzhs TN, et al. Revision of the Australian guidelines to reduce health risks from drinking alcohol. Med J Aust 2021;215(11):518-24. doi: 10.5694/mja2.51336.
2. National Health and Medical Research Council (NHMRC). Evaluating the evidence on the health effects of alcohol consumption: Evidence evaluation report. In: Australian guidelines to reduce health risks from drinking alcohol (https://www.nhmrc.gov.au/sites/default/files/documents/attachments/Alcohol/1-evidence-evaluation-report.pdf) . NHMRC, 2020 [Accessed 6 September 2024].

Weight management interventions for type 2 diabetes

Recommendation	Grade	References	Recommended as of:
In people with overweight or obesity with diabetes, a nutritionally balanced, calorie-reduced diet should be followed to achieve and maintain a lower, healthier body weight.	A, Level 1A	1-3	14/11/2024
An intensive healthy behaviour intervention program, combining dietary modification and increased physical activity, may be used to achieve weight loss, improve glycaemic control* and reduce cardiovascular disease (CVD) risk. *glycaemic management	A, Level 1A	2-4	14/11/2024
Obesity pharmacotherapy should be considered for people with diabetes and overweight or obesity along with lifestyle changes. Potential benefits and risks must be considered.	A	5	14/11/2024

People who achieve weight loss goals should be offered long-term (≥1 year) weight maintenance support which should, at minimum, involve monthly contact, ongoing monitoring and self-monitoring of weight and regular physical activity (200–300 min/ week).	A	5,6	14/11/2024
Consider metabolic surgery as a weight and glycaemic management approach in people with diabetes with body mass index (BMI) ≥30.0 kg/m2 who are otherwise good surgical candidates.	A	5,7	14/11/2024
Metabolic surgery should also be considered for people with type 2 diabetes and BMI 30.0–34.9 kg/m2 if hyperglycaemia is inadequately managed despite optimal treatment with either oral or injectable medications.	Consensus	5,7	14/11/2024

References

1. Churuangsuk C, Hall J, Reynolds A, Griffin SJ, Combet E, Lean MEJ. Diets for weight management in adults with type 2 diabetes: An umbrella review of published meta-analyses and systematic review of trials of diets for diabetes remission. Diabetologia 2022;65(1):14–36. doi: 10.1007/s00125-021-05577-2.
2. Aas AM, Axelsen M, Churuangsuk C, et al. Evidence-based European recommendations for the dietary management of diabetes. Diabetologia 2023;66(6):965–85. doi: 10.1007/ s00125-023-05894-8.
3. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada. Can J Diabetes 2018;42(Suppl 1):S1–326.
4. García-Molina L, Lewis-Mikhael AM, Riquelme-Gallego B, Cano-Ibáñez N, Oliveras-López MJ, Bueno-Cavanillas A. Improving type 2 diabetes mellitus glycaemic control through lifestyle modification implementing diet intervention: A systematic review and meta-analysis. Eur J Nutr 2020;59(4):1313–28. doi: 10.1007/s00394-019-02147-6.
5. American Diabetes Association Professional Practice Committee. 8. Obesity and weight management for the prevention and treatment of type 2 diabetes: Standards of care in diabetes –2024. Diabetes Care 2024;47(Suppl 1):S145–57. doi: 10.2337/dc24-S008.
6. Nordmo M, Danielsen YS, Nordmo M. The challenge of keeping it off, a descriptive systematic review of high-quality, follow-up studies of obesity treatments. Obes Rev 2020;21(1):e12949. doi: 1111/obr.12949.
7. Alqunai MS, Alrashid FF. Bariatric surgery for the management of type 2 diabetes mellitus –

current trends and challenges: A review article. Am J Transl Res 2022;14(2):1160–71.

Glucose monitoring

Recommendation	Grade	References	Recommended as of:
Glycated haemoglobin (HbA1c) measurement should be used to assess long-term blood glucose control.	A	1-3	14/11/2024
A reasonable HbA1c goal for many non-pregnant adults is <7% (53 mmol/mol) without significant hypoglycaemia is appropriate.	A	2	14/11/2024
Less stringent HbA1c goals may be appropriate for individuals with limited life expectancy or where the harms of treatment are greater than the benefits.	B	2	14/11/2024
Self-monitoring of blood glucose (SMBG) is recommended for people with type 2 diabetes who are using insulin and sulfonylureas due to hypoglycaemia risk.;	B	4	14/11/2024
Targets for SMBG levels are 4.0–7.0 mmol/L for fasting and preprandial, and 5.0–10.0 mmol/L for two-hour postprandial.	B, level 2	5	14/11/2024

Consider intermittent real-time continuous glucose monitoring (CGM) for people with insulin-treated type 2 diabetes if they have: • recurrent or severe hypoglycaemia • impaired hypoglycaemia awareness • a condition or disability (including a learning disability or cognitive impairment) that means they cannot self-monitor their blood glucose by capillary blood glucose monitoring but could use a CGM device (or have it scanned for them).	Conditional recommendation	3	14/11/2024
In adults with type 2 diabetes using basal bolus insulin therapy who have not achieved their HbA1c target, who are willing and able to use CGM, real-time CGM may be used to reduce HbA1c and duration of hypoglycaemia.	A, Level 1A	5	14/11/2024

References

1. Colagiuri S, Davies D, Girgis S, Colagiuri R. National evidence based guideline for case detection and diagnosis of type 2 diabetes. Diabetes Australia and the National Health and Medical Research Council, 2009 (https://www.diabetesaustralia.com.au/wp-content/uploads/National-Evidence-Based-Guideline-for-Case-Detection-and-Diagnosis-of-Type-2-Diabetes.pdf) . [Accessed 5 September 2024].
2. American Diabetes Association Professional Practice Committee. 6. Glycemic goals and hypoglycemia: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S111–25. doi: 10.2337/dc24-S006.
3. National Institute for Health and Care Excellence (NICE). Type 2 diabetes in adults (QS209). NICE, 2023.
4. Scottish Intercollegiate Guidelines Network (SIGN). Management of diabetes: A national clinical guideline. SIGN, 2017.
5. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada. Can J Diabetes 2018;42(Suppl 1):S1–326.

Medical management of glycaemia

Recommendation	Grade	References	Recommended as of:
Glucose-lowering medication in people newly diagnosed with type 2 diabetes			
A person-centred approach should be used to guide the choice of glucose-lowering medication. Considerations include comorbidities (atherosclerotic cardiovascular disease, heart failure, chronic kidney disease), hypoglycaemia risk, impact on weight, cost, risk for side effects and individual preferences.	E	1	14/11/2024
Healthy behaviour interventions should be initiated at diagnosis.	B, Level 2	2	14/11/2024
If glycaemic targets are not achieved within three months using healthy behaviour interventions alone, anti-hyperglycaemic therapy should be added to reduce the risk of microvascular complications.	A, Level 1A	2	14/11/2024
Metformin should usually be selected before other agents due to: • low risk of hypoglycaemia and weight gain • long-term experience with this agent.	A, Level 1A D, Consensus	2	14/11/2024
Individuals with metabolic decompensation (eg marked hyperglycaemia, ketosis or unintentional weight loss) consider receiving insulin with or without metformin to correct the relative insulin deficiency.	D, Consensus	2	14/11/2024
Advancing treatment			

Dose adjustments to, and/or addition of, glucose-lowering medications should be made in order to attain target glycated haemoglobin (HbA1c) within 3–6 months.	D, Consensus	2	14/11/2024
If glycaemic targets are not achieved, other classes of glucose-lowering agents should be added or substituted to improve glycaemic control**. **glycaemic management	Consensus	2	14/11/2024

References

1. American Diabetes Association Professional Practice Committee. 9. Pharmacologic approaches to glycemic treatment: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S158–78. doi: 10.2337/dc24-S009.
2. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada: 13 Pharmacologic glycemic management of type 2 diabetes in adults: 2020 update. Can J Diabetes 2018;44(Suppl 1):575–91.

Use of technology in type 2 diabetes management

Recommendation	Grade	References	Recommended as of:
Continuous glucose monitoring (CGM) should be considered for continual* or intermittent use in all individuals with type 2 diabetes on intensive insulin therapy (multiple daily injections [MDIs] or insulin pumps), subject to individual factors and the availability of resources. *'Continual use' refers to the use of CGM in a consistent manner based on the optimal number of recommended sensors, subject to patient factors and availability of resources.	A	1	14/11/2024

References

1. Kong APS, Lim S, Yoo SH, et al. Asia-Pacific consensus recommendations for application of continuous glucose monitoring in diabetes management. Diabetes Res Clin Pract 2023;201:110718. doi: 10.1016/j.diabres.2023.110718.

Complications - Type 2 diabetes and cardiovascular risk

Recommendation	Grade	References	Recommended as of:
Calculate cardiovascular disease (CVD) risk level using the Australian absolute cardiovascular disease risk calculator (Aus CVD Risk Calculator) (http://www.cvdcheck.org.au/) *. Age ranges for assessing CVD risk in people without known CVD are as follows: • All people aged 45–79 years • People with diabetes aged 35–79 years • Aboriginal and Torres Strait Islander people aged 30–79 years. Assess individual CVD risk factors in Aboriginal and Torres Strait Islander people aged 18–29 years** *The updated Aus CVD Risk Calculator can be accessed here (https://www.cvdcheck.org.au/calculator/) . When using the calculator within electronic medical records, verify the version to ensure it is not outdated. **Refer to the National Aboriginal Community Controlled Health Organisation (NACCHO)–Royal Australian College of General Practitioners (RACGP) *National guide to preventive healthcare for Aboriginal and Torres Strait Islander people* (https://www.racgp.org.au/national-guide) .	Conditional Conditional Consensus	1	14/11/2024
For Aboriginal and Torres Strait Islander people, consider reclassifying estimated CVD risk to a higher risk category after assessing the person's clinical, psychological and socioeconomic circumstances, and community CVD prevalence.* Refer to the NACCHO-RACGP *National guide to preventive healthcare for Aboriginal and Torres Strait Islander people* (https://www.racgp.org.au/national-guide) .	Conditional, moderate	1	14/11/2024

In people whose estimated CVD risk is close to the threshold for a higher risk category, consider reclassifying estimated CVD risk to a higher risk category for the following groups: • Māori people • Pacific Islander people • people of South Asian ethnicity (Indian, Pakistani, Bangladeshi, Sri Lankan, Nepali, Bhutanese, or Maldivian ethnicities)	Conditional, moderate	1	14/11/2024
People with pre-existing CVD are at high risk of another CVD event.	Consensus	2	14/11/2024
Managing CVD risk			
For people at high risk of CVD* (estimated 5-year risk ≥10% determined using the Australian cardiovascular disease risk calculator), prescribe lipid-modifying medicines to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle. * For people at intermediate or low risk of CVD, refer to the Australian guideline for assessing and managing CVD risk (https://www.cvdcheck.org.au/) .	Strong	1	14/11/2024

For people at high risk of CVD* (estimated 5-year risk ≥10% determined using the Australian CVD risk calculator), prescribe blood pressure-lowering medicines to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle. * For people at intermediate or low risk of CVD, refer to the Australian guideline for assessing and managing CVD risk (https://www.cvdcheck.org.au/) .	Strong	1	14/11/2024
We recommend the addition of an sodium-glucose cotransporter 2 inhibitor (SGLT2i) to other glucose-lowering medication(s) in adults with type 2 diabetes who also have CVD, multiple cardiovascular risk factors* and/or kidney disease. *We define multiple cardiovascular risk factors as men 55 years of age or older or women 60 years of age or older with type 2 diabetes who have one or more additional traditional risk factors, including hypertension, dyslipidaemia or smoking.	Strong	3	14/11/2024
We recommend the addition of a glucagon-like peptide-1 receptor agonist (GLP-1RA) to other glucose-lowering medication(s) in adults with type 2 diabetes who have CVD, multiple cardiovascular risk factors* and/or kidney disease, and are unable to be prescribed an SGLT2i due to either intolerance or contraindication. *We define multiple cardiovascular risk factors as men 55 years of age or older or women 60 years of age or older with type 2 diabetes who have one or more additional traditional risk factors, including hypertension, dyslipidaemia or smoking.	Strong	3	14/11/2024
Antihypertensive medication			

Antihypertensive therapy is strongly recommended in patients with diabetes and systolic blood pressure ≥140 mmHg.	Strong; Level I evidence	[4]	14/11/2024
For people with diabetes and hypertension, blood pressure targets should be individualised through a shared decision-making process that addresses cardiovascular risk, potential adverse effects of antihypertensive medications and individual preferences	B	[5]	14/11/2024
In patients with diabetes and hypertension, any of the first-line* antihypertensive drugs that effectively lower blood pressure are recommended. *Angiotensin-converting enzyme inhibitor or angiotensin receptor blocker (ARB) agents.[5]	Strong; Level I evidence	[4]	14/11/2024
In patients with diabetes and hypertension, chronic kidney disease or comorbidities of heart disease, a blood pressure target of <140/90 mmHg is recommended.	Strong; Level I evidence	[4]	14/11/2024
For individuals with hypertension and a history of transient ischemic attack (TIA) or stroke, a blood pressure target of <140/90 mmHg is recommended.	Strong; Level I evidence	[4]	14/11/2024
Lipid-lowering medications			
All adults with type 2 diabetes and known prior CVD (except haemorrhagic stroke) should receive the maximum tolerated dose of a statin, irrespective of their lipid levels. Note: The maximum tolerated dose should not exceed the maximum available dose (eg 80 mg atorvastatin, 40 mg rosuvastatin).	A	[2]	14/11/2024

In people with type 2 diabetes and known prior CVD, fibrates should be commenced in addition to a statin or on their own (for those intolerant to statin) when fasting triglycerides are greater than or equal to 2.3 mmol/L, or high-density lipoprotein (HDL) cholesterol is low†. Note: When used in combination with statins, fenofibrate presents a lower risk of adverse events than other fibrates combined with statins. †HDL <1.0 mmol/L (based on the cut-offs reported in the ACCORD and FIELD studies).	B	2	14/11/2024
In individuals with atherosclerotic CVD (ASCVD) or other cardiovascular risk factors on a statin with controlled low-density lipoprotein (LDL) cholesterol but elevated triglycerides (135–499 mg/dL [1.5–5.6 mmol/L]), the addition of icosapent ethyl can be considered to reduce cardiovascular risk.	A	5	14/11/2024
For people with diabetes and ASCVD, treatment with high-intensity statin therapy is recommended to target an LDL cholesterol reduction of ≥50% from baseline and an LDL cholesterol goal of <55 mg/dL (<1.4 mmol/L). Addition of ezetimibe or a proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitor/PCSK9 targeted therapies with proven benefit in this population is recommended if this goal is not achieved on maximum tolerated statin therapy.	B	5	14/11/2024
Antithrombotic medication			
All adults with type 2 diabetes and known prior CVD should receive long-term antiplatelet therapy unless there is a clear contraindication.	A	2	14/11/2024

Use aspirin therapy (75–162 mg/day) as a secondary prevention strategy in those with diabetes and a history of ASCVD*. *Based on a clinical history of atherosclerotic disease not imaging retinopathy risk reduction.	A	5	14/11/2024
For individuals with ASCVD and documented aspirin allergy, clopidogrel (75 mg/day) should be used*. *Based on a clinical history of atherosclerotic disease not imaging retinopathy risk reduction.	B	5	14/11/2024

References

1. National Heart Foundation of Australia. Australian guideline and calculator for assessing and managing cardiovascular disease risk. 2023 (https://www.cvdcheck.org.au/) .[Accessed 4 September 2024].
2. Baker IDI Heart and Diabetes Institute. National evidence-based guideline on secondary prevention of cardiovascular disease in type 2 diabetes. Baker IDI Heart and Diabetes Institute, 2015.
3. Living Evidence for Diabetes Consortium. Australian evidence-based clinical guidelines for diabetes. Living Evidence for Diabetes Consortium, 2024 (https://app.magicapp.org/#/guideline/E5AbPE) . [Accessed 4 September 2024].
4. National Heart Foundation of Australia. Guideline for the diagnosis and management of hypertension in adults – 2016. National Heart Foundation of Australia, 2016.
5. American Diabetes Association Professional Practice Committee. 10. Cardiovascular Disease and Risk Management: Standards of Care in Diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S179–218.

Complications - Diabetes-related eye disease

Recommendation	Grade	References	Recommended as of:
Individuals with type 2 diabetes should be screened and evaluated for retinopathy by an optometrist or ophthalmologist at the time of diagnosis.	B	1	14/11/2024
Follow-up screening interval for people with retinopathy should be tailored to the severity of retinopathy.	B	1	14/11/2024

The recommended interval for those with no or minimal retinopathy is 1–2 years.	B	1	14/11/2024
Examine higher-risk patients who do not have diabetic retinopathy (DR) at least annually (high risk defined as: longer duration of diabetes; suboptimal glycaemic management, blood pressure or blood lipid control; people from cross-cultural and linguistically diverse background).	Consensus	2	14/11/2024
Conduct annual DR screening for Aboriginal or Torres Strait Islander people with diabetes.	Consensus	2	14/11/2024
To delay onset and progression of DR, people with type 2 diabetes should be offered pharmacologic and non-pharmacological management options to achieve optimal control* of: • blood glucose • blood pressure • lipid levels. *management	A	1	14/11/2024
Fenofibrate, in addition to statin therapy, may be used in people with type 2 diabetes to slow the progression of established retinopathy.	A, Level 1A	3	14/11/2024
Promptly refer* individuals with any level of diabetic macular oedema, moderate or worse non-proliferative DR (a precursor of proliferative diabetic retinopathy [PDR]), or any PDR to an ophthalmologist who is knowledgeable and experienced in the management of DR. *Refer to Clinical context for timing of referral.	A	1	14/11/2024
Counsel individuals of childbearing potential with type 2 diabetes who are planning pregnancy or who are pregnant on the risk of development and/or progression of DR.	B	1	14/11/2024

Individuals with type 2 diabetes should receive an eye exam before pregnancy and in the first trimester and should be monitored every trimester and for one year postpartum as indicated by the degree of retinopathy*. *Back to the usual timeframes for the general population.	B	[1]	14/11/2024

References

1. American Diabetes Association Professional Practice Committee et al. 12. Retinopathy, neuropathy, and foot care: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S231–43. doi: 10.2337/dc24-S012.
2. The Royal Australian and New Zealand College of Ophthalmologists (RANZCO). RANZCO screening and referral pathway for diabetic retinopathy. RANZCO, 2019.
3. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada. Can J Diabetes 2018;42(Suppl 1):S1–326.

Complications - Diabetes-related neuropathy

Recommendation	Grade	References	Recommended as of:
All people with diabetes should be screened for diabetic peripheral neuropathy, starting at diagnosis of type 2 diabetes and at least annually thereafter.	D	[1,2]	14/11/2024
Assessment for distal symmetric polyneuropathy should include a careful history and assessment of either temperature or pinprick sensation (small-fibre function) and vibration sensation using a 128-Hz tuning fork (for large-fibre function). All people with diabetes should have annual 10-g monofilament testing to identify feet at risk for ulceration and amputation.	B	[1]	14/11/2024

The following agents may be used alone or in combination for relief of painful peripheral neuropathy: • anticonvulsants ◦ pregabalin ◦ gabapentin ◦ valproate • antidepressants ◦ amitriptyline ◦ duloxetine ◦ venlafaxine • topical nitrate spray In people not responsive to the above agents, opioid analgesics (tramadol, tapentadol ER, oxycodone ER) may be used.* *Prescribers should be cautious when prescribing opioid analgesics due to the risks of abuse, dependence and tolerance, and adhere to prescribing guidelines	A, Level 1 B, Level 2 B, Level 2 B, Level 2 B, Level 2 B, Level 2	2	14/11/2024
People with type 2 diabetes should be treated with intensified glycaemic control* to prevent the onset and progression of neuropathy. Optimise blood pressure and serum lipid control* to reduce the risk or slow the progression of diabetic neuropathy. *management	B	1, 2	14/11/2024

References

1. American Diabetes Association Professional Practice Committee. 12. Retinopathy, neuropathy, and foot care: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S231–43. doi: 10.2337/dc24-S012.
2. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada: 31 Neuropathy. Can J Diabetes 2018;42(Suppl 1):S217–21.

Complications - Diabetes-related foot care

Recommendation	Grade	References	Recommended as of:
Assess all people with diabetes and stratify their risk by enquiring about previous foot ulceration and amputation, visually inspecting the feet for structural abnormalities and ulceration, assessing for neuropathy using either the Neuropathy Disability Score or a 10-g monofilament, and palpating foot.	C	1,2	14/11/2024
In people stratified as having low-risk feet (where no risk factors or previous foot complications have been identified), foot examination should occur annually.	Consensus	1	14/11/2024
Repeat screening once every 6–12 months for those classified as International Working Group on the Diabetic Foot (IWGDF) risk 1 , once every 3–6 months for those classified as IWGDF risk 2 and once every 1–3 months for those classified as IWGDF risk 3 .	Strong; low	2	14/11/2024
Pressure reduction, otherwise referred to as ‘redistribution of pressure’ or ‘off-loading’, is required to optimise the healing of plantar foot ulcers.	B	1	14/11/2024
People with diabetes-related foot ulceration are best managed by a multidisciplinary foot care team.	C	1	14/11/2024
Dressings should be selected principally on the basis of exudate control, comfort and cost.	Strong; low	2	14/11/2024
Non-viable tissue should be debrided.	A, Level 1	3	14/11/2024

References

1. National Health and Medical Research Council (NHMRC). National evidence-based guideline: Prevention, identification and management of foot complications in diabetes. NHMRC, 2011.
2. Diabetes Feet Australia. 2021 Evidence-based Australian guidelines for diabetes-related foot disease. Diabetes Feet Australia, 2021 (https://diabetesfeetaustralia.stonly.com/kb/en) . [Accessed 4 September 2024].
3. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada. Can J Diabetes 2018;42(Suppl 1):S1–326.

Complications - Diabetes-related chronic kidney disease

Recommendation	Grade	References	Recommended as of:
At least once a year, assess urine albumin to creatinine ratio (uACR) and estimated glomerular filtration rate (eGFR) in all patients with type 2 diabetes, regardless of treatment.	B	1	14/11/2024
To prevent the onset and delay the progression of chronic kidney disease (CKD), people with diabetes should be treated to optimise blood glucose levels and blood pressure.	A, Level 1A	2	14/11/2024
Treatment for hypertension should include drug classes demonstrated to reduce cardiovascular events in people with diabetes. Angiotensin-converting enzyme inhibitors (ACEi) or (ARBs) angiotensin receptor blockers (ARBs) are recommended first-line therapy for hypertension in people with diabetes and coronary artery disease.	A A	3	14/11/2024

Multiple-drug therapy is generally required to achieve blood pressure targets. However, combinations of ACEi and ARBs and combinations of ACEi or ARBs with direct renin inhibitors should not be used.	A	3	14/11/2024
We recommend that treatment with an ACEi or an ARB be initiated in patients with diabetes, hypertension and albuminuria, and that these medications be titrated to the highest approved dose that is tolerated.	1B	2	14/11/2024
We recommend the addition of a sodium-glucose cotransporter 2 inhibitor (SGLT2i) to other glucose-lowering medication(s) in adults with type 2 diabetes who also have kidney disease. We recommend a glucagon-like peptide-1 (GLP-1) receptor agonist if the patient is unable to be prescribed an SGLT2i due to either intolerance or contraindication. The evidence base for this recommendation includes studies on people with kidney disease who had an eGFR of 30 mL/min/1.73 m2 of body surface area or higher, although a few studies included participants with lower eGFR.	Recommended	4	14/11/2024
For people with type 2 diabetes and chronic kidney disease CKD with albuminuria treated with maximum tolerated doses of ACEi or ARB, addition of finerenone is recommended to improve cardiovascular outcomes and reduce the risk of chronic kidney diseaseCKD progression.	A	3	14/11/2024
For people with type 2 diabetes and diabetic kidney disease CKD, use of an SGLT2i is recommended to reduce CKD progression and cardiovascular events in patients individuals with eGFR ≥20 mL/min/1.73 m2 and urinary albumin ≥200 mg/g creatinine.	A	1	14/11/2024

For people with type 2 diabetes and diabetic kidney diseaseCKD, use of an SGLT2i is recommended to reduce CKD progression and cardiovascular events in individuals with eGFR ≥20 mL/min/1.73 m2 and urinary albumin ranging from normal to 200 mg/g creatinine.	B	1	14/11/2024
For cardiovascular risk reduction in people with type 2 diabetes and diabetic kidney disease CKD, consider use of an SGLT2i (if eGFR is ≥20 mL/min/1.73 m2), a GLP-1 agonist or a non-steroidal mineralocorticoid receptor antagonist (if eGFR is ≥25 mL/min/1.73 m2).	A	1	14/11/2024

References

1. American Diabetes Association Professional Practice Committee. 11. Chronic kidney disease and risk management: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S219–30. doi: 10.2337/dc24-S011.
2. Stevens PE, Ahmed SB, Carrero JJ, et al. KDIGO 2024 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney Int 2024;105(4 4S):S117–314. doi: 10.1016/j.kint.2023.10.018.
3. American Diabetes Association Professional Practice Committee. 10. Cardiovascular disease and risk management: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S179–218. doi: 10.2337/dc24-S010.
4. Living Evidence for Diabetes Consortium. Australian evidence-based clinical guidelines for diabetes. Living Evidence for Diabetes Consortium, 2023 .[Accessed 3 September 2024].

Managing glycaemic emergencies

Recommendation	Grade	References	Recommended as of:
Individuals treated with combinations utilising insulin or sulfonylureas should be asked about symptomatic and asymptomatic hypoglycaemia at each encounter.	C	1	14/11/2024

Glycaemic goals for some older adults might reasonably be relaxed as part of individualised care, but hyperglycaemia leading to symptoms or risk of acute hyperglycaemia complications should be avoided in all people with diabetes.	C	1	14/11/2024

References

1. American Diabetes Association Professional Practice Committee. Standards of care in diabetes – 2024. Diabetes Care 2023;47(Suppl 1):S1–S322.

Type 2 diabetes and mental heath

Recommendation	Grade	References	Recommended as of:
Routinely monitor people with diabetes for diabetes distress.	B	1,2	14/11/2024
Providers should consider assessment for symptoms of diabetes distress, depression, anxiety, disordered eating and cognitive capacities using patient-appropriate standardised and validated tools when there is a change in disease, treatment, or life circumstance; including caregivers and family members in this assessment is recommended.	B	1,2	14/11/2024
People with diabetes with any of the following should be referred to a mental health professional and to do a care plan: • significant distress related to diabetes management • persistent fear of hypoglycaemia • psychological insulin resistance • psychiatric disorders (ie depression, anxiety, eating disorders).	D, Consensus	1,3	14/11/2024

Collaborative care by interprofessional teams should be provided for people with diabetes and depression to improve: • depressive symptoms • adherence to antidepressant and non-insulin glucose-lowering medications • glycaemic control*. *Glycaemic management	A, Level 1	3-6	14/11/2024
Psychosocial interventions should be integrated into diabetes care to improve adaptation to living with diabetes and engagement in self-management, including: • motivational interviewing • cognitive behaviour therapy • acceptance and commitment therapy • stress management strategies • coping skills training • family therapy • case management • mindfulness interventions	A, Level 1A A, Level 1A A, Level 1 A, Level 1A A, Level 1A A, Level 1B A, Level 1 C	3,4,7-9	14/11/2024

References

1. McMorrow R, Hunter B, Hendrieckx C, et al. Effect of routinely assessing and addressing depression and diabetes distress on clinical outcomes among adults with type 2 diabetes: A systematic review. BMJ Open 2022;12(5):e054650. doi: 10.1136/bmjopen-2021-054650.
2. American Diabetes Association Professional Practice Committee. Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S1–322.
3. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada. Diabetes and Mental Health 2023 Update. Can J Diabetes 2018;42(Suppl 1):S308–44.
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5. Diaz Bustamante L, Ghattas KN, Ilyas S, Al-Refai R, Maharjan R, Khan S. Does treatment for depression with collaborative care improve the glycemic levels in diabetic patients with depression? A systematic review. Cureus 2020;12(9):e10551. doi: 10.7759%2Fcureus.10551.
6. Franquez RT, de Souza IM, Bergamaschi CC. Interventions for depression and anxiety among people with diabetes mellitus: Review of systematic reviews. PLoS One 2023;18(2):e0281376. doi: 10.1371/journal.pone.0281376.
7. Ngan HY, Chong YY, Chien WT. Effects of mindfulness- and acceptance-based interventions on

diabetes distress and glycaemic level in people with type 2 diabetes: Systematic review and meta-analysis. Diabet Med 2021;38(4):e14525. doi: 10.1111/dme.14525.
8. Berhe KK, Gebru HB, Kahsay HB. Effect of motivational interviewing intervention on HgbA1C and depression in people with type 2 diabetes mellitus (systematic review and meta-analysis). PLoS One 2020;15(10):e0240839. doi: 10.1371/journal.pone.0240839.
9. Fisher V, Li WW, Malabu U. The effectiveness of mindfulness-based stress reduction (MBSR) on the mental health, HbA1C, and mindfulness of diabetes patients: A systematic review and meta-analysis of randomised controlled trials. Appl Psychol Health Well-Being 2023;15(4):1733–49. doi: 10.1111/aphw.12441.

Type 2 diabetes, reproductive health and pregnancy

Recommendation	Grade	References	Recommended as of:
In addition to focused attention on achieving glycaemic targets, standard preconception care should be augmented with extra focus on nutrition, diabetes education and screening for diabetes comorbidities and complications.	B	1	14/11/2023
Preconception counselling should address the importance of achieving glucose levels as close to normal as is safely possible, ideally glycated haemoglobin (HbA1c) <6.5% (48 mmol/mol), to reduce the risk of congenital anomalies, pre-eclampsia, macrosomia, preterm birth and other complications.	A	1	14/11/2023
Potentially harmful medications in pregnancy (eg angiotensin-converting enzyme [ACE] inhibitors, angiotensin receptor blockers, statins) should be stopped prior to conception and avoided in sexually active individuals of childbearing potential who are not using reliable contraception.	B	1	14/11/2023

Women on metformin planning a pregnancy may continue on these agents if glycaemic control* is adequate until pregnancy is achieved. *management	C, Level 3	2	14/11/2023
The decision to continue insulin analogues that have little available safety data in pregnancy, and metformin, should be individualised, but neither medication should be ceased abruptly in early pregnancy due to the imperative to maintain euglycaemia. Cessation should depend on the risks and benefits of continuation. While metformin crosses the placenta, there has not been any evidence that it is teratogenic. Other non-insulin glucose-lowering agents should be ceased prior to or as soon as pregnancy is detected.	Consensus	3	14/11/2023
Folic acid 2.5–5 mg daily in total, taking multivitamin supplementation into account, commenced ideally three months prior to conception and continued until 12 weeks gestation. Total daily doses of folic acid >5 mg are not recommended given the potential for harm.	Consensus	3	14/11/2023

Prior to conception, women with diabetes should be referred to a multidisciplinary team which is experienced in the care of women with diabetes as this has been shown to improve pregnancy outcomes. This team may consist of an obstetrician, endocrinologist/diabetes physician, credentialled diabetes educator, accredited practising dietitian, lead maternity carer (New Zealand) and other health specialists as required. In rural areas where distance is a barrier to antenatal attendance, the local healthcare team should contact the nearest expert diabetes in pregnancy multidisciplinary team for access to telehealth options.	Consensus	[3]	14/11/2023

References

1. American Diabetes Association Professional Practice Committee. 15. Management of diabetes in pregnancy: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S282–94. doi: 10.2337/dc24-S015.
2. Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada: Diabetes and pregnancy. Can J Diabetes. 2018;42(Suppl 1):S255–82.
3. Rudland VL, Price SAL, Hughes R, et al. ADIPS 2020 guideline for pre-existing diabetes and pregnancy. Aust N Z J Obstet Gynaecol 2020;60(6):E18–52. doi: 10.1111/ajo.13265.

Gestational diabetes

Recommendation	Grade	References	Recommended as of:

Overt diabetes in pregnancy (overt DIP) should be diagnosed at any time in pregnancy if one or more of the following criteria are met: • fasting plasma glucose (FPG) ≥7.0 mmol/L; • two-hour plasma glucose (2hPG) ≥11.1 mmol/L following a 75 g two-hour pregnancy oral glucose tolerance test (POGTT); and/or • glycated haemoglobin (HbA1c) ≥6.5% (≥48 mmol/mol).	Consensus	1	01/08/2025
Women with a previous history of gestational diabetes (GDM) or an early pregnancy HbA1c ≥6.0 to 6.4% (42-47 mmol/L) but without diagnosed diabetes, should be advised to undergo a 75 g two-hour POGTT prior to 20 weeks' gestation, ideally between 10-14 weeks' gestation but considering factors such as nausea. POGTT should not be performed prior to 10 weeks' gestation due to poor tolerance and limited evidence of benefit.	Consensus	1	01/08/2025
In the first trimester*, all women not known to have diabetes should be assessed for risk of hyperglycaemia. * at the initial Antenatal visit or between 10-14 weeks.	Consensus	2,3	14/11/2024
All women (without diabetes already detected in the current pregnancy) should be advised to undergo a 75 g two-hour POGTT at 24-28 weeks' gestation.	Consensus	1	01/08/2025
Irrespective of gestation, GDM should be diagnosed using one or more of the following criteria during a 75 g two-hour POGTT: • FPG ≥5.3-6.9 mmol/L; • one-hour plasma glucose (1hPG) ≥10.6 mmol/L; • 2hPG ≥9.0-11.0 mmol/L.	Consensus	1	01/08/2025

Pregnant women with GDM should be offered dietary advice and blood glucose monitoring, and be treated with glucose-lowering therapy** depending on target values for fasting and postprandial targets. **glucose lowering therapies: as individually indicated by multidisciplinary team	A	4, 5	14/11/2024
Consider continuous glucose monitoring (CGM) for pregnant women who are on insulin therapy but do not have type 1 diabetes, such as those with type 2 or GDM, if: • they have problematic severe hypoglycaemia (with or without impaired awareness of hypoglycaemia) or • they have unstable blood glucose levels that are causing concern despite efforts to optimise glycaemic control	High-level	5	14/11/2024
Postnatal education and support are important in preventing or delaying the onset of diabetes in the future, and women should be encouraged to attend postnatal testing.	Consensus	3	14/11/2024
Women diagnosed with GDM should have a 75 g two-hour oral glucose tolerance test, preferably at 6–12 weeks postpartum, with classification according to World Health Organization criteria.	Consensus	6	14/11/2024

Change history

01/08/2025

Content has been updated to align with ADIPS 2025 Consensus Recommendations for the Screening, Diagnosis and Classification of Gestational Diabetes, which provides updated diagnostic glucose thresholds for GDM and clarifies approaches to early pregnancy screening for women with risk factors for hyperglycaemia in pregnancy.[1]

References

1. Sweeting A, Hare M JL , de Jersey SJ, et al. Australasian Diabetes in Pregnancy Society (ADIPS) 2025 consensus recommendations for the screening, diagnosis and classification of gestational diabetes. Med J Aust. doi: 10.5694/mja2.52696 [Accessed 23 June 2025].
2. American Diabetes Association. Standards of medical care in diabetes – 2022 Abridged for primary care providers. Clin Diabetes 2022;40(1):10–38. doi: 10.2337/cd22-as01.
3. Australian Living Evidence Collaboration. Australian pregnancy care guidelines, 2025 (https://app.magicapp.org/?language=hr) [version 6]. Australian Living Evidence Collaboration [Accessed 30 April 2025].
4. Scottish Intercollegiate Guidelines Network (SIGN). Management of diabetes: A national clinical guideline. SIGN, 2017.
5. National Institute for Health and Care Excellence (NICE). Diabetes in pregnancy: Management from preconception to the postnatal period. NICE, 2020 [Accessed 5 September 2024].
6. Nankervis A, McIntyre HD, Moses R, et al. ADIPS consensus guidelines for the testing and diagnosis of gestational diabetes mellitus in Australia. Australasian Diabetes in Pregnancy Society, 2014 (https://www.adips.org/downloads/2014ADIPSGDMGuidelinesV18.11.2014.pdf) [Accessed 5 September 2024].

Type 2 diabetes management for older people and residential aged care facilities

Recommendation	Grade	References	Recommended as of:
Consider the assessment of medical, psychological, functional (self-management abilities) and social domains in older adults to provide a framework to determine targets and therapeutic approaches for diabetes management.	B	1	14/11/2024
Screen for geriatric syndromes (ie polypharmacy, cognitive impairment, depression, urinary incontinence, falls, persistent pain, and frailty) in older adults, as they may affect diabetes self-management and diminish quality of life.	B	1	14/11/2024

Overtreatment of diabetes is common in older adults and should be avoided. Deintensification (or simplification) of complex regimens is recommended to reduce the risk of hypoglycaemia in older adults, if achievable within the individualised HbA1c target.	B	1	14/11/2024
For older adults in residential aged care facilities, individualised care plans should be developed and agreed upon by the individual, their general practitioner (GP) and facility staff. This will provide clarity regarding aims of care and metabolic targets, and facilitate screening for diabetes-related complications and annual reviews.	Consensus*		14/11/2024
*Consensus-based recommendation formulated by the RACGP Diabetes Handbook Expert Advisory Group.			

References

1. American Diabetes Association Professional Practice Committee. 13. Older adults: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S244–57. doi: 10.2337/dc24-S013.

Diabetes and end-of-life care

Recommendation	Grade	References	Recommended as of:
Determine a blood glucose and glycated haemoglobin (HbA1c) range that is appropriate for the individual, aligns with the individual's advance care plan and avoids hypoglycaemia and symptomatic hyperglycaemia.	Consensus*		14/11/2024
*Consensus-based recommendation formulated by the RACGP Diabetes Handbook Expert Advisory Group.			

Managing risks and other impacts of type 2 diabetes

Recommendation	Grade	References	Recommended as of:
Sick day management (#accordion-heading-Content3) Sick-day management plans are an integral component of diabetes education. The development of a sick-day management plan along with education on sick-day management should be provided at diagnosis and reviewed or updated at regular intervals.	Consensus	1-3	14/11/2024
Sleep and diabetes (#accordion-heading-Content4) Consider screening for sleep health in people with diabetes, including symptoms of sleep disorders, disruptions to sleep due to diabetes symptoms or management needs and worries about sleep. Refer to sleep medicine specialists and/or qualified behavioural health professionals as indicated.	B	4	14/11/2024
Planning surgical procedures (#accordion-heading-Content5) When commencing a person with diabetes on sodium-glucose cotransporter 2 inhibitors (SGLT2i), clinicians should inform them about the risk of diabetic ketoacidosis (DKA) associated with clinical procedures, ideally with written information and management plans. It is advisable to document that the advice has been provided.	Consensus	5	14/11/2024
Dementia and cognitive decline (#accordion-heading-Content6) Screening for early detection of mild cognitive impairment or dementia should be performed for adults 65 years of age or older at the initial visit, annually, and as appropriate.	B	6	14/11/2024

Dementia and cognitive decline (#accordion-heading-Content6) In the presence of cognitive impairment, diabetes treatment plans should be simplified as much as possible and tailored to minimise the risk of hypoglycaemia.	B	[7]	14/11/2024

References

1. Australian Diabetes Educators Association (ADEA). Clinical guiding principles for sick day management of adults with type 1 and type 2 diabetes: A Guide for Health Professionals. ADEA, 2020.
2. Australian Diabetes Educators Association (ADEA). Managing sick days for adults with type 2 diabetes who use insulin (factsheet). ADEA, 2020.
3. Australian Diabetes Educators Association (ADEA). Managing sick days for adults with type 2 diabetes not on insulin (factsheet). ADEA, 2020.
4. American Diabetes Association Professional Practice Committee. 5. Facilitating positive health behaviors and well-being to improve health outcomes: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S77–110.
5. Australian Diabetes Society (ADS). Alert update May 2023. Periprocedural diabetic ketoacidosis with SGLT2 inhibitor use in people with diabetes. ADS, 2023 (https://www.diabetessociety.com.au/wp-content/uploads/2023/05/ADS-ADEA-ANZCA-NZSSD_DKA_SGLT2i_Alert_Ver-May-2023.pdf) . [Accessed 9 September 2024].
6. American Diabetes Association Professional Practice Committee. 13. Older adults: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S244–57. doi: 10.2337/dc24-S013.
7. American Diabetes Association Professional Practice Committee. 4. Comprehensive medical evaluation and assessment of comorbidities: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl 1):S52–76. doi: 10.2337/dc24-S004.

Defining and diagnosing type 2 diabetes

Table of recommendations

Recommendation	Grade	References	Recommended as of:
General population of normal risk Assessing the risk of diabetes is recommended every 3 years for those in the general population aged >40 years without specific risk factors. Use a validated screening tool to assess the risk of diabetes, such as the Australian type 2 diabetes risk assessment tool (https://www.health.gov.au/resources/apps-and-tools/the-australian-type-2-diabetes-risk-assessment-tool-ausdrisk) (AUSDRISK).	Conditionally recommended	1	14/11/2024

Aboriginal and Torres Strait Islander people All adults aged 18 years and over should be screened on an opportunistic basis and/or annually. 1. Measure fasting blood glucose (FBG) or glycated haemoglobin (HbA1c): A laboratory test is preferable, but fingerprick testing is an alternative. If an FBG is impractical, perform a random (non-fasting) venous test or an HbA1c (which is not affected by fasting status). 2. Perform an oral glucose tolerance test (OGTT) in those with equivocal results (FBG 5.5–6.9 mmol/L, or random glucose 5.5–11.0 mmol/L*). Children/adolescents with the following additional risk factors should be screened** from the age of 10 years (or at the onset of puberty, whichever occurs first): • overweight or obesity (body mass index*** [BMI] ≥85th or ≥95th percentile, respectively, and/or waist circumference to height ratio >0.5) • maternal history of diabetes or gestational diabetes (GDM) • first-degree relative with type 2 diabetes • signs of insulin resistance (acanthosis nigricans) • other conditions associated with obesity and metabolic syndrome (eg dyslipidaemia, polyendocrine metabolic ovarian syndrome [PMOS]) • use of psychotropic medication. *Impaired fasting glucose (IFG) = fasting glucose 6.1–6.9 mmol/L; impaired glucose tolerance (IGT) = non fasting glucose ≥7.8 to <11.0 mmol/L.	Recommended (Strong)	2	14/11/2024

**Repeat annually if HbA1c <5.7%; repeat in six months if HbA1c 5.7–6.4%. ***BMI should be calculated using age- and gender-appropriate calculator/percentile growth charts.			

High-risk population* In asymptomatic adults at high risk* of developing type 2 diabetes, screen using fasting blood glucose (FBG) or glycated haemoglobin (HbA1c) every 3 years (every 12 months for people with impaired glucose tolerance [IGT] and impaired fasting glucose [IFG]**) *Adults at high risk of developing type 2 diabetes include people with any one of the following: • overweight or obesity and age ≥40 years • overweight or obesity, age 18–40 years and hypertension • overweight or obesity, age 18–40 years and clinical evidence of insulin resistance (acanthosis nigricans, dyslipidaemia) • a first-degree relative with type 2 diabetes • a history of a cardiovascular event (eg acute myocardial infarction, angina, peripheral vascular disease or stroke) • certain ethnicities (Aboriginal and Torres Strait Islander***, South Asian, South-east Asian, North African, Latin American, Middle Eastern, Māori or Pacific Islander people [includes individuals of mixed ethnicity]) • a history of GDM • PMOS • taking antipsychotic medication. An AUSDRISK score ≥12 also indicates high risk. **IFG = fasting glucose 6.1–6.9 mmol/L; IGT = non fasting glucose ≥7.8 to <11.0 mmol/L. ***Aboriginal and Torres Strait Islander people refer to recommendation above	Conditionally recommended	1	14/11/2024

Individuals with impaired glucose metabolism, defined by fasting glucose, OGTT or HbA1c should be screened: • with FBG or HbA1c* • every 12 months. *If impaired glucose metabolism was diagnosed only on the two-hour plasma glucose of the OGTT, consider using the OGTT for subsequent screenings.	B C	3, 4	14/11/2024

Defining type 2 diabetes

Diabetes is a group of disorders and the tenth leading cause of death in Australia.[5] There are four clinical classes of diabetes:[6]

- **type 1 diabetes** – results from ß-cell destruction due to an autoimmune process usually leading to insulin deficiency
- **type 2 diabetes** – results from a progressive insulin secretory defect on a background of insulin resistance
- **GDM** – defined as glucose intolerance with onset or first recognition during pregnancy
- **other specific types of diabetes** – for example, monogenic diabetes and diabetes secondary to other causes (see below).

Type 2 diabetes is a chronic and progressive medical condition that results from two major metabolic dysfunctions: insulin resistance followed by pancreatic islet cell dysfunction, causing a relative insulin deficiency. These occur due to modifiable lifestyle-related risk factors interacting with non-modifiable (eg age) and genetic risk factors.[7]

The relative insulin deficiency leads to chronic hyperglycaemia and multiple disturbances in carbohydrate, protein and fat metabolism.[7]

Who is at risk of type 2 diabetes?

Type 2 diabetes is the most common form of diabetes in Australia. Almost 1.2 million (4.6%) people were living with type 2 diabetes in 2021, although this is likely to be an underestimate of the true prevalence.[5] In addition, almost one in six adults are affected by impaired glucose tolerance (IGT) or impaired fasting glucose (IFG).[8]

Clinical suspicion for type 2 diabetes needs to remain high, because type 2 diabetes is often asymptomatic and is increasingly developing in younger people (refer to 'Early-onset type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/early-onset-type-2-diabetes) ').[6] Causes of secondary diabetes,

such as diseases of the exocrine pancreas (eg pancreatic cancer, cystic fibrosis, haemochromatosis), metabolic or drug-induced causes (eg treatment of human immunodeficiency virus [HIV]), should also be considered in the presence of symptoms suggestive of diabetes.8

Type 2 diabetes in specific populations

There is a higher prevalence of type 2 diabetes among Australians from lower socioeconomic backgrounds compared with higher socioeconomic groups,5 and people with certain ethnicities (Aboriginal and Torres Strait Islander people, South Asian, South-east Asian, North African, Latin American, Middle Eastern, Māori or Pacific Islander people [includes individuals of mixed ethnicity]).[1]

Aboriginal and Torres Strait Islander peoples have almost three times the rate of type 2 diabetes than other Australians, with onset at an earlier age.[9] Type 2 diabetes is a direct or indirect cause of 20% of deaths among Aboriginal and Torres Strait Islander people.[10] There are many structural barriers to access to and affordability of healthy foods for many Aboriginal and Torres Strait Islander people, and colonisation has disrupted traditional diets and knowledge of food systems.[2] (Refer to the National Aboriginal Community Controlled Health Organisation [NACCHO]–Royal Australian College of General Practitioners [RACGP] National guide to preventive healthcare for Aboriginal and Torres Strait Islander people (https://www.racgp.org.au/national-guide)).

Assessing diabetes risk

People should be assessed for diabetes risk every three years from the age of 40 years using the Australian type 2 diabetes risk assessment tool (AUSDRISK (https://www1.health.gov.au/internet/main/publishing.nsf/Content/diabetesRiskAssessmentTool) ; Table 1).[3]

Aboriginal and Torres Strait Islander people

Given the high background prevalence of type 2 diabetes in Aboriginal and Torres Strait Islander adults, AUSDRISK has limited use as a screening tool in this population.

Aboriginal or Torres Strait Islander people should instead proceed directly to blood testing for diabetes, in conjunction with other opportunistic screening (such as for cardiovascular risk assessment) from the age of 18 years.[2]

Refer to the NACCHO-RACGP National guide to preventive healthcare for Aboriginal and Torres Strait Islander people (https://www.racgp.org.au/national-guide) .

An AUSDRISK score of ≥12 is considered ‘high risk’ for developing type 2 diabetes (Table 1). The following people are also considered at high risk, **regardless** of AUSDRISK score:[1,3]

- any age with IGT or IFG
- overweight or obesity and age ≥40 years

- overweight or obesity, age 18–40 years and hypertension
- overweight or obesity, age 18–40 years and clinical evidence of insulin resistance (acanthosis nigricans, dyslipidaemia)
- a first-degree relative with type 2 diabetes
- a history of a cardiovascular event (eg acute myocardial infarction, angina, peripheral vascular disease or stroke)
- certain ethnicities (Aboriginal and Torres Strait Islander, South Asian, South-east Asian, North African, Latin American, Middle Eastern, Māori or Pacific Islander people [includes individuals of mixed ethnicity])
- a history of GDM
- PMOS
- taking antipsychotic medication.

It is recommended that all people at high risk are tested every three years for diabetes with either FBG or a non-fasting HbA1c (refer to 'Diagnosing diabetes in asymptomatic people' (#accordion-heading-Content3#)).[1,3] People with IGT or IFG should be tested annually.[3] For recommended management of people at high risk of developing diabetes, refer to 'Preventing progression to type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/preventing-progression-to-type-2-diabetes) '.

For recommendations on screening in pregnancy, refer to 'Type 2 diabetes, reproductive health and pregnancy (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/type-2-diabetes-reproductive-health-and-pregnancy) '.

Aboriginal and Torres Strait Islander people

Obesity is a major cause of type 2 diabetes; Aboriginal and Torres Strait Islander adults who are obese are sevenfold more likely as those of healthy weight or underweight to have diabetes (17% versus 2.4%, respectively).[10] Obesity is a very strong predictor of who may get type 2 diabetes in the future; a study of non-diabetic Aboriginal adults in Central Australia found that those who were overweight or obese were [3].3-fold more likely to develop diabetes than those who were not.[2,3]

The AusDiab study found that BMI, waist circumference and waist-to-hip ratio all had similar correlations with diabetes and cardiovascular disease (CVD) risk.[11] However, a later study of diabetes risk in an Aboriginal community found that in women, central obesity (defined as waist circumference ≥88 cm) or BMI ≥25 kg/m2 were better predictors of type 2 diabetes and CVD risk; many women with 'normal' BMIs were found to have central obesity. For men, a BMI ≥25 kg/m2 was a better predictor than BMI ≥30 kg/m2 or a waist circumference ≥102 cm.[12]

Table 1. AUSDRISK tool for assessing type 2 diabetes risk[13]

AUSDRISK score	Risk of developing type 2 diabetes within five years*
≤5	1 in 100
6–8	1 in 50
9–11	1 in 30
12–15	1 in 14
16–19	1 in 7
≥20	1 in 3

*The overall score may overestimate the risk of diabetes in those aged <25 years and underestimate the risk in Aboriginal and Torres Strait Islander people.[1]

IFG and IGT

The definition of diabetes is based on a collection of symptoms and agreed glycaemic measures associated with escalating retinopathy risk. People with elevated glucose not high enough to be diagnosed with type 2 diabetes might have either IFG or IGT, also known as 'dysglycaemic states' or 'intermediate hyperglycaemia'. IFG is identified by a FBG test, and IGT can be identified by a two-hour OGTT (Figure 1).[14]

These states are not considered benign, and they reflect a risk of developing diabetes in the future; however, IFG and IGT have been shown to regress over three years in 18% of cases if people follow standard (ie non-intensive) lifestyle recommendations.[15]

As CVD risk is distributed across a continuum of post-challenge glucose levels, any degree of post-challenge hyperglycaemia may be associated with the development of premature CVD.[16]

Refer also to '[Preventing progression to type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/preventing-progression-to-type-2-diabetes)]'.

Diagnosing type 2 diabetes

Clinical symptoms suggestive of diabetes

Symptoms of diabetes include:

- lethargy, polyuria, polydipsia
- frequent fungal or bacterial infections
- blurred vision
- loss of sensation (ie touch, vibration, cold)
- poor wound healing
- weight loss.

Clinical signs of insulin resistance

Signs of insulin resistance may include the following:[17]

- **Acanthosis nigricans** – typically characterised by hyperpigmentation (darkening of skin pigment) and usually accompanied by a velvety change in the texture of the affected skin. Common sites are the neck and axillae.
- **Skin tags** – benign (non-cancerous) skin growths on the body or face. They can be smooth or wrinkled, skin-coloured or just slightly darker than skin colour and can vary in size.
- **Central obesity** - defined by a high waist-to-hip ratio, waist-to-thigh ratio and waist circumference.
- **Signs of PMOS** - such as excess facial and body hair and menstrual irregularity.[18,19]

Box 1 provides information about testing insulin levels.

Box 1. Testing insulin levels to assess insulin resistance

- There is no role for routine testing of insulin levels to assess insulin resistance in IGT or IFG, or in the evaluation of type 2 diabetes.
- Although measuring insulin C-peptide (along with relevant auto-antibodies) can be helpful when type 1 diabetes is suspected, it has no clinical role in characterising insulin resistance in prediabetes or type 2 diabetes. No studies have shown that measuring C-peptide in prediabetes or type 2 diabetes assists with management.

Diagnosing type 2 diabetes

Three laboratory tests can be used to diagnose type 2 diabetes:

- FBG
- HbA1c
- OGTT.

Notes about the use of each in making a diagnosis are provided in Table 2.

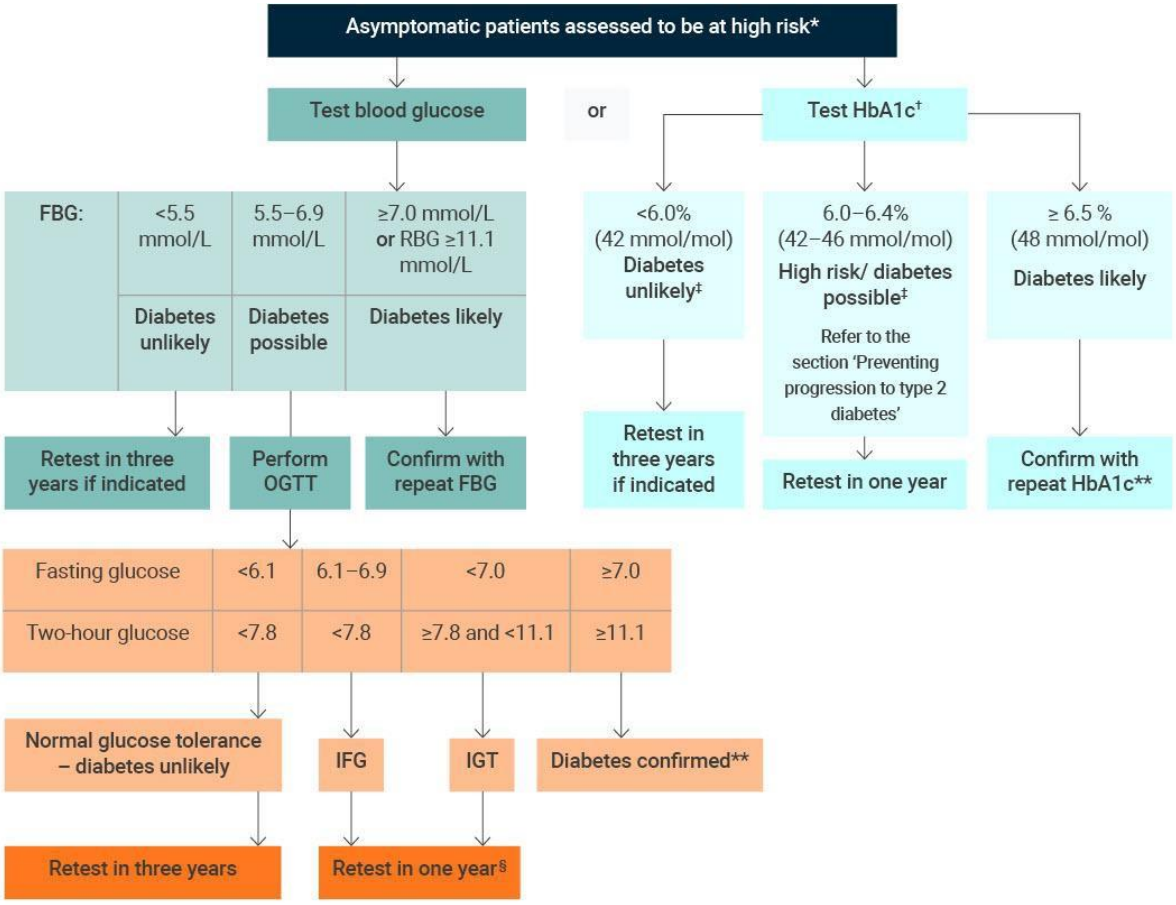
Diagnostic criteria differ depending on whether a person is symptomatic or asymptomatic (see below). Asymptomatic people should be assessed for diabetes risk prior to testing and screened as shown in Figure 1.

Table 2. Diagnostic tests for type 2 diabetes

Diagnostic method	Use when diagnosing diabetes	Further notes
FBG	Fasting (eight hours)	May also be used to detect IFG
HbA1c	Non-fasting Abnormal HbA1c values should be repeated in asymptomatic people and confirmed on a different day, unless two abnormal tests (eg FBG and HbA1c) are already available from the same day Note that HbA1c may lack accuracy (specificity and/or sensitivity) in the following cases, when FBG or OGTT may assist diagnosis: • acute-onset glycaemic states such as post-traumatic type 2 diabetes (eg pancreatitis), rapid onset of glycaemia with sepsis and steroid use • within four months postpartum • people with haemoglobinopathy or haemolysis, or advanced chronic kidney disease • people with iron deficiency (artificially elevated HbA1c) • people who have recently had a blood or iron transfusion[20,21]	Not useful for assessment of IGT A threshold of 6.5% (48 mmol/ mol) is linked to escalating microvascular disease, and HbA1c is a better predictor of macrovascular disease than FBG and two-hour post-glucose22,23

OGTT	Fasting (eight hours) 75 g glucose administered orally Blood is collected from a fasting venous sample and two-hour post-glucose challenge venous sample Abnormal glucose values should be repeated in asymptomatic people and confirmed on a different day	Only method able to detect IGT May concurrently detect IFG

FBG, fasting blood glucose; HbA1c, glycated haemoglobin; IFG, impaired fasting glucose; IGT, impaired glucose tolerance; OGTT, oral glucose tolerance test



FBG, fasting blood glucose; HbA1c, glycated haemoglobin; IFG, impaired fasting glucose; IGT, impaired glucose tolerance; OGTT, oral glucose tolerance test; RBG, random blood glucose

Note: IGT and IFG cannot be diagnosed using HbA1c.

* Using AUSDRISK (score ≥12) or in specific high-risk categories

† Medicare Benefits Schedule (MBS) item number 66841 allows for diagnostic use only, once every 12 months. The request slip should be annotated as HbA1c or for Service Incentive Payment (SIP) and Practice Incentives Program (PIP) purposes. However, a confirmatory HbA1c test (MBS item number 66551) should be ordered before treatment initiation

‡ HbA1c results <6.5% do not exclude diabetes diagnosed by glucose tests

§ If confirmatory test is negative, repeat assessment one year or earlier if symptomatic

** For clinical purposes, the diagnosis of diabetes should always be confirmed by repeating the abnormal test on another day, unless there is unequivocal hyperglycaemia with acute metabolic decompensation or obvious symptoms.

Figure 1. Screening and diagnosing type 2 diabetes in asymptomatic people[3,24-27]

Diagnosing diabetes in asymptomatic people

People who do not have symptoms of hyperglycaemia but who fall in the high-risk categories cited above, or people for whom there is clinical suspicion of diabetes, should be tested using FBG, HbA1c or OGTT (Box 2).

A **second concordant laboratory result** is required to confirm a diagnosis of diabetes in asymptomatic people (Figure 1). It is recommended that the same laboratory test be repeated, using a new blood sample, for a greater likelihood of concurrence.

Box 2. Diagnostic criteria for type 2 diabetes in asymptomatic people

- HbA1c ≥6.5% (48 mmol/mol) on two separate occasions

or

- FBG ≥7.0 mmol/L or random blood glucose ≥11.1 mmol/L confirmed by a second abnormal FBG on a separate day

or

- OGTT before (fasting) and two hours after an oral 75-g glucose load is taken. Diabetes is diagnosed as FBG ≥7.0 mmol/L or two-hour post-challenge blood glucose ≥11.1 mmol/L

These tests are undertaken on venous blood samples.

For clinical purposes, the diagnosis of diabetes should always be confirmed by repeating the abnormal test on another day, unless there is unequivocal hyperglycaemia with acute metabolic decompensation or obvious symptoms.

Diagnosing diabetes in symptomatic people

The presence of symptoms suggestive of hyperglycaemia (refer to 'Clinical symptoms suggestive of diabetes') with **one of the following** is confirmatory of a diagnosis of diabetes:

- a single elevated FBG ≥7.0 mmol/L or single HbA1c ≥6.5%
- a random blood glucose ≥11.1 mmol/L.

A second laboratory test is not required to confirm the diagnosis, unless diagnostic uncertainty remains.

Discordant testing

Due to the different physiological measures of glycaemia, confirmatory tests at times may give discordant results, especially if the second diagnostic test used is not the same as the initial one. For example, HbA1c levels may not be elevated in acute glycaemic states in newly diagnosed diabetes, such that a value of <6.5% (48 mmol/mol) does not exclude diabetes in the presence of an elevated result on blood glucose testing (≥7.0 mmol/L fasting or ≥11.1 mmol/L random).

When the results of more than one type of test are discordant, the result that is above the diagnostic cut-off point should be repeated to make the diagnosis.

Problems with the testing process, such as incorrect fasting or laboratory error, can also lead to discordant results.

Other types of diabetes

Alternative types of diabetes are listed below. (Also refer to the comparison [table 1] in '[Early-onset type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/early-onset-type-2-diabetes)](https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/early-onset-type-2-diabetes) '.)

Type 1 diabetes

Type 1 diabetes is typically considered a disease of children and the young; however, the majority of people with type 1 diabetes are adults and, in as many as 42% of cases of type 1 diabetes, onset occurs in people between the ages of 30 and 60 years.[28]

Consider type 1 diabetes if there is the presence of:

- ketosis/ketonuria (which may be absent)
- polyuria, polydipsia
- acute weight loss (>5% in less than four weeks)
- age <50 years
- personal and family history of autoimmune disease
- acute onset of symptoms.

If suspicious of type 1 diabetes:

- management of hyperglycaemia should not be delayed, and should include immediate assessment for possible ketosis and metabolic disorders, such as hyperosmolar states, while seeking specialist endocrinology assessment. If the blood ketone level is >1.5 mmol/L, seek help immediately. Blood ketones >0.5 mmol/L are abnormal in the presence of hyperglycaemia. Refer to the RACGP's position statement on [Emergency management of hyperglycaemia in primary care.]
  .
- consider non-urgent confirmatory tests for glutamic acid decarboxylase (GAD) and/or insulinoma antigen-2 (IA-2) antibodies. These will be present in 90% of people with type 1 diabetes. When measuring antibodies, higher rates of false-negative results occur early in the development of type 1 diabetes. However, false-negative results decrease when two different antibody tests are performed.
- consider testing for plasma C-peptide level.[29] Levels <0.2 nmol/L in a non-fasting sampling support the diagnosis of type 1 diabetes; however, the diagnostic accuracy of this test varies in presymptomatic type 1 diabetes. Specialist endocrinology evaluation will assist in the case of diagnostic uncertainty.

Latent autoimmune diabetes of adults

Latent autoimmune diabetes of adults (LADA) is diabetes with islet ß-cell antibodies that occurs more commonly in adulthood. LADA often presents similarly to type 2 diabetes, but involves a more rapid course of ß-cell destruction, a poorer metabolic response to non-insulin therapy and a more rapid progression to requiring insulin to control hyperglycaemia due to ß-cell failure.[30]

Monogenic diabetes

Monogenic diabetes is a collection of single-gene-mutation disorders that accounts for 1–2% of cases of diabetes. Monogenic diabetes usually develops before the age of 25 years and is often non-insulin requiring. Monogenic diabetes can be misdiagnosed as either type 1 or type 2 diabetes.[31]

Monogenic diabetes is genetically heterogeneous, but all forms are dominantly inherited, unless they occur as a result of a de novo mutation. There is variance among the forms, with two main types: neonatal diabetes mellitus, occurring in the first six months of life (rare); and monogenic diabetes. Monogenic diabetes subtypes may vary in the severity of hyperglycaemia. The most prevalent subtypes are due to mutations in the HNF1A, GCK and HNF4A genes. Not all forms of the monogenic diabetes phenotype have yet been defined.[32] Suspected cases should be referred to a specialist endocrinologist, and management options and possible genetic diagnosis should be considered.[33]

Gestational diabetes

Refer to 'Gestational diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/gestational-diabetes) '.

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Remission of type 2 diabetes

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Intensive lifestyle changes, including weight loss, may achieve diabetes remission (defined as glycated haemoglobin [HbA1c] levels remaining below 6.5% [48 mmol/mol] for at least three months in the absence of glucose-lowering medications). *Consensus-based recommendation formulated by the RACGP Diabetes Expert Advisory Group.	Consensus*		14/11/2024
Low-calorie (800–850 kcal/day)** diets with meal replacement products for three to five months aimed at achieving >15-kg body weight loss, followed by structured food reintroduction and increased physical activity for weight loss maintenance, should be recommended as an option to potentially induce type 2 diabetes remission to selected non-pregnant adults with a body mass index (BMI) between 27 and 45 kg/m2, type 2 diabetes duration <6 years, HbA1c <12% and not using insulin. **3,344–3,553 kJ/day. To convert from calories (kcal) to kilojoule (kJ), multiple calories by 4.18 (1 calorie = 4.18 kJ).	A, Level 1A	1	14/11/2024

Bariatric surgery*** should be recommended to non-pregnant adults with type 2 diabetes and a BMI ≥35 kg/m2 as an option to potentially induce type 2 diabetes remission. ***Metabolic surgery; refer to 'Weight management interventions for type 2 diabetes', which explains the different types of surgeries.	A, Level 1A	1	14/11/2024
If type 2 diabetes remission criteria are met, HbA1c (or, if HbA1c unreliable, fasting plasma glucose or an oral glucose tolerance test) should be performed at a minimum interval of every six months to assess persistence of diabetes remission or relapse of diabetes.	D, Consensus	1	14/11/2024

Clinical context

Type 2 diabetes remission is defined as a sustained improvement in blood glucose where HbA1c levels remain below 6.5% (48 mmol/mol) for at least three months in the absence of glucose-lowering medications.[2,3] Remission does not mean that type 2 diabetes is cured or reversed. The underlying glucose intolerance may continue, an increased cardiovascular health risk may continue and, over time, glucose levels may return to levels indicative of type 2 diabetes requiring further intervention. Thus, achieving remission means that the person has an HbA1c less than 6.5% (48 mmol/mol) through intensive health behaviour changes rather than glucose-lowering medication.

Remission of type 2 diabetes is more likely in people with a shorter duration of diabetes (less than five years), a lower HbA1c when attempting remission and those not requiring insulin therapy.[4] There is in insufficient evidence on the impact of remission on specific diabetes complications; everyone who is in remission should continue to receive regular monitoring.[2]

In practice

Practice point: The concept of diabetes remission

Diabetes 'remission' is often stated as one of the measured outcomes of clinical trials of weight loss interventions, usually defined as a reduction or cessation of the use of glucose-lowering agents by participants for a minimum of three months.[2]

However, the period that normalisation of glycaemia can be sustained for varies in the long term, according to study length, intervention methods and time to follow-up.[5-9] Periods beyond 12 months report lowered efficacy in maintaining remission with interventions across different populations.

Remission of type 2 diabetes is often linked to sustained weight loss for people who have been overweight or obese, but requires significant weight changes. People have a higher chance of achieving remission if they lose around 10–15% of their body weight. This may be achieved through multiple and complementary approaches, such as intensive dietary change (eg very-low-energy diet) and other healthy behaviour modification, pharmacotherapy or bariatric surgery.[2]

Close consultation with their diabetes healthcare team is required to support people with type 2 diabetes who want to attempt diabetes remission because intensive dietary and weight changes need careful management, monitoring and support. Less than half of all people with type 2 diabetes who attempt remission through intensive dietary changes will achieve it at one year, and only one-third will sustain it over two years.[2]

Evidence supporting practice

- In the Look AHEAD study, an intensive lifestyle intervention resulted in remission in 11.5% and 7.3% of individuals at one and four years, compared with 2% at both time points in the control group.[10]
- The UK DiRECT study, which randomised people with type 2 diabetes into a weight management program, including a low-calorie meal-replacement diet followed by stepped food reintroduction and supportive follow-up, reported that 46% of participants were in remission after one year and 36% after two years.[6] A one-year remission rate of 86% was reported in participants who lost 15 kg or more.[6]
- The DiRECT-AUS study in Australia used a 13-week low-energy total diet replacement with structured introduction of foods and demonstrated remission in 56% of 155 participants, with an average weight loss of 8.1% at 1 year.[11]
- The DIADEM-1 study from Qatar, which replicated the DiRECT approach in people with type 2 diabetes from the Middle East and North Africa, found that 61% of participants were in remission after one year.[12]

- Therapeutic carbohydrate restriction diets have medium to low level evidence for diabetes remission in people who can adhere to low- or very-low-carbohydrate diet approaches for at least six months.[7,13-15] Longer-term studies are still required to support the persistence of remission,
- Metabolic surgery[16] is indicated for people with type 2 diabetes and a BMI ≥35 kg/m2. The optimal procedure is an individually negotiated process involving the person and their management team. A review of diabetes remission rates after bariatric surgery reported remission in over 75% of people 2 years after Roux-en-Y gastric bypass that persisted in 30% of people at five years and in 25% of people at 10 years.[17]

Healthcare professionals should provide consistent, evidence-based information to a person with type 2 diabetes about the potential for remission as a goal of treatment, at the time of diagnosis and in the first few years following diagnosis. Encourage active participation in available services.[18] Type 2 diabetes remission may not be realistic for everyone. Nor is it desirable for some people to stop taking certain glucose-lowering medications because they have benefits beyond the management of blood glucose levels, such as cardiovascular and kidney disease risk reductions (sodium–glucose cotransporter 2 inhibitors and glucagon-like peptide-1 receptor agonist classes).[2]

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Preventing progression to type 2 diabetes

Table of recommendations

Recommendation	Grade	References	Recommended as of:
People with impaired glucose tolerance (IGT) or impaired fasting glucose (IFG) should be referred to lifestyle intervention programs to: • achieve and maintain a 7% reduction in weight • achieve a moderate-intensity physical activity to at least 150 minutes per week	A	1	14/11/2024
People with glycated haemoglobin (HbA1c) 6.0–6.4% may also benefit from a structured weight loss and exercise program to reduce their risk of developing type 2 diabetes	D, Consensus	2	14/11/2024

Clinical context

Defining risk

Risk factors for type 2 diabetes include:[3]

- demographic and social factors – age, family history, ethnicity
- lifestyle factors – obesity, physical inactivity, smoking
- clinical history – high blood pressure, high triglycerides and low high-density lipoprotein cholesterol (HDL-C), gestational diabetes, heart disease, stroke, depression, polyendocrine metabolic ovarian syndrome, acanthosis nigricans and metabolic-associated fatty liver disease (MALFD)
- medications – including corticosteroids and antipsychotic medications.

Clinicians should be alert to the possibility of type 2 diabetes in people with these risk factors, many of which are also risk factors for cardiovascular disease.

The 'metabolic syndrome' (defined by the presence of at-risk measures for waist circumference, triglycerides, HDL-C, blood pressure and fasting glucose[4]) confers a three- to fivefold increased risk of type 2 diabetes, as well as an increased risk for cardiovascular disease.[5]

People with MALFD are at twice the risk of developing type 2 diabetes as the general population.[6]

Particular population groups are also at greater risk of developing type 2 diabetes, such as those with a high-risk ethnicity/background (Aboriginal and Torres Strait Islander, South Asian, South-East Asian, North African, Latin American, Middle Eastern, Māori or Pacific Islander people, including individuals of mixed ethnicity).[7] (Refer to 'Who is at risk of type 2 diabetes? (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/defining-and-diagnosing-type-2-diabetes) ' in the section 'Defining and diagnosing type 2 diabetes'.)

Aboriginal and Torres Strait Islander peoples have more than three times the prevalence of type 2 diabetes than non-Indigenous Australians, with onset at an earlier age.[8] Waist circumference has been found to be a strong predictor of the risk of developing type 2 diabetes, especially in Aboriginal women.[9] For advice on the prevention of type 2 diabetes refer to 'Chapter 17: Type 2 diabetes' in the National Aboriginal Community Controlled Health Organisation (NACCHO)–Royal Australian College of General Practitioners (RACGP) National guide to a preventive health assessment for Aboriginal and Torres Strait Islander people.[10]

Other groups particularly at high risk of developing type 2 diabetes are people with IFG, IGT or gestational diabetes.[11,12] (For definitions of these states, refer to 'Defining and diagnosing type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/defining-and-diagnosing-type-2-diabetes) '.)

Progression to type 2 diabetes in people at high risk

Annually, approximately 5–10% of people at high risk develop diabetes, although this varies according to age, sex, family history and ethnic background.[13] Three-quarters of people with IFG or IGT will develop type 2 diabetes over their lifetime.[14] People with IFG or IGT whose glucose metabolism returns to normal, either as a result of interventions or spontaneously, have roughly half the risk of developing type 2 diabetes compared with those with persistently abnormal glucose metabolism.[15]

Women with a history of gestational diabetes have an approximate 7- to 10-fold[16] elevated risk of future development of type 2 diabetes depending on diagnostic criteria applied to this population.[17-19]

Evidence for lifestyle interventions to prevent type 2 diabetes

In randomised controlled trials, intensive lifestyle interventions have been shown to reduce the rates of progression to type 2 diabetes by 27–45% over periods ranging from 10 to 23 years.[1] Recent analyses suggest that longer-term (more than three years) with sustained (mixed lifestyle and medication) interventions may reduce the risks of cardiovascular disease, retinopathy and mortality in identified high-risk people across different population groups.[20] (Refer to 'Who is at risk of type 2 diabetes?' in

'Defining and diagnosing type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/defining-and-diagnosing-type-2-diabetes) '.)

People at high risk of type 2 diabetes should consider lifestyle interventions to help them increase physical activity to at least 150 minutes per week, and to achieve and maintain a 7% reduction in weight if they are overweight or obese. This may involve individual or group education and coaching. Cardiovascular fitness significantly decreases the risk of progression to type 2 diabetes in people with IFG and/or IGT, whether or not they are overweight.[21]

In women with a history of gestational diabetes, beginning lifestyle interventions soon after pregnancy has been shown to reduce the incidence of type 2 diabetes by 25%.[22]

Other interventions

There is evidence that, in high-risk people, metformin reduces the relative risk of developing type 2 diabetes by approximately 25%.[23,24] However, metformin is not licensed by the Therapeutic Goods Administration for this use in Australia.

There have been no randomised controlled trials of the effect of bariatric surgery on preventing progression to type 2 diabetes. Longitudinal studies have observed longer-term reduction in progression from IGT to diabetes (ie return to nonormoglycaemia) at rates of 58% at four years after surgery, with only 5% progressing to diabetes. However, results are more promising for people diagnosed with diabetes and the incidence of diabetes remission.[25] (Refer to 'Remission of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/remission-of-type-2-diabetes) '.)

In practice

Identifying people at high risk of type 2 diabetes

Identifying risk factors for type 2 diabetes in people is a routine part of general practice. The RACGP's Guidelines for preventive activities in general practice (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/preventive-activities-in-general-practice/about-the-red-book) (10th edition) recommend assessing body mass index, waist circumference, diet and physical activity in adults every two years. Screening for diabetes risk with the Australian type 2 diabetes risk assessment tool (AUSDRISK) is recommended in all adults aged ≥40 years every three years.[7]

For information about assessing diabetes risk and screening recommendations for diabetes, IFG and IGT, refer to 'Defining and diagnosing type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/defining-and-diagnosing-type-2-diabetes) '.

Interventions to manage diabetes risk

People at high risk of type 2 diabetes are also at increased risk of cardiovascular disease. Thus, their cardiovascular risk (https://www.cvdcheck.org.au/) should be assessed, and lifestyle change and medications considered where appropriate.[26] (Refer to 'Type 2 diabetes and cardiovascular risk (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/type-2-diabetes-and-cardiovascular-risk) '.)

Particular lifestyle interventions have been shown to reduce the risk of type 2 diabetes in people with IGT, but not in those with IFG alone. These interventions are of moderate intensity (eg at least 16 one- to two-hour sessions focusing on diet and physical activity delivered over six months by a range of health professionals). People should consider at least 150 minutes per week of physical activity[27] and a low-glycaemic index diet rich in fruit, vegetables and fibre, and low in meat and fat.

Maintaining lifestyle change, especially weight loss, in high-risk people can be difficult. Technology-assisted modalities, including 'apps' that support change in diet and physical activity, activity trackers and websites providing information and referral options, are promising tools to help people maintain physical activity and weight loss.[28]

Intensive lifestyle intervention may be beyond the scope of the brief interventions routinely delivered in general practice or practice nurse consultations, or even by those delivered through allied health visits as part of a care plan. People may therefore benefit from referral to a diabetes prevention program. A list of state-based diabetes prevention programs can be found on the Diabetes Australia (https://www.diabetesaustralia.com.au/prevention-programs/) website.

Telephone coaching programs run by state and territory governments and health insurance funds have also shown promising results.[29]

Refer to the RACGP's Smoking, nutrition, alcohol, physical activity (SNAP) (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/snap) guide designed to assist GPs and practice staff (the general practice team) to work with patients on the lifestyle risk factors of SNAP.

The Australian National Diabetes Strategy 2021–2023 (https://www.health.gov.au/resources/publications/australian-national-diabetes-strategy-2021-2030?language=en) includes information on reducing modifiable risk factors and areas for action to prevent people developing type 2 diabetes (pp 14–15).

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Early-onset type 2 diabetes

Table of recommendations

Recommendation	Grade	References	Recommended as of:
For people aged 18–30 years with early-onset type 2 diabetes, due to the complexity of management and higher risk of complications, consider timely referral to an endocrinologist or non-general practitioner specialist with an interest in diabetes through a shared care arrangement.	Consensus	1	14/11/2024

Clinical context

In recent years there has been an increase in the incidence and prevalence of type 2 diabetes in children, adolescents and young adults.[2,3] This early-onset (also called 'young-onset') type 2 diabetes is concerning because it results in a longer lifetime exposure to hyperglycaemia and consequent complications. There is also emerging evidence that early-onset type 2 diabetes is a more aggressive disease than later-onset type 2 diabetes and is accompanied by the earlier onset and more rapid progression of macrovascular and microvascular complications.[3-6]

Table 1. Comparison of type 1 diabetes, type 2 diabetes and monogenic diabetes[7-9]

	Type 1 diabetes	Type 2 diabetes	Monogenic diabetes
Clinical features			
Usual onset	Acute	Insidious	Variable

Osmotic symptoms	Pronounced	Not evident unless in cases of severe hyperglycaemia	Variable
Ketosis	May be present at diagnosis and risks may be ongoing	Usually not present but may occur with the use of an SGLT2i	Common in neonatal forms; rare in others
Obesity	Can co-exist as per general population; weight loss is more usual prior to or at diagnosis	Often obese – up to 85%	Usually not obese
Signs of insulin resistance (eg acanthosis nigricans)	Rare	Often present	Rare
Family history in parents	2–4%	80%	90%
Diagnostic aid biomarkers			
Antibodies	IAA, ICA, GAD, IA-2, IA-2β or ZnT8 antibodies present in 85–95% of cases	Usually not present	Not present
C-peptide	Below normal range (<0.2 nmol/L)9	Normal or above normal range (>0.2 nmol/L)9	Normal

Genetic test	If family history of diabetes (eg autosomal dominant), see monogenic diabetes for exclusion purposes	In early onset diabetes (age <30 years) atypical presentations* or autosomal dominant family history of diabetes, consider monogenic diabetes for exclusion purposes or seek specialist endocrinology advice	Common positive genetic mutations: HNF4A, HNF1A, GCK (seek specialist advice)

*For example, failure to respond to glycaemic management options for type 2 diabetes.

GCK, glucokinase; HNF1A, HNF1 homeobox A; HNF4A, hepatocyte nuclear factor 4 alpha; SGLT2i, sodium–glucose cotransporter 2 inhibitor.

Definitions and diagnosis

Early-onset type 2 diabetes is usually defined as occurring under the age of 30 years.[1] This can be further separated into child and adolescent (<18 years) and young adult (<30 years) onset. However, there is no consistency of definitions across the literature, especially of the upper age limit. Although this handbook refers only to the young adult group, there is clearly a continuum across the age groups.

Unlike older-onset type 2 diabetes, this group can offer a diagnostic challenge for general practitioners to differentiate between type 1 diabetes, latent autoimmune disease of adults, type 2 diabetes and monogenic diabetes (Table 1). Careful diagnostic assessment is required, because this has a major impact on management and outcome.[7]

For children and adolescents, hyperglycaemia (at levels diagnostic of diabetes) can be a medical emergency, and immediate referral to an emergency department or, if not available, urgent consultation with a specialist is strongly recommended. For more information, refer to The Royal Australian College of General Practitioners' Emergency management of hyperglycaemia in primary care.

Screening and risk factors

Risk factors for early-onset type 2 diabetes include:[1]

- a maternal history of type 2 diabetes or gestational diabetes during an individual's gestation
- a family history of type 2 diabetes in a first-degree relative
- certain ethnicity (Aboriginal and Torres Strait Islander, South Asian, South-East Asian, North African, Latin American, Middle Eastern, Māori or Pacific Islander people [includes individuals of mixed ethnicity])

- clinical evidence of insulin resistance (polyendocrine metabolic ovarian syndrome, acanthosis nigricans, dyslipidaemia, hypertension) or existing macrovascular disease, impaired fasting glucose, impaired glucose tolerance or history of gestational diabetes
- the use of antipsychotic medications.

There are no specific tools currently available for the screening or early detection of early-onset type 2 diabetes other than maintaining a high index of suspicion, especially in high-risk groups.

Treatment challenges

Compared with late-onset type 2 diabetes, the early-onset group is more likely to have suboptimal glycaemic management,10 diastolic hypertension, an earlier need to initiate insulin and a greater burden of diabetes-related complications (Box 1), resulting in a reduced quality of life, greater morbidity and premature mortality.

In the cohort of people with early-onset type 2 diabetes, life expectancy is reduced by 14 years for males and 16 years for females compared with those without diabetes.3 An Australian study showed 11% mortality over 20 years in a cohort of young adults diagnosed between the ages of 15 and 30 years.[11]

Box 1. Complications in early-onset type 2 diabetes compared with older-onset type 2 diabetes[3,12]

Lifetime risk of complications greater with onset at a younger age

Life expectancy reduced

Non-alcoholic fatty liver disease is twice as common

Earlier onset of microalbuminuria and end-stage renal failure

Earlier onset and greater prevalence of diabetic retinopathy

Earlier onset of neuropathy

Apolipoprotein B concentration is higher despite statin therapy

Risk of myocardial infarction is 14-fold higher compared with same-age counterparts, compared with a two- to fourfold higher risk in older-onset type 2 diabetes

Early onset of diastolic myocardial dysfunction

Reduced fertility and greater pregnancy complications

Risk of premature decline in cognitive function

Higher rate of diabetes-related psychological distress and psychological issues, especially depression

Limited work capacity and consequent socioeconomic impact

Reduced quality of life

In practice

The treatment of people with early-onset type 2 diabetes is limited by a lack of evidence, and current recommended treatment strategies are extrapolated from the evidence base for older-onset type 2 diabetes.[7]

Structured education is fundamental to long-term self-care and can benefit young people. Developing programs tailored to their needs and addressing factors such as diabetes-related distress, depression and other socioeconomic issues can enhance young people's participation and support their diabetes management more effectively.

Lifestyle changes, including weight loss and exercise, are recommended as first-line therapy. However, limited studies are available to inform management. Although lifestyle changes can provide benefits, emerging evidence suggests these changes may not be easily maintained once support programs ceases, and there is low-level evidence that the benefit provides protection against future cardiovascular disease.[13,14] Limited data suggest that metabolic surgery may be a treatment option for some.[12]

The use of glucose-lowering medication is generally extrapolated from management algorithms for people with older-onset type 2 diabetes. There is a paucity of data, especially with the newer therapies, in people aged <18 years. It is likely that people with early-onset type 2 diabetes will require early initiation of insulin.[7]

Treatments to address cardiovascular risk factors are again based on evidence from older person groups. To reduce the lifetime risk of coronary heart disease, early and aggressive treatment of cardiovascular risk factors in young people with type 2 diabetes is recommended;[12,15] however, there is evidence that the use of cardioprotective treatments, such as statins and antihypertensive medication, in the younger age group is suboptimal.[3] This might be due to reluctance by doctors to prescribe such lifelong therapies to younger people, especially women,[12] and the fact that cardiovascular risk calculators are reliable in older age groups only.

Adherence to medication and follow-up is also a problem in younger age groups. This can be a challenge for adequate management, and emphasises the need for education and for healthcare providers to ensure they provide accessible, patient-centred, coordinated, continuous and effective care during this period. This period of 'vulnerability' may require the general practitioner and treating team to specifically plan for that person's support needs and maintain adequate monitoring and complication screening.

Prepregnancy counselling and/or contraception are imperative in this age group to offset preventable diabetes-related pregnancy and fetal complications (refer to 'Type 2 diabetes, reproductive health and pregnancy (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/type-2-diabetes-reproductive-health-and-pregnancy) ').

It is recommended that all child, adolescent and young-adult (aged 18–30 years) people with type 2 diabetes be referred to an endocrinologist or, if not accessible, a specialist physician with an interest in diabetes. For people aged 18–30 years with early-onset type 2 diabetes, consider referral and/or shared care, because management can be difficult and there is a high burden of complications.

Resources

Further reading

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Lifestyle interventions for the management of type 2 diabetes

Lifestyle interventions for the management of type 2 diabetes

In this section

Physical activity (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/lifestyle-interventions-for-the-management-of-type/physical-activity)
Diet (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/lifestyle-interventions-for-the-management-of-type/diet)
Smoking cessation (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/lifestyle-interventions-for-the-management-of-type/smoking-cessation)
Alcohol consuption (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/lifestyle-interventions-for-the-management-of-type/alcohol-consumption)

Physical activity

Lifestyle interventions for the management of type 2 diabetes | **Physical activity**

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Counsel youth with type 2 diabetes to engage in 60 min/day or more of moderate- or vigorous-intensity aerobic activity, with vigorous muscle-strengthening and bone-strengthening activities at least three days/ week. Sedentary behaviours, especially prolonged screen time, should be avoided.	B	1,2	14/11/2024
Counsel most adults with type 2 diabetes to engage in 150 minutes or more of moderate- to vigorous-intensity aerobic activity per week, spread over at least three days/week, with no more than two consecutive days without activity. Shorter durations (minimum 75 min/week) of vigorous-intensity or interval training may be sufficient for younger and more physically fit individuals.	B	2	14/11/2024
For all people with diabetes, evaluate baseline physical activity and time spent in sedentary behaviour.	B	2	14/11/2024
Counsel that prolonged sitting should be interrupted every 30 minutes for blood glucose benefits.	C	2	14/11/2024

Recommend flexibility training and balance training two to three times/week for older adults with diabetes. Yoga and tai chi may be included based on individual preferences to increase flexibility, muscular strength, and balance.	C	[2]	14/11/2024

Clinical context

Physical activity is one of the cornerstones of diabetes management. Regular physical activity of any kind can have a favourable impact on glycaemic management, cardiovascular disease (CVD) risk and overall mortality.[3] However, more structured, specialised and individualised exercise prescription can achieve superior benefits.[4]

The goal is for people with diabetes, impaired fasting glucose or impaired glucose tolerance to accumulate at least 150 min/week of moderate- to vigorous-intensity activity with no more than two consecutive days without activity. This weekly total should include at least two moderate-to-vigorous resistance training sessions for a total of at least 60 minutes. These exercise amounts will establish and maintain muscular fitness and aerobic capacity.[5]

It is recommended to refer people with type 2 diabetes to an accredited exercise physiologist for the prescription of a safe and effective and sustainable exercise intervention.

Aerobic exercise

In people with type 2 diabetes, aerobic exercise (eg walking, cycling, swimming) reduces HbA1c, triglycerides, blood pressure and insulin resistance.[4]

Aerobic exercise intensity can be set as a percentage of estimated maximum heart rate (HRmax) using the equation 208–0.7×age (in years).[6,7] For moderate- and vigorous-intensity aerobic exercise, values of 55–69% and 70–89% of HRmax, respectively, can be used.[5]

Alternatively, ‘moderate’- and ‘vigorous’-intensity aerobic exercise are defined on rate of perceived exertion (RPE) scales as ‘somewhat hard’ and ‘hard’, respectively. Using the talk/sing test, if a person can comfortably talk but cannot sing, they are doing moderate-intensity exercise; if they are unable to talk comfortably, they are doing vigorous-intensity exercise.

Resistance exercise

Resistance, or strength, training involves activity such as using free weights, resistance machines or body weight. ‘Moderate-to-vigorous’ resistance training can be defined as two to four sets of 8–10 repetitions of 8–10 exercises, with rest intervals of one to two minutes.[5]

Resistance training reduces HbA1c.[8] However, combining aerobic and resistance training appears to be superior compared with either alone.[9] Both types of activity reduce CVD markers similarly,[8] and a single bout of either may have a similar acute effect.[10]

In practice

When advising people about physical activity, general practitioners (GPs) should:

- emphasise that some physical activity is better than none[4]
- discuss the importance of reducing sedentary behaviour – advise people to interrupt prolonged sitting every 30 minutes for blood glucose benefits
- explore the risks and benefits of different forms of physical activity for the individual, taking into account whether the person is already physically active
- explain the importance of varying the intensity of exercise levels
- explain the importance of following the chest pain/discomfort and/or diabetes symptom management plan[11]
- comment on foot care and appropriate footwear when exercising.

Pre-exercise health assessment

Asymptomatic sedentary people with diabetes who wish to undertake low- to moderate-intensity activity should have a CVD assessment as part of usual diabetes care; however, those identified as having CVD risk on screening tools, or who have existing atherosclerotic or functional CVD, may require more specific physical assessment prior to engaging in moderate- to high-intensity exercise. When prescribing intensity, consider that vigorous intensity exercise is more time efficient and may also result in greater benefits in appropriate individuals with consideration of complications and contraindications. The existence of diabetes complications may require specific advice (see below).

When prescribing a physical activity program, the GP should take a careful history and be aware of the following:

- Special attention needs to be paid to exertion-induced symptoms, chest or abdominal discomfort, claudication or syncope.
- People with type 2 diabetes frequently have silent macrovascular disease.
- For people with hypertrophic obstructive cardiomyopathy, heavy weightlifting and high-intensity aerobic exercise are not recommended.[12]
- For people with long QT syndrome, exercise may trigger a cardiac arrhythmic event.[12]
- Vigorous exercise is contraindicated for those with proliferative retinopathy, and for three months after laser retinal treatment.[12]
- Exercise may be relatively contraindicated in people with peripheral neuropathy, a history of recurrent falls or uncontrolled hypertension.[12]
- A foot assessment should be conducted and people advised about the importance of appropriate footwear during exercise.
- Referral to an accredited exercise physiologist is recommended. Relevant Medicare Benefit Schedule item numbers (https://www9.health.gov.au/mbs/fullDisplay.cfm?type=item&qt=ItemID&q=81115) are available.

Any symptoms suggestive of CVD need to be actively investigated.

Safety advice during and after exercising

People with diabetes should be advised to moderate or cease their activity if they develop cardiovascular symptoms or feel unwell.

People with claudication need to be encouraged to continue physical activity under appropriate clinical supervision.

Managing blood glucose levels

People with diabetes need to be aware of the potential delayed effects of physical activity on blood glucose levels, in particular delayed hypoglycaemia, particularly for people using insulin or sulfonylureas (or combinations of these). Postexercise hypoglycaemia can occur 12–15 hours after exercise, but is still a risk up to 48 hours after the cessation of activity.[4]

Advise people on how to recognise, prevent or manage glycaemic events (Box 1). Clinical advice should be given to all people to guide physical activity if they experience symptoms of a glycaemic event, including how to manage the glycaemic event, when to discontinue and continue further physical activity and when to be reviewed by their GP or other suitably trained health professional.

Box 1. Advice for people to recognise, prevent or manage glycaemic events when exercising

- Do not begin exercising if you have experienced a hypoglycaemic event within the previous 24 hours that required assistance from another person to treat (severe hypoglycaemia; see 'Managing glycaemic emergencies' (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-glycaemic-emergencies)) or if you are feeling unwell.
- Check blood glucose levels (BGLs) before and during exercise, especially if using insulin or sulfonylureas; check every 30–45 minutes during exercise and adjust medication and carbohydrate intake as appropriate.[13] Continuous glucose monitoring or structured glucose self-monitoring can offer 'real-time' glucose information to help reflect changes from exercise.
- If the pre-exercise BGL is <5 mmol/L and you are taking insulin or a sulfonylurea, you are at risk of a hypoglycaemic episode during or after exercise. Ensure you have access to additional carbohydrates as per the advice of an endocrinologist, credentialled diabetes educator or accredited practising dietitian.
- If BGL >15 mmol/L is noted at any time with exercise you are potentially at risk of a hyperglycaemic event and strenuous exercise can sometimes cause a temporary period of raised blood glucose due to hormones released during some types of strenuous exercise and thus increase this risk. If BGL is >15 mmol/L on two subsequent occasions two hours apart, seek medical assistance if not able to implement your sick-day plan. It is recommended to take a blood ketone level (if using an SGLT2i); if elevated >1.5 mmol/L, seek emergency medical care. Once acute events have been managed, avoid further strenuous exercise and discuss a structured plan with an endocrinologist and/or credentialled diabetes educator to help prevent further events.
- Be aware that delayed hypoglycaemia can occur up to 48 hours after exercise.
- Carry a rapid-acting glucose source at all times (eg glucose jelly beans or glucose gel/drink). Working with the diabetes team to support a documented hypoglycaemic management plan would be useful.

Other exercise safety advice

- Advise people to wear correct supportive footwear, especially if there is neuropathy, vascular disease, abnormal foot structure or previous foot ulcer/s, in which case the advice of a podiatrist with an interest in high-risk feet should be sought. This advice would also include the appropriateness of 'jolting' exercises, such as running, skipping and jumping.
- Advise people with neuropathy or peripheral arterial disease to check their feet daily and after physical activity for blisters, warm areas or redness.
- Advise people to stay hydrated during exercise, particularly in warmer weather.

Aboriginal and Torres Strait Islander people

Many Aboriginal and Torres Strait Islander people are involved in physically demanding sporting and cultural activities, and this should be encouraged for all people with diabetes.

For Aboriginal and Torres Strait Islander people, GPs should be aware of activities or programs that are affordable, appropriate and accessible. These might be run by local community groups.

A careful history in the context of a trusting doctor–patient relationship may bring about better understanding and opportunity.

For more information, refer to the Australian Institute of Health and Welfare report on Healthy lifestyle programs for physical activity and nutrition.[14]

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Diet

Lifestyle interventions for the management of type 2 diabetes | **Diet**

Clinical context

Most of the burden of disease due to poor nutrition in Australia is associated with eating too much energy-dense and relatively nutrient-poor foods, and eating too few micronutrient-dense foods, including vegetables, fruit and wholegrain cereals. Type 2 diabetes may arise in an individual as one consequence of these factors.

Key dietary themes for people with type 2 diabetes are to:[1]

- promote and support healthy eating patterns, emphasising a variety of nutrient-dense foods in appropriate portion sizes, to improve overall health and:
    - achieve and maintain body weight goals
    - attain individualised glycaemic, blood pressure and lipid goals
    - delay or prevent the complications of diabetes
    - address individual nutrition needs based on personal and cultural preferences, health literacy and numeracy, access to healthful foods, willingness and ability to make behavioural changes and existing barriers to change
    - maintain the pleasure of eating by providing non-judgemental messages about food choices while limiting food choices only when indicated by scientific evidence
    - provide an individual with diabetes the practical tools to develop healthy eating patterns rather than focusing on individual macronutrients, micronutrients or single foods.

All people should be offered and encouraged to seek advice on medical nutrition therapy by referral to an accredited practising dietitian (APD). An APD can help people address core issues around nutrition, such as achieving sustainable healthy eating patterns and, where appropriate, healthy body weight (and, if needed, loss) by reducing energy intake (portion control and type of food). An APD can also assist with recipe modification, changing cooking techniques, label reading, eating out and understanding of fad diets.

Glycaemic management and meal planning

Assistance from an APD as part of a multidisciplinary team may help people adjusting their dietary intake.

To influence the glycaemic response after eating, meal plans need to consider both the amount and quality of carbohydrates eaten. The total amount of carbohydrate consumed (compared with other macronutrients or the glycaemic index of the meal) may be the major dietary factor that contributes to high postprandial blood glucose levels.[2] Eating low-glycaemic-load foods instead of higher glycaemic index (GI) foods may modestly improve glycaemic management.[3]

Low GI foods include dense wholegrain breads, steel-cut oats, lower fat milk and yoghurt, minimally processed (eg wholegrain, low GI) breakfast cereals, pasta, Doongara rice, legumes and most fruits. Intake of high-carbohydrate, low-nutrient-dense foods, such as soft drinks, cakes and confectionaries, should be confined to infrequent, small amounts to reduce the risk of weight gain and a worsening cardiometabolic profile.[3]

There is evidence that nutrition education may be particularly important for the prevention of hypoglycaemia in people with type 2 diabetes on insulin or sulfonylureas. Consistent carbohydrate intake and education on quantities of carbohydrate consumed and spaced, regular meal consumption may help some people manage blood glucose levels and weight. Alternatively, adjusting or reducing carbohydrate content consumed may require supported glucose monitoring and medication dose adjustment to prevent hypoglycaemic events, especially if fasting or using sulfonylureas or insulin. The inclusion of snacks as part of a person's meal plan should be individualised and should be balanced against the potential risk of weight gain and/or glycaemic variability.[4]

Diabetes-specific nutritional formulas (DSNFs) are specialised supplemental nutritional therapies for people with diabetes that are not specific for weight management, but are supportive in sustaining shorter-term healthy nutrient intake, improving glycaemic management when people are not able to sustain a healthy whole-food intake (eg postoperative nutrition support, using glucagon-like peptide-1 receptor agonists in weight management or with metabolic surgery). DSNFs can be implemented with the support of an APD who will provide guidance on their appropriate use, including dosage, frequency and duration, while considering an individual's overall dietary intake and health needs. An APD as part of the multidisciplinary diabetes team can support people with advice on any necessary changes to medications with the use of DSNFs, as well as how to practically transition back to a whole-food diet.

The Australian Diabetes Society (ADS) has released a position statement with practical advice on DSNFs.[5]

Certain dietary approaches have evidence to support individual cardiovascular risk reduction, including the Dietary Approaches to Stop Hypertension (DASH) diet and Mediterranean diet.[6]

In practice

Evaluation of current dietary intake and the eating patterns of an individual is an initial critical step to support the management of type 2 diabetes.[7] It remains an important initial step on diagnosis of diabetes and should be reviewed regularly as part of ongoing management.

Dietary habit changes are often slow and incremental. There is no need for a 'special' diet for diabetes, just the requirement to consider a sustainable, sensible, balanced eating plan that is culturally appropriate for each individual. Keep advice simple and educate people about healthy food choices.

Low and lower carbohydrate eating patterns can be beneficial for some individuals with type 2 diabetes, but they require careful planning and monitoring to ensure safety and effectiveness. It is important to tailor dietary interventions to individual needs and circumstances, in discussion with an APD.

Identifying psychosocial issues around eating (eg binge eating, eating when stressed or bored) is also very important. Clinically assess people with diabetes about personal experiences with different dietary approaches and whether there have been any cycles of weight loss and gain, and identify any modifiable issues that impact upon healthy dietary adherence.

Not all dietary sugars need to be eliminated. Small amounts of added simple carbohydrate as part of a high-fibre, modified-fat meal plan increases the choice of food available and may aid sustainability for dietary approaches and healthy adherence. Foods naturally high in sugars, such as fruit and dairy, do not need to be avoided in a balanced, individually managed diet.

Referral to an APD and a credentialled diabetes educator[8] will support implementation and reinforcement of these recommendations. A list of APDs in your area can be found on the Dietitians Australia (https://dietitiansaustralia.org.au/seeing-dietitian-australia) website.

Further information about diet for people with diabetes, including a position statement about low-carbohydrate diets for diabetes, can be found on the Diabetes Australia (https://www.diabetesaustralia.com.au/eating-well) website.

Aboriginal and Torres Strait Islander people

There is evidence that Aboriginal and Torres Strait Islander communities in urban and remote regions face significant access barriers to nutritious and affordable food. Nutritious food tends to cost more and require refrigeration and preparation. Food choices can be significantly altered when people have access to appropriate foods and education about nutrition.

General practitioners should make themselves aware of local community initiatives for the supply of fresh fruit and vegetables at affordable prices. In some areas, these include arrangements with farmers' markets or local community gardens. For more information specific to nutrition for Aboriginal and Torres Strait Islander peoples, refer to:

- results from the Australian Bureau of Statistics Australian Aboriginal and Torres Strait Islander Health Survey (http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4727.0.55.005~2012-13~Main%20Features~Key%20Findings~1)
- the Australian Institute of Health and Welfare publication Healthy lifestyle programs for physical activity and nutrition (https://www.aihw.gov.au/reports/indigenous-australians/healthy-lifestyle-programs-for-physical-activity-n/summary) .

Resources

Further reading

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Smoking cessation

Lifestyle interventions for the management of type 2 diabetes | **Smoking cessation**

Table of recommendations

Recommendation	Grade	References	Recommended as of:
All people who smoke should be offered brief advice and medications to quit smoking	Recommended (Strong)	[1]	14/11/2024

Clinical context

Smoking is associated with an increased risk of type 2 diabetes in men and women,[2] and smoking negatively affects glycaemic management (eg smokers with type 2 diabetes need larger doses of insulin to achieve glycaemic targets similar to that of those who do not smoke).[3]

People with diabetes who smoke also further increase their risk of cardiovascular disease, peripheral vascular disease and neuropathy (and progression of neuropathy). Smoking also increases the risks associated with surgery.[1]

In practice

The importance of smoking cessation in those with, or at risk of, type 2 diabetes cannot be overstated.

In the absence of contraindications, smokers who have evidence of nicotine dependence should be offered pharmacotherapy, along with behavioural support, if they are motivated to stop smoking. The choice of pharmacotherapy is based on efficacy, clinical suitability and patient choice.[1]

Guidelines for smoking cessation and a pharmacotherapy treatment algorithm are available in the RACGP's Supporting smoking cessation: A guide for health professionals (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/supporting-smoking-cessation) .

Aboriginal and Torres Strait Islander people

The following organisations provide resources and strategies for smoking cessation for Aboriginal and Torres Strait Islander people:

- Centre for Excellence in Indigenous Tobacco Control (CEITC) (https://tacklingsmoking.org.au/key-resources/resources/21033/?title=CEITC+fact+sheet+series+for+health+workers&contentid=21033_1)
- Tackling Indigenous Smoking (https://tacklingsmoking.org.au/)
- Australian Indigenous HealthInfoNET (https://healthinfonet.ecu.edu.au/) .

Specific support for Aboriginal and Torres Strait Islander people is also provided by Quitline.

Refer to 'Chapter 2.4: Smoking' in the National Aboriginal Community Controlled Health Organisation–Royal Australian College of General Practitioners National guide to preventive healthcare for Aboriginal and Torres Strait Islander people.[4]

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Alcohol consumption

Lifestyle interventions for the management of type 2 diabetes | **Alcohol consumption**

Table of recommendations

Recommendation	Grade	References	Recommended as of:
People with diabetes drink no more than 10 standard drinks per week	B	1, 2	14/11/2024

Clinical context

Alcohol has complex metabolic effects that affect the management of type 2 diabetes through its effects on diet and the management of blood glucose levels:

- Alcohol interferes with the action of insulin, insulin secretagogues and glucagon, thereby increasing the risk of hypoglycaemia in people with type 2 diabetes who take these medications.[3]
- Alcohol reduces awareness of hypoglycaemia.
- The effects of alcohol may depend upon the quantity consumed and the length of exposure to alcohol (eg single one-off episodes versus the effects of chronic consumption).

Alcohol and hypoglycaemia have independent but additive adverse effects on cognitive function.[4] Additional potential negative effects from alcohol consumption can impact diabetes-associated disease and neuropathies.[5]

A reduction in energy intake, which should involve assessing the impact of chronic alcohol intake, may be important for managing people who are overweight or obese as part of diabetes management.

In practice

People with diabetes should be educated about safe levels of alcohol intake, according to Australian guidelines (https://www.nhmrc.gov.au/health-advice/alcohol) , and should be told that there is an increased risk of hypoglycaemia if alcohol is consumed while using medications such as sulfonylureas and insulin.[6]

Current Australian guidelines to reduce health risks from drinking alcohol recommend no more than 10 standard drinks (a standard drink contains 10 g alcohol) per week, and no more than four standard drinks on any one day.[3] Low-alcohol beers are an alternative to ordinary or diet beers. The carbohydrate content of low-carbohydrate beer is not significantly less than that of full-carbohydrate beers, and the alcohol content is often full strength. Light (low alcohol) beer has about 2.7% alcohol (compared with around 4.6% in a standard beer), but it has the same number of kilojoules as a low-carb beer, and a similar amount of carbohydrates to a standard beer. Any benefit will be negated unless the person is consuming the same number or fewer of standard drinks.

It is recommended that people with diabetes abstain from alcohol if they plan to drive.[7]

Australian alcohol guidelines can be found on the National Health and Medical Research Council (https://www.nhmrc.gov.au/health-advice/alcohol) website.

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Weight management interventions for type 2 diabetes

Table of recommendations

Recommendation	Grade	References	Recommended as of:
In people with overweight or obesity with diabetes, a nutritionally balanced, calorie-reduced diet should be followed to achieve and maintain a lower, healthier body weight.	A, Level 1A	1-3	14/11/2024
An intensive healthy behaviour intervention program, combining dietary modification and increased physical activity, may be used to achieve weight loss, improve glycaemic control* and reduce cardiovascular disease (CVD) risk. *glycaemic management	A, Level 1A	2-4	14/11/2024
Obesity pharmacotherapy should be considered for people with diabetes and overweight or obesity along with lifestyle changes. Potential benefits and risks must be considered.	A	5	14/11/2024
People who achieve weight loss goals should be offered long-term (≥1 year) weight maintenance support which should, at minimum, involve monthly contact, ongoing monitoring and self-monitoring of weight and regular physical activity (200–300 min/ week).	A	5,6	14/11/2024

Consider metabolic surgery as a weight and glycaemic management approach in people with diabetes with body mass index (BMI) ≥30.0 kg/m2 who are otherwise good surgical candidates.	A	[5,7]	14/11/2024
Metabolic surgery should also be considered for people with type 2 diabetes and BMI 30.0–34.9 kg/m2 if hyperglycaemia is inadequately managed despite optimal treatment with either oral or injectable medications.	Consensus	[5,7]	14/11/2024

Clinical context

For people with type 2 diabetes who are overweight or obese, even modest weight loss (5–10%) may provide clinical benefits, including improved glycaemic management, blood pressure and lipid profiles, especially early in the disease process.[8-10] Lifestyle-induced sustained weight loss contributes to the prevention, or delays the progression, of diabetes.[11-13] However, the relationship between weight loss and clinical benefits is complex. The multicentre randomised clinical trial Action for Health in Diabetes (Look AHEAD) provided evidence that intensive lifestyle intervention focusing on weight loss did not result in a significant reduction in cardiovascular events in overweight or obese adults with established type 2 diabetes.[14] This was despite greater reductions in glycated haemoglobin (HbA1c) and greater initial improvement in fitness and all CVD risk factors, except for low-density lipoprotein cholesterol levels. Increasing physical activity, regardless of weight loss, may reduce CVD risk factors,[15] and reduce HbA1c by approximately 0.6% in adults with type 2 diabetes.[16] The causes of overweight and obesity are likewise complex. Cultural and social issues have a strong influence on health behaviours such as diet and physical activity. A person-centred approach should be taken to support people to make choices that are consistent with their culture and social environment. Diet and physical activity are central to the energy balance equation, but are directly and indirectly influenced by a wide range of social, environmental, behavioural, genetic and physiological factors, the relationships between which are not yet fully understood. Older people with diabetes and those undergoing metabolic surgery may also be at risk of malnutrition.[17] When managing people, be mindful that some medications are associated with weight gain, including insulin, sulfonylureas, thiazolidinediones, second-generation antipsychotics (especially olanzapine and clozapine), beta-blockers (especially propranolol), tricyclic antidepressants, lithium, pizotifen, sodium valproate and glucocorticosteroids.[18]

In practice

It is important to encourage a degree of a healthy lifestyle approach to managing diabetes. Where appropriate, develop a shared decision making plan on whether support may be needed for weight loss in anyone with type 2 diabetes who is overweight/obese. Exceptions, however, may arise if there are other associated risks (eg in the frail and elderly, or those with eating disorders). Because a healthy

body weight is sometimes not achievable, setting this as an absolute goal might discourage people from attempting any dietary change. Avoidance of weight stigmatisation and a sole focus on weight loss may impact negatively on people living with diabetes.

An accredited practising dietitian (APD) can provide practical and evidence-based approaches to supporting people considering, commencing and sustaining their weight goals. Additional health professional support may be appropriate, such as psychology, exercise science professionals and specialist metabolic/obesity services. The Australian Obesity Management Algorithm (https://www.diabetessociety.com.au/guideline/obesity/) is a practical clinical tool to guide the implementation of existing guidelines for the treatment of obesity in the primary care setting in Australia.[19]

Weight assessment

Weight can be assessed using BMI. However, this can be a difficult parameter to standardise between different population groups and may not adequately assess visceral weight gain, and thus additional measures, such as waist circumference, are helpful. Measuring waist circumference in people with a BMI >35 kg/m2 may not add any further to predictive disease risk classification.[20] However, it can provide a non-weight health focus for the patient, should this be preferable to them.

There are variable accepted ranges for BMI among different populations within the diabetes community. For those of European descent, a healthy BMI is 18.5–24.9 kg/m2, overweight is 25–29.9 kg/m2 and obese is ≥30 kg/m2.[2,3] Different classification criteria may apply to other population groups. Some groups may have equivalent levels of risk of health problems at a lower BMI (eg these BMI thresholds should be reduced by 2.5 kg/m2 for people of Asian ethnicity[21]) or higher BMI (eg some Torres Strait Islander and Māori peoples).[22]

It is advisable to also assess waist circumference (in centimetres) because this is a good indicator of total body fat and a useful predictor of visceral fat. Waist measurements of ≥94 cm in men and ≥80 cm in women convey increased risk of obesity-related complications; measures of ≥102 cm in men and ≥88 cm in women convey greatly increased risk.[23] As with BMI, these values may differ for other population groups.[3]

Lifestyle interventions for weight management

In overweight or obese people with diabetes, advice from qualified health professional, such as an APD, on a sustainable, culturally appropriate, nutritionally balanced, energy-reduced diet should be recommended if a lower, healthier body weight is to be achieved and maintained as part of a multicomponent lifestyle intervention (including healthy eating, physical activity and support for behavioural change).[2,24]

Advice to people with diabetes about medication use/deprescribing should accompany any dietary energy restriction and/or carbohydrate restriction and with progressing weight loss. Advising people using sodium–glucose cotransporter 2 inhibitors (SGLT2i) about the risks and management of euglycaemic ketoacidosis with fasting and/or higher-protein/lowered-carbohydrate approaches may be needed. Consider the impact of total protein intake in people with renal disease. Hypoglycaemia is important to manage clinically with dietary interventions, especially in people using medications that cause hypoglycaemia. Some diabetes medication may have non-glycaemic benefits, and it may be

necessary to continue these (refer to 'Medical management of glycaemia (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-glycaemic-emergencies) '). Timely monitoring and clinical advice should be actioned for any changes in glycaemic variability and cardiovascular and kidney disease risk factors (eg blood pressure and lipids); in addition, consider appropriate clinical evaluation and support of psychological health.

Very low energy diets (VLEDs) can be considered as an initial weight loss strategy when supervised lifestyle interventions have been unsuccessful in reducing weight or when rapid weight loss is required (eg prior to bariatric or general surgery that is conditional on weight loss).[19] These diets may be considered in adults with diabetes with BMI >27 kg/m2, taking into account each individual situation.[19,25] The Diabetes Remission Clinical Trial (DiRECT), a primary care-based weight loss study, showed that VLED with associated weight loss led to 46% of participants reducing or ceasing diabetes medications after 12 months of intervention.[26] (Refer to 'Remission of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/remission-of-type-2-diabetes) '.)

VLEDs require regular appointments with appropriate health professionals, such as an APD, to support an individual's progress. Caution should be exercised if hypoglycaemia is a risk (people taking sulfonylureas and insulin). The use of SGLT2i in people on VLEDs or any high-protein/low-carbohydrate diet should be carefully considered, and the person educated on risks (due to a raised risk of ketoacidosis, which might be euglycaemic).

The definition of 'lower-carbohydrate' diets varies, making for complexity in the translation of clinical trial results into pragmatic clinical practice. It is important to reassess and individualise meal plan advice regularly for people willing to consider this approach (consult an APD to support people with diabetes who wish to manage these dietary changes) to ensure adequate fibre intake, avoid micronutrient deficiencies and ensure saturated fat intake is optimal.[2] General practice services, particularly in the UK, have been able to implement non-randomised multidisciplinary weight management approaches including low-carbohydrate diets that have supported people with diabetes achieve healthy outcomes, including lowered HbA1C and weight.[27-29]

A recent (2022) Cochrane analysis[30] of randomised trials of low-carbohydrate versus balanced-carbohydrate diets found there is probably little to no difference in weight reduction and changes in cardiovascular risk factors up to two years of follow-up in overweight and obese participants without and with type 2 diabetes. Another systematic review with a stricter definition of 'low-carbohydrate' diets did show successful weight loss using both low-energy and lowered-carbohydrate approaches,[31] and that evidence for longer-term efficacy beyond two years was lacking. Finally, an umbrella review of published systematic reviews and meta-analyses[1] comparing the quality of evidence published for weight loss and type 2 diabetes showed that the greatest weight loss was reported with VLEDs, and that based on high-quality data, low-carbohydrate diets were no better for weight loss than higher-carbohydrate/low-fat diets. This divergence of evidence highlights that more longer-term studies (including randomised trials with dietary comparisons) and standardisation of definitions on lowered-carbohydrate approaches, with consistent measurable clinical endpoints, are still needed to consolidate the evidence.[32]

For more information on managing diabetes with therapeutic carbohydrate reduction, refer to guideline document Managing type 2 diabetes with Therapeutic Carbohydrate Reduction.[33]

Be clinically aware of higher-protein diets in people with, or those at risk of, real impairment.[34]

Pharmacotherapy

Pharmacotherapy for chronic weight management should be supported by healthy individualised lifestyle management. Pharmacotherapy for chronic weight management uses medications licensed by the Therapeutic Goods Administration (TGA) for weight management, including for people with diabetes, but none are currently reimbursed by the Pharmaceutical Benefits Scheme. These agents can be used as adjuncts to dietary changes and physical activity improvement and include phentermine (a sympathomimetic amine), orlistat (an inhibitor of intestinal lipase), liraglutide and semaglutide (glucagon-like peptide-1 receptor agonists [GLP-1RAs]) and combined naltrexone and bupropion. The addition of semaglutide (maximum 2.4 mg) to the TGA-approved list of GLP-1RAs that can be used in type 2 diabetes opens further opportunities for people to achieve meaningful weight loss before considering bariatric surgery.

These drugs may be considered in adults with diabetes with a BMI ≥27 kg/m2, taking into account each individual situation.[19]

Each drug has the potential for significant clinical side effects and contraindications associated with its use. The drugs require careful clinical risk–benefit assessment when applied in practice. Refer to the TGA (http://www.tga.gov.au/) website for more information.

Surgical interventions

Surgery for weight loss, also called metabolic or bariatric surgery, may induce weight loss in people who have failed to lose weight by other means. The following procedures are used in Australia.[19,21,25,35]

- **Sleeve gastrectomy** involves removing the greater portion of the fundus and body of the stomach, reducing its volume from up to 2.5 L to approximately 200 mL. This procedure provides fixed restriction and does not require adjustment like laparoscopic adjustable gastric banding (LAGB).
- **Single/one anastomosis gastric bypass surgery** involves a procedure in which a gastric pouch is formed from a division of the stomach and a small bowel bypass is connected to this pouch.
- **Roux-en-Y gastric bypass** is a combination procedure in which a small stomach pouch is created to restrict food intake, and the lower stomach, duodenum and first portion of the jejunum are bypassed to produce modest malabsorption of nutrients and thereby reduce kilojoule intake.
- **Biliopancreatic diversion** is also a combination procedure that involves removing the lower part of the stomach and bypassing the duodenum and jejunum to produce significant malabsorption. This procedure tends to be performed in subspeciality centres.

Used in the past, **LAGB** is less used now in Australia and North America due to less sustained weight loss, fewer metabolic benefits and high surgical complication rates. This procedure involves placing a band around the stomach near its upper end to create a small pouch.[3]

Sleeve gastrectomy, Roux-en-Y gastric bypass and biliopancreatic diversion lead to sustained weight loss and normalisation of type 2 diabetes metabolic markers, although techniques vary in efficacy.[3]

The improvement in diabetes metabolic markers for Roux-en Y gastric bypass surgery at the two-year follow-up was 52.7% in one meta-analysis, compared with 0.7% for medical management.[36] For individuals who achieve improvement in diabetes metabolic markers with Roux-en-Y gastric bypass, the median period of sustained improvement is 8.3 years.[21]

In non-randomised studies, metabolic surgery in people with type 2 diabetes is associated with reductions in microvascular and macrovascular complications, as well as reduced cardiovascular mortality and non-fatal cardiac and renal events, versus non-surgical type 2 cohorts;[37,38] however, the risk of suicide was higher in the surgical intervention groups. Moreover, studies have shown that metabolic surgery can prevent or delay the onset of type 2 diabetes in people with obesity,[39] as well as the development of microvascular complications.[40]

Taking into account each individual situation, metabolic surgery may be considered for people with a BMI >30–35 kg/m2 who have suboptimal blood glucose levels, are at increased CVD risk and are not achieving recommended targets with medical therapy.[21]

General practitioners should assess the appropriateness of metabolic surgery for each individual and provide information on the risks, benefits and appropriateness of the type of procedure. Metabolic surgery performed in a high-volume specialist centre with an experienced surgical team may offer lower risks, and general practitioners should liaise with a specialised surgical team if there are concerns.[19,25]

Metabolic surgery, when indicated, should be included as part of an overall clinical pathway for adult weight management that is delivered by a multidisciplinary team (including surgeons, APDs, nurses, psychologists and physicians), and includes planning for surgery and continuing follow-up.[19]

Adverse events of metabolic surgery, particularly in the long term, need more research;[41] however, suggested follow-up care includes monitoring for nutritional deficiencies and acid reflux disorders.[42]

Women of reproductive age who have had metabolic surgery need particular advice on contraceptive choices;[43] those who plan to have a pregnancy need assessment, before and throughout pregnancy, regarding nutritional status, the need for higher multivitamin doses and close obstetric monitoring. Referral prior to pregnancy to appropriate speciality services is strongly advised, even if the diabetes appears well managed and the interval before recommending conception may extend to 18 months after surgery.

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Assessment of the person with type 2 diabetes

Understanding the person: Initial assessment

A detailed assessment of the person with diabetes should be made at diagnosis. The aim of the assessment is to provide a whole-of-person evaluation to determine and understand which factors are affecting their health and quality of life.

Individualised planning for ongoing care should also be developed at this stage, including negotiated goals and expectations.

This assessment should include:

- a full medical and psychosocial history
- appropriate physical assessment
- assessment for complications and cardiovascular risk status
- investigations where required.

A comprehensive list of assessment components, including intervals of assessment, is provided in Tables 1–3. Refer also to Box 1 for the diabetes 'cycle of care' minimum requirements. Suggestions as to which members of the multidisciplinary team should perform components of assessment are provided in Table 4.

Aboriginal and Torres Strait Islander people

In supporting an Aboriginal and Torres Strait Islander person with diabetes, the development of rapport may take precedence over a detailed assessment in a single consultation. An assessment could be done over several visits.[1]

Developing a clinician–person with diabetes relationship based on trust and respect is the best way of overcoming cultural barriers and ensuring effective care in the long term.

Refer to the National Aboriginal Community Controlled Health Organisation (NACCHO) and The Royal Australian College of General Practitioners National guide to preventive healthcare for Aboriginal and Torres Strait Islander people.[2]

What needs ongoing assessment?

The purpose of ongoing structured assessment is to determine the impact of care and diabetes on the life of the person with diabetes. Ongoing assessment appointments should include:

- a history and examination to assess the impact of clinical management (Table 1)
- review and re-evaluation of the person's diabetes goals, individualised targets and risk factors, particularly focusing on the risks of cardiovascular, renal and diabetes complications (Table 2)
- refining of the management plan (including a review of medication using the principles of the 'review rule'; refer to 'Medical management of glycaemia (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/medical-management-of-glycaemia) ').

Specific areas for ongoing or intermittent review might include:

- diabetes literacy and glycaemic management, such as structured education about self-management (with a credentialled diabetes educator [CDE])
- emotional issues, including diabetes-specific distress and/or depressive symptoms
- the need for allied health/specialist intervention (eg psychologist, accredited practising dietitian [APD])
- pregnancy planning and contraception
- other diabetes-related issues (eg risks and complications) identified earlier
- medication/therapy review every three or six months, following the principles of the 'review rule' (refer to 'Medical management of glycaemia (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/medical-management-of-glycaemia) ')
    - ask about adherence and side effects; consider the choice of therapies, dose, combination or deprescribing
    - if necessary, specifically ask about symptoms of hypoglycaemia
- complication management – is specific intervention/change to glycaemic or other therapeutic management needed/referral indicated?

Measure glycated haemoglobin (HbA1c) on an individual basis:

- three-monthly in newly diagnosed people, people undergoing therapeutic changes or those whose HbA1c is outside their individualised target range
- less frequently, if appropriate, in people with stable blood sugar levels who have reached agreed targets
- review the use of self-monitoring of blood glucose (SMBG) or continuous glucose monitoring (CGM; if used) and target ranges.

Base further investigations on re-evaluated clinical symptoms and history.

Routine investigations are best organised before the review appointment.

What should be assessed yearly?

The annual review (Box 1) is an opportunity to coordinate care. It may involve:

- detailed assessment and review for specific complications or onset of multimorbidity
- updating the problem priority list
- re-establishing goals
- checking agreed arrangements for management.

In addition, general practitioners (GPs) should:

- renew team care planning with identified specific interventions
- work with the individual to identify therapeutic management changes and additional education goals
- organise appropriate referral where clinically necessary; some people may require ongoing specialist or other allied health reviews.

The diabetes cycle of care

Box 1. The diabetes cycle of care[3]

At least six-monthly:

- Measure weight, height, weight circumference and body mass index
- Measure blood pressure
- Assess diabetes management by measuring HbA1c (funded by the Medicare Benefit Schedule for up to four measurements per year)
- Assess feet for complications

At least annually:

- Review and discuss diet, physical activity, smoking status, medications (the need for more frequent review should be individualised, as outlined in Table 1)
- Sick-day management and, when indicated, glucose monitoring
- Review and discuss complication prevention – eyes, feet, kidneys, cardiovascular disease
- Measure total cholesterol, triglycerides and high-density lipoprotein cholesterol (interval may be less [eg six monthly] if adjusting therapy)
- Assess for microalbuminuria

In addition, consider assessment for:

- Psychosocial issues or other individual specific concerns and include assessment for diabetes distress or depression
- Review vaccination status and provide guidance of appropriate preventive activities

At least every two years:

- Undertake a comprehensive eye examination (more frequently for those at high risk)

Table 1. Medical history and ongoing assessments for the person with type 2 diabetes[4]

Components for assessment	Assessment interval		
	Initial	Ongoing	Annual

Diabetes-specific assessment			
Age/year of diagnosis			
Symptoms • Hypoglycaemia • Hyperglycaemia ◦ Polyuria, polydipsia, polyphagia, weight loss, nocturia • Sequelae of hyperglycaemia and complications of diabetes • Malaise/fatigue • Neurological and autonomic symptoms • Altered vision • Bladder and sexual dysfunction • Foot and toe numbness and pain • Recurrent infections (especially urinary and skin with delayed wound healing) • Gastrointestinal dysfunction (eg gastroparesis and nausea) • Poor dental hygiene and gingivitis (refer to 'Managing multimorbidity in people with type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-multimorbidity-in-people-with-type-2-diab) ')		Three-monthly or individualised	
Predisposing factors			
Pancreatic disease, Cushing's disease, obstructive sleep apnoea Medications (eg corticosteroids, antipsychotics; see below) Autoimmune diseases (eg hypothyroidism or hyperthyroidism)		Individualised	
Other medical history			

Gestational diabetes			
Other secondary causes (eg pancreatic disease)			
Multimorbidities • Overweight and obesity • Hypertension • Hyperlipidaemia • Cardiovascular disease • MALFD		Three-monthly or individualised	
Complications • Eye For those at high risk, refer to 'Defining and diagnosing type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/defining-and-diagnosing-type-2-diabetes) '			Every two years; more frequently for those at high risk
Complications • Kidney • Feet (discuss appropriate footwear [refer to 'Complications: Diabetes-related foot care (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/diabetes-related-foot-care)]) • Fatty liver disease (MALFD) • Other			
Family history			
Haemochromatosis			
Gestational diabetes		Individualised	
Psychosocial history			

Lifestyle • Physical activity • Smoking • Diet			
Emotional and mental health • Using tools (refer to 'Type 2 diabetes and mental health (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/type-2-diabetes-and-mental-health) ') • Health literacy • Social support network		Individualised	
Medications			
Past and current medications Complementary therapies		Individualised	
Other therapy, glucose monitoring and technology • Role of routine and non-routine SMBG • Use of technology		Individualised	
Immunisations*			
As per the National Immunisation Program (https://www.health.gov.au/our-work/national-immunisation-program) /ATAGI		Individualised	
Pregnancy and contraception			
Pregnancy planning Contraceptive use		Individualised	
Other*			

• Sick-day management • NDSS enrolment and services • Driving (interval depends on Assessing fitness to drive guidelines (https://austroads.com.au/publications/assessing-fitness-to-drive/ap-g56/diabetes-mellitus)) • Occupational factors • Diving • Insurance		Individualised	

*For more information, refer to the discussion of immunisations in 'Managing risks and other impacts of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-risks-and-other-impacts-of-type-2-diabete) '.

ATAGI, Australian Technical Advisory Group on Immunisation; MALFD, metabolic-associated fatty liver disease; NDSS, National Diabetes Services Scheme; SMBG, self-monitoring of blood glucose.

Table 2. Medical examinations to assess the person with type 2 diabetes[4]

Components for examination	Examination intervals		
	Initial	Ongoing	Annual
Physical			
General • BMI • Waist circumference (cm) • Blood pressure • Central and peripheral vascular systems		Individualised	

Complications of diabetes • Feet: Stratify the risk of developing foot complications (refer to 'Complications: Diabetes-related foot care' (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/diabetes-related-foot-care)) • Peripheral nerves: Tendon reflexes, sensation (touch [eg 10-g monofilament] and vibration [eg 128-Hz turning fork]), existence of peripheral neuropathic changes • Heart: consider ECG if arrhythmia detected (eg atrial fibrillation in those aged >65 years) • Sexual dysfunction: Both male and female sexual dysfunction • Eyes: Such as acuity, cataract, retinopathy (refer to 'Complications: Diabetes-related eye disease (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/diabetes-related-eye-disease) ') • Skin: Lipohypertrophy or dystrophy, acanthosis nigricans, mycotic infections		Individualised	(eyes every 2 years)
Psychological			
Depressive symptoms • Patient Health Questionnaire (PHQ)-2 • If PHQ-2 score ≥3, progress to PHQ-9 Diabetes distress • Problem Areas in Diabetes (PAID) • Diabetes Distress Scale (DDS) • Cognitive assessment when indicated Refer to 'Type 2 diabetes and mental health (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/type-2-diabetes-and-mental-health) '		Individualised	
BMI, body mass index; CVD, cardiovascular disease; ECG, electrocardiogram			

Table 3. Investigations for diabetes and multimorbidity[4]

Components for examination	Assessment interval		
	Initial	Ongoing	Annual
HbA1c Note: variance factors may affect the accuracy of this result. Refer to 'Diagnosing type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/defining-and-diagnosing-type-2-diabetes) '.		Three to six monthly	
Lipids LDL-C, HDL-C, TC, TG Absolute CVD risk assessment (https://www.cvdcheck.org.au/) if needed for primary CVD prevention		Individualised	
Urinalysis Urine ACR at least annually: • Microalbuminuria ACR ≥2.5 mg/mmol (men) or ≥3.5 mg/mmol (women), or albumin concentration ≥20 mg/L • Proteinuria (macroalbuminuria) ACR ≥25 mg/mmol (men) or ≥35 mg/mmol (women)		Individualised if abnormal	
eGFR Normal levels are reported as >90 mL/min/1.73 m2; refer to the section 'Complications: Diabetes-related chronic kidney disease (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/diabetes-related-chronic-kidney-disease) ' for criteria of CKD stages		Individualised if abnormal	

Other as appropriate for symptomatic presentation or existence of comorbidity or multimorbidity (eg vitamin B12 deficiency if on prolonged metformin therapy)			

ACR, albumin-to-creatinine ratio; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; TC, total cholesterol; TG, triglyceride.

Table 4. Suggested actions and health professionals to provide treatment or service

Suggested actions	Suggested team resource: Who?*
Ask	
Symptoms	GP
Goal-setting supporting self-management, including lifestyle factors, health literacy and adherence, medication tolerance	GP/practice nurse/CDE
Complication concerns (eg chest pains, palpitations, neuropathy symptoms, sleep disorders)	GP/practice nurse/CDE
Glycaemic management – if self monitoring	GP/practice nurse/CDE
Assess (inclusive within an annual cycle of care)	
Risk factors for modification	GP/practice nurse/CDE
Weight, height	GP/practice nurse/CDE
Cardiovascular disease risk assessment, including blood pressure	GP/practice nurse/CDE

Foot examination	GP/podiatrist/practice nurse/CDE
The presence of other complications, especially hypoglycaemia risk with insulin or sulfonylureas	GP/practice nurse/endocrinologist/CDE
Psychological status	GP/psychologist/CDE
Eye examination	GP/optometrist/ophthalmologist
Dental review	GP/dentist
Medication review	GP/credentialled pharmacist
Consider other assessments where appropriate (eg cognitive impairment, obstructive sleep apnoea)	GP/endocrinologist/other specialist (where indicated)
Advise	
Review smoking, nutrition, alcohol, physical activity (SNAP) profiles, including specific issues	GP/practice nurse/CDE
Nutrition	GP/APD
Physical activity levels	GP/AEP/physiotherapist
Pregnancy planning and contraception, including NDSS six-month blood glucose strip access	GP/endocrinologist/obstetrician/CDE
Driving	GP/endocrinologist/other specialist/CDE
Immunisation	GP/practice nurse/CDE

Sick-day management	GP/practice nurse/CDE
Medication issues	GP/pharmacist/CDE/endocrinologist
Self-monitoring of blood glucose	GP/CDE/practice nurse
Insulin/injectable management	GP/CDE/accredited nurse practitioner/ endocrinologist
Assist	
Register for NDSS/review NDSS resources (https://www.ndss.com.au/)	GP/practice nurse/CDE/nurse practitioner
General practice management plan and chronic disease management plan	GP/practice nurse
Cultural and psychosocial issues	GP/Aboriginal and/or Torres Strait Islander health workers and practitioners*/interpreter service/ social worker/CDE/psychologist
Arrange	
Addition to the practice's diabetes register and recall	GP/practice nurse/practice staff
Organise reviews, including pathology, vaccination and annual cycle of care	GP/practice nurse
Driver's licence assessment	GP/practice nurse/endocrinologist (when indicated)

*An Aboriginal and/or Torres Strait Islander health worker and/or practitioner is recommended to assist with all actions supporting Aboriginal and Torres Strait Islander people.

AEP, accredited exercise physiologist; APD, accredited practising dietitian; CDE, credentialled diabetes educator; GP, general practitioner; NDSS, National Diabetes Services Scheme.

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Glucose monitoring

The aim of determining and attaining glycaemic targets is to achieve the optimal balance between preventing complications associated with hyperglycaemia and mitigating the risk of hypoglycaemia, as well as goals prioritised to patient expectations, priorities and circumstances.

In tandem with managing glycaemia (refer to 'Medical management of glycaemia (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/medical-management-of-glycaemia) '), cardiorenal risk management is of paramount importance (refer to 'Type 2 diabetes and cardiovascular risk (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/type-2-diabetes-and-cardiovascular-risk) ').

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Glycated haemoglobin (HbA1c) measurement should be used to assess long-term blood glucose control.	A	1-3	14/11/2024
A reasonable HbA1c goal for many non-pregnant adults is <7% (53 mmol/mol) without significant hypoglycaemia is appropriate.	A	2	14/11/2024
Less stringent HbA1c goals may be appropriate for individuals with limited life expectancy or where the harms of treatment are greater than the benefits.	B	2	14/11/2024
Self-monitoring of blood glucose (SMBG) is recommended for people with type 2 diabetes who are using insulin and sulfonylureas due to hypoglycaemia risk.;	B	4	14/11/2024

Targets for SMBG levels are 4.0–7.0 mmol/L for fasting and preprandial, and 5.0–10.0 mmol/L for two-hour postprandial.	B, level 2	5	14/11/2024
Consider intermittent real-time continuous glucose monitoring (CGM) for people with insulin-treated type 2 diabetes if they have: • recurrent or severe hypoglycaemia • impaired hypoglycaemia awareness • a condition or disability (including a learning disability or cognitive impairment) that means they cannot self-monitor their blood glucose by capillary blood glucose monitoring but could use a CGM device (or have it scanned for them).	Conditional recommendation	3	14/11/2024
In adults with type 2 diabetes using basal bolus insulin therapy who have not achieved their HbA1c target, who are willing and able to use CGM, real-time CGM may be used to reduce HbA1c and duration of hypoglycaemia.	A, Level 1A	5	14/11/2024

Accuracy and limitations of HbA1c measurements

HbA1c has been the gold standard for monitoring long-term glycaemic management since 1976, and it is one method used to diagnose diabetes. HbA1c testing should be performed routinely at initial assessment. Monitoring is usually recommended at three-month intervals (four per year); however, with stable diabetes, a six-month interval may be appropriate.

HbA1c measurement and natural test variation

HbA1c can be measured and reported using two different standards:

- as a percentage measure of the glycated N-terminal residue of the ß-chain of haemoglobin (eg 7%)
- in units of mmol/mol, according to the International Federation of Clinical Chemistry (IFCC)

standardised reporting (eg 53 mmol/mol).

In Australia, the variability in laboratory HbA1c test results is acceptably low.[6] However, there may be some variability,[7,8] which needs to be considered when monitoring long-term glucose management and that there are limitations to the utility of HbA1c in accurately reflecting day-to-day or week-to-week glycaemic variability. Conditions that affect HbA1c results also need to be considered (see below).

Conditions that affect HbA1c results

A number of conditions can cause HbA1c discordance, where HbA1c does not accurately reflect mean blood glucose.

Any condition that shortens erythrocyte survival or decreases mean erythrocyte age will falsely lower HbA1c test results, regardless of the assay method used.

The presence of abnormal haemoglobin variants can occur in people of Mediterranean, African or South-East Asian heritage. Screening for haemoglobinopathies before HbA1c testing should be considered.[8] If a haemoglobinopathy is suspected, then haemoglobin electrophoresis is suggested.

Some important clinical situations may indicate the presence of a haemoglobinopathy, such as when:

- results of SMBG have a poor correlation with HbA1c results
- an HbA1c result is discordant with measured alternative laboratory glycaemic values
- an HbA1c result is >15% or <4%
- a person's HbA1c test result is radically different from a previous test result following a change in laboratory HbA1c measurement methods.

Other causes of HbA1c discordance are presented in Box 1.

Alternative forms of diabetes monitoring, such as SMBG, CGM and flash glucose monitoring (refer to 'Use of technology in type 2 diabetes management), should be considered for people with conditions that can affect HbA1c results.

Note that fructosamine as an alternative longer-term glucose measure may not be suitable in people with iron deficiency anaemia, because this condition raises both HbA1c and fructosamine; conversely, iron infusion spuriously lowers both HbA1c and fructosamine.[9-11]

The shorter fructosamine time window is not sufficient for determining a long-term prognosis.[1] The fructosamine test measures glycated proteins (not glycated haemoglobin) that circulate in the blood for only 14–21 days. Anything affecting serum proteins may invalidate the test.[12]

Box 1. Other causes of HbA1c discordance

Abnormally low HbA1c can be caused by:

- anaemia
- haemolytic anaemia – congenital (eg spherocytosis, elliptocytosis)
- haemoglobinopathies
- acquired haemolytic anaemias (eg drug-induced, such as with dapsone, methyldopa)
- recovery from acute blood loss
- blood transfusions, iron infusions
- chronic blood loss
- chronic renal failure (variable)
- advanced liver disease and cirrhosis.[13]

Abnormally high HbA1c can be caused by:

- iron deficiency anaemia[9]
- splenectomy
- alcoholism.[14]

HbA1c is an unreliable measure of glycaemic management in the first four weeks of pregnancy.

Advantages and limitations of HbA1c

Clinical management of diabetes has been using HbA1c as a marker for healthy goals, complication prevention and management. However, HbA1c may be affected by various clinical physiological and pathological conditions, and this measure may lack sensitivity related to in-day and between-day glucose variability. Because HbA1c only provides an 'average' measure related to HbA1c over the past two to three months, various glycaemic excursion patterns may lead to the same HbA1c result, thus not accurately reflecting periods spent in hypoglycaemia and hyperglycaemia.[15-18]

HbA1c targets

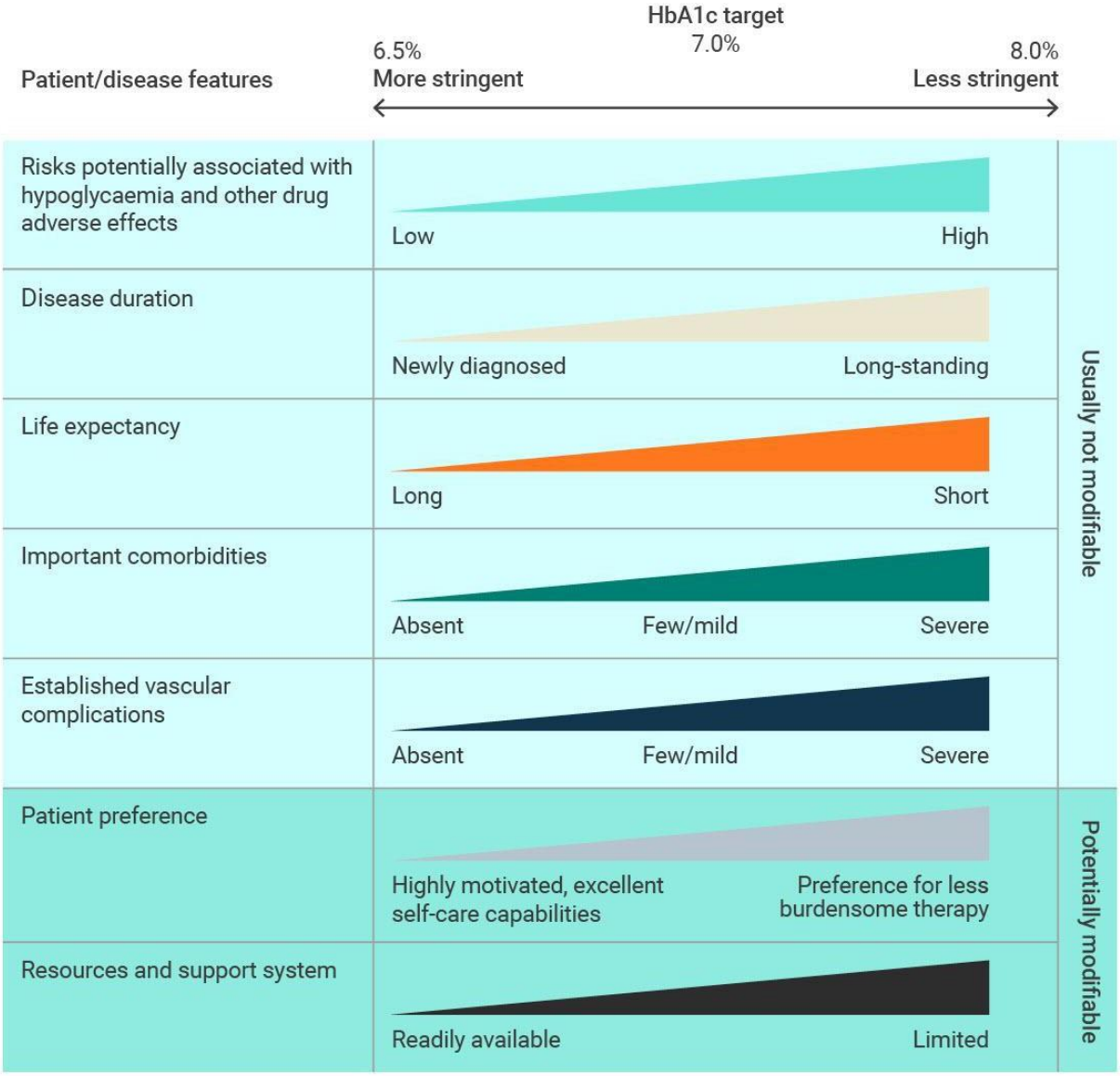
The general target in (non-pregnant) people with type 2 diabetes is HbA1c ≤7% (≤53 mmol/mol).[1]

In the vast majority of (non-pregnant) people with diabetes, optimising their blood glucose management may improve specific short- and long-term health outcomes. However, what is 'optimal' will vary, depending on the balance between benefits and risks and the individual's priorities (Figure 1). Thus, there is no single glycaemic target that suits all people.

For example, HbA1c targets may vary in selected people as follows:[2]

- A more stringent target of 6.5% (48 mmol/mol) might be appropriate for people with short disease duration, long life expectancy and no significant cardiovascular disease, if this can be easily and safely achieved without hypoglycaemia or other adverse effects of treatment. The HbA1c target should be determined after assessment of hypoglycaemia risk and be re-evaluated in pregnancy and with the person's characteristics.[5]
- If adults with type 2 diabetes reach an HbA1c level that is lower than their target and they are not experiencing hypoglycaemia, encourage them to maintain it. Be aware that there are other possible reasons for a low HbA1c level (eg deteriorating renal function or sudden weight loss).[3]
- Less stringent targets might be more appropriate for people with reduced life expectancy or extensive comorbid conditions; those who have difficulty attaining targets despite intensive self-management education, repeated counselling and effective doses of multiple glucose-lowering agents (including insulin); or those at risk of hypoglycaemia.
- Investigate unexplained discrepancies between HbA1c and other glucose measurements. Seek advice from a team with specialist expertise in diabetes or clinical biochemistry.[3]

Diabetes symptoms (eg polydipsia, polyuria) are related to increasing glycaemia, as measured by HbA1c levels above 8% (64 mmol/mol).[19]



Some important patient characteristics to consider when individualising HbA1c targets are listed on the left. More stringent efforts to lower HbA1c are justified for people who fall to the left of the range; those toward the right may have other priorities and require less stringent efforts.

Source: Adapted from Inzucchi SE, Bergenstal RM, Buse JB, et al. Management of hyperglycemia in type 2 diabetes, 2015: A patient-centered approach: Update to a position statement of the American Diabetes Association and the European Association for the Study of Diabetes. Diabetes Care 2015;38(1):140-49, with permission of the American Diabetes Association.

Figure 1. Approach to individualising HbA1c targets[20]

Self-monitoring of blood glucose

SMBG in people with type 2 diabetes is recommended:[2,4]

- for people on insulin and sulfonylureas, which can cause hypoglycaemia
- for people not on insulin who are having difficulty achieving their glycaemic target (the person and their healthcare providers should be trained in methods to modify health behaviours and

glucose-lowering medications in response to SMBG values)
- when monitoring hypo-/hyperglycaemia arising from intercurrent illness (refer to 'Medical management of glycaemia (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/medical-management-of-glycaemia) ', 'Managing risks and other impacts of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-risks-and-other-impacts-of-type-2-diabete) ' and 'Type 2 diabetes sick-day management plan – template (https://www.racgp.org.au/getmedia/518fab68-93d9-46d2-a613-707153c8b4d4/Type-2-diabetes-sick-day-management-plan-template.pdf.aspx) ')
- during prepregnancy and pregnancy management for people with established diabetes or gestational diabetes
- when there is a clinical need for monitoring, such as during changes in management or lifestyle, or for conditions or medications (such as corticosteroids) that require data on glycaemic patterns that HbA1c cannot provide
- when HbA1c estimations are unreliable (eg haemoglobinopathies).

Routine SMBG for people with type 2 diabetes who are considered low risk and who are using non-insulin glucose-lowering drugs (with the exception of sulfonylureas) is not recommended.[21-25]

The method and frequency of monitoring need to reflect individual circumstances and therapeutic aims. SMBG is most effective where the person with diabetes and their healthcare providers have the knowledge, skills and willingness to incorporate SMBG and therapy adjustments into diabetes care plans.

Targets for self-monitored glycaemic management in type 2 diabetes (where stringent glycaemic management is recommended) are presented in Table 1.

The National Diabetes Services Scheme (NDSS) provides subsidised blood glucose monitoring strips for SMBG for a six-month period after an initial diagnosis of diabetes. Ongoing access, in six-monthly increments, is available when assessed as clinically necessary and authorised by a general practitioner, credentialled diabetes educator, endocrinologist, nurse practitioner or other registered medical practitioner in the following categories: intercurrent illness; medications affecting blood glucose; critical need for self-monitoring; diabetes management change; and diabetes management not stable. Refer to the NDSS website (https://www.ndss.com.au/wp-content/uploads/forms/blood-glucose-test-strip-6-month-access-approval-form.pdf) for further information.

For adults with type 2 diabetes who are self-monitoring their capillary blood glucose levels, a structured assessment at least annually should include:[3]

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

There is an emerging role for CGM and flash glucose monitoring in people with type 2 diabetes on complex insulin regimens who have not achieved their glycaemic targets; however, this technology is not available through the NDSS for people with type 2 diabetes. For more information, refer to 'Use of technology in type 2 diabetes management (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/diabetes/use-of-technology-in-type-2-diabetes-management) '.

Table 1. Targets for self-monitored glycaemic management in type 2 diabetes[5]

Fasting blood glucose (FBG; mmol/L)	Preprandial blood glucose (mmol/L)	Postprandial blood glucose (mmol/L)	Comment
4.0–7.0	4.0–7.0	5.0–10	Diabetes Canada guidelines NDSS factsheet (https://www.ndss.com.au/about-diabetes/resources/find-a-resource/blood-glucose-monitoring-fact-sheet/)

Glycaemic variability and time in range

Glycaemic variability represents the degree of stability of the glucose profile and refers to swings in blood glucose levels. Glycaemic variability can be measured as within-day, between-days or, most commonly, as the mean (and standard deviation) glucose level over two weeks.

Emerging evidence in randomised controlled trials of people using multiple daily insulin shows an association between within-day or between-days glycaemic variability or 'time spent in range' observations and diabetes-related complications, especially microvascular complication.[26-28] Additional observational studies have linked same-day or between-days glycaemic variability to higher rates of both hypo- and hyperglycaemia for a given HbA1c, as well as peripheral neuropathy and retinopathy.[29] Lower levels of HbA1c are not directly linked to increased hypoglycaemia risk.[30]

Intermittent real-time CGM

In adults with type 2 diabetes using basal bolus insulin therapy who have not achieved their HbA1c target, and who are willing to use CGM, real-time CGM maybe used to reduce HbA1c and the duration of hypoglycaemia. If using CGM to assess glycaemia, targets for non-pregnant adults are as follows:[2,31]

- time in range >70%, with time below range <4% and time <3 mmol/L being <1%
- for those with frailty or at high risk of hypoglycaemia, a target of >50% time in range, with <1% time below range, is recommended.

References

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Medical management of glycaemia

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Glucose-lowering medication in people newly diagnosed with type 2 diabetes			
A person-centred approach should be used to guide the choice of glucose-lowering medication. Considerations include comorbidities (atherosclerotic cardiovascular disease, heart failure, chronic kidney disease), hypoglycaemia risk, impact on weight, cost, risk for side effects and individual preferences.	E	1	14/11/2024
Healthy behaviour interventions should be initiated at diagnosis.	B, Level 2	2	14/11/2024
If glycaemic targets are not achieved within three months using healthy behaviour interventions alone, anti-hyperglycaemic therapy should be added to reduce the risk of microvascular complications.	A, Level 1A	2	14/11/2024
Metformin should usually be selected before other agents due to: • low risk of hypoglycaemia and weight gain • long-term experience with this agent.	A, Level 1A D, Consensus	2	14/11/2024

Individuals with metabolic decompensation (eg marked hyperglycaemia, ketosis or unintentional weight loss) consider receiving insulin with or without metformin to correct the relative insulin deficiency.	D, Consensus	2	14/11/2024
Advancing treatment			
Dose adjustments to, and/or addition of, glucose-lowering medications should be made in order to attain target glycated haemoglobin (HbA1c) within 3–6 months.	D, Consensus	2	14/11/2024
If glycaemic targets are not achieved, other classes of glucose-lowering agents should be added or substituted to improve glycaemic control**. **glycaemic management	Consensus	2	14/11/2024

Introduction

In addition to lifestyle modification, most people with type 2 diabetes may eventually require pharmacotherapy to achieve long-term glycaemic control and prevent the complications of diabetes. People who are symptomatic of hyperglycaemia may need to start medication without delay, in addition to ongoing lifestyle support.

The benefits of management of hyperglycaemia for the prevention of microvascular complications have been demonstrated in randomised clinical trials.[3-5]

The choice, order and combination of medications used is based on:

- individualised goals for glycaemia (refer to 'Glucose monitoring (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/glucose-monitoring) ')
- evidence of improved clinical outcomes, including cardiovascular, kidney disease and other risks
- consideration of potential adverse effects
- individual choice and capacity.

The above should all be taken into consideration when implementing the treatment recommendations in these guidelines.

Note: Hyperglycaemia-related metabolic dysfunction (eg hyperosmolar states or ketosis) constitutes a medical emergency, and may be present at diagnosis in type 2 diabetes. Information about symptoms and emergency management of hyperglycaemia is available on The Royal Australian College of General Practitioners' (RACGP's) website.[6]

Clinical context

Glucose-lowering medicines

Many glucose-lowering medicines are available (Table 1). To navigate the many options, the Australian type 2 diabetes management algorithm (Figure 1) was developed by the Australian Diabetes Society in consultation with all key stakeholders, including the RACGP.

Although algorithms are designed to help navigate choice, applying the principles of patient-centred care might mean that choices suggested by the algorithm are not always appropriate because some medications have non-glycaemic effects, benefits and indications.

Also note that high-quality clinical trials of the combination therapies that are suggested in current algorithms for glucose treatment in type 2 diabetes may be lacking. Management is also increasingly informed by the outcomes of trials for sodium–glucose cotransporter 2 inhibitors (SGLT2i) and glucagon-like peptide-1 receptor agonists (GLP-1RAs), for which long-term data are emerging with respect to both potential benefits and harms.[7-9]

Prescribing algorithms for type 2 diabetes suggest multiple ways of combining agents. Always consult the Pharmaceutical Benefits Scheme (PBS) when combining therapy, because restrictions and reimbursements may change.

Table 1 outlines the clinical considerations for choosing glucose-lowering medications. An evidence table summarising properties of these medications is provided with the full Australian type 2 diabetes management algorithm (Figure 1).

Table 1. Clinical considerations when choosing diabetes medications

Clinical outcome	Medication effects on clinical outcomes				
	Metformin	Sulfonylurea (SU)	Dipeptidyl peptidase-4 inhibitors (DPP-4i)	Acarbose	Insulin

People with multiple cardiovascular risk factors[A] (refer to 'Type 2 diabetes and cardiovascular risk (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/type-2-diabetes-and-cardiovascular-risk) ')	Neutral effect[3]	Increased risk compared with metformin monotherapy (excluding gliclazide), but neutral when used in combination with metformin[11]	Neutral effect[8,12-15] Refer to **Note A**	Neutral effect[16]	Neutral ef
People at risk of hypoglycaemia	Lower rates compared with SU[11]	Higher clinical risks, both as monotherapy and in combination with other agents[11] Gliclazide: fewer hypoglycaemia episodes versus other SUs[18] Glibenclamide: higher rates of hypoglycaemia, especially in older people[19]	Lower rates compared with SU[11]	Neutral effect	Higher cl as monot in combir other age
People at risk of gastrointestinal conditions (eg IBS, IBD and gastroparesis)	Known intolerance as monotherapy or combination therapy: diarrhoea[11,22]	Neutral effect	Neutral effect	Known intolerance: bloating and flatulence[C]	Neutral ef

People in whom stabilisation of BMI or weight loss is desired	Neutral effect	Neutral effect (gliclazide) Modest weight gain for other SUs compared with metformin monotherapy[11]	Neutral effect	Neutral effect	Modest g
People with renal impairment (eg lowered CrCl[D])	Reduce dose by 50% with eGFR 30–60 mL/min/1.73 m^2 Contraindication with CrCl <30 mL/min[22]	Contraindication if CrCl <15 mL/min Hypoglycaemia risk increases	Safe with dose reduction but linagliptin can be used in all stages (no dose reduction) Refer to **Note B**	Contraindication in severe renal impairment[B]	No contra but hypog risk incre
Other class-specific information	Monotherapy or combination with other agents (DPP-4i or SGLT2i) is available to reduce 'pill burden' Pregnancy category C but currently widely and safely used	The Australian algorithm (Figure 1) suggests SU may be considered as monotherapy or combined with other agents but has a risk for hypoglycaemia Pregnancy category C	Contraindication: do not use with a GLP-1RA Increased hospitalisation for heart failure with saxagliptin Pregnancy category B3	Pregnancy category B3	Dose req titrated to goals whi glycaemi and hypo Pregnanc varies: • C • C i • R i A • I A • I a p

Clinical outcome	**Medication effects on clinical outcomes**			
	Thiazolidinedione (TZD)	**Sodium glucose co-transporter 2 inhibitors (SGLT2i)**	**Glucagon-like peptide-1 receptor agonists (GLP-1 RAs)**	**GLP-1RA/GIP Tirzepatide**

People with multiple cardiovascular risk factors[A] (refer to 'Type 2 diabetes and cardiovascular risk (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/type-2-diabetes-and-cardiovascular-risk) ')	Contraindication if symptomatic heart disease, including heart failure[24,F] Pioglitazone is the preferred TZD	Selective benefit, heart failure benefit (empagliflozin and dapagliflozin) and decrease CVD death (empagliflozin)[25]	Selective benefit, depending on individual drug choice (dulaglutide, liraglutide and semaglutide)[17,26,27]	No conclusive evide positive or negative outcomes publishe
People at risk of hypoglycaemia	Lower rates compared with SU[11]	Lower rates compared with SU[11]	Lower rates compared with SU[11]	Neutral effect
People at risk of gastrointestinal conditions (eg IBS, IBD and gastroparesis)	Neutral effect	Neutral effect	Known intolerance: nausea and vomiting, diarrhoea and constipation[11]	Known intolerance: vomiting, diarrhoea
People in whom stabilisation of BMI or weight loss is desired	Modest gain compared with other dual combination therapies[11]	Modest weight loss (in monotherapy, plus in combination with metformin versus metformin with alternative dual oral drug combinations)[11,H]	Weight loss (in monotherapy, plus in combination with metformin versus metformin with alternative dual oral drug combinations)[11,28,29]	Weight loss (in mon plus in combinatio metformin versus m with alternative du combinations

People with renal impairment (eg lowered CrCl[D])	Neutral effect	Glycaemic-lowering efficacy decreases, with renal impairment (eGFR ≤45 mL/min)[I] Selective benefits shown in people with and without diabetes and albuminuric CKD[30,31]	Contraindication with lowered end-stage renal disease However, semaglutide has shown improvement in the risk of kidney disease-related events in people with moderate to severe albuminuria[27]	No dose adjustmen including end-stage disease
Other class-specific information	Increased atypical fractures (relative risk 1.57),[32] with women more at risk than men[F] Pioglitazone is contraindicated in individuals with bladder cancer or undiagnosed haematuria[F] Pregnancy category C	Modest lowering of BP[11] Increased genitourinary infections (especially females) Refer to **Note C** Less common: euglycaemic diabetic ketoacidosis[J] (refer also to discussion of surgery in 'Managing risks and other impacts of type 2 diabetes') Pregnancy category D	Once-weekly formulations are available Contraindication: combination with a DPP-4i PBS indications may restrict combination with other agents (eg SGLT2i) Pregnancy category D	Do not use with DP works on similar pa Prescribing indicat restrict combinatio agents (eg SGLT2i Pregnancy category

Note A: Dipeptidyl peptidase-4 inhibitors (DPP-4i) and heart failure: In the SAVOR-TIMI 53 trial, hospitalisations for heart failure (a secondary outcome) in saxagliptin with a statistically non-significant trend to increased heart failure with alogliptin. In contrast, cardiovascular outcomes trials of sitagliptin and to show any heart failure signal.[7]

Note B: DPP-4i: dose reduction for advancing renal dysfunction for all except linagliptin (no dose reduction) because this is hepatically metabolised.

Note C: All classes: The US Agency for Healthcare Research and Quality (AHRQ) review[9] determined **no** moderate-to-high levels of evidence for the follow events (this does not mean no risk):

- lactic acidosis (metformin)
- urinary tract infections/fractures/volume depletion (sodium-glucose cotransporter 2 inhibitors [SGLT2i])
- pancreatitis (DPP-4i and glucagon-like peptide-1 receptor agonist [GLP-1RA])
- bladder cancer risks (pioglitazone).

[A]We define multiple cardiovascular risk factors as men aged ≥55 years or women aged ≥60 years with type 2 diabetes who have one or more additional t factor, including hypertension, dyslipidaemia or smoking.[10]

[B]Creatinine clearance (CrCl) <25 mL/min.

[C]Acarbose product information is available on the Therapeutic Goods Administration (TGA) (https://www.ebs.tga.gov.au/ebs/picmi/picmirepository.nsf/t&id=CP-2022-PI-01673-1&d=20240711172310101&d=20240723172310101) website.

[D]The product information of most agents refers to CrCl as a measure of kidney function. Kidney Health Australia (https://kidney.org.au/health-professionals/calculator-and-tools) offers a conversion to estimated glomerular filtration rate (eGFR).

[F]Pioglitazone product information is available on the TGA (https://www.ebs.tga.gov.au/ebs/picmi/picmirepository.nsf/pdf?OpenAgent&id=CP-2021-PI-0

[G]Tirzepatide product information is available on the TGA (https://www.ebs.tga.gov.au/ebs/picmi/picmirepository.nsf/pdf?OpenAgent&id=CP-2023-PI-02

[H]Weight loss of −2.14 kg for dapagliflozin (see product information (https://www.ebs.tga.gov.au/ebs/picmi/picmirepository.nsf/pdf?OpenAgent&id=CP-1-1)) as an add-on to metformin versus placebo at 104 weeks; −1.63 and −2.03 kg for 10 and 25 mg empagliflozin, respectively (see product informatio bs.tga.gov.au/ebs/picmi/picmirepository.nsf/pdf?OpenAgent&id=CP-2014-PI-01783-1)), as an add-on to metformin at 24 weeks.

[I]Check renal function and individual medication product information before prescribing.

[J]The Australian Diabetes Society (https://diabetessociety.com.au/documents/August2019_ALERT-ADS_SGLT2i_PerioperativeKetoacidosisfinal.pdf) has for SGLT2i use and the risk of diabetic ketoacidosis.

BMI, body mass index; BP, blood pressure; CKD, chronic kidney disease; CVD, cardiovascular disease; eGFR, estimated glomerular filtration rate; IBD, infla disease; IBS, irritable bowel syndrome; SU, sulfonylurea; TZD, thiazolidinedione.

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AUSTRALIAN TYPE 2 DIABETES GLYCAEMIC MANAGEMENT ALGORITHM

This Type 2 Diabetes Glycaemic Management Algorithm should be read in conjunction with the Living Evidence Guidelines in Diabetes (please click here)

All patients should receive education regarding lifestyle measures: healthy diet, physical activity and weight management.()

Determine the indiviclial's HbA1c target - commonly :.53 mmol/mol (7.0%) but should be appropriately individualised (refer to ADS position statement).

+ Weight loss of ≥ 10% will likely allow a reduction or cessation of glucose lowering medication. Consider intensive weight management options including:
- Low energy or very low energy diets with meal replacements
- Pharmacotherapy
- Bariatric surgery.

6 Clck here for the Australian Obesity Management Algorithm

Review treatment: if not at target HbA1c or if presence of cardiovascular/chronic kidney disease-

Check patient understanding of self-management including drug treatment

Ensure current therapies are clinically appropriate including comorbidities/ therapies impacting glycaemic control

Review medication adherence

Assess tolerability, adverse effects and risk of interactions

Review treatment in 3 months. If HbA1c not at target: Reinforce lifestyle measures and review weight management strategies.

MONOTHERAPY: Metformin is the usual monotherapy unless contraindicated or not tolerated

SU

Insulin

Less commonly used: acarbose, DPP-4 inhibitor, SGLT2 inhibitor GLP-1RA, orTZD Only acarbose is PBS reimbursed for monolherapy_

DUAL THERAPY: Choice of treatment - add on an oral agent or injectable therapy

Choice of dual therapy should be guidedby clinical considerations (presence of, or high risk of, cardiNascular disease, heart failure, chronic kidney disease, hypoglycaemia risk, obesjty). side *effect* profile, contrainclcations and cost

SU

Less commonly used are: acarbose or TZD

MULTIPLE THERAPIES: Choice of treatment : include addltlonal oral agent or GLP-1 RA or insulin

Choice of agents should be guided by clinical considerations a,above Note combinations not approved by PBS include GLP-1RA with SGLT2i. Consider reviewing any previws medcation that has not reduced HbA1c by >0.5% after 3 months and take into cons1derat1on glycaomic AND non-glycaomic benefits.

SGLT2 inhibitor

GLP-1RA

SU

Less commonly used are: acarbose or TZD.

THEN...

To intensify treatment to meet glycaemic targets
- If on metformin+ SU+DPP-4i, consider *adding* SGLT2i, or *switching* DPP-4i to a GLP-1RA, or an SGLT2i.
- When adding incretin therapy, use either a DPP4i or GLP-1RA (not both together).
- If on basal insulin, consider *adding* SGLT2i or GLP-1RA or bolus insulin with meals, or *change* to premixed/coformulated insulin.
- If on metformin+DPP4i+SGLT2i *consider* adding SU or insulin.

With increasing clinical complexity consider specialist endocrinology consultation

*Combinations not approved by PBS include GLP-1RA with SGLT2i. Use of PBS-subsidised GLP-1 RAs in combination with an SGLT2i is permitted when the SGLT2i is prescribed for an indication other than T2D (e.g. chronic kidney disease or heart failure). PBS-subsidised GLP-1 RA can only be commenced if SGLT2i has not achieved a clinically meaningful glycaemic response or if there is a contraindication/intolerance to an SGLT2i. PBS-subsidised GLP-1RA can only be combined with PBS-subsidised SGLT2i if the SGLT2i is being prescribed through the heart failure or CKD PBS code. Consider reviewing any previous medication that has not reduced HbA1c by ≥0.5% after 3 months, and consider glycaemic AND non-glycaemic benefits.

Recommendationror ad:lition of a SGLT2i (or GLP-1RA where SGLT2i is not tolerated or contraindicated) to other glucose lo'J/1.iering medication(s) in adults with type 2 diabetes V\lh o also have cardiovascular disease, multiple cardiovascular risk factors and/or kidney disease

Condfliona/ recomrrendaflon for metformin as first-line rmnotherapy in adults wth type 2 diabetes.

Cond>t10na! recomrrendat>em forDPP-4i addition to other glucose lowering medication(s) in adults wth type 2 diabetes vvho have cardiovascular disease, multiple cardicrvascular risk factors and/or kidm□y disease, and are unable to be prescribed an SGLT2i or a GLP-1RA due to either intolerance or contraindication

For more details click hereto access the Living Evidence Guidelines in Diabetes.

- *Condlt!onal reo:Jmmendat!On agamst* sulphonylurea bEmg first choKOe medaition to add tometlormln as dual therapy as It may increase 11sk of hypoglycaemia.

Dark blue boxes indicate usual therapeutic strategy (order is not meant to denote any specific preference); usual refers to corrmonly available, evidence based, cost effective therapy

Light blue boxes denote alternate approaches (order is not meant to denote any specific preference).

D V\ll7ite boxes indicate less corrmonly used approaches

PBS= Pharmaceutical Benefits Scheme, HF= heart failure, CK□= chronic kidney disease, SU = sulfonylurea, TZD = thiazolidinedione, DPP-4i = dipeptidy1 peptidase-4 inhibitor, GLP-1RA = glucagon like peptide-1 receptor agonist, SGLT2i = sodium glucose co-transporter inhibitor

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Australi.:m Diabst,s,s Soci;ity

diabetes australia

Figure 1. Australian type 2 diabetes management algorithm (June 2024)[33]

The Australian Diabetes Society (ADS) has updated the Australian Type 2 Diabetes Glycaemic Management Algorithm diagram to reflect the recent Pharmaceutical Benefits Scheme (PBS) restriction changes to type 2 diabetes medicines (https://www.pbs.gov.au/info/reviews/pbs-restriction-changes-to-type-2-diabetes-mellitus-t2dm-medicines) (June 2024). The ADS has a dedicated website specifically on **Treatment Management Plans: Type 2 Diabetes & Obesity** (https://treatment.diabetessociety.com.au) . The website features type 2 diabetes case studies and an interactive treatment algorithm designed to assist clinicians in treatment options.

In practice

Commencing and advancing glucose-lowering therapy

Healthy eating, physical activity and education remain the foundation of all type 2 diabetes treatment programs.

If acute metabolic decompensation appears (sudden weight loss, polydipsia, polyuria, severe fatigue), assess for hyperglycaemic emergencies. If present, or uncertain, seek specialist assistance.

If lifestyle modification is not effective in meeting glycaemic targets within three months, metformin is the first choice unless contraindicated or not tolerated. Always review by the 'review rule' (see 'Practice point ') and consider excluding type 1 diabetes before advancing therapies.

Second-line agents (added to existing metformin) may be necessary and should be chosen using an individualised approach, noting that agents work in different ways and should be chosen to work synergistically.

The choice of second-line and subsequent medications should be informed by:

- the individual's clinical profile, in particular renal function status and high risk, or presence, of cardiovascular disease (CVD)
- the likely efficacy of the agent with respect to the magnitude of glycaemic lowering required
- issues that might affect safety, such as hypoglycaemia risk or agent-specific side effects
- tolerability
- cost
- the individual's preferences and abilities to engage in the proposed treatment
- prioritisation of weight-management goals
- emerging and evolving data on new medications and whether medication combinations are available (may assist adherence).

Figure 1 provides options based on consideration of efficacy, non-glycaemic effects (eg effects on cardiovascular and renal outcomes), side effects and cost.

Start with the correct dose of each medication and review on an individual basis at least every three to six months, keeping in mind the individual's HbA1c target.[1,32]

Practice point: What if medication is not working? The 'review rule'

The review rule is a call to action. In addition to replacing or intensifying therapies, consideration should be given to deprescribing when appropriate. If, despite optimisation of medication or lifestyle intervention, glycaemic objectives are not being met after three months (six months at the most), review and:

- consider alternative diagnoses if not done previously, such as type 1 diabetes (consider C-peptide and islet cell antibody testing), latent autoimmune diabetes of adults (LADA) or monogenic diabetes (refer to 'Defining and diagnosing type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/defining-and-diagnosing-type-2-diabetes) ')
- check the individual's understanding of the medication, its indication and dosing regimen (health literacy)
- assess persistence and adherence to the therapeutic regimen, including lifestyle modification
- is medication titration needed or do additional options need to be added
- exclude potential confounders, such as occult infection (eg urinary), medications that might interfere with glucose management (eg steroids, some antipsychotics) or the presence of unmanaged obesity
- assess tolerability and safety, particularly hypoglycaemia, and other factors such as planning for pregnancy or adverse effects that may affect patient engagement.

The review rule emphasises that optimisation of the current regimen, including lifestyle modification, should be implemented before advancing through additional glucose-lowering medicines to achieve HbA1c targets within three to six months.

Safety

Each class of glucose-lowering medication may have common and uncommon side effects that affect quality of life and require careful clinical reassessment. Consider individualised cardiovascular assessment for all people with diabetes and timely kidney health assessments.

Some groups (eg older people and those with multiple comorbidities) may not be represented in the published clinical outcome trials of newer diabetes agents, so caution should be exercised when considering the choice of agents for these groups.

When used as monotherapy or in combination, metformin, acarbose, glitazones, GLP-1RAs DPP-4i and SGLT2i have a low propensity for causing hypoglycaemia.

Of the sulfonylureas, hypoglycaemia is a risk in both monotherapy and in combinations, but gliclazide is less likely to cause hypoglycaemia than other sulfonylureas (eg glimepiride) or sulfonylureas with renally excreted active metabolites (eg glibenclamide).[34,35]

Special care needs to be taken with those at increased risk of hypoglycaemia and renal impairment, especially older people.

Weight gain can occur with the use of sulfonylureas.[11] Thiazolidinedione (TZD) agents have associated unique risks (eg heart failure, fracture risks) in clinical practice (Table 1) and individualised clinical assessment is advised before using these agents. Mycotic infections or euglycaemic diabetic ketoacidosis are risks to consider with SGLT2i. GLP-1RAs are associated with nausea, vomiting and gastrointestinal upsets, and this may interfere with the absorption of other medications, including contraceptives.

Most agents carry risks with pregnancy, so assess the use of medications in this risk situation (refer to 'Type 2 diabetes, reproductive health and pregnancy (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/type-2-diabetes-reproductive-health-and-pregnancy) ').

People with diabetes who drive may need to notify their state motor vehicle licensing authority of their condition, because medications can affect driving performance. For more information, refer to the discussion on driving in 'Managing risks and other impacts of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-risks-and-other-impacts-of-type-2-diabete) ' or refer to Section 3.3.2 (https://austroads.com.au/publications/assessing-fitness-to-drive/ap-g56/diabetes-mellitus/medical-standards-for-licensing-2) of Austroads' and National Transport Commission's Assessing fitness to drive.

Insulin

The use of insulin can improve glycaemic management in most people, but any benefits need to be balanced against increased risks of hypoglycaemia and possible weight gain.[23]

International and Australian guidelines suggest considering a GLP-1RAs before commencing insulin, unless a person has extreme hyperglycaemic symptoms or HbA1c >11%.[36] GLP-1RAs are associated with weight loss as well as sparing insulin dose. Limitations to this approach include possible side effects of GLP-1RAs (nausea) and Therapeutic Goods Administration or PBS restrictions on GLP-1RA use in combination with other therapy that do not apply to insulin.

Side effects of insulin therapy

Rare adverse events associated with the use of insulin have been reported in observational studies. Such events include congestive heart failure, oedema, lipodystrophy, allergic reactions, reversible transaminitis, reversible nephrotic syndrome and ß-cell destruction.[37]

Common side effects include hypoglycaemia and weight gain. Risk factors for hypoglycaemia include:

- inappropriate dose
- timing or type of insulin (see below)

- incorrect injection technique (eg injecting insulin intramuscularly, rather than subcutaneously, can increase absorption rates by 50%)
- missing meals, or meals with no or insufficient carbohydrate
- alcohol intake
- exercise or unplanned physical activity
- weight loss
- treatment with agents potentiating hypoglycaemia (eg sulfonylureas)
- decreased insulin clearance (eg renal failure)
- changes to other medications (eg reducing or ceasing steroids).

Strategies for preventing hypoglycaemia in people include education about hypoglycaemic symptoms, structured self-monitoring of blood glucose (SMBG), discussing and individualising glycaemic goals and continued team-based support.[37]

Weight gain is variable on initiation of insulin and may accompany initial titration such that weight gain may eventually level off. Slower titration can lead to slower weight gain.

Strategies to address weight include:

- referral to a credentialled diabetes educator (CDE) and/or accredited practising dietitian (APD)
- review of other clinical conditions that may impact glycaemic management, such as possible type 1 diabetes, depression, occult malignancy, thyroid disease
- review of medications that may contribute to weight gain
- advice on increasing physical activity.

Early insulin intervention

Guidelines outlining the use of insulin in acute hyperglycaemic emergencies (including ketosis-inducing and hyperosmolar crises) are available.[38,39] The use of insulin in these cases may be life saving, and reassessment of long-term use can occur on metabolic stabilisation. Remember to assess for type 1 diabetes 'masquerading' with a type 2 diabetes phenotype (older, insulin-resistant persons) in these presentations.

Insulin types

Refer to 'Appendix 1: Types of insulin available (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/appendices/appendix-1-types-of-insulin-available) '.

Insulin delivery options

Various devices are available to deliver insulin, including insulin pens, syringes and pumps. Choice will depend on individual preference and the need and ability to self-manage injections. A CDE or a diabetes nurse practitioner can help provide support.

Insulin pens are the most common way of administering insulin because they make multiple daily injection schedules much easier and allow people to be more flexible in their self-management.

There is mounting evidence of selective beneficial effects of using insulin pumps and insulin patch pumps in people with type 2 diabetes (refer to 'Use of technology in type 2 diabetes management (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/use-of-technology-in-type-2-diabetes-management) ').

The National Diabetes Services Scheme (NDSS) provides subsidised access to insulin pump consumables for people with type 1 diabetes. For people with type 2 diabetes, some health funds cover insulin pumps, but consumables need to be self-funded.

Recommendations for delivery of insulin and non-insulin injectable medications

Using the correct delivery technique to ensure the optimal effect of insulin and GLP-1RAs is critical to achieving optimal management of diabetes and reducing the risk of some adverse effects of injectable medications.

The following recommendations for insulin delivery are based on the Forum for Injection Technique and Therapy Expert Recommendations (FITTER):[40]

- Single use of pen needles and syringes is recommended (lipohypertrophy has been associated with the reuse of pen needles and syringes).
- Shorter (size 4 mm or shortest available) needles applied to either the abdomen, thigh or buttock are adequate for most adults using insulin pen devices and will lessen the risk of intramuscular injection.
- Lipohypertrophy and lipodystrophy may occur with repeated insulin injections into the same site, and this can affect insulin absorption. This problem is overcome by ensuring rotation of injection sites.

Full recommendations are available on the Mayo Clinic (https://www.mayoclinicproceedings.org/article/S0025-6196(16)30321-4/fulltext) website.

Ozempic and Trulicity pens can be stored below 30°C once in use. Trulicity can be kept at this temperature for up to 14 days, whereas Ozempic can be stored for up to six weeks. The remaining stock should be refrigerated.

Refer to Box 1 for insulin delivery techniques.

More information can be found in the *Australian Journal of General Practice* article 'Teaching patients with type 2 diabetes to self-administer insulin'.[41]

When should people start insulin?

General practitioners should anticipate and proactively address the person's (and their own) reluctance to start insulin therapy. Early after a diagnosis of diabetes, it is important to discuss with patients that insulin may be used at some point to manage their diabetes.

With the appropriate insulin regimen, insulin therapy can be well managed in general practice, with people achieving better HbA1c management, fewer hypoglycaemic episodes and less weight gain, thus alleviating many of their concerns.[42]

Insulin is one of the most effective glucose-lowering agents for type 2 diabetes, and can be titrated to suit an individual's requirements. Commencement should not be delayed if hyperglycaemia and symptoms cannot be managed adequately by a patient's existing treatments. Recent evidence suggests that people who decline treatment with insulin when it is recommended to them can take longer to achieve HbA1c targets.[43]

Importantly, insulin is not the end of the road for the person with diabetes, nor does it represent therapeutic or patient failure.

Insulin should be initiated in people with type 2 diabetes who are taking maximum doses of non-insulin glucose-lowering medicines and who have suboptimal glycaemic management (HbA1c or blood glucose above individualised target), whether they are asymptomatic or symptomatic.[36,44]

Insulin therapy may remain an alternative for older people or people in aged care facilities, even in end-of-life care, with HbA1c >9% (75 mmol/mol), especially if management of symptomatic hyperglycaemia is difficult.

Before starting insulin

Ensure that other possible causes of hyperglycaemia have been addressed (eg lifestyle, non-adherence to non-insulin glucose-lowering medicines, other medications or medical conditions).[45]

Discuss with the person the benefits and costs of using insulin for optimal glycaemic management. Referral to a CDE and/or accredited practising dietitian is recommended to provide the necessary support and education to the person with diabetes in the lead-up to insulin initiation.

A general practitioner or CDE can complete the NDSS medication change registration form to allow people to access syringes or pen needles through the NDSS scheme.

The NDSS has an information booklet for people with type 2 diabetes who are starting insulin.[46]

Education for people with type 2 diabetes

Initial management planning and education (with both the person with type 2 diabetes and carers) should cover:

- self-management – timing and frequency of SMBG, timing of meals, dose adjustment
- the impact of diet, in particular carbohydrate content (both type and amount)
- the effects of altered eating patterns, such as for religious fasts or weight loss strategies (eg intermittent fasting, 5:2 diets, very-low-calorie diets)
- the impact of physical activity
- hypoglycaemia management
- insulin delivery techniques (Box 1)
- weight management and the mitigation of weight gain with insulin therapy
- sick-day management (refer to 'Managing risks and other impacts of type 2 diabetes' (http

s://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-risks-and-other-impacts-of-type-2-diabete))
- exercise, illness and travel considerations
- identification, roads and maritime services notifications.

This should be followed up regularly with structured education sessions.

Box 1. Insulin delivery

Fundamental information for person with type 2 diabetes about insulin delivery includes the following:

- Insulin in use can be stored at room temperature for up to one month but the remaining stock should be kept refrigerated until the expiry date.
- Cloudy pre-mix insulin must be resuspended prior to each use.
- Insulin pen needles should be used only once, because reuse increases the risk of lipohypertrophy.[47]
- When using a new insulin pen needle, use 1–2 units to expel air prior to dialling up the prescribed dose.
- The abdomen is the preferred site for injecting.
- Insulin needs to be injected only into subcutaneous tissue; injecting into muscle can not only be painful, but can also increase the absorption rate of insulin.[48]

People with type 2 diabetes should also be educated about:

- how to safely dispose (https://www.safesharps.org.au/) of used needles
- how to rotate injection sites (people should be taught and provided with an easy-to-follow injection site rotation plan, reviewed regularly, to reduce the risk of lipohypertrophy[49])
- how to time insulin injections
- the importance of regular inspection of injection sites.

Initiating insulin

All insulins can work effectively.[42] Selecting an insulin for initiation will depend on the characteristics of the person and the disease. At the selection of the insulin preparation, consider which injecting device is most suitable for the person.

Set an individualised target (refer to 'Glucose monitoring (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/glucose-monitoring) '), following the principle of 'start low, go slow' to gain confidence and reduce the risk of hypoglycaemia.[50]

Select one of the following insulin schedules:

- basal insulin (eg glargine U100 or U300) once daily, regardless of meals (basal insulin alone)
- basal insulin once daily irrespective of meals added together with a weekly GLP-1RA
- basal insulin once daily irrespective of meals plus a single rapid-acting (prandial) insulin dose given at the largest meal of the day (basal plus one)
- co-formulated insulin (eg degludec–aspart) or premixed (biphasic) insulin (eg lispro–lispro protamine or aspart–protamine insulin) once daily before the largest carbohydrate-containing meal of the day. Premixed insulins have various combinations of intermediate-acting basal insulins and rapid-acting insulins. Common combinations are 25/75, 30/70 and 50/50 (rapid-acting/basal insulins), by percentage.

Basal insulin alone has a slightly lower risk of hypoglycaemia, especially if the fasting glucose is consistently above target.[36,51]

Premixed or co-formulated insulin may be more appropriate and simpler (because a single delivery device is used) for a person where fasting and postprandial glucose are both consistently elevated.

Dosage adjustment can be more complex with premixed and co-formulated insulins, because both insulin components are adjusted simultaneously, possibly increasing the risk of hypoglycaemia and weight gain compared with basal insulin.[51,52]

Non-insulin glucose-lowering medicines should generally be continued, because:

- cessation of non-insulin glucose-lowering medicines before blood glucose targets are achieved may result in significant hyperglycaemia[50]
- ongoing use can mitigate weight gain (particularly SGLT2i and GLP-1RAs)[36]
- ongoing use may be insulin-sparing and can reduce the risk of hypoglycaemia with insulin dose titrations as well as hyperglycaemia.[50]

Careful review of the use of sulfonylureas should be considered if risks for hypoglycaemia are present (commencing insulin in older people, or uptitration of insulins containing prandial/rapid-acting insulins).

A low starting dose for premixed, co-formulated of 10 units with a meal or basal insulin of 10 units or 0.1–0.2 units/kg in the evening will usually be a safe dose; **however, titration is needed**, because this low dose may be insufficient to achieve glycaemic targets in most people.

Detailed information about insulin doses, titration and intensification is provided in ‘Appendix 2: Guide to insulin initiation and titration (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/appendices/appendix-2-guide-to-insulin-initiation-and-titrati) ’.

Resources

The Australian Diabetes Educators Association has produced the *Clinical guiding principles for subcutaneous injection technique*.

The NDSS has produced a fact sheet (https://www.ndss.com.au/about-diabetes/resources/find-a-resou rce/concerns-about-starting-insulin-for-people-with-type-2-diabetes-fact-sheet/) for people with type 2
diabetes starting on insulin.

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Use of technology in type 2 diabetes management

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Continuous glucose monitoring (CGM) should be considered for continual* or intermittent use in all individuals with type 2 diabetes on intensive insulin therapy (multiple daily injections [MDIs] or insulin pumps), subject to individual factors and the availability of resources. *'Continual use' refers to the use of CGM in a consistent manner based on the optimal number of recommended sensors, subject to patient factors and availability of resources.	A	1	14/11/2024

Clinical context

Recently, there has been an acceleration of uptake of technology for managing diabetes: as an adjunct to conventional therapy, to improve self-management and to provide education. This presents both challenges and opportunities for general practitioners and people with type 2 diabetes.

The technology available to help manage diabetes falls into three main categories:

- information technology – such as mobile phone apps, SMS messaging, wearable technology (eg fitness trackers, smartwatches), web-based programs and clinic-based chronic disease care programs
- technological innovations for monitoring of glycaemia – such as CGM and flash glucose monitoring (FlashGM), which provide greater insights into glycaemic variability patterns and alarm systems for defined hypoglycaemia or hyperglycaemic excursions
- technology for medication delivery – such as evolving medication pen devices and continuous

subcutaneous infusion of insulin (insulin pumps). Although insulin pump infusions have traditionally been used mainly by people with type 1 diabetes, they are increasingly being used in type 2 diabetes.

Technology: Clinical utility

A recent meta-analysis found that information technology such as mobile phone apps and web-based applications combined with standard diabetes care resulted in clinically significant reduction in glycated haemoglobin (HbA1c) in people with type 2 diabetes.[2] In addition, there is emerging evidence that information technology interventions are associated with:

- reduced sedentary behaviour (computer, mobile and wearable technologies)[3]
- increased physical activity (online self-tracking program)[4]
- improvements in diet and exercise, including understanding of nutrition (counselling delivered via mobile phone messaging).[5]

Continuous glucose monitoring

What is it?

CGM involves a small sensor being implanted in the subcutaneous tissue to monitor interstitial glucose. 'Real-time' CGM continuously records and reports glucose levels, with some remote devices at times using visual or auditory 'alarms' to alert users to hypoglycaemia or hyperglycaemia. CGM measures interstitial glucose, and is not exactly equivalent to capillary blood glucose measurement (eg there may be a delay of a maximum of 15 minutes between interstitial glucose being equilibrated with capillary glucose levels), which remains the standard for confirmation of high and low blood glucose levels and treatment decisions.

FlashGM, also called 'intermittently viewed CGM', uses a disc device, worn on the arm, that can be scanned with a reader or smart phone to obtain interstitial glucose results instantly.[6] These devices do have similar alerts for either low or high blood glucose levels and trends to changing levels.

How does it help?

HbA1c is the standard for assessing long-term glycaemic management; however, it does not reflect within-day and day-to-day glycaemic variability that might lead to hypoglycaemia or postprandial hyperglycaemia.[7]

CGM can be a useful clinical tool to detect glycaemic patterns, including hypoglycaemia, and hyperglycaemic events, and assist in the assessment of the quality of glycaemic management, evaluate glycaemic variability and patterns of hypoglycaemia.[8] Clinical situations may include sick-day management, effects of lifestyle changes on glucose and complex insulin initiation and titration. Evidence is less robust in support of the use of CGM in people with type 2 diabetes on non-insulin glucose-lowering medicines or premix insulin.[1]

Increasingly, standardised reporting that uses the ambulatory glucose profile (AGP)9 is being adopted. AGP represents the modal distribution of interstitial glucose in a graphic form, which allows the identification of issues such as hypoglycaemic risk, glycaemic variability and excessive glycaemic excursions, which informs clinical intervention such as modifying pharmacotherapy or implementing medical nutrition therapy. The Australian Diabetes Society has published a practical guide (https://www.diabetessociety.com.au/downloads/20220601%20ADS%20Primary%20Care%20GPI%20Report%20Consensus%20Statement%20V2.pdf) to interpret CGM and FlashGM data.

The minimum duration of CGM to obtain enough data to effectively characterise and interpret glycaemia patterns has been reported as at least 7 days.[1]

Accuracy of CGM

The accuracy of CGM is often reported as the 'mean absolute relative difference' (MARD) between the CGM system values and matched reference values. A MARD of ≤10% is considered desirable.[10]

Calibration requirements for each sensor may vary. FlashGM sensors do not require calibration; however, discrepancy with SMBG can occur when glucose levels are changing rapidly or in a lower glucose range. Compression on the sensor (eg when lying on it while asleep) can lead to false reporting of hypoglycaemia due to restriction of flow of interstitial fluid around the sensor. Glucose levels should be confirmed with a fingerprick assessment if:[6]

- glucose levels are changing rapidly
- sensors indicate hypoglycaemia or possible hypoglycaemia
- a person displays symptoms inconsistent with reported glucose levels.

Continuous subcutaneous insulin infusion (insulin pumps)

Continuous subcutaneous insulin infusion (CSII) allows for more controlled delivery of insulin compared with injectable insulin, particularly for basal insulin. Pumps deliver basal plus bolus (prandial and correction) doses that can be programmed to change in response to the user's changing needs (eg meal times, exercise). These integrated systems are referred to as automated insulin delivery (AID) systems.

Integrated smart insulin pens

Smart insulin pens provide additional functionality beyond insulin delivery. These additional properties may include:

- electronic recording of insulin dosing information (type of insulin, time of injection and number of units injected)
- electronic data sharing with a healthcare professional via an appropriate app, creating an insulin dosing summary
- integrating insulin dosing and timing with CGM, providing insights into how insulin may affect blood glucose and, combined with compatible apps, allowing overlay of blood glucose data with insulin dosing information.

In practice

Mobile apps, web-based programs, text messaging

Many practices already use web- and phone-based messaging for recalls, reminders and appointment scheduling (eg mySugr app for calculation of the insulin to carbohydrate ratio).

More work needs to be done to determine the most effective interventions and the optimal integration of technology with validated models of care for chronic disease management.

AID systems

The decision to implement an AID system incorporating CSII and CGM is a case-by-case assessment based on cost–benefit analysis, individualising the decisions according to needs, wishes and capacity. These technologies can be costly and resource intensive, and might increase stress and distress to the person. They also require careful education delivered within specialised trained healthcare team environments. Thus, the introduction, implementation and ongoing use of any complex technology requires high levels of professional support to instruct users about the appropriate use and interpretation of outcomes.[11,12]

Clinicians who recommend these technologies should be experienced in their use or consult experts such as endocrinologists or credentialled diabetes educators.

The National Association of Diabetes Centres has developed national standards for diabetes technology (https://nadc.net.au/dts/) to guide primary care user.

Consider the use of CGM or FlashGM in individuals with type 2 diabetes on basal insulin regimens who have suboptimal glycaemic control, based on the recent Asia-Pacific consensus recommendations.[1]

Individuals who might benefit most from CGM or FlashGM are those:[10]

- at high risk of hypoglycaemia
- with hypoglycaemic unawareness
- with high glycaemic variability.

Intermittent use of CGM or FlashGM by the person can be a useful adjunct to SMBG.

Those likely to benefit from CSII most are those:

- with the most unstable glycaemic levels
- with recurrent hypoglycaemia
- who are engaged with the additional offerings of the technology beyond insulin delivery.

When paired with CSII, the benefits of CGM are added to those of CSII.

Potential barriers include:

- cost (insulin pumps are covered by most private health insurers, but consumables are not; the

National Diabetes Services Scheme subsidies consumables only for people living with type 1 diabetes)
- lack of technical or information technology literacy (users need to navigate pump menus, upload pump and/or CGM data, be able to 'troubleshoot')
- level of clinical and technological support that is required from family, healthcare professionals and purveyors of technology
- the dexterity required to apply infusion sets, CGM sensors and transmitters.

Recommended glycaemic targets for users of CGM/FlashGM with type 2 diabetes (not during pregnancy) are as follows:[13]

- time in range – a target of 3.9–10 mmol/L should be maintained at least 70% of the time
- time below range – blood glucose levels <3.9 mmol/L should occur for less than 4% of the day (approximately one hour); very low levels (<3.0 mmol/L) should occur for no more than 1% of the day (15 minutes)
- time above range – blood glucose levels >10 mmol/L should occur less than 25% of the time; very high levels (>13.9 mmol/L) should occur less than 5% of the time.

The following targets are recommended for older or high-risk individuals with type 2 diabetes:[13]

- time in range – a target of 3.9–10 mmol/L should be maintained more than 50% of the time
- time below range – avoiding hypoglycaemia is a priority in this population, so blood glucose levels <3.9 mmol/L should occur for less than 1% of the day, or 15 minutes
- time above range – very high blood glucose levels of >13.9 mmol/L should be allowed for less than 10% of the time.

Battelino et al[13] have published detailed information about clinical glucose targets for CGM, including CGM-based targets for different diabetes populations (figure 1 (https://diabetesjournals.org/view-large/figure/3249168/dci190028f1.jpeg)).

The AGP (https://www.diabetessociety.com.au/guideline/utilising-the-ambulatory-glucose-profile-agp-combined-with-the-glucose-pattern-summary-to-support-clinical-decision-making-in-diabetes-care/) enables retrospective analysis of dense data, trends and patterns for people with diabetes and their healthcare team to help achieve appropriate glucose targets and to minimise hypoglycaemia and hyperglycaemia.[9]

Artificial Intelligence in diabetes management is emerging mostly related to fully automated insulin delivery that detects blood glucose and adjusts drug delivery or can suspend insulin if hypoglycaemia is detected; however, this application is mostly focused on type 1 diabetes. The article by Guan et al[14] gives an overview of current opportunities for artificial intelligence with type 2 diabetes.

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Complications

Complications

In this section

Type 2 diabetes and cardiovascular risk (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/type-2-diabetes-and-cardiovascular-risk)
Diabetes-related eye disease (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/diabetes-related-eye-disease)
Diabetes-related neuropathy (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/diabetes-related-neuropathy)
Diabetes-related foot care (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/diabetes-related-foot-care)
Diabetes-related chronic kidney disease (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/diabetes-related-chronic-kidney-disease)

Type 2 diabetes and cardiovascular risk

Complications| **Type 2 diabetes and cardiovascular risk**

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Calculate cardiovascular disease (CVD) risk level using the Australian absolute cardiovascular disease risk calculator (Aus CVD Risk Calculator) (http://www.cvdcheck.org.au/) *. Age ranges for assessing CVD risk in people without known CVD are as follows: • All people aged 45–79 years • People with diabetes aged 35–79 years • Aboriginal and Torres Strait Islander people aged 30–79 years. Assess individual CVD risk factors in Aboriginal and Torres Strait Islander people aged 18–29 years** *The updated Aus CVD Risk Calculator can be accessed here (https://www.cvdcheck.org.au/calculator/) . When using the calculator within electronic medical records, verify the version to ensure it is not outdated. **Refer to the National Aboriginal Community Controlled Health Organisation (NACCHO)–Royal Australian College of General Practitioners (RACGP) *National guide to preventive healthcare for Aboriginal and Torres Strait Islander people* (https://www.racgp.org.au/national-guide) .	Conditional Conditional Consensus	1	14/11/2024

For Aboriginal and Torres Strait Islander people, consider reclassifying estimated CVD risk to a higher risk category after assessing the person's clinical, psychological and socioeconomic circumstances, and community CVD prevalence.* Refer to the NACCHO-RACGP *National guide to preventive healthcare for Aboriginal and Torres Strait Islander people* (https://www.racgp.org.au/national-guide) .	Conditional, moderate	1	14/11/2024
In people whose estimated CVD risk is close to the threshold for a higher risk category, consider reclassifying estimated CVD risk to a higher risk category for the following groups: • Māori people • Pacific Islander people • people of South Asian ethnicity (Indian, Pakistani, Bangladeshi, Sri Lankan, Nepali, Bhutanese, or Maldivian ethnicities)	Conditional, moderate	1	14/11/2024
People with pre-existing CVD are at high risk of another CVD event.	Consensus	2	14/11/2024
Managing CVD risk			
For people at high risk of CVD* (estimated 5-year risk ≥10% determined using the Australian cardiovascular disease risk calculator), prescribe lipid-modifying medicines to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle. * For people at intermediate or low risk of CVD, refer to the Australian guideline for assessing and managing CVD risk (https://www.cvdcheck.org.au/) .	Strong	1	14/11/2024

For people at high risk of CVD* (estimated 5-year risk ≥10% determined using the Australian CVD risk calculator), prescribe blood pressure-lowering medicines to reduce CVD risk, unless contraindicated or clinically inappropriate. Explain the potential benefits and harms of treatment to the person and encourage shared decision-making. Encourage, support and advise a healthy lifestyle. * For people at intermediate or low risk of CVD, refer to the Australian guideline for assessing and managing CVD risk (https://www.cvdcheck.org.au/) .	Strong	1	14/11/2024
We recommend the addition of an sodium-glucose cotransporter 2 inhibitor (SGLT2i) to other glucose-lowering medication(s) in adults with type 2 diabetes who also have CVD, multiple cardiovascular risk factors* and/or kidney disease. *We define multiple cardiovascular risk factors as men 55 years of age or older or women 60 years of age or older with type 2 diabetes who have one or more additional traditional risk factors, including hypertension, dyslipidaemia or smoking.	Strong	3	14/11/2024
We recommend the addition of a glucagon-like peptide-1 receptor agonist (GLP-1RA) to other glucose-lowering medication(s) in adults with type 2 diabetes who have CVD, multiple cardiovascular risk factors* and/or kidney disease, and are unable to be prescribed an SGLT2i due to either intolerance or contraindication. *We define multiple cardiovascular risk factors as men 55 years of age or older or women 60 years of age or older with type 2 diabetes who have one or more additional traditional risk factors, including hypertension, dyslipidaemia or smoking.	Strong	3	14/11/2024
Antihypertensive medication			

Antihypertensive therapy is strongly recommended in patients with diabetes and systolic blood pressure ≥140 mmHg.	Strong; Level I evidence	[4]	14/11/2024
For people with diabetes and hypertension, blood pressure targets should be individualised through a shared decision-making process that addresses cardiovascular risk, potential adverse effects of antihypertensive medications and individual preferences	B	[5]	14/11/2024
In patients with diabetes and hypertension, any of the first-line* antihypertensive drugs that effectively lower blood pressure are recommended. *Angiotensin-converting enzyme inhibitor or angiotensin receptor blocker (ARB) agents.[5]	Strong; Level I evidence	[4]	14/11/2024
In patients with diabetes and hypertension, chronic kidney disease or comorbidities of heart disease, a blood pressure target of <140/90 mmHg is recommended.	Strong; Level I evidence	[4]	14/11/2024
For individuals with hypertension and a history of transient ischemic attack (TIA) or stroke, a blood pressure target of <140/90 mmHg is recommended.	Strong; Level I evidence	[4]	14/11/2024
Lipid-lowering medications			
All adults with type 2 diabetes and known prior CVD (except haemorrhagic stroke) should receive the maximum tolerated dose of a statin, irrespective of their lipid levels. Note: The maximum tolerated dose should not exceed the maximum available dose (eg 80 mg atorvastatin, 40 mg rosuvastatin).	A	[2]	14/11/2024

In people with type 2 diabetes and known prior CVD, fibrates should be commenced in addition to a statin or on their own (for those intolerant to statin) when fasting triglycerides are greater than or equal to 2.3 mmol/L, or high-density lipoprotein (HDL) cholesterol is low†. Note: When used in combination with statins, fenofibrate presents a lower risk of adverse events than other fibrates combined with statins. †HDL <1.0 mmol/L (based on the cut-offs reported in the ACCORD and FIELD studies).	B	2	14/11/2024
In individuals with atherosclerotic CVD (ASCVD) or other cardiovascular risk factors on a statin with controlled low-density lipoprotein (LDL) cholesterol but elevated triglycerides (135–499 mg/dL [1.5–5.6 mmol/L]), the addition of icosapent ethyl can be considered to reduce cardiovascular risk.	A	5	14/11/2024
For people with diabetes and ASCVD, treatment with high-intensity statin therapy is recommended to target an LDL cholesterol reduction of ≥50% from baseline and an LDL cholesterol goal of <55 mg/dL (<1.4 mmol/L). Addition of ezetimibe or a proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitor/PCSK9 targeted therapies with proven benefit in this population is recommended if this goal is not achieved on maximum tolerated statin therapy.	B	5	14/11/2024
Antithrombotic medication			
All adults with type 2 diabetes and known prior CVD should receive long-term antiplatelet therapy unless there is a clear contraindication.	A	2	14/11/2024

Use aspirin therapy (75–162 mg/day) as a secondary prevention strategy in those with diabetes and a history of ASCVD*. *Based on a clinical history of atherosclerotic disease not imaging retinopathy risk reduction.	A	5	14/11/2024
For individuals with ASCVD and documented aspirin allergy, clopidogrel (75 mg/day) should be used*. *Based on a clinical history of atherosclerotic disease not imaging retinopathy risk reduction.	B	5	14/11/2024

Clinical context

CVD is the leading cause of death in people with diabetes, making the assessment, prevention and management of CVD risk a vital part of diabetes care.

It is important to note that although myocardial infarction and stroke are commonly used as primary outcomes in type 2 diabetes trials, other common manifestations of CVD in people with type 2 diabetes are, in fact, peripheral arterial disease and heart failure.[6] General practitioners (GPs) therefore need to consider these risks when addressing CVD risk in people with type 2 diabetes.

Assessment of CVD risk

Assessment of combined multiple risk factors (absolute CVD risk) is more accurate than the use of individual risk factors.[1]

All people with type 2 diabetes should be assessed for absolute CVD risk, using a validated tool, at diagnosis. Note that all patients with type 2 diabetes and existing CVD are considered to be at high risk of another event.[2]

Depending on the level of risk, people should be reassessed at the following intervals:

- low absolute risk (<5%): every two years
- moderate risk (5–10%): every 6–12 months
- high risk (>10%): as clinically indicated.[1]

Calculate CVD risk level using the Australian CVD Risk Calculator (https://www.cvdcheck.org.au/calculator) .

Coronary artery calcium (CAC) scoring: the clinical utility of CAC scoring may be utilised to re-evaluate the calculated risk scores. A level of zero may allow downgrading of calculated risk, whereas higher levels (>100) may necessitate upgrading calculated risk.[5,7]

People with type 2 diabetes have double the risk of developing CVD and risk is higher for people with a longer-term duration of diabetes and in the presence of microvascular disease and persistently elevated glycaemic levels.[8] Thus, it is important to identify and manage CVD risk in people with type 2 diabetes.

Aboriginal and Torres Strait Islander people aged from 30 to 79 years should have specific CVD risk screening annually. Individuals aged 18–29 years should be assessed for diabetes. If diabetes is present in this group, screening for chronic kidney disease and serum lipids should be assessed. Refer to NACCHO-RACGP National guide to preventive healthcare for Aboriginal and Torres Strait Islander people (https://www.racgp.org.au/national-guide) Cardiovascular disease, Type 2 diabetes and Chronic kidney disease.[9]

Prevention and management of CVD

Interventions to manage CVD risk include:

- lifestyle modification
- antihypertensive medication
- lipid-lowering medication
- antithrombotic therapy
- glucose-lowering medications that show novel non-glycaemic effects.

In addition to lifestyle modification, **all people at high absolute CVD risk** should be treated with both antihypertensive medication and lipid-lowering medication (see below), unless contraindicated or clinically inappropriate.[1]

GPs should set individual treatment targets for patients, balancing the benefits and risks of interventions. For example, the CVD risk associated with lipid and blood pressure levels is continuous; hence, specific targets are somewhat arbitrary and should be used as a guide to treatment, not as mandatory goals. It is important to understand that there might be small absolute benefits required to reach suggested goals. However, any reduction in risk factor values will be associated with some benefit.[1]

When developing a management plan for people, refer to the 2023 guideline for assessing and managing CVD risk (https://www.cvdcheck.org.au/) and the Australian CVD Risk Calculator (https://www.cvdcheck.org.au/calculator) .

Lifestyle modification

Lifestyle changes in nutrition, physical activity and smoking status underpin a general practice approach to CVD risk minimisation. Lifestyle changes show excellent cost-effectiveness in lowering the burden of disease and remain the basis for the management of all CVD risk levels.[10,11]

In people with type 2 diabetes and obesity (mean body mass index 36 kg/m2), the Look AHEAD study found that a lifestyle intervention that focused on weight loss improved glycated haemoglobin (HbA1c) and quality of life, but did not significantly reduce the risk of cardiovascular morbidity or mortality.[12]

For further information, refer to the section 'Lifestyle interventions for management of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/lifestyle-interventions-for-the-management-of-type) '.

Antihypertensive medication

Lowering blood pressure reduces cardiovascular events and all-cause mortality in people with type 2 diabetes. Although no difference is noted between different classes of blood pressure-lowering therapy for CVD outcomes, there is clear evidence that in people with type 2 diabetes, antihypertensive therapy with an ARB or angiotensin-converting enzyme inhibitor (ACEi) decreases the rate of progression of albuminuria and retinopathy, promotes regression to normoalbuminuria and may reduce the risk of decline in renal function. Combining an ARB and an ACEi is not recommended.[1,13]

Blood pressure targets

The target level for optimum blood pressure is controversial. Some international guidelines have changed their blood pressure targets to <140/90 mmHg[4,14] whereas others remain at <130/80 mmHg.[15] Some suggest that low targets such as <130/80 mmHg could be appropriate for people at high risk of CVD, if achievable without undue treatment burden.[14]

Considering these guidelines, the RACGP recommends a blood pressure target of <140/90 mmHg for people with diabetes, with lower targets considered for younger people and those at high risk of stroke, as long as the treatment burden is not high.

For secondary prevention of CVD, the target blood pressure for people with diabetes and microalbuminuria or proteinuria (emergent chronic kidney disease) remains <130/80 mmHg. As always, treatment targets should be individualised and people with diabetes monitored for side effects from the use of medications to achieve lower targets.

Lipid-lowering medication

GPs should consider treatable secondary causes of raised blood lipids before commencing pharmacotherapy.

As part of patient centred care, develop a shared decision-making process to decide on optimal therapy including individuals' preferences and CVD risk calculation. Statins are an appropriate first line lipid-modifying therapy.[1] The results from several systematic reviews are consistent, and suggest that people with diabetes gain at least similar benefits as people without diabetes. The data clearly demonstrate that statin therapy results in a significant decrease in coronary artery disease morbidity and mortality in type 2 diabetes for those at high CVD risk.[1,16,17] This benefit is in contrast to the contentious effects of improved glycaemic control in CVD risk management.

Statin use for primary prevention of CVD

Statins are indicated for people with diabetes at high absolute risk of CVD, at any cholesterol level.[1]

Statin use for secondary prevention

Statin therapy is recommended for all people with CVD (unless exceptional circumstances apply).

Other lipid-lowering medications

The evidence for using lipid-lowering medications other than statins to decrease the risk of coronary artery disease is still accumulating. Recent evidence suggests CVD benefit in select subpopulations (see below).

Ezetimibe

Ezetimibe has been studied in the IMPROVE-IT trial in people with diabetes and existing acute coronary syndrome. Compared with a statin alone, ezetimibe combined with a statin showed an absolute risk reduction of 5.5% (40% versus 45.5%) for the composite primary end point of cardiovascular death, major coronary events or non-fatal stroke over seven years.[18]

Thus, in adults with diabetes with acute coronary syndrome, ezetimibe combined with a statin may provide additional LDL-C lowering (if >1.8 mmol/L on statin therapy and requiring CVD risk reduction).

Nicotinic acid, bile acid resins and fibrates

These agents have been suggested as alternatives for people who cannot tolerate statins.

Nicotinic acid (niacin) was shown in one trial to reduce CVD outcomes, although the study was performed in a cohort of people without diabetes.[19] More recent trials have not confirmed this initial result.[21] The use of nicotinic acid, in particular, as well as gemfibrozil and cholestyramine, is limited by a high rate of adverse effects.

The role of fibrates (fenofibrate, gemfibrozil) to decrease the risk of CVD is contentious. Fibrates, preferably fenofibrate, should be commenced in addition to a statin or on their own (for those intolerant to statin) when fasting triglycerides are ≥2.3 mmol/L, or HDL-C is low.[2]

Eicosapentaenoic acid-derived ethyl ester

The Reduce-IT trial of 4 g daily of eicosapentaenoic acid (EPA)-derived icosapent ethyl demonstrated a 25% risk reduction in high-risk people with diabetes on statin therapies who had elevated triglycerides.[21] There was an excess of hospitalisation for atrial fibrillation but no associated elevated risk of stroke. The clinical availability of this intervention is still being evaluated in Australia.

PCSK9 inhibitors

PCSK9 inhibitors are injectable lipid-lowering agents that have restricted Therapeutic Goods Administration (TGA) and Pharmaceutical Benefits Scheme (PBS) approval for use in select high-risk patients. They provide potent lowering of LDL-C in addition to other approved lipid-lowering therapies such as statins, ezetimibe and PCSK9-targeted therapies, including monoclonal antibodies and small interfering RNA. Long-term outcome studies on safety for both in class agents are needed. For more information, refer to the TGA (http://www.ebs.tga.gov.au/) and the PBS (https://www.pbs.gov.au/pbs/home) websites.

Antithrombotic therapy

It is not usually recommended that antiplatelet therapy (eg aspirin, clopidogrel) be used in the primary prevention of CVD. For secondary prevention, the strong positive effects in the conditions outlined in the ‘Table of recommendations’ need to be weighed against individual risks.

Glucose-lowering medications (novel non-glycaemic effects)

In populations with existing CVD, cardiovascular outcome trials have been conducted for newly developed diabetes drugs to demonstrate, primarily, cardiovascular safety and various secondary non-glycaemic endpoints.[22] Some trials did include people with multiple risk factors for CVD. The trials were not glycaemic efficacy trials.

Summary of outcomes

Refer below to the individual trial designs and outcomes for specific drug effects.

Sodium glucose co-transporter 2 inhibitors

A 2019 meta-analysis of cardiovascular outcomes trials showed that the use of SGLT2i led to:[23]

- an 11% reduction in major adverse cardiovascular events, seen only in those with established CVD and not those without CVD
- a 23% reduction in CVD death or hospitalisation for heart failure in those with or without atherosclerotic disease or heart failure.

An updated 2022 meta-analysis evaluating the use of SGLT2i in people with diabetes, with or without other diseases, reported that the use of an SGLT2i over a period of 3.5 years by 1000 people with diabetes and an elevated CVD risk would result in a reduce the number of deaths by nine, major cardiovascular events by nine, hospitalisations for heart failure by 11 and cases of end stage kidney disease by two, but potentially create two cases of ketoacidosis and 36 cases of genital infection.[24]

The exact mechanism of action of SGLT2i on CVD, chronic kidney disease and heart failure has not been fully elucidated.

Glucagon-like peptide-1 receptor agonists

A 2022 meta-analysis of six RCTs showed that GLP-1RAs reduced the risk of:

- death from cardiovascular causes by 10%
- fatal and non-fatal stroke by 15%.[25]

A 2023 meta-analysis showed that the use of GLP-1RAs led to:

- a 17% reduction in primary end points for major adverse cerebrovascular outcomes
- a 15% reduction in non-fatal stroke and a 27% reduction in ischaemic stroke, but no reduction in haemorrhagic stroke.[26]

The exact mechanism of action of GLP-1RAs has not been fully elucidated.

CVD outcomes of combined GLP-1RA/glucose-dependent insulinotropic polypeptide (GIP) agents are yet to be reported.

Dipeptidyl peptidase-4 inhibitors

Recent meta-analyses for dipeptidyl peptidase-4 inhibitors showed that:[27-29]

- safety, but non-significant benefits for cardiovascular outcomes in those at high risk of cardiovascular events or with established CVD
- a statistically non-significant 5% increased risk of hospitalisation for heart failure with

saxagliptin.

Sulfonylureas

Meta-analyses of randomised clinical trials for sulfonylureas have shown:

- no excess cardiovascular risks associated with this class[30,31]
- lower all-cause and cardiovascular mortality associated with gliclazide and glimepiride compared with glibenclamide.[32]

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Diabetes-related neuropathy

Complications| **Diabetes-related neuropathy**

Table of recommendations

Recommendation	Grade	References	Recommended as of:
All people with diabetes should be screened for diabetic peripheral neuropathy, starting at diagnosis of type 2 diabetes and at least annually thereafter.	D	1,2	14/11/2024
Assessment for distal symmetric polyneuropathy should include a careful history and assessment of either temperature or pinprick sensation (small-fibre function) and vibration sensation using a 128-Hz tuning fork (for large-fibre function). All people with diabetes should have annual 10-g monofilament testing to identify feet at risk for ulceration and amputation.	B	1	14/11/2024

The following agents may be used alone or in combination for relief of painful peripheral neuropathy: • anticonvulsants ◦ pregabalin ◦ gabapentin ◦ valproate • antidepressants ◦ amitriptyline ◦ duloxetine ◦ venlafaxine • topical nitrate spray In people not responsive to the above agents, opioid analgesics (tramadol, tapentadol ER, oxycodone ER) may be used.* *Prescribers should be cautious when prescribing opioid analgesics due to the risks of abuse, dependence and tolerance, and adhere to prescribing guidelines	A, Level 1 B, Level 2 B, Level 2 B, Level 2 B, Level 2 B, Level 2	2	14/11/2024
People with type 2 diabetes should be treated with intensified glycaemic control* to prevent the onset and progression of neuropathy. Optimise blood pressure and serum lipid control* to reduce the risk or slow the progression of diabetic neuropathy. *management	B	1, 2	14/11/2024

Clinical context

Diabetic neuropathies increase with age, duration of diabetes and level of management of diabetes. They are heterogeneous and may be focal or diffuse. These increase the person's burden of self-care and overall management. Foot ulceration and amputation are important and costly sequelae of diabetic neuropathy[2] (refer to 'Complications: Diabetes-related foot care (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/diabetes-related-foot-care) ').

Peripheral neuropathy

Symptoms may include pain and/or paraesthesia.

Manifestations of diabetes-related peripheral neuropathy include:

- polyneuropathy – diffuse and symmetrical neuropathy (most common)
- mononeuropathy
- polyradiculoneuropathy
- thoracic radiculopathy
- cranial neuropathy.

Autonomic neuropathy

Symptoms may include gastrointestinal, cardiovascular, bladder and sexual problems.

Autonomic neuropathy may result in:

- difficulty recognising hypoglycaemia (hypoglycaemic unawareness)
- orthostatic hypotension with a >20-mmHg drop
- loss of cardiac pain, 'silent' ischaemia or myocardial infarction
- sudden, unexpected cardiorespiratory arrest, especially under anaesthetic or treatment with respiratory-depressant medications
- impaired and unpredictable gastric emptying (gastroparesis), which can cause a person's blood glucose levels to be erratic and difficult to manage
- diarrhoea, chronic constipation, reduced anal sphincter control
- delayed/incomplete bladder emptying, urinary incontinence
- erectile dysfunction and retrograde ejaculation in males
- reduced vaginal lubrication with arousal in women
- reduced sweating
- loss of hearing
- unexplained ankle oedema.

See See resources (#accordion-heading-Content4) for foot disease resources for people with diabetes.

In practice

Before any treatment is instigated, exclusion of non-diabetic causes of neuropathy is suggested. This includes assessment for vitamin B12 deficiency, hypothyroidism and renal disease, and a review of neurotoxic drugs, including excessive alcohol consumption. Neuropathy may be seen with other foot conditions, such as deformity and peripheral arterial disease, so a comprehensive clinical assessment other than for neuropathy is appropriate.

The clinical focus is on prevention by optimising glycaemic management and early recognition, facilitated by good history and routine sensory testing.

Assessment

People with type 2 diabetes should be checked for diabetic peripheral neuropathy at diagnosis, and at least annually thereafter, but more frequently (ie 3–6 monthly) should abnormal clinical findings be present such as peripheral arterial disease and/or foot deformity.[3,4]

Tests to assess for diabetic peripheral neuropathy are shown in Box 1. Combinations of more than one test have >87% sensitivity in detecting diabetic peripheral neuropathy. Loss of 10-g monofilament perception and reduced vibration perception predict heightened risk for foot ulcers.[5]

There are several neuropathy scoring systems (Diabetic Neuropathy Symptom Score, Neuropathy Impairment Score and Michigan Neuropathy Screening Instrument) that may be used with examination to confirm diagnosis and assess severity.[6-8]

Motor neuropathy sometimes occurs, with muscle wasting, weakness and abnormalities of gait. This can contribute to foot problems by altering the biomechanics of the ankle and foot.

Cardiovascular autonomic neuropathy should be suspected with resting tachycardia (>100 bpm) or orthostatic reduction in blood pressure (a fall in systolic blood pressure >20 mmHg on standing without an appropriate heart rate response). This applies to people not currently on antihypertensive agents such as beta-blockers. It is associated with increased cardiac event rates.

Box 1. Assessments for peripheral neuropathy[5]

- Small fibre:
  - pinprick sensation
- Large fibre:
  - vibration perception (using a 128-Hz tuning fork)
  - 10-g monofilament pressure sensation at the distal plantar aspect of both great toes and metatarsal joints
  - assessment of ankle reflexes
  - loss of protective sensation (10-g monofilament)

Management

Management mainly involves professional assessment and foot care to prevent diabetes-associated foot disease. The appearance of peripheral neuropathy should prompt a review of glycaemic management and consideration of intensified management to prevent progression.[2] See the Table of recommendations for pharmacotherapy management. Consider topical capsaicin topically when oral pharmacotherapy is not tolerated or contraindicated.

The pain of peripheral neuropathy can be assessed using the DN4 neuropathy score (https://aci.health.nsw.gov.au/__data/assets/pdf_file/0014/212900/DN4_Assessment_Tool.pdf) and can be difficult to manage, although there is evidence that several agents can improve symptom control and quality of life.[2] Options for pain management therapy are in the Table of recommendations.

Autonomic neuropathy may require involvement of a specialist multidisciplinary team approach to address each individual's presentation (eg gastroenterology with gastroparesis).

For information about the Foot Forward program to prevent amputation, contact Diabetes Australia (http://www.diabetesaustralia.com.au/) .

Resources

Foot disease resources for people with diabetes:

- Low risk (https://www.ndss.com.au/wp-content/uploads/information-prescriptions-feet-low-fillable.pdf)
- Moderate or high risk (https://www.ndss.com.au/wp-content/uploads/information-prescriptions-feet-mod-high-fillable.pdf)

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Diabetes-related eye disease

Complications | **Diabetes-related eye disease**

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Individuals with type 2 diabetes should be screened and evaluated for retinopathy by an optometrist or ophthalmologist at the time of diagnosis.	B	1	14/11/2024
Follow-up screening interval for people with retinopathy should be tailored to the severity of retinopathy.	B	1	14/11/2024
The recommended interval for those with no or minimal retinopathy is 1–2 years.	B	1	14/11/2024
Examine higher-risk patients who do not have diabetic retinopathy (DR) at least annually (high risk defined as: longer duration of diabetes; suboptimal glycaemic management, blood pressure or blood lipid control; people from cross-cultural and linguistically diverse background).	Consensus	2	14/11/2024
Conduct annual DR screening for Aboriginal or Torres Strait Islander people with diabetes.	Consensus	2	14/11/2024

To delay onset and progression of DR, people with type 2 diabetes should be offered pharmacologic and non-pharmacological management options to achieve optimal control* of: • blood glucose • blood pressure • lipid levels. *management	A	[1]	14/11/2024
Fenofibrate, in addition to statin therapy, may be used in people with type 2 diabetes to slow the progression of established retinopathy.	A, Level 1A	[3]	14/11/2024
Promptly refer* individuals with any level of diabetic macular oedema, moderate or worse non-proliferative DR (a precursor of proliferative diabetic retinopathy [PDR]), or any PDR to an ophthalmologist who is knowledgeable and experienced in the management of DR. *Refer to Clinical context for timing of referral.	A	[1]	14/11/2024
Counsel individuals of childbearing potential with type 2 diabetes who are planning pregnancy or who are pregnant on the risk of development and/or progression of DR.	B	[1]	14/11/2024
Individuals with type 2 diabetes should receive an eye exam before pregnancy and in the first trimester and should be monitored every trimester and for one year postpartum as indicated by the degree of retinopathy*. *Back to the usual timeframes for the general population.	B	[1]	14/11/2024

Diabetes-related retinopathy

Clinical context

Diabetes-related retinopathy (DR) occurs as a result of microvascular disease of the retina. It affects up to one in three people with diabetes, and can cause visual impairment and blindness.[4] DR also impairs quality of life and the ability to manage diabetes.[5]

Three distinct forms of DR are:

- macular oedema, which includes diffuse or focal vascular leakage within the macula
- DR caused by microvascular changes:
    - non-proliferative DR (NPDR), which includes microaneurysms, intra-retinal haemorrhage, malformation and torturous vessels; may be asymptomatic
    - PDR, which involves abnormal vessel growth on the optic disc or retina.

Sight-threatening DR includes:

- severe NPDR
- PDR
- foveal-threatening diabetic macular oedema.

NPDR affects 19.3% of people with diabetes, whereas 2.1% of people with diabetes may have PDR and 3.3% may have macular oedema.[6] PDR and macular oedema are associated with an elevated risk of cardiovascular disease.[7]

In practice

Risk factors for the onset or progression of DR include:

- existing DR
- poor glycaemic management
- raised blood pressure
- duration of diabetes >10 years (DR may be present at the time of diagnosis of type 2 diabetes)
- microalbuminuria
- dyslipidaemia
- anaemia
- pregnancy.

Visual impairment due to diabetes can be avoided for the vast majority of people through recommended screening and the management of risk factors. This involves regular review of fundi, early detection and optimisation of therapy. DR may progress to advanced stages without affecting vision, hence the importance of regular DR screening examinations. A meta-analysis has suggested some increased risk of DR with the use of sulfonylureas.[8]

Monitoring for diabetic eye disease involves assessment of:

- changes in visual acuity (with correction)
- lens disease (eg cataracts; see below)
- fundal disease (eg fundoscopy with dilation or retinal camera, or refer to an optometrist or ophthalmologist).

Screening methods and intervals for retinopathy are presented in Box 1.

Consider the timing of referral to an ophthalmologist; for instance, non-centre-involving macular oedema and moderate NPDR are less urgent (within 12 weeks) than PDR (within 1 week).

Strategies for delaying the onset and progression of DR include:

- Lifestyle advice to optimise healthy nutrition and activity levels[9]
- optimising blood glucose[10-12]

Refer to the section 'Glucose monitoring (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/glucose-monitoring)' for suggested glycated haemoglobin (HbA1c) targets. Note that intensive glucose management in people with DR that is more severe than moderate NPDR on the International Clinical Diabetic Retinopathy Disease Severity Scale may not be beneficial.[13,14] Rapid and marked reductions in HbA1c as a result of improved glycaemic management initiated during pregnancy, bariatric surgery or intensified insulin treatment have previously been associated with transitory worsening of DR and should be avoided. Eye examinations should occur at shorter intervals.

- managing blood pressure[15]
- adding fenofibrate

Indicated for the reduction of DR progression in people with type 2 diabetes who have existing DR. Fenofibrate does not replace managing blood pressure, blood glucose and blood lipids as strategies to delay the progression of DR.[16,17]

- ophthalmological specialist care:
    - laser therapy
    - intraocular anti-vascular endothelial growth factor (VEGF) agents (for further information, refer to the Pharmaceutical Benefits Scheme)
    - vitreoretinal surgery.

KeepSight (https://www.keepsight.org.au/), managed by Diabetes Australia, is a free online reminder system for people with diabetes about their next diabetes eye examination.

The National Diabetes Services Scheme (NDSS) and Diabetes Australia send alerts and reminders to people with diabetes registered on the NDSS to have their eyes checked.

A report on diabetes-related eye disease, titled 'Out of sight' has been published.[6]

The article by Yuen et al includes clinical references to support person centred care in diabetes associated eye disease.[9]

Box 1. Screening for retinopathy in type 2 diabetes

When to initiate screening[1]

- At diagnosis (non-pregnant with type 2 diabetes)
    - Educate people with diabetes about the link to sight-threatening eye disease, highlighting the importance of regular eye screening to protect their vision.
- At diagnosis (pregnancy with diabetes)
    - Examination in first trimester. Routine referral to ophthalmologist. Pregnant women who develop gestational diabetes do not require screening for diabetic retinopathy[2]

Screening methods[1]

- Visual acuity should be tested for each eye in turn (with occlusion of the fellow eye)
- Retinal photography, with or without pupil dilation (mydriasis), with disc-centred and macular-centred images of both eyes, with interpretation by a trained reader
- Direct ophthalmoscopy or indirect slit-lamp fundoscopy through dilated pupil, performed by an examiner proficient in the use of these methods

Research on the optimal number of fields to be photographed is still unclear

If retinopathy is present[1,3]

- Grade retinopathy severity, refer to ophthalmologist as appropriate and establish appropriate monitoring intervals (≤1 year)
- Sight-threatening retinopathy may be treated with laser, pharmacological or surgical therapy by an ophthalmologist*
- Review glycaemic, blood pressure and lipid management, and adjust therapy to reach targets as per guidelines
- Screen for other diabetes complications, especially cardiovascular disease, including peripheral arterial disease and chronic kidney disease

If retinopathy is not present

- Rescreen every year:[2]
    - people with duration of diabetes >15 years
    - suboptimal glycaemic management (HbA1c >8% or 64 mmol/mol)
    - systemic disease (poorly managed hypertension, lipids; other diabetes complications; foot ulcers)
    - Aboriginal and Torres Strait Islander people
    - people from a non-English-speaking background
- Uncertainties over the presence of retinopathy or maculopathy (eg unclear retinal

photographs) may warrant referral to an ophthalmologist.
- Rescreen every two years:[2]
    - all other people with type 2 diabetes
- Review glycaemic, blood pressure and lipid management, and adjust therapy to reach targets as per guidelines
- Screen for other diabetes complications

For more information, refer to The Royal Australian and New Zealand College of Ophthalmologists (RANZCO) screening and referral algorithm for diabetic retinopathy (https://ranzco.edu/wp-content/uploads/2018/11/RANZCO-Referral-pathway-for-DR-2016.pdf) .[2]

*Treatment options include fenofibrate, laser therapy, intra-ocular anti-VEGF agents and vitreoretinal surgery. Evidence highlights the importance of regular, life-long participation in retinopathy screening.

Role of retinal photography

Retinal photography is technically simple and is now usually performed within the Australian community by general practitioners, optometrists and ophthalmologists. Training is required to ensure quality of image interpretation.

Some Aboriginal Community Controlled Health Services are providing their own retinal photography services with support through telemedicine to promote access to screening.

People whose retinal images suggest they may be at increased risk of having, or at some point developing, sight-threatening retinopathy should be referred for assessment by an ophthalmologist.

Retinal photography may serve as a screening tool for retinopathy; however, it is not a substitute for a comprehensive eye exam.[5]

Note, a Medicare Benefits Schedule item number (http://www9.health.gov.au/mbs/fullDisplay.cfm?type=item&qt=ItemID&q=12326) for retinal photography with a non-mydriatic retinal camera is available for general practice use.

Other ophthalmological effects

Refractive errors

Refractive errors occur as the lens shape alters with changes in blood glucose concentrations and results in blurred vision. Correction of refractive errors should be postponed until blood glucose levels are stabilised. Detection is done with a pinhole test; blurred vision due purely to refractive error corrects with the pinhole test.

Cataracts

Cataracts occur prematurely in people with diabetes. People with cataracts may present with blurred vision and glare intolerance, and may find night vision a particular problem. Over time, interpretation of colours becomes more difficult.

Clinically, the light reflex is reduced, and the fundus may be difficult to see.

Surgical treatment is recommended when reduced acuity is affecting lifestyle and independence.

Maculopathy

Macular oedema is difficult for the non-expert to detect via ophthalmoscopy. Any unexplained vision loss in a person with diabetes should warrant prompt review by an optometrist or ophthalmologist.

Glaucoma

The incidence of glaucoma in people with diabetes is approximately twice that of the general population. All people with type 2 diabetes should be monitored for glaucoma by an optometrist or an ophthalmologist.[18]

Ischaemic optic neuropathy

Ischaemic optic neuropathy is a cause of sudden vision loss and has a poor prognosis for sight.

Sudden blindness

Sudden loss of vision is an emergency and may be caused by:

- central retinal artery occlusion
- retinal detachment
- vitreous haemorrhage.

These conditions can occur independently of diabetes. Urgent contact with an ophthalmologist or timely assessment by a specialist team is indicated.

Semaglutide has been associated with an increased risk of non-arteritic anterior ischemic optic neuropathy in an observational study. These conditions can occur independently of diabetes. Urgent contact with an ophthalmologist or timely assessment by a specialist team would be indicated.[19]

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Diabetes-related foot care

Complications | **Diabetes-related foot care**

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Assess all people with diabetes and stratify their risk by enquiring about previous foot ulceration and amputation, visually inspecting the feet for structural abnormalities and ulceration, assessing for neuropathy using either the Neuropathy Disability Score or a 10-g monofilament, and palpating foot.	C	1,2	14/11/2024
In people stratified as having low-risk feet (where no risk factors or previous foot complications have been identified), foot examination should occur annually.	Consensus	1	14/11/2024
Repeat screening once every 6–12 months for those classified as International Working Group on the Diabetic Foot (IWGDF) risk 1 , once every 3–6 months for those classified as IWGDF risk 2 and once every 1–3 months for those classified as IWGDF risk 3 .	Strong; low	2	14/11/2024
Pressure reduction, otherwise referred to as ‘redistribution of pressure’ or ‘off-loading’, is required to optimise the healing of plantar foot ulcers.	B	1	14/11/2024

People with diabetes-related foot ulceration are best managed by a multidisciplinary foot care team.	C	[1]	14/11/2024
Dressings should be selected principally on the basis of exudate control, comfort and cost.	Strong; low	[2]	14/11/2024
Non-viable tissue should be debrided.	A, Level 1	[3]	14/11/2024

Clinical context

Diabetes foot care prevention includes examining and inspecting the feet, providing individualised education about self-management for foot care and instructions on the need for early assessment for any concerning signs of risk such as injury or deformity.

People assessed as having intermediate-risk or high-risk feet should be offered a foot protection program. A foot protection program that includes prevention, foot care education, multidisciplinary care[4] and close monitoring and treatment of foot ulcers can substantially reduce amputation rates. This includes podiatry review and appropriate footwear.

Foot ulceration and limb amputation are among the major drivers of disability and healthcare costs in people with diabetes. Foot ulceration as a lifetime risk in diabetes is estimated to be 19–34%.[5] In Australia, 12,500 people have had a diabetes-related amputation and 12 people each day may undergo a diabetes-related amputation.[6]

For information about the Foot Forward program to prevent amputation, contact Diabetes Australia (http://www.diabetesaustralia.com.au/) .

In practice

Patient education and support

Foot care education should be provided to all people with diabetes to assist with the prevention of foot complications.

Patient education and support regarding foot care should include:

- emphasising the importance of appropriate footwear and foot care (improper footwear and tinea infection are associated with increased problems)
- establishing a regular self-monitoring schedule (including visual checks)
- developing an action plan to respond to early problems (eg skin breakdown).

Assessing the risk of foot complications

A comprehensive Diabetes and feet (https://www.ndss.com.au/wp-content/uploads/diabetes-and-feet-toolkit.pdf) toolkit, published by the National Diabetes Services Scheme, is available to guide the careful assessment, prevention and management of diabetes-related foot complications.[7]

A careful foot assessment should be performed to stratify the risk of developing foot complications. Stratification is dependent on four risk factors:[1]

- peripheral arterial disease (PAD), which can be assessed by dorsalis pedis and tibialis anterior pulses or hand-held Doppler; if problems are suspected, consider ankle–brachial pressure index (ABI) testing, toe–brachial index (TBI) testing or absolute toe pressure, with an understanding of the clinical limitations of each method
- peripheral neuropathy, which can be assessed using the neuropathy disability score or a 10-g monofilament
- deformities
- previous amputation or ulceration.

The following factors might also increase the risk of foot complications:[1]

- visual impairment
- kidney disease
- suboptimal glucose management
- ill-fitting footwear
- socioeconomic disadvantage.

To determine foot screening requirements, refer to the International Working Group on the Diabetic Foot (IWGDF) risk stratification system (https://diabetesfeetaustralia.stonly.com/kb/guide/en/prevention-interactive-pathway-xDFlakvpui/Steps/1889845,1862353,1862356,1889846,1862355,1889852) in the 2021 Australian guidelines for diabetes-related foot disease.[2] (The stratification system refers to the loss of peripheral sensation [LOPS] and peripheral artery disease [PAD].) People at intermediate and high risk should be assessed by a diabetic high-risk foot service. The intensity of monitoring and review increases according to the level of risk.

For practice-based tools to assess circulation and foot deformity, refer to 'Complications: Diabetes-related neuropathy (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/diabetes-related-neuropathy) '.

Indications for immediate referral to a multidisciplinary foot care clinic include active foot disease, such as:

- foot ulcer, with or without local Infection
- suspected Charcot neuroarthropathy (eg unilateral, red, hot, swollen, possibly aching foot).

Any patients presenting with acute limb ischaemia should be referred immediately to an emergency department.

Patients with chronic limb-threatening ischaemia require urgent referral to a vascular specialist/surgeon. Look for the 5P's: acute onset of progressive pain in the affected limb (pain), pulselessness, pallor, paraesthesia and paralysis.[7]

Foot ulceration

A foot ulcer is a serious condition and needs to be managed immediately.

Assessment

Several wound classifications have been developed to provide objective assessment of the severity of foot ulcers.

- The IWGDF guidelines recommend using IWGDF/Infectious Diseases Society of America (IDSA) classification criteria to assess infection severity.[9]
- The Wound, Ischaemia, foot Infection (WIfI) system is recommended for use in people with PAD to stratify amputation risk and revascularisation benefit.[9]
- The Site, Ischaemia, Neuropathy, Bacterial infection, Area, Depth (SINBAD) system is recommended for communication between health professionals (Table 1).[10]

If arterial insufficiency is suspected, assessment and management of the peripheral vasculature is mandatory before debridement.

Referral to a vascular surgeon, high-risk foot clinic and/or multidisciplinary team is suggested in this situation.

Table 1. The SINBAD wound classification system[10]

Clinical domain	Condition	Score*
Site	Forefoot	0
	Mid-foot/hind foot	1
Ischaemia	Pedal blood flow intact (at least one pulse palpable)	0
	Clinical evidence of reduced pedal blood flow	1
Neuropathy	Protective sensation intact	0

	Protective sensation lost	1
Bacterial infection	None present	0
	Present	1
Area	Ulcer <1 cm2	0
	Ulcer ≥1 cm2	1
Depth	Ulcer confined to the skin and subcutaneous tissue	0
	Ulcer reaching the muscle, tendon or deeper	1
*The highest total possible score is 6. Scores >3 are considered elevated risk.[10]		

Wound management

A patient's ability to understand and undertake management should always be a factor in choosing a treatment and in counselling the patient regarding the treatment plan.

The general principles of wound care include the provision of a physiologically moist wound environment and off-loading the ulcer. Off-loading of the wound can be achieved with the use of a total contact cast or other irremovable devices.[12]

Debridement

Local sharp debridement of non-ischaemic wounds improves healing and should be performed by a suitably qualified health professional.

The priority of debriding wound tissue is to prepare the surface and edges of a wound to facilitate healing. Debridement also reduces pressure on the wound, allows for full inspection of tissue underneath the debrided tissue and helps drain secretions or pus.[13]

Wound dressings

Dressings should be selected principally on the basis of exudate control, comfort and cost, and therefore be tailored to the specific characteristics of the wound.

- In non-ischaemic ulcers, create a moist wound environment.
- Appropriate management of wound exudate levels should be a guiding principle in dressing selection and the frequency of dressing change.
- In ischaemic ulcers, maintain a dry wound environment using a dry, non-adherent dressing until someone with experience in PAD has reviewed the wound.

A full list of considerations for dressing choice can be found on page 50 of the Diabetes and feet (https://www.ndss.com.au/wp-content/uploads/diabetes-and-feet-toolkit.pdf) toolkit.[6]

Off-loading devices

Ongoing weight bearing on an insensate foot causes continued trauma and results in poor wound healing.

Pressure on the wound should be off-loaded, using padding or other off-loading devices, such as total contact casts and removable prefabricated devices (eg controlled ankle movement walkers, half-shoes, therapeutic shoes).

Ulcers are often caused by patients' footwear; if this is the case, advise the patient not to continue wearing the same shoes.

Guidelines on footwear for people with diabetes can be found in the Diabetes and feet (https://www.ndss.com.au/wp-content/uploads/diabetes-and-feet-toolkit.pdf) toolkit and in an article by van Netten et al (https://jfootankleres.biomedcentral.com/articles/10.1186/s13047-017-0244-z) .[14]

Infection

The need for antibiotics should be determined on clinical grounds and appropriate choices based on what is appropriate for the patient.

It is appropriate for cultures to be collected for identification of microbiological organisms and antibiotic sensitivities. The most appropriate tissue samples for microbiological evaluation are either deep tissue swabs after debridement or tissue/bone biopsies.

There is no need to culture clinically uninfected ulcers, because colonising organisms will always be detected.

Infected ulcers should be treated with antimicrobial therapy according to published antibiotic guidelines (https://tgldcdp.tg.org.au/guideLine?guidelinePage=Antibiotic&frompage=etgcomplete) .

The duration of therapy may need to be for extended periods.

It is not recommended to use topical antibiotic therapy to treat mild diabetes wound infections.[6]

Resources

- The National Diabetes Services Scheme has resources (https://www.ndss.com.au/about-diabetes/resources/find-a-resource/diabetes-and-feet-toolkit/) for health professionals and people

with diabetes.

- Diabetes Feet Australia: 2021 Evidence-based Australian guidelines for diabetes-related foot disease (https://www.diabetesfeetaustralia.org/new-guidelines/)

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Diabetes-related chronic kidney disease

Complications | **Diabetes-related chronic kidney disease**

Table of recommendations

Recommendation	Grade	References	Recommended as of:
At least once a year, assess urine albumin to creatinine ratio (uACR) and estimated glomerular filtration rate (eGFR) in all patients with type 2 diabetes, regardless of treatment.	B	1	14/11/2024
To prevent the onset and delay the progression of chronic kidney disease (CKD), people with diabetes should be treated to optimise blood glucose levels and blood pressure.	A, Level 1A	2	14/11/2024
Treatment for hypertension should include drug classes demonstrated to reduce cardiovascular events in people with diabetes. Angiotensin-converting enzyme inhibitors (ACEi) or (ARBs) angiotensin receptor blockers (ARBs) are recommended first-line therapy for hypertension in people with diabetes and coronary artery disease.	A A	3	14/11/2024
Multiple-drug therapy is generally required to achieve blood pressure targets. However, combinations of ACEi and ARBs and combinations of ACEi or ARBs with direct renin inhibitors should not be used.	A	3	14/11/2024

We recommend that treatment with an ACEi or an ARB be initiated in patients with diabetes, hypertension and albuminuria, and that these medications be titrated to the highest approved dose that is tolerated.	1B	2	14/11/2024
We recommend the addition of a sodium-glucose cotransporter 2 inhibitor (SGLT2i) to other glucose-lowering medication(s) in adults with type 2 diabetes who also have kidney disease. We recommend a glucagon-like peptide-1 (GLP-1) receptor agonist if the patient is unable to be prescribed an SGLT2i due to either intolerance or contraindication. The evidence base for this recommendation includes studies on people with kidney disease who had an eGFR of 30 mL/min/1.73 m2 of body surface area or higher, although a few studies included participants with lower eGFR.	Recommended	4	14/11/2024
For people with type 2 diabetes and chronic kidney disease CKD with albuminuria treated with maximum tolerated doses of ACEi or ARB, addition of finerenone is recommended to improve cardiovascular outcomes and reduce the risk of chronic kidney diseaseCKD progression.	A	3	14/11/2024
For people with type 2 diabetes and diabetic kidney disease CKD, use of an SGLT2i is recommended to reduce CKD progression and cardiovascular events in patients individuals with eGFR ≥20 mL/min/1.73 m2 and urinary albumin ≥200 mg/g creatinine.	A	1	14/11/2024
For people with type 2 diabetes and diabetic kidney diseaseCKD, use of an SGLT2i is recommended to reduce CKD progression and cardiovascular events in individuals with eGFR ≥20 mL/min/1.73 m2 and urinary albumin ranging from normal to 200 mg/g creatinine.	B	1	14/11/2024

For cardiovascular risk reduction in people with type 2 diabetes and diabetic kidney disease CKD, consider use of an SGLT2i (if eGFR is ≥20 mL/min/1.73 m2), a GLP-1 agonist or a non-steroidal mineralocorticoid receptor antagonist (if eGFR is ≥25 mL/min/1.73 m2).	A	[1]	14/11/2024

Clinical context

Kidney disease associated with diabetes is the single leading cause of kidney failure.[5]

CKD occurs in one in four women with type 2 diabetes and in one in five men with type 2 diabetes,[6] and is more common in Aboriginal and Torres Strait Islander people.[7]

Some non-European groups (eg South-east Asian, African American, Afro-Caribbean, Māori peoples) have high rates of end-stage diabetic nephropathy, possibly, but not entirely, due to later or delayed diagnosis and suboptimal care.[8]

There is strong evidence that treatment in the early stages of CKD reduces the progression of kidney damage, morbidity and mortality. Therefore, people with type 2 diabetes should be screened and retested regularly to detect early indications of kidney damage and to monitor the effects of treatment. Detection of CKD involves a 'kidney health check', which comprises of blood pressure measurement, blood measurement of eGFR plus uACR. This check should be done annually in people with diabetes or hypertension or in Aboriginal and Torres Strait Islander peoples aged over 18 years.[9] (Refer to the National Aboriginal Community Controlled Health Organisation (NACCHO) and The Royal Australian College of General Practitioners (RACGP) National guide to preventive healthcare for Aboriginal and Torres Strait Islander people (https://www.racgp.org.au/national-guide) .)

Diagnosis of the cause of the CKD is important because people with diabetes may have additional or alternative causes of renal impairment.

Systolic blood pressure appears to be the best indicator of the risk of CKD in people with type 2 diabetes. However, the optimal and safest lower limit of systolic blood pressure has not been clearly defined and recommendations vary in current guidelines. Kidney Health Australia currently recommends a blood pressure consistently below 130/80 mmHg as a goal for all people with CKD, whereas the Heart Foundation recommends a target below <140/90 mmHg with a systolic blood pressure of <120 mmHg in some patients.[9,10]

For appropriate individual targets for blood pressure, refer to 'Type 2 diabetes and cardiovascular risk (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/type-2-diabetes-and-cardiovascular-risk) ' and 'Type 2 diabetes: Goals for optimum management (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/type-2-diabetes-goals-for-optimum-management) '.

Independent of diabetes, proteinuria and reduced eGFR have been associated with an increased risk of major cardiovascular disease; the additional presence of type 2 diabetes increases this risk 2.4- to 4.6-fold compared with people without diabetes.[11]

In practice

CKD is largely asymptomatic until advanced CKD occurs, so early assessment and diagnosis are critical before the severity of disease is advanced, diagnosed by the persistent presence of elevated urine albumin excretion, low eGFR or other manifestations of kidney damage. Screening for CKD can be performed by the following two laboratory tests:

- early morning or spot urine uACR)
- eGFR (in Australia, eGFR is now automatically calculated from measurement of serum creatinine).

Any positive uACR needs to be confirmed with a repeated collection performed within three months to ascertain persistent abnormality. Contributors to transient albuminuria should be considered; for example:[12]

- urinary tract infection
- decompensated congestive heart failure
- menstruation
- acute severe elevation in blood glucose or blood pressure
- recent major exercise
- febrile illness.

Figure 1 provides an algorithm for the initial detection and diagnosis of CKD.

Algorithm for initial detection and diagnosis of CKD

Offer a Kidney Health Check to people with

- Diabetes
- Hypertension
- Established CVD
- Family history of kidney failure
- Obesity (BMI ≥30)
- Current or past smoker/ vaper
- History of AKI
- First Nations Australians aged ≥18 years
- All Australians aged ≥60 years

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Repeat Kidney Health Check in 1-2 years (annually in First Nations Australians aged 2'18, people with diabetes or hypertension)

Repeat uACR within 3 months. If uACR normal, complete a third test (preferably first morning void)

Repeat eGFR within 7 days

Repeat eGFR within 3 months

If 2'20% reduction in eGFR, possible AKI. Discuss with nephrologist

If minimum of two uACRs ≥3 mg/mmol over 3 months

If minimum of two eGFRs <60 ml/min/1.73m² over 3 months

Stage CKD with staging table, using eGFR and uACR test results

Albuminuria Stage

Kidney Function Stage	GFR (ml/min/1.73m²)	Normal (A1) uACR <3.0 mg/mmol	Microalbuminuria (A2) uACR 3.0-30 mg/mmol	Macroalbuminuria (A3) uACR >30 mg/mmol
	2'90	**Not CKD** unless **haematuria, structural or pathological abnormalities present**		
2	60-89			
3a	45-59			
3b	30-44			
4	15-29			
5	<15 or on dialysis			

Undertake investigations to determine underlying diagnosis

Fully specify CKD diagnosis, e.g CKD stage 2 with microalbuminuria (A2) in the presence of type 2 diabetes

Refer to the colour-coded clinical action plans for CKD management strategies:

Yellow clinical action plan • **Orange clinical action plan** • **Red clinical action plan**

See colour coded clinical action plans pages 26-28 in the CKD handbook

kidney'..org.au/ckdhandbook

Chronic Kidney Disease (CKD) Management in Primary Care 5th edition, Kidney Health Australia, Melbourne VIC, 2024

Figure 1. Algorithm for initial detection and diagnosis of chronic kidney disease (CKD).[9]

Type 2 diabetes and CKD

The baseline approach to managing CKD in people with type 2 diabetes is as follows:

- exclude treatable causes of kidney disease, such as glomerulonephritis, renal artery stenosis, obstructive nephropathy and acute kidney injury due to dehydration
- perform CVD risk assessment (refer to 'Type 2 diabetes and cardiovascular risk (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/type-2-diabetes-and-cardiovascular-risk) ')
- regularly review the choice and dose of medications in order to achieve optimal blood pressure and glycaemic management
- support lifestyle management in addition to pharmacological management
- advise on smoking cessation, limiting salt intake, moderate alcohol consumption and weight management
- pharmacological therapies include:
    - the use of an ACEi or ARB to the maximally tolerated dose, which, in addition to addressing hypertension, may also assist albuminuric CKD
    - SGLT2i should be considered according to CKD stage, and a dip in eGFR may occur on initiation, but this stabilises in most patients
    - the use of a non-steroidal mineralocorticoid receptor antagonist (currently finerenone is available; careful selection in individual patients and the risks of hyperkalaemia may need to be managed with this agent)
    - lipid-lowering combinations such as statins and ezetimibe need to be considered to address cardiovascular risks
    - the use of GLP-1 receptor agonists (GLP-1RAs) with evidence of renal benefits may be appropriate in individual patients, noting current Therapeutic Goods Administration indications and Pharmaceutical Benefits Scheme restrictions
    - avoid the 'triple whammy' (refer below)
- maintain up-to-date immunisations
- provide adults with diabetes and CKD a 'sick-day' medication list that outlines which medications should be withheld during times of acute illness.[12]

Detailed consideration regarding diabetes medications are as follows.

- **Metformin**: use with caution as eGFR decreases. Dose reduction is needed for eGFR 30–60 mL/min/1.73 m2. Metformin should be ceased if eGFR falls below 30 mL/min/1.73 m2 due to a risk of lactic acidosis.
- **Dipeptidyl peptidase-4 inhibitors**:[13] no dose adjustment required for linagliptin in renal impairment due to hepatic metabolism. Reductions in doses of alogliptin, saxagliptin, sitagliptin and vildagliptin are required in patients with eGFR <60 mL/min/1.73 m2 due to pharmacological accumulation without toxicity. Saxagliptin is not recommended in patients with eGFR <15 mL/min/1.73 m2, whereas the other drugs may be used with appropriate dose adjustment.[14]
- **Sulfonylureas**:[13] dose review is required because CKD increases the risk of hypoglycaemia.
- **SGLT2i**:[15,16] these require adequate glomerular filtration for glycaemic-lowering efficacy.

Dapagliflozin and empagliflozin may be used for glycaemic management, but if eGFR <45 mL/min/1.73 m2 in the case of dapagliflozin and <30 mL/min/1.73 m2 in the case of empagliflozin, then additional therapeutic options may need to be considered. However, non-glycaemic effects in reducing the progression of microalbuminuria and macroalbuminuria, as well as the progression of renal disease and end-stage renal disease, have been demonstrated in recent trials down to an eGFR of 25 mL/min/1.73 m2 for dapagliflozin and 20 mL/min/1.73 m2 for empagliflozin[17]

- **Acarbose**:[13] avoid if the creatinine clearance rate is <25 mL/min.
- **Glitazones**: dose adjustment in patients with CKD is not needed.[13] Glitazones should not be used in people on dialysis, because safety in this patient group has not been established.
- **GLP-1RAs**: GLP-1RAs have been shown to improve albuminuria, and semaglutide has demonstrated a positive effect on a composite of kidney and cardiovascular outcomes in albuminuric kidney disease.[18] There is limited experience in the use of dulaglutide and semaglutide in people with end-stage renal disease.[17,19]
- **Insulin**: regular review of dose is indicated, because CKD increases the risks of hypoglycaemia.
- Any potentially nephrotoxic medications, such as non-steroidal anti-inflammatory drugs (NSAIDs), should be avoided.
- Avoid the 'triple whammy', which refers to acute nephrotoxicity when people are exposed to the combination of NSAIDs, diuretics and ACEi/ARBs.[20]

Consider referral of people to specialist renal care if they fulfil the criteria in Box 1. Referral to other members of a multidisciplinary team, such as an accredited practising dietitian or a credentialled diabetes educator, may also assist with management and appropriate renal dietary recommendations.

Box 1. Referral criteria for specialist renal care[9]

- Estimated glomerular filtration rate (eGFR) <30 mL/min/1.73 m2
- Stage 4 or 5 chronic kidney disease (CKD) of any cause
- Persistent significant albuminuria ≥30 mg/mmol
- Sustained decrease in eGFR of ≥25% or
- Sustained decrease in eGFR of 15 mL/min/1.73 m2 within 12 months
- CKD with hypertension despite at least three antihypertensive agents

Resources

Resources for general practitioners

- The Kidney Failure Risk Equation (https://kidneyfailurerisk.com/#assessment)
- KDIGO (https://www.theisn.org/wp-content/uploads/2023/02/KDIGO-CKD-EARLY-IDENT-INFOGRAPHIC.pdf)
- Kidney Health Australia Chronic kidney disease (CKD) management in primary care handbook (5th edition) (https://kidney.org.au/health-professionals/ckd-management-handbook)

- Kidney Health Australia patient resources (https://kidney.org.au/resources)
- Kidney Health Australia resources for Aboriginal and Torres Strait Islander People (https://kidney.org.au/your-kidneys/first-nations-australians)
- CARI Guidelines (https://www.cariguidelines.org/)

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Managing glycaemic emergencies

Managing glycaemic emergencies: Hypoglycaemia and hyperglycaemia

Hypoglycaemia- and hyperglycaemia-related emergency presentations such as diabetic ketoacidosis (DKA) and hyperglycaemic hyperosmolar states (HHS) form the basis of this section. For more information, refer to '[Appendix 3: Detailed information on glycaemic emergencies (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/appendices/appendix-3-detailed-information-on-glycaemic-emerg)]' .

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Individuals treated with combinations utilising insulin or sulfonylureas should be asked about symptomatic and asymptomatic hypoglycaemia at each encounter.	C	1	14/11/2024
Glycaemic goals for some older adults might reasonably be relaxed as part of individualised care, but hyperglycaemia leading to symptoms or risk of acute hyperglycaemia complications should be avoided in all people with diabetes.	C	1	14/11/2024

Clinical context

Very high and low glycaemic states can occur in people with type 2 diabetes. Both have significant impacts and implications. People with type 2 diabetes should be well educated and an active management plan should be developed about both states.

Hypoglycaemia

Hypoglycaemia is defined as a blood glucose level (BGL) ≤3.9 mmol/L and/or to a level that causes neurogenic and neuroglycopenic symptoms and signs.[2,3] Rarely, a person who has normal BGLs can exhibit symptoms (known as 'pseudo-hypoglycaemia'); this might occur, for example, when someone has experienced persistent, prolonged hyperglycaemia (defined below) and the elevated glucose levels have become normalised.[4,5]

Hypoglycaemia in people with type 2 diabetes is common,[5] and its impact must not be underestimated, particularly in people where the morbidity of hypoglycaemia poses particular problems and symptoms may be unrecognised. People at higher risk include older people, people with renal impairment, people with poor cognitive function and those with low health literacy.[1,6]

Symptoms of hypoglycaemia vary between people and include:

- adrenaline activation symptoms, including pale skin, sweating, shaking, palpitations and a feeling of anxiety or dizziness
- neuroglycopenic symptoms, including hunger, a change in intellectual processing, confusion and changes in behaviour (eg irritability), paraesthesia, then coma and seizures.

Hypoglycaemia is more common in people taking insulin, alone or in combination with other glucose-lowering medications; it can also occur with sulfonylurea therapy. Other causative factors are insufficient carbohydrate intake, renal impairment, excessive alcohol ingestion and a change in physical activity.

Asymptomatic hypoglycaemia (or biochemical hypoglycaemia) occurs when a person's BGLs are low (≤3.9 mmol/L), but the typical symptoms of hypoglycaemia are not present.[4] There are assessment tools for hypoglycaemic unawareness, such as the Clark hypoglycaemia awareness survey (https://austroads.com.au/publications/assessing-fitness-to-drive/ap-g56/diabetes-mellitus/general-assessment-and-management-guidelines#aftd-b-figure-9) , where more than 4 'R' response indicates unawareness.[7]

Severe hypoglycaemia is defined as signs of hypoglycaemia whereby the person is functionally impaired and requires the assistance of another person to actively administer corrective action, such as carbohydrate, and/or glucagon and glucose infusion. A BGL <3.0 mmol/L may carry a risk of severe hypoglycaemia.[4] Severe hypoglycaemia carries specific risks, such as driving restrictions, and requires planning for prevention of any recurrence.

Impaired hypoglycaemia awareness occurs where the pathophysiological symptoms that arise in response to mild or severe hypoglycaemia (refer to Appendix 3 (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/appendices/appendix-3-detailed-information-on-glycaemic-emerg)) are reduced or absent and the person loses the ability to detect the early symptoms of hypoglycaemia. In such cases, symptoms may be recognised by other family members and carers before they are recognised by the person, and the person is more likely to have episodes of severe hypoglycaemia.

The development of impaired hypoglycaemia awareness is associated with recurrent episodes of hypoglycaemia and a longer duration of type 2 diabetes. People with impaired hypoglycaemia awareness may benefit from options such as review of pharmacological and hypoglycaemia management, and continuous or ambulatory glucose monitoring, because this condition may be reversible.

Hyperglycaemia

Hyperglycaemic states include emergencies such as undiagnosed type 1 diabetes, HHS (formerly known as hyperosmolar non-ketotic coma [HONC]) and diabetic ketoacidosis (DKA) or euglycaemic ketoacidosis (in which blood glucose elevation may not be extreme but ketosis is present) when using sodium–glucose cotransporter 2 inhibitors (SGLT2i).

Signs of hyperglycaemic states include:

- severe dehydration with polyuria and polydipsia
- abdominal pain, nausea and vomiting
- altered consciousness
- shock
- ketotic breath in people with DKA.

The presence of these signs imply diabetes management issues or underlying causes such as infection or myocardial infarction, which require concomitant management. DKA is rare in people with type 2 diabetes relative to type 1 diabetes, but it has increased with SGLT2i use and is important to recognise because glucose levels may not be as extreme as other forms of DKA (Appendix 3).

Venous or self-monitored blood glucose results >15 mmol/L on two subsequent occasions, two hours apart, with clinical symptoms of metabolic disturbance should be considered a hyperglycaemic emergency and require assessment and intervention. If ketosis is not able to be tested for in the clinic, consider urgent referral for emergency assessment: refer below or to The Royal Australian College of General Practitioners (RACGP) and Australian Diabetes Society (ADS) clinical position statement Emergency management of hyperglycaemia in primary care) .

More information about the management of hypoglycaemia and hyperglycaemia can be found in Appendix 3 (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/appendices/appendix-3-detailed-information-on-gl ycaemic-emerg) .

Sick-day management of hyperglycaemia is discussed in the section ‘Managing risks and other impacts of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guideline s/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-risks-and-other-impacts-of-typ

e-2-diabete) ’.

In practice

All people with type 2 diabetes on insulin and/or sulfonylureas, and their families or carers, should be informed about the risk factors, signs and symptoms of hypoglycaemia and what actions should be taken if it occurs. In addition, they should be informed that hyperglycaemia may be possible, particularly during sick days.

If a person with diabetes has experienced severe hypoglycaemia, it may help to identify a carer who can be trained in glucagon administration to assist with early intervention and avoid recurrence.

The Australian Diabetes Educators Association sick-day management guidelines (https://www.adea.com.au/resources/standards-position-statements-and-other-resources/adea-clinical-guidelines/) and the RACGP sick-day plan for diabetes template (https://www.racgp.org.au/getmedia/d2d2497f-e110-4704-b1f1-5a79e49d9333/Type-2-diabetes-sick-day-management-plan-template_1.pdf.aspx) may be used to assist practical management.

You may also refer to the National Diabetes Services Scheme and Diabetes Australia's advice on sick-day management for people with type 2 diabetes (https://www.ndss.com.au/about-diabetes/resources/find-a-resource/managing-sick-days-for-type-2-diabetes-fact-sheet/) .

Hypoglycaemia: Practice points

- People can experience episodes of hypoglycaemia at any glycated haemoglobin (HbA1c) level, even if it is at target. Regular BGL monitoring should be used to monitor for hypoglycaemia. Real-time continuous glucose monitoring may help reduce the risks of hypoglycaemia, but the cost and availability of this technology and its use in at-risk populations, such as older people, need further evaluation.[8]
- Deprescribing of medication may be needed to manage the risk of hypoglycaemia.
- People with diabetes are often not forthcoming about symptoms of hypoglycaemia. GPs should therefore ask appropriate questions to detect hypoglycaemia (adrenergic and neuroglycopenic symptoms) to help with interpretation of BGLs. This is particularly important for older people and those with renal dysfunction.
- Severe hypoglycaemia has important implications for driving and the safe operation of equipment. For more information, see Austroads Assessing fitness to drive, Section 3.2 General assessment and management guidelines (https://austroads.com.au/publications/assessing-fitness-to-drive/ap-g56/diabetes-mellitus/general-assessment-and-management-guidelines#aftd-b-3-2-1) .
- All people with diabetes with impaired hypoglycaemic awareness should be referred to an endocrinologist or specialist physician with an interest in diabetes for assessment.

Managing hyperglycaemic emergencies: General advice

- Look for an underlying cause – for example, sepsis, cellulitis, myocardial infarction.
- If no causes are evident, or if you are unable to urgently assess ketones with the hyperglycaemia and the person is unwell, referral to the nearest emergency department may be

prudent.
- After the event, review medications, dietary intake and hyperglycaemic and sick-day management.
- Re-evaluate for possible undiagnosed type 1 diabetes.

For more detailed information on DKA and HHS and euglycaemic ketoacidosis, refer to:

- the RACGP and ADS position statement on Emergency management of hyperglycaemia in primary care.
- the ADS alert regarding periprocedural euglycaemic ketoacidosis DKA with SGLT2i use (https://diabetessociety.com.au/documents/ADS_DKA_SGLT2i_Alert_update_2020.pdf)
- Appendix 3 (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelin es/view-all-racgp-guidelines/management-of-type-2-diabetes/appendices/appendix-3-detailed-information-on-glycaemic-emerg) for detailed information on glycaemic emergencies.

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Managing multimorbidity in people with type 2 diabetes

Managing multimorbidity in people with type 2 diabetes

Clinical context

Multimorbidity is commonly defined as the presence of two or more chronic medical conditions in an individual, and can present several challenges in healthcare, particularly with higher numbers of coexisting conditions and related polypharmacy.[1] Approximately half the people seen by general practitioners in Australia meet this definition.[2]

Multimorbidity increases the risk of premature death, hospitalisation, functional impairment and deterioration in quality of life, in addition to increasing the complexity of self-care.[3,4]

Multimorbidity is associated with negative clinical and patient experience outcomes, as well as the increased use of healthcare. Most clinical trials do not consider patients with multimorbidity. A structured approach to multimorbidity includes identification, establishing treatment burden and jointly clarifying the goals of care with the patient and multidisciplinary team.[5]

Type 2 diabetes is associated with multimorbidity, which increases in prevalence and changes over time. More than 80% of people with type 2 diabetes will have multimorbidity within 16 years of being diagnosed, and 47.6% will have two or more conditions other than diabetes.[6] The number of associated conditions increases with age, as people with diabetes live longer, partly as a consequence of improved treatment.[7]

Other well-established determinants of multimorbidity include socioeconomic status and gender (higher prevalence in females).[3] The prevalence of multimorbidity among Aboriginal and Torres Strait Islander peoples is 2.59-fold that of non-Indigenous Australians, a factor that contributes significantly to higher mortality.[4,8]

Multimorbidity in people with type 2 diabetes can lead to:[9,10]

- premature mortality
- reduced quality of life
- increased healthcare use
- high burden of treatment
- loss of physical functioning
- increased mental health problems
- polypharmacy, with increased risk of drug interactions and adverse drug events
- fragmentation of care.

Multimorbidities may or may not be diabetes-related, and can be either concordant or discordant with diabetes care.[7]

Concordant conditions have a similar risk profile to type 2 diabetes and share the same management goals. They are usually incorporated in the single-disease guidelines.

Discordant conditions are not related in pathogenesis to type 2 diabetes and do not share similar management goals. This may impact on quality of care.[11-13]

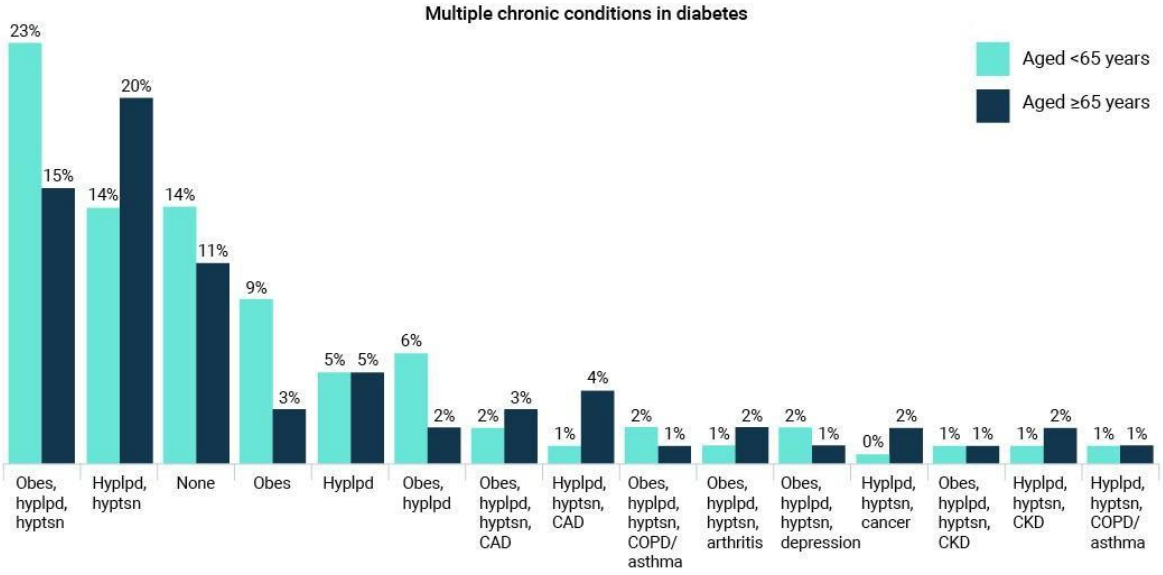
Common multimorbidity clusters found in people with type 2 diabetes are shown in Figure 1. Because of the complex relationships between co-existing conditions, guidelines based on single diseases may not provide evidence for optimal care.[14-16] Although many conditions have a concordant treatment focus (eg hypertension, dyslipidaemia, cardiovascular disease [CVD], metabolic-associated fatty liver disease [MAFLD] and renal disease), others, such as depression, chronic obstructive pulmonary disease and painful conditions, may be discordant.[15,17]

Few studies have examined the effectiveness of specific interventions to improve outcomes in people with multimorbidity. Findings have been mixed, but suggest there is an improvement in health outcomes when interventions target specific risk factors for the comorbid conditions (eg CVD and depression) or areas of functional difficulty.[9]

On an individual level, multimorbidity can have a profound effect on a patient's ability to self-care and balance different treatment needs across multiple conditions.[7,15] In particular, people with discordant multimorbidity will likely require extra support to prioritise goals of care and to self-manage diabetes.[18]

The literature suggests that care for multimorbidity should be person-centred, promoting achievement of agreed goals through self-management and focusing on quality of life.

The challenge for general practice is to optimise the care for these patients, taking into account co-existing physical or mental health disorders, age and socioeconomic and cultural issues.



The graph shows the 15 most multiple chronic condition clusters, representing 75% of the diabetes sample.

CAD, coronary artery disease; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; hyplpd, hyperlipidaemia; hyptsn, hypertension; obes, obesity.

Figure 1. Prevalence of the 15 most common comorbidity clusters in type 2 diabetes.[19]

Common comorbidities with diabetes

Be aware of the following common comorbidities with type 2 diabetes.

- Macrovascular disease
  - Includes coronary artery disease, hypertension, chronic heart failure and cerebrovascular and peripheral vascular disease
- Obesity
- MAFLD
- Painful conditions (acute and chronic)
  - Common in patients with type 2 diabetes[20] Peripheral neuropathies and arthritis account for most causes of pain; tendinopathy is also a common cause
- Fractures/falls
  - Research has shown that overall fracture risks are significantly higher for men and women with type 2 diabetes and the falls risk is higher especially with insulin and sulphonylurea use[21]
- Obstructive sleep apnoea
  - Obstructive sleep apnoea or sleep deprivation from any cause can aggravate insulin resistance, hypertension and hyperglycaemia
- Cancer
  - Diabetes is associated with increased cancer risk, including substantially elevated risks of pancreatic and liver cancer, and moderately increased risk of ovarian, cervical, breast, kidney, bladder and colorectal cancer[22]
- Renal impairment
  - Diabetes-related kidney disease is one of the most frequent complications of

diabetes. It is the leading cause of end-stage renal disease, accounting for approximately 50% of cases in the developed world.[23] Refer also to 'Complications: Chronic kidney disease'

- Cognitive impairment and dementia
  - Type 2 diabetes is associated with cognitive impairment[24,25] and higher rates of dementia[26]
- Mental health issues
  - Conditions such as diabetes-related distress, depression and anxiety can adversely affect practitioner–patient communication and the patient's ability to live and apply the principles of a diabetes management plan and glycaemic management (refer to 'Type 2 diabetes and mental health (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/type-2-diabetes-and-mental-health) '). They can also add to the burden of disease and reduce quality of life. Depression and diabetes are also associated with a significantly increased all-cause and CVD-related mortality
  - Some antipsychotic medications can increase the risk of developing diabetes. Olanzapine and clozapine are associated with higher rates of diabetes compared with other antipsychotic agents[27]
- Dental problems
  - Dental problems such as periodontitis (ie localised inflammation of the supporting structures of the teeth due to a chronic bacterial infection) are more common in patients with diabetes. Periodontitis can result in tooth loss and other dental complications that can interfere with the diet
  - There is a two-way relationship between diabetes and periodontitis – the management of periodontitis may lead to a modest reduction in glycated haemoglobin (HbA1c) of approximately 0.4%.[28-31] Inversely, improving glycaemic management may also improve the severity and complications associated with periodontitis
  - Early prevention and intervention may prevent permanent dental loss and aid in glycaemic management
  - Oral and periodontal health reviews should be incorporated into the systematic individualised care of patients with diabetes. General practitioners should ask patients about smoking status, pain, swelling or bleeding in the gums and loose teeth. Examination of the gums should include looking for signs of inflammation, such as swelling and redness, recession of the gums and build-up of plaque/tartar
  - Information about dental health and diabetes can be found on the Diabetes Australia (https://www.diabetesaustralia.com.au/living-with-diabetes/preventing-complications/dental-health/) website

In practice

Approach to managing multimorbidity

Increasing evidence is emerging for shared risk factors and management options have focused on clustered diabetes comorbidities such as 'cardiorenal metabolic' syndromes, where bidirectional elevated risks clustering CVDs, heart failure, chronic kidney disease (CKD) and MAFLD for people with type 2 diabetes.[32-34] Increasing evidence exists for specific multimorbidity interventions and individual clinical guidelines to address components of cardiorenal metabolic syndromes. Examples include:

- Key takeaways (https://kdigo.org/wp-content/uploads/2024/03/KDIGO-2024-CKD-Guideline-Key-Takeaways-Slide-Set.pptx) from the KDIGO 2024 Clinical Practice Guideline for Diabetes Management in CKD
- Kidney Health Australia CKD Management in Primary Care handbook (https://kidney.org.au/health-professionals/ckd-management-handbook)
- Australian Heart Failure Guidelines[35]
- Gastroenterological Society of Australia (GESA) clinical resources.

These examples have incorporated diabetes-specific management strategies, including the usefulness of specific diabetes therapies that address more than just glycaemic-lowering effects.

Refer also to the chapter 'Multimorbidity (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/silver-book-part-a/part-a/multimorbidity) ' in the RACGP aged care clinical guide (Silver Book).

Recognise clinical context and prognosis

Consider clinical management decisions within the context of risks, burdens, benefits and prognosis of a patient's life (eg remaining life expectancy, functional status, quality of life).[36-38]

Promote person-centred care

Focus on outcomes that matter most to the individual. Shared decision making with patients is vital to ensure care is aligned with their values and preferences.[7,38-41]

Recognise and manage mental health issues, cognitive decline and socioeconomic deprivation.

Recognise the limitations of the evidence base

Many of the patterns of multimorbidity have similar pathogenesis and therapeutic management strategies (eg diabetes, hypertension, coronary artery disease). Focus on functional optimisation and shared (concordant) risk factors.

Clinical guidance regarding discordant conditions, such as steroid-dependent conditions (which destabilise glycaemic management), or conditions that alter medication pharmacokinetics (eg renal disease, cardiac failure, liver disease, malabsorptive states) is often lacking or sparse.

A degree of clinical judgement and a 'best care given the circumstances' approach are required in these situations.[10]

Manage medication

Adherence to therapy can be much more difficult for patients taking numerous medications for multiple conditions. Deprescribing and the use of fixed-dose combination therapies plus reviewing medications, where indicated, may reduce medication burden.

Important drug interactions and side effects

People with diabetes may be taking multiple glucose-lowering medications in addition to other prescription and non-prescription agents. Some drug interactions are dangerous, and special care is required in older patients and patients with comorbidities such as renal impairment and autonomic neuropathy.

Polypharmacy

Polypharmacy (taking more than five medications) is one consequence of following single-disease guidelines in people with multimorbidity.[16,38,42-44]

Polypharmacy can be appropriate and has been said to be the price of success in creating effective treatments. However, it is also associated with higher rates of adverse drug events and hospitalisation, and is often particularly problematic in people who are physically frail[45] or have cognitive impairment.

Use strategies to choose therapies that optimise benefit, minimise harm and enhance quality of life, particularly in older adults with multimorbidity (refer to the Silver Book (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/silver-book/part-a/multimorbidity)).

Plan regular (at least annual) reviews of immunisation requirements and medication, incorporating home medication reviews and, where needed, residential medication management reviews.

Coordinate care

Provide continuity of care, preferably through a single healthcare provider.

Ensure adequate time for consultations and set up practice systems to ensure regular review and best use of practice resources (eg scheduling concurrent practice nurse and doctor consultations) to address problems and develop patient-oriented solutions such as chronic disease planning and allied health or specialist referral. This should allow adequate time for reaching management decisions.[10]

Use a coordinated, multidisciplinary team approach where appropriate.

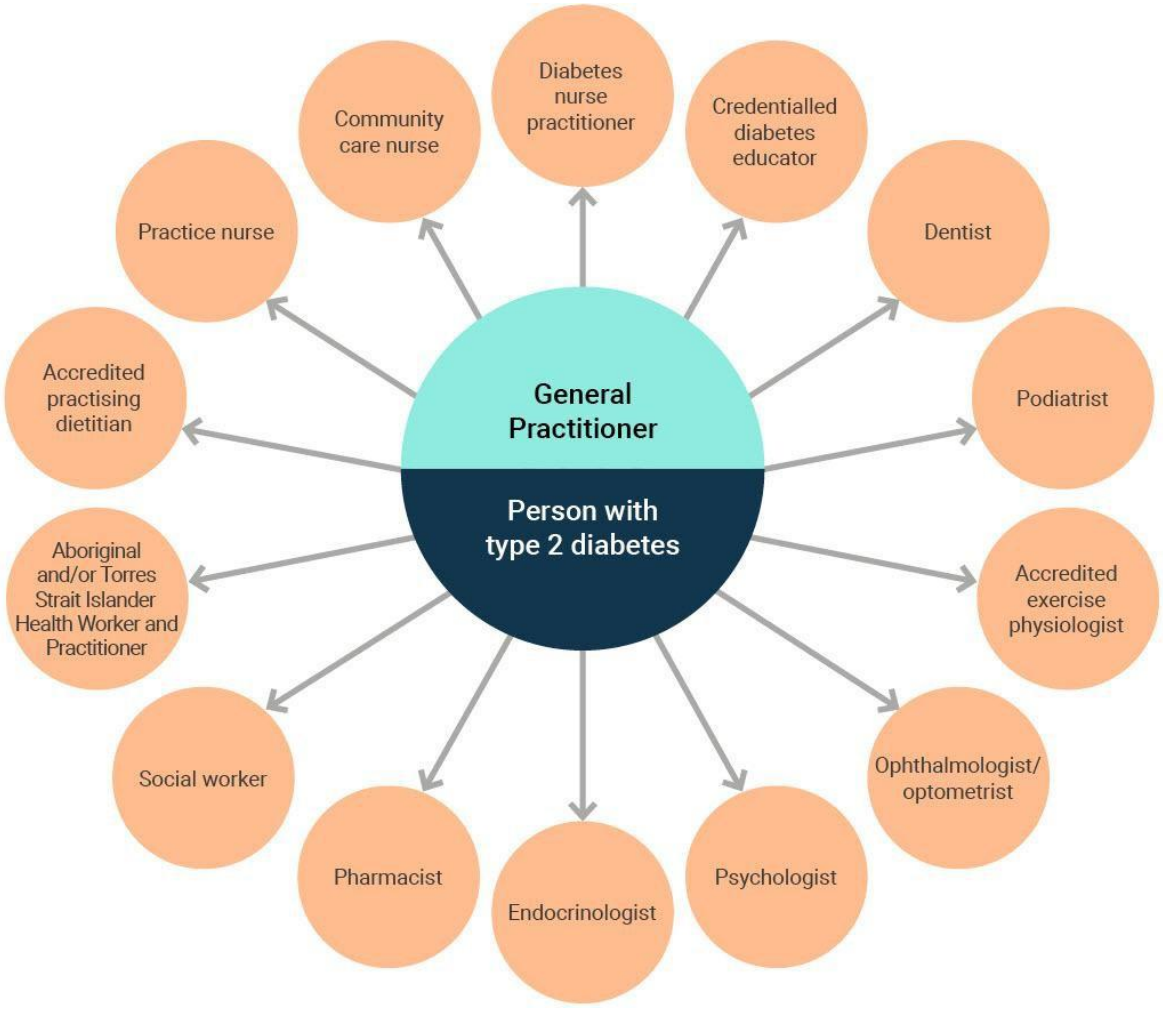


Figure 2. Potential members of the multidisciplinary diabetes care team.

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Type 2 diabetes and mental health

Type 2 diabetes and mental health

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Routinely monitor people with diabetes for diabetes distress.	B	1,2	14/11/2024
Providers should consider assessment for symptoms of diabetes distress, depression, anxiety, disordered eating and cognitive capacities using patient-appropriate standardised and validated tools when there is a change in disease, treatment, or life circumstance; including caregivers and family members in this assessment is recommended.	B	1,2	14/11/2024
People with diabetes with any of the following should be referred to a mental health professional and to do a care plan: • significant distress related to diabetes management • persistent fear of hypoglycaemia • psychological insulin resistance • psychiatric disorders (ie depression, anxiety, eating disorders).	D, Consensus	1,3	14/11/2024

Collaborative care by interprofessional teams should be provided for people with diabetes and depression to improve: • depressive symptoms • adherence to antidepressant and non-insulin glucose-lowering medications • glycaemic control*. *Glycaemic management	A, Level 1	3-6	14/11/2024
Psychosocial interventions should be integrated into diabetes care to improve adaptation to living with diabetes and engagement in self-management, including: • motivational interviewing • cognitive behaviour therapy • acceptance and commitment therapy • stress management strategies • coping skills training • family therapy • case management • mindfulness interventions	A, Level 1A A, Level 1A A, Level 1 A, Level 1A A, Level 1A A, Level 1B A, Level 1 C	3,4,7-9	14/11/2024

Clinical context

People with diabetes can face a number of psychosocial challenges, which can change over the course of their lives with the condition (Figure 1). It is common for people with diabetes to sometimes feel overwhelmed, guilty or frustrated by the considerable burden of self-care and management required by diabetes. They might also feel worried about their current or future diabetes management and health outcomes,[10] and can face stigma, discrimination or a lack of understanding from friends or family members about their condition. Timely assessment of the impact of diabetes on people's mental health can be incorporated into routine clinical reviews and, as a minimum, needs to be aligned to the annual cycle of care. People with diabetes are more likely to experience other mental health problems:

- Diabetes has a bidirectional relationship with some psychological conditions, particularly major depression (however, the mechanisms of this relationship are as yet unknown).[3]
- Anxiety disorders and disordered eating are more common in people with diabetes.[11]
- People with psychotic disorders (eg schizophrenia) have significantly increased rates of type 2 diabetes.[11]

The main risk factors in type 2 diabetes for cognitive dysfunction, depression and psychological problems are illustrated in figure 2 (https://www.mdpi.com/diabetology/diabetology-05-00004/article_deploy/html/images/diabetology-05-00004-g002.png) in the article by Randväli et al.[12] Diabetes distress is a clinically recognised emotional response to living with diabetes and the medical, financial and social impacts of diabetes. Other common diabetes-specific psychological responses are fear of hypoglycaemia and psychological insulin resistance (refer below). Diabetes distress and other psychological conditions can negatively affect health outcomes due to suboptimal self-management and glycaemic outcomes.[10,13,14] General practitioners (GPs) also need to be aware that the metabolic effects of some psychotropic medications (eg the antipsychotic medications olanzapine and clozapine[15, 16]) can increase the complexity of type 2 diabetes management or add additional burdens such as obesity (refer to 'Managing multimorbidity in people with type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-multimorbidity-in-people-with-type-2-diab) ').

	Continuum of psychosocial issues and behavioural health disorders in people with diabetes	
	Non-clinical (normative) symptoms and behaviours	Clinical symptoms and behaviours
Behavioural health disorder prior to diabetes diagnosis	None	• Mood and anxiety disorders • Psychotic disorders • Intellectual disabilities
Diabetes diagnosis	Normal course of adjustment reactions, including distress, fear, grief, anger, initial changes in activities, conduct or personality	• Adjustment disorders*
Learning diabetes self-management	Issues of autonomy, independence and empowerment. Initial challenges with self-management demonstrate improvement with further training and support	• Adjustment disorders* • Psychological factors affecting medical conditiont
Maintenance of self-management and coping skills	Periods of waning self-management behaviours, responsive to booster educational or supportive interventions	• Maladaptive eating behaviours • Psychological factors affecting medical conditiont
Life transitions impacting disease self-management	Distress and/or changes in self-management during times of life transition+	• Adjustment disorders* • Psychological factors affecting medical conditiont
Disease progression and onset of complications	Distress, coping difficulties with progression of diabetes/onset of diabetes complications impacting function, quality of life, sense of self, roles, interpersonal relationships	• Adjustment disorders* • Psychological factors affecting medical conditiont
Ageing and its impact on disease and self-management	Normal age-related forgetfulness, slowed information processing and physical skills potentially impacting diabetes self-management and coping	• Mild cognitive impairment • Alzheimer's disease or vascular dementia
	A	A
	All care-team members (general practitioners, nurses, diabetes educators, dietitians) and other behavioural providers	Behavioural or mental health providers (psychologists, psychiatrists, clinical social workers, certified counsellors or therapists)
	Providers for psychosocial and behavioural health intervention	

Living with diabetes

* With depressed mood, anxiety, or emotion and conduct disturbance

' Personality traits, coping style, maladaptive health behaviours or stress-related physiological response

; Examples include changing schools, moving, job/occupational changes, marriage or divorce, experiencing loss

Source Adapted with permission from Young-Hyman D, de Grood M, Hill-Briggs F, Gonzalez JS, Hood K, Peyrot M_ Psychosocial care for people with diabetes: A position statement of the American Diabetes Association_Diabetes Care 2016;39:2126-40

Figure 1. Psychosocial challenges experienced by people with diabetes at different phases of life[11]

Diabetes distress

Diabetes distress is a condition distinct from other psychological disorders and is estimated to affect 18–45% of people with diabetes.[11] Severe diabetes distress is experienced by 20% of people with insulin-treated type 2 diabetes and by 11% of those with non-insulin-treated type 2 diabetes.[17]

Although some symptoms often overlap with depressive symptoms, diabetes distress is a separate psychological condition that should be assessed for separately (Table 1).[18] It is associated with suboptimal diabetes self-care and glycaemic outcomes[10,11]

Causes of diabetes distress differ between individuals, but are commonly related to the following domains:[19]

- emotional and cognitive distress – for example:
  - worries about long-term diabetes-related complications
  - fears about loss of quality of life
  - guilt, anger, frustration or burnout associated with the ongoing need for care
- interpersonal distress – for example:
  - feeling unsupported or misunderstood by loved ones
- regimen or management distress – for example:
  - difficulty keeping up with dietary recommendations
  - stress from changes to treatment (eg changing from oral to injectable therapy)
  - stress related to the need for ongoing glucose self-monitoring
  - fear associated with reviews of glycated haemoglobin (HbA1c) and not achieving target levels
- distress arising from interactions with healthcare professionals – for example:
  - feeling that treating clinicians do not understand concerns or take them seriously.

Psychological insulin resistance

Psychological insulin resistance refers to a person's strong negative thoughts and feelings about starting, using or intensifying insulin therapy.[3]

This may be due to fear and anxiety about having to self-administer injections, concerns about insulin and its effects (eg hypoglycaemia or weight gain) or misplaced beliefs (eg that requiring insulin means they have failed to self-manage their diabetes or that the condition has become much more serious).

The National Diabetes Services Scheme (NDSS) and Diabetes Australia have developed resources to support people starting and using insulin to manage their diabetes:

- Starting insulin (https://www.ndss.com.au/about-diabetes/resources/find-a-resource/starting-insulin-booklet/) booklet
- a fact sheet of concerns about starting insulin (https://www.ndss.com.au/about-diabetes/resources/find-a-resource/concerns-about-starting-insulin-for-people-with-type-2-diabetes-fact-she

et/) .

Fear of hypoglycaemia

Experiences of hypoglycaemia, especially severe (requiring assistance) or nocturnal episodes, can be physically dangerous and psychologically traumatic. Some level of concern about hypoglycaemia is adaptive and is a motive to respond to low glucose levels on time. However, fear of hypoglycaemia (extreme fear in response to risk or occurrence of hypoglycaemia) can lead to unhelpful strategies to avoid hypoglycaemia, such as:

- maintaining a higher blood glucose level (compensatory hyperglycaemia)
- treating perceived symptoms without confirming hypoglycaemia by self-monitoring.

Left unmanaged, in the long term these behaviours can affect glycaemic outcomes and reduce quality of life. Technology such as continuous glucose monitoring or flash monitoring (often with alarms developed for hypoglycaemia) may help people who are averse to finger pricking.

Other psychological and psychiatric conditions

Increased understanding of the psychological aspects of the person with diabetes would allow clinicians to formulate strategies focusing on improvements in diabetes outcomes and reducing disease burden.[20] Other mental health conditions that can affect or are affected by diabetes include major depression, schizophrenia spectrum disorders, bipolar disorder, eating disorders and anxiety.[3]

Depression and diabetes are interlinked with a higher risk of developing diabetes in people who have a history of or current depression that is compounded if the person is overweight or obese and with a family history of depression.

GPs play an essential role in assessing and supporting people with diabetes and mental health conditions by providing care and serving as the pivotal point for referral to appropriate mental health professionals that form the multidisciplinary care team. Collaborative care should be considered for people with diabetes and depression. Routine interval assessment for the presence of these conditions, particularly anxiety and depression, may be incorporated into the annual diabetes cycles of care, but also be provided opportunistically. Validated tools may support comparative interval assessment. Avoidance of stigmatisation and using appropriate language when managing people living with diabetes are foundational on building a trusted therapeutic care model.[21]

Medications used for the management of depression, particularly selective serotonin reuptake inhibitors (SSRIs) have been shown to improve glycaemic management. Any medication used, particularly antipsychotic agents when used in at-risk individuals (eg history of gestational diabetes, family history of diabetes, presence of visceral obesity), may need to be evaluated for risks of inducing hyperglycaemia and diabetes.[3]

In practice

Given the high prevalence of diabetes distress and other mental health conditions, people with type 2 diabetes should be assessed at the initial visit, at periodic intervals (eg at annual review) and when there is a change in condition, treatment or life circumstance. It is recommended to assess for diabetes distress, depression, anxiety, disordered eating and cognitive capacities.[2,11] GPs may decide to prioritise assessment of conditions according to each individual's phase of living with diabetes (Figure 1); for example, assessing for cognitive impairment in older people (see 'Dementia, cognitive decline and hearing impairment' in the 'Managing risks and other impacts of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-risks-and-other-impacts-of-type-2-diabete) ' section).

Information and guidance about how to have conversations with people about diabetes and mental health, including tips for using the screening tools detailed below, can be found in the NDSS publication Diabetes and emotional health: A handbook for health professionals supporting adults with type 1 or type 2 diabetes (https://www.ndss.com.au/about-diabetes/resources/find-a-resource/diabetes-and-emotional-health/) .

If necessary, people should be referred to a mental health professional, preferably one with experience in psychosocial care for people with diabetes (Box 1).[11]

Screening

GPs can identify clinically significant diabetes distress and other mental health issues by having ongoing conversations with people about how they feel about their diabetes. Informal, open-ended questions can help get a sense of what the likely problems are for a person. For example:

- 'How is diabetes bothering you at the moment?'
- 'What is the most difficult part of living with diabetes for you?'

For more information, refer to Diabetes Australia's position statement Our language matters: Improving communication with and about people with diabetes[22] and the American Diabetes Association article 'The use of language in diabetes care and education'.[23] These publications **provide recommendations for the language healthcare professionals and others should use when discussing diabetes** through spoken or written words.

If indicated, standardised tools can then be used to further assess for symptoms. Tools for assessing diabetes distress (Table 1) are freely available.

The Patient Health Questionnaire (PHQ)-2 or PHQ-9 can be used to screen for depressive symptoms.

- A PHQ-2 total score of ≥3 in a person who is not currently receiving treatment for depression requires assessment with the PHQ-9.[24]
- PHQ-9 scores are interpreted as follows:
    - 0–4: no depressive symptoms (or a minimal level)
    - 5–9: mild depressive symptoms – these people will benefit from watchful waiting
    - 10–27: moderate-to-severe depressive symptoms – these people will benefit from a

more active method of intervention.

If depression is suspected from the PHQ-9, a formal clinical assessment for depression and management should be undertaken.

In addition, the Depression, Anxiety and Stress Scale (DASS) (https://dass.psy.unsw.edu.au/) may be helpful as an assessment tool for people with diabetes and mental health symptoms. The Kessler Psychological Distress Scale (K10) (https://www.blackdoginstitute.org.au/wp-content/uploads/2020/04/k10.pdf) is widely recommended as a simple measure of psychological distress and is often used by GPs because it is available in consultation software.[25]

To effectively use screening tools, GPs should be mindful of the person's health literacy, being sure to explain what the tool is for and how it can help the person receive individualised support.

Table 1. Tools to assess diabetes distress in people with diabetes

Tool	Scoring	Validated population
Problem Areas in Diabetes (PAID)26	Patients receive a total score out of 100; scores ≥40 indicate severe diabetes distress	Adults with type 1 and type 2 diabetes Paediatric, teen and parent versions are also available
Diabetes Distress Scale (DDS)27,28	A 17-item questionnaire measuring diabetes-specific distress in four domains: emotional burden, interpersonal distress, physician-related distress and regimen-related distress A mean score ≥3 in any domain indicates 'high' distress	Adults with type 1 and type 2 diabetes

Management

The 7A's model (see below) is a practical way to structure mental health care for people with diabetes, adapted from the 5A's model often used for counselling in other areas (eg smoking cessation, obesity).[18] The 7A's model encourages healthcare professionals to:

- be **aware** that people with diabetes might have emotional or mental health problems
- **ask** about these problems, using open-ended questions
- **assess** for emotional or mental health problems using a validated tool
- **advise** people about identified problems
- **assist** them with developing an achievable action plan

- **assign** care, where appropriate, to another healthcare professional (eg psychologist, diabetes specialist or credentialled diabetes educator)
- **arrange** follow-up care.

More information about the 7A's model can be found in the NDSS publication Diabetes and emotional health: A handbook for health professionals supporting adults with type 1 or type 2 diabetes.[18]

Versions of this model to specifically manage diabetes distress, fear of hypoglycaemia, psychological barriers to insulin use, depression, anxiety disorders and eating disorders can be found in the NDSS handbook summary cards (https://www.ndss.com.au/wp-content/uploads/resources/diabetes-emotional-health-handbook-summary-cards.pdf) .[17]

Management of mental health problems should be offered within diabetes care settings and general practices, using current supported care such as mental health care planning. GP mental health treatment plans (https://gpmhsc.org.au/InfoSection/Index/ab953256-1969-429e-8c71-bd476fede52f) provide a structured framework for GPs to undertake assessment, early intervention and management of people with a mental illness.[29]

For more information, refer to The 2020 Royal Australian and New Zealand College of Psychiatrists clinical practice guidelines for mood disorders,
which includes:

- table 9: Pharmacological treatment based on clinical profile
- table 10: Classes of antidepressants
- figure 26: Management of major depression.[30]

Box 1. Referring people with diabetes to a mental health provider

The listed conditions and symptoms are suggestions of an underlying possible psychosocial or mental health issue that needs exploration BEFORE referral, if required.

People with diabetes who display any of the following should be referred to a mental health provider:[11]

- diabetes distress and impaired self-care despite tailored diabetes education
- positive screen for depressive symptoms on a validated screening tool
- symptoms or signs of disordered eating behaviour, an eating disorder or disrupted patterns of eating
- deliberate omission of insulin or oral medication to cause weight loss
- positive screen for anxiety or fear of hypoglycaemia on a validated screening tool
- positive screen for cognitive impairment
- declining or impaired ability to self-care.

People should be referred before undergoing bariatric surgery, and after, if assessment reveals an ongoing need for adjustment support.[11]

Resources

The NDSS has a range of resources regarding emotional health and diabetes (https://www.ndss.com.au/about-diabetes/resources/emotional-health-resources/) .

The NDSS and Diabetes Australia have developed resources to support people starting and using insulin to manage their diabetes (see 'Psychological insulin resistance'):

- Starting insulin (https://www.ndss.com.au/about-diabetes/resources/find-a-resource/starting-insulin-booklet/) booklet
- a fact sheet of concerns about starting insulin (https://www.ndss.com.au/about-diabetes/resources/find-a-resource/concerns-about-starting-insulin-for-people-with-type-2-diabetes-fact-sheet/) .

The NDSS and Diabetes Australia have published Diabetes and emotional health: A handbook for health professionals supporting adults with type 1 or type 2 diabetes (https://www.ndss.com.au/about-diabetes/resources/find-a-resource/diabetes-and-emotional-health/) .

The Royal Australian and New Zealand College of Psychiatrists has developed clinical practice guidelines for mood disorders.

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Type 2 diabetes, reproductive health and pregnancy

Table of recommendations

Recommendation	Grade	References	Recommended as of:
In addition to focused attention on achieving glycaemic targets, standard preconception care should be augmented with extra focus on nutrition, diabetes education and screening for diabetes comorbidities and complications.	B	1	14/11/2023
Preconception counselling should address the importance of achieving glucose levels as close to normal as is safely possible, ideally glycated haemoglobin (HbA1c) <6.5% (48 mmol/mol), to reduce the risk of congenital anomalies, pre-eclampsia, macrosomia, preterm birth and other complications.	A	1	14/11/2023
Potentially harmful medications in pregnancy (eg angiotensin-converting enzyme [ACE] inhibitors, angiotensin receptor blockers, statins) should be stopped prior to conception and avoided in sexually active individuals of childbearing potential who are not using reliable contraception.	B	1	14/11/2023

Women on metformin planning a pregnancy may continue on these agents if glycaemic control* is adequate until pregnancy is achieved. *management	C, Level 3	2	14/11/2023
The decision to continue insulin analogues that have little available safety data in pregnancy, and metformin, should be individualised, but neither medication should be ceased abruptly in early pregnancy due to the imperative to maintain euglycaemia. Cessation should depend on the risks and benefits of continuation. While metformin crosses the placenta, there has not been any evidence that it is teratogenic. Other non-insulin glucose-lowering agents should be ceased prior to or as soon as pregnancy is detected.	Consensus	3	14/11/2023
Folic acid 2.5–5 mg daily in total, taking multivitamin supplementation into account, commenced ideally three months prior to conception and continued until 12 weeks gestation. Total daily doses of folic acid >5 mg are not recommended given the potential for harm.	Consensus	3	14/11/2023

Prior to conception, women with diabetes should be referred to a multidisciplinary team which is experienced in the care of women with diabetes as this has been shown to improve pregnancy outcomes. This team may consist of an obstetrician, endocrinologist/diabetes physician, credentialled diabetes educator, accredited practising dietitian, lead maternity carer (New Zealand) and other health specialists as required. In rural areas where distance is a barrier to antenatal attendance, the local healthcare team should contact the nearest expert diabetes in pregnancy multidisciplinary team for access to telehealth options.	Consensus	[3]	14/11/2023

Contraception

Contraception advice should follow guidelines that apply to women without diabetes. However, because the risks associated with pregnancy in women with diabetes are high, it is particularly important to consider long-acting reversible contraception as a first-line option to avoid unplanned pregnancy.[4] The use of the non-hormonal copper intrauterine contraceptive device might be preferred over the combined oral contraceptive pill, depending on any risks or contraindications caused by the presence of diabetes complications. In all cases, contraception choice should be based on the woman's preferences, considering the risks and benefits and the presence of diabetes-related complications. **Smoking combined with diabetes and the use of the combined oral contraceptive pill significantly elevates vascular risks.** For more information, refer to the World Health Organization Medical eligibility criteria for contraceptive use.[5] Information about contraceptive choice is available from the National Diabetes Services Scheme (NDSS) (https://www.ndss.com.au/living-with-diabetes/everyday-life-with-diabetes/sexual-health/contraception/) website.

Sexual problems

Men

Men with diabetes are three times more likely to develop erectile dysfunction than men without diabetes.[6] The prevalence of erectile dysfunction in men aged >40 years with diabetes may be as high as 50%, and incidence increases by approximately 10% per year as men age. Men with diabetes are also affected by erectile dysfunction at an earlier age, with occurrence approximately a decade earlier.[6,7] In addition, diabetes is associated with lower testosterone levels in men.[8] This might contribute to reduced libido and aggravate or exacerbate erectile dysfunction. Healthy Male provides a clinical summary guide for the management of male erectile dysfunction.[9]

Women

Sexual dysfunction in women is often under-reported and could co-exist with underlying depression. Women with diabetes might experience higher rates of sexual dysfunction than women without diabetes: rates of depression, anxiety and psychological distress are higher in people with diabetes and may contribute to sexual dysfunction in women and men.[10,11] It is also fair to say that sexual dysfunction in women could be linked to complications of diabetes, namely vascular and neuropathic complications; however, more research is needed to assess this.[12,13] Symptoms of sexual dysfunction in women include:

- decreased or total lack of interest in intimacy or sexual relations
- decreased or no sensation in the genital area
- a degree of anorgasmia
- dryness in the vaginal area, leading to dyspareunia.

Genital infections such as monilial vaginitis occur more frequently in women with diabetes and may contribute to sexual dysfunction. People taking sodium–glucose cotransporter 2 inhibitors (SGLT2i) are at higher risk of genital infections.[14] More information about evaluating and managing female sexual dysfunction can be found in a paper by Krakowsky and Grober.[15] It is important to enquire about sexual problems in the annual review and manage physical and emotional aspects. A sexual desire questionnaire or screening tool (eg the Decreased Sexual Desire Screener[16]) will help with diagnosis and treatment.

Managing hyperglycaemia in pregnancy

For information about gestational diabetes, refer to 'Gestational diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/gestational-diabetes) '.

Pregnancy with pre-existing diabetes

Clinical context

The Australasian Diabetes in Pregnancy Society recommends a fasting and premeal self-monitoring of blood glucose (SMBG) target of 4.0–5.3 mmol/L and a post-meal SMBG target of 5.5–7.8 mmol/L (one hour after the meal) or 5.0–6.7 mmol/L (two hours after the meal), provided that these levels can be achieved without causing significant hypoglycaemia. In early pregnancy, the HbA1c target for women with pre-existing diabetes is ≤6.5% (48 mmol/mol), which is the same as the preconception target. HbA1c is slightly lower in pregnancy compared with outside pregnancy due to increased red blood cell turnover. Therefore, as the pregnancy progresses, a lower HbA1c of ≤6.0% (42 mmol/mol) can be targeted if this can be achieved without causing significant hypoglycaemia.[3] Suboptimal glycaemic management at conception and early in pregnancy is associated with an increased risk of congenital malformations and first trimester miscarriages. Women with pre-existing diabetes (types 1 and 2) are more prone to the complications of pregnancy, such as higher rates of stillbirth,[17] pre-eclampsia prematurity and caesarean section.[18] In addition, pregnancy may accelerate maternal complications of

diabetes, such as diabetic retinopathy (see 'Complications: Diabetes-related eye disease (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/complications/diabetes-related-eye-disease) ').[19] Both maternal and fetal complications are increased by diabetes. Risk is progressive with increasing glycaemia.[20] Optimising glycaemic management can mitigate these risks, the likelihood of birth trauma and the risk of early induction of labour and need for caesarean section. Women should be advised that metformin crosses the placenta and that the long-term effects of in utero exposure to metformin on the offspring as they grow to adulthood is unclear, although some recent studies suggest that metformin has benefits to both the mother and offspring.[21,22] There is a small proportion of babies born small for gestation age. This is primarily in women who have hypertension with or without nephropathy. A 24-month follow-up study published in 2023 showed that anthropometrics were similar in children exposed and not exposed to metformin in utero.[23] Cessation or continuation of metformin should be discussed and depends on the risks and benefits of continuation.[23] Women of reproductive age with existing diagnoses of diabetes should be advised of the benefits of contraception to prevent inadvertent pregnancy before glycaemia can be optimised. Women should be advised of the need for advice, education and support to achieve optimal glycaemic management before pregnancy. Women with type 2 diabetes and polyendocrine metabolic ovarian syndrome or irregular periods must be advised that improved fertility may accompany weight loss and the use of therapies, including metformin.[24]

In practice

Pre-pregnancy

Where possible and practicable, formal, diabetes-specific pregnancy planning should occur prior to pregnancy. This should be patient-focused, support self-management and involve a multidisciplinary team. Planning should include assessment of diabetes-related complications, review of all medications and commencement of folic acid.[24,25] Deferring pregnancy should be recommended until glycaemic management is optimal. Women should be reassured that any reduction in HbA1c towards the individualised target is likely to reduce the risk of congenital malformations. Refer to the NDSS for advice on pre-pregnancy blood glucose targets (https://www.ndss.com.au/about-diabetes/pregnancy/) . Medications should be reviewed and ceased or replaced as appropriate, ideally before pregnancy during the planning period, or urgently once pregnancy is confirmed. Consultation with local specialist services is advised. Agents such as sulfonylureas, glitazones, SGLT2i and incretin-based therapies will need to be reviewed or ceased, and insulin therapy instituted. Table 1 presents safety profiles and advice for diabetes medications in pregnancy.

Practice points: Before and during pregnancy

- Counsel people that the risks associated with diabetes in pregnancy can be reduced, but not eliminated.
- Recommend a reliable form of contraception until blood glucose management is optimised.
- Advise that optimising HbA1c with a balanced diet, physical activity, healthy weight management and appropriate diabetes medication may positively affect pregnancy outcomes.
- Review sick-day management plans, and discuss the need for insulin therapy possibly prior to conception and throughout the pregnancy.
- Revise hypoglycaemia prevention and management.
- Review all medications and supplements for potential risks of teratogenicity and advise on suitable alternatives (see Table 3).
- Advise that nausea and vomiting in pregnancy may affect blood glucose management.
- Aim for blood glucose to be as close to the normal (non-diabetes) range as possible, ensuring risks of maternal hypoglycaemia are minimised. This reduces the risks of spontaneous abortion, congenital abnormalities, pre-eclampsia, retinopathy progression and stillbirth.[2]
- Review SMBG and/or continuous glucose monitoring to determine whether medication adjustment and/or commencement of insulin is required, and assess the risk of hypoglycaemia. Some people may be eligible for NDSS-subsidised access.
- Folic acid supplementation, at least 5 mg daily, should be taken, for a minimum of one month before conception and for the first three months of pregnancy because there is an increased risk of neural tube defects with prepregnancy diabetes.[25]
- Be aware that women treated for hypothyroidism may require higher doses of thyroid hormone replacement therapy. Based on reassessment, a suggested dose change is an increase of 30% once there is a positive pregnancy test (eg if on one tablet per day, increase by two tablets per week).[26]
- Advise examination of the retina prior to conception and during each trimester for women with types 1 and 2 diabetes. More frequent assessment may be required if retinopathy is present. People with active, moderate–severe non-proliferative retinopathy or with proliferative retinopathy who have not had an ophthalmological assessment within the preceding six months should undergo testing prior to pregnancy to see whether the retinopathy is stable enough for pregnancy.
- Test renal function if this has not been done within the preceding three months. Elevated creatinine or estimated glomerular filtration rate <45 mL/min/1.73 m^2 or an albumin-to-creatinine ratio >30 mg/mmol is an indication for pre-pregnancy

nephrology assessment.[27]

Table 1: Safety and risks of common diabetes medications before and during pregnancy

Medication	Category in pregnancy	Advice
Sulfonylureas	C	Review or cease and institute insulin therapy
SGLT2i	D	
Incretin-based therapies DPP-4i	B3	
GLP-1RA; GIP/GLP-1RA	D	
Glitazones	B3	
Metformin	C	Not associated with an increase in congenital malformation or early pregnancy loss, but remains category C[28] Could be used as an adjunct to other therapies, including insulin, in type 2 diabetes, both before conception and during pregnancy.[29] Consult with specialist endocrine and obstetric services
Insulin		
Aspart, lispro	A	Safe to use
Detemir	A	Safe to use (PBS-listed for type 1 diabetes only)

Table 1: Safety and risks of common diabetes medications before and during pregnancy		
Medication	**Category in pregnancy**	**Advice**
Glargine/degludec/ aspart (co-formulated)	B3	Insufficient evidence about use. Patients already stabilised on either insulins may continue, but the B3 category rating should be discussed with the patient
Isophane, or NPH insulin	Not assigned	NPH is the most common long-acting insulin choice during pregnancy for women with type 2 diabetes
Antihypertensives		ACEi and ARBs should be discontinued during the pregnancy planning period, or as soon as pregnancy is confirmed
Methyldopa	A	Safe
Clonidine	B3	May cause temporary rise in glucose
Spironolactone	B3	Seek advice
Moxonidine	B3	Seek advice
Calcium channel blocker	C	Avoid (except nifedipine)
Beta-blockers	C	Avoid (except labetalol and oxprenolol)
Thiazide and loop diuretics	C	Seek advice
ACEi	D	Contraindicated
ARBs	D	Contraindicated

Table 1: Safety and risks of common diabetes medications before and during pregnancy

Medication	Category in pregnancy	Advice
Statins	D	Discontinue during the pregnancy planning period, or as soon as pregnancy is confirmed

*For definitions of the Australian categories for prescribing medicines in pregnancy, visit the Therapeutic Goods Administration, Australian categorisation system for prescribing medicines in pregnancy.

ACEi, angiotensin-converting enzyme inhibitors; ARBs, angiotensin receptor blockers; DPP-4i, dipeptidyl peptidase-4 inhibitors; GIP, glucose-dependent insulinotropic polypeptide; GLP-1RA, glucagon-like peptide-1 receptor agonists; NPH, neutral protamine Hagedorn; PBS, Pharmaceutical Benefits Scheme; SGLT2i, sodium–glucose cotransporter 2 inhibitors.

Antenatal care

Insulin therapy will need regular review and titration to achieve glycaemic goals.

Insulin requirements are typically increased early in the first trimester.[30] Insulin requirements increase further progressively from around 16 weeks gestation to around 36 weeks gestation before declining slightly towards term.[31] Thus, there is a significant danger of major hypoglycaemia during the first few weeks in the first trimester. Early referral to a multidisciplinary team before 10 weeks is ideal, with an awareness that hypoglycaemia may occur before the woman gets to see the multidisciplinary team. Pregnant women on insulin therapy are recommended to check their glucose levels more frequently during this critical period and reduce their insulin dose appropriately.

Other factors contribute to hypoglycaemia during this early pregnancy period: nausea and vomiting of pregnancy, elevated pregnancy hormonal levels.[30] Risk factors include a prior history of severe hypoglycaemia, long duration of diabetes, lower baseline HbA1c and higher total daily insulin dose.[32]

Intensive glycaemic management guided by SMBG or continuous glucose monitoring, versus SMBG alone, in studies[33] that included people with type 2 diabetes in pregnancy have failed to demonstrate this benefit compared with type 1 diabetes.[34]

Close surveillance for new diabetes complications and monitoring of existing complications should occur routinely.

General practitioners (GPs) should provide timely and appropriate support and referral for women who are experiencing an unplanned pregnancy where the risks of abnormal pregnancy outcomes are elevated.

Ultrasound screening is advised at 10–13 weeks gestation (with biochemistry) for trisomies, and at 18–20 weeks for congenital cardiac and other malformations. Pregnant women with diabetes should be offered ultrasound monitoring of fetal growth and amniotic fluid volume every four weeks from 28 to 36 weeks.[27] Fetal growth and wellbeing monitoring should occur under specialist supervision. It is strongly recommended to refer to your local specialist endocrine and obstetric services.

During pregnancy

Patients should be referred to specialised diabetes antenatal care as early as possible, because multidisciplinary shared care is considered best practice.[17,27] A multidisciplinary team ideally involves:

- GP
- endocrinologist
- midwife
- obstetrician
- credentialled diabetes educator
- accredited practising dietitian
- psychologist.

Postpartum

The GP should maintain or re-establish contact with the mother and child as early as practicable to address any issues arising from the pregnancy, labour, surgery or breastfeeding, and to review medications.

Metformin may be continued while breastfeeding with minimal effect on the baby.[35] Breastfeeding may alter glucose levels, so glycaemic monitoring, oral medications and insulin need careful review during breastfeeding to minimise the risk of hypoglycaemia.

Reintroduction of other medications needs careful review. The LactMed® (https://www.ncbi.nlm.nih.gov/books/NBK501922/) database contains information on drugs and other chemicals to which breastfeeding mothers may be exposed. Ultimately, studies are lacking with many drugs to give more accurate guidance on risk, and a general rule is to use the pregnancy risk category. The use of insulin may need to be supported until weaning occurs.

Re-establishing glycaemic management goals, reassessment of complications and timely contraceptive advice are also appropriate in the postpartum period.

Resources

The Australian Government Department of Health has produced a practice summary for managing diabetes in pregnancy in its Clinical practice guidelines: Pregnancy care. The relevant extract has been reproduced in Appendix 4 (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/appendices/appendix-4-practice-summary-diabetes-in-pregnancy) .

Australasian Diabetes in Pregnancy Society 2020 guideline for pre-existing diabetes and pregnancy.[3]

The NDSS has produced a pregnancy planning checklist (https://www.ndss.com.au/about-diabetes/pregnancy/pregnancy-planning-checklist/) .

The NDSS and Diabetes Australia have produced a guide to planning and managing pregnancy for women with type 2 diabetes (https://www.ndss.com.au/wp-content/uploads/resources/booklet-pregnancy-having-healthy-baby-type2.pdf) .

Diabetes UK has developed a guide to pregnancy for women with diabetes (https://www.diabetes.org.uk/guide-to-diabetes/life-with-diabetes/pregnancy) .

The National Aboriginal Community Controlled Health Organisation and The Royal Australian College of General Practitioners National guide to preventive healthcare for Aboriginal and Torres Strait Islander people (https://www.racgp.org.au/national-guide) has information on pregnancy care for Aboriginal and Torres Strait Islander people with diabetes in Chapter 5.

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Gestational diabetes

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Overt diabetes in pregnancy (overt DIP) should be diagnosed at any time in pregnancy if one or more of the following criteria are met: • fasting plasma glucose (FPG) ≥7.0 mmol/L; • two-hour plasma glucose (2hPG) ≥11.1 mmol/L following a 75 g two-hour pregnancy oral glucose tolerance test (POGTT); and/or • glycated haemoglobin (HbA1c) ≥6.5% (≥48 mmol/mol).	Consensus	1	01/08/2025
Women with a previous history of gestational diabetes (GDM) or an early pregnancy HbA1c ≥6.0 to 6.4% (42-47 mmol/L) but without diagnosed diabetes, should be advised to undergo a 75 g two-hour POGTT prior to 20 weeks' gestation, ideally between 10-14 weeks' gestation but considering factors such as nausea. POGTT should not be performed prior to 10 weeks' gestation due to poor tolerance and limited evidence of benefit.	Consensus	1	01/08/2025
In the first trimester*, all women not known to have diabetes should be assessed for risk of hyperglycaemia. * at the initial Antenatal visit or between 10-14 weeks.	Consensus	2,3	14/11/2024

All women (without diabetes already detected in the current pregnancy) should be advised to undergo a 75 g two-hour POGTT at 24-28 weeks' gestation.	Consensus	1	01/08/2025
Irrespective of gestation, GDM should be diagnosed using one or more of the following criteria during a 75 g two-hour POGTT: • FPG ≥5.3-6.9 mmol/L; • one-hour plasma glucose (1hPG) ≥10.6 mmol/L; • 2hPG ≥9.0-11.0 mmol/L.	Consensus	1	01/08/2025
Pregnant women with GDM should be offered dietary advice and blood glucose monitoring, and be treated with glucose-lowering therapy** depending on target values for fasting and postprandial targets. **glucose lowering therapies: as individually indicated by multidisciplinary team	A	4, 5	14/11/2024
Consider continuous glucose monitoring (CGM) for pregnant women who are on insulin therapy but do not have type 1 diabetes, such as those with type 2 or GDM, if: • they have problematic severe hypoglycaemia (with or without impaired awareness of hypoglycaemia) or • they have unstable blood glucose levels that are causing concern despite efforts to optimise glycaemic control	High-level	5	14/11/2024
Postnatal education and support are important in preventing or delaying the onset of diabetes in the future, and women should be encouraged to attend postnatal testing.	Consensus	3	14/11/2024

Women diagnosed with GDM should have a 75 g two-hour oral glucose tolerance test, preferably at 6–12 weeks postpartum, with classification according to World Health Organization criteria.	Consensus	[6]	14/11/2024

Clinical context

Gestational diabetes (GDM; also referred to as gestational diabetes mellitus) is defined as glucose intolerance that begins, or is first diagnosed, during pregnancy. It may appear at any time during pregnancy, particularly in women at high risk of GDM.

Early gestational diabetes (eGDM) is defined as glucose intolerance (but not meeting the criteria for other forms of diabetes) that was diagnosed before 20 weeks gestation.

Diabetes in pregnancy is defined by the World Health Organization as pregnant women whose blood glucose levels in pregnancy meet the criteria used to diagnose diabetes outside pregnancy.[7] Some of these women may have previously undiagnosed diabetes (usually type 2).

Most published data that report on GDM include both diabetes in pregnancy and GDM, and indeed most women will fit the specific criteria for GDM.

Note that not all women with diabetes in pregnancy will continue to have diabetes following delivery. One Australian study reported that 41% of women with diabetes in pregnancy returned to normal glucose tolerance by 6–8 weeks postpartum.[8]

The 2008 Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study reported a correlation between increasing maternal glucose levels at 24–32 weeks gestation and a range of adverse maternal and fetal outcomes.[9] The study suggested that the relationship between increasing blood glucose levels and adverse effects was continuous, with no threshold or inflection point at which lower levels confer protection. Hyperglycaemia that is first detected at any time during pregnancy should be classified as either overt DIP or GDM. Early GDM refers to GDM detected before 20 weeks' gestation.[1]

The early testing and diagnosis of GDM has substantial costs, both for women and the health system. Early screening for people with a high risk of pregnancy-associated diabetes (see Box1) may detect undiagnosed diabetes requiring intervention and support for healthier pregnancy outcomes. However, general earlier screening (<24–28 weeks gestation) for GDM has not been supported by clinical evidence except in selected cases (prior GDM or elevated glycated haemoglobin [HbA1c] at the initial screening visit [eg 6.0–6.4%]).[10] The EGGO trial looked at early screening for gestational diabetes in obese women and did not show benefit.[11] However, the Treatment of Booking Gestational Diabetes Mellitus (ToBOGM) study went further and demonstrated that the immediate treatment of women diagnosed with GDM before 20 weeks (eGDM) led to a modest reduction in adverse neonatal outcomes (especially neonatal respiratory distress and days in the neonatal intensive care unit) and a reduction in adverse maternal outcomes (especially severe perineal tears); however, no material differences were observed for pregnancy-related hypertension or neonatal lean body mass.[12]

Women diagnosed using the criteria prior to the Australasian Diabetes in Pregnancy Society (ADPIS) 2025 update should continue to be managed with the same postnatal recalls and follow ups previously agreed.[6] Refer to 'Follow-up of patients with a history of GDM'. (#anchortest)

In practice

Overt DIP

Overt DIP should be diagnosed at any time in pregnancy if one or more of the following criteria are met:[1]

- FPG ≥7.0 mmol/L;
- 2hPG ≥11.1 mmol/L following a 75 g two-hour POGTT; and/or
- HbA1c ≥6.5% (≥48 mmol/mol).

Additionally, DIP may be present when a random glucose is ≥11.0mmol/l in the presence of clinical signs or symptoms indicative of hyperglycaemia.

Women with overt DIP should be managed similarly to those with pre-existing diabetes. At diagnosis, consideration should be given to the aetiology of diabetes, including the possibility of autoimmune diabetes. Not all women with overt DIP will have persistent diabetes postpartum, but the risk of future diabetes is high.[1]

If performed in early pregnancy, assessment of HbA1c should be classified under Medicare Benefits Schedule - Item 73839 (https://www9.health.gov.au/mbs/fullDisplay.cfm?type=item&q=73839&qt=item) as for the diagnosis of diabetes. This is because it is not intended for the diagnosis of GDM, but rather to identify women with previously undiagnosed diabetes in pregnancy who require early supportive interventions.

Identifying and diagnosing GDM

Identifying women at risk of GDM, or who have previously undetected hyperglycaemia, enables the GP to advise women appropriately on risk minimisation and provide support and treatment. Hyperglycaemia is increasing in pregnancy parallel to rising rates of diabetes and obesity. Of women giving birth in 2015–16, approximately 15% were diagnosed with GDM.[13]

Australian clinical guidelines for care during pregnancy recommend that:[3]

- Women who are at risk of hyperglycaemia (see Box 1) and who have not already been screened with a HbA1c in the past 12 months, should have a HbA1c at their first antenatal clinic visit in primary care.
- Women with a previous history of GDM or early pregnancy HbA1c of between 6.0-6.4% undergo a 75 gram POGTT prior to 20 weeks gestation, ideally between 10-14 weeks gestational age.
- Women tested in the first trimester of pregnancy (early pregnancy), with FPG <5.3 mmol/L can await further screening between 24-28 weeks gestation.
- All pregnant women (without diabetes) should be advised to undergo testing for hyperglycaemia between 24 and 28 weeks gestation.

Discussion to inform a woman's decision making about testing for hyperglycaemia should take place before testing.

Box 1. Identifying women at risk of gestational diabetes[1,6,14,15]

The following are risk factors for gestational diabetes (GDM)

Moderate risk factors for GDM

- Ethnicity: Asian, Indian subcontinent, Aboriginal, Torres Strait Islander, Pacific Islander, Māori, Middle Eastern, non-White African
- Body mass index (BMI) 25–35 kg/m2

Women with either ethnicity or a BMI of 25–35 kg/m2 as their only risk factor should be considered as being at 'moderate risk' and should initially be screened with either a random or a fasting glucose test in early pregnancy, followed by a pregnancy oral glucose tolerance test if clinically indicated. The thresholds for further action are not clear at present and clinical judgement should be exercised.

High risk factors for GDM

- Previous GDM
- Previously elevated blood glucose level
- Maternal age ≥40 years
- Family history of diabetes (first-degree relative with diabetes or a sister with GDM)
- BMI >35 kg/m2
- Previous macrosomia (baby with a birth weight >4500 g or >90th centile)
- polyendocrine metabolic ovarian syndrome
- Medications: corticosteroids, antipsychotics

Box 2. Diagnosis for GDM

Irrespective of gestation, GDM should be diagnosed using one or more of the following criteria during a 75 g two-hour POGTT:[1]

- FPG ≥5.3-6.9 mmol/L;
- 1hPG ≥10.6 mmol/L;
- 2hPG ≥9.0-11.0 mmol/L.

HbA1c is not recommended to test for GDM due to a lack of sensitivity.[3]

OGTT in pregnancy

Box 3. OGTT in pregnancy[16]

The correct procedure for a 75-g OGTT is as follows:

- an 8- to 12-hour overnight fast
- start the test before 9.30am
- patients should consume the glucose drink within five minutes, remaining seated throughout the two-hour test period
- ideally, the drink should be chilled to improve tolerance.

The OGTT should be postponed if the woman has an acute illness.

The correct procedure for OGTT is described in Box 3. The following conditions should be met before an OGTT is performed:[16]

- discontinue, when possible, medications known to affect glucose tolerance
- perform the test in the morning after three days of unrestricted diet (containing at least 150 g/day carbohydrates) and activity.

Some women may vomit during the OGTT. In such cases, if the recorded fasting glucose meets the criteria for GDM, the woman should be referred to start GDM management. If a woman's fasting glucose level is normal, repeat the OGTT with the woman taking metoclopramide beforehand. Metoclopramide does not appear to alter glucose absorption, but ondansetron may lead to falsely lower post-load glucose levels. Recliner chairs can also reduce the tendency to vomit.

Women who have had metabolic surgery should not be sent for an OGTT because they may not be able to tolerate the test.[17] Seek specialist advice from your local diabetes-in-pregnancy service regarding alternative testing options.

Although none will equate to an OGTT, alternatives include giving a different source of 75 g carbohydrate, measuring blood glucose concentrations using continuous glucose monitoring, measuring fasting and postprandial blood glucose concentrations with capillary (fingerprick) blood testing, measuring HbA1c or using a combination of these methods.

Women who have had metabolic surgery also need particular assessment throughout pregnancy regarding nutritional status, the need for higher multivitamin doses and close obstetric monitoring.[17] Referral to appropriate specialty services is strongly advised prior to and during pregnancy, even for women in this group who do not have diabetes or GDM.

Management of GDM

Lifestyle interventions and insulin remain the mainstay of treatment for GDM. All women with GDM should be offered individualised management, including education, appropriate blood glucose monitoring and dietary advice.

Education

In most cases, GDM responds positively to lifestyle management, and women should be referred to an accredited practising dietitian and a credentialled diabetes educator, if these are not provided by their obstetric service.

All women with GDM who qualify for Medicare access should be registered with the National Diabetes Services Scheme (NDSS) on the National Gestational Diabetes Register (https://www.ndss.com.au/about-the-ndss/national-gestational-diabetes-register/) .

If GDM diabetes is diagnosed during pregnancy, points for discussion include:[3]

- the role of diet, physical activity and pregnancy/gestational weight gain in managing diabetes
- that healthy dietary patterns can be supported by individualised advice from an accredited practising dietitian as part of the multidisciplinary team and, when appropriate, may be characterised by the intake of whole foods such as fruits, vegetables, legumes, wholegrains, fish, seafood, unprocessed meats, dairy foods and water
- the role of insulin or metformin in the management of diabetes (ie if diet and physical activity do not adequately manage blood glucose levels)
- the importance of monitoring and managing blood glucose levels during pregnancy, labour and birth and early feeding of the baby to reduce the likelihood of the baby having macrosomia and associated risks (eg fractures, shoulder dystocia, jaundice)
- the possibility of the baby requiring admission to a special care nursery/neonatal intensive care unit to manage possible hypoglycaemia or respiratory distress
- the woman's increased future risk of developing type 2 diabetes and cardiovascular disease, and the importance of reviewing glucose tolerance postpartum and maintaining a healthy weight
- the benefits of registering on the NDSS, including the National Gestational Diabetes Register (eg reminders for glucose tolerance assessment)
- the benefits of breastfeeding in reducing the risk of the woman developing type 2 diabetes in the future
- the risk of the baby developing obesity, heart disease and/or diabetes in the future.

Follow-up of patients with a history of GDM

Women diagnosed with GDM have an approximate 40% risk of recurrence of GDM in a subsequent pregnancy and an increased risk of developing future type 2 diabetes.[18] Regular ongoing surveillance is required.[6] Box 4 provides RACGP criteria for the follow-up of patients with a history of GDM.

A review of medications needs to be assessed with any ongoing breast feeding and appropriateness of ongoing prescribing. Primary care provides an ideal environment to support the mother and infant in the postnatal period, including psychosocial and mental health support, lifestyle advice and support and, where appropriate, referral to maintain the health of the mother and child.

Box 4. Follow-up of people with a history of gestational diabetes

- Conduct a 75-g two-hour oral glucose tolerance test (OGTT) at 6–12 weeks postpartum
- If the results are normal, conduct a fasting blood glucose and glycated haemoglobin (HbA1c) test every three years. Screening and diagnostic criteria for type 2 diabetes follow those set out in the section 'Defining and diagnosing type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/defining-and-diagnosing-type-2-diabetes) '
- Women with HbA1c ≥6.0% (42 mmol/mol) may require further investigation and advice before another pregnancy occurs
- Women contemplating another pregnancy should have an OGTT annually[3]
- Enrol any person on the NDSS National Gestational Diabetes Register
- Advise and support sustainable lifestyle changes to maximise health goals, including weight, psychological wellbeing and relevant modifiable risks for cardiovascular disease
- Re-evaluate any prior ceased medication with pregnancy for either deprescribing or reintroduction on an individual basis acknowledging the risks associated with lactation

Change history

01/08/2025

Content has been updated to align with ADIPS 2025 Consensus Recommendations for the Screening, Diagnosis and Classification of Gestational Diabetes, which provides updated diagnostic glucose thresholds for GDM and clarifies approaches to early pregnancy screening for women with risk factors for hyperglycaemia in pregnancy.[1]

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Type 2 diabetes management for older people and residential aged care facilities

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Consider the assessment of medical, psychological, functional (self-management abilities) and social domains in older adults to provide a framework to determine targets and therapeutic approaches for diabetes management.	B	1	14/11/2024
Screen for geriatric syndromes (ie polypharmacy, cognitive impairment, depression, urinary incontinence, falls, persistent pain, and frailty) in older adults, as they may affect diabetes self-management and diminish quality of life.	B	1	14/11/2024
Overtreatment of diabetes is common in older adults and should be avoided. Deintensification (or simplification) of complex regimens is recommended to reduce the risk of hypoglycaemia in older adults, if achievable within the individualised HbA1c target.	B	1	14/11/2024

For older adults in residential aged care facilities, individualised care plans should be developed and agreed upon by the individual, their general practitioner (GP) and facility staff. This will provide clarity regarding aims of care and metabolic targets, and facilitate screening for diabetes-related complications and annual reviews.	Consensus*		14/11/2024

*Consensus-based recommendation formulated by the RACGP Diabetes Handbook Expert Advisory Group.

Clinical context

In 2020, there were an estimated 4.2 million Australians aged ≥65 years, with these older people comprising 16% of the total population.[2] This number and percentage is expected to grow; by 2066 it is projected that older people will make up between 21% and 23% of the total population.[2] The prevalence of type 2 diabetes increases with age and, in 2021, of the 1.2 million Australians living with type 2 diabetes, 59% were aged ≥65 years.[3] There is a high burden of diabetes in Australian long-term care facilities, with nearly one in three aged care residents (28.2%) living with diabetes.[4]

The 'older' or 'elderly' age group is often defined administratively and in clinical studies as ≥65 years; however, there is movement to raise this definition to ≥75 years because the physical and mental functioning of the ageing population is improving.[5] The status of 'elderly' might be better defined based on function, cognition, ability to self-care and quality of life. Therefore, the principle of individualised care still applies to older people with type 2 diabetes, and people in this group who are otherwise well and functionally independent should be treated in the same way as any other patient.[6]

There are, however, differences that GPs must consider in this cohort regarding the signs and symptoms of type 2 diabetes in older people and the goals of treatment. These may be particularly relevant to residents of aged care facilities, where management of diabetes can be challenging, inadequate or inappropriate.

In practice

Diagnosing type 2 diabetes in older people

Many of the symptoms of type 2 diabetes in older people are the same as in younger people; however, they can often be overlooked or mistakenly attributed to 'old age'. It is important to be alert to the clinical features of diabetes in older patients, such as:

- lethargy
- urinary incontinence as part of polyuria
- recurrent infections

- slow wound healing
- cognitive changes.

GPs should also be aware that type 1 diabetes does occur in older people; clear identification of diabetes type is therefore vital.

For more information, refer to *The McKellar guidelines for managing older people with diabetes in residential and other care settings* (http://adma.org.au/download/the-mckellar-guidelines/) .

Assessment

The following additional assessment should be undertaken in elderly patients with type 2 diabetes:[1]

- full assessment of physical, mental and social health, including falls risk, nutrition and immunisation status
- careful screening and monitoring for cognitive impairment.

The NO TEARS tool[7,8] can be useful to review medications and can be tailored to the individual practitioner's consultation style:

- **N**eed and indication
- **O**pen questions
- **T**ests and monitoring
- **E**vidence and guidelines
- **A**dverse events
- **R**isk reduction or prevention
- **S**implification and switches

Additional tools as outlined in the *RACGP aged care clinical guide (Silver Book)* (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/silver-book) to help identify medication-related safety concerns and potential medication to deprescribe or reintroduce include:

- Screening Tool of Older People's Prescriptions (STOPP)
- Screening Tool to Alert to Right Treatment (START).

An accredited pharmacist may be helpful in initiating any such changes.

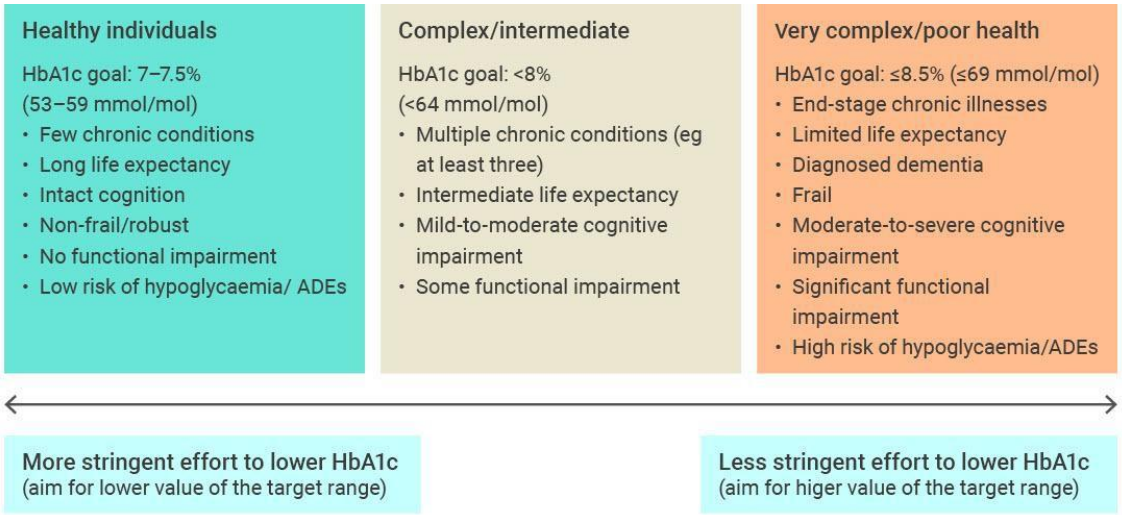
For information about frailty screening, assessment and management, see:

- 'Frailty (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/silver-book/part-a/frailty) ' in the *RACGP aged care clinical guide (Silver Book)*
- Identifying frailty (https://www2.health.vic.gov.au/hospitals-and-health-services/patient-care/older-people/frailty/frailty-identifying) (State Government of Victoria)
- 'Diabetes in long-term care (https://guidelines.diabetes.ca/cpg/chapter37#sec6) ' in *Diabetes in older people* (Diabetes Canada)
- a statement of key principles (https://www.medscape.co.uk/viewarticle/diabetes-and-frailty-expert-consensus-statement-management-2022a100254u) from Diabetes UK.

Management and care planning

Care planning is vitally important in older people with diabetes. It can provide clarity regarding aims of care and help avoid reactive management to problems. Care planning should include up-to-date care plans, regular reviews, documented sick-day management plans and hyper- and hypoglycaemia risk assessment.

Management of diabetes in elderly patients should take into account quality of life, life expectancy and functioning (Figure 1). In some patients, strict glycaemic management may be less important than risk minimisation and maintaining quality of life. Blood glucose targets may therefore be higher than for younger adults with type 2 diabetes (see 'Considerations in management ' below).



ADEs, adverse drug events; HbA1c, glycated haemoglobin

Source: Adapted from Stasinopoulos J, Bell J, Manski-Nankervis J, Hogan M, Jenkin P, Sluggett JK. Medication management of type 2 diabetes in residential aged care. Aust J Gen Pract 2018;47(10):675–81.

Figure 1. Consensus framework for individualising targets and therapeutic approach to glycaemic management across the continuum of care for older people with type 2 diabetes.[9]

However, optimising glycaemia might help prevent acute symptoms of diabetes such as polyuria, weight loss, confusion and falls.[9] Note that HbA1c levels greater than 8–8.5% (64–69 mmol/mol) are associated with greater morbidity and mortality in older patients.[10,11] Older people with diabetes have higher rates of conditions that might impair their ability to self-manage diabetes compared with younger people. These include functional disability, accelerated muscle loss, osteoporosis, cognitive impairment, urinary incontinence, injurious falls and persistent pain.[1]

Refer to the section 'Managing multimorbidity in people with type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-multimorbidity-in-people-with-type-2-diab) ' for approaches to managing comorbidities, including cognitive decline.

Possible strategies to manage diabetes in some clinical presentations are described in table 3 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5317234/table/T3/) in the American Diabetes Association publication *Management of diabetes in long-term care and skilled nursing facilities*.[12]

Considerations in management

Older people are at higher risk of hypoglycaemia, so medication regimens should aim to avoid hypoglycaemia.[1] Where needed, individualised targets should be redefined, and treatment regimens deintensified (if possible) to reduce the risk of hypoglycaemia and avoid polypharmacy.[1]

Older people with diabetes should have an individualised hypoglycaemia management plan.

Glycaemic targets for some elderly people may be higher than for the non-elderly (eg an HbA1c target of 8% [64 mmol/mol] rather than 7% [53 mmol/mol]). Intensive glycaemic management reduces microvascular but not macrovascular complications, and may increase adverse events and mortality. However, optimising glycaemia might help prevent acute symptoms of diabetes such as polyuria, weight loss, confusion and falls.[9] Note that HbA1c levels greater than 8–8.5% (64–69 mmol/mol) are associated with greater morbidity and mortality in older patients.[10,11]

Consideration of the use of insulin to reduce symptoms of hyperglycaemia in combination with other glucose-lowering medications is still possible in the elderly. Complex regimens should be avoided, and prefilled insulin pens can reduce dosing errors.[13] Nursing or carer support may be needed to administer injections; however, older people who have been self-injecting their insulin at home should be enabled to continue to do so in a residential aged care facility, subject to their capability.

Insulin regimens and the time/frequency of blood glucose monitoring should be reviewed regularly, including a review of doses and timing of administration relative to food intake, activity, frailty or clinical changes and glycaemic profile. There should not be a ‘set and forget’ approach. Technology such as continuous glucose monitoring (CGM) may need specific management plans from a credentialled diabetes educator to provide support and advice for appropriate nursing support while in residential care.

Reduce polypharmacy after discussion with clinical staff and family. Very often medications are listed as ‘prn’, but could be stopped.[14] Consider fixed-dose combinations where available to assist ‘pill burden’.

Table 1 presents prescribing considerations of different glucose-lowering medications in elderly patients.

Table 1: Considerations for selecting, monitoring and deintensifying glucose-lowering medications in elderly people with type 2 diabetes[9]

Medication	Considerations for elderly populations
Metformin	• May cause weight loss and gastrointestinal upset • Cease if diarrhoea continues for a few days after starting, even after dose reduction • Extended-release form has fewer gastrointestinal side effects and may reduce regimen complexity; however, cannot be crushed • In renal impairment, cease if at risk of further decline in renal function
Sulfonylureas	• Efficacy may reduce over time as ß-cell function is lost • Long-acting sulfonylureas (glimepiride, glibenclamide and slow-release gliclazide) have a higher risk of hypoglycaemia. Avoid in frail people or when eating patterns are irregular
DPP-4i	• Given once daily, except vildagliptin (once or twice daily) • Dose reduction is required in renal impairment, except linagliptin (excreted unchanged in bile)
GLP-1RAs	• May cause weight loss. Need to consider issues of malnutrition and sarcopenia and avoid in people who are frail and underweight • Gastrointestinal effects are more common in older people • Liraglutide is not recommended in people aged ≥75 years and in end-stage renal disease (no experience in these groups)
Acarbose	• Limited role because of gastrointestinal side effects and inferior glycaemic effect compared with metformin and sulfonylureas
Thiazolidinediones	• May worsen heart failure, oedema and bone fracture risk • Change in glycaemic management may take up to 12 weeks after initiation, dose changes or cessation

Table 1: Considerations for selecting, monitoring and deintensifying glucose-lowering medications in elderly people with type 2 diabetes[9]

Medication	Considerations for elderly populations
SGLT2i	• Watch for increased urinary frequency or incontinence, genitourinary infections and dehydration, which can contribute to delirium • Not recommended with loop diuretics, due to volume depletion concerns • May be problematic in people with urinary incontinence and those who require assistance getting to the toilet • Care should be taken with use in people aged ≥75 years and in end-stage renal disease (limited experience in these groups) • May be prescribed primarily for the treatment of heart failure and/or chronic kidney disease even when limited glycaemic efficacy is indicated
Insulin	• Appropriate meal planning is essential • Basal insulin may have a lower hypoglycaemia risk than premixed insulin in some cases • Administration by syringe increases the risk of overdose; a pen device is preferred in residential aged care facilities

DPP-4i, dipeptidyl peptidase-4 inhibitors; GLP-1RAs, glucagon-like peptide-1 receptor agonists; SGLT2i, sodium-glucose cotransporter 2 inhibitors. Source: Adapted from Stasinopoulos et al.[9]

Lifestyle interventions

Diet

Nutritional interventions can help reduce the risk of adverse diabetes events in older people, such as hypoglycaemia, undesired weight loss, frailty and falls.[1,15] It is important to consider the different nutritional needs of elderly people compared with younger people, including the healthy weight range in people aged >65 years.

Elderly people may lack awareness of thirst, and can experience reduced appetite. Adequate hydration and nutrition can therefore be a problem. Consideration of the use of an accredited practicing dietitian and supplementing nutrition with diabetes specific formulas may assist with nutritional problems. Other areas to assess and monitor include constipation, oral hygiene and the ability to cook or shop for food.

Refer also to the National Diabetes Services Scheme (NDSS) booklet *Healthy eating: A guide for older people living with diabetes*.[16]

Physical activity

Even in older adults with multiple chronic diseases, the risks associated with exercise are considered to be less than those of inactivity. Targeted exercise programs (aerobic, resistance, balance training or a combination) have been shown to provide clinically significant symptom relief for osteoarthritis, peripheral vascular disease, mobility impairment, peripheral neuropathy and elevated fall risk, depression and cognitive impairment.[17]

Therefore, exercise training is an essential component of any treatment plan for all elderly people who have, or are at risk of, type 2 diabetes.[17] An accredited exercise physiologist can safely prescribe exercise programs. For more information, refer to ' (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/lifestyle-interventions-for-the-management-of-type) Lifestyle interventions for management of type 2 diabetes '.

Sick-day management

Sick days should be planned for as usual, with the additional inclusion of advice for nurses or carers. Refer to 'Managing risks and other impacts of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-risks-and-other-impacts-of-type-2-diabete) '.

Diabetes management in residential aged care facilities

The McKellar guidelines for managing older people with diabetes in residential and other care settings (https://adma.org.au/download/the-mckellar-guidelines/) provide comprehensive and detailed information about managing older patients with type 2 diabetes in aged care facilities, including hyperglycaemia management guidelines (pp 25–28) and hypoglycaemia management guidelines and a risk tool (pp 29–33). Medical considerations for care plans are also presented in Appendix 5 (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/appendices/appendix-5-medication-related-care-plan-considerat) .

The key considerations in residential care are the same as for other elderly patients; however, optimising care will necessarily involve collaboration with health professionals such as nurses, aged care staff, pharmacists, dietitians, credentialled diabetes educators and residential-based allied health teams.

Staff clinical knowledge and communication is critical. Page 15 of *The McKellar guidelines for managing older people with diabetes in residential and other care settings* (https://adma.org.au/download/the-mckellar-guidelines/) outlines to residential care staff how to consult with GPs in terms of care context and preparation for a GP consultation. Refer to the 'Resources ' (#accordion-heading-Content4) list at the end of this section for links to guidebooks specifically for residential care staff.

In addition to the considerations listed above, medication management in residential aged care facilities requires management of the complex processes that underpin prescription, supply, administration and monitoring of glucose-lowering medication in residential aged care facilities.

- Consider residents' goals of care and susceptibility to adverse drug events.[9]

- Aim for optimisation of care, deprescribing, reducing polypharmacy and avoiding hypoglycaemia.
- Conduct medication reviews with facility pharmacists and nurses.[9]
- Appropriate training for nursing staff (preferably annually) will help with care, and should include the safe management of insulin, understanding insulin profiles, monitoring blood glucose levels and when to increase monitoring.

For more information about medicine management, deprescribing and polypharmacy, refer also to the *RACGP aged care clinical guide (Silver Book)* (https://www.racgp.org.au/silverbook) .

Resources

The Royal Australian College of General Practitioners (RACGP) provides general guidance on aged care in the *RACGP aged care clinical guide (Silver Book)* (https://www.racgp.org.au/silverbook) .

Assessment and management

Diabetes UK has produced a statement of key principles (https://www.medscape.co.uk/viewarticle/diabetes-and-frailty-expert-consensus-statement-management-2022a100254u) of management, including the assessment of frailty, in older people with type 2 diabetes. Trend Diabetes has published the *For healthcare professionals: Diabetes and dementia: Guidance on practical management* (https://trenddiabetes.online/wp-content/uploads/2023/11/HCP_Dementia_TREND_2023_FINAL.pdf) , which includes practical management of diabetes and dementia. *Diabetes and Frailty: An Expert Consensus Statement on the Management of Older Adults with Type 2 Diabetes* (https://link.springer.com/article/10.1007/s13300-021-01035-9) provides guidance on the assessment of frailty in older adults with type 2 diabetes, including target setting, recommended interventions and treatment goals according to frailty in older adults with diabetes (table 2 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5317234/table/T2/)). Care plan contribution template (https://www.health.gov.au/resources/publications/care-plan-contribution-template?language=en) ; this template can be used as a care planner for aged care home residents registered as incentive patients.

Lifestyle interventions

The Australian Government has developed physical activity guidelines for older adults (https://www.healthdirect.gov.au/physical-activity-guidelines-for-older-adults) . The National Diabetes Services Scheme (NDSS) has produced a guide to healthy eating for older people living with diabetes (https://www.ndss.com.au/wp-content/uploads/booklets/booklet-healthy-eating-guide-for-people-over-65.pdf) .

Aged care facilities

Deakin University and Barwon Health have published *The McKellar guidelines for managing older people with diabetes in residential and other care settings* (https://adma.org.au/download/the-mckellar-guidelines/) , which includes tools for assessing the risk of adverse drug events from glucose-lowering medication. The NDSS has developed a handbook and fact sheet on diabetes management in aged care (https://www.ndss.com.au/about-diabetes/supporting-older-people-with-diabetes/residential-aged-care-facility/) . The NDSS has devised a quality review tool for management of aged care residents with diabetes (https://www.ndss.com.au/wp-content/uploads/resources/aged-care-quality-review-tool-management-of-residents-with-diabetes.pdf) .

Palliative and end-of-life care for older people with diabetes

The Centre for Quality and Patient Safety Research has information on palliative and end-of-life care for older patients (https://www.dropbox.com/s/ypmfadvgeqvijfe/Information-to-help-older-people.pdf?dl=0) , families (https://www.dropbox.com/s/u5absf19uv01kmx/Information-to-help-family.pdf?dl=0) and healthcare professionals (https://www.dropbox.com/s/ubjazs6z6rsoq4l/Information-for-HPs.pdf?dl=0) .

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Diabetes and end-of-life care

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Determine a blood glucose and glycated haemoglobin (HbA1c) range that is appropriate for the individual, aligns with the individual's advance care plan and avoids hypoglycaemia and symptomatic hyperglycaemia.	Consensus*		14/11/2024

*Consensus-based recommendation formulated by the RACGP Diabetes Handbook Expert Advisory Group.

Clinical context

The general aims of end-of-life care in the months before progression to palliative care (terminal illnesses in the days or weeks before expected passing) for people with type 2 diabetes are to:[1]

- consider ethical and legal aspects of care
- improve and maintain dignity and quality of life
- help the person achieve life goals
- manage pain and distressing symptoms
- talk honestly about prognosis and the person's concerns, values and goals
- achieve a dignified death in a place of the person's choosing
- advance care planning, will preparation, completion of enduring power of attorney, statements of choices and appropriate family meetings[2]
- support family and carers.

Clinically, this will usually involve modifying the person's usual care so that an appropriate level of intervention is provided, according to terminal stage, prognosis, symptoms, personal values and dignity. This can be challenging, and requires general practitioners to manage:[3]

- changes to glycaemic targets

- individual and carer expectation
- risk of hyperglycaemia and hypoglycaemia
- effects of other medications, such as corticosteroids
- tailoring of glucose-lowering medications
- de-intensification/deprescribing (eg aspirin, statins, blood pressure medications).

In practice

Ideally, discuss dying with individuals and their families prior to the need for end-of-life care so that the important considerations can be addressed in advance care planning.[1] Liaison with a palliative care team and community diabetes team is recommended as part of a multidisciplinary approach to end-of-life diabetes care.[4]

Managing glycaemia

Although there is little evidence about optimal blood glucose range, it is generally agreed that a range of 6–15 mmol/L is appropriate for most palliative care people to optimise their wellbeing and cognitive function.[5,6]

Multiple factors can affect glycaemic management in terminally ill people (Box 1). Glucose-lowering therapy should be tailored to minimise the risks of hypoglycaemia and hyperglycaemic states and symptoms.

Hyperglycaemia can worsen pain, confusion, thirst, cognition, confusion and incontinence. Blood glucose levels >15 mmol/L may cause polyuria and increase the risk of infection. Diabetic ketoacidosis can mimic terminal illness. If not recognised and treated, it can severely impair quality, and even duration, of life.

Hypoglycaemia can also cause discomfort, confusion, falls risk and impaired cognitive function.

Box 1. Factors affecting glycaemic management in people with type 2 diabetes at end of life

- Stress response to severe or sustained illness
- Poor appetite/smaller or irregular meals
- Poor nutrition
- Weight loss and cachexia
- Malignancy
- Dehydration
- Organ failure
- Chemotherapy
- Difficulty taking medications
- Frequent infections

Diabetes medications at end of life

The key considerations for decision making regarding glucose-lowering medication are risk minimisation and quality of life. The following classes of medications should be avoided in certain cases:[3]

- insulin and long-acting sulfonylurea preparations (eg glibenclamide, glimepiride) if small meals are being taken due to risks of hypoglycaemia
- sodium–glucose cotransporter 2 inhibitors (SGLT2i) if dietary intake is reduced; reduced intake can increase ketone production and may increase the risk of ketoacidosis, which can be euglycaemic
- glucagon-like peptide-1 receptor agonists (GLP-1RAs) if people have reduced or poor appetites.

Renal function may also decline, and several non-insulin glucose-lowering medications should be discontinued in response to this.

The Diabetes UK guideline End of life diabetes care: Clinical care recommendations (https://www.diabetes.org.uk/professionals/position-statements-reports/diagnosis-ongoing-management-monitoring/end-of-life-care) provides recommendations for tailoring medication at different stages of end-of-life care. An algorithm for managing diabetes in the last days of life is also provided.[3]

Consider referral to specialist care for assistance with complex treatment, such as managing frequent hypoglycaemia, the use of insulin or managing the effects of steroids on glycaemia.

Voluntary assisted dying

Voluntary assisted dying is an additional end-of-life choice that gives eligible people who are suffering and dying the option of asking for medical assistance to end their lives. There are strict eligibility criteria[7] for accessing voluntary assisted dying. Please refer to state-based guidelines and criteria for more information.

Resources

Refer also to 'Type 2 diabetes management for older people and residential aged care facilities (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/management-of-type-2-diabetes-in-older-people-and) '.

For health professionals

- Deakin University has produced comprehensive information about end-of-life care for people with diabetes, including advance care planning, in the Guidelines for managing people with diabetes at the end of life care: Final report (https://dro.deakin.edu.au/articles/book/Guidelines_for_managing_people_with_diabetes_at_the_end_of_life_Final_report_2010/21021745) .
- The Diabetes UK guideline End of life diabetes care: Clinical care recommendations (https://www.diabetes.org.uk/professionals/position-statements-reports/diagnosis-ongoing-management-monitoring/end-of-life-care) provides recommendations for tailoring medication and an algorithm to manage diabetes at end of life.
- The National framework for advance care planning documents (https://www.health.gov.au/resources/publications/national-framework-for-advance-care-planning-documents?language=en) supports advance care planning across all states and territories.

For carers

- Palliative Care Australia has produced information for family members and carers (https://palliativecare.org.au/im-a-carer/) on diabetes and palliative care.

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Managing risks and other impacts of type 2 diabetes

Table of recommendations

Recommendation	Grade	References	Recommended as of:
Sick day management Sick-day management plans are an integral component of diabetes education. The development of a sick-day management plan along with education on sick-day management should be provided at diagnosis and reviewed or updated at regular intervals.	Consensus	1-3	14/11/2024
Sleep and diabetes Consider screening for sleep health in people with diabetes, including symptoms of sleep disorders, disruptions to sleep due to diabetes symptoms or management needs and worries about sleep. Refer to sleep medicine specialists and/or qualified behavioural health professionals as indicated.	B	4	14/11/2024

Planning surgical procedures When commencing a person with diabetes on sodium-glucose cotransporter 2 inhibitors (SGLT2i), clinicians should inform them about the risk of diabetic ketoacidosis (DKA) associated with clinical procedures, ideally with written information and management plans. It is advisable to document that the advice has been provided.	Consensus	[5]	14/11/2024
Dementia and cognitive decline Screening for early detection of mild cognitive impairment or dementia should be performed for adults 65 years of age or older at the initial visit, annually, and as appropriate.	B	[6]	14/11/2024
Dementia and cognitive decline In the presence of cognitive impairment, diabetes treatment plans should be simplified as much as possible and tailored to minimise the risk of hypoglycaemia.	B	[7]	14/11/2024

Immunisation

Recommended vaccines for people with type 2 diabetes are as follows:[8-10]

- **Influenza** - annual vaccination is recommended for people with chronic conditions, including diabetes, that require regular medical follow-up or have required hospitalisation in the past year.
- **Diphtheria, tetanus, pertussis** – for all adults aged ≥65 years if they have not had one in the previous 10 years.
- **Hepatitis B** - consider for travellers to hepatitis B-endemic areas.
- **Herpes zoster** – consider for Aboriginal and/or Torres Strait Islander peoples aged 50 years and over, and for the general population aged 65 years and over (available for free in this age group under the National Immunisation Program).
- **COVID 19** – assess as per current Australian Technical Advisory Group on Immunisation (ATAGI) advice (https://www.health.gov.au/our-work/covid-19-vaccines/advice-for-providers) .[11]
- **Pneumococcus** – diabetes is considered a 'Category B' condition for increased risk of invasive pneumococcal disease. It is recommended that all adults with type 2 diabetes receive:
    - one dose of a pneumococcal conjugate vaccine (13vPCV, 15vPCV or 20vPCV [only

people aged ≥18 years are eligible for 20vPCV]) at diagnosis (at least two months after any previous doses of a pneumococcal conjugate vaccine) and
    - one dose of 23vPPV 12 months after a pneumococcal conjugate vaccine (13vPCV, 15vPCV or 20vPCV; 2–12 months later is acceptable) and
    - a second dose of 23vPPV at least five years after the first dose of 23vPPV.
    - For people who have previously received doses of 23vPPV, it is recommended they receive an age-appropriate pneumococcal conjugate vaccine 12 months after their last 23vPPV dose. If they have already received at least two doses of 23vPPV, no further 23vPPV doses are recommended.
- Respiratory syncytial virus (RSV) vaccine – adults aged >60 years.[12]

- Consult the *Australian immunisation handbook* (https://immunisationhandbook.health.gov.au/contents/vaccine-preventable-diseases) for specific advice.

Sick-day management

'Sick days' are periods of minor illness (due to other causes) of around 1–4 days duration that require changes to a person's usual diabetes self-management.

People with diabetes require careful individualised management during these periods to prevent:

- hyperglycaemic and hypoglycaemic emergencies
- hyperosmolar hyperglycaemic state
- DKA.

Refer below or to The Royal Australian College of General Practitioners (RACGP) and Australian Diabetes Society (ADS) clinical position statement 'Emergency management of hyperglycaemia in primary care'.[13]

Provide telephone access or after-hours support to ensure continuity of advice and accessibility. Increase self-monitoring of blood glucose (SMBG) if required by individual circumstances (eg people at risk of hypoglycaemia or using a sulfonylurea or insulin). Advise on obtaining a blood ketone monitor and appropriate monitoring strips if a risk of DKA exists (SGLT2i use or pregnancy). Refer to the National Diabetes Services Scheme (NDSS) (https://www.ndss.com.au/wp-content/uploads/forms/blood-glucose-test-strip-6-month-access-approval-form.pdf) website for necessary forms.

Review medications (see Table 1).

A warning regarding the use of SGLT2i and DKA: SGLT2i carry a small but definite risk of a form of DKA, sometimes without significantly raised blood glucose levels (euglycaemic DKA).[5] People should be periodically warned that the chance of developing DKA (which can be euglycaemic) is low, but advised of the symptoms and told to present to an emergency department if they develop any of these symptoms.[13] People should be instructed on obtaining a ketone monitor and appropriate monitoring strips and they should inform treating doctors that they are taking an SGLT2i. Risk factors and warning signs should be incorporated into their management plan.[5] Note that DKA/euglycaemic DKA should be considered in people who are taking an SGLT2i if they exhibit abdominal pain, nausea, vomiting, fatigue or metabolic acidosis.[5]

General practices and general practitioners (GPs) should consider routinely incorporating sick-day plans into a person's documented management plans.

Sick-day management should be tailored to the individual and involve identifying the underlying cause (always consider possible undiagnosed type 1 diabetes) and treating as appropriate. Underlying causes include:

- intercurrent illnesses, sepsis, infections (eg skin, urinary tract and chest infections), trauma, acute myocardial infarction and stroke
- the use of medications such as corticosteroids.

Special considerations

Diabetes carries a higher risk of morbidity and mortality from infection with COVID-19[14] and influenza[15], and GPs have an essential role in supporting people with diabetes.

In addition to addressing the extra vulnerability with sick days from illness such as COVID-19 and influenza, it is also essential to ensure other aspects of diabetes management are not neglected. Some simple steps to help GPs and people manage diabetes amid ongoing risks are outlined in the sections below.

Identify people in high-risk diabetes groups as a priority for focused clinical review, and proactively schedule timely in-person or telehealth appointments. High-risk groups include people who:[16-19]

- have type 1 diabetes
- are aged ≥65 years
- have insulin-requiring type 2 diabetes
- are using SGLT2i agents (elevated risks of DKA)
- have multimorbidity or diabetes complications
- have unstable HbA1c ≥8.5% or with no recorded HbA1c in the past 6–12 months
- smoke.

However, all people with diabetes may need advice on preventive health, immunisations and sick-day management and timely access (if indicated) to antiviral agents.

Different groups have different considerations for sick-day management.

Type 2 diabetes managed with diet alone

- For worsening glycaemia, consider the introduction of medication and symptomatic management of hyperglycaemia.
- During inter-current illnesses, consider SMBG (refer to the NDSS website for necessary forms).
- People with type 2 diabetes may have impaired body systems that will make recovery slower.
- In addition, people may become dehydrated because of the osmotic diuresis.

Type 2 diabetes managed with oral or non-insulin glucose-lowering medication

- Worsening glycaemia may require urgent review by the GP or referral to a specialist diabetes service or hospital emergency department, or contact with an endocrinologist.
- Additional insulin (short-acting or prandial) may be temporarily required for persistent and extreme symptomatic hyperglycaemia (≥15 mmol/L), which may also require hospital admission.
- In people with nausea, vomiting and/or diarrhoea:

- consider temporarily stopping metformin and glucagon-like peptide-1 receptor agonists (GLP-1RAs). Metformin may aggravate these symptoms, and GLP-1RAs may aggravate nausea or vomiting. There may be a risk of acute renal impairment due to dehydration
- review and cease SGLT2i, metformin and GLP-1RAs if acute gastrointestinal illness is present because these medications may further aggravate dehydration and hypovolaemia.
- note that DKA/euglycaemic DKA[13] should be considered in people who are taking SGLT2i if they display abdominal pain, nausea, vomiting, fatigue or metabolic acidosis.[5] Advise on the timely assessment for blood ketones using a home ketone monitor.

Type 2 diabetes managed on insulin

- All people should commence SMBG and, if needed, have adequate insulin delivery devices and pen needles and be advised to seek an urgent review by their GP or health professional when unwell or if their blood glucose is >15 mmol/L on two consecutive SMBG readings (at two hours apart), as per the action plan. Assess blood ketones in this setting if the person is using SGLT2i or they are pregnant.
- Blood glucose monitoring should be increased to every two to four hours if unwell. People on insulin may need to increase their morning intermediate or long-acting insulin dose by 10–20% if the glucose reading remains elevated and, depending on further blood glucose levels, modify subsequent doses of short-acting insulin during the day. For people on ultra-long-acting basal insulins, including glargine U300 or degludec insulins, GPs may need to seek advice from an appropriate specialist regarding dose adjustment because dose changes may take four to seven days to take effect. Advice on the additional use of oral agents and GLP-1RAs is listed in Table 1.
- Additional blood ketone testing (with appropriate self-monitoring equipment) may be incorporated if the person is using an SGLT2i, if there are symptoms suggestive of ketosis (eg nausea, vomiting, shortness of breath or fruity odour, abdominal pains, altered consciousness) or there is a history of DKA (refer to Emergency management of hyperglycaemia in primary care[13]). This should be a documented strategy in the person's sick-day management plan
- Note that many people are only on basal insulin or a premixed insulin with oral medications. These people require appropriate medical advice, and may need acute medical advice or a prescription for additional rapid-acting insulin to use as a supplemental insulin dose.1 If uncertain, consult an appropriate specialist.
- People with gastrointestinal upset who are not eating, but who feel well and continue their usual activities, may need to reduce their insulin according to SMBG readings (especially rapid-acting insulin) to avoid hypoglycaemia. For more information, refer to the NDSS clinical guiding principles for sick-day management.

Table 1. Action plan for management of sick days in people with type 2 diabetes[1,20]

Commence action plan	Commence: • when a person starts to feel unwell for any reason or • if blood glucose is >15 mmol/L on two consecutive readings
Frequency of blood glucose monitoring	Monitor every 2–4 hours, or more frequently if blood glucose is low Ketones to be assessed with persistent hyperglycaemia ≥15 mmol/L on two occasions, two hours apart if using SGLT2i or the person is pregnant
Medication	Continue insulin or diabetes medications, but assess use of metformin, SGLT2i (dapagliflozin or empagliflozin) and GLP-1RAs, which may require cessation if vomiting or dehydration is a concern and recommenced once symptoms have ceased. Also review other medications, such as NSAIDs, sulfonylureas, ACEi/ARBs and diuretics
Food and water intake	There is potential increased risk of hypoglycaemia from insulin and sulfonylureas if appropriate intake of meals is not maintained People should try to maintain their normal meal plans if possible Fluid intake (eg water or oral rehydration solutions) should be increased to prevent dehydration, if appropriate Advise about alternative easy-to-digest foods, such as soups, if the person cannot tolerate a normal diet (some non-diet soft drinks may provide essential carbohydrate in this situation) If the person is vomiting or has diarrhoea, SGLT2i, GLP-1RAs and metformin should be reviewed or temporarily ceased and appropriate alternative glucose-lowering therapy be advised. Review doses of ACEi/ ARBs and diuretics If illness is causing loss of appetite and a marked reduction of carbohydrate intake, SGLT2i should be ceased due to elevated DKA risks If blood glucose is >15 mmol/L, use non-glucose-containing fluids for hydration (assess for ketones if persistent) If blood glucose is <15 mmol/L, use oral rehydration solutions (may contain glucose) if needed If unable to tolerate oral fluids and blood glucose continues to drop, advise them to seek medical care
Seek assistance	Individuals and support people need to assess whether the person is well enough or able to follow the plan; if they are not well enough, they should call for help or attend hospital Recommencement of oral intake/normal diet may allow the re-introduction of diabetes medications

ACEi, angiotensin-converting enzyme inhibitors; ARBs, angiotensin II receptor blockers; GLP-1RAs, glucagon-like peptide-1 receptor agonists; NSAIDs, non-steroidal anti-inflammatory drugs; SGLT2i, sodium–glucose cotransporter 2 inhibitors.

Sleep and diabetes

Multiple issues affect sleep in people with diabetes and assessment of sleep hygiene and quality should be considered. Counsel people with diabetes to practice sleep-promoting routines and habits (eg maintaining a consistent sleep schedule and limiting caffeine in the afternoon).[4] Diabetes management, such as hypoglycaemia, may affect sleep, and the presence of associated diabetes distress or depression impacts on being able to maintain healthy sleep. Obstructive sleep apnoea is linked to overweight and obesity and remains the most prominent sleep condition affecting many people with diabetes. Using appropriate sleep assessment tools (eg Epworth Sleepiness scale, OSA50 or STOP BANG) and referral to sleep specialists may be required.[21]

Planned surgical procedures

People with diabetes should be seen several weeks before surgery for assessment of glycaemic management and anaesthetic suitability, including their cardiovascular disease risks, and any treatment modifications instituted and stabilised from the time of referral before proceeding to surgery.

Attaining glycaemic goals (ie a glycated haemoglobin [HbA1c] approaching 7% [53 mmol/mol]) in the preoperative period has been shown to result in fewer complications and shorter hospital stays after surgery.[22] A patient with an HbA1c ≥9% (75 mmol/mol) may need to have their surgery delayed until glycaemic management is optimised.[22]

Preoperative care is the same for minor and major surgery. For prolonged procedures, blood glucose levels should be monitored intra- and postoperatively for several days.

Insulin may be required postoperatively for some people with type 2 diabetes.

Further information can be found in the Australian Diabetes Society's *Peri-operative diabetes management guidelines*[22] and the Australian Diabetes Society alert regarding DKA with SGLT2i use in people with diabetes.[5]

Rural GPs who perform operations and GPs who administer anaesthetics should refer to the *Peri-operative diabetes management guidelines*[22] to guide the advice they give to people in their care.

In practice

Ceasing medication before surgery

Appropriate written instructions should be given to people beforehand.

People who are prescribed oral glucose-lowering medications **except** SGLT2i, and people on injectable GLP-1RAs:

- can continue their diabetes medications on the day prior to surgery (be aware that gastric emptying is affected by GLP-1RAs and this may affect anaesthetic risks; also note that ceasing weekly dosed agents may not alter these risks due to their long drug half-lives, so notify

anaesthetic teams preoperatively if they apply to any clinical case)
- should omit their oral glucose-lowering medications on the morning of surgery, regardless of whether they are on the morning or afternoon list.

SGLT2i should be reviewed prior to surgery and procedures that require one or more days in hospital and/or require bowel preparation, including endoscopy/colonoscopy (two days prior to and the day of the procedure), to prevent DKA in the perioperative period.[5] Other glucose-lowering medications may need to be increased in this period.[5]

Specifically, with SGLT2i use, the Australian Diabetes Society has guidelines for temporary cessation prior to procedures (noting that other glucose-lowering medications may need adjustment to variable glucose levels) as follows:[5]

- For surgery and procedures requiring one or more days in hospital, omit SGLT2i for at least three days (ie two days before the procedure and on the day of procedure). This may require increasing other glucose-lowering drugs during that time. If the SGLT2i is part of a fixed dose combination, this will lead to withdrawal of two glucose-lowering drugs unless the second drug is prescribed separately.
- For surgery and procedures including colonoscopy requiring bowel preparation with carbohydrate restriction commencing on the day prior to the procedure, omit SGLT2i for at least three days (i.e. two days before and on the day of the procedure).
- For day-stay procedures (including gastroscopy) that do not require bowel preparation, SGLT2i can be stopped just for the day of the procedure. However, fasting before and after the procedure should be minimised.

Insulin and surgery

Insulin requires individualised advice as follows, and is usually not completely omitted (never withhold basal insulin):

- long-acting (basal) insulin – continue as usual (including morning doses)
- rapid/short-acting (prandial) insulin – omit rapid/short-acting insulin if not eating; depending on timing of procedure:
    - morning procedure: withhold rapid/short-acting insulin (and all oral glucose-lowering medication)
    - afternoon procedure: take half the normal morning rapid/short-acting dose in the morning before a light breakfast
- premixed insulin – take one-third to half the usual morning dose on the day of the procedure.

People taking intermediate-acting (basal) insulin who are booked for afternoon procedures or are on prolonged fasting may need a reduced dose. Seek specialist endocrinology and anaesthetic advice before planned procedures.

People on a multiple daily insulin regimen might require perioperative glucose infusion and associated close blood glucose monitoring. Many hospitals have a protocol or working plan that should be followed for the individual in that service.

Insulin may be recommenced with oral intake, with appropriate SMBG to guide dose adjustments.

Recommencing oral medication

People on oral glucose-lowering medication, with the exception of SGLT2i, can generally recommence medications when they are able to eat meals. Specific advice is available in Australian Diabetes Society's Peri-operative diabetes management guidelines.[22]

SGLT2i should only be recommenced postoperatively when the person is eating and drinking normally or close to discharge from hospital. People who have had day surgery should only recommence SGLT2i once they are on full oral intake. It may be prudent to delay recommencement for another 24 hours; however, this must be balanced against the risk of hyperglycaemia.[5]

Metformin can generally be recommenced 24 hours after major surgery, provided there has been no deterioration in serum creatinine.[22] For people using metformin and SGLT2i pre- and postoperatively, the maintenance of hydration and carbohydrate intake is important.

People undergoing colonoscopy

For colonoscopy preparation, Colonlytely or Glycoprep (rather than Fleet or Phosphoprep) should be used in people with renal impairment, who may become severely hyperphosphataemic with phosphate preparations.[23]

The dietary modifications that are advised for colonoscopy preparation might alter glucose management and hypoglycaemic risks; instruction on appropriate SMBG testing may be required. It is also essential to avoid excessive carbohydrate restriction during the bowel preparation period if the person has been using SGLT2i.

On preparation days and the day of the procedure, commence SMBG and withhold all oral medications. Note that SGLT2i should be ceased three days before colonoscopy and only recommenced when the person is eating and drinking normally.[5]

Basal and/or rapid-acting insulin should be managed as above.

Premixed insulin should be managed as follows:

- on the day of bowel preparation, reduce premixed dose by half for all doses
- on the day of the procedure, arrange a morning procedure and use half the usual dose and glucose infusion.

Disability, dementia, cognitive decline and hearing impairment

Disability and diabetes

Among those aged over 50 years, people with diabetes had reduced life expectancy (–4.6 years), developed disability earlier (6–7 years) and lived longer in states of disability (1–2 years) than people without diabetes.[24] People with diabetes have increased odds ratios for mobility-related disability (1.71)

and impaired basic activities of daily living (1.82).[25] The disability associated with diabetes may be related to vascular, neurological, cardiac and renal impairments and appears to be related to diabetes duration.[26,27]

Fracture risk is elevated in people with type 2 diabetes independent of the presence of osteoporosis.[7] For more information on osteoporosis, refer to *Osteoporosis prevention, diagnosis and management in postmenopausal women and men over 50 years of age*.[28]

People with diabetes have a higher risk of falls, especially those using insulin or sulfonylureas compared with those not using these agents.[29,30]

Longer-term lifestyle interventions, including physical activity and weight reduction, have been shown to reduce long-term disability.[31]

Cognitive decline and dementia

People with type 2 diabetes have twice the rate of cognitive decline as they age than people without diabetes. Increased rates of all-cause dementia, Alzheimer's dementia and vascular dementia (1.5- to 2-fold risk) are independently associated with type 2 diabetes.[32] Conversely, people with Alzheimer's disease have twice the rates of type 2 diabetes and impaired glucose tolerance than those without. The exact underlying mechanisms are not yet proven, but unstable glycaemic management (including glycaemic variability), increasing age, depression and vascular complications have been observed to increase risk of dementia in type 2 diabetes and decrease cognitive performance.[33-35]

Hearing and sensory impairment

Hearing impairment is twice as common in people with than without diabetes across frequency ranges, and occurs often in younger people with diabetes. Risk factors include hyperlipidaemia, coronary heart disease, peripheral neuropathy and general poor health, but an association of hearing loss with blood glucose levels has not been consistently observed. Accompanying Impairments in smell, but not taste, have been reported in people with diabetes.[36-40]

Driving

Diabetes is identified as one of the medical conditions that may impair driving ability. Impairment can be caused by:

- unexpected hypoglycaemia for drivers on insulin or sulfonylureas (main hazard)
- sensory or end-organ complications, particularly reduced vision or reduced sensation in the feet
- other comorbidities, such as sleep apnoea and cardiovascular problems.

Drivers with diabetes must meet specific national standards to ensure that their health status does not increase the risk of an accident. However, GPs should be aware that there are variations to these standards in individual states and territories, and should check with the relevant transport authority.

In practice

National medical standards (https://austroads.com.au/publications/assessing-fitness-to-drive/ap-g56/diabetes-mellitus/medical-standards-for-licensing-2) for private and commercial licensing and a table to assist with the management of diabetes and driving (section 3.3.2 (https://austroads.com.au/publications/assessing-fitness-to-drive/ap-g56/diabetes-mellitus)) are found in Austroads' and the National Transport Commission's Assessing fitness to drive.[41] This document was updated in 2022. Note that HbA1c measurements are not used to assess fitness to drive, and, for clarity, all references to HbA1c have been removed.

Private licences

- **People taking glucose-lowering medications other than insulin** do not necessarily require a conditional licence; however, they must have a medical review by their treating doctor every five years.
- **People on insulin** may have a conditional licence, requiring a two-yearly review. This must be granted as outlined in the national medical standards (https://austroads.com.au/publications/assessing-fitness-to-drive/ap-g56/diabetes-mellitus/medical-standards-for-licensing-2) , with similar criteria as above.

For more information refer to Austroads and the National Transport Commission Assessing fitness to drive.[41]

Commercial licences

People with diabetes on any form of glucose-lowering therapy, including insulin, may be granted a conditional commercial licence. Specialist referral is required.

This licence is subject to yearly specialist review; if the person is on metformin alone, this review may be performed by the treating GP, by mutual agreement with the treating specialist. However, the initial recommendation of a conditional licence must be based on the opinion of a diabetes specialist.

Severe hypoglycaemia

The minimum period of time before returning to drive after an episode of severe hypoglycaemia is generally six weeks. A specialist's assessment and agreement is required for all licencing categories.

Consumer education and resources

The NDSS's consumer booklet Driving and diabetes[42] provides a checklist and offers advice for people with diabetes to ensure that they have safe blood glucose levels before they drive.

The importance of taking extra precautions to maximise road safety and reduce the risks of road accidents caused by hypoglycaemic incidents is highlighted and should be actively promoted.

For example, drivers are required to perform a blood glucose check before they drive, and again during the journey if driving for more than two hours.

Travel

People with diabetes can travel safely, provided a few extra precautions are taken and the travel is planned.

Those not using insulin generally have few problems during travel. Immunisation status should be reviewed and updated prior to expected travel. The stress of travel may increase blood glucose levels slightly. The decreased activity experienced during a long plane trip, together with the amount of food given en route, often results in increased blood glucose levels. Increased activity and altered eating patterns on travelling to different destinations may also induce glucose variability and risks for hypoglycaemia. Glucose levels should return to normal once a more usual lifestyle has been resumed at the destination.

People should ideally have a medical consultation at least six weeks before the proposed travel, particularly if they are on insulin. This allows time to assess management and alter management as required. People might benefit from referral to a credentialled diabetes educator to go through their travel plans and help prepare a detailed travel management plan, including sick-day management and the use of SMBG.

Before travelling, people should:

- check routine immunisation status and other medical conditions
- obtain a covering letter from their doctor (refer below)
- pack extra food (if allowed by customs) and double the quantity of supplies of medication and monitoring equipment, dividing them between different luggage/bags in case one is lost or stolen (it is not advisable to pack extra insulin in checked-in luggage because insulin exposed to extreme temperatures of the cargo hold will lose efficacy)
- get advice about specific insurance needs
- familiarise themselves with Australian/other air security guidelines (refer below).

Travelling by air: Security guidelines

Australian air authorities stipulate the following security guidelines. If the person is not using an Australian carrier, it is advisable that the person checks with the chosen airline for applicable security guidelines.

- All diabetes supplies, including equipment, insulin and glucagon-delivery devices (eg syringes, pen needles, insulin pump consumables), carried on board must be in the hand luggage of the person who has diabetes and whose name appears on the airline ticket.
- The traveller’s name should appear on the oral medicines, insulin and/or glucagon prescription labels.
- It is advisable to carry legible prescriptions for all medications. The prescriptions must include the traveller’s name, the name and type of medication and the contact details of an attending medical practitioner.

- The NDSS card is accepted as primary proof that a person with insulin-treated diabetes needs to carry their diabetes equipment (eg insulin pen, pump, syringes, needles and glucagon kit) with them. Supplementary photographic proof of identity, such as a driver's licence, may also be requested.
- It is advisable to carry a letter from the attending medical practitioner that outlines medical diagnoses, prescribed medications, whether insulin is used and, if so, the delivery device/s. The letter must stress the importance of the person having to carry medications with them and include the frequency of dosage. For those using an insulin pump, the letter must stress the need for the pump to be always worn.
- Some international regulations set limits on fluid containers that may be personally taken on board aircraft. People with diabetes who need to carry supplies of insulin are exempt. They will be required to present the insulin at the security point and carry proof of their condition and need for insulin.
- People wearing electronic devices to monitor blood glucose levels or to infuse insulin should check with the airline as to whether these devices can be operated during the flight.

Rights of people with diabetes during security check

People with diabetes who use an insulin pump are not required to remove their pump at the security point. If the security staff request this, the person with diabetes has the right to request access to a private consultation room, which security staff are required to provide. People with diabetes are also entitled to make this request if discussion about their condition is required.

For more information about travel and diabetes, consult the travel advice on the websites of Diabetes Australia (https://www.diabetesaustralia.com.au/living-with-diabetes/travel/) and the Department of Home Affairs (https://www.homeaffairs.gov.au/about-us/what-we-do/travelsecure/people-with-special-circumstances) .

Insurance and advocacy

Insurance of all types may be an area difficult to navigate for people with diabetes and comorbidities. Diabetes Australia[43] can provide advice about rights, responsibilities and other tips regarding:

- private health insurance
- life and disability insurance
- income protection
- travel insurance.

Diving

People with type 2 diabetes, including those who use medication, can participate in recreational scuba diving. They must be otherwise qualified to dive and meet several criteria as outlined in the consensus guidelines for recreational diving with diabetes that were developed in 2005.[44]

When evaluating people with diabetes for medical fitness to dive, first ensure that no other exclusionary conditions (eg epilepsy, pulmonary disease) exist.

The physiological demands of diving must then be considered. People with diabetes are at higher risk than the general diving population of medical complications such as myocardial infarction, angina and hypoglycaemia.

The Australian Diabetes Society has recommendations for people with insulin-treated diabetes regarding suitability for diving, the scope of diving and blood glucose management on the day of diving.[45]

Diabetes during Ramadan

Fasting during Ramadan is one of the five pillars of Islam, and all healthy adult Muslims are obliged to refrain from eating and drinking from sunrise to sunset during this lunar month. The fast may last 11–19 hours, depending on where and at what time of year Ramadan occurs. People with an acute illness, such as influenza, may postpone fasting to other days when their acute illness has resolved. People with chronic illnesses, such as diabetes, are not obliged to fast and are able to donate to a charity as atonement; however, many still choose to fast.

Some Muslim people with diabetes might be more inclined to discuss fasting during Ramadan with their local imam rather than their GP; GPs may therefore need to ask people specifically whether they intend to fast.[46]

The main concern for diabetes management during Ramadan is hypoglycaemia. Fasting can disrupt normal glucose homeostasis and lead to serious consequences. People who choose to fast should be warned of these complications. Regular monitoring of glucose may be required for people with diabetes using sulfphonylureas, insulin or feeling unwell with or without hypoglycaemia.

People in the very high- or high-risk groups shown in Box 1 should be actively discouraged from fasting during Ramadan.[46] This includes people at high risk of hypoglycaemia.

A post-Ramadan GP assessment is recommended.

Taking oral glucose-lowering agents during Ramadan

Guidelines recommend therapeutic choices to help minimise the risk of hypoglycaemia during Ramadan.[46,47]

Insulin use during Ramadan

People taking insulin who wish to fast during Ramadan should have renal and liver function tests ordered, because both renal and hepatic impairment may precipitate or prolong hypoglycaemia in people with diabetes.

People taking insulin should be instructed on SMBG and individual adjustment of insulin doses based on glucose goals discussed before commencing Ramadan.

People taking the long-acting basal insulin analogue glargine have been shown to be able to fast safely with no significant increases in hypoglycaemic episodes.[46] Rapid-acting (meal-time) insulin should be given at fast-breaking evening meal-times.

If weight loss occurs due to fasting, people may need a reduction in basal insulin dose in the second half of the Ramadan period.

People with type 2 diabetes on premixed insulin twice daily should reduce the morning breakfast dose by 25–50% and take the normal evening dose with their sunset fast-breaking meal.[46] If postprandial hyperglycaemia develops as a result of the larger-than-usual sunset meal (iftar), which breaks the day's fast, then consider changing the premixed insulin to 50:50 (for people on 30:70 or 25:75 premixed insulin). Alternatively, the premixed insulin dose can remain the same, with additional rapid-acting insulin given to cover the iftar meal. Rapid-acting insulin might also be required for people who have an additional evening meal before bedtime, when iftar is early.

Because eating patterns can vary significantly from person to person during Ramadan, GPs should develop individualised plans for insulin use for each person.

Box 1. Risk categories for people with diabetes who are considering fasting during Ramadan[46]

Very high risk

People with any of the following:

- Severe or recurrent episodes of hypoglycaemia in the three months before Ramadan
- History of recurrent hypoglycaemia
- History of hypoglycaemic unawareness
- Unstable glycaemic management before the month of Ramadan
- Diabetic ketoacidosis episode or hyperosmolar hyperglycaemic state within three months before Ramadan
- Acute illness
- Pregnancy with pre-existing diabetes or gestational diabetes treated with glucose-lowering medication*
- Comorbidities such as chronic kidney disease (stage 4 or 5) or cardiovascular disease

High risk

People with any of the following:

- Sustained poor glycaemic management
- Well-controlled type 2 diabetes on multiple-dose or mixed insulin
- Pregnancy with pre-existing diabetes or gestational diabetes managed by diet only*
- Chronic kidney disease stage 3 or lower
- Stable macrovascular complications
- Comorbid conditions that present additional risk factors
- Diabetes and performing intense physical labour
- Treatment with drugs that may affect cognitive function

Low to moderate risk

People with well-managed type 2 diabetes treated with one or more of the following:

- Lifestyle interventions
- Metformin
- Dipeptidyl peptidase-4 inhibitors (DPP-4i)
- Glucagon-like peptide-1 receptor agonists (GLP-1RAs)
- Sodium–glucose cotransporter 2 inhibitors (SGLT2i) or thiazolidinediones (TZDs)

- Basal insulin

*Note that it is not advised for pregnant women to fast, and they are considered exempt from fasting during Ramadan if they wish.

The British Islamic Medical Association provides useful information in its *Ramadan compedium*,[48] in particular a risk stratification table (https://britishima.org/wp-content/uploads/2024/02/ramadan-compendium-table-1-1.pdf) that includes a summary by condition/disease.

The Australian Diabetes Society has published the *Management of people with diabetes who choose to fast during Ramadan* position statement.[49]

Exercising and diet during Ramadan

Regular or light exercise is allowed during Ramadan and should be encouraged. However, care should be taken to avoid hypoglycaemia and dehydration.[46] This is particularly an issue when Ramadan falls in summer months, due both to the higher ambient temperature and the greater number of daylight hours.

People should try to divide their daily calories between the breakfast (suhoor) the iftar meal. They should try to eat a well-balanced diet consisting of foods with a, low-glycaemic-index that are high in fibre, such as fruits and vegetables.

Diabetes UK has information about fasting during Ramadan (https://www.diabetes.org.uk/guide-to-diabetes/managing-your-diabetes/ramadan) for people with diabetes and for imams.

Resources

Sick-day management
The NDSS (https://www.ndss.com.au/living-with-diabetes/health-management/sick-days/) and Australian Diabetes Educators Association (https://www.adea.com.au/resources/standards-position-statements-and-other-resources/adea-clinical-guidelines/) have resources regarding sick-day management.

The Victorian Virtual Emergency Department (VVED) (https://www.vved.org.au/) allows you to access urgent diabetes care 24 hours a day, seven days a week. The program is now open to all patients across Victoria.

Surgery
The Australian Diabetes Society has published the *Peri-operative diabetes management guidelines* (https://diabetessociety.com.au/documents/PerioperativeDiabetesManagementGuidelinesFINALCleanJuly2012.pdf) and advice on use of SGLT2i perioperatively (https://www.diabetessociety.com.au/wp-content/uploads/2023/05/ADS-ADEA-ANZCA-NZSSD_DKA_SGLT2i_Alert_Ver-May-2023.pdf) .

Dementia and diabetes

The *British Journal of Diabetes* has published and article on the *Management of diabetes and dementia* (https://bjd-abcd.com/index.php/bjd/article/view/167/423) .

Trend Diabetes has published the *For healthcare professionals: Diabetes and dementia: Guidance on practical management* (https://trenddiabetes.online/wp-content/uploads/2023/11/HCP_Dementia_TREND_2023_FINAL.pdf) , which includes practical management of diabetes and dementia.

Driving

The NDSS has published the *Driving and diabetes* consumer booklet.

Austroads has published *Assessing fitness to drive* (https://austroads.com.au/publications/assessing-fitness-to-drive/ap-g56) .

Diabetes and Ramadan

The Australian Diabetes Society has published a position statement on the *Management of people with diabetes who choose to fast during Ramadan* (https://www.diabetessociety.com.au/guideline/diabetes-and-ramadan-position-statement/) .

The International Diabetes Federation and the Diabetes and Ramadan International Alliance have published *Diabetes and Ramadan: Practical guidelines 2021* (https://www.diabetesresearchclinicalpractice.com/article/S0168-8227(21)00545-3/fulltext) .

Diabetes UK has information about fasting during Ramadan (https://www.diabetes.org.uk/guide-to-diabetes/managing-your-diabetes/ramadan) for people with diabetes and imams.

The British Islamic Medical Association has published the *Ramadan compendium*,[48] which contains a risk stratification table (https://britishima.org/wp-content/uploads/2024/02/ramadan-compendium-table-1-1.pdf) that includes a summary by condition/disease.

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Appendices

Appendices

In this section

Appendix 1. Types of insulin available (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/appendices/appendix-1-types-of-insulin-available)
Appendix 2. Guide to insulin initiation and titration (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/appendices/appendix-2-guide-to-insulin-initiation-and-titrati)
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Appendix 1

Appendix 1. Types of insulin available

Type	Brand name	Manufacturer	Nature
Mealtime or prandial insulins			
Ultra rapid-acting (onset in 5–10 minutes, peak at 30 minutes, duration for 3.5–4 hours)			
Faster insulin aspart	FiAsp	Novo Nordisk	Analogue
Rapid-acting (onset in 15–20 minutes, peak at 1 hour, duration for 3.5–4.5 hours)			
U200 Insulin lispro	Humalog	Lilly	Analogue
Insulin aspart	NovoRapid	Novo Nordisk	Analogue
Insulin glulisine	Apidra	Sanofi	Analogue
Short-acting (onset in ~1 hour, peak at 2–5 hours, duration for 6–8 hours)			
Neutral	Actrapid	Novo Nordisk	Human
	Humulin R	Lilly	Human
Basal insulins			
Intermediate-acting			

Isophane	Humulin NPH	Lilly	Human
	Protaphane	Novo Nordisk	Human
Insulin detemir Onset in 3–4 hours, peak at 3–8 hours, duration for 20–24 hours	Levemir	Novo Nordisk	Analogue
Insulin glargine (U100) Onset in 1–2 hours, flat, duration for 18–24 hours	Optisulin	Sanofi	Analogue
	Semglee	Alphapharm	Analogue
Insulin glargine (U300) Onset in 1–2 hours, flat, duration for 24–36 hours	Toujeo	Sanofi	Analogue
Premixed insulins			
Lispro 25%/lispro protamine 75% Onset in 15–20 minutes, peak at 1 hour, duration for 14–24 hours	Humalog Mix 25	Lilly	Analogue
Lispro 50%/lispro protamine 50% Onset in 15–20 minutes, peak at 1 hour, duration for 14–24 hours	Humalog Mix 50	Lilly	Analogue
Insulin aspart 30%/insulin aspart protamine 70% Onset in 15–20 minutes, peak at 1 hour, duration for 14–24 hours	NovoMix 30	Novo Nordisk	Analogue

Neutral 30%/isophane 70% Onset in 1–2 hours, peak at 2–5 hours, duration for 12–18 hours	Humulin 30/ 70	Lilly	Human
	Mixtard 30/ 70	Novo Nordisk	Human
Insulin co-formulation			
Insulin degludec 70% and insulin aspart 30% Onset in 5–20 minutes, peak at 1 hour, duration for 36–48 hours	Ryzodeg 70/ 30	Novo Nordisk	Analogue

Notes:

ltra-rapid acting insulin should be administered from up to 2 minutes before a meal, at the start of a meal, or up to 20 minutes after starting a meal.

Rapid-acting, pre-mixed and co-formulated insulin should be administered 15 minutes prior to a meal.

Short-acting insulin should be administered 20–30 minutes prior to a meal.

Intermediate- and long-acting basal insulins can be given regardless of a meal.

Appendix 2

Appendix 2. Guide to insulin initiation and titration

For fasting and preprandial blood glucose targets, please refer to the section 'Glucose monitoring (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/glucose-monitoring) '. Note that the adjustments given below are based on average blood glucose levels over at least 2–3 days.

Principles of insulin titration by regimen[1]

Basal (intermediate- or long-acting insulin):

- Adjust the dose based on previous average fasting glucose levels

Premixed insulin at breakfast and dinner:

- Adjust the breakfast dose based on average previous dinner readings (as long as a dose increase does not cause hypoglycaemia at lunchtime)
- Adjust the dinner dose based on previous average fasting glucose levels (as long as a dose increase does not cause hypoglycaemia at bedtime)
- Basal–bolus:*
- Adjust the dose at mealtime based on the previous day's glucose level measured either two hours after the corresponding mealtime or before the next mealtime (eg adjust the breakfast dose based on the previous 2–3 days' average two-hour post-breakfast value or the pre-lunch value)

*Rapid- or short-acting insulin is used for bolus dose.

The American Diabetes Association recommends:[2]

- In adults with type 2 diabetes, initially initiating a glucagon-like peptide-1 receptor agonist (GLP-1RA), including a dual glucose-dependent insulinotropic polypeptide (GIP) and GLP-1RA, is preferred before considering insulin. Grade: A
- In adults with type 2 diabetes, glucose-lowering agents may be continued upon initiation of insulin therapy (unless contraindicated or not tolerated) for ongoing glycaemic and metabolic benefits (ie weight, cardiometabolic or kidney benefits). Grade: A
- To minimise the risk of hypoglycaemia and treatment burden when starting insulin therapy in adults with type 2 diabetes, reassess the need for and/or dose of glucose-lowering agents with higher hypoglycaemia risk (ie sulfonylureas). Grade: A

Starting and adjusting basal insulin[1,3,4]

STEP 1. SELECT basal insulin and injecting device

↓

STEP 2. START basal insulin: 0.1 units/kg or **10 units** at bedtime or morning

CONTINUE oral glucose-lowering medication

If fasting blood glucose (FBG) is high (pre-breakfast), consider evening or morning insulin dosing of a long-acting (>24 hours) basal insulin

If FBG is on target, but pre-dinner blood glucose level (BGL) is high, consider morning insulin dosing of intermediate-acting insulin

↓

STEP 3. TITRATION

If using long-acting basal insulin doses (morning or evening doses), adjust doses to achieve FBG targets

If using intermediate-acting basal insulin, use pre-dinner glucose targets to adjust the morning doses and FBG targets to adjust any additional evening doses

Practitioner-led titration (below left) can achieve target in a shorter time period than **patient-led titration (below right)**

Practitioner-led titration

Adjust insulin dose twice weekly as shown, until FBG target is achieved

Mean FBG over previous two days (mmol/L)*	Insulin dose adjustment
≥10.0	↑ by 4 units
8.0–9.9	↑ by 2–4 units
7.0–7.9	No change or ↑ by 2 units
6.0–6.9	No change
4.0–5.9	No change or ↓ by 2 units
<4.0	↓ by 2–4 units

OR

Patient-led titration

Adjust insulin dose every three days. Increase by 2 units until FBG target is achieved

Mean FBG over previous three days (mmol/L)*	Insulin dose adjustment
≥6.0 but ≤8.0	No change
4.0–6.0	↓ insulin dose by 2 units
<4.0	↓ insulin dose by 4 units

* Do not increase insulin dose if FBG <4.0 mmol/L at any time in the preceding week.

Check for weight gain for all these titrations.

Figure 1. Starting and adjusting basal insulin

Starting and adjusting pre-mixed (biphasic) and co-formulated insulin[1,3]

STEP 1. SELECT premixed or co-formulated insulin and injecting device

↓

INSULIN-NAÏVE patients

STEP 2. START premixed or co-formulated insulin 10 units immediately before or soon after the largest meal (usually evening meal)

CONTINUE metformin if indicated; consider tapering sulfonylureas as glycaemic management improves

↓

STEP 3. TITRATION

Adjust the evening pre-mixed insulin dose once or twice a week according to the schedule below to FBG
Co-formulated insulin should be titrated once a week

Lowest BGL reading (mmol/L) of the previous three days – fasting or preprandial	Insulin dosage adjustment
≥10	↑ by 6 units
8.0–9.9	↑ by 4 units
6.0–7.9	↑ by 2 units
4.0–5.9	No change
<4.0	↓ by 2 units

If a morning insulin dose is given, adjust the insulin dose according to evening preprandial BGL according to the same titration recommendations

Hypoglycaemia should prompt a review of other oral therapy. Which insulin is adjusted depends on regimen and target glucose

↓

STEP 4. INTENSIFICATION Once-daily insulin to twice-daily premixed insulin

WHEN?

- With FBG at target, if evening preprandial BGL > FBG, or if evening preprandial BGL is high, or
- After After three months if glycated haemoglobin (HbA1c) > target, despite FBG and evening preprandial BGL at target

HOW?

- Calculate any increased total daily insulin dose and divide this into two doses, considering the continued need to maintain FBG and postprandial targets
- Give the increased dose adjustment as twice-daily injections (pre-breakfast and pre-dinner). This may not be a 50/50 split, as prandial targets may require a higher proportion to be given at the largest meal of the day (eg 60/40)
- Monitor pre-dinner BGL and FBG against targets
- Once a week, adjust both insulin doses independently (according to protocol above in step 3); pre-breakfast insulin is adjusted according to pre-dinner BGL, and pre-dinner insulin is adjusted according to FBG

Figure 2. Starting and adjusting pre-mixed biphasic

Guide to basal plus insulin intensification schedules

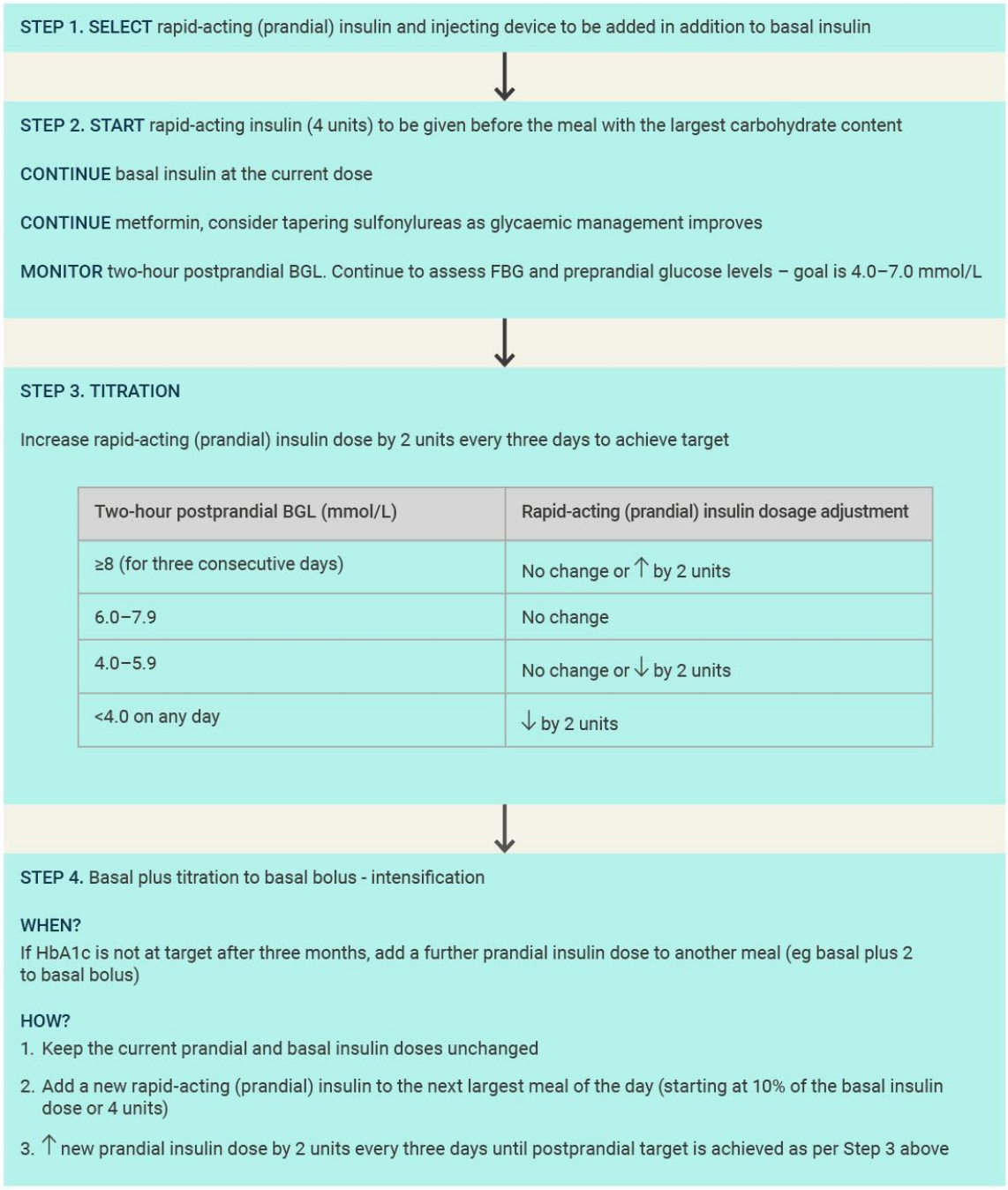


Figure 3. Guide to basal plus insulin intensification schedules

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Appendix 3

Appendix 3. Detailed information on glycaemic emergencies

Hypoglycaemia

Managing an episode of hypoglycaemia

If a patient with diabetes is showing signs of potential hypoglycaemia, first make sure that the patient is safe (eg seated securely and not at risk of falling).

If possible, confirm that the symptoms are due to hypoglycaemia by performing a fingerprick blood glucose level (BGL). If the person is awake, alert and can swallow, hypoglycaemia may be managed according to the Rule of 15 (Box A3.1). If the patient is symptomatic, but blood glucose or capillary glucose cannot be performed to confirm that the episode is due to hypoglycaemia, use the Alternative Rule of 15 (Box A3.2).

Box A3.1. Rule of 15 (hypoglycaemia confirmed)

If BGL <4.0 mmol/L:

- Provide 15 g quick-acting carbohydrate that is easy to consume (eg half a can of regular [non-diet] soft drink, half a glass of fruit juice, three teaspoons of sugar or honey, six or seven jellybeans, three glucose tablets)
- Wait 15 minutes and repeat BGL check – if the level is not rising, suggest eating another quick-acting carbohydrate from the above list
- Provide some longer-acting carbohydrate if the patient's next meal is more than 15 minutes away (eg a sandwich; one glass of milk or soy milk; one piece of fruit; two or three pieces of dried apricots, figs or other dried fruit; one tub of natural low-fat yoghurt; six small dry biscuits and cheese)
- Test glucose every 1–2 hours for the next four hours

Box A3.2. Alternative Rule of 15

Patients and carers should be made aware of the use of an Alternative Rule of 15.

If the patient is symptomatic, but blood glucose or capillary glucose cannot be performed to confirm that the episode is due to hypoglycaemia, treat the patient as if they have hypoglycaemia:

- administer 15 g quick-acting carbohydrate
- if there is no improvement after 15 minutes, the patient could have another cause for the episode and further medical assistance may be necessary.

Severe hypoglycaemia

Severe hypoglycaemia is usually defined as hypoglycaemia requiring the assistance of another person. It may be a medical emergency. Clinical status can progress to impaired consciousness or coma.

Management should consider each of the following:

- Commence resuscitation protocols, if appropriate.
- For those unable or unwilling to take carbohydrates by mouth:
- if available, give an injection of glucagon 1 mg intramuscularly or subcutaneously into the thigh, buttock or upper arm (with usual precaution to avoid vulnerable anatomical structures).
- if intravenous access is obtained, deliver 50% glucose – 20 mL intravenously via a securely positioned cannula (optimally the antecubital veins). Use 10% glucose in children, because hyperosmolality has caused harm.
- Phone for an ambulance (dial 000) stating a ‘diabetic emergency’.
- Wait with the patient until the ambulance arrives.
- When the person regains full consciousness and can swallow, they can be given carbohydrates orally.

If glucagon is administered, always review the monitored capillary glucose after 15 minutes to ensure effective management of hypoglycaemia has occurred and BGL remains ≥4.0 mmol/L. Test again one hour after severe hypoglycaemia to ensure stable glucose levels.

Post-hypoglycaemia

After any severe hypoglycaemic episode, a patient review is mandatory. Reassess the patient’s circumstances, medication dosages and dietary intake, as well as the overall need for glucose monitoring, with the patient and/or with their immediate family or support persons. Also discuss implications for driving competence and other similar areas (eg operation of machinery). The patient should be advised not to drive if a severe hypoglycaemic event is experienced while driving, or at any other time, until they have been cleared to drive by a medical practitioner.[1] For more information see

Austroads Assessing fitness to drive,[1] Section 3.2 'General assessment and management guidelines' (https://austroads.com.au/publications/assessing-fitness-to-drive/ap-g56/diabetes-mellitus/general-assessment-and-management-guidelines) .

Refer to the discussion of driving in the section 'Managing risks and other impacts of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-risks-and-other-impacts-of-type-2-diabete) '.

Managing hyperglycaemic emergencies

Diabetic ketoacidosis

Diabetic ketoacidosis (DKA) is a medical emergency requiring specialist care and should generally be managed in hospital. Whatever the setting, it is important that treatment commences as early as possible. Always consider the possibility of undiagnosed type 1 diabetes.

Biochemical criteria for DKA are shown in Box A3.3. Once thought to typify type 1 diabetes, DKA can occur in patients with type 2 diabetes under stress (eg during surgery, trauma, infections, high-dose steroids). The very young, older people and pregnant people are also at greater risk of DKA.[2]

There is a small but definite risk of DKA with the use of sodium–glucose cotransporter 2 (SGLT2) inhibitors. This can sometimes occur without significantly raised blood glucose levels (euglycaemic DKA).[2,3] Because of the absence of extreme hyperglycaemia, euglycaemic DKA may be overlooked, and diagnosis and treatment delayed.

GPs should inform all patients commencing SGLT2 inhibitors about the risks of DKA/euglycaemic DKA, including potential symptoms and signs, and provide management advice. Please also refer to the section 'Managing risks and other impacts of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/managing-risks-and-other-impacts-of-type-2-diabete) ' and the Australian Diabetes Society alert regarding SGLT2 inhibitors and DKA3 for specific recommendations pertaining to SGLT2 inhibitor use perioperatively and/or in the presence of significant intercurrent illness.

Box A3.3. Biochemical criteria for DKA

- Hyperglycaemia, defined by a BGL >11 mmol/L*
- Venous pH <7.3 or bicarbonate <15 mmol/L
- Presence of blood ketones or urinary ketones (an abnormal blood ketone level is ≥0.6 mmol/L; severe ketosis is >3.0 mmol/L)

*Note that euglycaemic DKA, characterised by only mild to moderately elevated BGL, can occur in people who are taking SGLT2 inhibitors, people who are pregnant, after excessive alcohol intake, after surgery/colonoscopy or in people on extremely low-carbohydrate diets.

Assessment and management

Blood ketone testing is preferred. Blood ketone testing equipment should be made available for medical practices and at-risk patient use (including all people with type 1 diabetes).

Where possible, patients with DKA should be urgently transferred to a specialist medical unit in a hospital.[4,5]

The main aim in treating DKA is to progressively normalise the blood pH and clear the body of excessive ketones, achieved by aggressive fluid replacement and insulin therapy. This also improves blood glucose concentration. Hyperglycaemia corrects before acidosis; therefore, intravenous glucose is required to allow insulin infusion to continue to suppress ketone production while acidosis resolves.[6]

Hyperosmolar hyperglycaemic state

A hyperosmolar hyperglycaemic state (HHS) in type 2 diabetes occurs most often in the elderly or in those with newly diagnosed type 2 diabetes. It is characterised by severe hyperglycaemia (usually >25 mmol/L), hyperosmolality, dehydration and a change in mental state, with little or no ketoacidosis. HHS may present as hypovolaemic shock and coma in severe cases.[5] HHS is usually the result of illness or infection; however, it can also be due to the suboptimal use of diabetes medications.

General outline for the management of HHS

Wherever possible, the patient with HHS should be managed in a specialist medical unit due to the risk of hypovolaemic shock and coma.[7] It is important to note that blood glucose meters do not register very high glucose levels, so access to a laboratory is necessary to monitor the correction of hyperglycaemia, as well as to monitor sodium and potassium levels. Rapid correction of the hyperosmolar state is dangerous and should not be attempted.

Rural practice: Management of DKA and HHS

In remote rural practice, with both DKA and HHS, management in a specialist medical unit may not be possible. In this situation it is advisable to contact the most appropriate diabetes resource person (an endocrinologist or similarly qualified specialist) or regional tertiary hospital for advice while promptly commencing treatment.

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Appendix 4

Appendix 4. Practice summary: Diabetes in pregnancy

When: Assess the risk of undiagnosed diabetes or prediabetes at the first antenatal visit and offer testing to women with risk factors.

Offer testing to all women not already tested and repeat testing to women with risk factors with a previous normal blood glucose level.

Who: General practitioner, midwife, obstetrician, Aboriginal and Torres Strait Islander health practitioner, Aboriginal and Torres Strait Islander health worker, multicultural health worker, accredited practising dietitian, credentialled diabetes educator, endocrinologist, accredited exercise physiologist

- **Discuss the reasons for testing blood glucose levels**: Explain that diabetes in pregnancy can have effects on the pregnancy and the baby, and that early identification and taking steps to manage raised blood glucose as soon as possible can reduce the risk of these effects.
- **Take a holistic approach**: Provide women with practical advice on healthy eating and physical activity [...], taking into consideration the availability of foods and ways of being physically active that are appropriate to the woman's cultural practices and preferences. Consider a health promotion program to improve community understanding of the effects of diabetes in pregnancy and the importance of healthy lifestyle patterns.
- **Consider referral**: Where possible, women diagnosed with pre-existing diabetes should be referred for specialist assessment (by an endocrinologist or obstetric physician) and education on nutrition, monitoring and management (eg to a multidisciplinary team involving a general practitioner, accredited practising dietitian, credentialed diabetes educator, endocrinologist, obstetric physician). Where specialist allied health professionals are not available, other sources of information (eg written information, video or audio resources, telehealth services) may be useful.
- **Document and follow up**: When a woman's blood glucose is tested, tell her the results and note them in her antenatal record. Have a system in place so that women diagnosed with diabetes in pregnancy receive ongoing follow-up, including further testing of blood glucose levels after pregnancy. Postnatal education and support are important in preventing or delaying the onset of diabetes in the future, and women should be encouraged to attend postnatal testing.

Source: The Australian Clinical Practice Guidelines: Pregnancy Care are being actively updated. Australian Living Evidence Collaboration. Australian pregnancy care guidelines, 2024 [version 4]. Australian Living Evidence Collaboration (https://app.magicapp.org/?language=hr#/guideline/jm83RE) .

Appendix 5

Appendix 5. Medication-related care plan considerations for residents with type 2 diabetes

- Carefully evaluate a resident's comorbidities, overall health and resident/carer preferences.
- Ensure a sensitive discussion and documentation of an individualised treatment plan, glycaemic targets and strategies for medication management.
- Start low and go slow with doses when initiating and/or changing medications, using appropriate investigations.
- Assess and minimise the risk of hypoglycaemia and other adverse drug events (ADEs) related to glucose-lowering medications (GLMs). Consider using the following resources when assessing medication use:
    - GLM-related ADEs risk assessment tool (available from The McKellar guidelines for managing older people with diabetes in residential and other care settings[1])
    - Beers criteria[2] for potentially inappropriate medication use in older adults
    - STOPP (Screening Tool of Older people's Potentially inappropriate Prescriptions) and START (Screening Tool to Alert doctors to Right Treatments)[3]
    - Medication appropriateness index (The NO TEARS tool[4,5] can be useful to review medications and can be tailored to the individual practitioner's consultation style)
    - Australian inappropriate medication use and prescribing tool[6]
    - AMH aged care companion (https://agedcare.amh.net.au/auth) (online)
    - Australian type 2 diabetes management algorithm. (https://www.diabetessociety.com.au/guideline/australian-t2d-glycaemic-management-algorithm-june-2024/) [7]
- Consider the use of non-pharmacological alternatives where possible.
- Simplify treatment regimens.
- Avoid sliding scale insulin.
- Conduct annual testing of estimated glomerular filtration rate (by a blood test) for screening and monitoring of chronic kidney disease for residents who are otherwise 'healthy' and whose care resembles standard care.
- Seek multidisciplinary input (eg from credentialled diabetes educators, aged care staff, pharmacists, allied health) where necessary.
- Consider reviewing management when hypoglycaemia, falls, urinary tract or other infections, confusion or non-specific 'incidents' occur.
- Consider impacts on quality of life from side effects of common diabetes medicine (eg increased urination related to the use of sodium–glucose cotransporter 2 inhibitors for the person with urinary incontinence).
- Ensure the resident, family members and aged care provider staff are educated regarding resident self-monitoring, documentation of blood glucose levels, symptoms of hypo- and hyperglycaemia and sick-day medication management strategies. For more information on sick-day management, refer to 'Managing risks and other impacts of type 2 diabetes (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guid

elines/management-of-type-2-diabetes/managing-risks-and-other-impacts-of-type-2-diabete) ’.

Source: Adapted from Stasinopoulos et al.[8]

The Royal Australian College of General Practitioners (RACGP) provides general guidance on aged care in the RACGP aged care clinical guide (Silver Book) (https://www.racgp.org.au/silverbook) , an essential resource for general practitioners caring for older people in the community and residential aged care.

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Supplementary material

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Explanation and source of recommendations

Explanation and source of recommendations

The definitions of the levels of evidence and grades of recommendation in this handbook are provided here. For further explanation of how to use these recommendations, refer to 'How to use this handbook (https://www.racgp.org.au/clinical-resources/clinical-guidelines/key-racgp-guidelines/view-all-racgp-guidelines/management-of-type-2-diabetes/introduction) '.

Diabetes Canada criteria for assigning levels of evidence and grades of recommendation

Table 1. Criteria for assigning levels of evidence to published studies	
Level	**Criteria**
Studies of diagnosis	
Level 1	a. Independent interpretation of test results (without knowledge of the result of the diagnostic or gold standard) b. Independent interpretation of the diagnostic standard (without knowledge of the test result) c. Selection of people suspected (but not known) to have the disorder d. Reproducible description of both the test and diagnostic standard e. At least 50 patients with and 50 patients without the disorder
Level 2	Meets four of the Level 1 criteria
Level 3	Meets three of the Level 1 criteria

Level 4	Meets one of the Level 1 criteria
Studies of treatment and prevention	
Level 1A	Systematic overview or meta-analysis of high-quality RCTs a. Comprehensive search for evidence b. Authors avoided bias in selecting articles for inclusion c. Authors assessed each article for validity d. Reports clear conclusions that are supported by the data and appropriate analyses OR Appropriately designed RCT with adequate power to answer the question posed by the investigators a. Patients were randomly allocated to treatment groups b. Follow-up at least 80% complete c. Patients and investigators were blinded to the treatment* d. Patients were analysed in the treatment groups to which they were assigned e. The sample size was large enough to detect the outcome of interest
Level 1B	Non-randomised clinical trial or cohort study with indisputable results
Level 2	RCT or systematic overview that does not meet Level 1 criteria
Level 3	Non-randomised clinical trial or cohort study; systematic overview or meta-analysis of Level 3 studies
Level 4	Other
Studies of prognosis	

Level 1	a. Inception cohort of patients with the condition of interest, but free of the outcome of interest b. Reproducible inclusion/exclusion criteria c. Follow up of at least 80% of subjects d. Statistical adjustment for extraneous prognostic factors (confounders) e. Reproducible description of outcome measures
Level 2	Meets criterion (a) above, plus three of the other four criteria
Level 3	Meets criterion (a) above, plus two of the other criteria
Level 4	Meets criterion (a) above, plus one of the other criteria

*In cases where such blinding was not possible or was impractical (eg intensive versus conventional insulin therapy), the blinding of individuals who assessed and adjudicated study outcomes was felt to be sufficient.

RCT, randomised controlled trial.

Source: Adapted from Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada. Can J Diabetes 2018;42(Suppl 1):S1–S326.

Table 2. Criteria for assigning grades of recommendations for clinical practice

Grade	**Criteria**
Grade A	The best evidence was at Level 1
Grade B	The best evidence was at Level 2
Grade C	The best evidence was at Level 3
Grade D	The best evidence was at Level 4 or consensus

Source: Adapted from Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes Canada 2018 clinical practice guidelines for the prevention and management of diabetes in Canada. Can J Diabetes 2018;42(Suppl 1):S1–S326.

American Diabetes Association (ADA) evidence-grading system for Standards of care in diabetes

Table 3. ADA evidence-grading system for Standards of care in diabetes

Level of evidence	Description
A	Clear evidence from well-conducted, generalisable RCTs that are adequately powered, including: • evidence from a well-conducted multicentre trial • evidence from a meta-analysis that incorporated quality ratings in the analysis Supportive evidence from well-conducted RCTs that are adequately powered, including: • evidence from a well-conducted trial at one or more institutions • evidence from a meta-analysis that incorporated quality ratings in the analysis
B	Supportive evidence from well-conducted cohort studies, including: • evidence from a well-conducted prospective cohort study or registry • evidence from a well-conducted meta-analysis of cohort studies Supportive evidence from a well-conducted case-control study
C	Supportive evidence from poorly controlled or uncontrolled studies, including: • evidence from randomised clinical trials with one or more major or three or more minor methodological flaws that could invalidate the results • evidence from observational studies with high potential for bias (such as case series with comparison with historical controls) • evidence from case series or case reports
E	Expert consensus or clinical experience

Source: Adapted from American Diabetes Association Professional Practice Committee. Introduction and methodology: Standards of care in diabetes – 2024. Diabetes Care 2024;47(Suppl_1):S1–S4.

RCTs, randomised controlled trials.