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What's New in ADA 2026?

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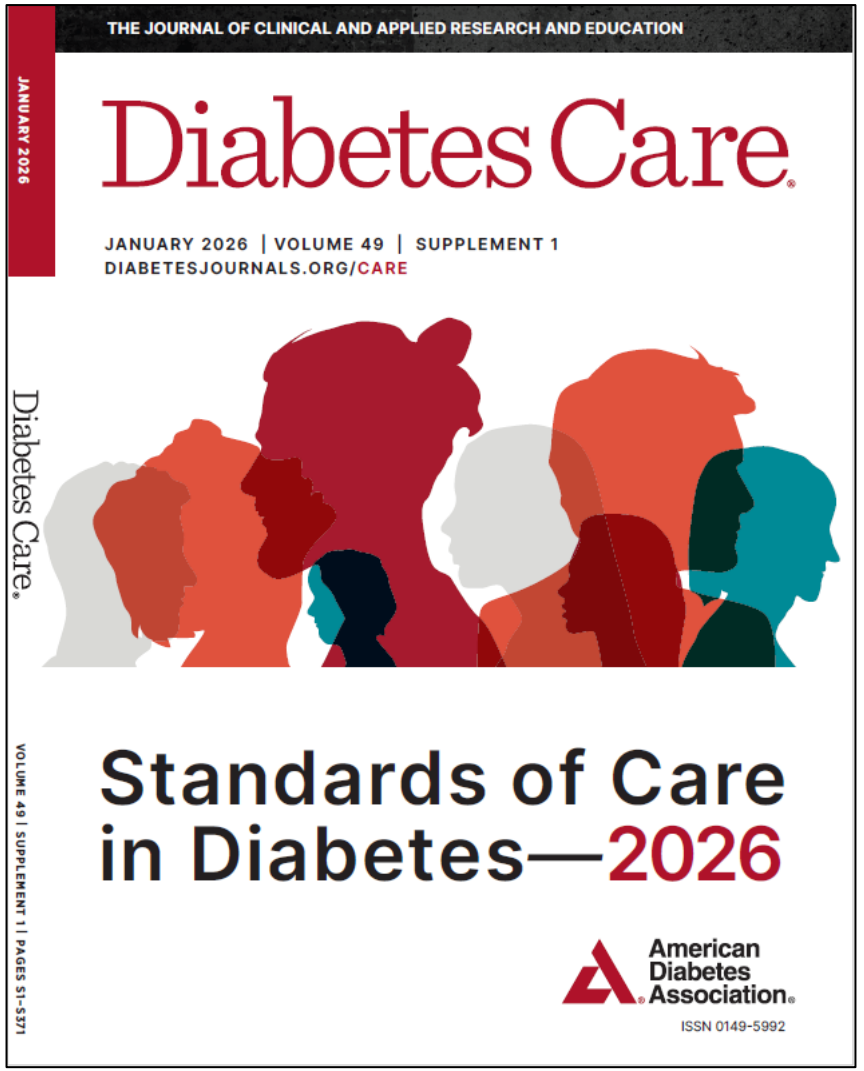
Standards of Care in Diabetes—2026

(Standards of Care)



ADA Evidence Levels- Quick Clinical Guide

Table 1.1—Considerations for engaging interprofessional members of a comprehensive, person-centered diabetes care team to identify and meet the needs of people with diabetes across the life span

Subpopulation of a person with diabetes	Team members to engage in care	Unique care considerations
All adults with diabetes	Primary care clinician, CDCES, RDN, and other specialists as available and appropriate to treat comorbidities (**Table 4.1**)	Assess for and address social determinants of health.
Adults treated with intensive insulin therapy, including multiple daily injections of insulin and insulin pump therapy	Clinicians and other health care team members experienced in advanced diabetes management, including technology use	
All children and adolescents with diabetes	Primary care clinician, pediatric endocrinologist, CDCES, RDN, other specialists as available and appropriate to treat comorbidities (**Table 14.1**), daycare or school nurse or other professional, behavioral health professional (as needed), and parent(s) or caregiver(s)	Assess for and address social determinants of health and barriers to safety, well-being, and academic performance in school. Engage professionals within the school and extracurricular/after-school activities to ensure safe diabetes management. An individualized diabetes medical management plan should be developed in collaboration with school professionals and parent(s) or caregiver(s). Support gradual developmentally appropriate transfer of self-management from caregivers to the children and adolescents with diabetes.

1. Improving Care and Promoting Health in Populations

Individuals with diabetes and diabetes-related complications or comorbidities	Specialist referrals as appropriate and available (e.g., behavioral health professional, cardiologist, endocrinologist, eye specialist, gastroenterologist or hepatologist, neurologist, nephrologist, obesity medicine specialist, or podiatrist), care coordinator/navigator or case manager, and clinical pharmacist (for those with polypharmacy or complex medication plans)	Screen for functional, cognitive, financial, and logistical barriers to self-management and evidence that self-care demands exceed capacity and available resources and support systems.
Individuals with social and/or structural barriers to care	Care coordinator/navigator, social services professional, insurance specialist/navigator, peer-to-peer support (as available), community health worker and/or community paramedic (as available), public health professional, and interpreter (as applicable)	Consider each person's psychosocial needs, available resources, and support systems.
Older adults	Geriatric medicine specialist, clinical pharmacist (for those with polypharmacy or complex medication plans), CDCES and/or RDN with expertise in the care for older adults, social services professional, case manager, community services provider, and physical and/or occupational therapist as available and appropriate based on functional status and independence	Consider the older adult's nutritional status, including ability to afford (financial barriers), acquire (accessibility), prepare (cooking), and consume (oral health) nutritious food. Assess for and address needs related to vision, hearing, dexterity, cognition, mobility, and other challenges.

Individuals in long-term care settings	Long-term care facility clinicians, nurses, other health care professionals, physical and occupational therapists, and RDN	Engage professionals within the long-term care facility to ensure safe and appropriate diabetes management.
Pregnant individuals with diabetes	Maternal-fetal medicine specialist or obstetrician experienced in the care of pregnant individuals with diabetes (particularly for individuals with type 1 diabetes or requiring intensive insulin therapy), CDCES, RDN, eye specialist (particularly for individuals with preexisting type 1 or type 2 diabetes), other specialists as appropriate, and lactation consultant as appropriate	Ensure appropriate postpartum follow-up and care, including transition from obstetric care to established primary care.
Individuals with behavioral health conditions	Behavioral health professional, care coordinator/ navigator, and social services professional as age and situation appropriate	Use age- and situation-appropriate screening protocols for general and diabetes-related psychosocial concerns.

CDCES, certified diabetes care and education specialist; RDN, registered dietitian nutritionist.

Diagnostic Tests for Diabetes

- Diagnose diabetes based on A1C or plasma glucose criteria. Plasma glucose criteria include either fasting plasma glucose (FPG), 2-h plasma glucose (2-h PG) during a 75-g oral glucose tolerance test (OGTT), or random glucose accompanied by classic hyperglycemic symptoms or crises. **B**

- In the absence of unequivocal hyperglycemia (e.g., hyperglycemic crises), diagnosis requires confirmatory testing. **B**

2. Diagnosis and Classification of Diabetes

Table 2.1—Criteria for the diagnosis of diabetes in nonpregnant individuals

A1C ≥6.5% (≥48 mmol/mol). The test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay.*
OR
FPG ≥126 mg/dL (≥7.0 mmol/L). Fasting is defined as no caloric intake for at least 8 h.*
OR
2-h PG ≥200 mg/dL (≥11.1 mmol/L) during OGTT. The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.*
OR
In an individual with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥200 mg/dL (≥11.1 mmol/L). Random is any time of the day without regard to time since previous meal.

DCCT, Diabetes Control and Complications Trial; FPG, fasting plasma glucose; OGTT, oral glucose tolerance test; NGSP, National Glycohemoglobin Standardization Program; WHO, World Health Organization; 2-h PG, 2-h plasma glucose. *In the absence of unequivocal hyperglycemia, diagnosis requires two abnormal results from different tests which may be obtained at the same time (e.g., A1C and FPG), or the same test at two different time points.

Use of A1C for Screening and Diagnosis of Diabetes

- The A1C test should be performed using a method that is certified by the National Glycohemoglobin Standardization Program **(NGSP)** as traceable to the Diabetes Control and Complications Trial (DCCT) reference assay. **B**

- **Point-of-care A1C** testing for diabetes screening and diagnosis should be **restricted to devices approved for diagnosis by the U.S**. Food and Drug Administration at Clinical Laboratory Improvement Amendments–certified laboratories that perform testing of moderate complexity or higher by trained personnel. **B**

- Evaluate for the possibility of a problem or interference with either test when there is consistent and substantial discordance between blood glucose values and A1C test results. **B**

- In conditions associated with an altered relationship between A1C and glycemia, such as some hemoglobin variants, pregnancy, glucose-6-phosphate dehydrogenase deficiency, HIV, and conditions that may alter red blood cell turnover, plasma glucose criteria should be used to diagnose diabetes. **B**

Classification

- Type 1 diabetes (due to autoimmune β-cell destruction, usually leading to absolute insulin deficiency, including latent autoimmune diabetes in adults)
- Type 2 diabetes (due to a nonautoimmune progressive loss of adequate β-cell insulin secretion, frequently on the background of insulin resistance)
- Specific types of diabetes due to other causes, e.g., monogenic diabetes syndromes, diseases of the exocrine pancreas, and drug- or chemical-induced diabetes
- Gestational diabetes mellitus (diabetes diagnosed in the second or third trimester of pregnancy that was not clearly overt diabetes prior to gestation or other types of diabetes occurring throughout pregnancy, such as type 1 diabetes)

Type 1 Diabetes

- Screen for presymptomatic type 1 diabetes by testing autoantibodies: insulin (IA), glutamic acid decarboxylase (GAD), islet antigen 2 (IA-2), or zinc transporter 8 (ZnT8). B
- Autoantibody-based screening for presymptomatic type 1 diabetes should be offered to those with a family history of type 1 diabetes or otherwise known elevated genetic risk. B
- Individuals with screening results positive for one or more islet autoantibodies should be evaluated for stage 3 (overt) type 1 diabetes (using A1C, urinalysis, and/or plasma glucose), which would require prompt clinical management and education. B
- Individuals with multiple confirmed islet autoantibodies and without overt type 1 diabetes have a high risk for progression to stage 3 type 1 diabetes and should be referred to a specialized center for metabolic staging, education, and consideration of prevention trials or approved treatments (e.g., teplizumab). E

Type 1 Diabetes

- Individuals with a single confirmed IA-2 autoantibody should be monitored similarly to individuals with multiple islet autoantibodies, as IA-2 autoantibody positivity is an independent risk factor for progression. **B**

- Individuals with a single confirmed islet autoantibody should undergo repeat antibody testing every 6 months to 3 years (depending on age) to assess for persistence or seroconversion. **E**

- Standardized islet autoantibody tests are recommended for classification of diabetes in adults who have phenotypic risk factors that overlap with those for type 1 diabetes (e.g., younger age at diagnosis, unintentional weight loss, ketoacidosis, or short time to insulin treatment). **E**

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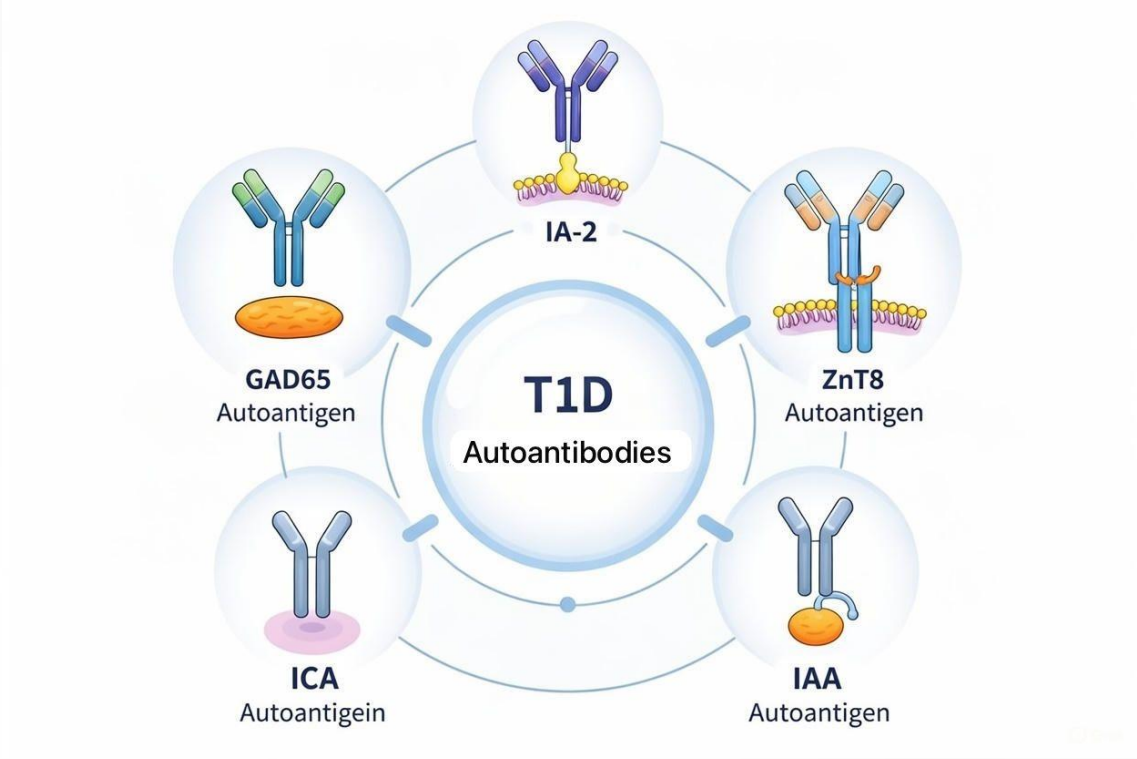
IA-2 Autoantibody

- Independent risk factor for progression to type 1 diabetes
- Monitor as multiple autoantibody–positive individuals



2. Diagnosis and Classification of Diabetes

Table 2.3—Considerations related to the use and interpretation of laboratory measurements of glucose and A1C

	Glucose	A1C
Cost	Inexpensive and available in most laboratories across the world	More expensive than glucose and not as widely available globally
Time frame of hyperglycemia	Acute measure	Chronic measure of glucose exposure over the past ~2–3 months
Preanalytic stability	Poor; plasma must be separated immediately or samples must be kept on ice to prevent glycolysis	Good
Sample	Measurement can vary depending on sample type (plasma, serum, whole blood) and source (capillary, venous, arterial)	Requires whole-blood sample
Assay standardization	Not standardized	Well standardized
Fasting	Fasting or timed samples required	Nonfasting test; no participant preparation is needed
Within-person variability	High	Low
Acute factors that can affect levels	Food intake, stress, recent illness, activity	Unaffected by recent food intake, stress, illness, activity
Other individual factors that can affect test results	Diurnal variation, medications, alcohol, smoking, bilirubin	Altered erythrocyte turnover (e.g., anemia, iron status, splenectomy, blood loss, transfusion, hemolysis, glucose-6-phosphate dehydrogenase deficiency, erythropoietin), HIV, cirrhosis, renal failure, dialysis, pregnancy
Test interferences	Depends on specific assay: sample handling/ processing time, hemolysis, severe hypertriglyceridemia, severe hyperbilirubinemia	Depends on specific assay: hemoglobin variants, severe hypertriglyceridemia, severe hyperbilirubinemia

Data are from Selvin (236).

2. Diagnosis and Classification of Diabetes

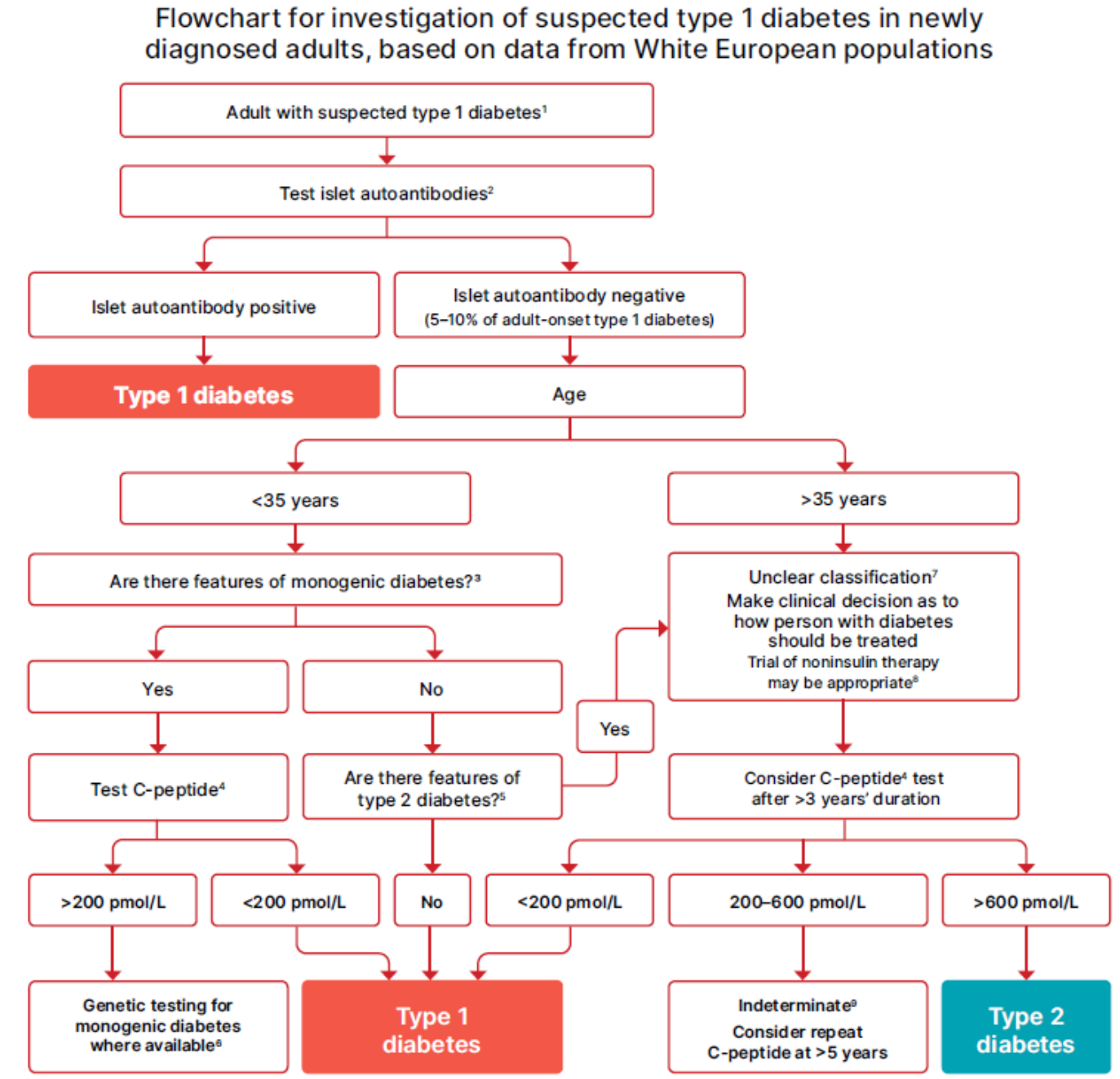


Figure 2.1—Flowchart for investigation of suspected type 1 diabetes in newly diagnosed adults, based on data from White European populations. [1]No single clinical feature confirms type 1 diabetes in isolation. [2]Glutamic acid decarboxylase (GAD) should be the primary antibody measured and, if negative, should be followed by islet tyrosine phosphatase 2 (IA-2) and/or zinc transporter 8 (ZnT8) where these tests are available. In individuals who have not been treated with insulin, antibodies against insulin may also be useful. In those diagnosed at <35 years of age who have no clinical features of type 2 diabetes or monogenic diabetes, a negative result does not change the diagnosis of type 1 diabetes, since 5–10% of people with type 1 diabetes do not have antibodies. [3]Monogenic diabetes is suggested by the presence of one or more of the following features: A1C <58 mmol/mol (<7.5%) at diagnosis, one parent with diabetes, features of a specific monogenic cause (e.g., renal cysts, partial lipodystrophy, maternally inherited deafness, and severe insulin resistance in the absence of obesity), and monogenic diabetes prediction model probability >5% (diabetesgenes.org/exeter-diabetes-app/ModyCalculator). [4]A C-peptide test is only indicated in people receiving insulin treatment. A random sample (with concurrent glucose) within 5 h of eating can replace a formal C-peptide stimulation test in the context of classification. If the result is ≥600 pmol/L (≥1.8 ng/mL), the circumstances of testing do not matter. If the result is <600 pmol/L (<1.8 ng/mL) and the concurrent glucose is <4 mmol/L (<70 mg/dL) or the person may have been fasting, consider repeating the test. Results showing very low levels (e.g., <80 pmol/L [<0.24 ng/mL]) do not need to be repeated. Where a person is insulin treated, C-peptide must be measured prior to insulin discontinuation to exclude severe insulin deficiency. Do not test C-peptide within 2 weeks of a hyperglycemic emergency. [5]Features of type 2 diabetes include increased BMI (≥25 kg/m^2), absence of weight loss, absence of ketoacidosis, and less marked hyperglycemia. Less discriminatory features include non-White ethnicity, family history, longer duration and milder severity of symptoms prior to presentation, features of metabolic syndrome, and absence of a family history of autoimmunity. [6]If genetic testing does not confirm monogenic diabetes, the classification is unclear and a clinical decision should be made about treatment. [7]Type 2 diabetes should be strongly considered in older individuals. In some cases, investigation for pancreatic or other types of diabetes may be appropriate. [8]A person with possible type 1 diabetes who is not treated with insulin will require careful monitoring and education so that insulin can be rapidly initiated in the event of glycemic deterioration. [9]C-peptide values 200–600 pmol/L (0.6–1.8 ng/mL) are usually consistent with type 1 diabetes or maturity-onset diabetes of the young but may occur in insulin-treated type 2 diabetes, particularly in people with normal or low BMI or after long duration. Reprinted and adapted from Holt et al. (32).

Prediabetes and Type 2 Diabetes

- Screening for risk of prediabetes and type 2 diabetes with an assessment of risk factors or validated risk calculator should be done in asymptomatic adults. **B**
- Testing for prediabetes or type 2 diabetes in asymptomatic people should be considered in adults of any age with overweight or obesity who have one or more risk factors. **B**
- For all other people, screening should begin at age 35 years. **B**
- In people without prediabetes or diabetes after screening, repeat screening recommended at a minimum of 3-year intervals is reasonable, sooner with symptoms or change in risk (e.g., weight gain). **C**

Prediabetes and Type 2 Diabetes

- When using OGTT as a screening tool for prediabetes or diabetes, adequate carbohydrate intake (at least 150 g/day) should be assured for 3 days prior to testing. **C**
- Risk-based screening for prediabetes or type 2 diabetes should be considered after the onset of puberty or after 10 years of age, whichever occurs earlier, in children and adolescents with overweight (BMI ≥ 85th percentile) or obesity (BMI ≥ 95th percentile) and who have one or more risk factors for diabetes. **B**
- Consider screening people for prediabetes or diabetes if they are on certain medications, such as statins, thiazide diuretics, and some HIV medications, as these agents are known to increase the risk of these conditions. **C**
- In people who are prescribed second-generation antipsychotic medications, screen for prediabetes and diabetes at baseline and repeat 12–16 weeks after medication initiation or sooner, if clinically indicated, and annually thereafter. **B**

2. Diagnosis and Classification of Diabetes

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Table 2.4—Staging of type 1 diabetes

	Stage 1	Stage 2	Stage 3
Characteristics	• Autoimmunity • Normoglycemia • Presymptomatic	• Autoimmunity • Dysglycemia • Presymptomatic	• Autoimmunity • Overt hyperglycemia • Symptomatic
Diagnostic criteria	• Multiple islet autoantibodies • No IGT or IFG, normal A1C	• Islet autoantibodies (usually multiple) • Dysglycemia: ◦ IFG: FPG 100–125 mg/dL (5.6–6.9 mmol/L) or ◦ IGT: 2-h PG 140–199 mg/dL (7.8–11.0 mmol/L) or ◦ A1C 5.7–6.4% (39–47 mmol/mol) or ≥10% increase in A1C	• Autoantibodies may become absent • Diabetes by standard criteria

Adapted from Skyler et al. (35). FPG, fasting plasma glucose; IFG, impaired fasting glucose; IGT, impaired glucose tolerance; 2-h PG, 2-h plasma glucose. Alternative additional stage 2 diagnostic criteria of 30-, 60-, or 90-min plasma glucose on oral glucose tolerance test ≥200 mg/dL (≥11.1 mmol/L) and confirmatory testing in those aged ≥18 years have been used in clinical trials (82). Dysglycemia can be defined by one or more criteria as outlined in the table.

2. Diagnosis and Classification of Diabetes

Table 2.5—Criteria for screening for diabetes or prediabetes in asymptomatic adults

1. Testing should be considered in adults with overweight or obesity (BMI ≥25 kg/m^2 or ≥23 kg/m^2 in individuals of Asian ancestry) who have one or more of the following risk factors:
   - First-degree relative with diabetes
   - High-risk race, ethnicity, and ancestry (e.g., African American, Latino, Native American, Asian American)
   - History of cardiovascular disease
   - Hypertension (≥130/80 mmHg or on therapy for hypertension)
   - HDL cholesterol level <35 mg/dL (<0.9 mmol/L) and/or triglyceride level >250 mg/dL (>2.8 mmol/L)
   - Individuals with polycystic ovary syndrome
   - Physical inactivity
   - Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans, metabolic dysfunction–associated steatotic liver disease)
2. People with prediabetes (A1C ≥5.7% [≥39 mmol/mol], IGT, or IFG) should be tested yearly.
3. People who were diagnosed with GDM should have testing at least every 1–3 years.
4. For all other people, testing should begin at age 35 years.
5. If results are normal, testing should be repeated at a minimum of 3-year intervals, with consideration of more frequent testing depending on initial results and risk status.
6. Individuals in other high-risk groups (e.g., people with HIV, exposure to high-risk medicines, evidence of periodontal disease, history of pancreatitis) should also be closely monitored

GDM, gestational diabetes mellitus; IFG, impaired fasting glucose; IGT, impaired glucose tolerance.

Diabetes Induced by Systemic Anti-Cancer Therapy

- People starting cancer treatment with immune checkpoint inhibitors (ICI), including anti-PD-1 or anti-PDL-1 therapy (e.g., nivolumab, pembrolizumab, avelumab), phosphoinositidylinositol 3-kinase α (PI3Kα) inhibitors (e.g., alpelisib, inavolisib), or mammalian target of rapamycin (mTOR) inhibitors (e.g., everolimus), should be educated regarding risks, symptoms, and signs of hyperglycemia and hyperglycemic crises. **E**

- In people treated with ICIs, fasting or random plasma glucose should be tested before initiating treatment, during each visit, or if symptoms and signs of hyperglycemia develop during or after treatment cessation. **E**

- In people treated with PI3Kα inhibitors, fasting or random plasma glucose and A1C should be tested before initiating treatment, and random plasma glucose should be tested weekly for the first 2 weeks of treatment and then every 4 weeks during treatment. **C** Consider testing A1C every 3 months during treatment. **E**

- In people treated with mTOR inhibitors, fasting or random plasma glucose should be tested before starting and at each visit throughout the duration of treatment. Consider testing A1C every 3 months during treatment. **C**

Post-translplantation Diabetes Mellitus

- After organ transplantation, screening for hyperglycemia should be done. A formal diagnosis of posttransplantation diabetes mellitus (PTDM) is best made once the individual is stable on an immunosuppressive plan and in the absence of an acute infection. **B**
- The OGTT is the preferred test to make a diagnosis of PTDM. **B**
- Immunosuppressive plans shown to provide the best outcomes for individuals and graft survival should be used, irrespective of PTDM risk. **E**

Diagnosis of Monogenic Diabetes

The diagnosis of monogenic diabetes should be considered in children and adults diagnosed with diabetes in early adulthood with the following findings:

- Diabetes diagnosed within the first 6 months of life
- Diabetes without typical features of type 1 or type 2 diabetes (negative diabetes-associated autoantibodies, no obesity, and lacking other metabolic features, especially strong family history of diabetes)
- Stable, mild fasting hyperglycemia (100–150 mg/dL), stable A1C between 5.6% and 7.6%, especially if no obesity.

Gestational Diabetes Mellitus

- In individuals who are planning pregnancy, screen those with risk factors **B** and consider testing all individuals of childbearing potential for undiagnosed prediabetes or diabetes. **E**
- Before 15 weeks of gestation, test individuals with risk factors **B** and consider testing all individuals **E** for undiagnosed diabetes at the first prenatal visit using standard diagnostic criteria if not screened preconception.
- Before 15 weeks of gestation, screen for abnormal glucose metabolism (defined as A1C 5.9–6.4% or FPG 110–125 mg/dL to identify individuals who are at higher risk of adverse pregnancy and neonatal outcomes and are at high risk of a later gestational diabetes mellitus (GDM) diagnosis. **B**
- Screen for GDM at 24–28 weeks of gestation in pregnant individuals not previously found to have diabetes or high-risk abnormal glucose metabolism detected earlier in the current pregnancy. **A**

Gestational Diabetes Mellitus

- Screen individuals with GDM for prediabetes or diabetes at 4–12 weeks postpartum, using the 75-g OGTT and clinically appropriate nonpregnancy diagnostic criteria. **B**

- Individuals with a history of GDM should have lifelong screening for the development of prediabetes or diabetes every 1–3 years. **B**

Gestational Diabetes Mellitus

GDM diagnosis can be accomplished with either of two strategies:

- The “one-step” 75-g OGTT derived from the IADPSG criteria, or
- The older “two-step” approach with a 50-g (nonfasting) screen followed by a 100-g OGTT for those who screen positive based on the work of Carpenter-Coustan’s interpretation of the older O’Sullivan and Mahan criteria.

2. Diagnosis and Classification of Diabetes

Table 2.8—Screening for and diagnosis of GDM

One-step strategy

Perform a 75-g OGTT, with plasma glucose measurement when an individual is fasting and at 1 and 2 h, at 24–28 weeks of gestation in individuals not previously diagnosed with diabetes.

The OGTT should be performed in the morning after an overnight fast of at least 8 h.

The diagnosis of GDM is made when any of the following plasma glucose values are met or exceeded:

- Fasting: 92 mg/dL (5.1 mmol/L)
- 1 h: 180 mg/dL (10.0 mmol/L)
- 2 h: 153 mg/dL (8.5 mmol/L)

Two-step strategy

Step 1:

Perform a 50-g GLT (nonfasting), with plasma glucose measurement at 1 h, at 24–28 weeks of gestation in individuals not previously diagnosed with diabetes.

If the plasma glucose level measured 1 h after the load is ≥130, 135, or 140 mg/dL (7.2, 7.5, or 7.8 mmol/L, respectively),* proceed to a 100-g OGTT.

Step 2:

The 100-g OGTT should be performed when the individual is fasting.

The diagnosis of GDM is made when at least two>† of the following four plasma glucose levels (measured fasting and at 1, 2, and 3 h during OGTT) are met or exceeded (Carpenter-Coustan criteria [208]):

- Fasting: 95 mg/dL (5.3 mmol/L)
- 1 h: 180 mg/dL (10.0 mmol/L)
- 2 h: 155 mg/dL (8.6 mmol/L)
- 3 h: 140 mg/dL (7.8 mmol/L)

GDM, gestational diabetes mellitus; GLT, glucose load test; OGTT, oral glucose tolerance test. *American College of Obstetricians and Gynecologists (ACOG) recommends any of the commonly used thresholds of 130, 135, or 140 mg/dL for the 1-h 50-g GLT (223). †ACOG notes that one elevated value can be used for diagnosis (223).

Overall Recommendations

- In people with prediabetes, monitor for the development of diabetes at least annually; modify frequency of testing based on individual risk assessment. **E**

- In people with presymptomatic type 1 diabetes, monitor for disease progression using A1C approximately every 6 months and 75-g oral glucose tolerance test (i.e., fasting and 2-h plasma glucose) annually; modify frequency of monitoring and consider augmenting with other glycemic assessment tools such as continuous glucose monitoring metrics based on individual risk assessment based on age, number and type of autoantibodies, and glycemic metrics. **E**

Lifestyle Behavior Change for Type 2 Diabetes Prevention

- Refer adults with overweight or obesity at high risk of type 2 diabetes to a diabetes prevention program to achieve and maintain a weight reduction of at least 5–7% of initial body weight through a healthy reduced-calorie eating pattern and ≥150 min/week of moderate-intensity physical activity. **A**

- Prescribe an evidence-based eating pattern (e.g., Mediterranean, low carbohydrate) to individuals with prediabetes to prevent type 2 diabetes. **B**

- Based on individual preference, certified technology-assisted diabetes prevention programs through smartphones, web-based applications, and telehealth can be effective in preventing type 2 diabetes and should be considered. **B**

Lifestyle Behavior Change for Type 2 Diabetes Prevention

- Metformin for the prevention of type 2 diabetes should be considered in adults at high risk of type 2 diabetes, as typified by the Diabetes Prevention Program, especially those:
  - Aged 25–59 years with BMI ≥35 kg/m^2
  - Higher fasting plasma glucose (e.g., ≥110 mg/dL [≥6 mmol/L])
  - Higher A1C e.g., ≥6.0%
  - Prior gestational diabetes mellitus. **A**

- Consider using metformin to prevent hyperglycemia in high-risk individuals treated with high-dose glucocorticoids. **B**

- Consider periodic assessment of vitamin B12 levels in individuals receiving long-term metformin therapy, especially in those with anemia or peripheral neuropathy. **B**

Prevention of Vascular Disease and Mortality

- Prediabetes is associated with heightened cardiovascular risk; therefore, screening for and treatment of modifiable risk factors for cardiovascular disease are suggested. **B**

- Statin therapy may increase the risk of type 2 diabetes in people at high risk of developing type 2 diabetes. In such individuals, glucose status should be monitored regularly and diabetes prevention approaches reinforced. It is not recommended that statins be avoided or discontinued for this adverse effect. **B**

- In people with a history of stroke and evidence of insulin resistance and prediabetes, pioglitazone may be considered to lower the risk of stroke or myocardial infarction. However, this benefit needs to be balanced with the increased risk of weight gain, edema, and fractures. **A** Lower doses may mitigate the risk of adverse effects but may be less effective. **C**

Person-Centered Care Goals

- In adults with overweight or obesity at high risk of type 2 diabetes, care goals should include weight loss and maintenance, minimizing the progression of hyperglycemia, and attention to cardiovascular risk. **B**

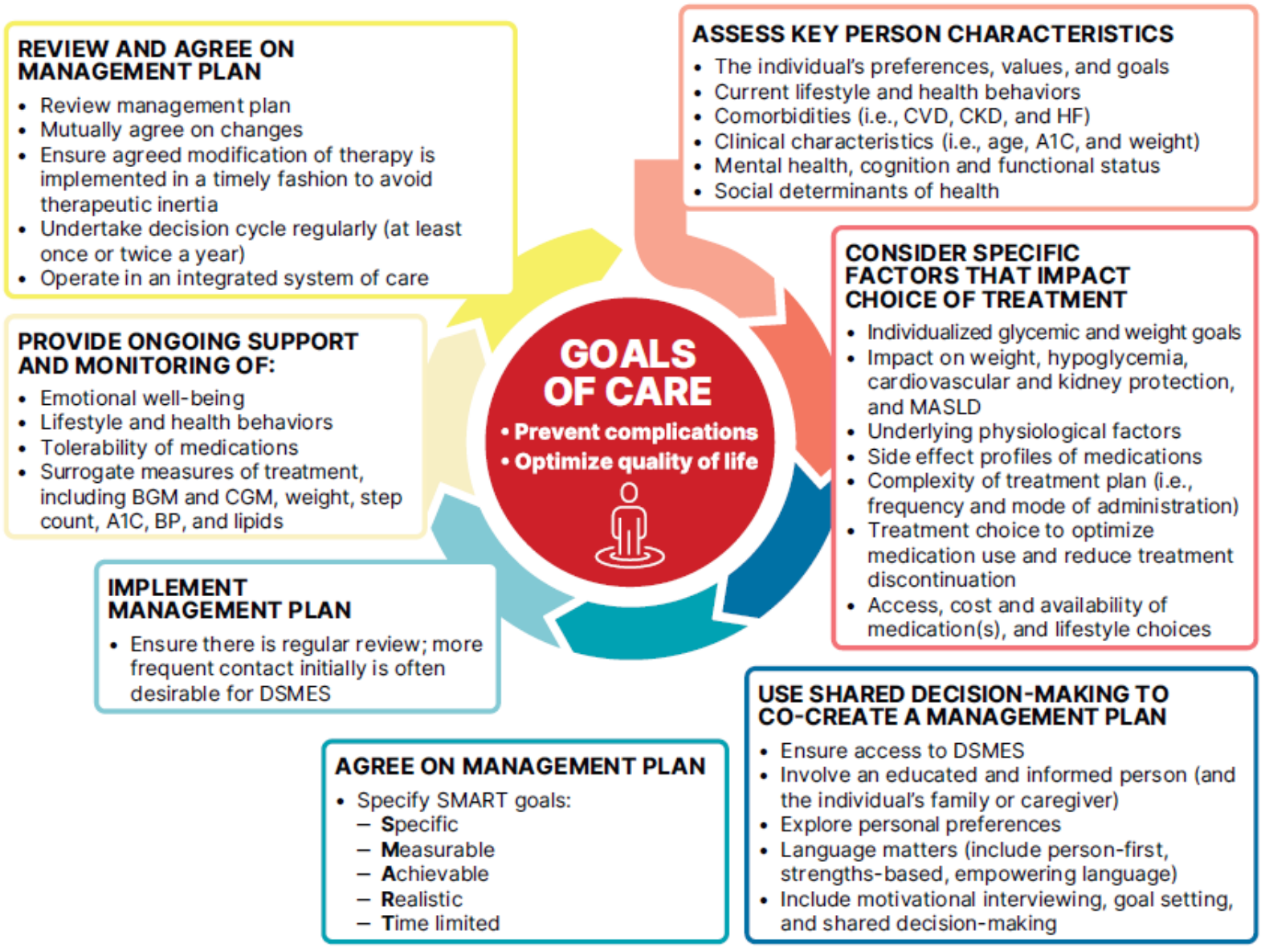
- Pharmacotherapy (e.g., for weight management, minimizing the progression of hyperglycemia, and cardiovascular risk reduction) should be considered to support person-centered care goals. **A**

- More intensive preventive approaches should be considered in individuals who are at particularly high risk of progression to diabetes, including individuals with BMI ≥35 kg/m^2, those with higher glucose levels (e.g., fasting plasma glucose 110–125 mg/dL, 2-h post-challenge glucose 173–199 mg/dL, and A1C ≥6.0%, and individuals with a history of gestational diabetes mellitus. **A**

Pharmacologic Interventions to Delay Symptomatic Type 1 Diabetes

- Teplizumab infusion to delay the onset of symptomatic type 1 diabetes (stage 3) should be discussed with selected individuals aged ≥8 years with stage 2 type 1 diabetes. Treatment should be in a setting with appropriately trained personnel. **B**

Decision cycle for person-centered glycemic management in type 2 diabetes



Comprehensive Medical Evaluation

A complete medical evaluation should be performed at the initial visit and follow-up, as appropriate, to:

- Confirm the diagnosis and classify diabetes. **A**
- Assess glycemic status and previous and current treatment. **A**
- Evaluate for diabetes complications, potential comorbid conditions, and overall health status. **A**
- Identify care partners, support systems, and available resources. **E**
- Assess social determinants of health and structural barriers to optimal health and health care. **A**
- Review risk factor management in the person with diabetes. **A**
- Begin engagement with the person with diabetes in the formulation of a care management plan including goals of care. **A**
- Develop a plan for continuing care. **A**

Comprehensive Medical Evaluation

Table 4.2—Essential components for assessment, planning, and referral

Assessing risk of diabetes complications

- ASCVD and heart failure history
- ASCVD risk factors and 10-year ASCVD risk assessment
- Staging of chronic kidney disease (see **Table 11.2**)
- Hypoglycemia risk (see section 6, "Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises")
- Assessment for retinopathy
- Assessment for neuropathy
- Assessment for MASLD and MASH

Goal setting

- Set A1C, blood glucose, and time-in-range goals
- Set lipid goal
- If hypertension is present, establish blood pressure goal
- Weight management and physical activity goals
- Diabetes self-management goals

Therapeutic treatment plans

- Lifestyle management (e.g., registered dietitian nutritionist)
- Pharmacologic therapy: glucose lowering
- Pharmacologic therapy: cardiovascular and kidney disease risk factors
- Weight management with pharmacotherapy or metabolic surgery, as appropriate
- Use of glucose monitoring and insulin delivery devices
- Referral to diabetes education and medical specialists (as needed)

Comprehensive Medical Evaluation

Referrals for initial care management

- Eye care professional for annual dilated eye exam
- Family planning for individuals of childbearing potential
- Registered dietitian nutritionist for medical nutrition therapy
- Diabetes self-management education and support
- Dentist for comprehensive dental and periodontal examination
- Behavioral health professional, if indicated
- Audiology, if indicated
- Social worker and community resources, if indicated
- Rehabilitation medicine or another relevant health care professional for physical and cognitive disability evaluation, if indicated
- Other appropriate health care professionals

Assessment and treatment planning are essential components of initial and all follow-up visits. ASCVD, atherosclerotic cardiovascular disease; MASH, metabolic dysfunction-associated steatohepatitis; MASLD, metabolic dysfunction-associated steatotic liver disease.

Autoimmune Diseases

- Screen people with type 1 diabetes for autoimmune thyroid disease soon after diagnosis and thereafter at repeated intervals if clinically indicated. **B**
- Adults with type 1 diabetes should be screened for celiac disease in the presence of gastrointestinal symptoms, signs, laboratory manifestations, or clinical suspicion suggestive of celiac disease. **B**

Bone Health

- Assess fracture risk in older adults with diabetes as a part of routine care in diabetes clinical practice, according to risk factors and comorbidities. **A**
- Monitor bone mineral density using dual-energy X-ray absorptiometry in older adults with diabetes (aged ≥65 years) and younger individuals with diabetes and multiple risk factors every 2–3 years. **A**
- Consider the potential adverse impact on skeletal health when selecting pharmacological options to lower glucose levels in people with diabetes. Avoiding medications with a known association with higher fracture risk (e.g., thiazolidinediones and sulfonylureas) is recommended, particularly for those at elevated risk for fractures. **B**

Bone Health

- To reduce the risk of falls and fractures, glycemic management goals should be individualized for people with diabetes at a higher risk of fracture. **C** Prioritize use of glucose-lowering medications that are associated with low risk for hypoglycemia to avoid falls. **B**
- Advise people with diabetes on their intake of calcium (1,000–1,200 mg/day) and vitamin D to ensure it meets the recommended daily allowance for those at risk for fracture, either through their food choices or supplemental means. **B**
- Consider osteoporosis drug therapy in older adults with diabetes who are at increased risk of fracture, including those with low bone mineral density (T-score ≤−2.5), history of fragility fracture, or elevated Fracture Risk Assessment Tool score (≥3% for hip fracture or ≥20% for major osteoporotic fracture). **B**
- Treatment may be considered for adults with diabetes with a T-score between −2.0 and −2.5 in the presence of additional risk factors for fracture. **C**

Bone Health

Table 4.4—Diagnostic assessment

Individuals who should receive BMD testing
People aged ≥65 years
Postmenopausal women and men aged ≥50 years with history of adult-age fracture or with diabetes-specific risk factors: • Frequent hypoglycemic events • Diabetes duration >10 years • Diabetes medications: insulin, thiazolidinediones, sulfonylureas • A1C >8% • Peripheral or autonomic neuropathy, retinopathy, nephropathy • Frequent falls • Glucocorticoid use: prednisone at doses >2.5 mg per day for ≥3 months

Cognitive Impairment / Dementia

In the presence of cognitive impairment, diabetes treatment plans should be simplified as much as possible and tailored to minimize the risk of hypoglycemia. **B**

Dental Care

People with diabetes should be referred for a dental exam at least once per year. **E**

Sexual Health in Men

- In men with diabetes or prediabetes, screen for erectile dysfunction (ED), particularly in those with high cardiovascular risk, retinopathy, cardiovascular disease, chronic kidney disease, peripheral or autonomic neuropathy, longer duration of diabetes, depression, and hypogonadism and in those who are not meeting glycemic goals. **B**
- In men with diabetes or prediabetes, inquire about sexual health (e.g., low libido and ED). If symptoms and/or signs of hypogonadism are detected, screen with a morning serum total testosterone level. **B**

Metabolic-Associated Steatotic Liver Disease and Metabolic-Associated Steatohepatitis - Screening

- Screen adults with type 2 diabetes or with prediabetes, particularly those with obesity or other cardiometabolic risk factors or established cardiovascular disease, for their risk of having or developing cirrhosis related to metabolic dysfunction-associated steatohepatitis (MASH) using a calculated fibrosis-4 index (FIB-4) (derived from age, ALT, AST, and platelets, even if they have normal liver enzymes. **B**
- Adults with diabetes or prediabetes with persistently elevated plasma aminotransferase levels for >6 months and low FIB-4 should be evaluated for other causes of liver disease. **B**
- Adults with type 2 diabetes or prediabetes with a FIB-4 ≥1.3 should have additional risk stratification by liver stiffness measurement with transient elastography, or, if unavailable, the enhanced liver fibrosis (ELF) test. **B**
- Refer adults with type 2 diabetes or prediabetes at higher risk for significant liver fibrosis (i.e., as indicated by FIB-4, liver stiffness measurement, or ELF) to a gastroenterologist or hepatologist for further evaluation and management. **B**

4. Comprehensive Medical Evaluation and Assessment of Comorbidities

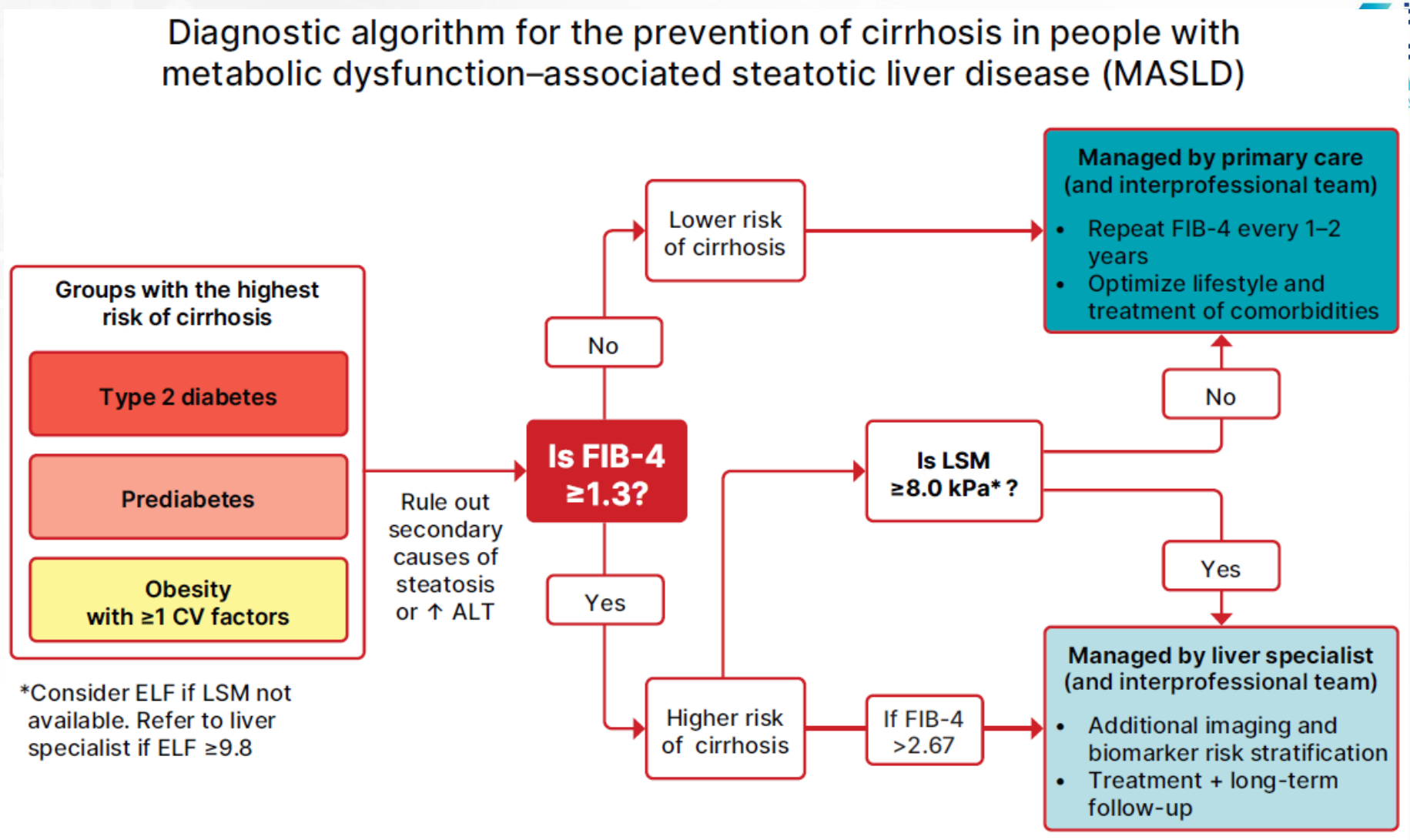


Figure 4.2—Diagnostic algorithm for risk stratification and the prevention of cirrhosis in individuals with metabolic dysfunction-associated steatotic liver disease (MASLD). CV, cardiovascular; ELF, enhanced liver fibrosis test; FIB-4, fibrosis-4 index; LSM, liver stiffness measurement, as measured by vibration-controlled transient elastography. *In the absence of LSM, consider ELF a diagnostic alternative. If ELF ≥9.8, an individual is at high risk of metabolic dysfunction-associated steatohepatitis with advanced liver fibrosis (≥F3–F4) and should be referred to a liver specialist.

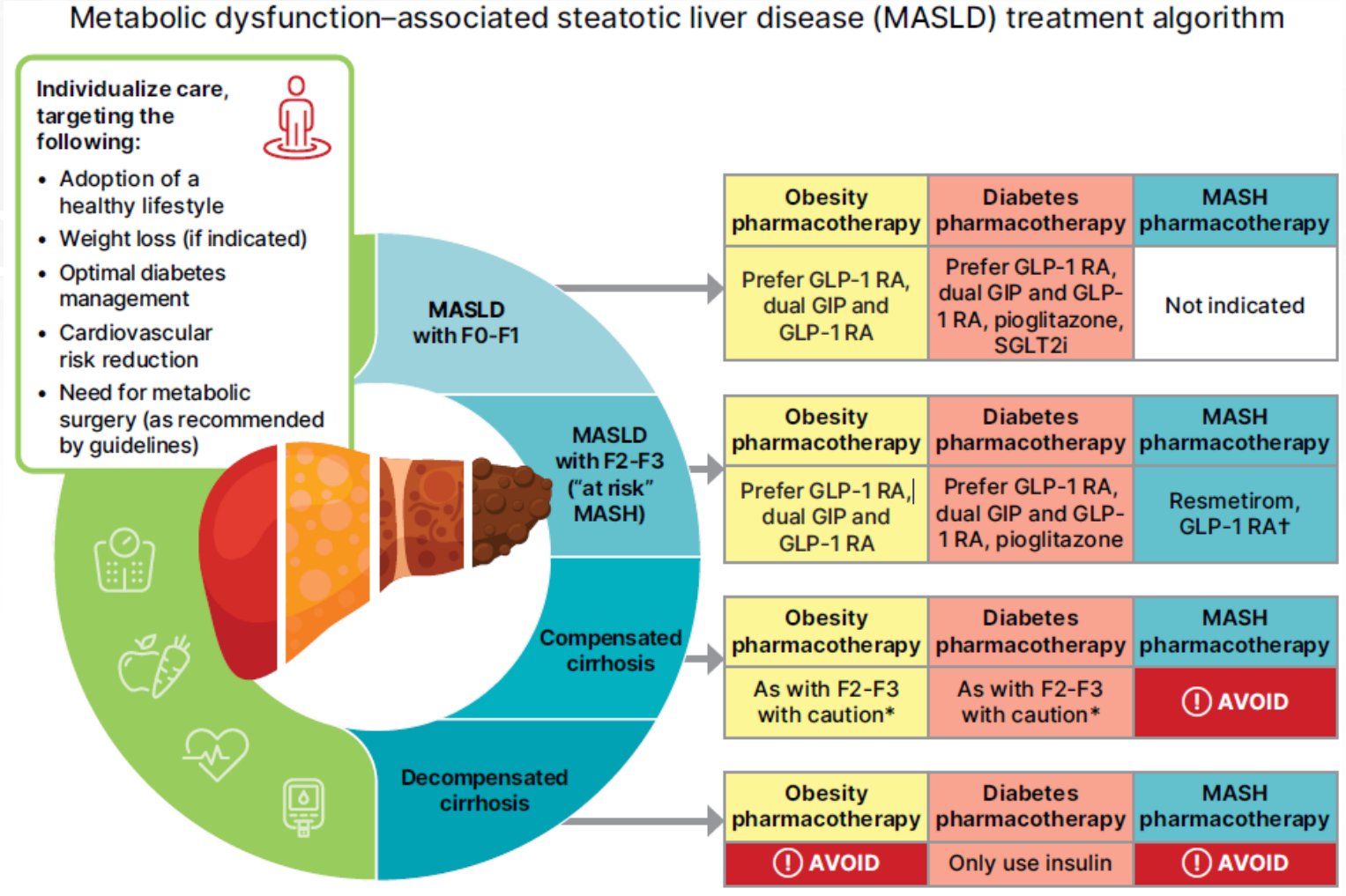
Metabolic-Associated Steatotic Liver Disease and Metabolic-Associated Steatohepatitis - Screening

- Adults with type 2 diabetes or prediabetes, particularly with overweight or obesity, who have metabolic dysfunction–associated steatotic liver disease (MASLD) should be recommended lifestyle changes using an interprofessional approach that promotes weight loss, ideally within a structured nutrition plan and physical activity program for cardiometabolic benefits **B** and histological improvement. **C**
- In adults with type 2 diabetes, MASLD, and overweight or obesity, consider using a glucagon-like peptide 1 receptor agonist (GLP-1 RA) with demonstrated benefits in MASH **A** or a dual glucose-dependent insulinotropic polypeptide (GIP) and GLP-1 RA with potential benefits in MASH **B** for the treatment of obesity as an adjunctive therapy to lifestyle interventions for weight loss.
- In adults with type 2 diabetes and biopsy-proven MASH or those at high risk for liver fibrosis (based on noninvasive tests), a GLP-1 RA is preferred for glycemic management due to beneficial effects on MASH. **A** Pioglitazone **B** or a dual GIP and GLP-1 RA **B** can be considered for glycemic management due to potential beneficial effects on MASH.
- Combination therapy with pioglitazone plus GLP-1 RA can be considered for the treatment of hyperglycemia in adults with type 2 diabetes with biopsy-proven MASH or those at high risk of liver fibrosis (identified with noninvasive tests) because of potential beneficial effects on MASH. **B**

Metabolic-Associated Steatotic Liver Disease and Metabolic-Associated Steatohepatitis - Screening

- In adults with type 2 diabetes and MASLD, use of glucose-lowering therapies other than pioglitazone or GLP-1 RAs may be continued as clinically indicated, but these therapies lack evidence of benefit in MASH. **B**
- Insulin therapy is the preferred agent for the treatment of hyperglycemia in adults with type 2 diabetes with decompensated cirrhosis. **C**
- Statin therapy is safe in adults with type 2 diabetes and compensated cirrhosis from MASLD and should be initiated or continued for cardiovascular risk reduction as clinically indicated. **B** In people with decompensated cirrhosis, statin therapy should be used with caution, and close monitoring is needed, given limited safety and efficacy data. **B**
- Consider metabolic surgery in appropriate candidates as an option to treat MASH in adults with type 2 diabetes **B** and to improve cardiovascular outcomes. **B**

4. Comprehensive Medical Evaluation and Assessment of Comorbidities



† Only semaglutide among GLP-1 RAs has been approved by the FDA for treatment of MASH.
* Individualized care and close monitoring needed in compensated cirrhosis given limited safety data available.

Figure 4.3—Metabolic dysfunction-associated steatotic liver disease (MASLD) treatment algorithm. F0-F1, no to minimal fibrosis; F2-F3, moderate fibrosis; F4, cirrhosis; GIP, glucose-dependent insulinotropic polypeptide; GLP-1 RA, glucagon-like peptide 1 receptor agonist; MASH, metabolic dysfunction-associated steatohepatitis; SGLT2i, sodium–glucose cotransporter 2 inhibitor.

Diabetes Self-Management Education and Support

- Advise all people with diabetes to participate in developmentally and culturally appropriate diabetes self-management education and support (DSMES) to facilitate informed decision-making, self-care behaviors, problem-solving, and active collaboration with the health care team. A
- Provide DSMES at diagnosis, annually and/or when not meeting treatment goals, when complicating factors develop (e.g., medical, functional, and psychosocial), and when transitions in life and care occur. E
- Assess clinical outcomes, health status, and well-being as key goals of DSMES on an individualized timeframe. C
- Use behavioral strategies (e.g., motivational interviewing, goal setting, problem-solving) to support DSMES and engagement in behaviors known to optimize health-related quality of life and outcomes. A

Medical Nutrition Therapy

- Provide individualized medical nutrition therapy by referring people with prediabetes or diabetes to a registered dietitian nutritionist, preferably one who has comprehensive experience in diabetes care. **A**
- Diabetes medical nutrition therapy can result in cost savings **B** and improved cardiometabolic outcomes **A** and should be reimbursed by insurance. **E**
- Provide an overweight/obesity treatment plan based on their nutrition, physical activity, and behavioral health status for all people with overweight or obesity, aiming for at least 5–7% weight loss. **A**
- Provide education on the glycemic impact of carbohydrate, **A** fat, and protein **B** tailored to an individual's needs, insulin plan, and preferences for care to optimize mealtime insulin dosing.

Religious Fasting

- Use the updated International Diabetes Federation along with Diabetes and Ramadan International Alliance comprehensive prefasting risk assessment to generate a risk score for the safety of religious fasting. Provide fasting-focused education to minimize risks. **B**
- Assess and optimize treatment plan, dose, and timing for people with diabetes well in advance of religious fasting to reduce risk of hypoglycemia, dehydration, hyperglycemia, and/or ketoacidosis. **B**

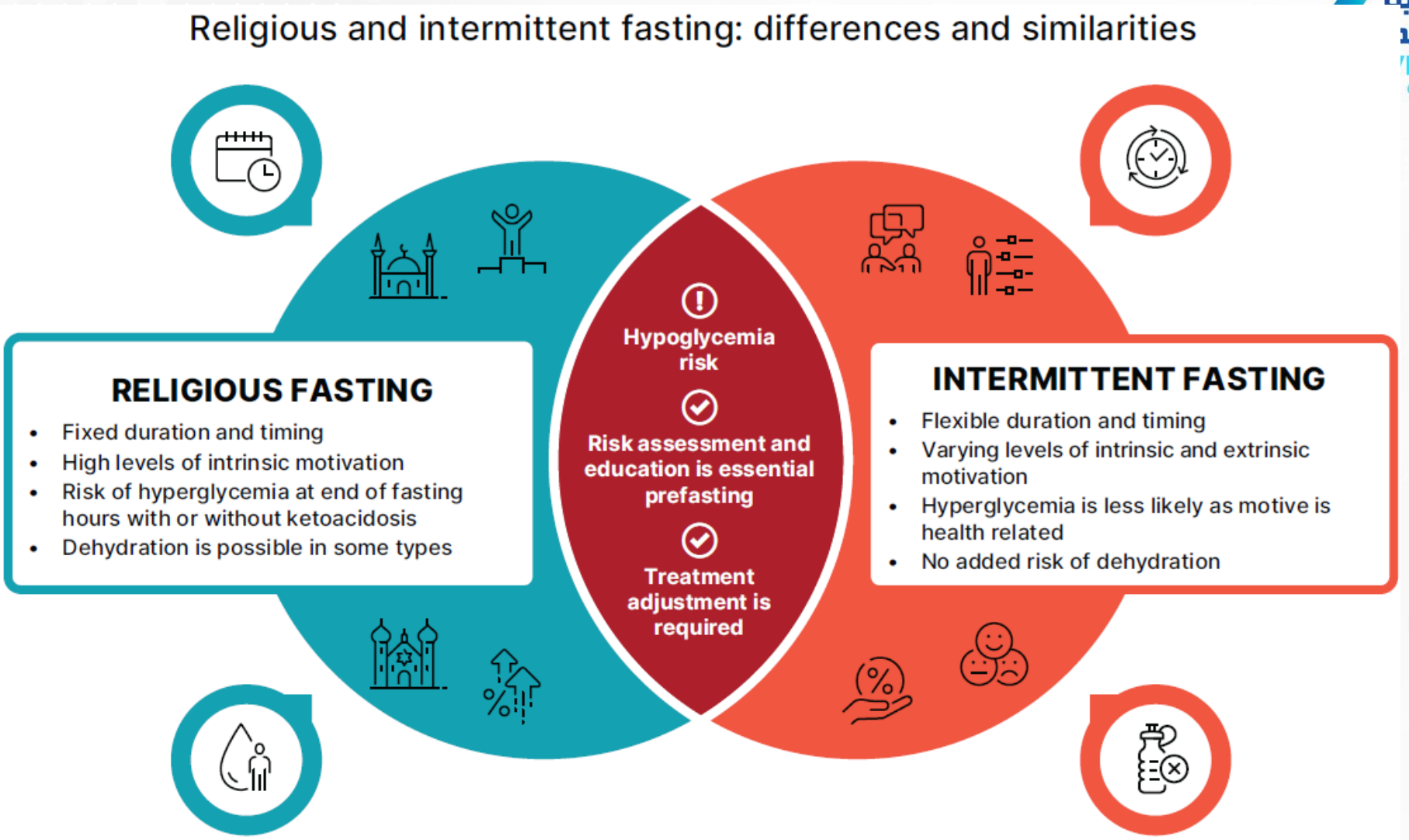


Figure 5.1—Differences and similarities between religious and intermittent fasting for people with diabetes.

5. Facilitating Positive Behaviors and Well-being to Improve Health Outcomes

Table 5.4—Changes in medications during fasting

Medication name	Risk of hypoglycemia	Timing	Total daily dose
Metformin, SGLT2 inhibitor, DPP-4 inhibitor, GLP-1 receptor agonist, acarbose, or pioglitazone	Low	• If once daily, then take at main mealtime. • If twice daily, then split dose between the two meals. • If once weekly, no change of time.	• No change
New generation of sulfonylurea (glimepiride and gliclazide)	Low to moderate	• If once daily, then take at main mealtime. • If twice daily, then split dose between the two meals.	• Reduce dose if glucose levels are within individualized goal range and if no hypoglycemia or hyperglycemia is present at baseline.
Older generation of sulfonylurea (glyburide)	Moderate to high	• Take at time of main meal	• Replace with newer-generation sulfonylurea or reduce dose by 50%.
Basal insulin	Moderate to high	• For longer-acting basal analogs (glargine 300 or degludec), no need to change timing. • For other basal insulins, take at beginning of breaking fast meal.	• Choose the insulin with lower risk of hypoglycemia among the class. • Reduce dose by 25–35% if not well managed.
Prandial insulin	High	• At mealtime	• Reduce dose of insulin for the meal followed by fasting (35–50%). • For other meals, insulin dose should match carbohydrate intake.
Mixed insulin and insulin coformulations	High	• If once daily, then take at main mealtime. • If twice daily, then split dose between the two meals	• Reduce dose of insulin for the meal followed by fasting (35–50%). • For other meals, no change of dose.

DPP-4, dipeptidyl peptidase 4; GLP-1, glucagon-like peptide 1; SGLT2, sodium–glucose cotransporter 2.

5. Facilitating Positive Behaviors and Well-being to Improve Health Outcomes

Table 5.5—Situations that warrant referral of a person with diabetes to a qualified behavioral health professional for evaluation and treatment

• A positive screen on a validated screening tool for depressive symptoms, diabetes distress, anxiety, fear of hypoglycemia, suicidality, or cognitive impairment
• The presence of symptoms or suspicions of disordered eating behavior, an eating disorder, or disrupted patterns of eating
• Intentional omission or underdosing of insulin or noninsulin medication to cause weight loss
• A serious mental illness is suspected
• In children and adolescents and families with behavioral self-care difficulties, repeated hospitalizations for diabetic ketoacidosis, failure to achieve expected developmental milestones, or significant distress
• Low engagement in diabetes self-management behaviors, including declining or impaired ability to perform diabetes self-management behaviors
• Before undergoing metabolic surgery and after surgery, if assessment reveals an ongoing need for adjustment support

5. Facilitating Positive Behaviors and Well-being to Improve Health Outcomes

Table 5.6—Psychosocial concerns and their association with diabetes-related outcomes in adults with type 1 diabetes

	Increased A1C	Increased blood pressure	Increased cholesterol	Increased macrovascular complications	Increased microvascular complications	Decreased self-care behaviors	Comorbid psychosocial concerns	Decreased quality of life	Increased mortality
Diabetes distress (576–579)	+++	?	+	+++	+++	+++	+++	+++	?
Depression and depressive symptoms (577,578,580,581)	+++	?	+++	+++	+++	+++	+++	+++	+++
Anxiety (383,582,583)	+++	?	?	?	?	+++	+++	+++	?
Disordered eating behaviors (insulin omission) (495,584)	+++	?	?	?	+++	+++	+++	+++	+++
Serious mental illness (schizophrenia, personality disorders) (585–587)	+++	?	+	+++	+++	?	+++	?	+++
Cognitive impairment (588–592)	+++	++ +	+++	+++	+++	++	+++	?	+++

+++, strong evidence (consistent findings in multiple studies of good methodological quality or one study of excellent methodological quality); ++, moderate evidence (consistent findings in multiple studies of fair methodological quality or one study of good methodological quality); +, limited evidence (evidence from one study of fair methodological quality); ?, no data available.

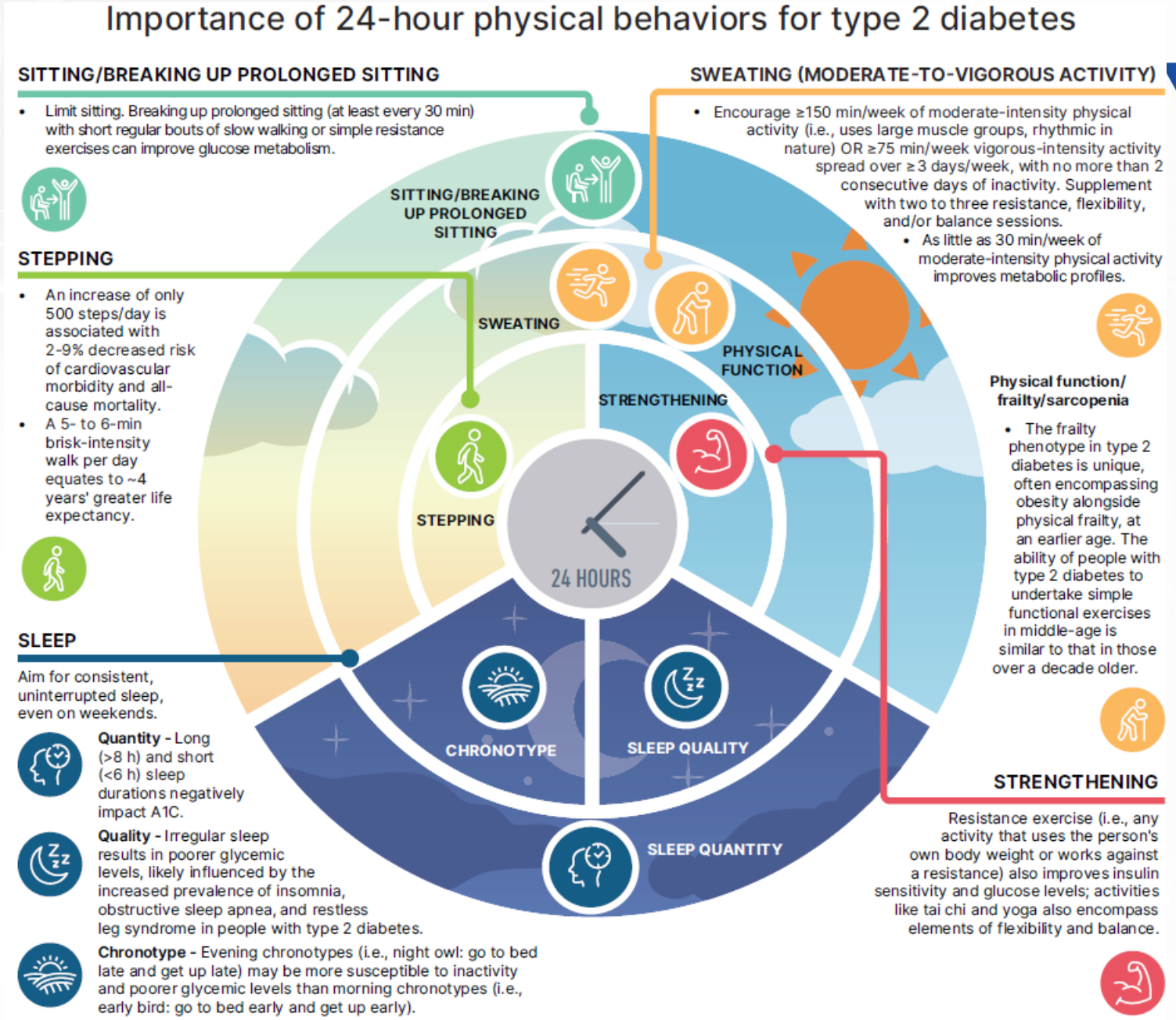
5. Facilitating Positive Behaviors and Well-being to Improve Health Outcomes

Table 5.7—Psychosocial concerns and their association with diabetes-related outcomes in adults with type 2 diabetes

	Increased A1C	Increased blood pressure	Increased dyslipidemia	Increased macrovascular complications	Increased microvascular complications	Decreased self-care behaviors	Comorbid psychosocial concerns	Decreased quality of life	Increased mortality
Diabetes distress (593–599)	+++	+	+	+++	+++	+++	+++	+++	+++
Depression and depressive symptoms (600–607)	+++	++	+++	+++	+++	+++	+++	+++	+++
Anxiety (382,430,601,608–611)	+++	++	+	+++	+	+++	+++	+++	+++
Disordered eating behaviors (binge eating disorder, night eating syndrome) (492,496,612–615)	+/–	+	?	?	+	+	+++	+++	?
Serious mental illness (schizophrenia, bipolar disorder) (616–624)	+/–	++	++	+++	+++	+++	+++	+++	+++
Cognitive impairment (625–632)	+++	+++	+++	+++	+++	+++	+++	+++	+++

+++, strong evidence (consistent findings in multiple studies of good methodological quality or one study of excellent methodological quality); ++, moderate evidence (consistent findings in multiple studies of fair methodological quality or one study of good methodological quality); +, limited evidence (evidence from one study of fair methodological quality); +/–, inconclusive evidence; ?, no data available.

5. Facilitating Positive Behaviors and Well-being to Improve Health Outcomes



Screen for sleep health in people with prediabetes, diabetes, and those at risk for diabetes, including sleep disorders and diabetes-related sleep disruptions. Refer to sleep medicine specialists and/or qualified behavioral health professionals or diabetes care team as indicated. **B**

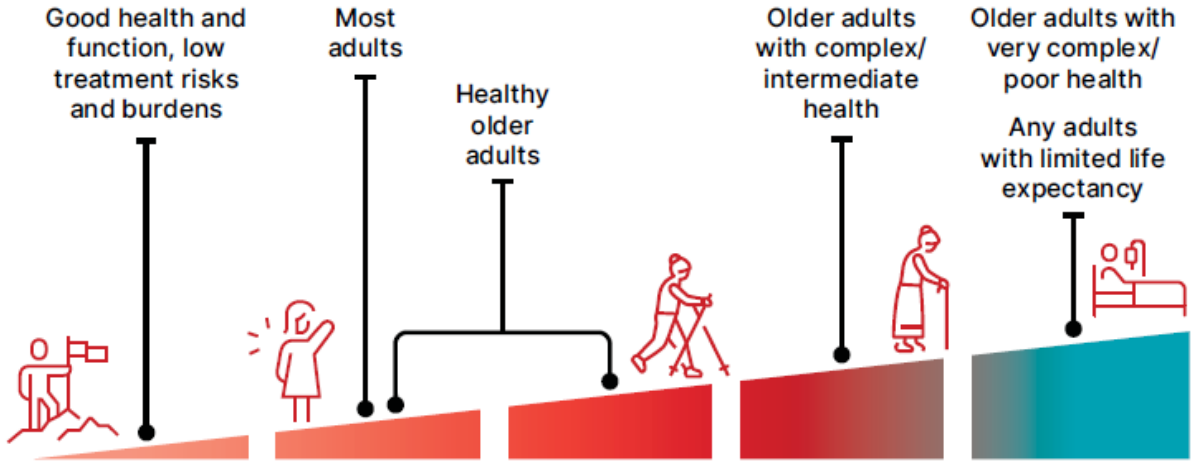
	Glucose/ insulin	Blood pressure	A1C	Lipids	Physical function	Depression	Quality of life
SITTING/BREAKING UP PROLONGED SITTING	↓	↓	↓	↓	↑	↓	↑
STEPPING	↓	↓	↓	↓	↑	↓	↑
SWEATING (MODERATE-TO-VIGOROUS ACTIVITY)	↓	↓	↓	↓	↑	↓	↑
STRENGTHENING	↓	↓	↓	↓	↑	↓	↑
ADEQUATE SLEEP DURATION	↓	↓	↓	↓	?	↓	↑
GOOD SLEEP QUALITY	↓	↓	↓	↓	?	↓	↑
CHRONOTYPE/CONSISTENT TIMING	↓	?	↓	?	?	↓	?

IMPACT OF PHYSICAL BEHAVIORS ON CARDIOMETABOLIC HEALTH IN PEOPLE WITH TYPE 2 DIABETES

↑ Higher levels of improvement (physical function, quality of life) ↓ Lower levels of improvement (glucose/insulin, blood pressure, A1C, lipids, depression)
? No data available
↑ Green arrows = strong evidence ↑ Yellow arrows = medium-strength evidence ↑ Red arrows = limited evidence

Figure 5.2—Importance of 24-h physical behaviors for type 2 diabetes. Adapted from Davies et al. (633).

6. Glycemic Goals, Hypoglycemia, and Hyperglycemic Crises



A1C goals	<6.5%	<7.0%	<7.5%	<8.0%	No A1C goal
CGM goals TIR:	—	>70%	—	>50%	—
• TBR <70	—	<4%	—	<1%	<1%
• TBR <54	—	<1%	—	<1%	<1%
• TAR >180	—	<25%	—	<50%	Avoid symptomatic hyperglycemia
• TAR >250	—	<5%	—	<10%	

Modifying Factors

Favor more stringent goal	Favor less stringent goal
Short diabetes duration	Long diabetes duration
Low hypoglycemia risk	High hypoglycemia risk
Low treatment risks and burdens	High treatment risks and burdens
Pharmacotherapy with cardiovascular, kidney, weight, or other benefits	Pharmacotherapy without nonglycemic benefits
No cardiovascular complications	Established cardiovascular complications
Few or minor comorbidities	Severe, life-limiting comorbidities

Glucose Lowering and Cardiovascular Disease Outcomes

- The cardiovascular benefits of **SGLT2 inhibitors and GLP-1 receptor agonists (including dual GIP/GLP-1 RAs) are independent of A1C lowering**.
- Therefore, these agents should be considered in people with type 2 diabetes and **established CVD, CKD, heart failure, and/or obesity, regardless of baseline A1C, individualized A1C target, or metformin use**.
- **Recommended Strategies**

1.**Therapy optimization**:

In patients already on dual or multiple glucose-lowering therapies, **switch to** an SGLT2 inhibitor or GLP-1 RA (or dual GIP/GLP-1 RA) **with proven cardiovascular benefit if not already included**.

2. **Add for CV benefit at goal A1C**:

Initiate an SGLT2 inhibitor or GLP-1 RA (or dual GIP/GLP-1 RA) **in patients with CVD who are at A1C goal, independent of metformin,** and **irrespective of baseline A1C or A1C target**.

Hypoglycemia Assessment, Prevention and Treatment

- Consider an individual's risk for hypoglycemia when selecting diabetes medications and glycemic goals. **B**
- Use of CGM is beneficial and recommended for individuals at high risk for hypoglycemia. **A**
- Glucose is the preferred treatment for the conscious individual with glucose <70 mg/dL (<3.9 mmol/L), although any form of carbohydrate that contains glucose may be used. Avoid using foods or beverages high in fat and/or protein for initial treatment of hypoglycemia. 15 minutes after initial treatment, repeat the treatment if hypoglycemia persists. **B**

Hypoglycemia Assessment, Prevention and Treatment

- One or more episodes of level 2 or 3 hypoglycemia should prompt reevaluation of the treatment plan, including deintensifying or switching diabetes medications if appropriate. **B**

Table 6.4—Classification of hypoglycemia

	Glycemic criteria/description
Level 1	Glucose <70 mg/dL (<3.9 mmol/L) and ≥54 mg/dL (≥3.0 mmol/L)
Level 2	Glucose <54 mg/dL (<3.0 mmol/L)
Level 3	A severe event characterized by altered mental and/or physical status requiring assistance for treatment of hypoglycemia, irrespective of glucose level

Adapted from Agiostratidou et al. (71).

Table 6.5—Assessment of hypoglycemia risk among individuals treated with insulin, sulfonylureas, or meglitinides

Clinical and biological risk factors	Social, cultural, and economic risk factors
Major risk factors • Recent (within the past 3–6 months) level 2 or 3 hypoglycemia • Intensive insulin therapy* • Impaired hypoglycemia awareness • Kidney failure • Cognitive impairment or dementia • History of metabolic surgery	Major risk factors • Food insecurity • Low-income status§ • Housing insecurity • Fasting for religious or cultural reasons • Underinsurance
Other risk factors • Multiple recent episodes of level 1 hypoglycemia • Basal insulin therapy* • Age ≥75 years† • Female sex • High glycemic variability‡ • Polypharmacy • Cardiovascular disease • Chronic kidney disease (eGFR <60 mL/min/1.73 m^2 or albuminuria) • Neuropathy • Retinopathy • Major depressive disorder • Severe mental illness • Gastroparesis • β-Blocker therapy	Other risk factors • Low health literacy • Alcohol or substance use disorder

Table 6.7—Components of hypoglycemia prevention for individuals at risk for hypoglycemia at initial, follow-up, and annual visits

Hypoglycemia prevention action	Initial visit	Every follow-up visit	Annual visit
Hypoglycemia history assessment	✓	✓	✓
Hypoglycemia awareness assessment	✓		✓
Cognitive function and other hypoglycemia risk factor assessment	✓		✓
Structured individual education for hypoglycemia prevention and treatment	✓	✓*	✓*
Consideration of diabetes technology needs	✓	✓	✓
Reevaluation of diabetes treatment plan with deintensification, simplification, or agent modification as appropriate	✓	✓†	✓†
Glucagon prescription and training for close contacts for insulin-treated individuals or those at high hypoglycemic risk	✓		✓
Training to improve hypoglycemia awareness	✓‡		✓‡

The listed frequencies are the recommended minimum; actions for hypoglycemia prevention should be taken more often as needed based on clinical judgment. *Indicated with recurrent hypoglycemic events or at initiation of medication with a high risk for hypoglycemia. †Indicated with any level 2 or 3 hypoglycemia, intercurrent illness, or initiating interacting medications. ‡Indicated when impaired hypoglycemia awareness is detected.

Table 6.8—Risk factors for hyperglycemic crises

Type 1 diabetes/absolute insulin deficiency
Younger age
Prior history of hyperglycemic crises
Prior history of hypoglycemic crises
Presence of other diabetes complications
Presence of other chronic health conditions (particularly in people with type 2 diabetes)
Presence of behavioral health conditions (e.g., depression, bipolar disorder, and eating disorders)
Alcohol and/or substance use
High A1C level
Insulin rationing
SGLT2 (SGLT1/2) inhibitor use
Social determinants of health

SGLT, sodium–glucose cotransporter. Data are from McCoy et al. (194), Gibb et al. (195), Randall et al. (196), Thomas et al. (197), and Borden et al. (198).

General Device Principles

- Diabetes devices should be offered to people with diabetes. **A**
- The type(s) and selection of devices should be individualized based on a person's specific needs, circumstances, preferences, and skill level.
- When prescribing a continuous glucose monitoring (CGM) device, ensure that people with diabetes and caregivers are offered initial and ongoing training and education as indicated by individual circumstances.
- Education should include utilization of data, including uploading or sharing data to monitor and adjust therapy. **C**

General Device Principles

- When prescribing an automated insulin delivery (AID) system, people with diabetes and their caregivers must receive education on how to use and troubleshoot the system. **C**
- Health care professionals working with people with diabetes should be aware of available technologies and seek additional support when needed. **E**
- Children and adolescents should be supported at school in the use of diabetes technology, such as CGM systems, CSII, connected insulin pens, and AID systems. **E**
- For adults with diabetes using diabetes technology, reasonable accommodations in educational and work settings should include having sufficient time to manage their devices and respond to high and low glucose levels. **E**

General Device Principles

- Consider early initiation, including at diagnosis, of CGM, CSII, and AID depending on a person's or caregiver's needs and preferences. **C**
- There should be no requirement of C-peptide level, **B** the presence of islet autoantibodies, **B** or duration of insulin treatment **C** before initiation of CSII or AID.
- Standardized reports for all CGM, CSII, AID, and connected insulin devices with a minimum of a single-page report, such as the **ambulatory glucose profile** and weekly summary, should be available and utilized. Options for daily and weekly reports and raw data should be available. **E**

Ambulatory Glucose Profile

Jack Sminth
DOB: 03/10/1980
MRN:
DEVICE: FreeStyle Libre

PreProd
PHONE: 7607101920

PAGE: 1 / 1
GENERATED: 12/20/2019

AGP Report

December 7, 2019 - December 20, 2019 (14 Days)

LibreView

GLUCOSE STATISTICS AND TARGETS

December 7, 2019 - December 20, 2019	14 Days
% Time CGM is Active	97%

Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges	**Targets** % of Readings (Time/Day)
Target Range70-180mg/dL	Greater than 70%(16h 48min)
Below 70 mg/dL	Less than 4% (57min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h 0min)
Above 250 mg/dL	Less than 5% (1h 12min)

Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.

Average Glucose	141 mg/dL
Glucose Management Indicator (GMI)	6.7 %
Glucose Variability	31.6%

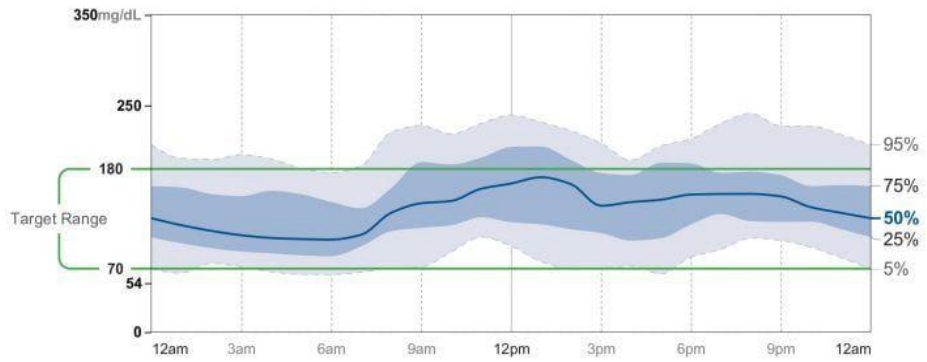
Defined as percent coefficient of variation (%CV); target ≤36%

TIME IN RANGES

Very High	>250 mg/dL	1% (14min)
High	181-250 mg/dL	18% (4h 19min)
Target Range	70-180 mg/dL	78% (18h 43min)
Low	54-69 mg/dL	3% (43min)
Very Low	<54 mg/dL	0% (0min)

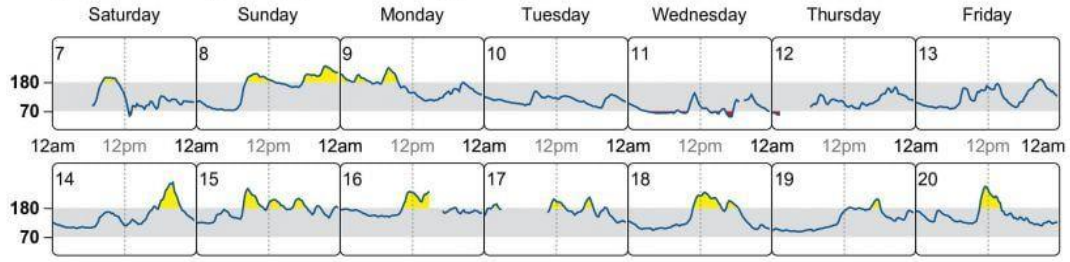
AMBULATORY GLUCOSE PROFILE (AGP)

AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if occurring in a single day.

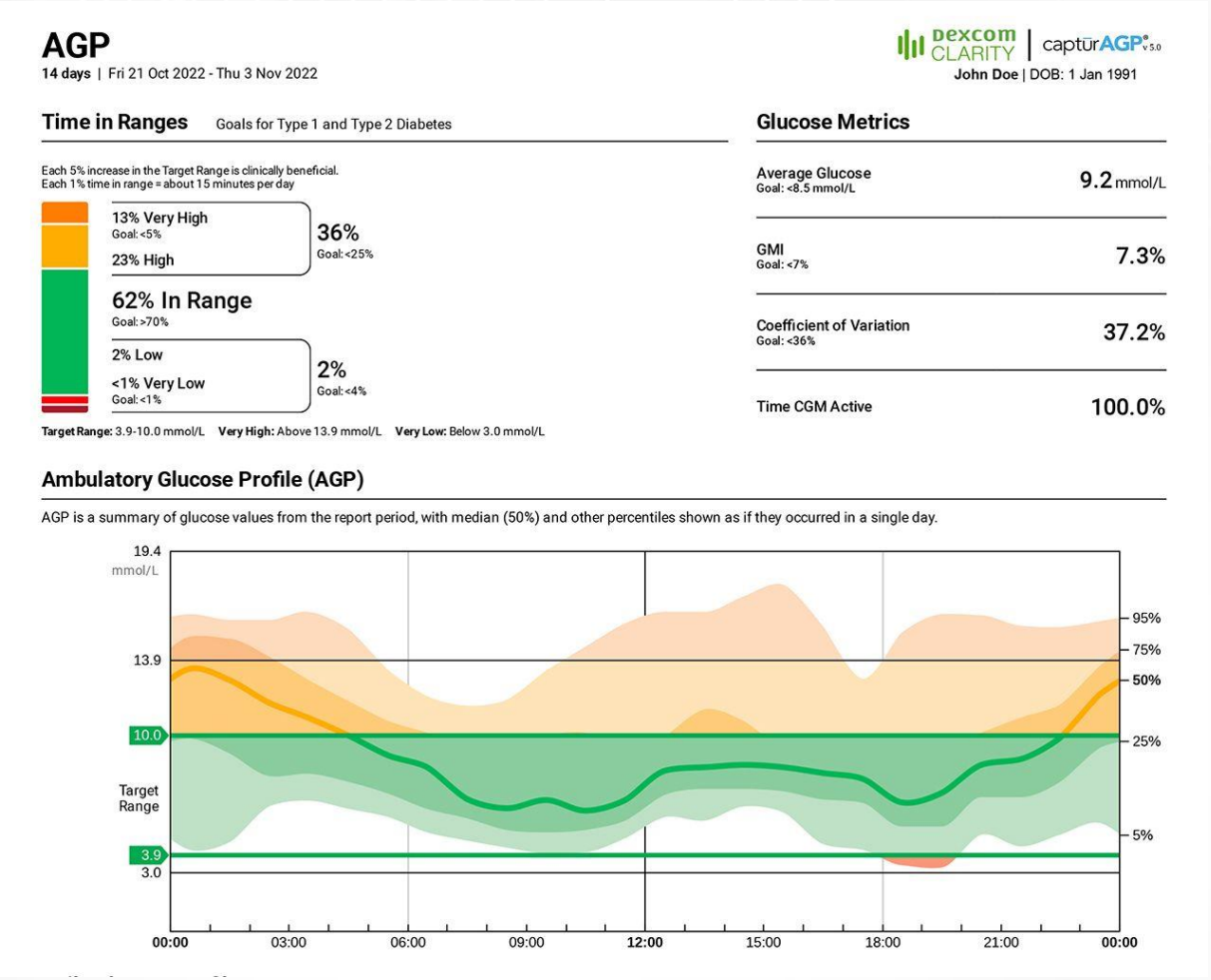


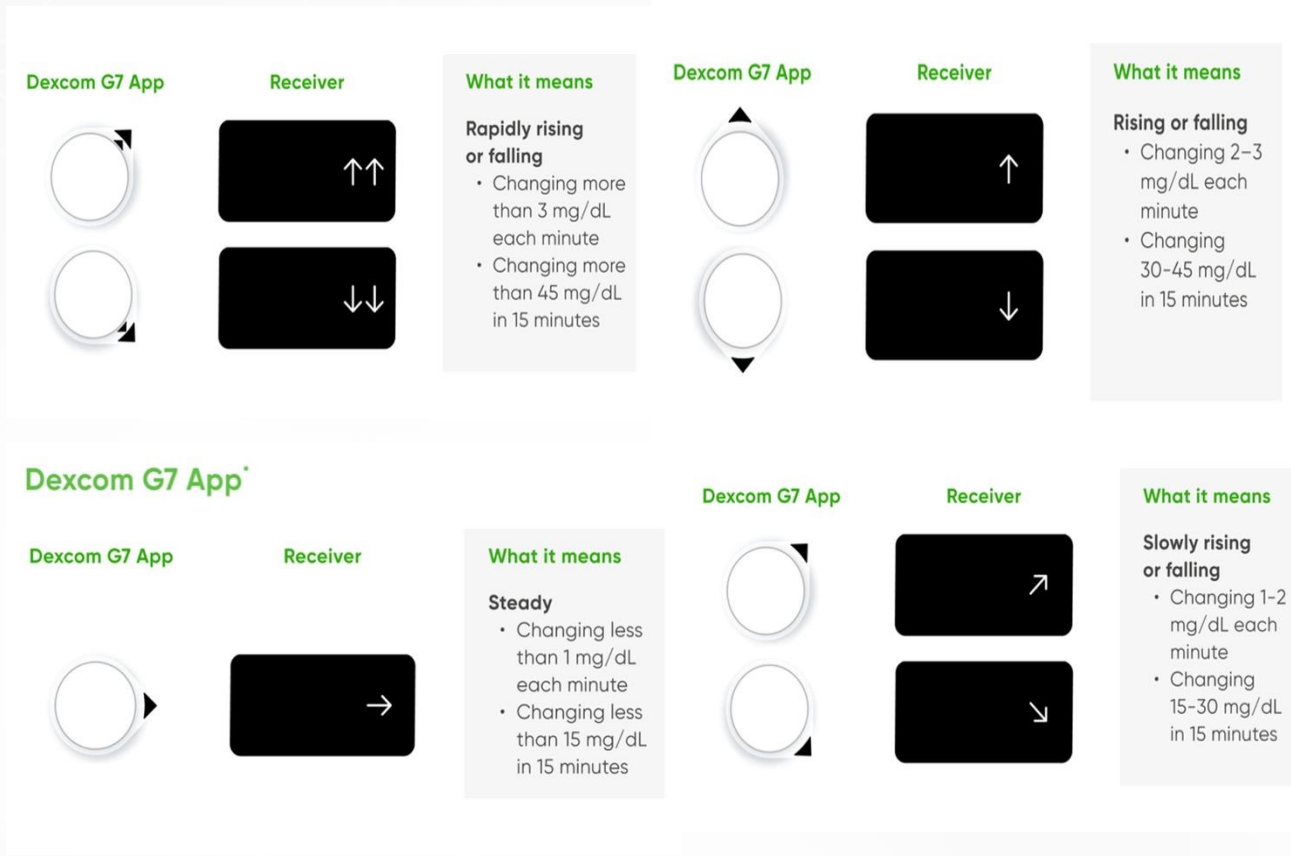
DAILY GLUCOSE PROFILES

Each daily profile represents a midnight to midnight period with the date displayed in the upper left corner.



Ambulatory Glucose Profile





Trend Arrows

Blood Glucose Monitoring

- People with diabetes should be provided with blood glucose monitoring (BGM) devices as indicated by their circumstances, preferences, and treatment. People using CGM devices must also have access to BGM at all times. **A**
- People who are taking insulin and using BGM should be encouraged to check their blood glucose levels when appropriate based on their insulin therapy. This may include checking when fasting, prior to meals and snacks, after meals, at bedtime, in the middle of the night, prior to, during, and after exercise, when hypoglycemia is suspected, after treating low blood glucose levels until achieving normoglycemia, when hyperglycemia is suspected, and prior to and while performing critical tasks such as driving. **B**
- Health care professionals should be aware of the differences in accuracy among blood glucose meters. Only meters approved by the U.S. Food and Drug Administration (FDA) (or comparable regulatory agencies for other geographical locations) with proven accuracy should be used, with unexpired test strips purchased from a pharmacy or licensed distributor and properly stored. **E**

Blood Glucose Monitoring

- Although BGM in people on noninsulin therapies has not consistently shown clinically significant reductions in A1C levels, it may be helpful when modifying meal plans, physical activity plans, and/or medications (particularly medications that can cause hypoglycemia) in conjunction with a treatment adjustment program. **E**
- Consider potential interference of medications and substances on glucose levels measured by blood glucose meters. **B**

Continuous Glucose Monitoring Devices

- Use of CGM is recommended at diabetes onset and anytime thereafter for children, adolescents, and adults with diabetes who are on insulin therapy, **A** on noninsulin therapies that can cause hypoglycemia, **C** and on any diabetes treatment where CGM helps in management. **C**
- In people with diabetes on insulin therapy, CGM devices should be used as close to daily as possible for maximal benefit.
- A People with diabetes should have uninterrupted access to their supplies to minimize gaps in CGM. **A**
- During pregnancy for individuals with type 1 diabetes, CGM can help achieve glycemic goals (e.g., time in range and time above range) **A** and A1C goal **B** and may be beneficial for other types of diabetes in pregnancy. **E**

Continuous Glucose Monitoring Devices

- In circumstances when consistent use of CGM is not feasible, consider periodic use of personal or professional CGM to adjust medication and/or lifestyle. **C**
- Skin reactions, either due to irritation or allergy, should be assessed and addressed to aid in successful use of devices. **E**
- People who wear CGM devices should be educated on potential interfering substances and other factors that may affect accuracy. **C**

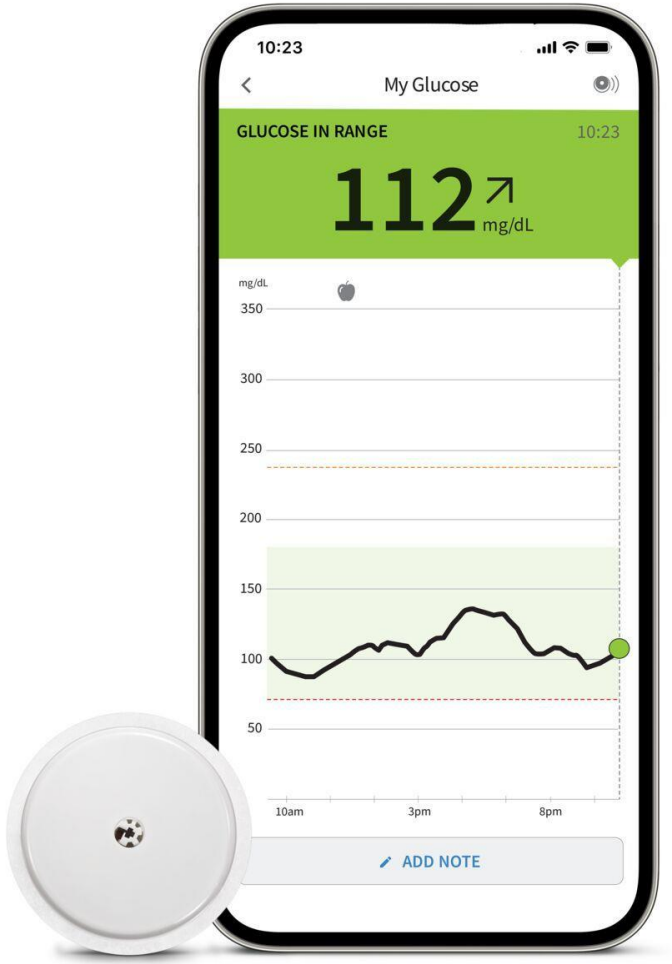


Table 7.2—Some of the more common interfering substances and/or conditions that affect blood glucose meters (for inpatient and outpatient use)

Substance or condition	Potential effects on glucose readings measured by BGMs*
Maltose†	Falsely higher blood glucose readings
Galactose	Falsely higher blood glucose readings
Xylose	Falsely higher blood glucose readings
N-Acetylcysteine	Falsely higher or lower blood glucose readings (depending on BGM design)
Acetaminophen	Falsely higher or lower blood glucose readings (depending on BGM design)
Dopamine	Falsely higher or lower blood glucose readings (depending on BGM design)
Pralidoxime (2-PAM)	Falsely higher or lower blood glucose readings (depending on BGM design)
Hydroxyurea	Falsely higher or lower blood glucose readings (depending on BGM design)
Vitamin C	Falsely higher or lower blood glucose readings (depending on BGM design)
Hematocrit (high)	Falsely lower blood glucose readings
Hematocrit (low)	Falsely higher blood glucose readings

*These are potential effects. There are blood glucose monitors (BGMs) that behave differently than listed in this table. Refer to product labeling for product-specific information. †Unmodified glucose dehydrogenase pyrroloquinoline quinone (GDH/PQQ) enzyme method only. Modern BGM designs do not incorporate unmodified GDH-PQQ enzyme.

Table 7.3—Continuous glucose monitoring devices

Type of device	Brand*	Availability	Alarms
rtCGM	Libre 2 Plus/Libre 3 Plus	Prescription	Yes
	Dexcom G6/G7	Prescription	Yes
	Eversense 365	Prescription	Yes
	Guardian 4	Prescription	Yes
	Simplera	Prescription	Yes
OTC-CGM	Dexcom Stelo	OTC	No
	Abbott Lingo	OTC	No
Professional CGM	Abbott Freestyle Libre Pro	In office	No
	Dexcom G6 Pro	In office	No

CGM, continuous glucose monitoring; isCGM, intermittently scanned CGM; OTC, over the counter; rtCGM, real-time CGM. *Generic names not available.

Table 7.4—Continuous glucose monitoring device interfering substances

Medication	Systems affected	Effect
Acetaminophen		
>4 g/day	Dexcom G6, Dexcom G7	Higher sensor readings than actual glucose
Any dose	Medtronic Guardian 4	Higher sensor readings than actual glucose
Ascorbic acid (vitamin C), >500 mg/day	FreeStyle Libre 2, FreeStyle Libre 3	Higher sensor readings than actual glucose
Ascorbic acid (vitamin C), >1,000 mg/day	FreeStyle Libre 2 Plus, FreeStyle Libre 3 Plus	Higher sensor readings than actual glucose
Hydroxyurea	Dexcom G6, Dexcom G7, Medtronic Guardian 4	Higher sensor readings than actual glucose
Mannitol (intravenously or as peritoneal dialysis solution)	Senseonics Eversense365	Higher sensor readings than actual glucose
Sorbitol (intravenously or as peritoneal dialysis solution)	Senseonics Eversense365	Higher sensor readings than actual glucose

Insulin Delivery (syringes and pens)

- For people with insulin-requiring diabetes on MDI, insulin pens are preferred in most cases. Still, insulin syringes may be used for insulin delivery considering individual and caregiver preference, insulin type, availability in vials, dosing therapy, cost, and self management capabilities. **C**
- Insulin pens or insulin injection aids are recommended for people with dexterity issues or vision impairment or when decided by shared decision making to facilitate the accurate dosing and administration of insulin. **C**
- Offer connected insulin pens for people with diabetes taking multiple daily insulin injections when appropriate. **B**
- FDA-approved insulin dose calculators/decision support systems may be helpful for calculating insulin doses. **B**

Insulin Delivery

(Pumps and Automated Delivery Systems)

- AID systems are the preferred insulin delivery method over multiple daily injections (MDI), CSII, and sensor- augmented pump in people with type 1 diabetes, **A** adults with type 2 diabetes, **A** children and adolescents with type 2 diabetes, **E** and other forms of insulin-deficient diabetes. **B**
- Choice of an AID system should be made based on the individual's circumstances, preferences, and needs. **E**
- Consider AID systems for select people with type 2 diabetes treated with basal insulin not achieving individualized glycemic goals. **B**

Inpatient Care

- In people with diabetes wearing personal CGM, the use of CGM should be continued when clinically appropriate during hospitalization, with confirmatory point-of-care glucose measurements for insulin dosing and hypoglycemia assessment and treatment under an institutional protocol. **B**
- Continue use of insulin pump or AID in people with diabetes who are hospitalized when clinically appropriate. This is contingent upon availability of necessary supplies, resources, training, ongoing competency assessments, and implementation of institutional diabetes technology protocols. **C**

Assessment and Monitoring of the Individual with Overweight or Obesity

- Use person-centered, nonjudgmental language that fosters collaboration between individuals and health care professionals, including person-first language (e.g., “person with obesity” rather than “obese person” and “person with diabetes” rather than “diabetic person”). **E**
- Screen for overweight and obesity using BMI annually. To confirm excess adiposity, additional assessments of body fat using anthropometric assessments (e.g., waist-to-hip ratio) or direct measurements (e.g., dual-energy X-ray absorptiometry, bioelectrical impedance analysis) could be considered where available/feasible. **E**

Assessment and Monitoring of the Individual with Overweight or Obesity

- In people with type 2 diabetes and overweight or obesity, weight management should represent a primary goal of treatment along with glycemic management. **A**
- Provide weight management treatment, aiming for any magnitude of weight loss. Weight loss of 5–7% of baseline weight improves glycemia and other intermediate cardiovascular risk factors. **A** Sustained loss of >10% of body weight usually confers greater benefits, including disease-modifying effects and possible remission of type 2 diabetes **A** and may improve long-term cardiovascular outcomes and mortality. **B**
- Individualize initial treatment approaches for obesity (i.e., lifestyle and nutritional therapy, pharmacologic therapy, or metabolic surgery) **A** based on the person's medical history, life circumstances, and preferences. **C** Consider combining treatment approaches if appropriate. **C**

Nutrition, Physical Activity, and Behavioral Therapy Interventions

- Nutrition, physical activity, and behavioral therapy are recommended for people with type 2 diabetes and overweight or obesity to achieve both weight and health outcome goals. **B**
- Interventions including high frequency of counseling (≥16 sessions in 6 months) with focus on nutrition changes, physical activity, and behavioral strategies to achieve a 500–750 kcal/day energy deficit (irrespective of macronutrient composition) should be recommended for weight loss when available. **A**
- If access to such interventions is limited, consider alternative structured programs delivering nutrition changes, physical activity, and behavioral counseling (e.g., remote, telehealth, mobile app). **E**

Nutrition, Physical Activity, and Behavioral Therapy Interventions

- For those who achieve weight loss goals, continue to monitor progress, provide ongoing support, and recommend continuing interventions to maintain weight goals long term. **E**
- Effective long-term (≥1 year) weight maintenance programs provide monthly contact and support, include frequent self-monitoring of body weight (weekly or more frequently) and other self-monitoring strategies (e.g., food diaries or wearables), and encourage regular physical activity (200–300min/week). **A**
- Short-term nutrition intervention using structured, very-low-calorie-meals (800–1,000 kcal/day) should be prescribed only to carefully selected individuals by trained practitioners in medical settings with close monitoring.
- Long-term, comprehensive weight maintenance strategies and counseling should be integrated to maintain weight loss. **B**

Pharmacotherapy

- Whenever clinically appropriate, engage other care team members to minimize use of weight-promoting medications for treatment of other conditions among adults with diabetes and obesity. **E**
- When choosing glucose-lowering medications for people with type 2 diabetes and overweight or obesity, prioritize medications with beneficial effect on weight. **B**
- 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**
- In people with diabetes and overweight or obesity, the preferred pharmacotherapy should be a GLP-1 RA or dual GIP and GLP-1 RA with greater weight loss efficacy (i.e., semaglutide or tirzepatide), especially considering their added weight-independent benefits. **A**

Pharmacotherapy

- Obesity pharmacotherapy indicated for **chronic therapy** should be continued beyond reaching weight loss goals to maintain the health benefits, as discontinuation often results in recurrence of weight gain and worsening or reemergence of cardiometabolic risk factors. **B**
- Individualize the dose and the dose titration approach of obesity pharmacotherapy to balance effectiveness, health benefits, and tolerability; the optimal treatment dose may not be the maximum approved dose. **B**
- In people with diabetes not reaching weight treatment goals, modify or intensify treatment with additional approaches, including structured lifestyle management programs, metabolic surgery, **A** and additional or alternative pharmacologic agents. **B**

Metabolic Surgery

- Consider metabolic surgery as a weight and glycemic management approach in people with type 2 diabetes with BMI ≥30.0 kg/m^2 (or ≥27.5 kg/m^2 in Asian American individuals) who are otherwise good surgical candidates. **A**
- Metabolic surgery should be performed in high-volume centers with interprofessional teams knowledgeable about and experienced in managing obesity, diabetes, and gastrointestinal surgery. **E**
- People being considered for metabolic surgery should be evaluated for comorbid psychological conditions and social and situational circumstances that have the potential to interfere with surgery outcomes. **B**
- People who undergo metabolic surgery should receive long-term medical and behavioral support and routine micronutrient, nutritional, and metabolic status monitoring. **B**

Treatment of Obesity in Type 1 Diabetes

- Apply obesity management strategies used in the general adult population, including GLP-1 RA-based therapy **B** and metabolic surgery, **C** to adults with type 1 diabetes who have obesity (BMI ≥30.0 kg/m², or ≥27.5 kg/m² in Asian American individuals).
- Shared decision-making should inform individualized care.

8. Obesity and Weight Management for the Prevention and Treatment of Diabetes

Table 8.1—Obesity pharmacotherapy in individuals with type 2 diabetes

Medication name	Treatment arm; weight loss from baseline	Time frame for weight loss (weeks)*	Common side effects	Possible safety concerns and considerations
Sympathomimetic amine anorectic: approved for short-term use only Phentermine (183,184)†	• 15 mg q.d.; 7.4% • 7.5 mg q.d.; 6.6% • Placebo; 2.3%	28	Dry mouth, insomnia, dizziness, irritability, increased blood pressure, elevated heart rate	• Contraindicated for use in combination with monoamine oxidase inhibitors • Contraindicated with a history of cardiovascular disease • Do not use if at high risk for glaucoma due to risk of acute angle-closure glaucoma
Lipase inhibitor Orlistat (4,185)‡	• 120 mg t.i.d.; 9.6% • Placebo; 5.6%	52	Abdominal pain, flatulence, fecal urgency	• Contraindicated in cholestasis • Potential malabsorption of fat-soluble vitamins (A, D, E, K) and of certain medications (e.g., cyclosporine, thyroid hormone, anticonvulsants) • Rare cases of severe liver injury reported • Cholelithiasis reported • Nephrolithiasis reported. Monitor renal function and discontinue if oxalate nephropathy occurs
Sympathomimetic amine anorectic/ antiepileptic combination Phentermine/topiramate ER (54,116)§	• 15 mg/92 mg q.d.; 9.8% • 7.5 mg/46 mg q.d.; 7.8% • Placebo; 1.2%	56	Constipation, paresthesia, insomnia, nasopharyngitis, xerostomia, increased blood pressure, nephrolithiasis	• Contraindicated for use in combination with monoamine oxidase inhibitors • Contraindicated during pregnancy due to risk of fetal harm with topiramate • Cognitive impairment associated with rapid dose titration or high initial doses • Caution with cardiovascular disease • Do not use if at high risk for glaucoma due to risk of acute angle-closure glaucoma
Opioid antagonist/antidepressant combination Naltrexone/bupropion ER (13,186)	• 16 mg/180 mg b.i.d.; 5% • Placebo; 1.8%	56	Constipation, nausea, headache, xerostomia, insomnia, elevated heart rate and blood pressure	• Contraindicated in people with unmanaged hypertension and/or seizure disorders • Contraindicated for use with chronic opioid therapy • Acute angle-closure glaucoma may occur • Increased blood pressure and heart rate may occur; monitor in people with cardiovascular and cerebrovascular disease **Boxed warning:** • Risk of suicidal behavior/ideation in people younger than 24 years old who have depression
GLP-1 receptor agonist Liraglutide (14,55,187)‖	• 3.0 mg q.d.; 6% • 1.8 mg q.d.; 4.7% • Placebo; 2%	56	Gastrointestinal side effects (nausea, vomiting, diarrhea, esophageal reflux, constipation)	The following apply to both GLP-1 receptor agonists: • Provide guidance on discontinuation prior to surgical procedures to mitigate potential for pulmonary aspiration with general anesthesia or deep sedation

8. Obesity and Weight Management for the Prevention and Treatment of Diabetes

Table 8.1—Continued

Medication name	Treatment arm; weight loss from baseline	Time frame for weight loss (weeks)*	Common side effects	Possible safety concerns and considerations
Semaglutide (54,117,188)	• 2.4 mg weekly; 9.6% • 1.0 mg weekly; 7% • Placebo; 3.4%			• Pancreatitis: acute pancreatitis has been reported, but causality has not been established. Do not initiate if at high risk for pancreatitis and discontinue if pancreatitis is suspected • Biliary disease: evaluate for gallbladder disease if cholelithiasis or cholecystitis is suspected; avoid use in at-risk individuals • Gastrointestinal disorders (severe constipation and small-bowel obstruction/ileus progression) • Diabetic retinopathy: close monitoring of retinopathy in those at high risk (older individuals and those with longer duration of type 2 diabetes [≥10 years]) • Nonarteritic anterior ischemic optic neuropathy reported; rare incidence. Monitor for this during eye examinations • Impact on drug absorption: orally administered drug absorption may be impaired during dose titration (including oral contraceptives) • Gastrointestinal side effects: counsel on potential for gastrointestinal side effects; provide guidance on dietary modifications to mitigate gastrointestinal side effects (reduction in meal size, mindful eating practices [e.g., stop eating once full], decreasing intake of high-fat or spicy food); consider slower dose titration for those experiencing gastrointestinal challenges. Not recommended for individuals with gastroparesis • Hypoglycemia (with concomitant use of insulin or sulfonylurea) **Boxed warning:** • Risk of thyroid C-cell tumors in rodents; human relevance not determined; do not use in individuals with personal or family history of medullary thyroid cancer or multiple endocrine neoplasia type 2
Dual GIP and GLP-1 receptor agonist				
Tirzepatide (109,189)	• 15 mg weekly; 14.7% • 10 mg weekly; 12.8% • Placebo; 3.2%	72	Gastrointestinal side effects (nausea, vomiting, diarrhea, esophageal reflux, constipation)	Same as for GLP-1 receptor agonists, with addition of the following: • Monitor effects of oral medications with narrow therapeutic index (warfarin) or whose efficacy is dependent on threshold concentration • Advise individuals using oral contraceptives to switch to a nonoral contraceptive method or add a barrier method of contraception for 4 weeks after initiation and for 4 weeks after each dose escalation

Select safety and side effect information is provided; for a comprehensive discussion of safety considerations, please refer to the prescribing information for each agent, b.i.d., twice daily; ER, extended release; GIP, glucose-dependent insulinotropic polypeptide; GLP-1, glucagon-like peptide 1; q.d., every day; Rx, prescription; t.i.d., three times daily, p.o., by mouth. *Time frames used in clinical trials. Medications approved for long-term use should be continued as indicated beyond reaching weight loss goals. †Phentermine was evaluated in a general adult population with obesity. As monotherapy, phentermine is only approved for short-term use. Use lowest effective dose; maximum appropriate dose is 37.5 mg. ‡Enrolled participants had normal (79%) or impaired (21%) glucose tolerance. §Maximum dose, depending on response, is 15 mg/92 mg q.d. Approximately 68% of enrolled participants had type 2 diabetes or impaired glucose tolerance. ||Agent has indication for reduction of cardiovascular events (55,117).

Pharmacologic Therapy for Adults with Type 1 Diabetes

- Treat most adults with type 1 diabetes with continuous subcutaneous insulin infusion or multiple daily doses of prandial (injected or inhaled) and basal insulin. **A**
- For most adults with type 1 diabetes, insulin analogs (or inhaled insulin) are preferred over injectable human insulins to minimize hypoglycemia risk. **A**
- To improve glycemic outcomes and quality of life and to minimize hypoglycemia risk, most adults with type 1 diabetes should receive education on how to match mealtime insulin doses to carbohydrate intake and fat and protein intake depending on the person's or caregiver's needs or preferences.
- They should also be taught how to modify the insulin dose (correction dose) based on concurrent glycemia, glycemic trends (if available), sick-day management, and anticipated physical activity. **B**

Quick Explanation of the normal physiology of insulin secretion

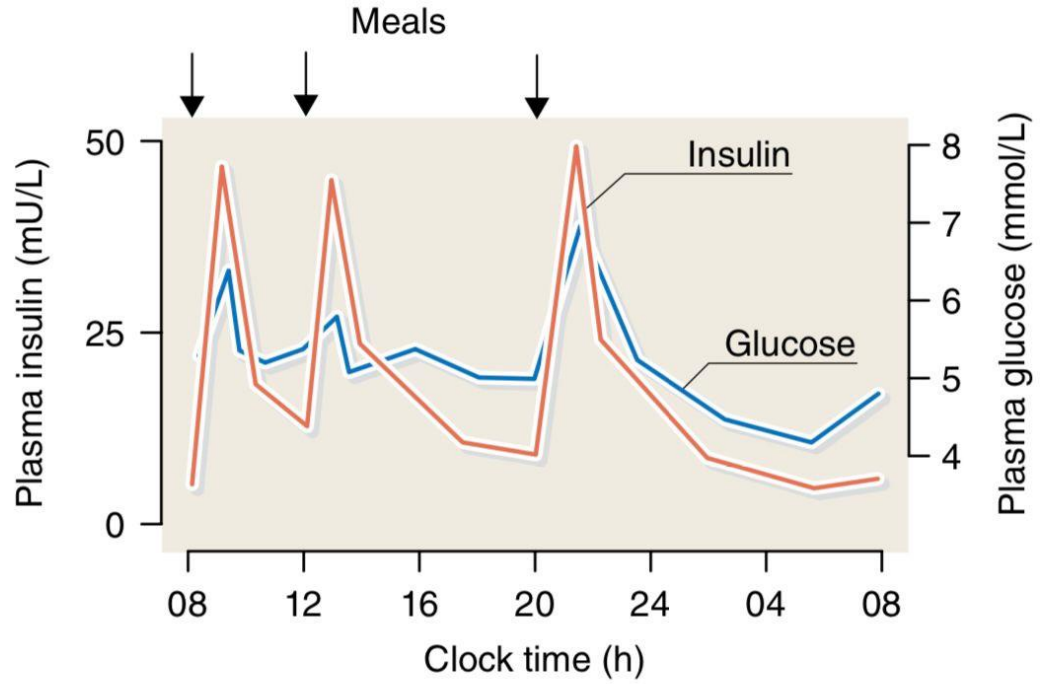
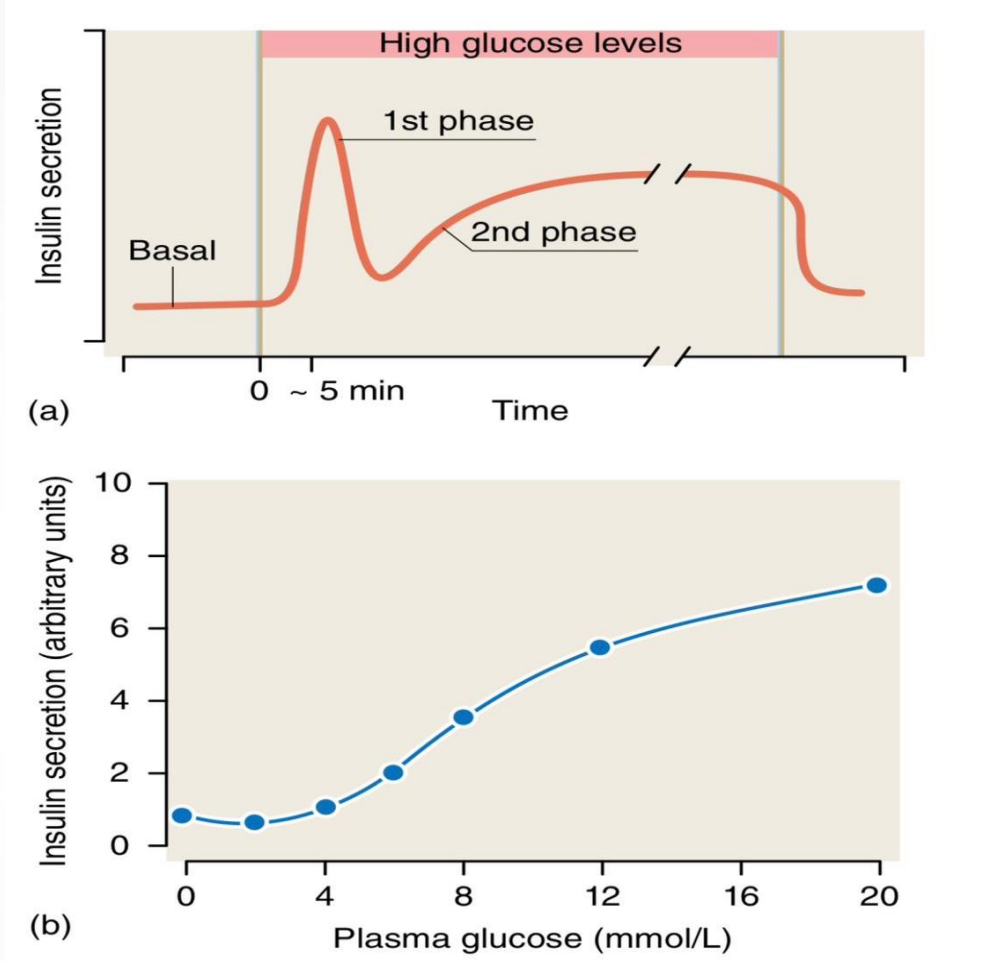


Figure 5.19 Profiles of plasma glucose and insulin concentrations in individuals without diabetes.



re 5.11 (a) The biphasic glucose-stimulated release of insulin from pancreatic
s. (b) The glucose–insulin dose–response curve for islets of Langerhans.

Basal/bolus regimen mimics normal insulin profile

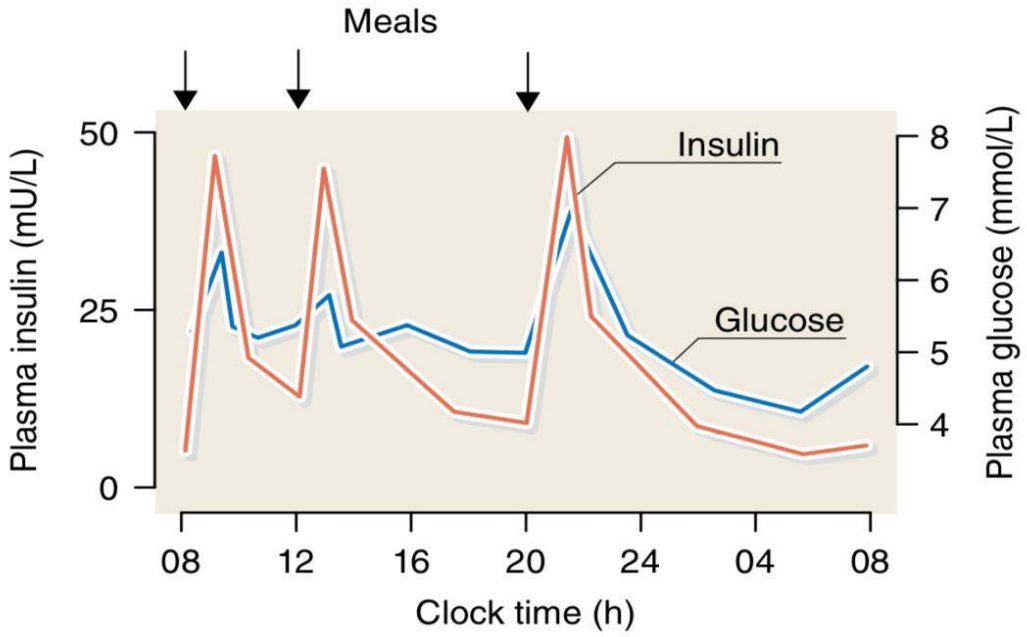
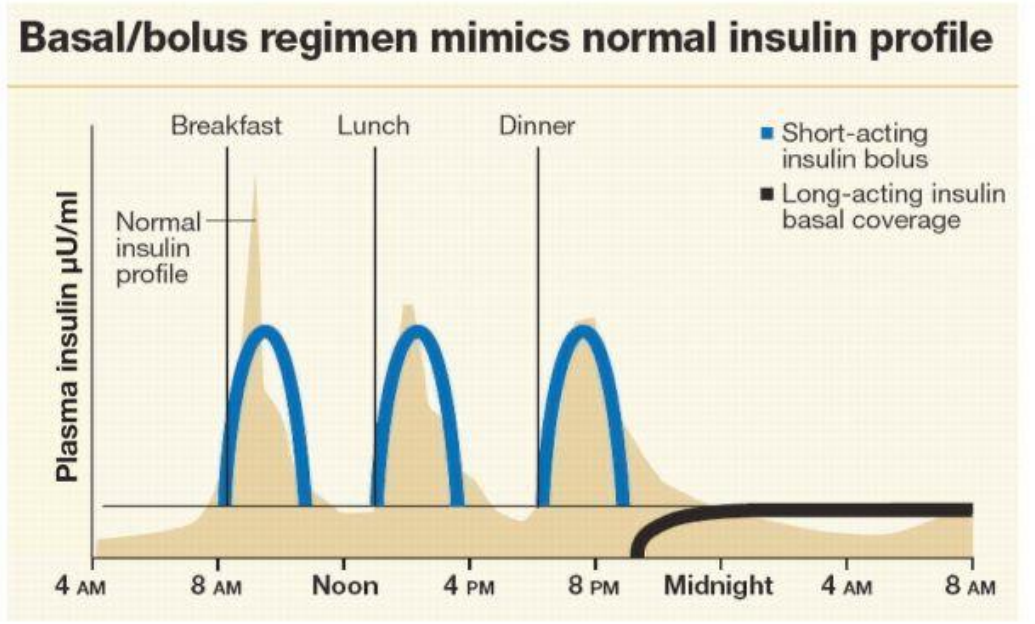


Figure 5.19 Profiles of plasma glucose and insulin concentrations in individuals without diabetes.

Normal insulin profile



Mimics of normal insulin profile

9. Pharmacologic Approaches to Glycemic Treatment

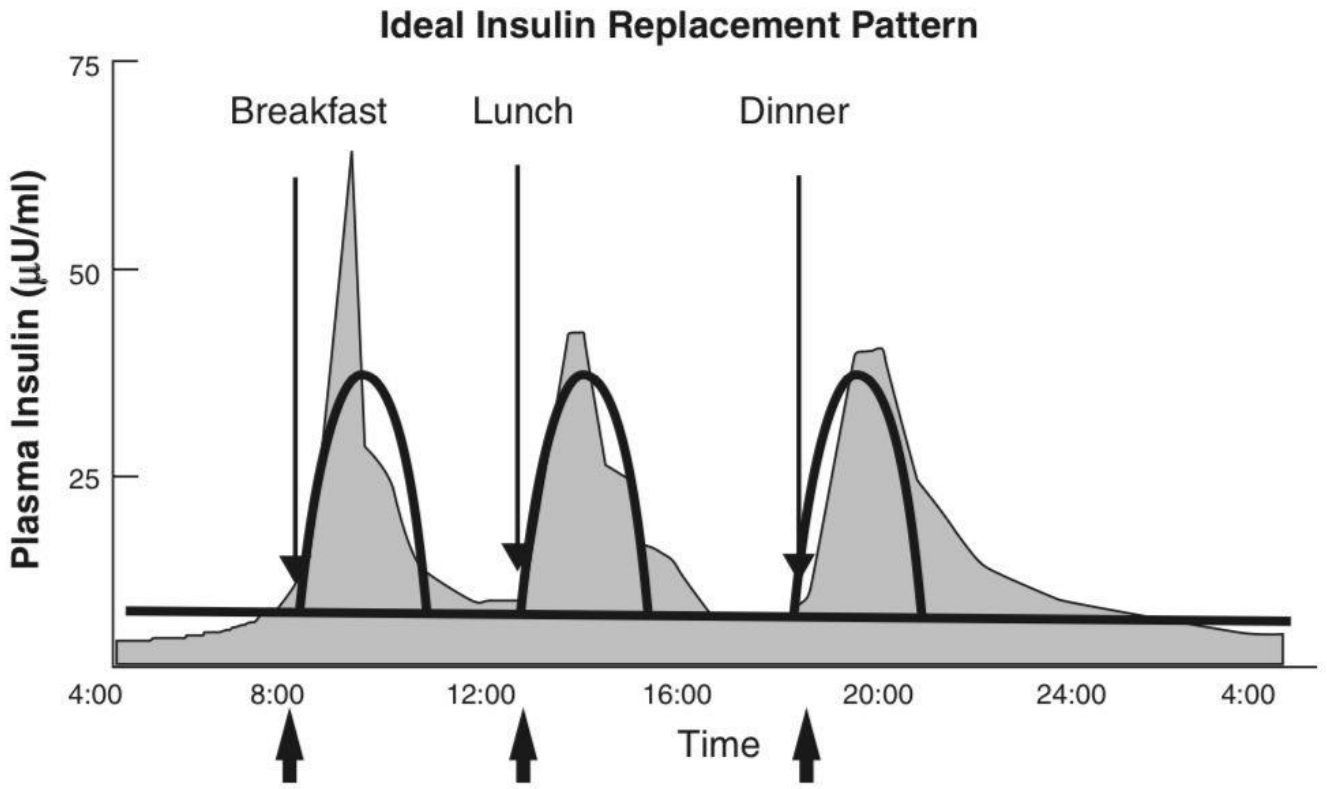


Fig. 11.2 Intensive insulin therapy pattern. Schematic representation of insulin therapy pattern provided by once-daily long-acting basal insulin and rapid-acting bolus insulin before each meal to mimic normal physiologic insulin secretion. (From White RD. Insulin pump therapy (continuous subcutaneous insulin infusion). *Prim. Care*. 2007;34:845–871.)

Representative relative attributes of insulin delivery approaches in people with type 1 diabetes

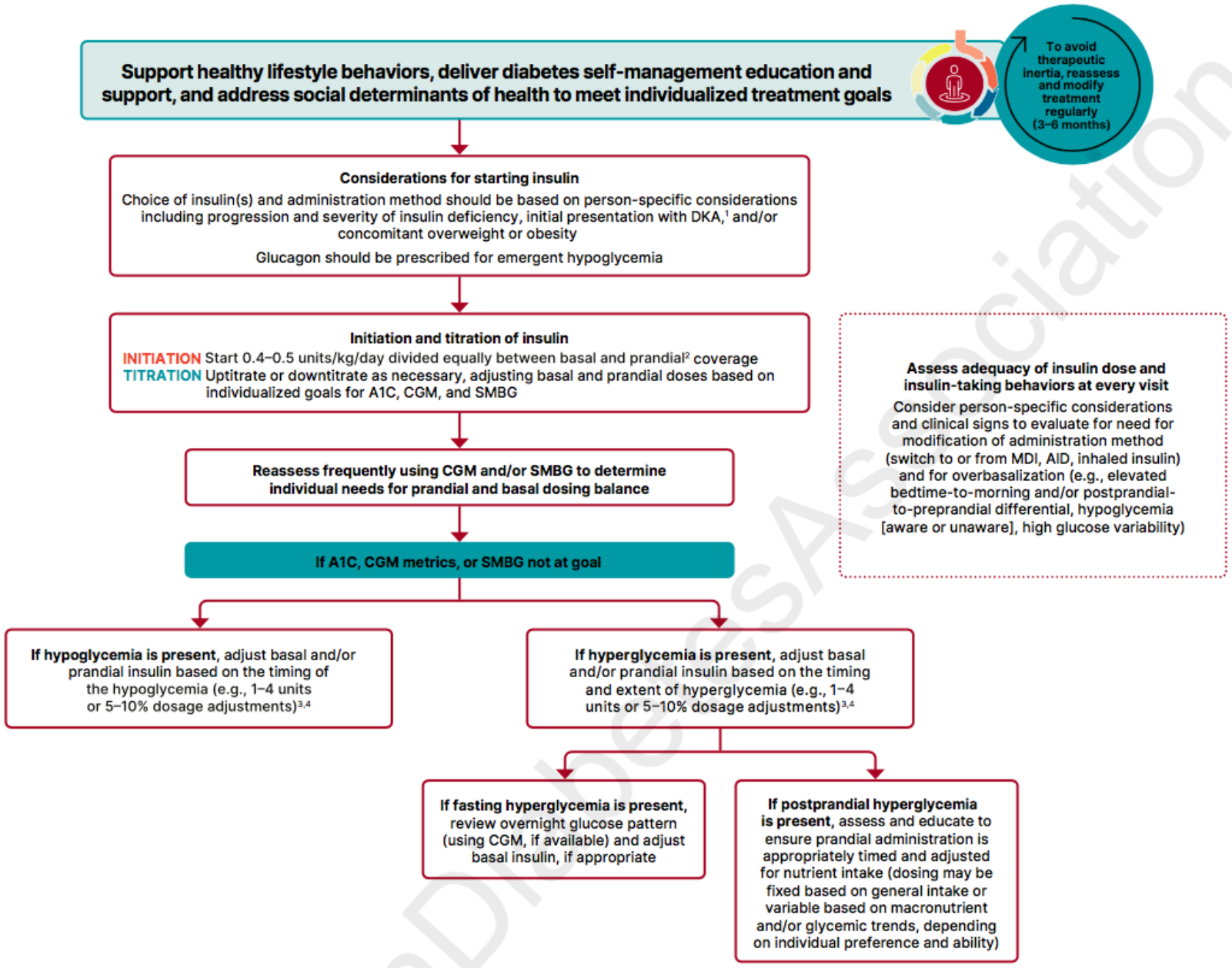
Insulin plans	Greater flexibility	Lower risk of hypoglycemia	Higher costs
MDI with LAA + RAA or URAA	+++	+++	$$$
Less-preferred, alternative injected insulin plans			
MDI with NPH + RAA or URAA	++	++	$$
MDI with NPH + short-acting (regular) insulin	++	+	$
Two daily injections with NPH + short-acting (regular) insulin or premixed	+	+	$

Continuous insulin infusion plans	Greater flexibility	Lower risk of hypoglycemia	Higher costs
Automated insulin delivery systems	+++++	+++++	$$$$$
Insulin pump with threshold/ predictive low-glucose suspend	++++	++++	$$$$$
Insulin pump therapy without automation	+++	+++	$$$$

Figure 9.1—Choices of insulin plans in people with type 1 diabetes. Continuous glucose monitoring improves outcomes with injected or infused insulin and is superior to blood glucose monitoring. Inhaled insulin may be used in place of injectable prandial insulin in the U.S. The number of plus or dollar signs is an estimate of relative association of the plan with greater flexibility, lower risk of hypoglycemia, and higher costs between the different plans. Cost symbols are reflective of general costs, which may vary for individuals based on various circumstances: insurance coverage, discounts, rebates, and other price adjustments involved in prescription sales. LAA, long-acting insulin analog; MDI, multiple daily injections; RAA, rapid-acting insulin analog; URAA, injectable ultra-rapid-acting insulin analog or inhaled insulin. Adapted from Holt et al. (4).

9. Pharmacologic Approaches to Glycemic Treatment

Initiation and adjustment of insulin using multiple daily dosing in individuals with type 1 diabetes



Pharmacologic Therapy for Adults with Type 2 Diabetes "important updates"

- **Metformin is still a strong option when** tolerated and eGFR allows.
- **ADA 2026 is not "metformin-first at all costs."** If the patient has HF/CKD/ASCVD/obesity/liver priorities, start SGLT2i and/or GLP-1/GIP-GLP-1 early, and metformin becomes optional/add-on depending on goals, tolerance, and access.
- "First-line" is now condition-specific, not a single drug for everyone!.

Pharmacologic Therapy for Adults with Type 2 Diabetes "important updates"

✓**"First-line" is condition-specific:**

ADA 2026 recommends, **irrespective of A1C**, using:

- **GLP-1 RA and/or SGLT2i** in T2D with **established/high-risk ASCVD** for glycemic management and comprehensive cardiovascular risk reduction (irrespective of A1C).
- **SGLT2i** in T2D with **HF** (with either reduced or preserved ejection fraction) for glycemic management and HF hospitalization prevention, irrespective of A1C
- In **CKD**, "preferred medications for glucose management" are **SGLT2 inhibitors or GLP-1 RAs** (if eGFR allows).
- In **MASH / high fibrosis risk**, **GLP-1 RA is preferred** for glycemic management due to beneficial effects on MASH.

Pharmacologic Therapy for Adults with Type 2 Diabetes

- In adults with type 2 diabetes, obesity, and symptomatic heart failure with preserved ejection fraction (HFpEF), the glucose-lowering treatment plan should include a dual GIP and GLP-1 RA with demonstrated benefits for HF-related symptoms and reduction in HF events (irrespective of A1C). **A**

- In adults with type 2 diabetes, obesity, and symptomatic HFpEF, the glucose-lowering treatment plan should include a GLP-1 RA with demonstrated benefits for HF-related symptoms **A** and/or reduction in HF events (irrespective of A1C). **B**

Pharmacologic Therapy for Adults with Type 2 Diabetes

- In adults with type 2 diabetes who have chronic kidney disease (CKD) (with confirmed estimated glomerular filtration rate [eGFR] 20–60 mL/min/1.73 m^2 and/or albuminuria), an SGLT2 inhibitor or GLP-1 RA with demonstrated benefit in this population should be used for both glycemic management and for slowing progression of CKD and reduction in cardiovascular events (irrespective of A1C). The glycemic benefits of SGLT2 inhibitors are reduced at eGFR <45 mL/min/1.73 m^2. **A**
- In adults with type 2 diabetes and advanced CKD (eGFR <30 mL/min/1.73 m^2), a GLP-1 RA is preferred for glycemic management due to lower risk of hypoglycemia and for cardiovascular event reduction. **B Individuals on dialysis can be safely initiated or continued on GLP-1–based therapy** (that is not dependent on kidney clearance) to reduce cardiovascular risk and mortality. **C**

Pharmacologic Therapy for Adults with Type 2 Diabetes

- In adults with type 2 diabetes, metabolic dysfunction–associated steatotic liver disease (MASLD), and overweight or obesity, consider using a GLP-1 RA with demonstrated benefits in metabolic dysfunction–associated steatohepatitis (MASH) **A** or a dual GIP and GLP-1 RA with potential benefits in MASH **B** for glycemic management and as an adjunctive therapy to interventions for weight loss.
- In adults with type 2 diabetes and biopsy-proven MASH or those at high risk for liver fibrosis (based on noninvasive tests), a GLP-1 RA is preferred for glycemic management due to beneficial effects on MASH. **A**
- Pioglitazone or a dual GIP and GLP-1 RA **B** can be considered for glycemic management due to potential beneficial effects on MASH.
- Combination therapy with pioglitazone plus a GLP-1 RA can be considered for the treatment of hyperglycemia in adults with type 2 diabetes with biopsy-proven MASH or those at high risk of liver fibrosis (identified with noninvasive tests) due to potential beneficial effects on MASH. **B**

Pharmacologic Therapy for Adults with Type 2 Diabetes

- Treatment modification (including intensification or deintensification) for adults not meeting individualized treatment goals should not be delayed. **A**
- Choice of glucose-lowering therapy modification should take into consideration individualized glycemic and weight goals, presence of comorbidities (cardiovascular, kidney, liver, and other metabolic comorbidities), and the risk of hypoglycemia. **A**
- When initiating a new glucose-lowering medication, reassess the need for and/or dose of medications with higher hypoglycemia risk (i.e., sulfonylureas, meglitinides, and insulin) to minimize the risk of hypoglycemia and treatment burden. **A**

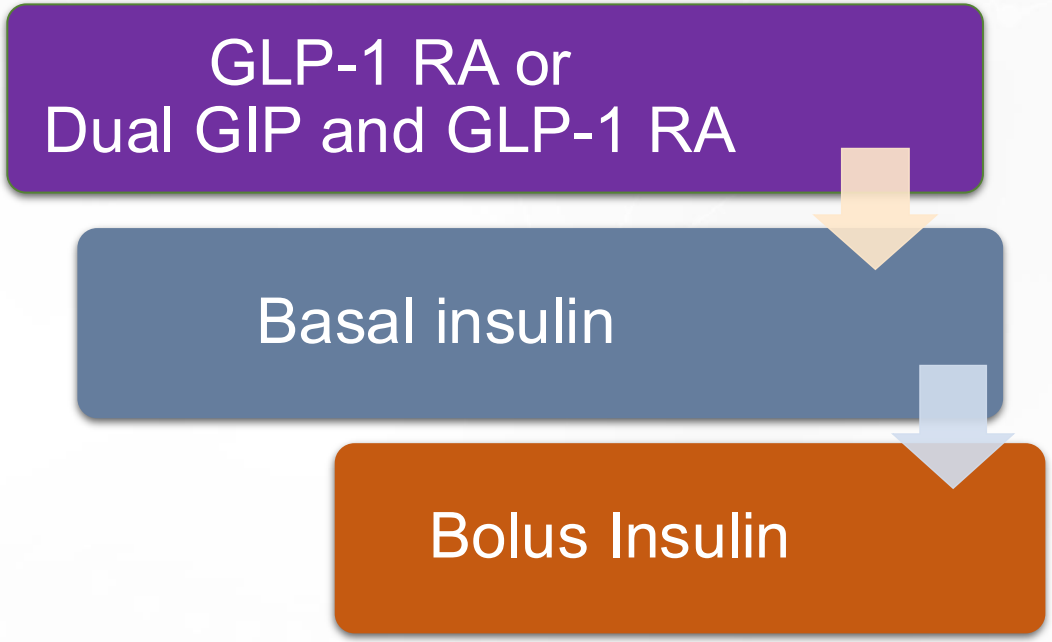
Pharmacologic Therapy for Adults with Type 2 Diabetes

- Concurrent use of dipeptidyl peptidase 4 (DPP-4) inhibitors with a GLP-1 RA or a dual GIP and GLP-1 RA is not recommended due to lack of additional glucose lowering beyond that of a GLP-1–based therapy. **B**
- In adults with type 2 diabetes who have not achieved their individualized weight goals, additional weight management interventions (e.g., intensification of lifestyle modifications, structured weight management programs, pharmacologic agents, or metabolic surgery, as appropriate) are recommended. **A**
- In adults with type 2 diabetes, initiation of insulin should be considered regardless of background glucose-lowering therapy or disease duration if symptoms of hyperglycemia are present or when A1C or blood glucose levels are very high (i.e., A1C >10% or blood glucose ≥300 mg/dL. **E**
- In adults with type 2 diabetes without severe hyperglycemia or hyperglycemic crisis, GLP-1–based therapy is preferred to insulin for initial or add-on glucose-lowering therapy. **B**

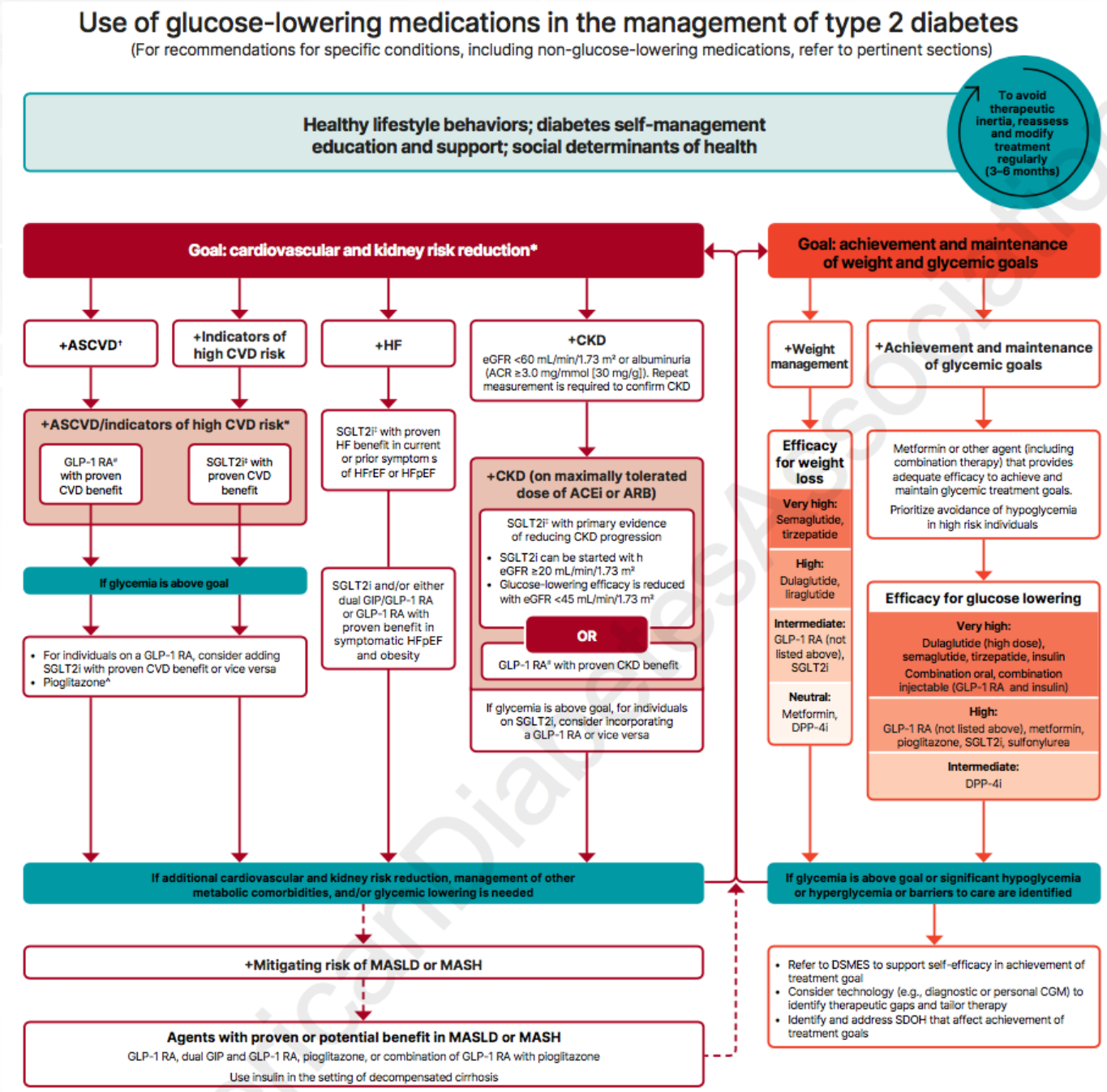
Pharmacologic Therapy for Adults with Type 2 Diabetes

- If insulin is used, combination therapy with a GLP-1 RA, including a dual GIP and GLP-1 RA, is recommended for greater glycemic effectiveness as well as beneficial effects on weight and hypoglycemia risk for adults with type 2 diabetes.
- Insulin dosing should be reassessed upon addition or dose escalation of a GLP-1 RA or dual GIP and GLP-1 RA. **A**
- In adults with type 2 diabetes who are initiating insulin therapy, continue glucose-lowering agents (unless contraindicated or not tolerated) for ongoing glycemic and metabolic benefits (i.e., weight, cardiometabolic, or kidney benefits). **A**

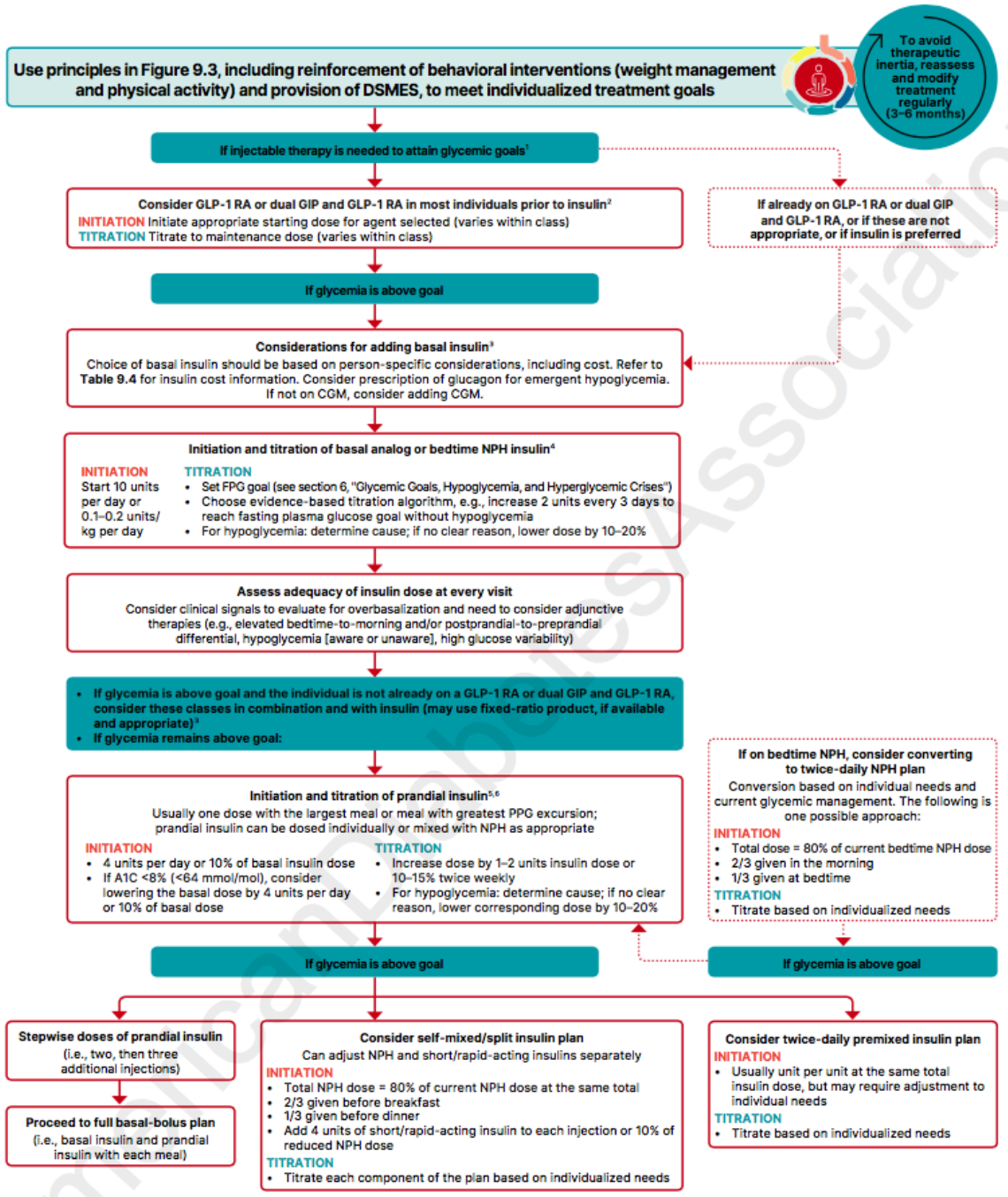
Recommended steps



9. Pharmacologic Approaches to Glycemic Treatment



9. Pharmacologic Approaches to Glycemic Treatment



Additional Recommendations For All Individuals with Diabetes

- Include healthy behaviors, diabetes self-management education and support, avoidance of therapeutic inertia, and social determinants of health as essential components of the glucose-lowering management of diabetes. **A**
- Use of continuous glucose monitoring (CGM) is recommended at diabetes onset and anytime thereafter for adults with diabetes who are on insulin therapy, **A** on noninsulin therapies that can cause hypoglycemia, **B** and on any diabetes treatment where CGM aids in management. **B** The choice of CGM device and method for use should be made based on the individual's circumstances, preferences, and needs. **B**
- Monitor for signs of overbasalization during insulin therapy, such as significant bedtime-to-morning or postprandial-to-preprandial glucose differential, occurrences of hypoglycemia (aware or unaware), and high glycemic variability. When overbasalization is suspected, a thorough reevaluation should occur promptly to further tailor therapy to the individual's needs. **E**
- Automated insulin delivery systems should be offered to all adults with type 1 and 2 diabetes on insulin depending on the person's or caregiver's needs and preferences. **A**

Special Circumstances and Populations

- Individuals of childbearing potential with diabetes should be counseled on contraception options **A** and the impact of some glucose-lowering medications on contraception efficacy. **C**
- A person-centered shared decision-making approach to preconception planning is essential for all individuals of childbearing potential with diabetes. **A** Preconception planning should address attainment of glycemic goals, **A** the time frame for discontinuing noninsulin glucose-lowering medications, **E** and optimal glycemic management in preparation for pregnancy. **A**
- Individuals who develop hyperglycemia during treatment with immunotherapy (including anti-PD-1 or anti-PD-L1 therapy, e.g., nivolumab, pembrolizumab, or avelumab) should be assessed for the immediate need for initiation of insulin therapy due to the potential risk of diabetic ketoacidosis while additional testing is completed to determine if the hyperglycemia is related to immunotherapy-associated diabetes. Close monitoring, education, and dose adjustment are needed if insulin is started. **C**

Special Circumstances and Populations

- Consider metformin as the first-line treatment of hyperglycemia due to mTOR inhibitors. **E**
- Consider metformin as the first-line treatment of hyperglycemia due to phosphoinositide 3-kinase (PI3K) inhibitors that affect the α isoform (e.g., alpelisib and inavolisib). **E**
- Use of insulin should be reserved for severe hyperglycemia and hyperglycemic crises due to its potential impact on the efficacy of PI3K inhibitors. **E**
- Adjust or initiate additional glucose-lowering therapies to maintain individualized glycemic goals based on the specific glucocorticoid treatment plan, with frequent reassessment of glucose levels and glucocorticoid treatment plans. **C**

Special Circumstances and Populations

- In adults with posttransplantation diabetes mellitus (PTDM) or preexisting type 2 diabetes, insulin is preferred for the management of hyperglycemia in the postoperative setting. **A** A DPP-4 inhibitor can be considered for mild hyperglycemia. **E**
- In adults with PTDM or preexisting type 2 diabetes, noninsulin pharmacotherapy can be used for long-term glycemic management, **C** and medication selection may differ depending on the transplanted organ(s). **E**
- In adults with PTDM or preexisting type 2 diabetes, a GLP-1 RA can be considered for long-term glycemic management due to additional cardiometabolic benefits (e.g., cardiovascular, kidney, weight, and liver benefits). **C**
- If long-term individualized glycemic goals cannot be achieved or maintained with noninsulin pharmacotherapy in adults with PTDM or preexisting type 2 diabetes, consider adding insulin. **C**
- Educate individuals with diabetes who are at risk for developing diabetic ketoacidosis and who are treated with SGLT inhibition on the risks and signs of ketoacidosis and methods of risk mitigation management, provide them with appropriate tools for ketone measurement (i.e., serum β-hydroxybutyrate), and discourage a ketogenic eating pattern. **E**

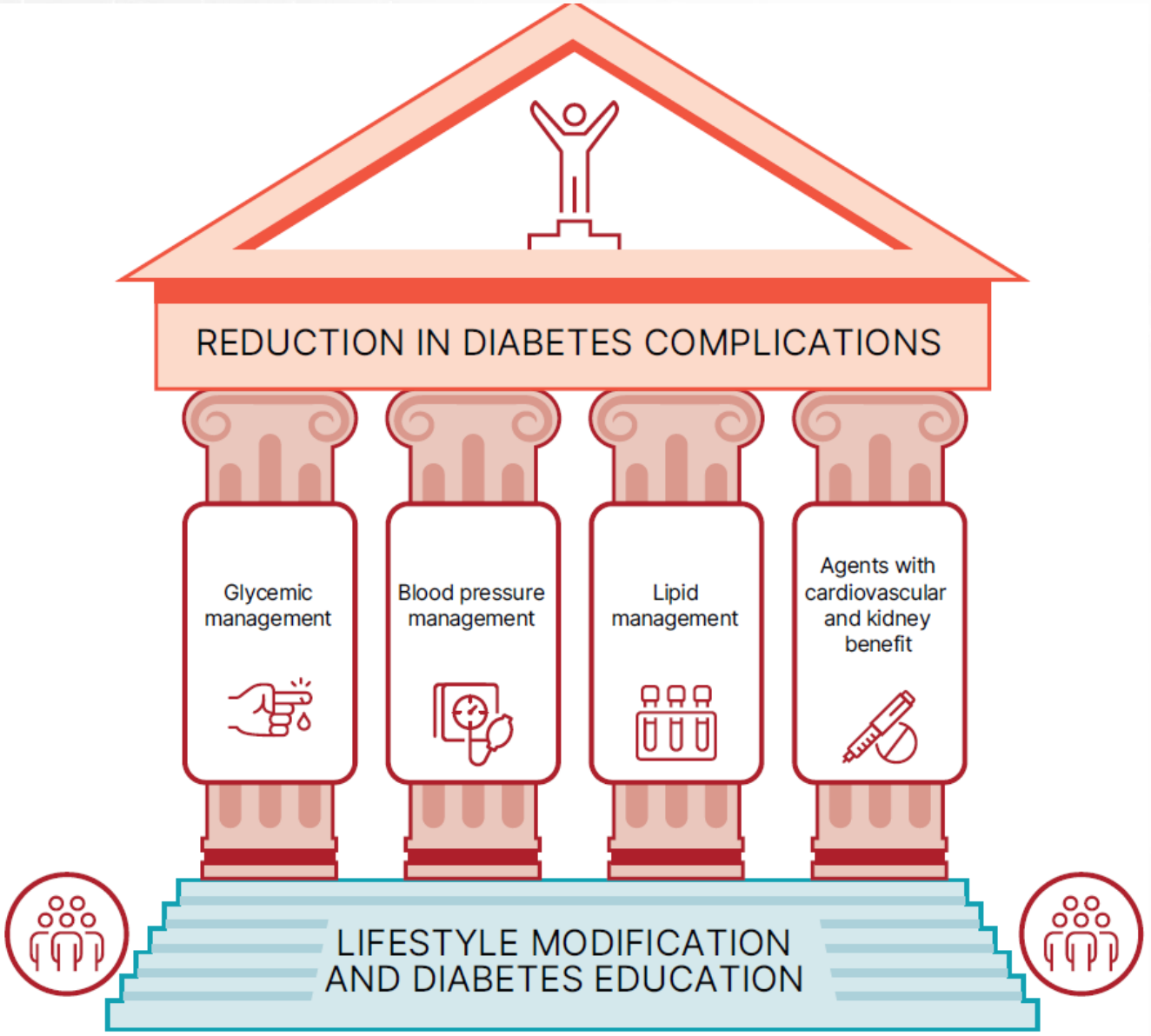


Figure 10.1—Multifactorial approach to reduction in risk of diabetes complications.

Hypertension and Blood Pressure Management

- Hypertension is defined as a systolic blood pressure ≥130 mmHg or a diastolic blood pressure ≥80 mmHg based on an average of two or more measurements obtained on two or more occasions. **A**
- Individuals with blood pressure ≥180/110 mmHg and cardiovascular disease could be diagnosed with hypertension at a single visit. **E**
- Counsel all people with hypertension and diabetes to monitor their blood pressure at home after appropriate education. **A**
- If it can be safely attained, the on-treatment blood pressure goal is <130/80 mmHg; a systolic blood pressure goal <120 mmHg should be encouraged in individuals with high cardiovascular or kidney risk. **A**

Statin Treatment

- For people with diabetes aged 40–75 years without ASCVD, use moderate-intensity statin therapy in addition to lifestyle therapy. **A**
- For people with diabetes aged 20–39 years with additional ASCVD risk factors, it may be reasonable to initiate statin therapy in addition to lifestyle therapy. **C**
- For people with diabetes aged 40–75 years at higher cardiovascular risk, especially those with multiple additional ASCVD risk factors and an LDL cholesterol ≥70 mg/dL (≥1.8 mmol/L), it may be reasonable to add ezetimibe or PCSK9 inhibitor to maximum tolerated statin therapy. **B**

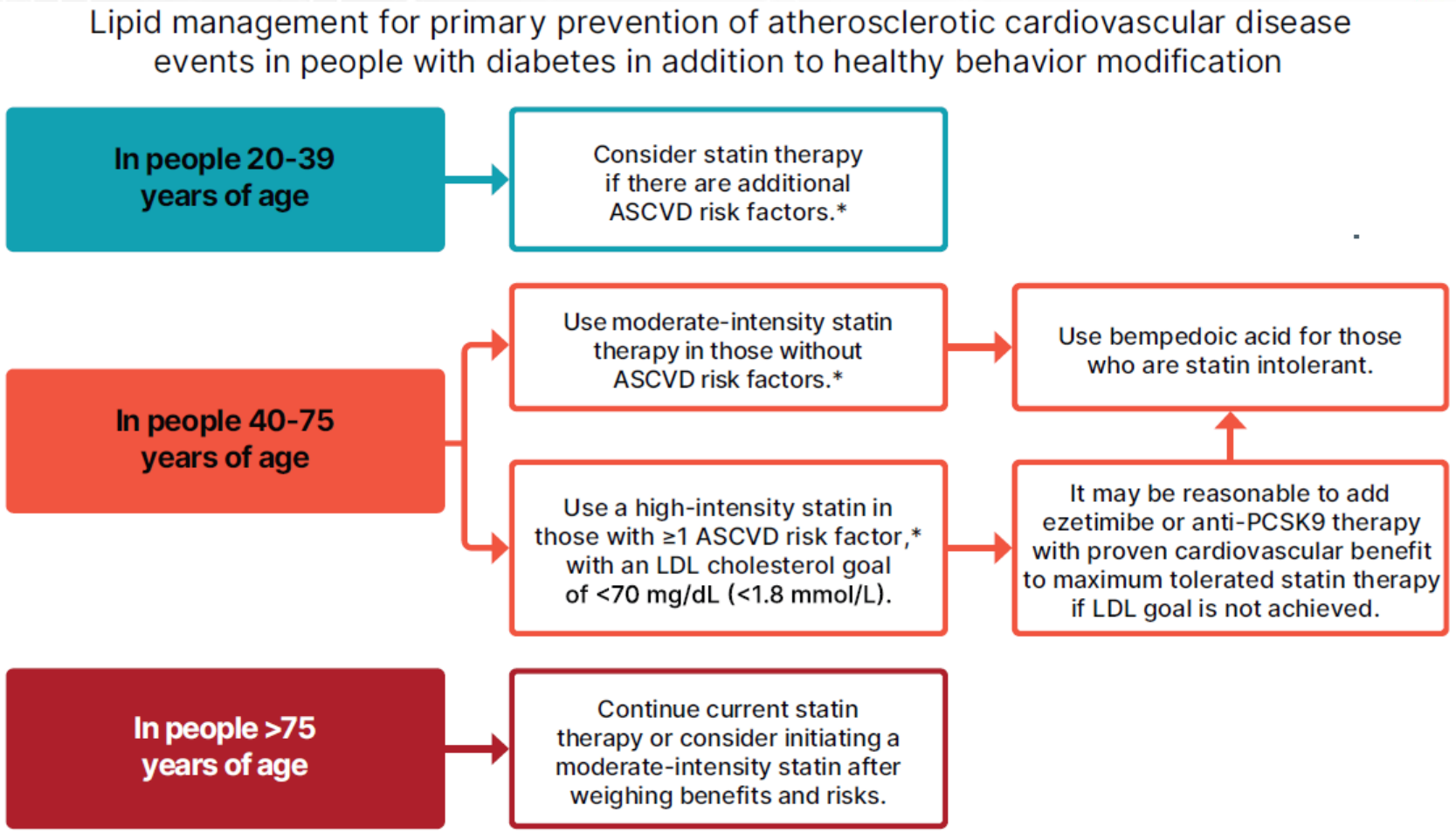
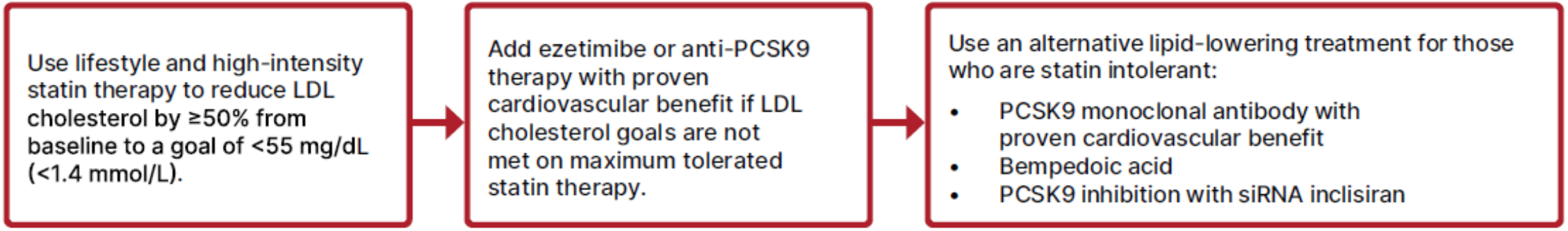


Figure 10.3—Recommendations for primary prevention of atherosclerotic cardiovascular disease (ASCVD) in people with diabetes using cholesterol-lowering therapy. *ASCVD risk factors include older age, hypertension, dyslipidemia, smoking, chronic kidney disease, or obesity. Adapted from "Standards of Care in Diabetes—2024 Abridged for Primary Care Professionals" (315).

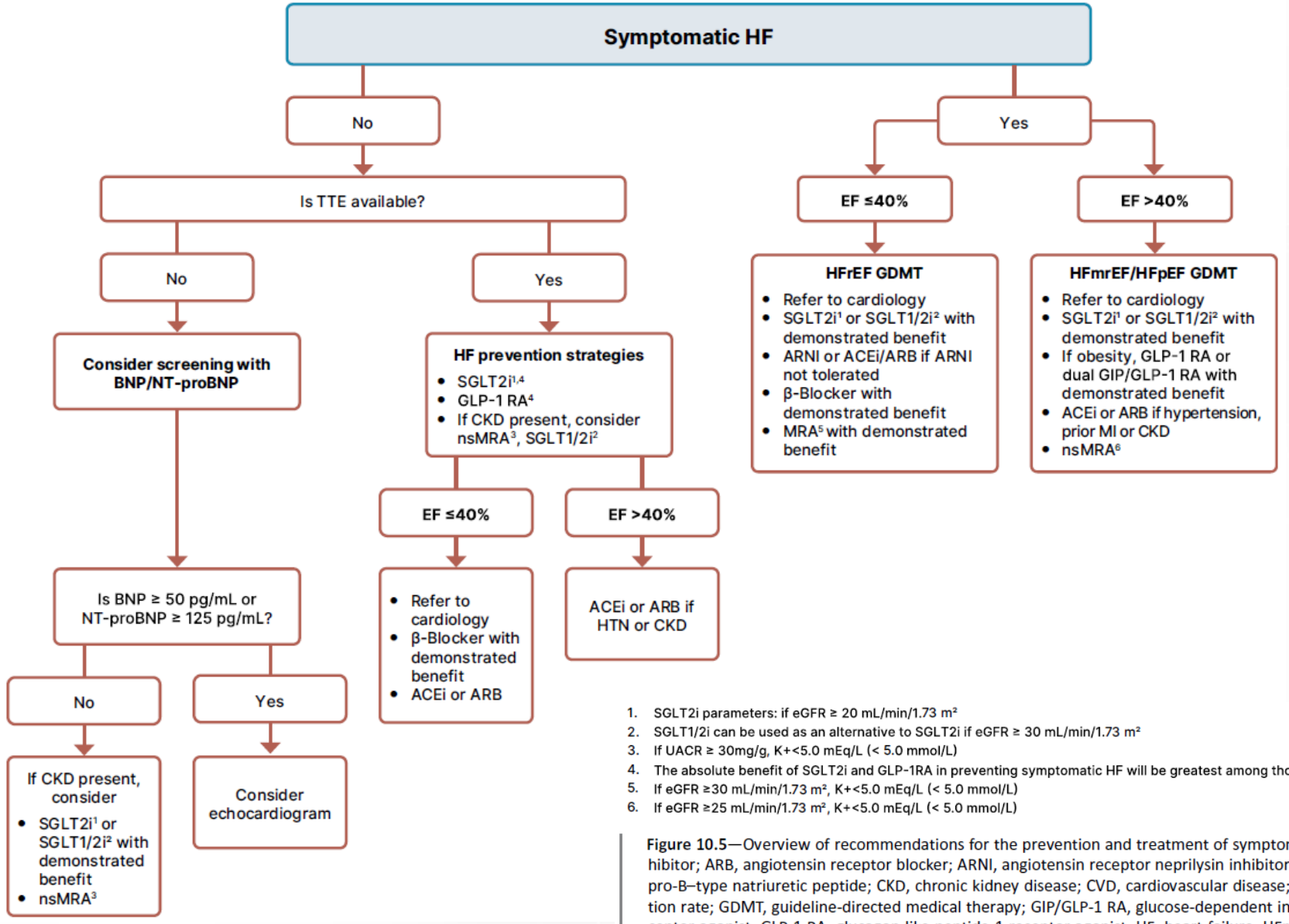
Statin Treatment

- For people of all ages with diabetes and ASCVD, high-intensity statin therapy should be added to lifestyle therapy. **A**
- For people with diabetes and ASCVD, treatment with high-intensity statin therapy is recommended to obtain 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 PCSK9 inhibitor with proven benefit in this population is recommended if this goal is not achieved on maximum tolerated statin therapy. **B**

Lipid management for secondary prevention of atherosclerotic cardiovascular disease events in people with diabetes



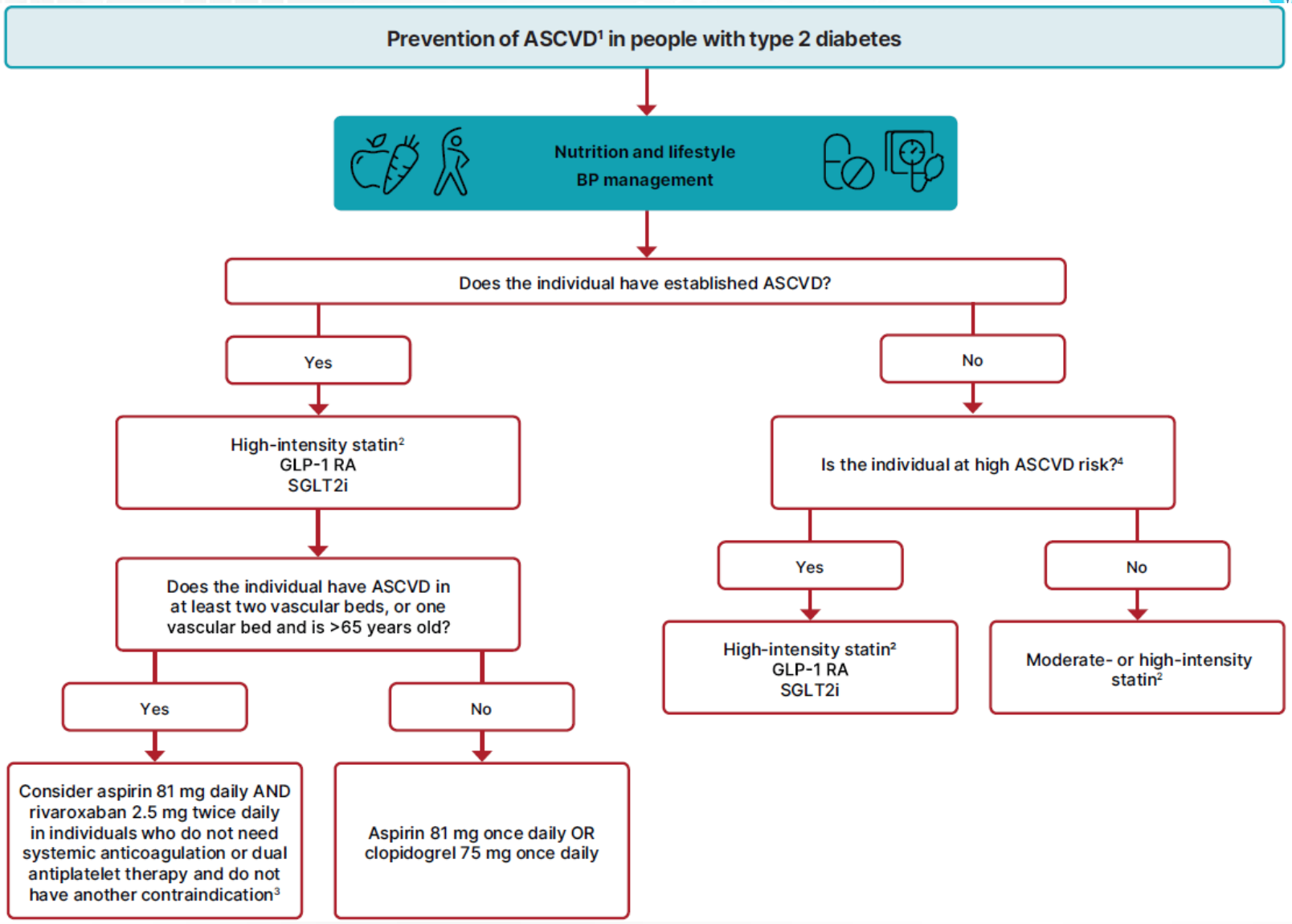
10. Cardiovascular Disease and Risk Management



1. SGLT2i parameters: if eGFR ≥ 20 mL/min/1.73 m²
2. SGLT1/2i can be used as an alternative to SGLT2i if eGFR ≥ 30 mL/min/1.73 m²
3. If UACR ≥ 30mg/g, K+<5.0 mEq/L (< 5.0 mmol/L)
4. The absolute benefit of SGLT2i and GLP-1RA in preventing symptomatic HF will be greatest among those at the highest absolute risk.
5. If eGFR ≥30 mL/min/1.73 m², K+<5.0 mEq/L (< 5.0 mmol/L)
6. If eGFR ≥25 mL/min/1.73 m², K+<5.0 mEq/L (< 5.0 mmol/L)

Figure 10.5—Overview of recommendations for the prevention and treatment of symptomatic heart failure in people with diabetes. ACEi, ACE inhibitor; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor neprilysin inhibitor; BNP, B-type natriuretic peptide; NT-proBNP, N-terminal pro-B–type natriuretic peptide; CKD, chronic kidney disease; CVD, cardiovascular disease; EF, ejection fraction; eGFR, estimated glomerular filtration rate; GDMT, guideline-directed medical therapy; GIP/GLP-1 RA, glucose-dependent insulinotropic polypeptide and glucagon-like peptide-1 receptor agonist; GLP-1 RA, glucagon-like peptide-1 receptor agonist; HF, heart failure; HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; HTN, hypertension; MI, myocardial infarction; MRA, mineralocorticoid receptor antagonist; nsMRA, nonsteroidal mineralocorticoid receptor antagonist; SGLT1/2i, sodium–glucose cotransporter 1 and 2 inhibitor; SGLT2i, sodium–glucose cotransporter 2 inhibitor; TTE, transthoracic echocardiography; UACR, urine albumin-to-creatinine ratio.

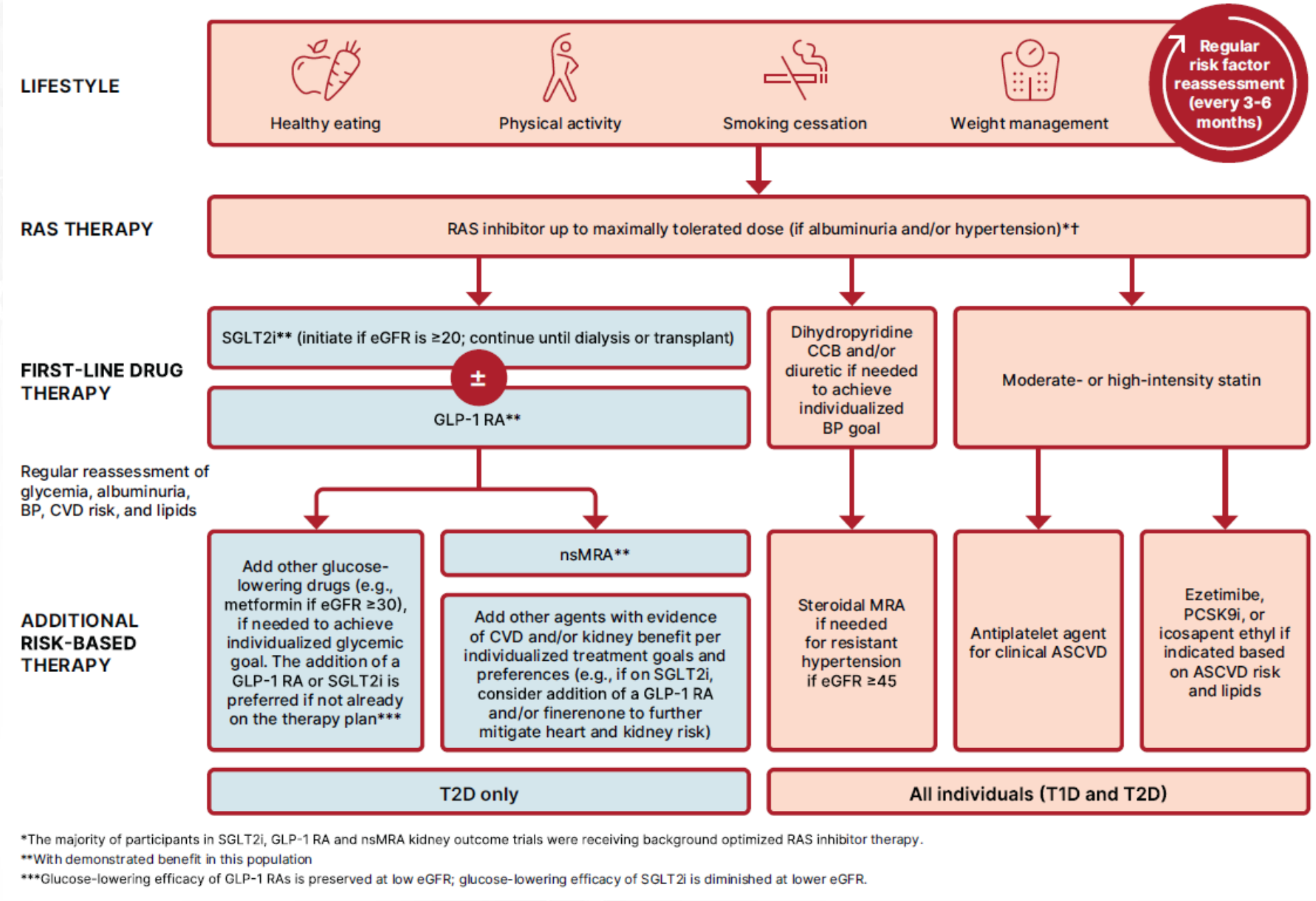
10. Cardiovascular Disease and Risk Management



Chronic Kidney Disease

- Assess kidney function with random urine albumin-to-creatinine ratio (UACR) and estimated glomerular filtration rate (eGFR) at least annually in people with type 1 diabetes with duration of ≥5 years and in all people with type 2 diabetes regardless of treatment. **B**
- In people with chronic kidney disease (CKD), monitor urinary albumin (e.g., spot UACR) and eGFR 1–4 times per year. **B**
- Aim to reduce urinary albumin by ≥30% in people with CKD and albuminuria ≥300 mg/g to slow CKD progression. **B**
- Optimize glucose management to reduce the risk or slow the progression of CKD. **A**
- Individuals on dialysis can be safely initiated or continued on GLP-1–based therapy that is not dependent on kidney clearance to reduce cardiovascular risk and mortality. **C**

11. Chronic Kidney Disease and Risk Management



*The majority of participants in SGLT2i, GLP-1 RA and nsMRA kidney outcome trials were receiving background optimized RAS inhibitor therapy.
**With demonstrated benefit in this population
***Glucose-lowering efficacy of GLP-1 RAs is preserved at low eGFR; glucose-lowering efficacy of SGLT2i is diminished at lower eGFR.

13. Older Adults

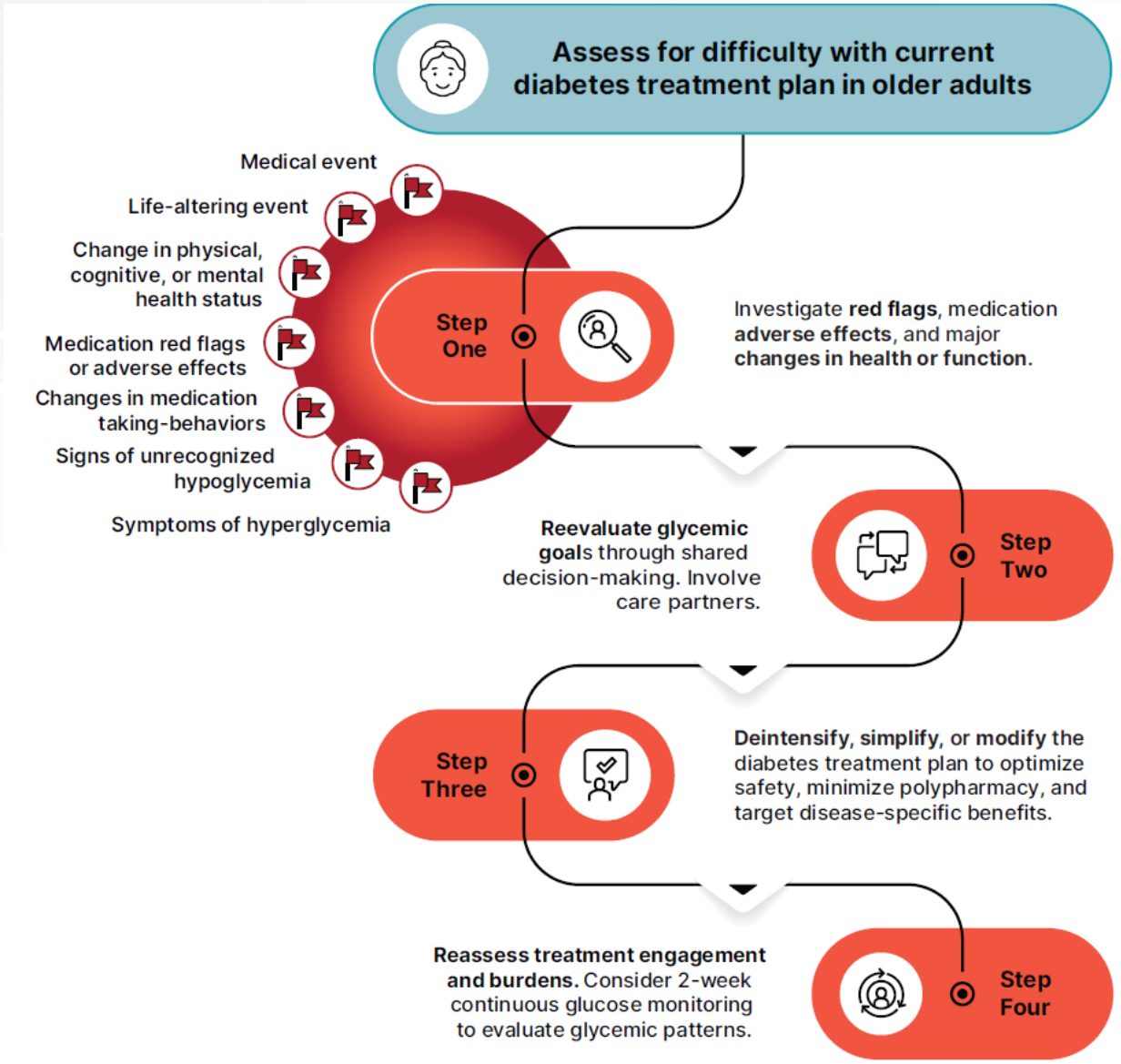


Figure 13.2—Stepwise approach for assessing difficulties in the diabetes treatment plan; reevaluating glycemic goals through shared decision-making; deintensifying, simplifying, or modifying the treatment plan; and reassessing the safety and burdens of any interventions. Created using recommendations from Munshi et al. (41).

Simplification of complex insulin therapy in people with type 2 diabetes on insulin

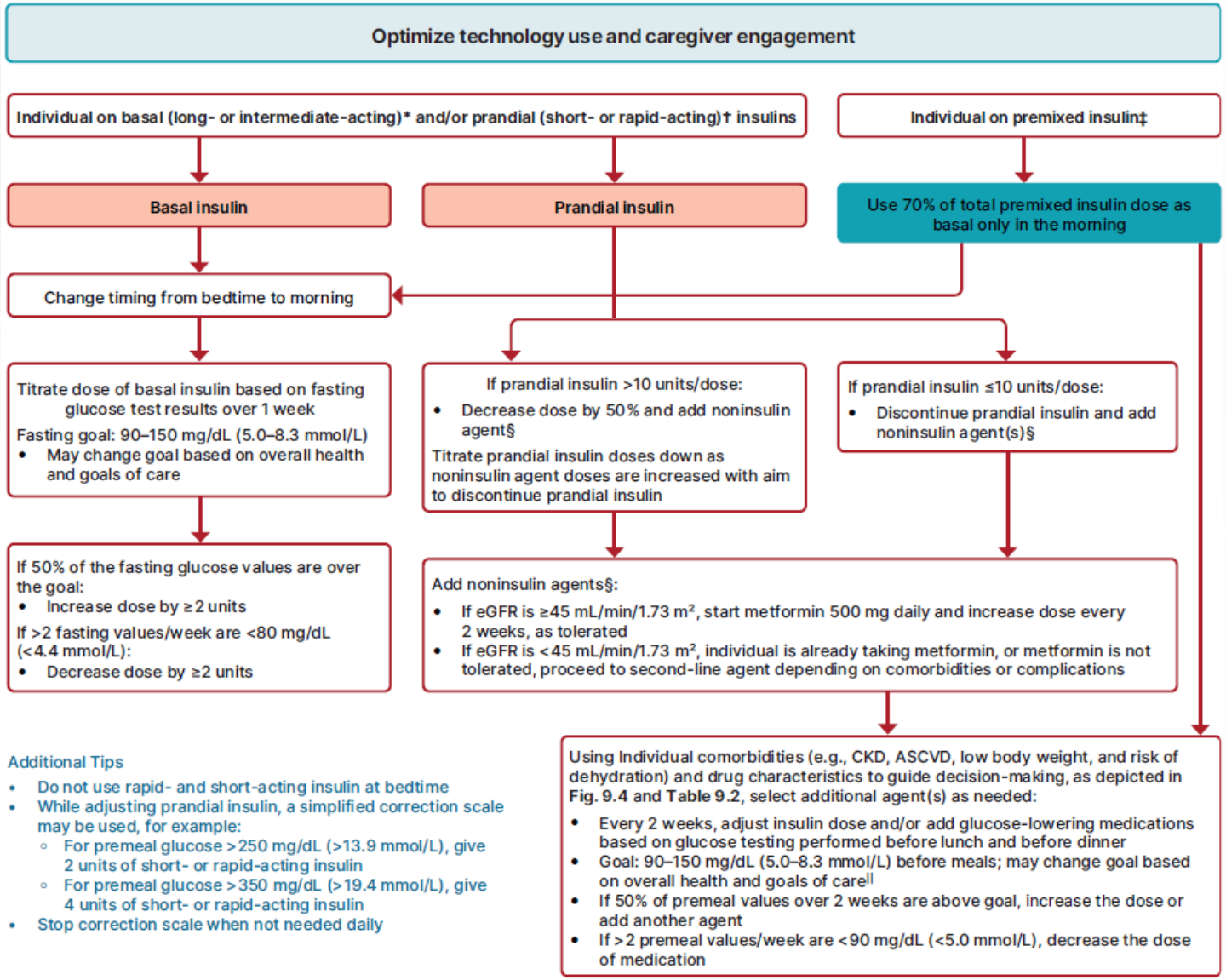
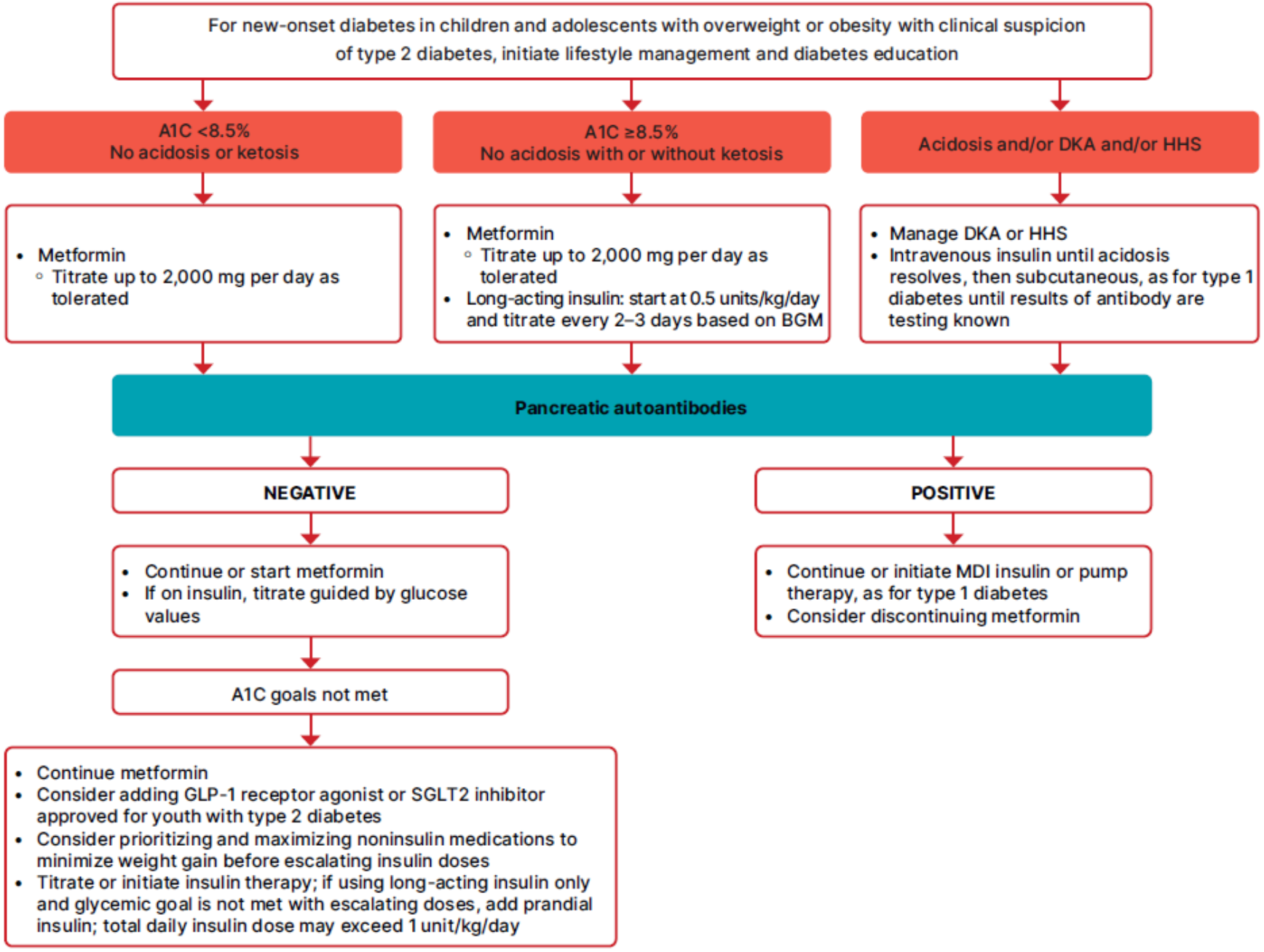


Figure 13.3—Algorithm to simplify insulin administration plans in older individuals. ASCVD, atherosclerotic cardiovascular disease; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate. *Basal insulins: glargine U-100 and U-300, degludec, and human NPH. †Prandial insulins: short-acting (regular human insulin) or rapid-acting (lispro, aspart, and glulisine). ‡Premixed insulins: 70/30, 75/25, and 50/50 products. §Examples of noninsulin agents include metformin, sodium-glucose cotransporter 2 inhibitors, dipeptidyl peptidase 4 inhibitors, glucagon-like peptide 1 receptor agonists (GLP1-RAs), and dual glucose-dependent insulinotropic polypeptide (GIP) and GLP-1 RAs. ‖See **Table 13.2**. Adapted with permission from Munshi et al. (151).

14. Children and Adolescents



Pharmacologic Management (Type 2)

- In individuals with incidentally diagnosed type 2 diabetes (A1C <8.5% and asymptomatic), metformin is the initial pharmacologic treatment of choice unless contraindicated by kidney function. **A**
- Children and adolescents with marked hyperglycemia (A1C ≥8.5% without acidosis at diagnosis should be treated initially with long-acting insulin while metformin is initiated and titrated. **B**
- If individualized glycemic goals are not achieved or maintained with metformin (with or without long-acting insulin), glucagon-like peptide 1 receptor agonist (GLP-1 RA) and/or sodium–glucose cotransporter 2 inhibitor(SGLT2i) should be considered in children and adolescents with type 2 diabetes of approved ages. **A**

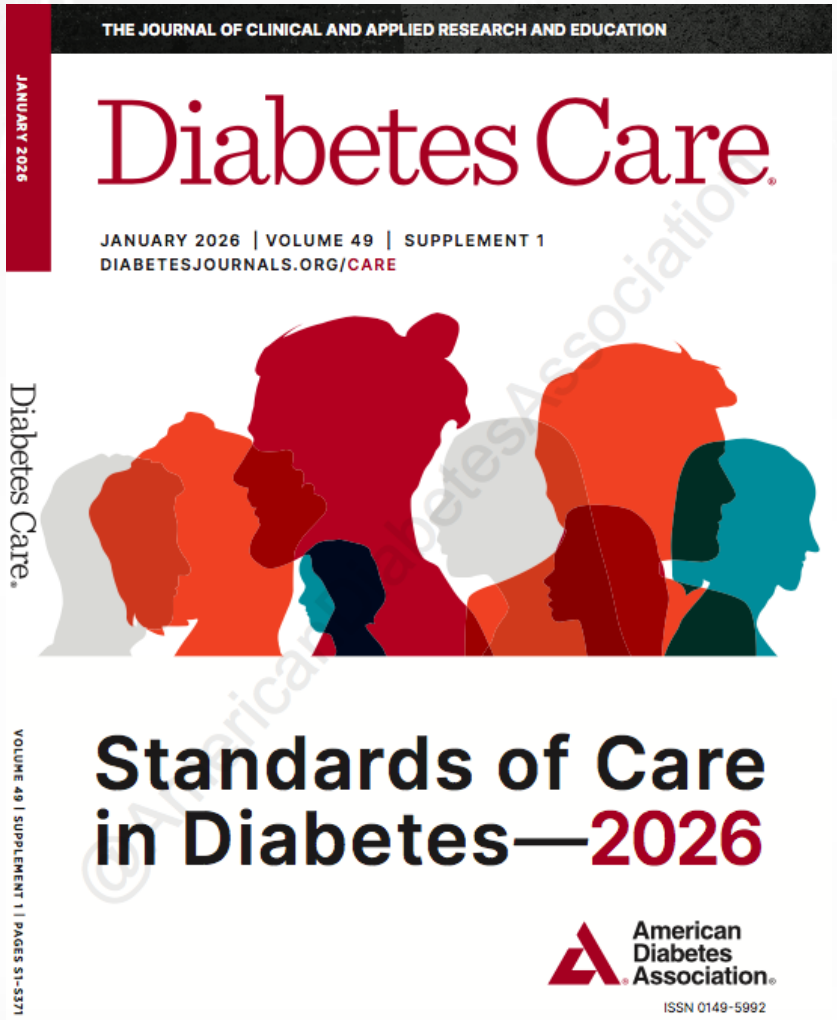
15. Management of Diabetes in Pregnancy

Table 15.2—Blood glucose goals in pregnancies associated with diabetes

	Blood glucose goal		
Glucose measurement	Type 1 diabetes or type 2 diabetes^	GDM treated with insulin	GDM not treated with insulin
Fasting glucose	70–95 mg/dL (3.9–5.3 mmol/L)	70–95 mg/dL (3.9–5.3 mmol/L)	<95 mg/dL (<5.3 mmol/L)
1-h postprandial glucose	110–140 mg/dL* (6.1–7.8 mmol/L)	110–140 mg/dL* (6.1–7.8 mmol/L)	<140 mg/dL* (<7.8 mmol/L)
2-h postprandial glucose	100–120 mg/dL (5.6–6.7 mmol/L)	100–120 mg/dL (5.6–6.7 mmol/L)	<120 mg/dL (<6.7 mmol/L)

Gestational diabetes mellitus (GDM) blood glucose goals shown are recommended by the Fifth International Workshop-Conference on Gestational Diabetes Mellitus (45). ^Lower glucose limits do not apply to individuals with type 2 diabetes treated with nutrition alone. Aim for less stringent goals if these cannot be achieved without significant hypoglycemia, based on clinical experience and individualization of care. *Optimal goal includes either a 1-h postprandial glucose level or 2-h postprandial glucose level within column of type of diabetes.

Reference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Thank You!

ANY QUESTIONS?

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