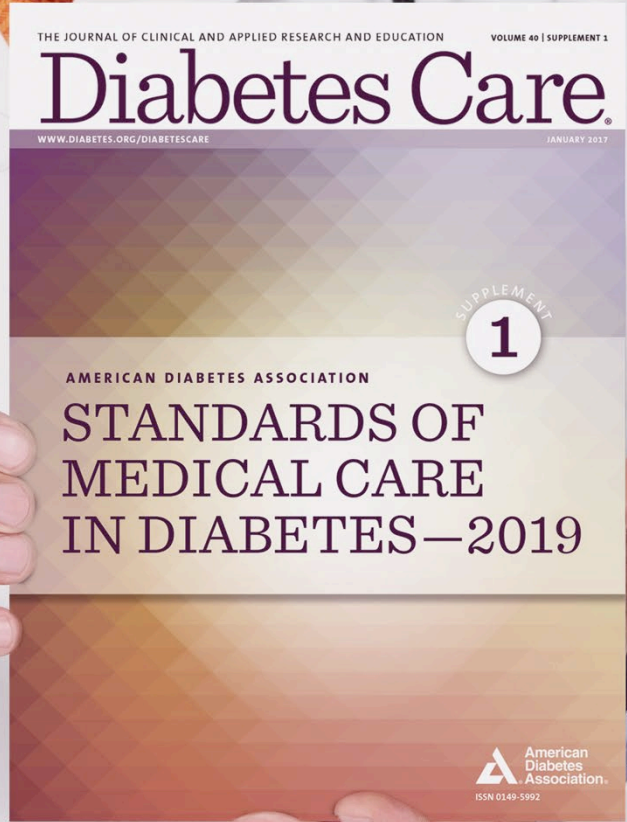


*This slide deck contains content created, reviewed, and approved by the American Diabetes Association. The slides include the March 27 Living Standards of Care update. You are free to use the slides in presentations without further permission as long as the slide content is not altered in any way and appropriate attribution is made to the American Diabetes Association (the Association name and logo on the slides constitutes appropriate attribution). **Permission is required from the Association for any commercial use or for reproduction in any print materials** (contact permissions@diabetes.org)*



Standards of Medical Care in Diabetes – 2019

The Standards.

Intended to provide clinicians, patients, researchers, payers, and other interested individuals with the components of diabetes care, general treatment goals, and tools to evaluate the quality of care.



EVIDENCE

- Search of scientific diabetes literature over past year
- Recommendations revised per new evidence



PROCESS

- Professional Practice Committee (PPC)
- Reviewed by ADA's Board of Directors
- Living Standards



FUNDING

- Funded out of ADA's general revenues
- Does not use industry support

Recent Process Changes.

- Standards are ADA's sole source of Clinical Practice Recommendations
- The Professional Practice Committee (PPC; ADA's national committee charged with reviewing and revising the Standards) updates the Standards annually, and has the option to update more frequently online should the PPC determine that new evidence or regulatory changes merit immediate incorporation- *"Living Standards"*
- ADA reviews proposals from the community for statements, consensus reports, scientific reviews, and clinical/research conferences. Proposals can be submitted to adaproposal@diabetes.org

Professional.Diabetes.org/SOC

ADA Standards of Care – A Living Document.

- Beginning with the 2018 ADA Standards of Medical Care in Diabetes, the Standards document became a “living” document where notable updates are incorporated into the Standards
- Updates will be made in response to important events inclusive of, but not limited to:
 - Approval of new treatments (medications or devices) with the potential to impact patient care;
 - Publication of new findings that support a change to a recommendation and/or evidence level of a recommendation; or
 - Publication of a consensus document endorsed by ADA that necessitates an update of the Standards to align content of the documents

Living Standards Updates Available at: <http://care.diabetesjournals.org/living-standards>

Table 1—ADA evidence-grading system for “Standards of Medical Care in Diabetes”

Level of evidence	Description
A	<p>Clear evidence from well-conducted, generalizable randomized controlled trials that are adequately powered, including</p> <ul style="list-style-type: none"> • Evidence from a well-conducted multicenter trial • Evidence from a meta-analysis that incorporated quality ratings in the analysis <p>Compelling nonexperimental evidence, i.e., “all or none” rule developed by the Centre for Evidence-Based Medicine at the University of Oxford</p> <p>Supportive evidence from well-conducted randomized controlled trials that are adequately powered, including</p> <ul style="list-style-type: none"> • Evidence from a well-conducted trial at one or more institutions • Evidence from a meta-analysis that incorporated quality ratings in the analysis
B	<p>Supportive evidence from well-conducted cohort studies</p> <ul style="list-style-type: none"> • Evidence from a well-conducted prospective cohort study or registry • Evidence from a well-conducted meta-analysis of cohort studies <p>Supportive evidence from a well-conducted case-control study</p>
C	<p>Supportive evidence from poorly controlled or uncontrolled studies</p> <ul style="list-style-type: none"> • Evidence from randomized clinical trials with one or more major or three or more minor methodological flaws that could invalidate the results • Evidence from observational studies with high potential for bias (such as case series with comparison with historical controls) • Evidence from case series or case reports <p>Conflicting evidence with the weight of evidence supporting the recommendation</p>
E	Expert consensus or clinical experience

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14. Diabetes Care in the Hospital
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Section 1.

Improving Care and Promoting Health in Populations

Care Delivery Systems.

- 33-49% of patients still do not meet targets for A1C, blood pressure, or lipids
- Only 14% of patients meet targets for all A1C, BP, lipids, and nonsmoking status
- Progress in CVD risk factor control is slowing
- System-level improvements are needed

Chronic Care Model.

The Chronic Care Model includes six core elements to optimize the care of patients with chronic disease:

1. Delivery system design (moving from a *reactive* to a *proactive* care delivery system where planned visits are coordinated through a team-based approach)
2. Self-management support
3. Decision support (basing care on evidence-based, effective care guidelines)
4. Clinical information systems (using registries that can provide patient-specific and population-based support to the care team)
5. Community resources and policies (identifying or developing resources to support healthy lifestyles)
6. Health systems (to create a quality-oriented culture)

Diabetes and Population Health.

- 1.1 Ensure treatment decisions are timely, rely on evidence-based guidelines, and are made collaboratively with patients based on individual preferences, prognoses, and comorbidities. **B**
- 1.2 Align approaches to diabetes management with the Chronic Care Model, emphasizing productive interactions between a prepared proactive care team and an informed activated patient. **A**
- 1.3 Care systems should facilitate team-based care, patient registries, decision support tools, and community involvement to meet patient needs. **B**
- 1.4 Efforts to assess the quality of diabetes care and create quality improvement strategies should incorporate reliable data metrics, to promote improved processes of care and health outcomes, with simultaneous emphasis on costs. **E**

Tailoring Treatment for Social Context.

- 1.5 Providers should assess social context, including potential food insecurity, housing stability, and financial barriers, and apply that information to treatment decisions. **A**
- 1.6 Refer patients to local community resources when available. **B**
- 1.7 Provide patients with self-management support from lay health coaches, navigators, or community health workers when available. **A**

Section 2.

Classification and Diagnosis of Diabetes

Classification.

Diabetes can be classified into the following general categories:

1. Type 1 diabetes (due to autoimmune β -cell destruction, usually leading to absolute insulin deficiency)
2. Type 2 diabetes (due to a progressive loss of β -cell insulin secretion frequently on the background of insulin resistance)
3. Gestational diabetes mellitus (GDM) (diabetes diagnosed in the second or third trimester of pregnancy that was not clearly overt diabetes prior to gestation)
4. Specific types of diabetes due to other causes, e.g., monogenic diabetes syndromes (such as neonatal diabetes and maturity-onset diabetes of the young [MODY]), diseases of the exocrine pancreas (such as cystic fibrosis and pancreatitis), and drug- or chemical-induced diabetes (such as with glucocorticoid use, in the treatment of HIV/AIDS, or after organ transplantation)

A1C.

- 2.1 To avoid misdiagnosis or missed diagnosis, the A1C test should be performed using a method that is certified by NGSP and standardized to the Diabetes Control and Complications Trial (DCCT) assay. **B**
- 2.2 Marked discordance between measured A1C and plasma glucose levels should raise the possibility of A1C assay interference due to hemoglobin variants (i.e., hemoglobinopathies) and consideration of using an assay without interference or plasma blood glucose criteria to diagnose diabetes. **B**
- 2.3 In conditions associated with an altered relationship between A1C and glycemia, such as sickle cell disease, pregnancy (second and third trimesters and the postpartum period), glucose-6-phosphate dehydrogenase deficiency, HIV, hemodialysis, recent blood loss or transfusion, or erythropoietin therapy, only plasma glucose criteria should be used to diagnose diabetes. **B**

Table 2.1—Staging of type 1 diabetes (4,5)

	Stage 1	Stage 2	Stage 3
Characteristics	<ul style="list-style-type: none"> • Autoimmunity • Normoglycemia • Presymptomatic 	<ul style="list-style-type: none"> • Autoimmunity • Dysglycemia • Presymptomatic 	<ul style="list-style-type: none"> • New-onset hyperglycemia • Symptomatic
Diagnostic criteria	<ul style="list-style-type: none"> • Multiple autoantibodies • No IGT or IFG 	<ul style="list-style-type: none"> • Multiple autoantibodies • Dysglycemia: IFG and/or IGT • FPG 100–125 mg/dL (5.6–6.9 mmol/L) • 2-h PG 140–199 mg/dL (7.8–11.0 mmol/L) • A1C 5.7–6.4% (39–47 mmol/mol) or $\geq 10\%$ increase in A1C 	<ul style="list-style-type: none"> • Clinical symptoms • Diabetes by standard criteria

Table 2.2—Criteria for the diagnosis of diabetes

FPG \geq 126 mg/dL (7.0 mmol/L). Fasting is defined as no caloric intake for at least 8 h.*

OR

2-h PG \geq 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

A1C \geq 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

In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose \geq 200 mg/dL (11.1 mmol/L).

*In the absence of unequivocal hyperglycemia, diagnosis requires two abnormal test results from the same sample or in two separate test samples.

Type 1 Diabetes.

- 2.4 Plasma blood glucose rather than A1C should be used to diagnose the acute onset of type 1 diabetes in individuals with symptoms of hyperglycemia. **E**
- 2.5 Screening for type 1 diabetes risk with a panel of autoantibodies is currently recommended only in the setting of a research trial or in first-degree family members of a proband with type 1 diabetes. **B**
- 2.6 Persistence of two or more autoantibodies predicts clinical diabetes and may serve as an indication for intervention in the setting of a clinical trial. **B**

Prediabetes and Type 2 Diabetes (1).

- 2.7 Screening for prediabetes and type 2 diabetes with an informal assessment of risk factors or validated tools should be considered in asymptomatic adults. **B**
- 2.8 Testing for prediabetes and/or type 2 diabetes in asymptomatic people should be considered in adults of any age who are overweight or obese (BMI ≥ 25 kg/m² or ≥ 23 kg/m² in Asian Americans) and who have one or more additional risk factors for diabetes (**Table 2.3**). **B**
- 2.9 For all people, testing should begin at age 45 years. **B**
- 2.10 If tests are normal, repeat testing carried out at a minimum of 3-year intervals is reasonable. **C**

Table 2.3—Criteria for testing for diabetes or prediabetes in asymptomatic adults

1. Testing should be considered in overweight or obese ($\text{BMI} \geq 25 \text{ kg/m}^2$ or $\geq 23 \text{ kg/m}^2$ in Asian Americans) adults who have one or more of the following risk factors:
 - First-degree relative with diabetes
 - High-risk race/ethnicity (e.g., African American, Latino, Native American, Asian American, Pacific Islander)
 - History of CVD
 - Hypertension ($\geq 140/90$ mmHg or on therapy for hypertension)
 - HDL cholesterol level $< 35 \text{ mg/dL}$ (0.90 mmol/L) and/or a triglyceride level $> 250 \text{ mg/dL}$ (2.82 mmol/L)
 - Women with polycystic ovary syndrome
 - Physical inactivity
 - Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
2. Patients with prediabetes ($\text{A1C} \geq 5.7\%$ [39 mmol/mol], IGT, or IFG) should be tested yearly.
3. Women who were diagnosed with GDM should have lifelong testing at least every 3 years.
4. For all other patients, testing should begin at age 45 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.

Prediabetes and Type 2 Diabetes (2).

- 2.11** To test for prediabetes and type 2 diabetes, fasting plasma glucose, 2-h plasma glucose during 75-g oral glucose tolerance test, and A1C are equally appropriate. **B**
- 2.12** In patients with prediabetes and type 2 diabetes, identify and, if appropriate, treat other cardiovascular disease risk factors. **B**
- 2.13** Risk-based screening for prediabetes and/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 who are overweight (BMI $\geq 85^{\text{th}}$ percentile) or obese (BMI $\geq 85^{\text{th}}$ percentile) and who have additional risk factors for diabetes (**see Table 2.4 for evidence grading of risk factors**).

Table 2.4—Risk-based screening for type 2 diabetes or prediabetes in asymptomatic children and adolescents in a clinical setting

Testing should be considered in youth* who are overweight ($\geq 85\%$ percentile) or obese ($\geq 95\%$ percentile) **A** and who have one or more additional risk factors based on the strength of their association with diabetes:

- Maternal history of diabetes or GDM during the child's gestation **A**
- Family history of type 2 diabetes in first- or second-degree relative **A**
- Race/ethnicity (Native American, African American, Latino, Asian American, Pacific Islander) **A**
- Signs of insulin resistance or conditions associated with insulin resistance (acanthosis nigricans, hypertension, dyslipidemia, polycystic ovary syndrome, or small-for-gestational-age birth weight) **B**

*After the onset of puberty or after 10 years of age, whichever occurs earlier. If tests are normal, repeat testing at a minimum of 3-year intervals, or more frequently if BMI is increasing, is recommended.

ARE YOU AT RISK FOR

TYPE 2 DIABETES?



Diabetes Risk Test

1 How old are you?

- Less than 40 years (0 points)
- 40—49 years (1 point)
- 50—59 years (2 points)
- 60 years or older (3 points)

Write your score
in the box.

2 Are you a man or a woman?

- Man (1 point) Woman (0 points)

3 If you are a woman, have you ever been diagnosed with gestational diabetes?

- Yes (1 point) No (0 points)

4 Do you have a mother, father, sister, or brother with diabetes?

- Yes (1 point) No (0 points)

5 Have you ever been diagnosed with high blood pressure?

- Yes (1 point) No (0 points)

6 Are you physically active?

- Yes (0 points) No (1 point)

7 What is your weight status? (see chart at right)

Height	Weight (lbs.)		
4' 10"	119-142	143-190	191+
4' 11"	124-147	148-197	198+
5' 0"	128-152	153-203	204+
5' 1"	132-157	158-210	211+
5' 2"	136-163	164-217	218+
5' 3"	141-168	169-224	225+
5' 4"	145-173	174-231	232+
5' 5"	150-179	180-239	240+
5' 6"	155-185	186-246	247+
5' 7"	159-190	191-254	255+
5' 8"	164-196	197-261	262+
5' 9"	169-202	203-269	270+
5' 10"	174-208	209-277	278+
5' 11"	179-214	215-285	286+
6' 0"	184-220	221-293	294+
6' 1"	189-226	227-301	302+
6' 2"	194-232	233-310	311+
6' 3"	200-239	240-318	319+
6' 4"	205-245	246-327	328+
	(1 Point)	(2 Points)	(3 Points)

You weigh less than the amount
in the left column
(0 points)

If you scored 5 or higher:

You are at increased risk for having type 2 diabetes. However, only your doctor can tell for sure if you do have type 2 diabetes or prediabetes (a condition that precedes type 2 diabetes in which blood glucose levels are higher than normal). Talk to your doctor to see if additional testing is needed.

Add up
your score.

Adapted from Bang et al., Ann Intern Med
151:775-783, 2009.
Original algorithm was validated without
gestational diabetes as part of the model.

diabetes.org/socrisktest

Table 2.5—Criteria defining prediabetes*

FPG 100 mg/dL (5.6 mmol/L) to 125 mg/dL (6.9 mmol/L) (IFG)

OR

2-h PG during 75-g OGTT 140 mg/dL (7.8 mmol/L) to 199 mg/dL (11.0 mmol/L) (IGT)

OR

A1C 5.7–6.4% (39–47 mmol/mol)

*For all three tests, risk is continuous, extending below the lower limit of the range and becoming disproportionately greater at the higher end of the range.

Gestational Diabetes Mellitus (1).

- 2.14 Test for undiagnosed diabetes at the first prenatal visit in those with risk factors using standard diagnostic criteria. **B**
- 2.15 Test for gestational diabetes mellitus at 24-28 weeks of gestation in pregnant women not previously known to have diabetes. **A**
- 2.16 Test women with gestational diabetes mellitus for prediabetes or diabetes at 4-12 weeks postpartum, using the 75-g oral glucose tolerance test and clinically appropriate nonpregnancy diagnostic criteria. **B**

Gestational Diabetes Mellitus (2).

2.17 Women with a history of gestational diabetes mellitus should have lifelong screening for the development of diabetes or prediabetes at least every 3 years.

B

2.18 Women with a history of gestational diabetes mellitus found to have prediabetes should receive intensive lifestyle interventions or metformin to prevent diabetes. **A**

Table 2.6—Screening for and diagnosis of GDM

One-step strategy

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

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

Step 2: The 100-g OGTT should be performed when the patient is fasting.

The diagnosis of GDM is made if at least two* of the following four plasma glucose levels (measured fasting and 1 h, 2 h, 3 h during OGTT) are met or exceeded:

	Carpenter-Coustan (86)	or	NDDG (87)
• Fasting	95 mg/dL (5.3 mmol/L)		105 mg/dL (5.8 mmol/L)
• 1 h	180 mg/dL (10.0 mmol/L)		190 mg/dL (10.6 mmol/L)
• 2 h	155 mg/dL (8.6 mmol/L)		165 mg/dL (9.2 mmol/L)
• 3 h	140 mg/dL (7.8 mmol/L)		145 mg/dL (8.0 mmol/L)

NDDG, National Diabetes Data Group. *ACOG notes that one elevated value can be used for diagnosis (82).

Cystic Fibrosis-Related Diabetes.

- 2.19 Annual screening for cystic fibrosis-related diabetes with an oral glucose tolerance test should begin by age 10 years in all patients with cystic fibrosis not previously diagnosed with cystic fibrosis-related diabetes. **B**
- 2.20 A1C is not recommended as a screening test for cystic fibrosis-related diabetes. **B**
- 2.21 Patients with cystic fibrosis-related diabetes should be treated with insulin to attain individualized glycemic goals. **A**
- 2.22 Beginning 5 years after the diagnosis of cystic fibrosis-related diabetes, annual monitoring for complications of diabetes is recommended. **E**

Posttransplantation Diabetes Mellitus.

- 2.23** Patients should be screened after organ transplantation for hyperglycemia, with a formal diagnosis of posttransplantation diabetes mellitus being best made once a patient is stable on an immunosuppressive regimen and in the absence of an acute infection. **E**
- 2.24** The oral glucose tolerance test is the preferred test to make a diagnosis of posttransplantation diabetes mellitus. **B**
- 2.25** Immunosuppressive regimens shown to provide the best outcomes for patient and graft survival should be used, irrespective of posttransplantation diabetes mellitus risk. **E**

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 (with occasional cases presenting later, mostly *INS* and *ABCC8* mutations)
- Diabetes without typical features of type 1 or type 2 diabetes (negative diabetes-associated autoantibodies, nonobese, lacking other metabolic features especially with strong family history of diabetes)
- Stable, mild fasting hyperglycemia (100-150 mg/dL [5.5-8.5 mmol/L]), stable A1C between 5.6 and 7.6% (between 38 and 60 mmol/mol), especially if nonobese

Monogenic Diabetes Syndromes.

- 2.26** All children diagnosed with diabetes in the first 6 months of life should have immediate genetic testing for neonatal diabetes. **A**
- 2.27** Children and adults, diagnosed in early adulthood, who have diabetes not characteristic of type 1 or type 2 diabetes that occurs in successive generations (suggestive of an autosomal dominant pattern of inheritance) should have genetic testing for maturity-onset diabetes of the young. **A**
- 2.28** In both instances, consultation with a center specializing in diabetes genetics is recommended to understand the significance of these mutations and how best to approach further evaluation, treatment, and genetic counseling. **E**

Table 2.7—Most common causes of monogenic diabetes (119)

	Gene	Inheritance	Clinical features
MODY			
	<i>GCK</i>	AD	GCK-MODY: stable, nonprogressive elevated fasting blood glucose; typically does not require treatment; microvascular complications are rare; small rise in 2-h PG level on OGTT (<54 mg/dL [3 mmol/L])
	<i>HNF1A</i>	AD	HNF1A-MODY: progressive insulin secretory defect with presentation in adolescence or early adulthood; lowered renal threshold for glucosuria; large rise in 2-h PG level on OGTT (>90 mg/dL [5 mmol/L]); sensitive to sulfonylureas
	<i>HNF4A</i>	AD	HNF4A-MODY: progressive insulin secretory defect with presentation in adolescence or early adulthood; may have large birth weight and transient neonatal hypoglycemia; sensitive to sulfonylureas
	<i>HNF1B</i>	AD	HNF1B-MODY: developmental renal disease (typically cystic); genitourinary abnormalities; atrophy of the pancreas; hyperuricemia; gout
Neonatal diabetes			
	<i>KCNJ11</i>	AD	Permanent or transient: IUGR; possible developmental delay and seizures; responsive to sulfonylureas
	<i>INS</i>	AD	Permanent: IUGR; insulin requiring
	<i>ABCC8</i>	AD	Permanent or transient: IUGR; rarely developmental delay; responsive to sulfonylureas
	6q24 (<i>PLAGL1</i> , <i>HYMA1</i>)	AD for paternal duplications	Transient: IUGR; macroglossia; umbilical hernia; mechanisms include UPD6, paternal duplication or maternal methylation defect; may be treatable with medications other than insulin
	<i>GATA6</i>	AD	Permanent: pancreatic hypoplasia; cardiac malformations; pancreatic exocrine insufficiency; insulin requiring
	<i>EIF2AK3</i>	AR	Permanent: Wolcott-Rallison syndrome: epiphyseal dysplasia; pancreatic exocrine insufficiency; insulin requiring
	<i>FOXP3</i>	X-linked	Permanent: immunodysregulation, polyendocrinopathy, enteropathy X-linked (IPEX) syndrome: autoimmune diabetes; autoimmune thyroid disease; exfoliative dermatitis; insulin requiring

AD, autosomal dominant; AR, autosomal recessive; IUGR, intrauterine growth restriction.

Section 3.

Prevention or Delay of Type 2 Diabetes

Prevention or Delay of Type 2 Diabetes.

3.1 At least annual monitoring for the development of type 2 diabetes in those with prediabetes is suggested. E

Lifestyle Interventions.

- 3.2 Refer patients with prediabetes to an intensive behavioral lifestyle intervention program modeled on the Diabetes Prevention Program (DPP) to achieve and maintain 7% loss of initial body weight and increase moderate-intensity physical activity (such as brisk walking) to at least 150 min/week. **A**
- 3.3 Based on patient preference, technology-assisted diabetes prevention interventions may be effective in preventing type 2 diabetes and should be considered. **B**
- 3.4 Given the cost-effectiveness of diabetes prevention, such intervention programs should be covered by third-party payers. **B**

Pharmacologic Interventions.

- 3.5 Metformin therapy for prevention of type 2 diabetes should be considered in those with prediabetes, especially for those with BMI ≥ 35 kg/m², those aged <60 years, and women with prior gestational diabetes mellitus. **A**
- 3.6 Long-term use of metformin may be associated with biochemical vitamin B12 deficiency, and periodic measurement of vitamin B12 levels should be considered in metformin-treated patients, especially in those with anemia or peripheral neuropathy. **B**

Prevention of Cardiovascular Disease.

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

Diabetes Self-Management Education and Support.

3.8 Diabetes self-management education and support programs may be appropriate venues for people with prediabetes to receive education and support to develop and maintain behaviors that can prevent or delay the development of type 2 diabetes. **B**

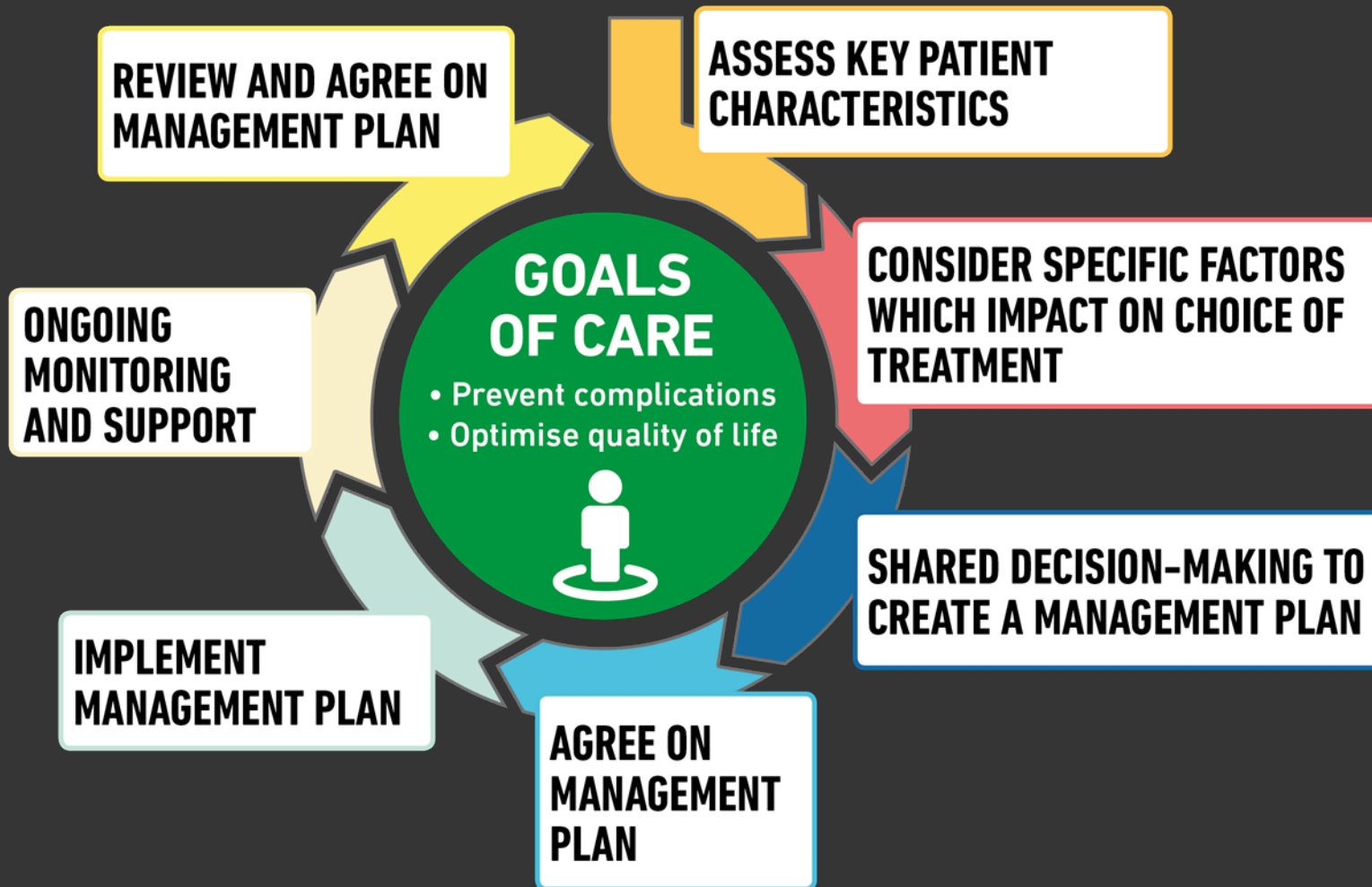
Section 4.

Comprehensive Medical Evaluation and Assessment of Comorbidities

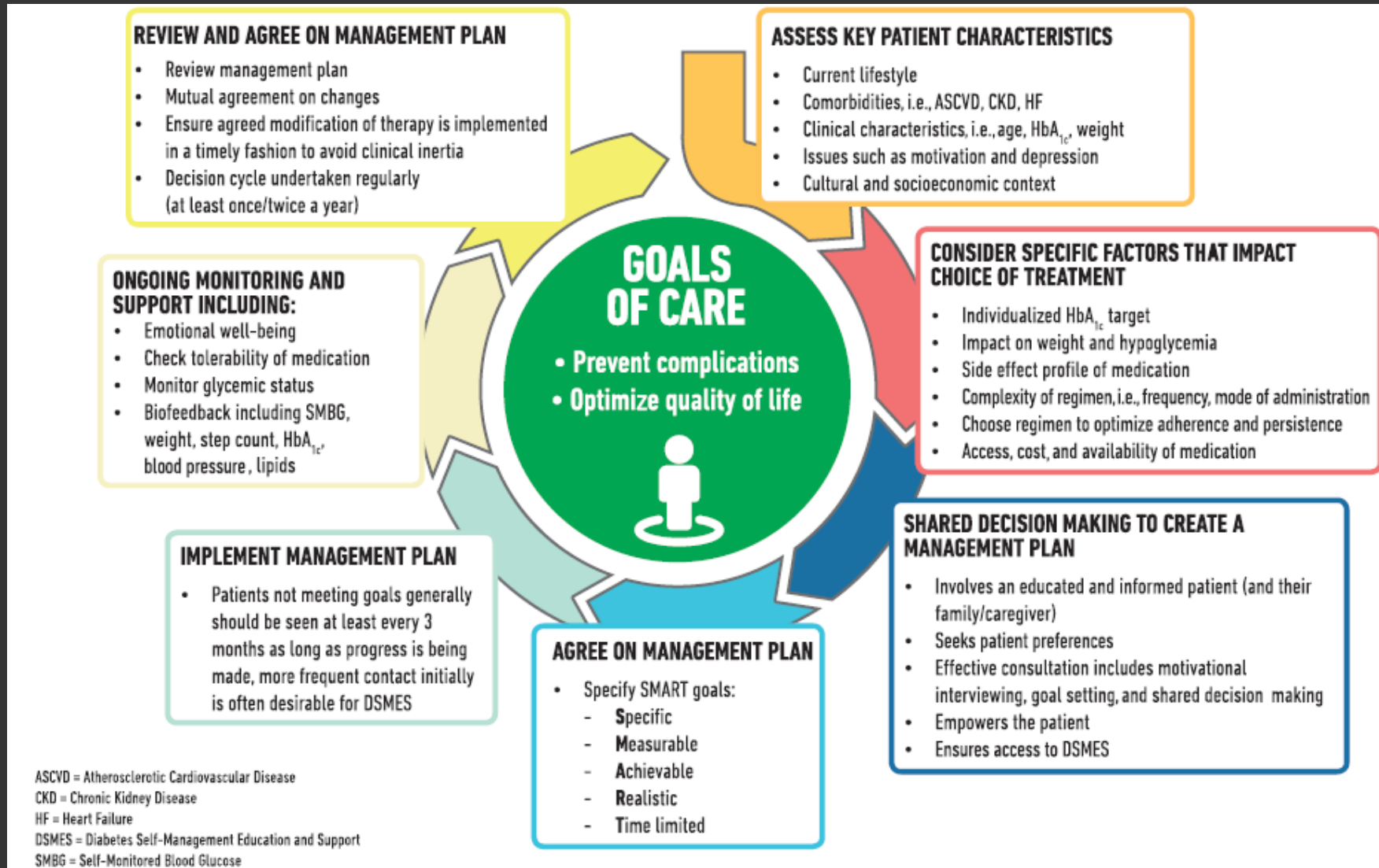
Patient-Centered Collaborative Care.

- 4.1 A patient-centered communication style that uses person-centered and strength-based language and active listening, elicits patient preferences and beliefs, and assesses literacy, numeracy, and potential barriers to care should be used to optimize patient and health outcomes and health-related quality of life. **B**
- 4.2 Diabetes care should be managed by a multidisciplinary team that may draw from primary care physicians, subspecialty physicians, nurse practitioners, physician assistants, nurses, dietitians, exercise specialists, pharmacists, dentists, podiatrists, and mental health professionals. **E**

Decision Cycle for Patient-Centered Glycemic Management in Type 2 Diabetes



Decision Cycle for Patient-Centered Glycemic Management in Type 2 Diabetes



Use of Empowering Language.

Five key consensus recommendations for language use:

1. Use language that is neutral, nonjudgmental, and based on factus, actions, or physiology/biology;
2. Use language that is free from stigma;
3. Use language that is strength based, respectful, and inclusive and that imparts hope;
4. Use language that fosters collaboration between patients and providers;
5. Use language that is person centered (e.g., “person with diabetes” is preferred over “diabetic”).

Comprehensive Medical Evaluation (1).

4.3 A complete medical evaluation should be performed at the initial visit to:

- Confirm the diagnosis and classify diabetes. **B**
- Evaluate for diabetes complications and potential comorbid conditions. **B**
- Review previous treatment and risk factor control in patients with established diabetes. **B**
- Begin patient engagement in the formulation of a care management plan. **B**
- Develop a plan for continuing care. **B**

Comprehensive Medical Evaluation (2).

- 4.4 A follow-up visit should include most components of the initial comprehensive medical evaluation including: interval medical history, assessment of medication-taking behavior and intolerance/side effects, physical examination, laboratory evaluation as appropriate to assess attainment of A1C and metabolic targets, and assessment of risk for complications, diabetes self-management behaviors, nutrition, psychosocial health, and the need for referrals, immunizations, or other routine health maintenance screening. **B**
- 4.5 Ongoing management should be guided by the assessment of diabetes complications and shared decision making to set therapeutic goals. **B**

Comprehensive Medical Evaluation (3).

4.6 The 10-year risk of a first atherosclerotic cardiovascular disease event should be assessed using the race- and sex-specific Pooled Cohort Equations to better stratify atherosclerotic cardiovascular disease risk. **B**

Immunizations (1).

- 4.7 Provide routinely recommended vaccinations for children and adults with diabetes by age. C
- 4.8 Annual vaccination against influenza is recommended for all people ≥ 6 months of age, *especially* those with diabetes. C
- 4.9 Vaccination against pneumococcal disease, including pneumococcal pneumonia, with 13-valent pneumococcal conjugate vaccine (PCV13) is recommended for children before age 2 years. People with diabetes ages 2 through 64 years should also receive 23-valent pneumococcal polysaccharide vaccine (PPSV23). At age ≥ 65 years, regardless of vaccination history, additional PPSV23 vaccination is necessary. C

Immunizations (2).

- 4.10 Administer a 2- or 3-dose series of hepatitis B vaccine, depending on the vaccine, to unvaccinated adults with diabetes ages 18 through 59 years. C
- 4.11 Consider administering 3-dose series of hepatitis B vaccine to unvaccinated adults with diabetes ages ≥ 60 years. C

Components of the Comprehensive Diabetes Medical Evaluation.

Table 4.1 – Components of the comprehensive diabetes medical evaluation at initial, follow-up, and annual visits		INITIAL VISIT	EVERY FOLLOW-UP VISIT	ANNUAL VISIT
PAST MEDICAL AND FAMILY HISTORY	Diabetes history			
	▪ Characteristics at onset (e.g., age, symptoms)	✓		
	▪ Review of previous treatment regimens and response	✓		
	▪ Assess frequency/cause/severity of past hospitalizations	✓		
	Family history			
	▪ Family history of diabetes in a first-degree relative	✓		
	▪ Family history of autoimmune disorder	✓		
	Personal history of complications and common comorbidities			
	▪ Macrovascular and microvascular	✓		✓
	▪ Common comorbidities (e.g., obesity, OSA)	✓		
	▪ Hypoglycemia: awareness/frequency/causes/timing of episodes	✓	✓	✓
	▪ Presence of hemoglobinopathies or anemias	✓		
	▪ High blood pressure or abnormal lipids	✓		✓
	▪ Last dental visit	✓		✓
	▪ Last dilated eye exam	✓		✓
	▪ Visits to specialists	✓	✓	✓
	Interval history			
	▪ Changes in medical/family history since last visit		✓	✓

Components of the Comprehensive Diabetes Medical Evaluation.

		INITIAL VISIT	EVERY FOLLOW-UP VISIT	ANNUAL VISIT
LIFESTYLE FACTORS	▪ Eating patterns and weight history	✓	✓	✓
	▪ Physical activity and sleep behaviors	✓	✓	✓
	▪ Tobacco, alcohol, and substance use	✓		✓
MEDICATIONS AND VACCINATIONS	▪ Current medication regimen	✓	✓	✓
	▪ Medication-taking behavior	✓	✓	✓
	▪ Medication intolerance or side effects	✓	✓	✓
	▪ Complementary and alternative medicine use	✓	✓	✓
	▪ Vaccination history and needs	✓		✓
TECHNOLOGY USE	▪ Assess use of health apps, online education, patient portals, etc.	✓		✓
	▪ Glucose monitoring (meter/CGM): results and data use	✓	✓	✓
	▪ Review insulin pump settings and use	✓	✓	✓

Components of the Comprehensive Diabetes Medical Evaluation.

		INITIAL VISIT	EVERY FOLLOW-UP VISIT	ANNUAL VISIT
BEHAVIORAL AND DIABETES SELF-MANAGEMENT SKILLS	Psychosocial conditions			
	▪ Screen for depression, anxiety, and disordered eating; refer for further assessment or intervention if warranted	✓		✓
	▪ Identify existing social supports	✓		
	▪ Consider assessment for cognitive impairment*	✓		✓
	Diabetes self-management education and support			
	▪ History of dietitian/diabetes educator visits/classes	✓	✓	✓
	▪ Assess diabetes self-management skills and barriers	✓		✓
	▪ Assess familiarity with carbohydrate counting (type 1 diabetes)	✓		
	Pregnancy planning			
	▪ For women with childbearing capacity, review contraceptive needs and preconception planning	✓	✓	✓

Components of the Comprehensive Diabetes Medical Evaluation.

		INITIAL VISIT	EVERY FOLLOW-UP VISIT	ANNUAL VISIT
PHYSICAL EXAMINATION	▪ Height, weight, and BMI; growth/pubertal development in children and adolescents	✓	✓	✓
	▪ Blood pressure determination	✓	✓	✓
	▪ Orthostatic blood pressure measures (when indicated)	✓		
	▪ Fundoscopic examination (refer to eye specialist)	✓		✓
	▪ Thyroid palpation	✓		✓
	▪ Skin examination (e.g., acanthosis nigricans, insulin injection or insertion sites, lipodystrophy)	✓	✓	✓
	▪ Comprehensive foot examination			
	• Visual inspection (e.g., skin integrity, callous formation, foot deformity or ulcer, toenails)**	✓		✓
	• Screen for PAD (pedal pulses—refer for ABI if diminished)	✓		✓
	• Determination of temperature, vibration or pinprick sensation, and 10-g monofilament exam	✓		✓
LABORATORY EVALUATION	▪ A1C, if the results are not available within the past 3 months	✓	✓	✓
	▪ If not performed/available within the past year	✓		✓
	• Lipid profile, including total, LDL, and HDL cholesterol and triglycerides [#]	✓		✓ [^]
	• Liver function tests [#]	✓		✓
	• Spot urinary albumin-to-creatinine ratio	✓		✓
	• Serum creatinine and estimated glomerular filtration rate ⁺	✓		✓
	• Thyroid-stimulating hormone in patients with type 1 diabetes [#]	✓		✓
	• Vitamin B12 if on metformin (when indicated)	✓		✓
	• Serum potassium levels in patients on ACE inhibitors, ARBs, or diuretics ⁺	✓		✓

Table 4.2—Assessment and treatment plan*

Assess risk of diabetes complications

- ASCVD and heart failure history
- ASCVD risk factors (see Table 10.2) and 10-year ASCVD risk assessment
- Staging of chronic kidney disease (see Table 11.1)
- Hypoglycemia risk (Table 4.3)

Goal setting

- Set A1C/blood glucose target
- If hypertension present, establish blood pressure target
- Diabetes self-management goals (e.g., monitoring frequency)

Therapeutic treatment plan

- Lifestyle management
- Pharmacologic therapy (glucose lowering)
- Pharmacologic therapy (cardiovascular disease risk factors and renal)
- Use of glucose monitoring and insulin delivery devices
- Referral to diabetes education and medical specialists (as needed)

ASCVD, atherosclerotic cardiovascular disease. *Assessment and treatment planning is an essential component of initial and all follow-up visits.

Table 4.3—Assessment of hypoglycemia risk

Factors that increase risk of treatment-associated hypoglycemia

- Use of insulin or insulin secretagogues (i.e., sulfonylureas, meglitinides)
- Impaired kidney or hepatic function
- Longer duration of diabetes
- Frailty and older age
- Cognitive impairment
- Impaired counterregulatory response, hypoglycemia unawareness
- Physical or intellectual disability that may impair behavioral response to hypoglycemia
- Alcohol use
- Polypharmacy (especially ACE inhibitors, angiotensin receptor blockers, nonselective β -blockers)

See references 114–118.

Table 4.4—Referrals for initial care management

- Eye care professional for annual dilated eye exam
 - Family planning for women of reproductive age
 - Registered dietitian for medical nutrition therapy
 - Diabetes self-management education and support
 - Dentist for comprehensive dental and periodontal examination
 - Mental health professional, if indicated
-

Common Comorbidities.

- Autoimmune Diseases (T1D)
- Cancer
- Cognitive Impairment/ Dementia
- Fatty Liver Disease
- Pancreatitis
- Fractures
- Hearing Impairment
- HIV
- Low Testosterone (Men)
- Obstructive Sleep Apnea
- Periodontal Disease
- Psychosocial/Emotional Disorders

Autoimmune Diseases.

4.12 Consider screening patients with type 1 diabetes for autoimmune thyroid disease and celiac disease soon after diagnosis. **B**

Cognitive Impairment/Dementia.

4.13 In people with a history of cognitive impairment/dementia, intensive glucose control cannot be expected to remediate deficits. Treatment should be tailored to avoid significant hypoglycemia. **B**

Nonalcoholic Fatty Liver Disease.

4.14 Patients with type 2 diabetes or prediabetes and elevated liver enzymes (alanine aminotransferase) or fatty liver on ultrasound should be evaluated for presence of nonalcoholic steatohepatitis and liver fibrosis. C

Pancreatitis.

4.15 Islet autotransplantation should be considered for patients requiring total pancreatectomy for medically refractory chronic pancreatitis to prevent postsurgical diabetes. C

HIV.

4.16 Patients with HIV should be screened for diabetes and prediabetes with a fasting glucose test before starting antiretroviral therapy, at the time of switching antiretroviral therapy, and 3-6 months after starting or switching antiretroviral therapy. If initial screening results are normal, checking fasting glucose every year is advised. **E**

Low Testosterone in Men.

4.17 In men with diabetes who have symptoms or signs of hypogonadism, such as decreased sexual desire (libido) or activity, or erectile dysfunction, consider screening with a morning serum testosterone level. **B**

Anxiety Disorders.

- 4.18** Consider screening for anxiety in people exhibiting anxiety or worries regarding diabetes complications, insulin injections or infusion, taking medications, and/or hypoglycemia that interfere with self-management behaviors and those who express fear, dread, or irrational thoughts and/or show anxiety symptoms such as avoidance behaviors, excessive repetitive behaviors, or social withdrawal. Refer for treatment if anxiety is present. **B**
- 4.19** People with hypoglycemia unawareness, which can co-occur with fear of hypoglycemia, should be treated using blood glucose awareness training (or other evidence-based intervention) to help reestablish awareness of hypoglycemia and reduce fear of hypoglycemia. **A**

Depression.

- 4.20 Providers should consider annual screening of all patients with diabetes, especially those with a self-reported history of depression, for depressive symptoms with age-appropriate depression screening measures, recognizing that further evaluation will be necessary for individuals who have a positive screen. **B**
- 4.21 Beginning at diagnosis of complications or when there are significant changes in medical status, consider assessment for depression. **B**
- 4.22 Referrals for treatment of depression should be made to mental health providers with experience using cognitive behavioral therapy, interpersonal therapy, or other evidence-based treatment approaches in conjunction with collaborative care with the patient's diabetes treatment team. **A**

Disordered Eating Behavior.

- 4.23** Providers should consider reevaluating the treatment regimen of people with diabetes who present with symptoms of disordered eating behavior, an eating disorder, or disrupted patterns of eating. **B**
- 4.24** Consider screening for disordered or disrupted eating using validated screening measures when hyperglycemia and weight loss are unexplained based on self-reported behaviors related to medication dosing, meal plan, and physical activity. In addition, a review of the medical regimen is recommended to identify potential treatment-related effects on hunger/caloric intake **B**

Serious Mental Illness.

- 4.25 Annually screen people who are prescribed atypical antipsychotic medications for prediabetes or diabetes. **B**
- 4.26 If a second-generation antipsychotic medication is prescribed for adolescents or adults with diabetes, changes in weight, glycemic control, and cholesterol levels should be carefully monitored and the treatment regimen should be reassessed. **C**
- 4.27 Incorporate monitoring of diabetes self-care activities into treatment goals in people with diabetes and serious mental illness. **B**

Section 5.

Lifestyle Management

Diabetes Self-Management Education and Support (1).

- 5.1** In accordance with the national standards for diabetes self-management education and support, all people with diabetes should participate in diabetes self-management education to facilitate the knowledge, skills, and ability necessary for diabetes self-care. Diabetes self-management support is additionally recommended to assist with implementing and sustaining skills and behaviors needed for ongoing self-management. **B**
- 5.2** There are four critical times to evaluate the need for diabetes self-management education and support: at diagnosis, annually, when complicating factors arise, and when transitions in care occur. **E**

Diabetes Self-Management Education and Support (2).

- 5.3 Clinical outcomes, health status, and quality of life are key goals of diabetes self-management education and support that should be measured as part of routine care. **C**
- 5.4 Diabetes self-management education and support should be patient centered, may be given in group or individual settings or using technology, and should be communicated with the entire diabetes care team. **A**
- 5.5 Because diabetes self-management education and support can improve outcomes and reduce costs **B**, adequate reimbursement by third-party payers is recommended. **E**

Diabetes Self-Management Education and Support: Delivery.

Four critical time points for DSMES delivery:

1. At diagnosis;
2. Annually for assessment of education, nutrition, and emotional needs;
3. When new complicating factors (health conditions, physical limitations, emotional factors, or basic living needs) arise that influence self-management; and
4. When transitions in care occur.

Goals of Nutrition Therapy for Adults with Diabetes.

1. To promote and support healthful eating patterns, emphasizing a variety of nutrient-dense foods in appropriate portion sizes, to improve overall health and:
 - Achieve and maintain body weight goals
 - Attain individualized glycemic, blood pressure, and lipid goals
 - Delay or prevent the complications of diabetes
2. To address individual nutrition needs based on personal and cultural preferences, health literacy and numeracy, access to healthful foods, willingness and ability to make behavioral changes, and barriers to change
3. To maintain the pleasure of eating by providing nonjudgmental messages about food choices
4. To provide an individual with diabetes the practical tools for developing healthy eating patterns rather than focusing on individual macronutrients, micronutrients, or single foods

MNT: Effectiveness of Nutrition Therapy.

- 5.6** An individualized medical nutrition therapy program as needed to achieve treatment goals, preferably provided by a registered dietitian, is recommended for all people with type 1 or type 2 diabetes, prediabetes, and gestational diabetes mellitus. **A**
- 5.7** A simple and effective approach to glycemia and weight management emphasizing portion control and healthy food choices may be considered for those with type 2 diabetes who are not taking insulin, who have limited health literacy or numeracy, or who are older and prone to hypoglycemia. **B**
- 5.8** Because diabetes nutrition therapy can result in cost savings **B** and improved outcomes (e.g., A1C reduction) **A**, medical nutrition therapy should be adequately reimbursed by insurance and other payers. **E**

MNT: Energy Balance.

5.9 Weight loss (>5%) achievable by the combination of reduction of calorie intake and lifestyle modification benefits overweight or obese adults with type 2 diabetes and also those with prediabetes. Intervention programs to facilitate weight loss are recommended. **A**

MNT: Eating Patterns and Macronutrient Distribution.

- 5.10** There is no single ideal dietary distribution of calories among carbohydrates, fats, and proteins for people with diabetes; therefore, meal plans should be individualized while keeping total calorie and metabolic goals in mind. **E**
- 5.11** A variety of eating patterns are acceptable for the management of type 2 diabetes and prediabetes. **B**

MNT: Carbohydrates (1).

- 5.12** Carbohydrate intake should emphasize nutrient-dense carbohydrate sources that are high in fiber, including vegetables, fruits, legumes, whole grains, as well as dairy products. **B**
- 5.13** For people with type 1 diabetes and those with type 2 diabetes who are prescribed a flexible insulin therapy program, education on how to use carbohydrate counting **A** and in some cases how to consider fat and protein content **B** to determine mealtime insulin dosing is recommended to improve glycemic control.

MNT: Carbohydrates (2).

- 5.14** For individuals whose daily insulin dosing is fixed, a consistent pattern of carbohydrate intake with respect to time and amount may be recommended to improve glycemic control and reduce the risk of hypoglycemia. **B**
- 5.15** People with diabetes and those at risk are advised to avoid sugar-sweetened beverages (including fruit juices) in order to control glycemia and weight and reduce their risk for cardiovascular disease and fatty liver **B** and should minimize the consumption of foods with added sugar that have the capacity to displace healthier, more nutrient-dense food choices. **A**

MNT: Protein.

5.16 In individuals with type 2 diabetes, ingested protein appears to increase insulin response without increasing plasma glucose concentrations. Therefore, carbohydrate sources high in protein should be avoided when trying to treat or prevent hypoglycemia. **B**

MNT: Dietary Fat.

- 5.17** Data on the ideal total dietary fat content for people with diabetes are inconclusive, so an eating plan emphasizing elements of a Mediterranean-style diet rich in monounsaturated and polyunsaturated fats may be considered to improve glucose metabolism and lower cardiovascular disease risk and can be an effective alternative to a diet low in total fat but relatively high in carbohydrates. **B**
- 5.18** Eating foods rich in long-chain n-3 fatty acids, such as fatty fish (EPA and DHA) and nuts and seeds (ALA), is recommended to prevent or treat cardiovascular disease **B**; however, evidence does not support a beneficial role for the routine use of n-3 dietary supplements. **A**

MNT: Micronutrient and Herbal Supplements.

5.19 There is no clear evidence that dietary supplementation with vitamins, minerals (such as chromium and vitamin D), herbs, or spices (such as cinnamon or aloe vera) can improve outcomes in people with diabetes who do not have underlying deficiencies and they are not generally recommended for glycemic control. **C**

MNT: Alcohol.

- 5.20** Adults with diabetes who drink alcohol should do so in moderation (no more than one drink per day for adult women and no more than two drinks per day for adult men). **C**
- 5.21** Alcohol consumption may place people with diabetes at increased risk for hypoglycemia, especially if taking insulin or insulin secretagogues. Education and awareness regarding the recognition and management of delayed hypoglycemia are warranted. **B**

MNT: Sodium.

5.22 As for the general population, people with diabetes should limit sodium consumption to <2,300 mg/day. **B**

MNT: Nonnutritive Sweeteners.

5.23 The use of nonnutritive sweeteners may have the potential to reduce overall calorie and carbohydrate intake if substituted for caloric (sugar) sweeteners and without compensation by intake of additional calories from other food sources. For those who consume sugar-sweetened beverages regularly, a low-calorie or nonnutritive-sweetened beverage may serve as a short-term replacement strategy, but overall, people are encouraged to decrease both sweetened and nonnutritive sweetened beverages and use other alternatives, with an emphasis on water intake. **B**

Physical Activity (1).

- 5.24** Children and adolescents with type 1 or type 2 diabetes or prediabetes should engage in 60 min/day or more of moderate- or vigorous-intensity aerobic activity, with vigorous muscle-strengthening and bone-strengthening activities at least 3 days/week. **C**
- 5.25** Most adults with type 1 **C** and type 2 **B** diabetes should engage in 150 min or more of moderate-to-vigorous intensity aerobic activity per week, spread over at least 3 days/week, with no more than 2 consecutive days without activity. Shorter durations (minimum 75 min/week) of vigorous intensity or interval training may be sufficient for younger and more physically fit individuals.
- 5.26** Adults with type 1 **C** and type 2 **B** diabetes should engage in 2-3 sessions/week of resistance exercise on nonconsecutive days.

Physical Activity (2).

- 5.27** All adults, and particularly those with type 2 diabetes, should decrease the amount of time spent in daily sedentary behavior. **B** Prolonged sitting should be interrupted every 30 min for blood glucose benefits, particularly in adults with type 2 diabetes. **C**
- 5.28** Flexibility training and balance training are recommended 2-3 times/week for older adults with diabetes. Yoga and tai chi may be included based on individual preferences to increase flexibility, muscular strength, and balance. **C**

Smoking Cessation: Tobacco and E-Cigarettes.

- 5.29 Advise all patients not to use cigarettes and other tobacco products **A** or e-cigarettes. **B**
- 5.30 Include smoking cessation counseling and other forms of treatment as a routine component of diabetes care. **A**

Psychosocial Issues (1).

- 5.31** Psychosocial care should be integrated with a collaborative, patient-centered approach and provided to all people with diabetes, with the goals of optimizing health outcomes and health-related quality of life. **A**
- 5.32** Psychosocial screening and follow-up may include, but are not limited to, attitudes about diabetes, expectations for medical management and outcomes, affect or mood, general and diabetes-related quality of life, available resources (financial, social, and emotional), and psychiatric history. **E**

Psychosocial Issues (2).

- 5.33** Providers should consider assessment for symptoms of diabetes distress, depression, anxiety, disordered eating, and cognitive capacities using patient-appropriate standardized and validated tools at the initial visit, at periodic intervals, and when there is a change in disease, treatment, or life circumstance. Including caregivers and family members in the assessment is recommended. **B**
- 5.34** Consider screening older adults (aged ≥ 65 years) with diabetes for cognitive impairment and depression. **B**

Diabetes Distress.

5.35 Routinely monitor people with diabetes for diabetes distress, particularly when treatment targets are not met and/or at the onset of diabetes complications. **B**

Table 5.2—Situations that warrant referral of a person with diabetes to a mental health provider for evaluation and treatment

- If self-care remains impaired in a person with diabetes distress after tailored diabetes education
- If a person has a positive screen on a validated screening tool for depressive symptoms
- In the presence of symptoms or suspicions of disordered eating behavior, an eating disorder, or disrupted patterns of eating
- If intentional omission of insulin or oral medication to cause weight loss is identified
- If a person has a positive screen for anxiety or fear of hypoglycemia
- If a serious mental illness is suspected
- In youth and families with behavioral self-care difficulties, repeated hospitalizations for diabetic ketoacidosis, or significant distress
- If a person screens positive for cognitive impairment
- Declining or impaired ability to perform diabetes self-care behaviors
- Before undergoing bariatric or metabolic surgery and after surgery if assessment reveals an ongoing need for adjustment support

Section 6.

Glycemic Targets

A1C Testing.

- 6.1 Perform the A1C test *at least* two times a year in patients who are meeting treatment goals (and who have stable glycemic control). E
- 6.2 Perform the A1C test quarterly in patients whose therapy has changed or who are not meeting glycemic goals. E
- 6.3 Point-of-care testing for A1C provides the opportunity for more timely treatment changes. E

Table 6.1—Mean glucose levels for specified A1C levels (6,7)

A1C % (mmol/mol)	Mean plasma glucose*		Mean fasting glucose		Mean premeal glucose		Mean postmeal glucose		Mean bedtime glucose	
	mg/dL	mmol/L	mg/dL	mmol/L	mg/dL	mmol/L	mg/dL	mmol/L	mg/dL	mmol/L
6 (42)	126 (100–152)	7.0 (5.5–8.5)								
5.5–6.49 (37–47)			122 (117–127)	6.8 (6.5–7.0)	118 (115–121)	6.5 (6.4–6.7)	144 (139–148)	8.0 (7.7–8.2)	136 (131–141)	7.5 (7.3–7.8)
6.5–6.99 (47–53)			142 (135–150)	7.9 (7.5–8.3)	139 (134–144)	7.7 (7.4–8.0)	164 (159–169)	9.1 (8.8–9.4)	153 (145–161)	8.5 (8.0–8.9)
7 (53)	154 (123–185)	8.6 (6.8–10.3)								
7.0–7.49 (53–58)			152 (143–162)	8.4 (7.9–9.0)	152 (147–157)	8.4 (8.2–8.7)	176 (170–183)	9.8 (9.4–10.2)	177 (166–188)	9.8 (9.2–10.4)
7.5–7.99 (58–64)			167 (157–177)	9.3 (8.7–9.8)	155 (148–161)	8.6 (8.2–8.9)	189 (180–197)	10.5 (10.0–10.9)	175 (163–188)	9.7 (9.0–10.4)
8 (64)	183 (147–217)	10.2 (8.1–12.1)								
8.0–8.5 (64–69)			178 (164–192)	9.9 (9.1–10.7)	179 (167–191)	9.9 (9.3–10.6)	206 (195–217)	11.4 (10.8–12.0)	222 (197–248)	12.3 (10.9–13.8)
9 (75)	212 (170–249)	11.8 (9.4–13.9)								
10 (86)	240 (193–282)	13.4 (10.7–15.7)								
11 (97)	269 (217–314)	14.9 (12.0–17.5)								
12 (108)	298 (240–347)	16.5 (13.3–19.3)								

Data in parentheses represent 95% CI, unless otherwise noted. A calculator for converting A1C results into eAG, in either mg/dL or mmol/L, is available at <http://professional.diabetes.org/eAG>. *These estimates are based on ADAG data of ~2,700 glucose measurements over 3 months per A1C measurement in 507 adults with type 1, type 2, and no diabetes. The correlation between A1C and average glucose was 0.92 (6).

A1C Goals (1).

- 6.4 A reasonable A1C goal for many nonpregnant adults is <7% (53 mmol/mol). **A**
- 6.5 Providers might reasonably suggest more stringent A1C goals (such as <6.5% [48 mmol/mol]) for selected individual patients if this can be achieved without significant hypoglycemia or other adverse effects of treatment (i.e., polypharmacy). Appropriate patients might include those with short duration of diabetes, type 2 diabetes treated with lifestyle or metformin only, long life expectancy, or no significant cardiovascular disease. **C**

Table 6.2—Summary of glycemic recommendations for many nonpregnant adults with diabetes

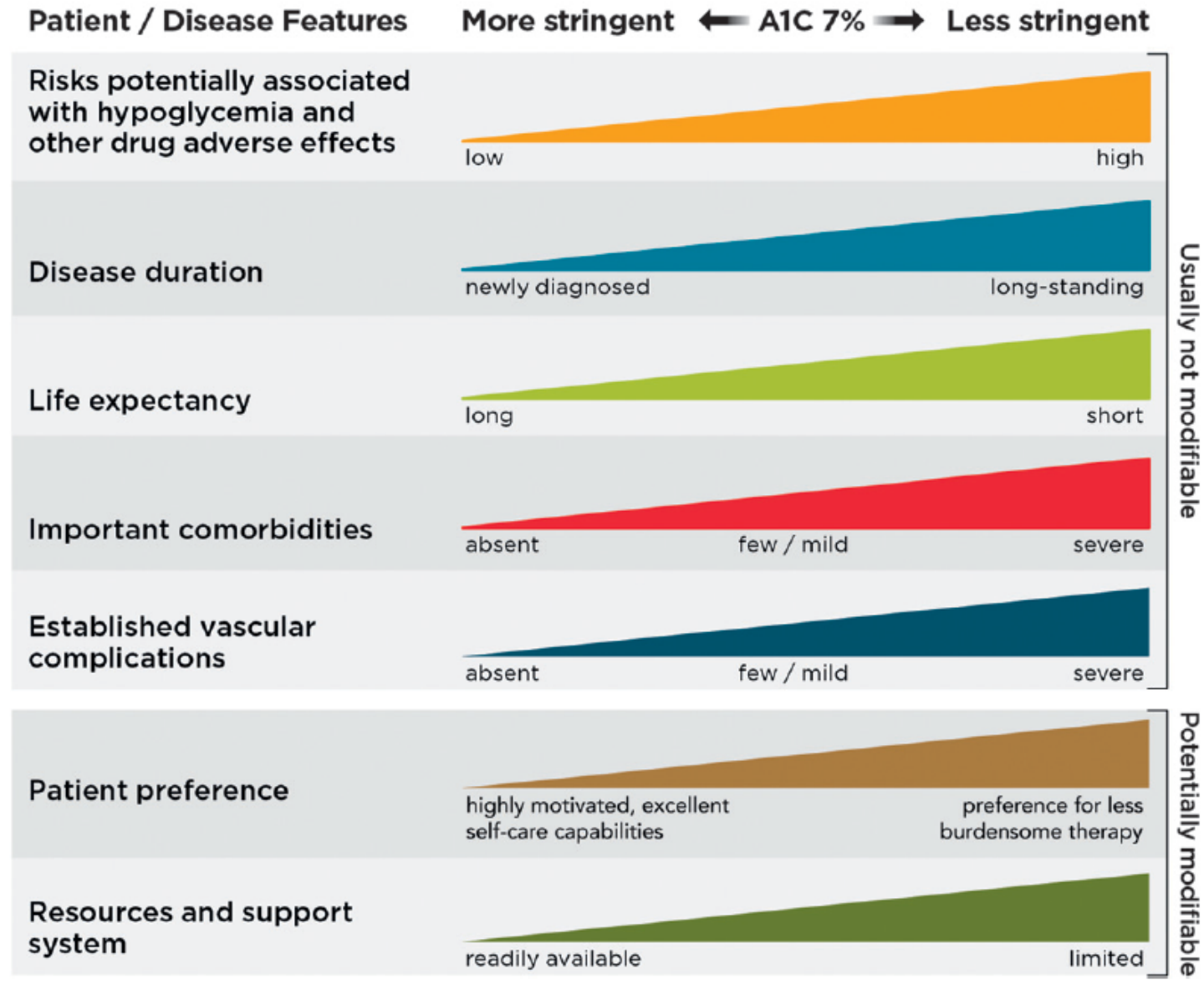
A1C	<7.0% (53 mmol/mol)*
Preprandial capillary plasma glucose	80–130 mg/dL* (4.4–7.2 mmol/L)
Peak postprandial capillary plasma glucose†	<180 mg/dL* (10.0 mmol/L)

*More or less stringent glycemic goals may be appropriate for individual patients. Goals should be individualized based on duration of diabetes, age/life expectancy, comorbid conditions, known CVD or advanced microvascular complications, hypoglycemia unawareness, and individual patient considerations. †Postprandial glucose may be targeted if A1C goals are not met despite reaching preprandial glucose goals. Postprandial glucose measurements should be made 1–2 h after the beginning of the meal, generally peak levels in patients with diabetes.

A1C Goals (2).

- 6.6** Less stringent A1C goals (such as $<8\%$ [64 mmol/mol]) may be appropriate for patients with a history of severe hypoglycemia, limited life expectancy, advanced microvascular or macrovascular complications, extensive comorbid conditions, or long-standing diabetes in whom the goal is difficult to achieve despite diabetes self-management education, appropriate glucose monitoring, and effective doses of multiple glucose-lowering agents including insulin. **B**
- 6.7** Reassess glycemic targets over time based on the criteria in **Fig. 6.1** or, in older adults, **Table 12.1**. **E**

Approach to Individualization of Glycemic Targets



Hypoglycemia (1).

- 6.8 Individuals at risk for hypoglycemia should be asked about symptomatic and asymptomatic hypoglycemia at each encounter. C
- 6.9 Glucose (15-20 g) is the preferred treatment for the conscious individual with blood glucose <70 mg/dL (3.9 mmol/L), although any form of carbohydrate that contains glucose may be used. Fifteen minutes after treatment, if SMBG shows continued hypoglycemia, the treatment should be repeated. Once SMBG returns to normal, the individual should consume a meal or snack to prevent recurrence of hypoglycemia. E

Table 6.3—Classification of hypoglycemia (44)

Level	Glycemic criteria/description
Level 1	Glucose <70 mg/dL (3.9 mmol/L) and glucose \geq 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

Hypoglycemia (2).

- 6.10** Glucagon should be prescribed for all individuals at increased risk of level 2 hypoglycemia, defined as blood glucose <54 mg/dL (3.0 mmol/L), so it is available should it be needed. Caregivers, school personnel, or family members of these individuals should know where it is and when and how to administer it. Glucagon administration is not limited to health care professionals. **E**
- 6.11** Hypoglycemia unawareness or one or more episodes of level 3 hypoglycemia should trigger reevaluation of the treatment regimen. **E**

Hypoglycemia (3).

- 6.12** Insulin-treated patients with hypoglycemia unawareness or an episode of level 2 hypoglycemia should be advised to raise their glycemic targets to strictly avoid hypoglycemia for at least several weeks in order to partially reverse hypoglycemia unawareness and reduce risk of future episodes. **A**
- 6.13** Ongoing assessment of cognitive function is suggested with increased vigilance for hypoglycemia by the clinician, patient, and caregivers if low cognition or declining cognition is found. **B**

Section 7.

Diabetes Technology

Insulin Syringes and Pens.

- 7.1 For people with diabetes who require insulin, insulin syringes or insulin pens may be used for insulin delivery with consideration of patient preference, insulin type and dosing regimen, cost, and self-management capabilities. **B**
- 7.2 Insulin pens or insulin injection aids may be considered for patients with dexterity issues or vision impairment to facilitate the administration of accurate insulin doses. **C**

Insulin Pumps.

- 7.3 Individuals with diabetes who have been successfully using continuous subcutaneous insulin infusion should have continued access across third-party payers. **E**
- 7.4 Most adults, children, and adolescents with type 1 diabetes should be treated with intensive insulin therapy with either multiple daily injections or an insulin pump. **A**
- 7.5 Insulin pump therapy may be considered as an option for all children and adolescents, especially in children under 7 years of age. **C**

Self-Monitoring of Blood Glucose (1).

- 7.6** Most patients using intensive insulin regimens (multiple daily injections or insulin pump therapy) should assess glucose levels using self-monitoring of blood glucose (or continuous glucose monitoring) prior to meals and snacks, at bedtime, occasionally postprandially, prior to exercise, when they suspect low blood glucose, after treating low blood glucose until they are normoglycemic, and prior to critical tasks such as driving. **B**
- 7.7** When prescribed as part of a broad educational program, self-monitoring of blood glucose may help to guide treatment decisions and/or self-management for patients taking less frequent insulin injections. **B**

Self-Monitoring of Blood Glucose (2).

7.8 When prescribing self-monitoring of blood glucose, ensure the patients receive ongoing instruction and regular evaluation of technique, results, and their ability to use data from self-monitoring of blood glucose to adjust therapy. Similarly, continuous glucose monitoring use requires robust and ongoing diabetes education, training, and support. **E**

Glucose Meter Accuracy.

7.9 Health care providers should be aware of the medications and other factors that can interfere with glucose meter accuracy and choose appropriate devices for their patients based on these factors. **E**

Table 7.1—Comparison of ISO 15197 and FDA blood glucose meter accuracy standards

Setting	FDA ^{125,126}	ISO 15197-2013 ¹²⁷
Home use	95% within 15% for all BG in the usable BG range† 99% within 20% for all BG in the usable BG range†	95% within 15% for BG ≥ 100 mg/dL 95% within 15 mg/dL for BG <100 mg/dL 99% in A or B region of Consensus Error Grid‡
Hospital use	95% within 12% for BG ≥ 75 mg/dL 95% within 12 mg/dL for BG <75 mg/dL 98% within 15% for BG ≥ 75 mg/dL 98% within 15 mg/dL for BG <75 mg/dL	

BG, blood glucose. To convert mg/dL to mmol/L, see <http://www.endmemo.com/medical/unitconvert/Glucose.php>. †The range of BG values for which the meter has been proven accurate and will provide readings (other than low, high, or error). ‡Values outside of the “clinically acceptable” A and B regions are considered “outlier” readings and may be dangerous to use for therapeutic decisions¹²⁸.

Table 7.2—Interfering substances

Glucose oxidase monitors

Uric acid

Galactose

Xylose

Acetaminophen

L-dopa

Ascorbic acid

Glucose dehydrogenase monitors

Icodextrin (used in peritoneal dialysis)

Continuous Glucose Monitors.

- 7.10 Sensor-augmented pump therapy may be considered for children, adolescents, and adults to improve glycemic control without an increase in hypoglycemia or severe hypoglycemia. Benefits correlate with adherence to ongoing use of the device. **A**
- 7.11 When prescribing continuous glucose monitoring, robust diabetes education, training, and support are required for optimal continuous glucose monitor implementation and ongoing use. **E**
- 7.12 People who have been successfully using continuous glucose monitors should have continued access across third-party payers. **E**

Real-Time Continuous Glucose Monitor Use in Youth.

7.13 Real-time continuous glucose monitoring should be considered in children and adolescents with type 1 diabetes, whether using multiple daily injections or continuous subcutaneous insulin infusion, as an additional tool to help improve glucose control and reduce the risk of hypoglycemia. Benefits of continuous glucose monitoring correlate with adherence to ongoing use of the device. **B**

Real-Time Continuous Glucose Monitor Use in Adults (1).

- 7.14** When used properly, real-time continuous glucose monitoring in conjunction with intensive insulin regimens is a useful tool to lower A1C in adults with type 1 diabetes who are not meeting glycemic targets. **A**
- 7.15** Real-time continuous glucose monitoring may be a useful tool in those with hypoglycemia unawareness and/or frequent hypoglycemic episodes. **B**
- 7.16** Real-time continuous glucose monitoring should be used as close to daily as possible for maximal benefit. **A**

Real-Time Continuous Glucose Monitor Use in Adults (2).

- 7.17** Real-time continuous glucose monitoring may be used effectively to improve A1C levels and neonatal outcomes in pregnant women with type 1 diabetes. **B**
- 7.18** Sensor-augmented pump therapy with automatic low-glucose suspend may be considered for adults with type 1 diabetes at high risk of hypoglycemia to prevent episodes of hypoglycemia and reduce their severity. **B**

Intermittently Scanned Continuous Glucose Monitor Use.

7.19 Intermittently scanned continuous glucose monitor use may be considered as a substitute for self-monitoring of blood glucose in adults with diabetes requiring frequent glucose testing. **C**

Automated Insulin Delivery.

7.20 Automated insulin delivery systems may be considered in children (>7 years) and adults with type 1 diabetes to improve glycemic control. **B**

Section 8.

Obesity Management for the Treatment of Type 2 Diabetes

Assessment.

8.1 At each patient encounter, BMI should be calculated and documented in the medical record. **B**

Overweight/Obese Treatment Options.

Treatment	Body Mass Index (BMI) Category (kg/m ²)				
	25.0-26.9 (or 23.0-26.9*)	27.0-29.9	30.0-34.9 (or 27.5-32.4*)	35.0-39.9 (or 32.5-37.4*)	≥40 (or ≥37.5*)
Diet, physical activity & behavioral therapy	+	+	+	+	+
Pharmacotherapy		+	+	+	+
Metabolic surgery			+	+	+

* Cutoff points for Asian-American individuals.

+ Treatment may be indicated for selected, motivated patients.

Diet, Physical Activity, and Behavioral Therapy (1).

- 8.2 Diet, physical activity, and behavioral therapy designed to achieve and maintain >5% weight loss should be prescribed for patients with type 2 diabetes who are overweight or obese and ready to achieve weight loss. **A**
- 8.3 Such interventions should be high intensity (≥ 16 sessions in 6 months) and focus on diet, physical activity, and behavioral strategies to achieve a 500-750 kcal/day energy deficit. **A**
- 8.4 Diets should be individualized, as those that provide the same caloric restriction but differ in protein, carbohydrate, and fat content are equally effective in achieving weight loss. **A**

Diet, Physical Activity, and Behavioral Therapy (2).

- 8.5** For patients who achieve short-term weight-loss goals, long-term (≥ 1 year) comprehensive weight-maintenance programs should be prescribed. Such programs should provide at least monthly contact and encourage ongoing monitoring of body weight (weekly or more frequently) and/or other self-monitoring strategies, such as tracking intake, steps, etc.; continued consumption of a reduced-calorie diet; and participation in high levels of physical activity (200-300 min/week). **A**
- 8.6** To achieve weight loss of $>5\%$, short-term (3-month) interventions that use very low-calorie diets (≤ 800 kcal/day) and total meal replacements may be prescribed for carefully selected patients by trained practitioners in medical care setting with close medical monitoring. To maintain weight loss, such programs must incorporate long-term comprehensive weight-maintenance counseling. **B**

Pharmacotherapy (1).

- 8.7 When choosing glucose-lowering medications for overweight or obese patients with type 2 diabetes, consider their effect on weight. **E**
- 8.8 Whenever possible, minimize medications for comorbid conditions that are associated with weight gain. **E**
- 8.9 Weight-loss medications are effective as adjuncts to diet, physical activity, and behavioral counseling for selected patients with type 2 diabetes and BMI ≥ 27 kg/m². Potential benefits must be weighed against the potential risks of the medications. **A**

Pharmacotherapy (2).

8.10 If a patient's response to weight-loss medications is <5% weight loss after 3 months or if there are significant safety or tolerability issues at any time, the medication should be discontinued and alternative medications or treatment approaches should be considered. **A**

Table 8.2—Medications approved by the FDA for the treatment of obesity

Medication name	Typical adult maintenance dose	Average wholesale price (30-day supply) (100)	National Average Drug Acquisition Cost (30-day supply) (101)	1-Year (52- or 56-week) mean weight loss (% loss from baseline)		Common side effects (102–107)	Possible safety concerns/considerations (102–107)
				Treatment arm	Weight loss (% loss from baseline)		
Short-term treatment (≤12 weeks)							
Phentermine (108)	8–37.5 mg q.d.*	\$5–\$56 (37.5 mg dose)	\$4 (37.5 mg dose)	15 mg q.d.† 7.5 mg q.d.† PBO	6.1 5.5 1.7	Dry mouth, insomnia, dizziness, irritability	<ul style="list-style-type: none">• Risk of severe hypertension• Contraindicated for use in combination with monoamine oxidase inhibitors
Long-term treatment (>12 weeks)							
Lipase inhibitor							
Orlistat (3)	60 mg t.i.d. (OTC)	\$41–\$82	\$42	120 mg t.i.d.‡	9.6	Abdominal pain, flatulence, fecal urgency, back pain, headache	<ul style="list-style-type: none">• Potential malabsorption of fat-soluble vitamins (A, D, E, K) and of certain medications (e.g., cyclosporine, thyroid hormone, anticonvulsants, etc.)• Rare cases of severe liver injury reported• Cholelithiasis• Nephrolithiasis
	120 mg t.i.d. (Rx)	\$748	\$556	PBO	5.6		
Selective serotonin (5-HT) 5-HT _{2C} receptor agonist							
Lorcaserin (14)	10 mg b.i.d.	\$318	\$255	10 mg b.i.d.	4.5	Headache, nausea, dizziness, fatigue, nasopharyngitis	<ul style="list-style-type: none">• Serotonin syndrome– and neuroleptic malignant syndrome–like reactions theoretically possible when coadministered with other serotonergic or antidopaminergic agents• Monitor for depression or suicidal thoughts• Worsening hypertension• Avoid in liver and renal failure
Lorcaserin XR	20 mg q.d.	\$318	\$254	PBO	1.5		

Medication name	Typical adult maintenance dose	Average wholesale price (30-day supply) (100)	National Average Drug Acquisition Cost (30-day supply) (101)	1-Year (52- or 56-week) mean weight loss (% loss from baseline)		Common side effects (102–107)	Possible safety concerns/considerations (102–107)
				Treatment arm	Weight loss (% loss from baseline)		
Sympathomimetic amine anorectic/antiepileptic combination							
Phentermine/topiramate ER (109)	7.5 mg/46 mg q.d.§	\$223 (7.5 mg/46 mg dose)	\$178 (7.5 mg/46 mg dose)	15 mg/92 mg q.d.	9.8	Constipation, paresthesia, insomnia, nasopharyngitis, xerostomia	<ul style="list-style-type: none">• Birth defects• Cognitive impairment• Acute angle-closure glaucoma
				7.5 mg/46 mg q.d.	7.8		
				PBO	1.2		
Opioid antagonist/antidepressant combination							
Naltrexone/bupropion ER (15)	8 mg/90 mg, 2 tablets b.i.d.	\$334	\$267	16 mg/180 mg b.i.d.	5.0	Constipation, nausea, headache, xerostomia, insomnia	<ul style="list-style-type: none">• Contraindicated in patients with uncontrolled hypertension and/or seizure disorders• Contraindicated for use with chronic opioid therapy• Acute angle-closure glaucoma• Black box warning:<ul style="list-style-type: none">• Risk of suicidal behavior/ideation
				PBO	1.8		
Glucagon-like peptide 1 receptor agonist							
Liraglutide (16)	3 mg q.d.	\$1,441	\$1,154	3.0 mg q.d.	6.0	Hypoglycemia, constipation, nausea, headache, indigestion	<ul style="list-style-type: none">• ?Acute pancreatitis• Black box warning:<ul style="list-style-type: none">• Risk of thyroid C-cell tumors• Contraindicated with personal or family history of MTC or MEN 2
				1.8 mg q.d.	4.7		
				PBO	2.0		

All medications are contraindicated in women who are or may become pregnant. Women of reproductive potential must be counseled regarding the use of reliable methods of contraception. 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; MEN 2, multiple endocrine neoplasia syndrome type 2; MTC, medullary thyroid carcinoma; OTC, over the counter; PBO, placebo; q.d., daily; Rx, prescription; t.i.d, three times daily; XR, extended release. *Use lowest effective dose; maximum appropriate dose is 37.5 mg. †Duration of treatment was 28 weeks in a general obese adult population. ‡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.

Metabolic Surgery (1).

- 8.11** Metabolic surgery should be recommended as an option to treat type 2 diabetes in appropriate surgical candidates with BMI ≥ 40 kg/m² (BMI ≥ 37.5 kg/m² in Asian Americans) and in adults with BMI 35.0-39.9 kg/m² (32.5-37.4 kg/m² in Asian Americans) who do not achieve durable weight loss and improvement in comorbidities (including hyperglycemia) with reasonable nonsurgical methods. **A**
- 8.12** Metabolic surgery may be considered as an option for adults with type 2 diabetes and BMI 30.0-34.9 kg/m² (27.5-32.4 kg/m² in Asian Americans) who do not achieve durable weight loss and improvement in comorbidities (including hyperglycemia) with reasonable nonsurgical methods. **A**

Metabolic Surgery (2).

- 8.13** Metabolic surgery should be performed in high-volume centers with multidisciplinary teams that understand and are experienced in the management of diabetes and gastrointestinal surgery. **C**
- 8.14** Long-term lifestyle support and routine monitoring of micronutrient and nutritional status must be provided to patients after surgery, according to guidelines for postoperative management of metabolic surgery by national and international professional societies. **C**

Metabolic Surgery (3).

8.15 People presenting for metabolic surgery should receive a comprehensive readiness and mental health assessment. **B**

8.16 People who undergo metabolic surgery should be evaluated to assess the need for ongoing mental health services to help them adjust to medical and psychosocial changes after surgery. **C**

Section 9.

Pharmacologic Approaches to Glycemic Treatment

Pharmacologic Therapy for Type 1 Diabetes.

- 9.1 Most people with type 1 diabetes should be treated with multiple daily injections of prandial and basal insulin, or continuous subcutaneous insulin infusion. **A**
- 9.2 Most individuals with type 1 diabetes should use rapid-acting insulin analogs to reduce hypoglycemia risk. **A**
- 9.3 Consider educating individuals with type 1 diabetes on matching prandial insulin doses to carbohydrate intake, premeal blood glucose levels, and anticipated physical activity. **E**
- 9.4 Individuals with type 1 diabetes who have been successfully using continuous subcutaneous insulin infusion should have continued access to this therapy after they turn 65 years of age. **E**

Insulin Injection Technique.

- Ensure patients and/or caregivers receive adequate education and understand correct insulin injection technique to optimize glucose control and safety
 - Inject into appropriate body areas (abdomen, thigh, buttock, upper arm)
 - Injection site rotation to avoid lipohypertrophy
 - Appropriate care of injection sites to avoid infection
 - Avoidance of intramuscular (IM) insulin delivery
- Use of short needles (e.g., 4-mm pen needles) as effective and well tolerated when compared to longer needles

Pharmacologic Therapy for Type 2 Diabetes.

- 9.5 Metformin is the preferred initial pharmacologic agent for the treatment of type 2 diabetes. **A**
- 9.6 Once initiated, metformin should be continued as long as it is tolerated and not contraindicated; other agents, including insulin, should be added to metformin. **A**
- 9.7 Long-term use of metformin may be associated with biochemical vitamin B12 deficiency, and periodic measurement of vitamin B12 levels should be considered in metformin-treated patients, especially in those with anemia or peripheral neuropathy. **B**

Pharmacologic Therapy for Type 2 Diabetes.

- 9.8 The early introduction of insulin should be considered if there is evidence of ongoing catabolism (weight loss), if symptoms of hyperglycemia are present, or when A1C levels ($>10\%$ [86 mmol/mol]) or blood glucose levels (≥ 300 mg/dL [16.7 mmol/L]) are very high. **E**
- 9.9 Consider initiating dual therapy in patients with newly diagnosed type 2 diabetes who have A1C $\geq 1.5\%$ (12.5 mmol/mol) above their glycemic target. **E**
- 9.10 A patient-centered approach should be used to guide the choice of pharmacologic agents. Considerations include comorbidities (atherosclerotic cardiovascular disease, heart failure, chronic kidney disease), hypoglycemia risk, impact on weight, cost, risk for side effects, and patient preferences. **E**

Pharmacologic Therapy for Type 2 Diabetes.

- 9.11** Among patients with type 2 diabetes who have established atherosclerotic cardiovascular disease, sodium-glucose cotransporter 2 inhibitors, or glucagon-like peptide 1 receptor agonists with demonstrated cardiovascular disease benefit (**Table 9.1**) are recommended as part of the antihyperglycemic regimen. **A**
- 9.12** Among patients with atherosclerotic cardiovascular disease at high risk of heart failure or in whom heart failure coexists, sodium-glucose cotransporter 2 inhibitors are preferred. **C**
- 9.13** For patients with type 2 diabetes and chronic kidney disease, consider use of a sodium-glucose cotransporter 2 inhibitor or glucagon-like peptide 1 receptor agonist shown to reduce risk of chronic kidney disease progression, cardiovascular events, or both. **C**

Pharmacologic Therapy for Type 2 Diabetes.

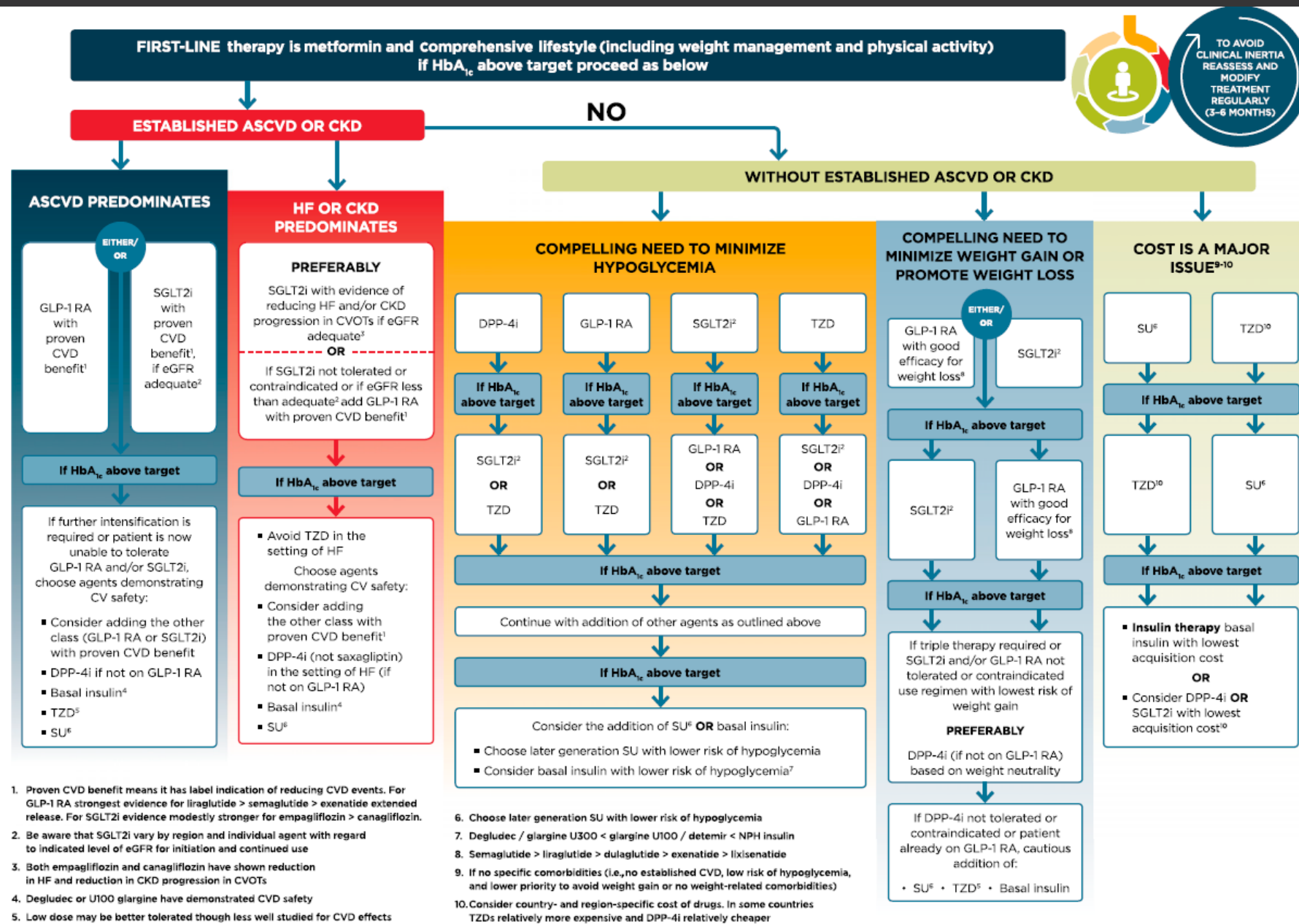
- 9.14 In most patients who need the greater glucose-lowering effect of an injectable medication, glucagon-like peptide 1 receptor agonists are preferred to insulin. **B**
- 9.15 Intensification of treatment for patients with type 2 diabetes not meeting treatment goals should not be delayed. **B**
- 9.16 The medication regimen should be reevaluated at regular intervals (every 3-6 months) and adjusted as needed to incorporate new patient factors (**Table 9.1**). **E**

Table 9.1—Drug-specific and patient factors to consider when selecting antihyperglycemic treatment in adults with type 2 diabetes

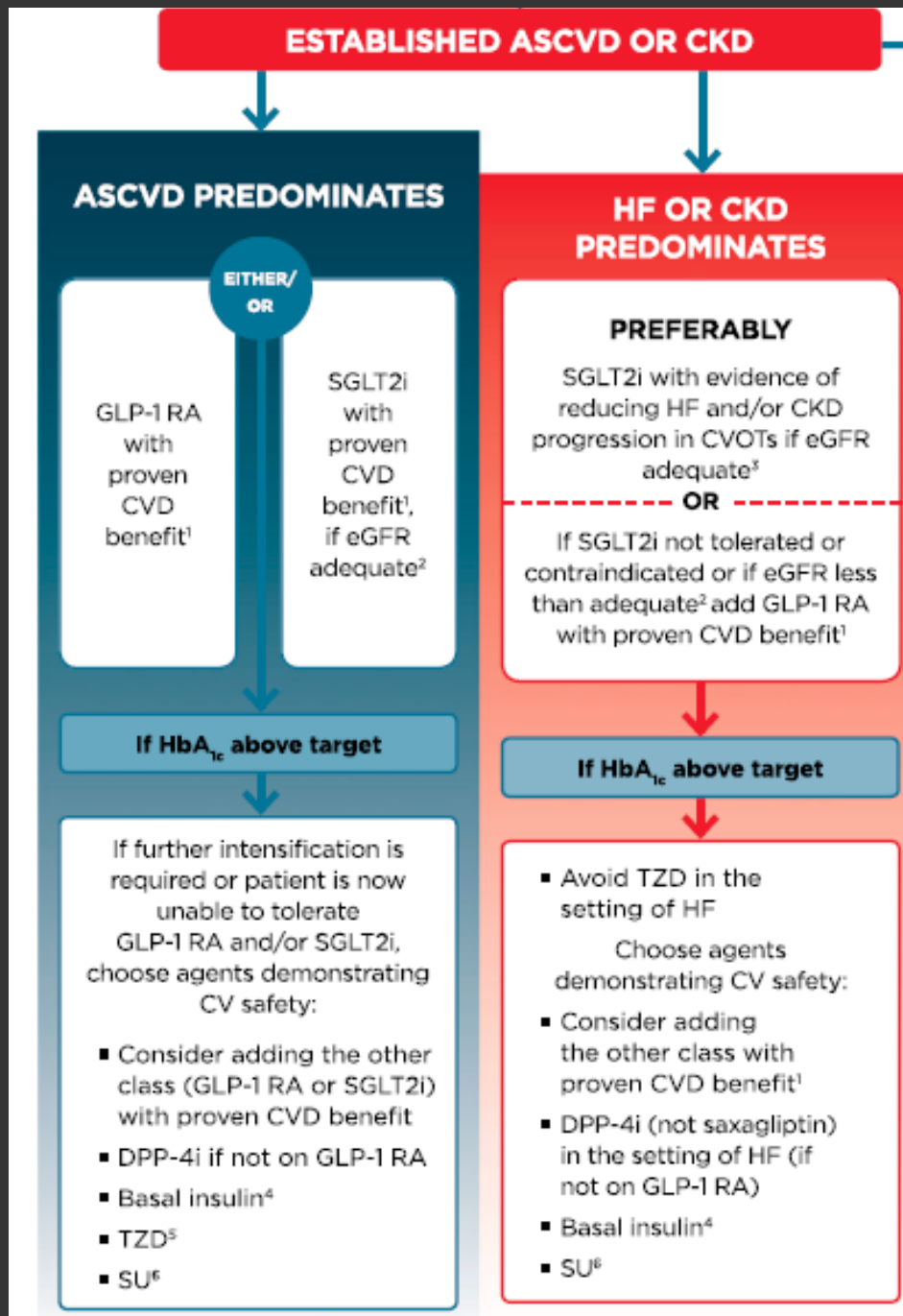
	Efficacy	Hypoglycemia	Weight change	CV effects		Cost	Oral/SQ	Renal effects		Additional considerations
				ASCVD	CHF			Progression of DKD	Dosing/use considerations*	
Metformin	High	No	Neutral (potential for modest loss)	Potential benefit	Neutral	Low	Oral	Neutral	<ul style="list-style-type: none"> Contraindicated with eGFR <30 	<ul style="list-style-type: none"> Gastrointestinal side effects common (diarrhea, nausea) Potential for B12 deficiency
SGLT-2 inhibitors	Intermediate	No	Loss	Benefit: empagliflozin†, canagliflozin	Benefit: empagliflozin†, canagliflozin	High	Oral	Benefit: canagliflozin, empagliflozin	<ul style="list-style-type: none"> Renal dose adjustment required (canagliflozin, dapagliflozin, empagliflozin, ertugliflozin) 	<ul style="list-style-type: none"> FDA Black Box: Risk of amputation (canagliflozin) Risk of bone fractures (canagliflozin) DKA risk (all agents, rare in T2DM) Genitourinary infections Risk of volume depletion, hypotension ↑ LDL cholesterol Risk of Fournier's gangrene
GLP-1 RAs	High	No	Loss	Neutral: lixisenatide Benefit: liraglutide† > semaglutide > exenatide extended release	Neutral	High	SQ	Benefit: liraglutide	<ul style="list-style-type: none"> Renal dose adjustment required (exenatide, lixisenatide) Caution when initiating or increasing dose due to potential risk of acute kidney injury 	<ul style="list-style-type: none"> FDA Black Box: Risk of thyroid C-cell tumors (liraglutide, albiglutide, dulaglutide, exenatide extended release) Gastrointestinal side effects common (nausea, vomiting, diarrhea) Injection site reactions ?Acute pancreatitis risk
DPP-4 inhibitors	Intermediate	No	Neutral	Neutral	Potential risk: saxagliptin, alogliptin	High	Oral	Neutral	<ul style="list-style-type: none"> Renal dose adjustment required (sitagliptin, saxagliptin, alogliptin); can be used in renal impairment No dose adjustment required for linagliptin 	<ul style="list-style-type: none"> Potential risk of acute pancreatitis Joint pain
Thiazolidinediones	High	No	Gain	Potential benefit: pioglitazone	Increased risk	Low	Oral	Neutral	<ul style="list-style-type: none"> No dose adjustment required Generally not recommended in renal impairment due to potential for fluid retention 	<ul style="list-style-type: none"> FDA Black Box: Congestive heart failure (pioglitazone, rosiglitazone) Fluid retention (edema; heart failure) Benefit in NASH Risk of bone fractures Bladder cancer (pioglitazone) ↑ LDL cholesterol (rosiglitazone)
Sulfonylureas (2nd generation)	High	Yes	Gain	Neutral	Neutral	Low	Oral	Neutral	<ul style="list-style-type: none"> Glyburide: not recommended Glipizide and glimepiride: initiate conservatively to avoid hypoglycemia 	<ul style="list-style-type: none"> FDA Special Warning on increased risk of cardiovascular mortality based on studies of an older sulfonylurea (tolbutamide)
Insulin	Human insulin	Yes	Gain	Neutral	Neutral	Low	SQ	Neutral	<ul style="list-style-type: none"> Lower insulin doses required with a decrease in eGFR; titrate per clinical response 	<ul style="list-style-type: none"> Injection site reactions Higher risk of hypoglycemia with human insulin (NPH or premixed formulations) vs. analogs
	Analog					High	SQ			

*For agent-specific dosing recommendations, please refer to the manufacturers' prescribing information. †FDA approved for CVD benefit. CHF, congestive heart failure; CV, cardiovascular; DPP-4, dipeptidyl peptidase 4; DKA, diabetic ketoacidosis; DKD, diabetic kidney disease; GLP-1 RAs, glucagon-like peptide 1 receptor agonists; NASH, nonalcoholic steatohepatitis; SGLT2, sodium-glucose cotransporter 2; SQ, subcutaneous; T2DM, type 2 diabetes.

Based on findings from The Dapagliflozin Effect on Cardiovascular Events-Thrombosis in Myocardial Infarction 58 (DECLARE-TIMI 58) Trial, which showed a reduction of hospitalization for heart failure with dapagliflozin treatment versus placebo (HR: 0.73; 95% CI: 0.61 to 0.88), the portion of the table highlighting benefit of SGLT-2 inhibitors for CHF is revised to read: "Benefit: empagliflozin†, canagliflozin, dapagliflozin"



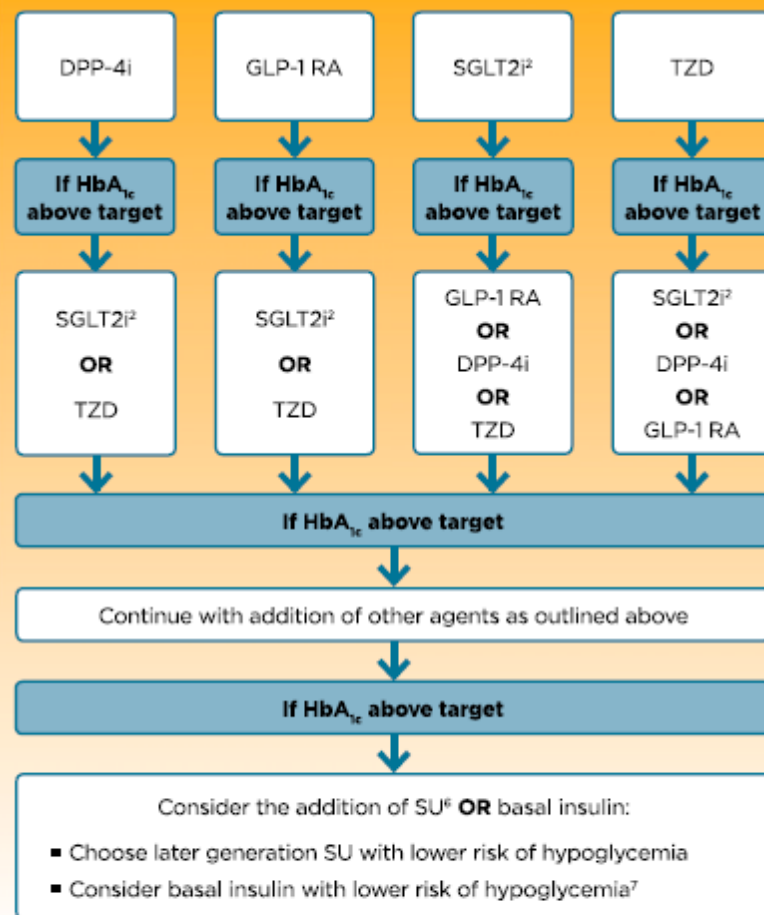
Based on findings from The Dapagliflozin Effect on Cardiovascular Events-Thrombosis in Myocardial Infarction 58 (DECLARE-TIMI 58) Trial, which showed a reduction of hospitalization for heart failure and a reduction in progression of CKD, footnote #3 within Figure 9.1 is revised to read: "Empagliflozin, canagliflozin and dapagliflozin have shown reduction in HF and reduction in CKD progression in CVOTs"



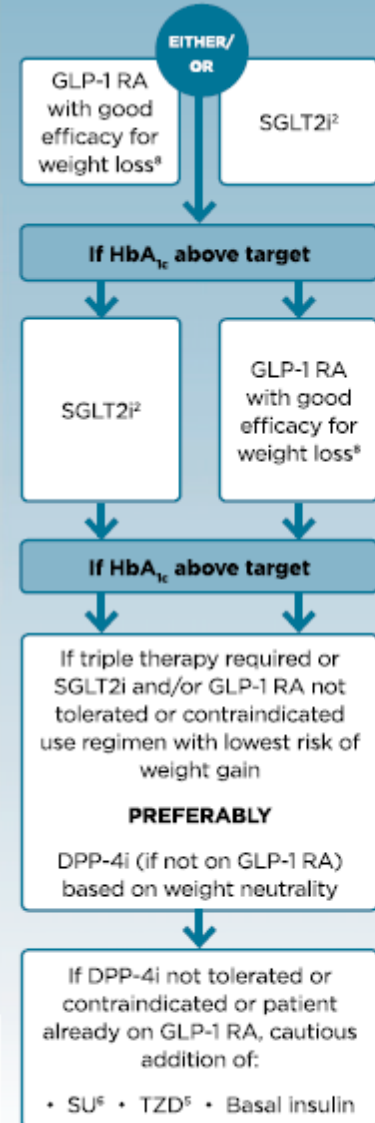
- If A1C is above target despite recommended first-line treatment and the patient has ASCVD or CKD:
 - **ASCVD Predominates:**
 - Add GLP-1 RA with proven CVD benefit, OR
 - Add SGLT-2 inhibitor with proven CVD benefit (if eGFR adequate)
 - **If HF or CKD Predominates:**
 - Add SGLT-2 inhibitor with evidence of benefit
 - If can't take an SGLT-2 inhibitor, use a GLP-1 RA with proven CVD benefit

WITHOUT ESTABLISHED ASCVD OR CKD

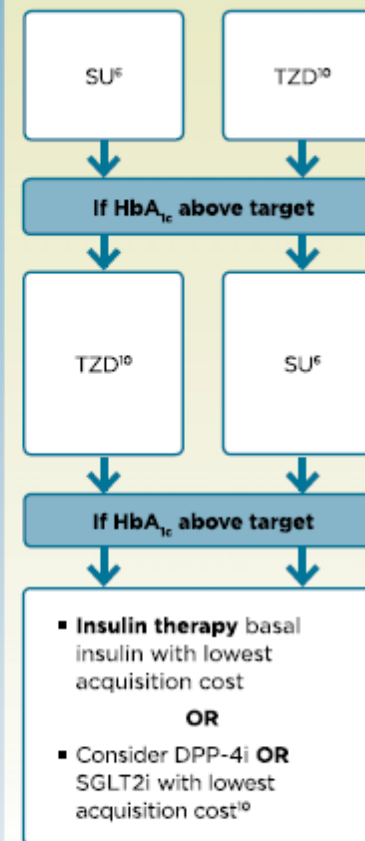
COMPELLING NEED TO MINIMIZE HYPOGLYCEMIA



COMPELLING NEED TO MINIMIZE WEIGHT GAIN OR PROMOTE WEIGHT LOSS



COST IS A MAJOR ISSUE⁹⁻¹⁰

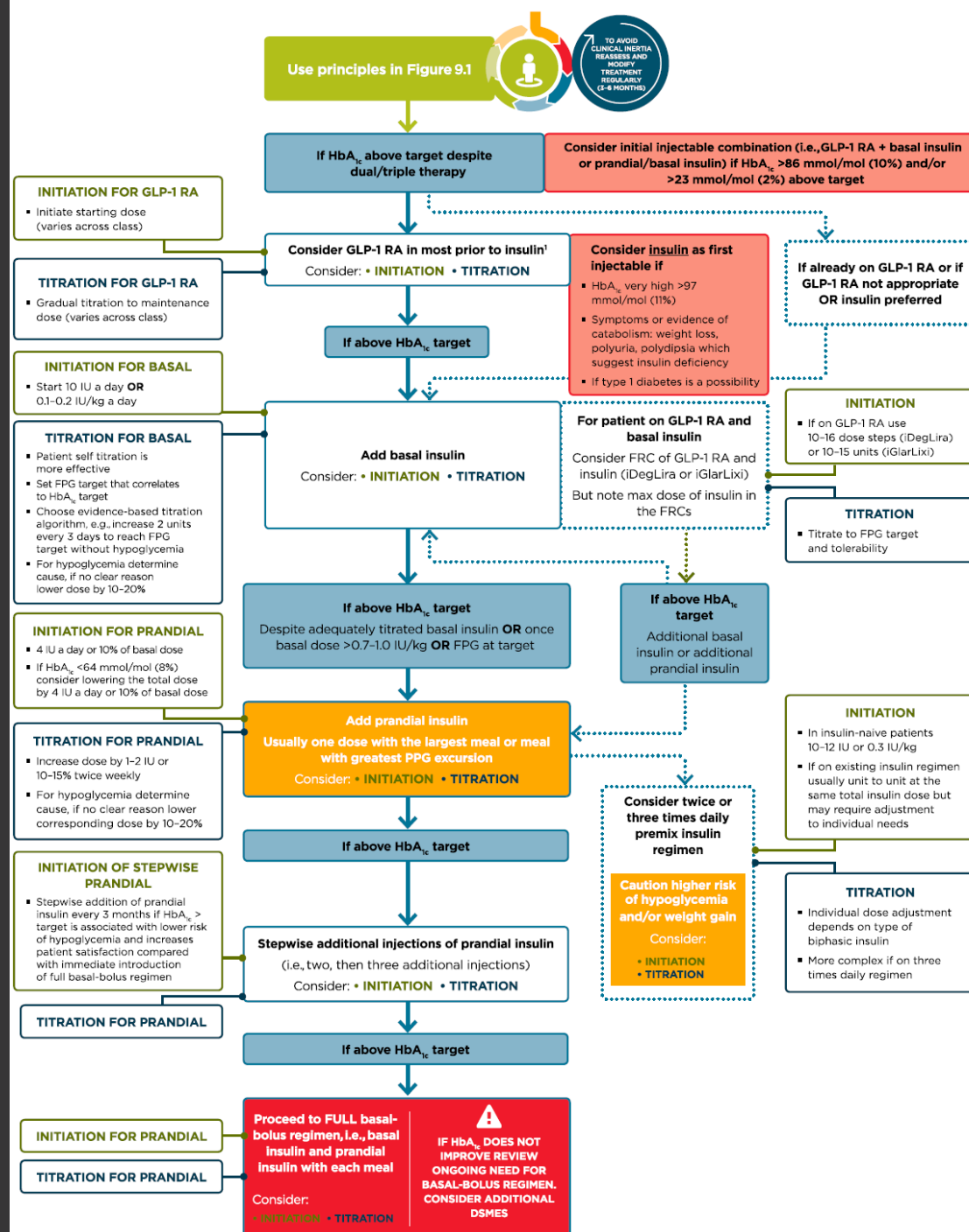


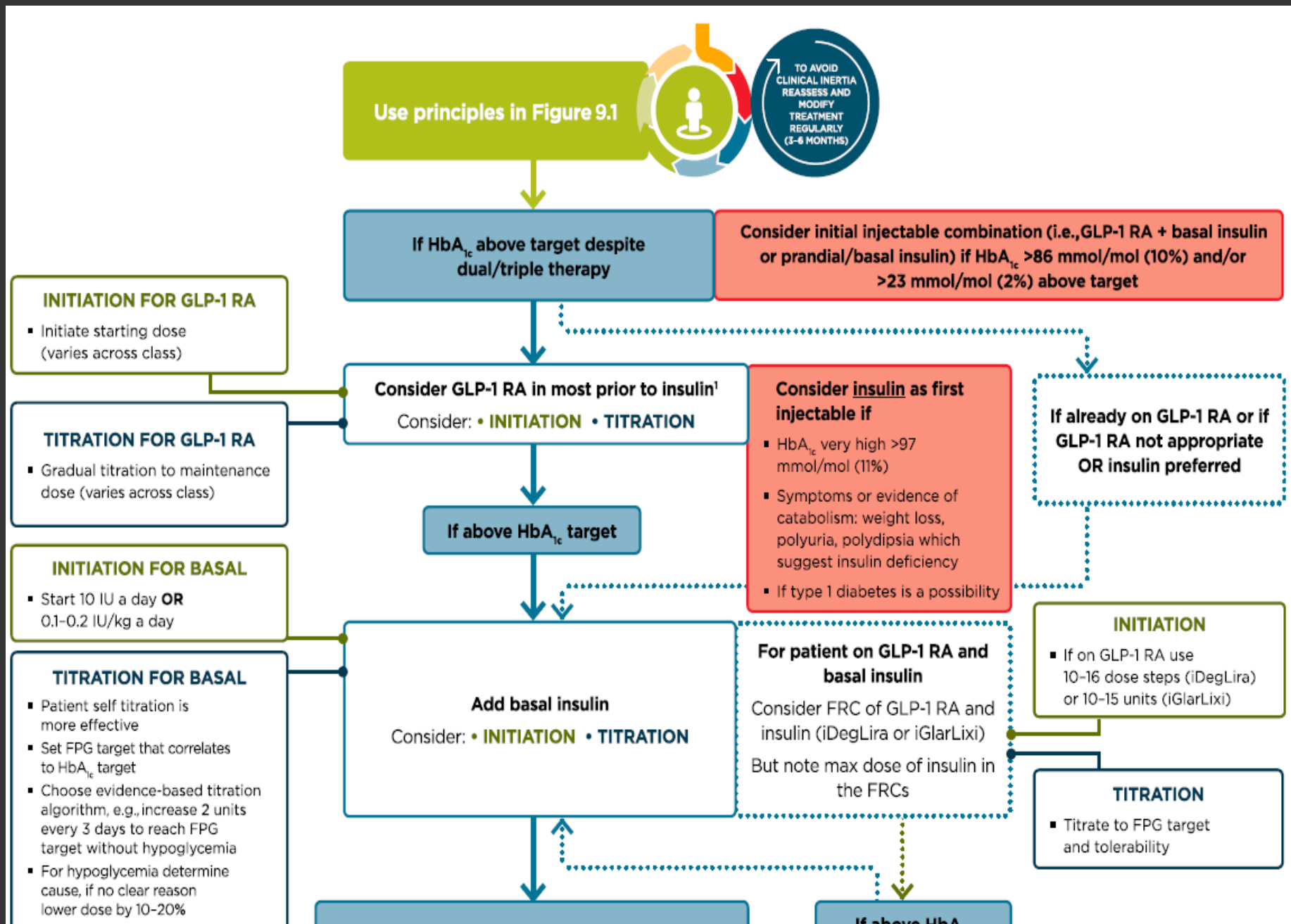
6. Choose later generation SU with lower risk of hypoglycemia
7. Degludec / glargine U300 < glargine U100 / detemir < NPH insulin
8. Semaglutide > liraglutide > dulaglutide > exenatide > lixisenatide
9. If no specific comorbidities (i.e., no established CVD, low risk of hypoglycemia, and lower priority to avoid weight gain or no weight-related comorbidities)
10. Consider country- and region-specific cost of drugs. In some countries TZDs relatively more expensive and DPP-4i relatively cheaper

Table 9.2—Median monthly cost of maximum approved daily dose of noninsulin glucose-lowering agents in the U.S.

Class	Compound(s)	Dosage strength/product (if applicable)	Median AWP (min, max) [†]	Median NADAC (min, max) [†]	Maximum approved daily dose*
Biguanides	• Metformin	500 mg (IR)	\$84 (\$4, \$93)	\$2	2,000 mg
		850 mg (IR)	\$108 (\$6, \$109)	\$3	2,550 mg
		1,000 mg (IR)	\$87 (\$4, \$88)	\$2	2,000 mg
		500 mg (ER)	\$89 (\$82, \$6,671)	\$4 (\$4, \$1,267)	2,000 mg
		750 mg (ER)	\$72 (\$65, \$92)	\$4	1,500 mg
		1,000 mg (ER)	\$1,028 (\$1,028, \$7,214)	\$311 (\$311, \$1,321)	2,000 mg
Sulfonylureas (2nd generation)	• Glimepiride	4 mg	\$71 (\$71, \$198)	\$4	8 mg
		10 mg (IR)	\$75 (\$67, \$97)	\$5	40 mg (IR)
		10 mg (XL)	\$48	\$15	20 mg (XL)
	• Glyburide	6 mg (micronized)	\$50 (\$48, \$71)	\$10	12 mg (micronized)
		5 mg	\$93 (\$63, \$103)	\$13	20 mg
Thiazolidinediones	• Pioglitazone	45 mg	\$348 (\$283, \$349)	\$4	45 mg
	• Rosiglitazone	4 mg	\$407	\$329	8 mg
α-Glucosidase inhibitors	• Acarbose	100 mg	\$106 (\$104, \$106)	\$23	300 mg
	• Miglitol	100 mg	\$241	\$311	300 mg
Meglitinides (glinides)	• Nateglinide	120 mg	\$155	\$46	360 mg
	• Repaglinide	2 mg	\$878 (\$162, \$898)	\$48	16 mg
DPP-4 inhibitors	• Alogliptin	25 mg	\$234	\$170	25 mg
	• Saxagliptin	5 mg	\$490 (\$462, \$490)	\$392	5 mg
	• Linagliptin	5 mg	\$494	\$395	5 mg
	• Sitagliptin	100 mg	\$516	\$413	100 mg
SGLT2 inhibitors	• Ertugliflozin	15 mg	\$322	\$257	15 mg
	• Dapagliflozin	10 mg	\$557	\$446	10 mg
	• Canagliflozin	300 mg	\$558	\$446	300 mg
	• Empagliflozin	25 mg	\$558	\$448	25 mg
GLP-1 receptor agonists	• Exenatide (extended release)	2 mg powder for suspension or pen	\$792	\$634	2 mg**
	• Exenatide	10 µg pen	\$850	\$680	20 µg
	• Dulaglutide	1.5/0.5 mL pen	\$876	\$702	1.5 mg**
	• Semaglutide	1 mg pen	\$875	\$704	1 mg**
	• Liraglutide	18 mg/3 mL pen	\$1,044	\$835	1.8 mg
Bile acid sequestrants	• Colesevelam	625 mg tabs	\$712 (\$674, \$712)	\$354	3.75 g
		3.75 g suspension	\$674	\$598	3.75 g
Dopamine-2 agonists	• Bromocriptine	0.8 mg	\$855	\$685	4.8 mg
Amylin mimetics	• Pramlintide	120 µg pen	\$2,547	\$2,036	120 µg/injection+++

AWP, average wholesale price; DPP-4, dipeptidyl peptidase 4; ER and XL, extended release; GLP-1, glucagon-like peptide 1; IR, immediate release; NADAC, National Average Drug Acquisition Cost; SGLT2, sodium-glucose cotransporter 2. [†]Calculated for 30-day supply (AWP [44] or NADAC [45] unit price × number of doses required to provide maximum approved daily dose × 30 days); median AWP or NADAC listed alone when only one product and/or price. *Utilized to calculate median AWP and NADAC (min, max); generic prices used, if available commercially. **Administered once weekly. +++AWP and NADAC calculated based on 120 µg three times daily.





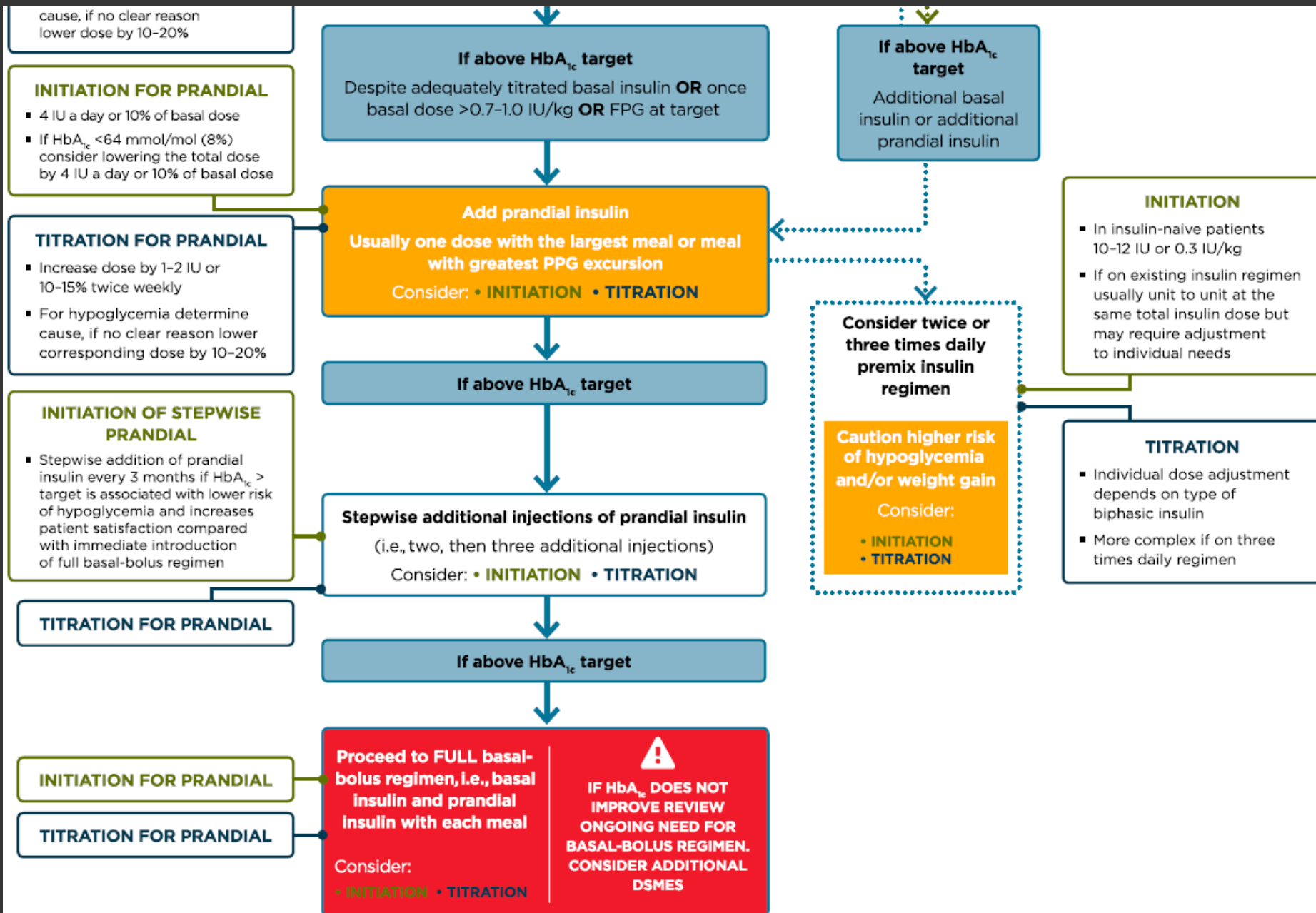


Table 9.3—Median cost of insulin products in the U.S. calculated as AWP (44) and NADAC (45) per 1,000 units of specified dosage form/product

Insulins	Compounds	Dosage form/product	Median AWP (min, max)*	Median NADAC (min, max)*
Rapid-acting analogs	• Lispro biosimilar	U-100 vial	\$280	\$226
		U-100 prefilled pen	\$361	\$289
	• Glulisine	U-100 vial	\$324	\$260
		U-100 prefilled pen	\$417	\$334
	• Lispro	U-100 vial	\$330	\$264
		U-100 3 mL cartridges	\$408	\$326
		U-100 prefilled pen; U-200 prefilled pen	\$424	\$340
	• Aspart	U-100 vial	\$347	\$278
		U-100 3 mL cartridges	\$430	\$343
		U-100 prefilled pen	\$447	\$358
• Inhaled insulin	Inhalation cartridges	\$993	\$606	
Short-acting	• Human Regular	U-100 vial	\$165 (\$165, \$178)	\$135 (\$135, \$146)
Intermediate-acting	• Human NPH	U-100 vial	\$165 (\$165, \$178)	\$135 (\$135, \$144)
		U-100 prefilled pen	\$377	\$304
Concentrated Human Regular insulin	• U-500 Human Regular insulin	U-500 vial	\$178	\$142
		U-500 prefilled pen	\$230	\$184
Basal analogs	• Glargine biosimilar	U-100 prefilled pen	\$261	\$209
	• Glargine	U-100 vial; U-100 prefilled pen	\$323	\$259
		U-300 prefilled pen	\$331	\$266
	• Detemir	U-100 vial; U-100 prefilled pen	\$353	\$281
	• Degludec	U-100 prefilled pen; U-200 prefilled pen	\$388	\$310
Premixed insulin products	• NPH/Regular 70/30	U-100 vial	\$165 (\$165, \$178)	\$135 (\$135, \$144)
		U-100 prefilled pen	\$377	\$306
	• Lispro 50/50	U-100 vial	\$342	\$274
		U-100 prefilled pen	\$424	\$340
	• Lispro 75/25	U-100 vial	\$342	\$273
		U-100 prefilled pen	\$424	\$340
	• Aspart 70/30	U-100 vial	\$360	\$288
		U-100 prefilled pen	\$447	\$358
Premixed insulin/GLP-1 receptor agonist products	• Degludec/Liraglutide	100/3.6 prefilled pen	\$793	\$638
	• Glargine/Lixisenatide	100/33 prefilled pen	\$537	\$431

AWP, average wholesale price; GLP-1, glucagon-like peptide 1; NADAC, National Average Drug Acquisition Cost. *AWP or NADAC calculated as in Table 9.2; median listed alone when only one product and/or price.

Section 10.

Cardiovascular Disease and Risk Management

The Risk Calculator.

The American College of Cardiology/American Heart Association ASCVD risk calculator (Risk Estimator Plus) is generally a useful tool to estimate 10-year ASCVD risk:

<http://tools.acc.org/ASCVD-Risk-Estimator-Plus>

Hypertension/Blood Pressure Control: Screening and Diagnosis.

- 10.1** Blood pressure should be measured at every routine clinical visit. Patients found to have elevated blood pressure ($\geq 140/90$ mmHg) should have blood pressure confirmed using multiple readings, including measurements on a separate day, to diagnose hypertension. **B**
- 10.2** All hypertensive patients with diabetes should monitor their blood pressure at home. **B**

Table 10.1—Randomized controlled trials of intensive versus standard hypertension treatment strategies

Clinical trial	Population	Intensive	Standard	Outcomes
ACCORD BP (28)	4,733 participants with T2D aged 40–79 years with prior evidence of CVD or multiple cardiovascular risk factors	Systolic blood pressure target: <120 mmHg Achieved (mean) systolic/diastolic: 119.3/64.4 mmHg	Systolic blood pressure target: 130–140 mmHg Achieved (mean) systolic/diastolic: 133.5/70.5 mmHg	<ul style="list-style-type: none"> • No benefit in primary end point: composite of nonfatal MI, nonfatal stroke, and CVD death • Stroke risk reduced 41% with intensive control, not sustained through follow-up beyond the period of active treatment • Adverse events more common in intensive group, particularly elevated serum creatinine and electrolyte abnormalities
ADVANCE BP (29)	11,140 participants with T2D aged 55 years and older with prior evidence of CVD or multiple cardiovascular risk factors	Intervention: a single-pill, fixed-dose combination of perindopril and indapamide Achieved (mean) systolic/diastolic: 136/73 mmHg	Control: placebo Achieved (mean) systolic/diastolic: 141.6/75.2 mmHg	<ul style="list-style-type: none"> • Intervention reduced risk of primary composite end point of major macrovascular and microvascular events (9%), death from any cause (14%), and death from CVD (18%) • 6-year observational follow-up found reduction in risk of death in intervention group attenuated but still significant (174)

Clinical trial	Population	Intensive	Standard	Outcomes
HOT (173)	18,790 participants, including 1,501 with diabetes	Diastolic blood pressure target: ≤ 80 mmHg	Diastolic blood pressure target: ≤ 90 mmHg	<ul style="list-style-type: none"> • In the overall trial, there was no cardiovascular benefit with more intensive targets • In the subpopulation with diabetes, an intensive diastolic target was associated with a significantly reduced risk (51%) of CVD events
SPRINT (39)	9,361 participants without diabetes	Systolic blood pressure target: < 120 mmHg Achieved (mean): 121.4 mmHg	Systolic blood pressure target: < 140 mmHg Achieved (mean): 136.2 mmHg	<ul style="list-style-type: none"> • Intensive systolic blood pressure target lowered risk of the primary composite outcome 25% (MI, ACS, stroke, HF, and death due to CVD) • Intensive target reduced risk of death 27% • Intensive therapy increased risks of electrolyte abnormalities and AKI

ACS, acute coronary syndrome; AKI, acute kidney injury; CVD, cardiovascular disease; HF, heart failure; MI, myocardial infarction; T2D, type 2 diabetes. Data from this table can also be found in the ADA position statement “Diabetes and Hypertension” (17).

Hypertension/Blood Pressure Control: Treatment Goals (1).

- 10.3 For patients with diabetes and hypertension, blood pressure targets should be individualized through a shared decision-making process that addresses cardiovascular risk, potential adverse effects of antihypertensive medications, and patient preferences. C
- 10.4 For individuals with diabetes and hypertension at high cardiovascular risk (existing atherosclerotic cardiovascular disease or 10-year atherosclerotic cardiovascular disease risk >15%), a blood pressure target of <130/80 mmHg may be appropriate, if it can be safely attained. C

Hypertension/Blood Pressure Control: Treatment Goals (2).

- 10.5 For individuals with diabetes and hypertension at lower risk for cardiovascular disease (10-year atherosclerotic cardiovascular disease risk <15%), treat to a blood pressure target <140/90 mmHg. **A**
- 10.6 In pregnant patients with diabetes and preexisting hypertension who are treated with antihypertensive therapy, blood pressure targets of 120-160/80-105 mmHg are suggested in the interest of optimizing long-term maternal health and minimizing impaired fetal growth. **E**

Hypertension/Blood Pressure Control: Lifestyle Intervention.

10.7 For patients with blood pressure >120/80 mmHg, lifestyle intervention consists of weight loss if overweight or obese, a Dietary Approaches to Stop Hypertension (DASH)-style dietary pattern including reducing sodium and increasing potassium intake, moderation of alcohol intake, and increased physical activity. **B**

Hypertension/Blood Pressure Control: Pharmacologic Interventions (1).

- 10.8** Patients with confirmed office-based blood pressure $\geq 140/90$ mmHg should, in addition to lifestyle therapy, have prompt initiation and timely titration of pharmacologic therapy to achieve blood pressure goals. **A**
- 10.9** Patients with confirmed office-based blood pressure $\geq 160/100$ mmHg should, in addition to lifestyle therapy, have prompt initiation and timely titration of two drugs or a single-pill combination of drugs demonstrated to reduce cardiovascular events in patients with diabetes. **A**
- 10.10** Treatment for hypertension should include drug classes demonstrated to reduce cardiovascular events in patients with diabetes (ACE inhibitors, angiotensin receptor blockers, thiazide-like diuretics, or dihydropyridine calcium channel blockers). **A**

Hypertension/Blood Pressure Control: Pharmacologic Interventions (2).

- 10.11** Multiple-drug therapy is generally required to achieve blood pressure targets. However, combinations of ACE inhibitors and angiotensin receptor blockers and combinations of ACE inhibitors or angiotensin receptor blockers with direct renin inhibitors should not be used. **A**
- 10.12** An ACE inhibitor or angiotensin receptor blocker, at the maximum tolerated dose indicated for blood pressure treatment, is the recommended first-line treatment for hypertension in patients with diabetes and urinary albumin-to-creatinine ratio ≥ 300 mg/g creatinine **A** or 30-299 mg/g creatinine. **B** If one class is not tolerated, the other should be substituted. **B**

Recommendations for the Treatment of Confirmed Hypertension in People With Diabetes

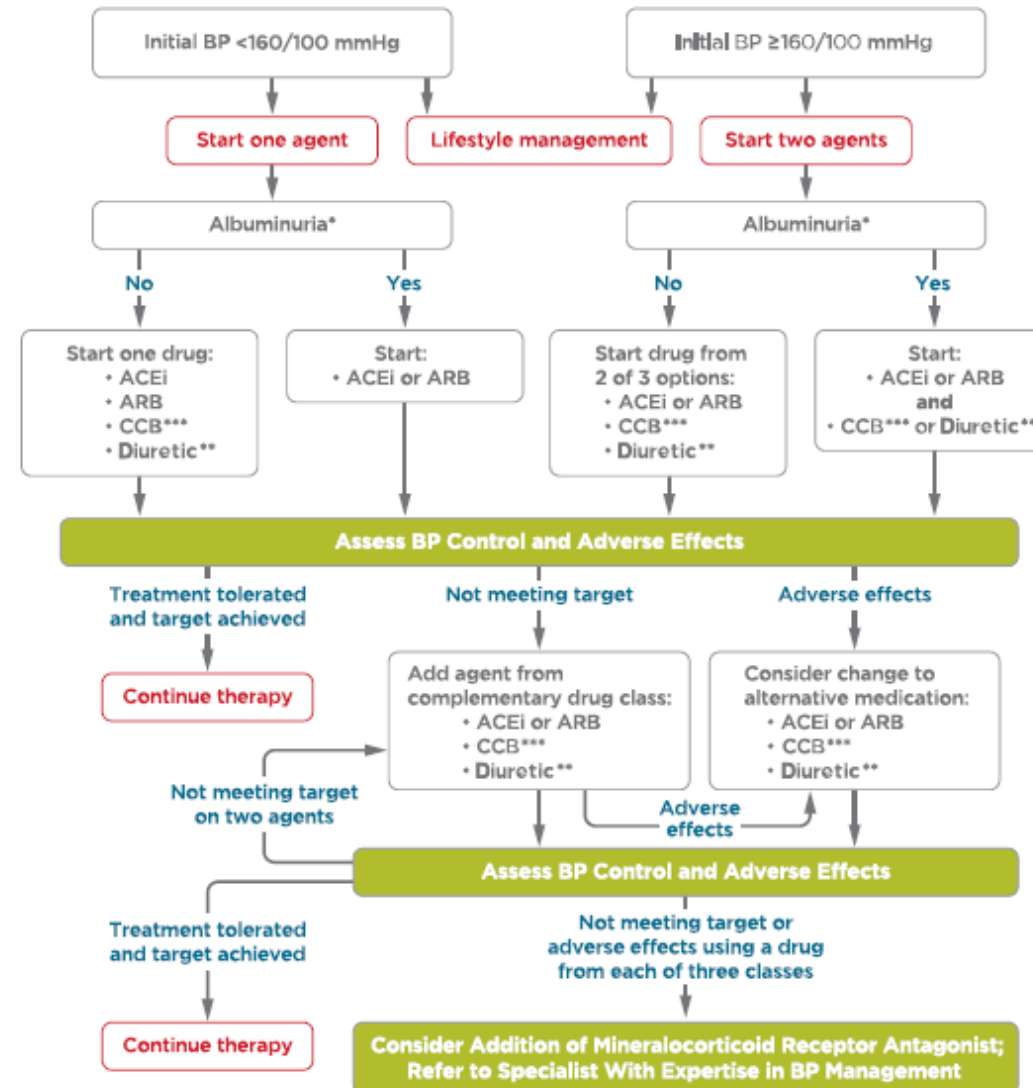
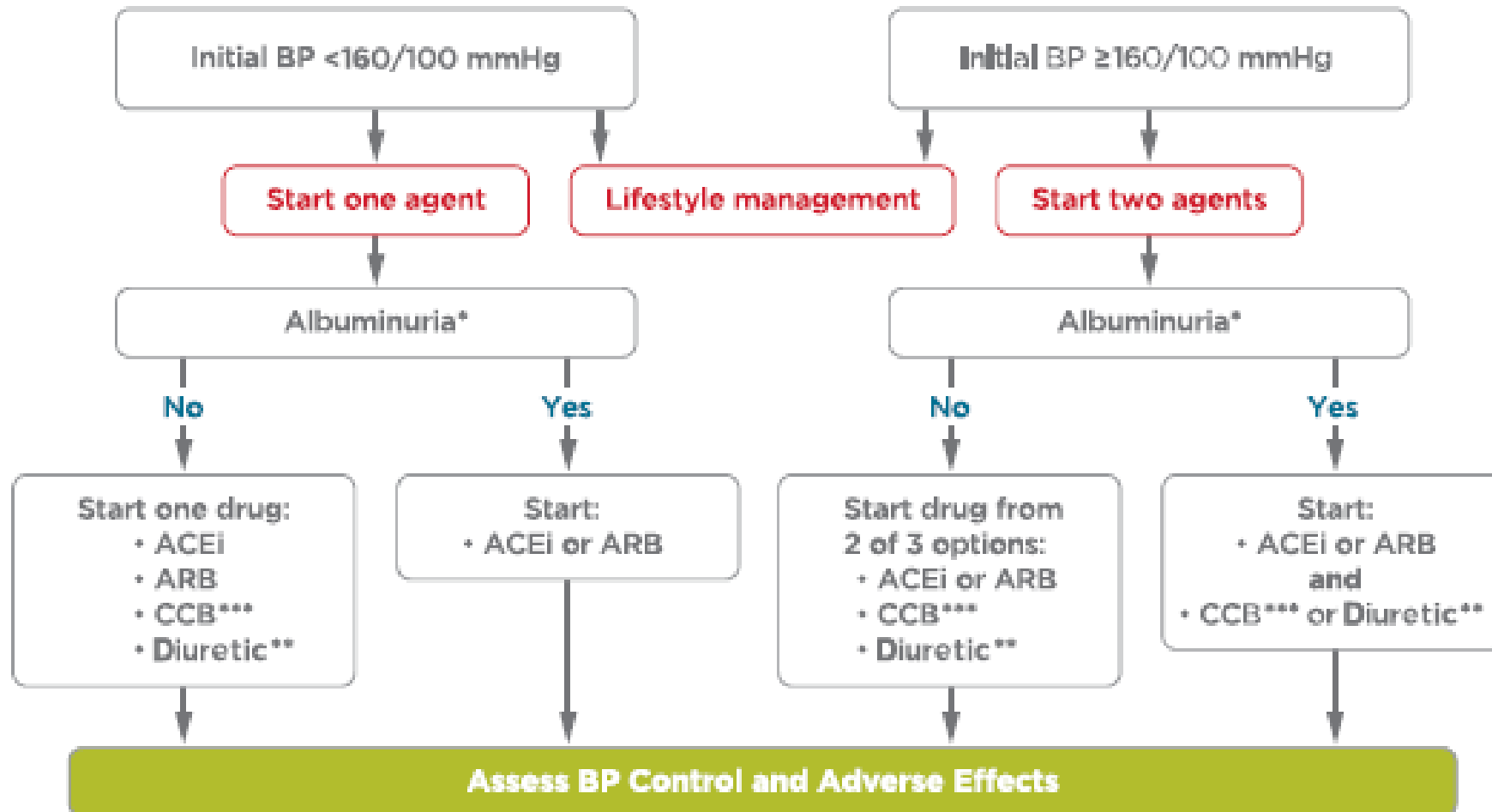
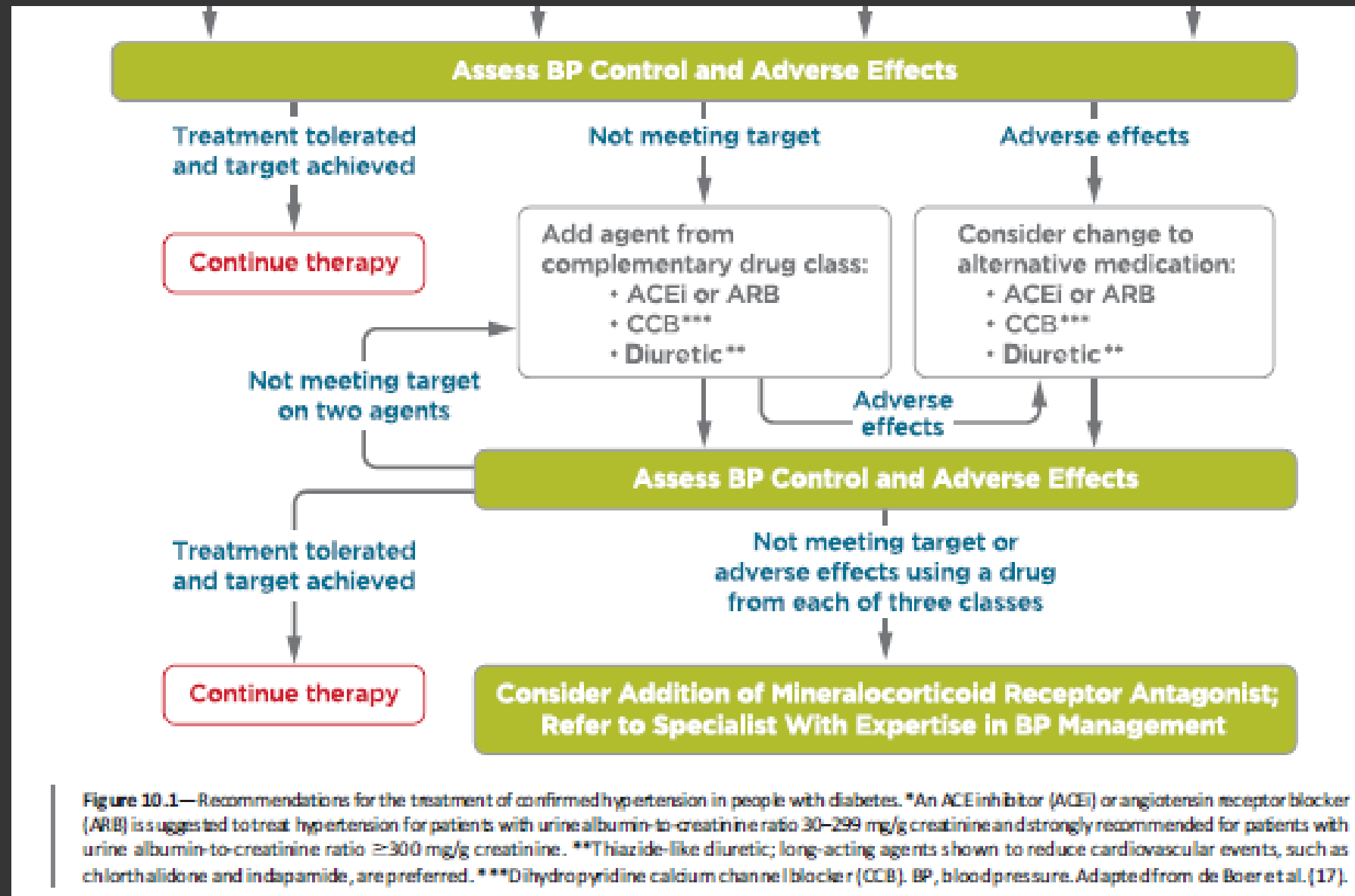


Figure 10.1—Recommendations for the treatment of confirmed hypertension in people with diabetes. *An ACE inhibitor (ACEi) or angiotensin receptor blocker (ARB) is suggested to treat hypertension for patients with urine albumin-to-creatinine ratio 30–299 mg/g creatinine and strongly recommended for patients with urine albumin-to-creatinine ratio ≥300 mg/g creatinine. **Thiazide-like diuretic; long-acting agents shown to reduce cardiovascular events, such as chlorthalidone and indapamide, are preferred. ***Dihydropyridine calcium channel blocker (CCB). BP, blood pressure. Adapted from de Boer et al. (17).

Recommendations for the Treatment of Confirmed Hypertension in People With Diabetes





Hypertension/Blood Pressure Control: Pharmacologic Interventions (3).

10.13 For patients treated with an ACE inhibitor, angiotensin receptor blocker, or diuretic, serum creatinine/estimated glomerular filtration rate and serum potassium levels should be monitored at least annually. **B**

Hypertension/Blood Pressure Control: Resistant Hypertension.

10.14 Patients with hypertension who are not meeting blood pressure targets on three classes of antihypertensive medications (including a diuretic) should be considered for mineralocorticoid receptor antagonist therapy. **B**

Lipid Management: Lifestyle Intervention.

- 10.15** Lifestyle modification focusing on weight loss (if indicated); application of a Mediterranean diet or Dietary Approaches to Stop Hypertension (DASH) dietary pattern; reduction of saturated fat and *trans* fat; increase of dietary n-3 fatty acids, viscous fiber, and plant stanols/sterols intake; and increased physical activity should be recommended to improve the lipid profile and reduce the risk of developing atherosclerotic cardiovascular disease in patients with diabetes. **A**
- 10.16** Intensify lifestyle therapy and optimize glycemic control for patients with elevated triglyceride levels (≥ 150 mg/dL [1.7 mmol/L]) and/or low HDL cholesterol (< 40 mg/dL [1.0 mmol/L] for men, < 50 mg/dL [1.3 mmol/L] for women). **C**

Lipid Management: Ongoing Therapy and Monitoring with Lipid Panel.

- 10.17** In adults not taking statins or other lipid-lowering therapy, it is reasonable to obtain a lipid profile at the time of diabetes diagnosis, at an initial medical evaluation, and every 5 years thereafter if under the age of 40 years, or more frequently if indicated. **E**
- 10.18** Obtain a lipid profile at initiation of statins or other lipid-lowering therapy, 4-12 weeks after initiation or a change in dose, and annually thereafter as it may help to monitor the response to therapy and inform medication adherence. **E**

Lipid Management: Statin Treatment (1).

- 10.19** For patients of all ages with diabetes and atherosclerotic cardiovascular disease or 10-year atherosclerotic cardiovascular disease risk $>20\%$, high-intensity statin therapy should be added to lifestyle therapy. **A**
- 10.20** For patients <40 years with additional atherosclerotic cardiovascular disease risk factors, the patient and provider should consider using moderate-intensity statin in addition to lifestyle therapy. **C**
- 10.21** For patients with diabetes aged 40-75 years **A** and >75 years **B** without atherosclerotic cardiovascular disease, use moderate-intensity statin in addition to lifestyle therapy.

Lipid Management: Statin Treatment (2).

- 10.22 In patients with diabetes who have multiple atherosclerotic cardiovascular disease risk factors, it is reasonable to consider high-intensity statin. **C**
- 10.23 For patients who do not tolerate the intended intensity, the maximally tolerated statin dose should be used. **E**
- 10.24 For patients with diabetes and atherosclerotic cardiovascular disease, if LDL cholesterol is ≥ 70 mg/dL on maximally tolerated statin dose, consider adding additional LDL-lowering therapy (such as ezetimibe or PCSK9 inhibitor). **A**
Ezetimibe may be preferred due to lower cost.
- 10.25 Statin therapy is contraindicated in pregnancy. **B**

Table 10.2—Recommendations for statin and combination treatment in adults with diabetes

Age	ASCVD or 10-year ASCVD risk >20%	Recommended statin intensity [^] and combination treatment [*]
<40 years	No	None [†]
	Yes	High <ul style="list-style-type: none"> • In patients with ASCVD, if LDL cholesterol ≥ 70 mg/dL despite maximally tolerated statin dose, consider adding additional LDL-lowering therapy (such as ezetimibe or PCSK9 inhibitor)[#]
≥ 40 years	No	Moderate [‡]
	Yes	High <ul style="list-style-type: none"> • In patients with ASCVD, if LDL cholesterol ≥ 70 mg/dL despite maximally tolerated statin dose, consider adding additional LDL-lowering therapy (such as ezetimibe or PCSK9 inhibitor)

ASCVD, atherosclerotic cardiovascular disease; PCSK9, proprotein convertase subtilisin/kexin type 9. ^{*}In addition to lifestyle therapy. [^]For patients who do not tolerate the intended intensity of statin, the maximally tolerated statin dose should be used. [†]Moderate-intensity statin may be considered based on risk-benefit profile and presence of ASCVD risk factors. ASCVD risk factors include LDL cholesterol ≥ 100 mg/dL (2.6 mmol/L), high blood pressure, smoking, chronic kidney disease, albuminuria, and family history of premature ASCVD. [‡]High-intensity statin may be considered based on risk-benefit profile and presence of ASCVD risk factors. [#]Adults aged <40 years with prevalent ASCVD were not well represented in clinical trials of non-statin-based LDL reduction. Before initiating combination lipid-lowering therapy, consider the potential for further ASCVD risk reduction, drug-specific adverse effects, and patient preferences.

Table 10.3—High-intensity and moderate-intensity statin therapy*

High-intensity statin therapy (lowers LDL cholesterol by $\geq 50\%$)	Moderate-intensity statin therapy (lowers LDL cholesterol by 30–50%)
Atorvastatin 40–80 mg	Atorvastatin 10–20 mg
Rosuvastatin 20–40 mg	Rosuvastatin 5–10 mg
	Simvastatin 20–40 mg
	Pravastatin 40–80 mg
	Lovastatin 40 mg
	Fluvastatin XL 80 mg
	Pitavastatin 2–4 mg

*Once-daily dosing. XL, extended release.

Lipid Management: Treatment of Other Lipoprotein Fractions or Targets (1).

- 10.26** For patients with fasting triglyceride levels ≥ 500 mg/dL (5.7 mmol/L), evaluate for secondary causes of hypertriglyceridemia and consider medical therapy to reduce the risk of pancreatitis. **C**
- 10.27** In adults with moderate hypertriglyceridemia (fasting or nonfasting triglycerides 175-499 mg/dL), clinicians should address and treat lifestyle factors (obesity and metabolic syndrome), secondary factors (diabetes, chronic liver or kidney disease and/or nephrotic syndrome, hypothyroidism), and medications that raise triglycerides. **C**

Lipid Management: Treatment of Other Lipoprotein Fractions or Targets (2).

Based on findings from the Reduction of Cardiovascular Event with Icosapent Ethyl Intervention Trial (REDUCE-IT), an additional recommendation has been officially added with the March 27, 2019 Living Standards of Care update. The new recommendation reads as follows:

In patients with ASCVD or other cardiac risk factors on a statin with controlled LDL-C, but elevated triglycerides (135-499), the addition of icosapent ethyl should be considered to reduce cardiovascular risk. **A**

Lipid Management: Other Combination Therapy.

10.28 Combination therapy (statin/fibrate) has not been shown to improve atherosclerotic cardiovascular disease outcomes and is generally not recommended. **A**

10.29 Combination therapy (statin/niacin) has not been shown to provide additional cardiovascular benefit above statin therapy alone, may increase the risk of stroke with additional side effects, and is generally not recommended. **A**

Antiplatelet Agents.

- 10.30 Use aspirin therapy (75-162 mg/day) as a secondary prevention strategy in those with diabetes and a history of atherosclerotic cardiovascular disease. **A**
- 10.31 For patients with atherosclerotic cardiovascular disease and documented aspirin allergy, clopidogrel (75 mg/day) should be used. **B**
- 10.32 Dual antiplatelet therapy (with low-dose aspirin and a P2Y12 inhibitor) is reasonable for a year after an acute coronary syndrome **A** and may have benefits beyond this period. **B**
- 10.33 Aspirin therapy (75-162 mg/day) may be considered as a primary prevention strategy in those with diabetes who are at increased cardiovascular risk, after a discussion with the patient on the benefits versus increased risk of bleeding. **C**

Cardiovascular Disease: Screening.

- 10.34** In asymptomatic patients, routine screening for coronary artery disease is not recommended as it does not improve outcomes as long as atherosclerotic cardiovascular disease risk factors are treated. **A**
- 10.35** Consider investigations for coronary artery disease in the presence of any of the following: atypical cardiac symptoms (e.g., unexplained dyspnea, chest discomfort); signs or symptoms of associated vascular disease including carotid bruits, transient ischemic attack, stroke, claudication, or peripheral arterial disease; or electrocardiogram abnormalities (e.g., Q waves). **E**

Cardiovascular Disease: Treatment (1).

- 10.36 In patients with known atherosclerotic cardiovascular disease, consider ACE inhibitor or angiotensin receptor blocker therapy to reduce the risk of cardiovascular events. **B**
- 10.37 In patients with prior myocardial infarction, β -blockers should be continued for at least 2 years after the event. **B**
- 10.38 In patients with type 2 diabetes with stable congestive heart failure, metformin may be used if estimated glomerular filtration rate remains >30 mL/min but should be avoided in unstable or hospitalized patients with congestive heart failure. **B**

Cardiovascular Disease: Treatment (2).

10.39 Among patients with type 2 diabetes who have established atherosclerotic cardiovascular disease, sodium-glucose cotransporter 2 inhibitors or glucagon-like peptide 1 receptor agonists with demonstrated cardiovascular disease benefit (**Table 9.1**) are recommended as part of the antihyperglycemic regimen.

A

10.40 Among patients with atherosclerotic cardiovascular disease at high risk for heart failure or in whom heart failure coexists, sodium-glucose cotransport 2 inhibitors are preferred. **C**

Table 10.4—Cardiovascular outcomes trials of available antihyperglycemic medications completed after the issuance of the FDA 2008 guidelines

	DPP-4 inhibitors			GLP-1 receptor agonists				SGLT2 inhibitors		
	SAVOR-TIMI 53 (168) (n = 16,492)	EXAMINE (175) (n = 5,380)	TECOS (171) (n = 14,671)	ELIXA (161) (n = 6,068)	LEADER (159) (n = 9,340)	SUSTAIN-6 (160)* (n = 3,297)	EXSCCEL (162) (n = 14,752)	EMPA-REG OUTCOME (8) (n = 7,020)	CANVAS (9) (n = 4,330)	CANVAS-R (9) (n = 5,812)
Intervention	Saxagliptin/ placebo	Alogliptin/ placebo	Sitagliptin/ placebo	Lixisenatide/ placebo	Liraglutide/placebo	Semaglutide/placebo	Exenatide QW/ placebo	Empagliflozin/ placebo	Canagliflozin/ placebo	
Main inclusion criteria	Type 2 diabetes and history of or multiple risk factors for CVD	Type 2 diabetes and ACS within 15–90 days before randomization	Type 2 diabetes and preexisting CVD	Type 2 diabetes and history of ACS (<180 days)	Type 2 diabetes and preexisting CVD, kidney disease, or HF at ≥50 years of age or cardiovascular risk at ≥60 years of age	Type 2 diabetes and preexisting CVD, HF, or CKD at ≥50 years of age or cardiovascular risk at ≥60 years of age	Type 2 diabetes with or without preexisting CVD	Type 2 diabetes and preexisting CVD	Type 2 diabetes and preexisting CVD at ≥30 years of age or >2 cardiovascular risk factors at ≥50 years of age	
A1C inclusion criteria (%)	≥6.5	6.5–11.0	6.5–8.0	5.5–11.0	≥7.0	≥7.0	6.5–10.0	7.0–10.0	7.0–10.5	
Age (years)††	65.1	61.0	65.4	60.3	64.3	64.6	62	63.1	63.3	
Diabetes duration (years)††	10.3	7.1	11.6	9.3	12.8	13.9	12	57% >10	13.5	
Median follow-up (years)	2.1	1.5	3.0	2.1	3.8	2.1	3.2	3.1	5.7	2.1
Statin use (%)	78	91	80	93	72	73	74	77	75	
Metformin use (%)	70	66	82	66	76	73	77	74	77	
Prior CVD/CHF (%)	78/13	100/28	74/18	100/22	81/18	60/24	73.1/16.2	99/10	65.6/14.4	
Mean baseline A1C (%)	8.0	8.0	7.2	7.7	8.7	8.7	8.0	8.1	8.2	
Mean difference in A1C between groups at end of treatment (%)	−0.3^	−0.3^	−0.3^	−0.3^	−0.4^	−0.7 or −1.0^†	−0.53^	−0.3^†	−0.58^	
Year started/ reported	2010/2013	2009/2013	2008/2015	2010/2015	2010/2016	2013/2016	2010/2017	2010/2015	2009/2017	

	DPP-4 inhibitors			GLP-1 receptor agonists				SGLT2 inhibitors		
	SAVOR-TIMI 53 (168) (n = 16,492)	EXAMINE (175) (n = 5,380)	TECOS (171) (n = 14,671)	ELIXA (161) (n = 6,068)	LEADER (159) (n = 9,340)	SUSTAIN-6 (160)* (n = 3,297)	EXSCEL (162) (n = 14,752)	EMPA-REG OUTCOME (8) (n = 7,020)	CANVAS (9) (n = 4,330)	CANVAS-R (9) (n = 5,812)
Intervention	Saxagliptin/ placebo	Alogliptin/ placebo	Sitagliptin/ placebo	Lixisenatide/ placebo	Liraglutide/placebo	Semaglutide/placebo	Exenatide QW/ placebo	Empagliflozin/ placebo	Canagliflozin/ placebo	
Primary outcome§	3-point MACE	3-point MACE	4-point MACE	4-point MACE	3-point MACE	3-point MACE	3-point MACE	3-point MACE	3-point MACE	Progression to albuminuria**
	1.00 (0.89–1.12)	0.96 (95% UL ≤1.16)	0.98 (0.89–1.08)	1.02 (0.89–1.17)	0.87 (0.78–0.97)	0.74 (0.58–0.95)	0.91 (0.83–1.00)	0.86 (0.74–0.99)	0.86 (0.75–0.97)§	0.73 (0.47–0.77)
Key secondary outcome§	Expanded MACE	4-point MACE	3-point MACE	Expanded MACE	Expanded MACE	Expanded MACE	Individual components of MACE (see below)	4-point MACE	All-cause and cardiovascular mortality (see below)	40% reduction in composite eGFR, renal replacement, renal death
	1.02 (0.94–1.11)	0.95 (95% UL ≤1.14)	0.99 (0.89–1.10)	1.00 (0.90–1.11)	0.88 (0.81–0.96)	0.74 (0.62–0.89)		0.89 (0.78–1.01)		0.60 (0.47–0.77)
Cardiovascular death§	1.03 (0.87–1.22)	0.85 (0.66–1.10)	1.03 (0.89–1.19)	0.98 (0.78–1.22)	0.78 (0.66–0.93)	0.98 (0.65–1.48)	0.88 (0.76–1.02)	0.62 (0.49–0.77)	0.96 (0.77–1.18)¶ 0.87 (0.72–1.06)#	
MI§	0.95 (0.80–1.12)	1.08 (0.88–1.33)	0.95 (0.81–1.11)	1.03 (0.87–1.22)	0.86 (0.73–1.00)	0.74 (0.51–1.08)	0.97 (0.85–1.10)	0.87 (0.70–1.09)	0.85 (0.65–1.11)	0.85 (0.61–1.19)
Stroke§	1.11 (0.88–1.39)	0.91 (0.55–1.50)	0.97 (0.79–1.19)	1.12 (0.79–1.58)	0.86 (0.71–1.06)	0.61 (0.38–0.99)	0.85 (0.70–1.03)	1.18 (0.89–1.56)	0.97 (0.70–1.35)	0.82 (0.57–1.18)
HF hospitalization§	1.27 (1.07–1.51)	1.19 (0.90–1.58)	1.00 (0.83–1.20)	0.96 (0.75–1.23)	0.87 (0.73–1.05)	1.11 (0.77–1.61)	0.94 (0.78–1.13)	0.65 (0.50–0.85)	0.77 (0.55–1.08)	0.56 (0.38–0.83)
Unstable angina hospitalization§	1.19 (0.89–1.60)	0.90 (0.60–1.37)	0.90 (0.70–1.16)	1.11 (0.47–2.62)	0.98 (0.76–1.26)	0.82 (0.47–1.44)	1.05 (0.94–1.18)	0.99 (0.74–1.34)	—	
All-cause mortality§	1.11 (0.96–1.27)	0.88 (0.71–1.09)	1.01 (0.90–1.14)	0.94 (0.78–1.13)	0.85 (0.74–0.97)	1.05 (0.74–1.50)	0.86 (0.77–0.97)	0.68 (0.57–0.82)	0.87 (0.74–1.01)†† 0.90 (0.76–1.07)###	
Worsening nephropathy§	1.08 (0.88–1.32)	—	—	—	0.78 (0.67–0.92)	0.64 (0.46–0.88)	—	0.61 (0.53–0.70)	0.60 (0.47–0.77)	

—, not assessed/reported; ACS, acute coronary syndrome; CHF, congestive heart failure; CKD, chronic kidney disease; CVD, cardiovascular disease; DPP-4, dipeptidyl peptidase 4; eGFR, estimated glomerular filtration rate; GLP-1, glucagon-like peptide 1; HF, heart failure; MACE, major adverse cardiac event; MI, myocardial infarction; SGLT2, sodium–glucose cotransporter 2; UL, upper limit. Data from this table was adapted from Cefalu et al. (176) in the January 2018 issue of *Diabetes Care*. *Powered to rule out a hazard ratio of 1.8; superiority hypothesis not prespecified. **On the basis of prespecified outcomes, the renal outcomes are not viewed as statistically significant. ††Age was reported as means in all trials except EXAMINE, which reported medians; diabetes duration was reported as means in all but four trials, with SAVOR-TIMI 58, EXAMINE, and EXSCEL reporting medians and EMPA-REG OUTCOME reporting as percentage of population with diabetes duration >10 years. †A1C change of 0.66% with 0.5 mg and 1.05% with 1 mg dose of semaglutide. ‡A1C change of 0.30 in EMPA-REG OUTCOME is based on pooled results for both doses (i.e., 0.24% for 10 mg and 0.36% for 25 mg of empagliflozin). §Outcomes reported as hazard ratio (95% CI). || Worsening nephropathy is defined as the new onset of urine albumin-to-creatinine ratio >300 mg/g creatinine or a doubling of the serum creatinine level and an estimated glomerular filtration rate of <45 mL/min/1.73 m², the need for continuous renal-replacement therapy, or death from renal disease in EMPA-REG OUTCOME, LEADER, and SUSTAIN-6 and as doubling of creatinine level, initiation of dialysis, renal transplantation, or creatinine >6.0 mg/dL (530 μmol/L) in SAVOR-TIMI 53. Worsening nephropathy was a prespecified exploratory adjudicated outcome in SAVOR-TIMI 53, LEADER, and SUSTAIN-6 but not in EMPA-REG OUTCOME. ¶Truncated data set (prespecified in treating hierarchy as the principal data set for analysis for superiority of all-cause mortality and cardiovascular death in the CANVAS Program). #Significant difference in A1C between groups (*P* < 0.05). #Nontruncated data set. ††Truncated integrated data set (refers to pooled data from CANVAS after 20 November 2012 plus CANVAS-R; prespecified in treating hierarchy as the principal data set for analysis for superiority of all-cause mortality and cardiovascular death in the CANVAS Program). ###Nontruncated integrated data (refers to pooled data from CANVAS, including before 20 November 2012 plus CANVAS-R).

SGLT2 Inhibitors DECLARE-TIMI 58 (n = 17,160)	
Intervention	Dapagliflozin/placebo
Main inclusion criteria	Type 2 diabetes and established ASCVD or multiple risk factors for ASCVD
A1C inclusion criteria (%)	≥6.5%
Age (years)	64.0
Diabetes duration (years)	11.0 (median)
Median follow-up (years)	4.2
Statin or ezetimibe use (%)	75
Metformin use (%)	82
Prior CVD/CHF (%)	40/10
Mean baseline A1C (%)	8.3
Mean difference in A1C between groups at end of treatment (%)	-0.43
Year started/reported	2013/2018
Primary outcomes	3-point MACE 0.93 (0.84-1.03)
Key secondary outcome	Cardiovascular death or hospitalization for HF 0.83 (0.73-0.95) Death from any cause 0.93 (0.82-1.04)
	Renal Composite (≥40% decrease in eGFR rate to <60 mL/min/1.73m ² , new ESRD, or death from renal or CV causes) 0.76 (0.67-0.87)
Cardiovascular death	0.98 (0.82-1.17)
MI	0.89 (0.77-1.01)
Stroke	1.01 (0.84-1.21)
HF hospitalizations	0.73 (0.61-0.88)
Unstable angina hospitalizations	-
All-cause mortality	0.93 (0.82-1.04)
Worsening nephropathy	0.53 (0.43-0.66)

Based on findings from The Dapagliflozin Effect on Cardiovascular Events-Thrombosis in Myocardial Infarction 58 (DECLARE-TIMI 58) Trial, Table 10.4 has been updated to incorporate findings from the trial into the SGLT2 inhibitor section of the table. This data table amendment summarizes findings from the study.

Section 11.

Microvascular Complications and Foot Care

Chronic Kidney Disease: Screening.

11.1 At least once a year, assess urinary albumin (e.g., spot urinary albumin-to-creatinine ratio) and estimated glomerular filtration rate in patients with type 1 diabetes with duration of ≥ 5 years, in all patients with type 2 diabetes, and in all patients with comorbid hypertension. **B**

Chronic Kidney Disease: Treatment (1).

- 11.2 Optimize glucose control to reduce the risk or slow the progression of chronic kidney disease. **A**
- 11.3 For patients with type 2 diabetes and chronic kidney disease, consider use of a sodium-glucose cotransporter 2 inhibitor or glucagon-like peptide 1 receptor agonist shown to reduce risk of chronic kidney disease progression, cardiovascular events, or both (**Table 9.1**). **C**
- 11.4 Optimize blood pressure control to reduce the risk or slow the progression of chronic kidney disease. **A**

Chronic Kidney Disease: Treatment (2).

- 11.5** For people with nondialysis-dependent chronic kidney disease, dietary protein intake should be approximately 0.8 g/kg body weight per day (the recommended daily allowance). For patients on dialysis, higher levels of dietary protein intake should be considered. **B**
- 11.6** In nonpregnant patients with diabetes and hypertension, either an ACE inhibitor or an angiotensin receptor blocker is recommended for those with modestly elevated urinary albumin-to-creatinine ratio (30-299 mg/g creatinine) **B** and is strongly recommended for those with urinary albumin-to-creatinine ratio ≥ 300 mg/g creatinine and/or estimated glomerular filtration rate < 60 mL/min/1.73m². **A**

Chronic Kidney Disease: Treatment (3).

- 11.7 Periodically monitor serum creatinine and potassium levels for the development of increased creatinine or changes in potassium when ACE inhibitors, angiotensin receptor blockers, or diuretics are used. **B**
- 11.8 Continued monitoring of urinary albumin-to-creatinine ratio in patients with albuminuria treated with an ACE inhibitor or an angiotensin receptor blocker is reasonable to assess the response to treatment and progression of chronic kidney disease. **E**
- 11.9 An ACE inhibitor or angiotensin receptor blocker is not recommended for the primary prevention of chronic kidney disease in patients with diabetes who have normal blood pressure, normal urinary albumin-to-creatinine ratio (<30 mg/g creatinine), and normal estimated glomerular filtration rate. **B**

Chronic Kidney Disease: Treatment (4).

- 11.10 When estimated glomerular filtration rate is <60 mL/min/ 1.73m^2 , evaluate and manage potential complications of chronic kidney disease. **E**
- 11.11 Patients should be referred for evaluation for renal replacement treatment if they have an estimated glomerular filtration rate <30 mL/min/ 1.73m^2 . **A**
- 11.12 Promptly refer to a physician experienced in the care of kidney disease for uncertainty about the etiology of kidney disease, difficult management issues, and rapidly progressing kidney disease. **B**

Table 11.1—CKD stages and corresponding focus of kidney-related care

CKD stage†			Focus of kidney-related care			
Stage	eGFR (mL/min/1.73 m ²)	Evidence of kidney damage*	Diagnose cause of kidney injury	Evaluate and treat risk factors for CKD progression**	Evaluate and treat CKD complications***	Prepare for renal replacement therapy
No clinical evidence of CKD	≥60	—				
1	≥90	+	✓	✓		
2	60–89	+	✓	✓		
3	30–59	+/-	✓	✓	✓	
4	15–29	+/-		✓	✓	✓
5	<15	+/-			✓	✓

CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate. †CKD stages 1 and 2 are defined by evidence of kidney damage (+), while CKD stages 3–5 are defined by reduced eGFR with or without evidence of kidney damage (+/-). At any stage of CKD, the degree of albuminuria, observed history of eGFR loss, and cause of kidney damage (including possible causes other than diabetes) may also be used to characterize CKD, gauge prognosis, and guide treatment decisions. *Kidney damage is most often manifest as albuminuria (UACR ≥30 mg/g Cr) but can also include glomerular hematuria, other abnormalities of the urinary sediment, radiographic abnormalities, and other presentations. **Risk factors for CKD progression include elevated blood pressure, hyperglycemia, and albuminuria. ***See Table 11.2.

Table 11.2—Selected complications of CKD

Complication	Medical and laboratory evaluation
Elevated blood pressure	Blood pressure, weight
Volume overload	History, physical examination, weight
Electrolyte abnormalities	Serum electrolytes
Metabolic acidosis	Serum electrolytes
Anemia	Hemoglobin; iron testing if indicated
Metabolic bone disease	Serum calcium, phosphate, PTH, vitamin 25(OH)D

Complications of chronic kidney disease (CKD) generally become prevalent when estimated glomerular filtration rate falls below 60 mL/min/1.73 m² (stage 3 CKD or greater) and become more common and severe as CKD progresses. Evaluation of elevated blood pressure and volume overload should occur at every clinical contact possible; laboratory evaluations are generally indicated every 6–12 months for stage 3 CKD, every 3–5 months for stage 4 CKD, and every 1–3 months for stage 5 CKD, or as indicated to evaluate symptoms or changes in therapy. PTH, parathyroid hormone; 25(OH)D, 25-hydroxyvitamin D.

Diabetic Retinopathy.

11.13 Optimize glycemic control to reduce the risk or slow the progression of diabetic retinopathy. **A**

11.14 Optimize blood pressure and serum lipid control to reduce the risk or slow the progression of diabetic retinopathy. **A**

Diabetic Retinopathy: Screening (1).

- 11.15** Adults with type 1 diabetes should have an initial dilated and comprehensive eye examination by an ophthalmologist or optometrist within 5 years after the onset of diabetes. **B**
- 11.16** Patients with type 2 diabetes should have an initial dilated and comprehensive eye examination by an ophthalmologist or optometrist at the time of diabetes diagnosis. **B**
- 11.17** If there is no evidence of retinopathy for one or more annual eye exam and glycemia is well controlled, then exams every 1-2 years may be considered. If any level of diabetic retinopathy is present, subsequent dilated retinal examinations should be repeated at least annually by an ophthalmologist or optometrist. If retinopathy is progressing or sight-threatening, then examinations will be required more frequently. **B**

Diabetic Retinopathy: Screening (2).

- 11.18** Telemedicine programs that use validated retinal photography with remote reading by an ophthalmologist or optometrist and timely referral for a comprehensive eye examination when indicated can be an appropriate screening strategy for diabetic retinopathy. **B**
- 11.19** Women with preexisting type 1 or type 2 diabetes who are planning pregnancy or who are pregnant should be counseled on the risk of development and/or progression of diabetic retinopathy. **B**
- 11.20** Eye examinations should occur before pregnancy or in the first trimester in patients with preexisting type 1 or type 2 diabetes, and then patients should be monitored every trimester and for 1-year postpartum as indicated by the degree of retinopathy. **B**

Diabetic Retinopathy: Treatment (1).

- 11.21** Promptly refer patients with any level of macular edema, severe nonproliferative diabetic retinopathy (a precursor of proliferative diabetic retinopathy), or any proliferative retinopathy to an ophthalmologist who is knowledgeable and experienced in the management of diabetic retinopathy. **A**
- 11.22** The traditional standard treatment, panretinal laser photocoagulation therapy, is indicated to reduce the risk of vision loss in patients with high-risk proliferative diabetic retinopathy and, in some cases, severe nonproliferative diabetic retinopathy. **A**

Diabetic Retinopathy: Treatment (2).

- 11.23 Intravitreous injections of antivascular endothelial growth factor ranibizumab are not inferior to traditional panretinal laser photocoagulation and are also indicated to reduce the risk of vision loss in patients with proliferative diabetic retinopathy. **A**
- 11.24 Intravitreous injections of antivascular endothelial growth factor are indicated for central-involved diabetic macular edema, which occurs beneath the foveal center and may threaten reading vision. **A**
- 11.25 The presence of retinopathy is not a contraindication to aspirin therapy for cardioprotection, as aspirin does not increase the risk of retinal hemorrhage. **A**

Diabetic Neuropathies.

The diabetic neuropathies are a heterogeneous group of disorders with diverse clinical manifestations – early recognition and appropriate management is important

1. Diabetic neuropathy is a diagnosis of exclusion. Nondiabetic neuropathies may be present in patients with diabetes and may be treatable.
2. Numerous treatment options exist for symptomatic diabetic neuropathy.
3. Up to 50% of diabetic peripheral neuropathy (DPN) may be asymptomatic. If not recognized and if preventive foot care is not implemented, patients are at risk for injuries to their insensate feet.
4. Recognition and treatment of autonomic neuropathy may improve symptoms, reduce sequelae, and improve quality of life.

Neuropathy: Screening.

- 11.26** All patients should be assessed for diabetic peripheral neuropathy starting at diagnosis of type 2 diabetes and 5 years after the diagnosis of type 1 diabetes and at least annually thereafter. **B**
- 11.27** Assessment for distal symmetric polyneuropathy should include a careful history and assessment of either temperature or pinprick sensation (small-fiber function) and vibration sensation using a 128-Hz tuning fork (for large-fiber function). All patients should have annual 10-g monofilament testing to identify feet at risk for ulceration and amputation. **B**
- 11.28** Symptoms and signs of autonomic neuropathy should be assessed in patients with microvascular complications. **E**

Neuropathy: Treatment.

- 11.29 Optimize glucose control to prevent or delay the development of neuropathy in patients with type 1 diabetes **A** and to slow the progression of neuropathy in patients with type 2 diabetes. **B**
- 11.30 Assess and treat patients to reduce pain related to diabetic peripheral neuropathy **B** and symptoms of autonomic neuropathy and to improve quality of life. **E**
- 11.31 Pregabalin, duloxetine, or gabapentin are recommended as initial pharmacologic treatments for neuropathic pain in diabetes. **A**

Foot Care (1).

- 11.32 Perform a comprehensive foot evaluation at least annually to identify risk factors for ulcers and amputations. **B**
- 11.33 Patients with evidence of sensory loss or prior ulceration or amputation should have their feet inspected at every visit. **C**
- 11.34 Obtain a prior history of ulceration, amputation, Charcot foot, angioplasty or vascular surgery, cigarette smoking, retinopathy, and renal disease and assess current symptoms of neuropathy (pain, burning, numbness) and vascular disease (leg fatigue, claudication). **B**
- 11.35 The examination should include inspection of the skin, assessment of foot deformities, neurological assessment (10-g monofilament testing with at least one other assessment: pinprick, temperature, vibration), and vascular assessment including pulses in the legs and feet. **B**

Foot Care (2).

- 11.36** Patients with symptoms of claudication or decreased or absent pedal pulses should be referred for ankle-brachial index and for further vascular assessment as appropriate. **C**
- 11.37** A multidisciplinary approach is recommended for individuals with foot ulcers and high-risk feet (e.g., dialysis patients and those with Charcot foot or prior ulcers or amputation). **B**
- 11.38** Refer patients who smoke or who have histories of prior lower-extremity complications, loss of protective sensation, structural abnormalities, or peripheral arterial disease to foot care specialists for ongoing preventive care and lifelong surveillance. **C**

Foot Care (3).

- 11.39 Provide general preventive foot self-care education to all patients with diabetes. **B**
- 11.40 The use of specialized therapeutic footwear is recommended for high-risk patients with diabetes including those with severe neuropathy, foot deformities, or history of amputation. **B**

Risk Factors for Ulcers or Amputation.

The risk of ulcers or amputations is increased in people who have the following risk factors:

- Poor glycemic control
- Peripheral neuropathy with LOPS
- Cigarette smoking
- Foot deformities
- Preulcerative callus or corn
- PAD
- History of foot ulcer
- Amputation
- Visual impairment
- CKD (especially patients on dialysis)

Section 12.

Older Adults

Older Adults.

- 12.1 Consider the assessment of medical, psychological, functional (self-management abilities), and social geriatric domains in older adults to provide a framework to determine targets and therapeutic approaches for diabetes management. C
- 12.2 Screening for geriatric syndromes may be appropriate in older adults experiencing limitations in their basic and instrumental activities of daily living as they may affect diabetes self-management and be related to health-related quality of life. C

Neurocognitive Function.

12.3 Screening for early detection of mild cognitive impairment or dementia and depression is indicated for adults 65 years of age or older at the initial visit and annually as appropriate. **B**

Hypoglycemia.

12.4 Hypoglycemia should be avoided in older adults with diabetes. It should be assessed and managed by adjusting glycemic targets and pharmacologic interventions. **B**

Treatment Goals (1).

- 12.5** Older adults who are otherwise healthy with few coexisting chronic illnesses and intact cognitive function and functional status should have lower glycemic goals (such as A1C <7.5% [58 mmol/mol]), while those with multiple coexisting chronic illnesses, cognitive impairment, or functional dependence should have less stringent glycemic goals (such as A1C <8.0-8.5% [64-69 mmol/mol]). **C**
- 12.6** Glycemic goals for some older adults might reasonably be relaxed as part of individualized care, but hyperglycemia leading to symptoms or risk of acute hyperglycemia complications should be avoided in all patients. **C**
- 12.7** Screening for diabetes complications should be individualized in older adults. Particular attention should be paid to complications that would lead to functional impairment. **C**

Treatment Goals (2).

- 12.8 Treatment of hypertension to individualized target levels is indicated in most older adults. **C**
- 12.9 Treatment of other cardiovascular risk factors should be individualized in older adults considering the time frame of benefit. Lipid-lowering therapy and aspirin therapy may benefit those with life expectancies at least equal to the time from of primary prevention or secondary intervention trials. **E**

Table 12.1—Framework for considering treatment goals for glycemia, blood pressure, and dyslipidemia in older adults with diabetes (2)

Patient characteristics/ health status	Rationale	Reasonable A1C goal†	Fasting or preprandial glucose	Bedtime glucose	Blood pressure	Lipids
Healthy (few coexisting chronic illnesses, intact cognitive and functional status)	Longer remaining life expectancy	<7.5% (58 mmol/mol)	90–130 mg/dL (5.0–7.2 mmol/L)	90–150 mg/dL (5.0–8.3 mmol/L)	<140/90 mmHg	Statin unless contraindicated or not tolerated
Complex/intermediate (multiple coexisting chronic illnesses* or 2+ instrumental ADL impairments or mild-to-moderate cognitive impairment)	Intermediate remaining life expectancy, high treatment burden, hypoglycemia vulnerability, fall risk	<8.0% (64 mmol/mol)	90–150 mg/dL (5.0–8.3 mmol/L)	100–180 mg/dL (5.6–10.0 mmol/L)	<140/90 mmHg	Statin unless contraindicated or not tolerated
Very complex/poor health (LTC or end-stage chronic illnesses** or moderate-to-severe cognitive impairment or 2+ ADL dependencies)	Limited remaining life expectancy makes benefit uncertain	<8.5%† (69 mmol/mol)	100–180 mg/dL (5.6–10.0 mmol/L)	110–200 mg/dL (6.1–11.1 mmol/L)	<150/90 mmHg	Consider likelihood of benefit with statin (secondary prevention more so than primary)

This represents a consensus framework for considering treatment goals for glycemia, blood pressure, and dyslipidemia in older adults with diabetes. The patient characteristic categories are general concepts. Not every patient will clearly fall into a particular category. Consideration of patient and caregiver preferences is an important aspect of treatment individualization. Additionally, a patient's health status and preferences may change over time. †A lower A1C goal may be set for an individual if achievable without recurrent or severe hypoglycemia or undue treatment burden. *Coexisting chronic illnesses are conditions serious enough to require medications or lifestyle management and may include arthritis, cancer, congestive heart failure, depression, emphysema, falls, hypertension, incontinence, stage 3 or worse chronic kidney disease, myocardial infarction, and stroke. "Multiple" means at least three, but many patients may have five or more (54). **The presence of a single end-stage chronic illness, such as stage 3–4 congestive heart failure or oxygen-dependent lung disease, chronic kidney disease requiring dialysis, or uncontrolled metastatic cancer, may cause significant symptoms or impairment of functional status and significantly reduce life expectancy. †A1C of 8.5% (69 mmol/mol) equates to an estimated average glucose of ~200 mg/dL (11.1 mmol/L). Looser A1C targets above 8.5% (69 mmol/mol) are not recommended as they may expose patients to more frequent higher glucose values and the acute risks from glycosuria, dehydration, hyperglycemic hyperosmolar syndrome, and poor wound healing. ADL, activities of daily living.

Lifestyle Management.

12.10 Optimal nutrition and protein intake is recommended for older adults; regular exercise, including aerobic activity and resistance training, should be encouraged in all older adults who can safely engage in such activities. **B**

Pharmacologic Therapy.

- 12.11 In older adults at increased risk of hypoglycemia, medication classes with low risk of hypoglycemia are preferred. **B**
- 12.12 Overtreatment of diabetes is common in older adults and should be avoided. **B**
- 12.13 Deintensification (or simplification) of complex regimens is recommended to reduce the risk of hypoglycemia, if it can be achieved within the individualized A1C target. **B**

Table 12.2—Considerations for treatment regimen simplification and deintensification/deprescribing in older adults with diabetes (39,55)

Patient characteristics/ health status	Reasonable A1C/ treatment goal	Rationale/considerations	When may regimen simplification be required?	When may treatment deintensification/ deprescribing be required?
Healthy (few coexisting chronic illnesses, intact cognitive and functional status)	A1C <7.5% (58 mmol/mol)	<ul style="list-style-type: none"> • Patients can generally perform complex tasks to maintain good glycemic control when health is stable • During acute illness, patients may be more at risk for administration or dosing errors that can result in hypoglycemia, falls, fractures, etc. 	<ul style="list-style-type: none"> • If severe or recurrent hypoglycemia occurs in patients on insulin therapy (even if A1C is appropriate) • If wide glucose excursions are observed • If cognitive or functional decline occurs following acute illness 	<ul style="list-style-type: none"> • If severe or recurrent hypoglycemia occurs in patients on noninsulin therapies with high risk of hypoglycemia (even if A1C is appropriate) • If wide glucose excursions are observed • In the presence of polypharmacy
Complex/intermediate (multiple coexisting chronic illnesses or 2+ instrumental ADL impairments or mild-to-moderate cognitive impairment)	A1C <8.0% (64 mmol/mol)	<ul style="list-style-type: none"> • Comorbidities may affect self-management abilities and capacity to avoid hypoglycemia • Long-acting medication formulations may decrease pill burden and complexity of medication regimen 	<ul style="list-style-type: none"> • If severe or recurrent hypoglycemia occurs in patients on insulin therapy (even if A1C is appropriate) • If unable to manage complexity of an insulin regimen • If there is a significant change in social circumstances, such as loss of caregiver, change in living situation, or financial difficulties 	<ul style="list-style-type: none"> • If severe or recurrent hypoglycemia occurs in patients on noninsulin therapies with high risk of hypoglycemia (even if A1C is appropriate) • If wide glucose excursions are observed • In the presence of polypharmacy

Patient characteristics/ health status	Reasonable A1C/ treatment goal	Rationale/considerations	When may regimen simplification be required?	When may treatment deintensification/ deprescribing be required?
Community-dwelling patients receiving care in a skilled nursing facility for short-term rehabilitation	Avoid reliance on A1C Glucose target: 100–200 mg/dL (5.55–11.1 mmol/L)	<ul style="list-style-type: none"> • Glycemic control is important for recovery, wound healing, hydration, and avoidance of infections • Patients recovering from illness may not have returned to baseline cognitive function at the time of discharge • Consider the type of support the patient will receive at home 	<ul style="list-style-type: none"> • If treatment regimen increased in complexity during hospitalization, it is reasonable, in many cases, to reinstate the prehospitalization medication regimen during the rehabilitation 	<ul style="list-style-type: none"> • If the hospitalization for acute illness resulted in weight loss, anorexia, short-term cognitive decline, and/or loss of physical functioning
Very complex/poor health (long-term care or end-stage chronic illnesses or moderate-to-severe cognitive impairment or 2+ ADL dependencies)	A1C <8.5% (69 mmol/L)†	<ul style="list-style-type: none"> • No benefits of tight glycemic control in this population • Hypoglycemia should be avoided • Most important outcomes are maintenance of cognitive and functional status 	<ul style="list-style-type: none"> • If on an insulin regimen and the patient would like to decrease the number of injections and fingerstick blood glucose monitoring events each day • If the patient has an inconsistent eating pattern 	<ul style="list-style-type: none"> • If on noninsulin agents with a high hypoglycemia risk in the context of cognitive dysfunction, depression, anorexia, or inconsistent eating pattern • If taking any medications without clear benefits
Patients at end of life	Avoid hypoglycemia and symptomatic hyperglycemia	<ul style="list-style-type: none"> • Goal is to provide comfort and avoid tasks or interventions that cause pain or discomfort • Caregivers are important in providing medical care and maintaining quality of life 	<ul style="list-style-type: none"> • If there is pain or discomfort caused by treatment (e.g., injections or fingersticks) • If there is excessive caregiver stress due to treatment complexity 	<ul style="list-style-type: none"> • If taking any medications without clear benefits in improving symptoms and/or comfort

Treatment regimen simplification refers to changing strategy to decrease the complexity of a medication regimen, e.g., fewer administration times, fewer fingerstick readings, decreasing the need for calculations (such as sliding scale insulin calculations or insulin-carbohydrate ratio calculations). Deintensification/deprescribing refers to decreasing the dose or frequency of administration of a treatment or discontinuing a treatment altogether. ADL, activities of daily living. †Consider adjustment of A1C goal if the patient has a condition that may interfere with erythrocyte life span/turnover.

Simplification of Complex Insulin Therapy

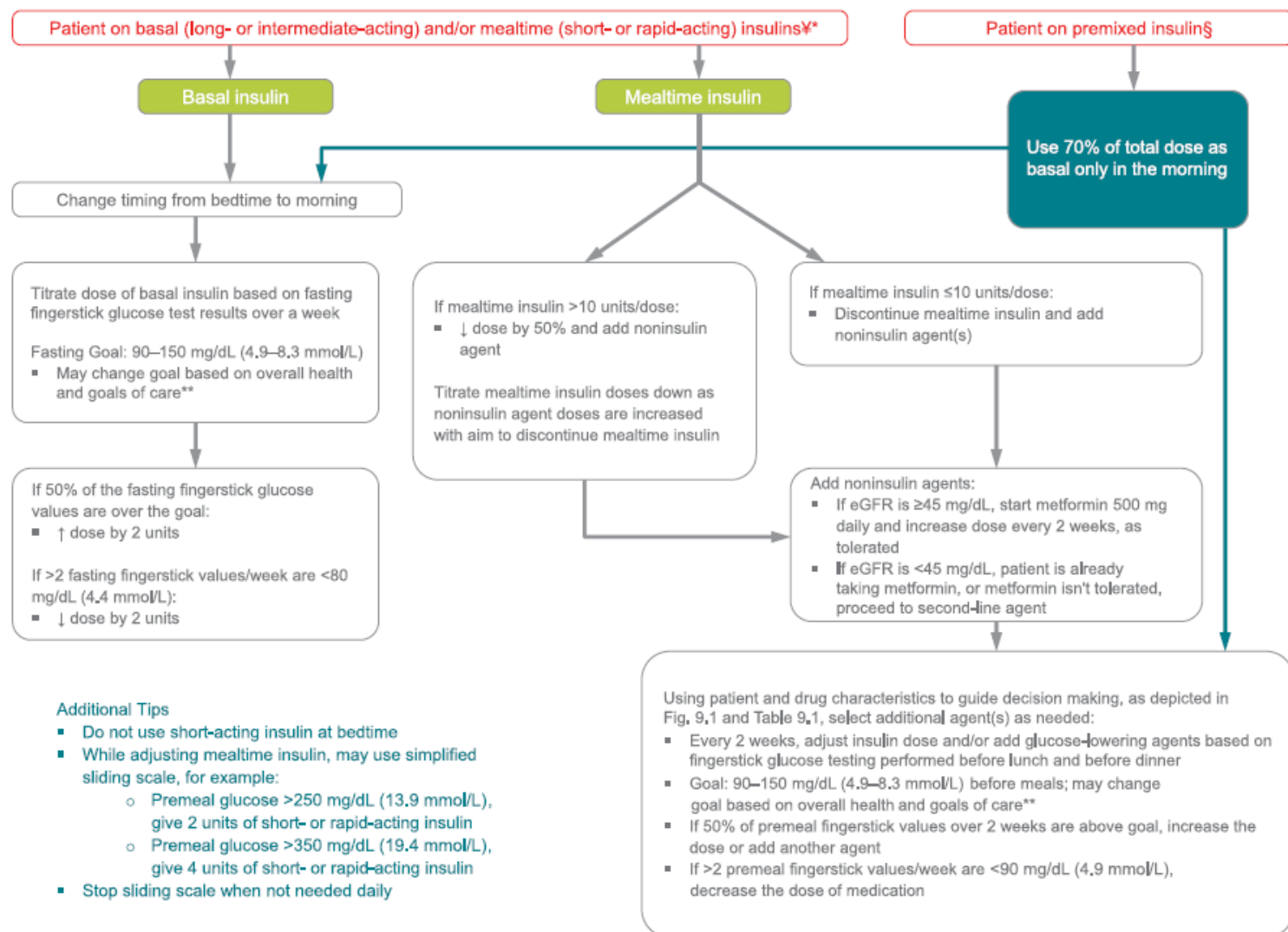


Fig. 12.1—Algorithm to simplify insulin regimen for older patients with type 2 diabetes. eGFR, estimated glomerular filtration rate. *Basal insulins: glargine U-100 and U-300, detemir, degludec, and human NPH. **See Table 12.1. ‡Mealtime insulins: short-acting (regular human insulin) or rapid-acting (lispro, aspart, and glulisine). §Premixed insulins: 70/30, 75/25, and 50/50 products. Adapted with permission from Munshi and colleagues (39,55,56).

Treatment in Skilled Nursing Facilities and Nursing Homes.

- 12.14 Consider diabetes education for the staff of long-term care facilities to improve the management of older adults with diabetes. **E**
- 12.15 Patients with diabetes residing in long-term care facilities need careful assessment to establish glycemic goals and to make appropriate choices of glucose-lowering agents based on their clinical and functional status. **E**

End-Of-Life Care.

12.16 When palliative care is needed in older adults with diabetes, strict blood pressure control may not be necessary, and withdrawal of therapy may be appropriate. Similarly, the intensity of lipid management can be relaxed, and withdrawal of lipid-lowering therapy may be appropriate. **E**

12.17 Overall comfort, prevention of distressing symptoms, and preservation of quality of life and dignity are primary goals for diabetes management at the end of life. **E**

Section 13.

Children and Adolescents

Type 1 Diabetes: Diabetes Self-Management Education and Support.

13.1 Youth with type 1 diabetes and parents/caregivers (for patients aged <18 years) should receive culturally sensitive and developmentally appropriate individualized diabetes self-management education and support according to national standards at diagnosis and routinely thereafter. **B**

Type 1 Diabetes: Nutrition Therapy.

13.2 Individualized medical nutrition therapy is recommended for children and adolescents with type 1 diabetes as an essential component of the overall treatment plan. **A**

13.3 Monitoring carbohydrate intake, whether by carbohydrate counting or experience-based estimation, is key to achieving optimal glycemic control. **B**

13.4 Comprehensive nutrition education at diagnosis, with annual updates, by an experienced registered dietitian is recommended to assess caloric and nutrition intake in relation to weight status and cardiovascular disease risk factors and to inform macronutrient choices. **E**

Type 1 Diabetes: Physical Activity and Exercise (1).

- 13.5** Exercise is recommended for all youth with type 1 diabetes with the goal of 60 min of moderate- to vigorous-intensity aerobic activity daily, with vigorous muscle-strengthening and bone-strengthening activities at least 3 days per week. **C**
- 13.6** Education about frequent patterns of glycemia during and after exercise, which may include initial transient hyperglycemia followed by hypoglycemia, is essential. Families should also receive education on prevention and management of hypoglycemia during and after exercise, including ensuring patients have a pre-exercise glucose level of 90-250 mg/dL (5-13 mmol/L) and accessible carbohydrates before engaging in activity, individualized according to the type/intensity of the planned physical activity. **E**

Type 1 Diabetes: Physical Activity and Exercise (2).

13.7 Patients should be educated on strategies to prevent hypoglycemia during exercise, after exercise, and overnight following exercise, which may include reducing prandial insulin dosing for the meal/snack preceding (and, if needed, following) exercise, increasing carbohydrate intake, eating bedtime snacks, using continuous glucose monitoring, and/or reducing basal insulin doses. **C**

13.8 Frequent glucose monitoring before, during, and after exercise, with or without use of continuous glucose monitoring, is important to prevent, detect, and treat hypoglycemia and hyperglycemia with exercise. **C**

Type 1 Diabetes: Psychosocial Issues (1).

- 13.9** At diagnosis and during routine follow-up care, assess psychosocial issues and family stresses that could impact diabetes management and provide appropriate referrals to trained mental health professionals, preferably experienced in childhood diabetes. **E**
- 13.10** Mental health professionals should be considered integral members of the pediatric diabetes multidisciplinary team. **E**
- 13.11** Encourage developmentally appropriate family involvement in diabetes management tasks for children and adolescents, recognizing that premature transfer of diabetes care to the child can result in diabetes burn-out nonadherence and deterioration in glycemic control. **A**

Type 1 Diabetes: Psychosocial Issues (2).

- 13.12 Providers should consider asking youth and their parents about social adjustment (peer relationships) and school performance to determine whether further intervention is needed. **B**
- 13.13 Assess youth with diabetes for psychosocial and diabetes-related distress, generally starting at 7-8 years of age. **B**
- 13.14 Offer adolescents time by themselves with their care provider(s) starting at age 12 years, or when developmentally appropriate. **E**

Type 1 Diabetes: Psychosocial Issues (3).

13.15 Starting at puberty, preconception counseling should be incorporated into routine diabetes care for all girls of childbearing potential. **A**

13.16 Begin screening youth with type 1 diabetes for eating disorders between 10 and 12 years of age. The Diabetes Eating Problems Survey – Revised (DEPS-R) is a reliable, valid, and brief screening tool for identifying disturbed eating behavior. **B**

Type 1 Diabetes: Glycemic Control (1).

13.17 The majority of children and adolescents with type 1 diabetes should be treated with intensive insulin regimens, either via multiple daily injections or continuous subcutaneous insulin infusion. **A**

13.18 All children and adolescents with type 1 diabetes should self-monitor glucose levels multiple times daily (up to 6-10 times/day), including premeal, prebedtime, and as needed for safety in specific situations such as exercise, driving, or the presence of symptoms of hypoglycemia. **B**

Type 1 Diabetes: Glycemic Control (2).

- 13.19** Continuous glucose monitoring should be considered in all children and adolescents with type 1 diabetes, whether using injections or continuous subcutaneous insulin infusion, as an additional tool to help improve glucose control. Benefits of continuous glucose monitoring correlate with adherence to ongoing use of the device. **B**
- 13.20** Automated insulin delivery systems appear to improve glycemic control and reduce hypoglycemia in children and should be considered in children with type 1 diabetes. **B**
- 13.21** An A1C target of <7.5% (58 mmol/mol) should be considered in children and adolescents with type 1 diabetes but should be individualized based on the needs and situation of the patient and family. **E**

Table 13.1—Blood glucose and A1C targets for children and adolescents with type 1 diabetes

Blood glucose goal range		A1C	Rationale
Before meals	Bedtime/overnight		
90–130 mg/dL (5.0–7.2 mmol/L)	90–150 mg/dL (5.0–8.3 mmol/L)	<7.5% (58 mmol/mol)	A lower goal (<7.0% [53 mmol/mol]) is reasonable if it can be achieved without excessive hypoglycemia

Type 1 Diabetes: Autoimmune Conditions.

13.22 Assess for additional autoimmune conditions soon after the diagnosis of type 1 diabetes and if symptoms develop. **E**

Type 1 Diabetes: Thyroid Disease.

- 13.23** Consider testing children with type 1 diabetes for antithyroid peroxidase and antithyroglobulin antibodies soon after the diagnosis. **B**
- 13.24** Measure thyroid-stimulating hormone concentrations at diagnosis when clinically stable or soon after glycemic control has been established. If normal, suggest rechecking every 1-2 years or sooner if the patient develops symptoms or signs suggestive of thyroid dysfunction, thyromegaly, an abnormal growth rate, or unexplained glycemic variability. **E**

Type 1 Diabetes: Celiac Disease.

- 13.25** Screen children with type 1 diabetes for celiac disease by measuring IgA tissue transglutaminase (tTG) antibodies, with documentation of normal total serum IgA levels, soon after the diagnosis of diabetes, or IgG to tTG and deamidated gliadin antibodies if IgA deficient. **E**
- 13.26** Repeat screening within 2 years of diabetes diagnosis and then again after 5 years and consider more frequent screening in children who have symptoms or a first-degree relative with celiac disease. **B**
- 13.27** Individuals with biopsy-confirmed celiac disease should be placed on a gluten-free diet and have a consultation with a dietitian experienced in managing both diabetes and celiac disease. **B**

Type 1 Diabetes: Hypertension Screening.

13.28 Blood pressure should be measured at each routine visit. Children found to have high-normal blood pressure (systolic blood pressure or diastolic blood pressure $\geq 90^{\text{th}}$ percentile for age, sex, and height) or hypertension (systolic blood pressure or diastolic blood pressure $\geq 95^{\text{th}}$ percentile for age, sex, and height) should have elevated blood pressure confirmed on 3 separate days. **B**

Type 1 Diabetes: Hypertension Treatment (1).

13.29 Initial treatment of high-normal blood pressure (systolic blood pressure or diastolic blood pressure $\geq 90^{\text{th}}$ percentile for age, sex, and height) includes dietary modification and increased exercise, if appropriate, aimed at weight control. If target blood pressure is not reached within 3-6 months of initiating lifestyle intervention, pharmacologic treatment should be considered. **E**

13.30 In addition to lifestyle modification, pharmacologic treatment of hypertension (systolic blood pressure or diastolic blood pressure $\geq 95^{\text{th}}$ percentile for age, sex, and height) should be considered as soon as hypertension is confirmed. **E**

Type 1 Diabetes: Hypertension Treatment (2).

13.31 ACE inhibitors or angiotensin receptor blockers should be considered for the initial pharmacologic treatment of hypertension **E** in children and adolescents, following reproductive counseling due to the potential teratogenic effects of both drug classes. **E**

13.32 The goal of treatment is blood pressure consistently <90th percentile for age, sex, and height. **E**

Type 1 Diabetes: Dyslipidemia Testing.

13.33 Obtain a fasting lipid profile in children ≥ 10 years of age soon after the diagnosis of diabetes (after glucose control has been established). **E**

13.34 If LDL cholesterol values are within the accepted risk level (< 100 mg/dL [2.6 mmol/L]), a lipid profile repeated every 3-5 years is reasonable. **E**

Type 1 Diabetes: Dyslipidemia Treatment.

- 13.35** If lipids are abnormal, initial therapy should consist of optimizing glucose control and medical nutrition therapy using a Step 2 American Heart Association diet to decrease the amount of saturated fat to 7% of total calories and dietary cholesterol to 200 mg/day, which is safe and does not interfere with normal growth and development. **B**
- 13.36** After the age of 10 years, addition of a statin is suggested in patients who, despite medical nutrition therapy and lifestyle changes, continue to have LDL cholesterol >160 mg/dL (4.1 mmol/L) or LDL cholesterol >130 mg/dL (3.4 mmol/L) and one or more cardiovascular disease risk factors, following reproductive counseling because of the potential teratogenic effects of statins. **E**
- 13.37** The goal of therapy is an LDL cholesterol value <100 mg/dL (2.6 mmol/L). **E**

Type 1 Diabetes: Smoking.

- 13.38 Elicit a smoking history at initial and follow-up diabetes visits; discourage smoking in youth who do not smoke, and encourage smoking cessation in those who do smoke. **A**
- 13.39 e-Cigarette use should be discouraged. **B**

Type 1 Diabetes: Nephropathy Screening.

13.40 Annual screening for albuminuria with a random (morning sample preferred to avoid effects of exercise) spot urine sample for albumin-to-creatinine ratio should be considered at puberty or at age >10 years, whichever is earlier, once the child has had diabetes for 5 years. **B**

Type 1 Diabetes: Nephropathy Treatment.

13.41 An ACE inhibitor or an angiotensin receptor blocker, titrated to normalization of albumin excretion, may be considered when elevated urinary albumin-to-creatinine ratio (>30 mg/g) is documented (two of three urine samples obtained over a 6-month interval following efforts to improve glycemic control and normalize blood pressure). **E**

Type 1 Diabetes: Retinopathy.

13.42 An initial dilated and comprehensive eye examination is recommended once youth have had type 1 diabetes for 3-5 years, provided they are age ≥ 10 years or puberty has started, whichever is earlier. **B**

13.43 After the initial examination, annual routine follow-up is generally recommended. Less frequent examinations, every 2 years, may be acceptable on the advice of an eye care professional and based on risk factor assessment. **E**

Type 1 Diabetes: Neuropathy.

13.44 Consider an annual comprehensive foot exam at the start of puberty or at age ≥ 10 years, whichever is earlier, once the youth has had type 1 diabetes for 5 years. **B**

Type 2 Diabetes in Youth and Adolescents.

- Type 2 diabetes in youth has increased over the past 20 years with an estimated incidence of ~5,000 new cases per year in the U.S.
- Type 2 diabetes in youth is different not only from type 1 diabetes but also from type 2 diabetes in adults and has unique features:
 - More rapidly progressive decline in β -cell function
 - Accelerated development of diabetes complications

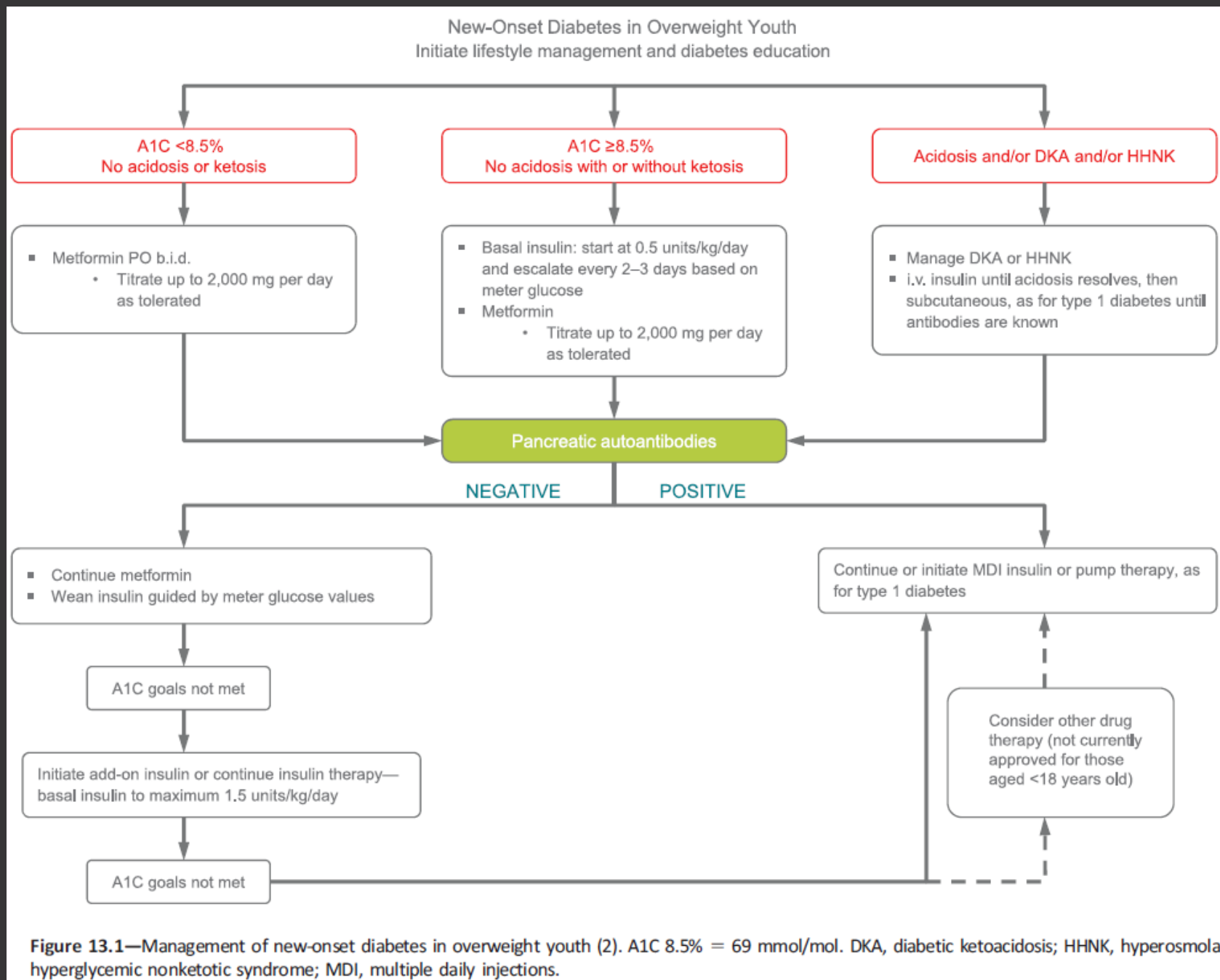


Figure 13.1—Management of new-onset diabetes in overweight youth (2). A1C 8.5% = 69 mmol/mol. DKA, diabetic ketoacidosis; HHNK, hyperosmolar hyperglycemic nonketotic syndrome; MDI, multiple daily injections.

Type 2 Diabetes: Screening and Diagnosis (1).

- 13.45** Risk-based screening for prediabetes and/or type 2 diabetes should be considered in children and adolescents after the onset of puberty or ≥ 10 years of age, whichever occurs earlier, who are overweight (BMI $\geq 85^{\text{th}}$ percentile) or obese (BMI $\geq 95^{\text{th}}$ percentile) and who have one or more additional risk factors for diabetes (see **Table 2.4** for evidence grading of other risk factors).
- 13.46** If tests are normal, repeat testing at a minimum of 3-year intervals **E**, or more frequently if BMI is increasing. **C**

Type 2 Diabetes: Screening and Diagnosis (2).

13.47 Fasting plasma glucose, 2-h plasma glucose during a 75-g oral glucose tolerance test, and A1C can be used to test for prediabetes or diabetes in children and adolescents. **B**

13.48 Children and adolescents with overweight/obesity in whom the diagnosis of type 2 diabetes is being considered should have a panel of pancreatic autoantibodies tested to exclude the possibility of autoimmune type 1 diabetes. **B**

Type 2 Diabetes: Lifestyle Management (1).

- 13.49** All youth with type 2 diabetes and their families should receive comprehensive diabetes self-management education and support that is specific to youth with type 2 diabetes and is culturally competent. **B**
- 13.50** Youth with overweight/obesity and type 2 diabetes and their families should be provided with developmentally and culturally appropriate comprehensive lifestyle programs that are integrated with diabetes management to achieve 7-10% decrease in excess weight. **C**

Type 2 Diabetes: Lifestyle Management (2).

- 13.51** Given the necessity of long-term weight management for children and adolescents with type 2 diabetes, lifestyle intervention should be based on a chronic care model and offered in the context of diabetes care. **E**
- 13.52** Youth with diabetes, like all children, should be encouraged to participate in at least 30-60 min of moderate to vigorous physical activity at least 5 days per week (and strength training on at least 3 days/week) **B** and to decrease sedentary behavior. **C**
- 13.53** Nutrition for youth with type 2 diabetes, like all children, should focus on healthy eating patterns that emphasize consumption of nutrient-dense, high-quality foods and decreased consumption of calorie-dense, nutrient-poor foods, particularly sugar-added beverages. **B**

Type 2 Diabetes: Glycemic Targets (1).

13.54 Home self-monitoring of blood glucose regimens should be individualized, taking into consideration the pharmacologic treatment of the patient. **E**

13.55 A1C should be measured every 3 months. **E**

13.56 A reasonable A1C target for most children and adolescents with type 2 diabetes treated with oral agents alone is <7% (53 mmol/mol). More stringent A1C targets (such as <6.5% [48 mmol/mol]) may be appropriate for selected individual patients if this can be achieved without significant hypoglycemia or other adverse effects of treatment. Appropriate patients might include those with short duration of diabetes and lesser degrees of β -cell dysfunction and patients treated with lifestyle or metformin only who achieve significant weight improvements. **E**

Type 2 Diabetes: Glycemic Targets (2).

13.57 A1C targets for patients on insulin should be individualized, taking into account the relatively low rates of hypoglycemia in youth-onset type 2 diabetes. **E**

Type 2 Diabetes: Pharmacologic Management (1).

- 13.58** Initiate pharmacologic therapy, in addition to lifestyle therapy, at diagnosis of type 2 diabetes. **A**
- 13.59** In incidentally diagnosed or metabolically stable patients (A1C <8.5% [69 mmol/mol] and asymptomatic), metformin is the initial pharmacologic treatment of choice if renal function is normal. **A**
- 13.60** Youth with marked hyperglycemia (blood glucose ≥ 250 mg/dL [13.9 mmol/L], A1C $\geq 8.5\%$ [69 mmol/mol]) without acidosis at diagnosis who are symptomatic with polyuria, polydipsia, nocturia, and/or weight loss should be treated initially with basal insulin while metformin is initiated and titrated. **B**

Type 2 Diabetes: Pharmacologic Management (2).

- 13.61** In patients with ketosis/ketoacidosis, treatment with subcutaneous or intravenous insulin should be initiated to rapidly correct the hyperglycemia and the metabolic derangement. Once acidosis is resolved, metformin should be initiated while subcutaneous insulin therapy is continued. **A**
- 13.62** In individuals presenting with severe hyperglycemia (blood glucose ≥ 600 mg/dL [33.3 mmol/L]), consider assessment for hyperglycemic hyperosmolar nonketotic syndrome. **A**
- 13.63** If the A1C target is no longer met with metformin monotherapy, or if contraindications or intolerable side effects of metformin develop, basal insulin therapy should be initiated. **B**

Type 2 Diabetes: Pharmacologic Management (3).

- 13.64** Patients treated with basal insulin up to 1.5 units/kg/day who do not meet A1C target should be moved to multiple daily injections with basal and premeal bolus insulins. **E**
- 13.65** In patients initially treated with insulin and metformin who are meeting glucose targets based on home blood glucose monitoring, insulin can be tapered over 2-6 weeks by decreasing the insulin dose 10-30% every few days. **B**
- 13.66** Use of medications not approved by the U.S. Food and Drug Administration for youth with type 2 diabetes is not recommended outside of research trials. **B**

Type 2 Diabetes: Metabolic Surgery.

- 13.67** Metabolic surgery may be considered for the treatment of adolescents with type 2 diabetes who are markedly obese (BMI >35 kg/m²) and who have uncontrolled glycemia and/or serious comorbidities despite lifestyle and pharmacologic intervention. **A**
- 13.68** Metabolic surgery should be performed only by an experienced surgeon working as part of a well-organized and engaged multidisciplinary team including surgeon, endocrinologist, nutritionist, behavioral health specialist, and nurse. **A**

Type 2 Diabetes: Nephropathy (1).

13.69 Blood pressure should be measured at every visit. **A**

13.70 Blood pressure should be optimized to reduce risk and/or slow the progression of diabetic kidney disease. **A**

13.71 If blood pressure is >95th percentile for age, sex, and height, increased emphasis should be placed on lifestyle management to promote weight loss. If blood pressure remains above the 95th percentile after 6 months, antihypertensive therapy should be initiated. **C**

13.72 Initial therapeutic options include ACE inhibitors or angiotensin receptor blockers. Other blood pressure-lowering agents may be added as needed. **C**

Type 2 Diabetes: Nephropathy (2).

- 13.73 Protein intake should be at the recommended daily allowance of 0.8 g/kg/day. **E**
- 13.74 Urine albumin-to-creatinine ratio should be obtained at the time of diagnosis and annually thereafter. An elevated urine albumin-to-creatinine ratio (>30 mg/g creatinine) should be confirmed on two of three samples. **B**
- 13.75 Estimated glomerular filtration rate should be determined at the time of diagnosis and annually thereafter. **E**

Type 2 Diabetes: Nephropathy (3).

- 13.76** In nonpregnant patients with diabetes and hypertension, either an ACE inhibitor or an angiotensin receptor blocker is recommended for those with modestly elevated urinary albumin-to-creatinine ratio (30-299 mg/g creatinine) and is strongly recommended for those with urinary albumin-to-creatinine ratio >300 mg/g creatinine and/or estimated glomerular filtration rate <60 mL/min/1.73m². **E**
- 13.77** For those with nephropathy, continued monitoring (yearly urinary albumin-to-creatinine ratio, estimated glomerular filtration rate, and serum potassium) may aid in assessing adherence and detecting progression of disease. **E**
- 13.78** Referral to nephrology is recommended in case of uncertainty of etiology, worsening urinary albumin-to-creatinine ratio, or decrease in estimated glomerular filtration rate. **E**

Type 2 Diabetes: Neuropathy.

- 13.79** Youth with type 2 diabetes should be screened for the presence of neuropathy by foot examination at diagnosis and annually. The examination should include inspection, assessment of foot pulses, pinprick and 10-g monofilament sensation tests, testing of vibration sensation using 128-Hz tuning fork, and ankle reflexes. **C**
- 13.80** Prevention should focus on achieving glycemic targets. **C**

Type 2 Diabetes: Retinopathy.

- 13.81 Screening for retinopathy should be performed by dilated fundoscopy or retinal photography at or soon after diagnosis and annually thereafter. **C**
- 13.82 Optimizing glycemia is recommended to decrease the risk or slow the progression of retinopathy. **B**
- 13.83 Less frequent examination (every 2 years) may be considered if there is adequate glycemic control and a normal eye exam. **C**

Type 2 Diabetes: Nonalcoholic Fatty Liver Disease.

- 13.84** Evaluation for nonalcoholic fatty liver disease (by measuring aspartate aminotransferase and alanine aminotransferase) should be done at diagnosis and annually thereafter. **B**
- 13.85** Referral to gastroenterology should be considered for persistently elevated or worsening transaminases. **B**

Type 2 Diabetes: Obstructive Sleep Apnea.

13.86 Screening for symptoms of sleep apnea should be done at each visit, and referral to a pediatric sleep specialist for evaluation and a polysomnogram, if indicated, is recommended. Obstructive sleep apnea should be treated when documented. **B**

Type 2 Diabetes: Polycystic Ovary Syndrome.

- 13.87 Evaluate for polycystic ovary syndrome in female adolescents with type 2 diabetes, including laboratory studies when indicated. **B**
- 13.88 Oral contraceptive pills for treatment of polycystic ovary syndrome are not contraindicated for girls with type 2 diabetes. **C**
- 13.89 Metformin in addition to lifestyle modification is likely to improve the menstrual cyclicity and hyperandrogenism in girls with type 2 diabetes. **E**

Type 2 Diabetes: Cardiovascular Disease.

13.90 Intensive lifestyle intervention focusing on weight loss, dyslipidemia, hypertension, and dysglycemia are important to prevent over macrovascular disease in early adulthood. **E**

Type 2 Diabetes: Dyslipidemia (1).

- 13.91** Lipid testing should be performed when initial glycemic control has been achieved and annually thereafter. **B**
- 13.92** Optimal goals are LDL cholesterol <100 mg/dL (2.6 mmol/L), HDL cholesterol >35 mg/dL (0.905 mmol/L), and triglycerides <150 mg/dL (1.7 mmol/L). **E**
- 13.93** If LDL cholesterol is >130 mg/dL, blood glucose control should be maximized and dietary counseling should be provided using the American Heart Association Step 2 diet. **E**

Type 2 Diabetes: Dyslipidemia (2).

- 13.94** If LDL cholesterol remains above goal after 6 months of dietary intervention, initiate therapy with statin, with goal of LDL <100 mg/dL. **B**
- 13.95** If triglycerides are >400 mg/dL (4.7 mmol/L) fasting or >1,000 mg/dL (11.6 mmol/L) nonfasting, optimize glycemia and begin fibrate, with a goal of <400 mg/dL (4.7 mmol/L) fasting (to reduce risk for pancreatitis). **C**

Type 2 Diabetes: Cardiac Function Testing.

13.96 Routine screening for heart disease with electrocardiogram, echocardiogram, or stress testing is not recommended in asymptomatic youth with type 2 diabetes. **B**

Type 2 Diabetes: Psychosocial Factors (1).

- 13.97** Providers should assess social context, including potential food insecurity, housing stability, and financial barriers, and apply that information to treatment decisions. **E**
- 13.98** Use patient-appropriate standardized and validated tools to assess for diabetes distress and mental/behavioral health in youth with type 2 diabetes, with attention to symptoms of depression and eating disorders, and refer to specialty care when indicated. **B**
- 13.99** When choosing glucose-lowering or other medications for youth with overweight/obesity and type 2 diabetes, consider medication-taking behavior and their effect on weight. **E**

Type 2 Diabetes: Psychosocial Factors (2).

- 13.100** Starting at puberty, preconception counseling should be incorporated into routine diabetes clinic visits for all females of childbearing potential because of the adverse pregnancy outcomes in this population. **A**
- 13.101** Patients should be screened for smoking and alcohol use at diagnosis and regularly thereafter. **C**

Type 2 Diabetes: Transition from Pediatric to Adult Care.

13.102 Pediatric diabetes providers should begin to prepare youth for transition to adult health care in early adolescents and, at the latest, at least 1 year before the transition. **E**

13.103 Both pediatric and adult diabetes care providers should provide support and resources for transitioning young adults. **E**

13.104 Youth with type 2 diabetes should be transferred to an adult-oriented diabetes specialist when deemed appropriate by the patient and provider. **E**

Section 14.

Management of Diabetes in Pregnancy

Preconception Counseling.

- 14.1 Starting at puberty and continuing in all women with reproductive potential, preconception counseling should be incorporated into routine diabetes care. **A**
- 14.2 Family planning should be discussed and effective contraception should be prescribed and used until a woman is prepared and ready to become pregnant. **A**
- 14.3 Preconception counseling should address the importance of glycemic management as close to normal as is safely possible, ideally A1C <6.5% (48 mmol/mol), to reduce the risk of congenital anomalies, preeclampsia, macrosomia, and other complications. **B**

Preconception Care.

- 14.4** Women with preexisting type 1 or type 2 diabetes who are planning pregnancy or who have become pregnant should be counseled on the risk of development and/or progression of diabetic retinopathy. Dilated eye examinations should occur ideally before pregnancy or in the first trimester, and then patients should be monitored every trimester and for 1-year postpartum as indicated by the degree of retinopathy and as recommended by the eye care provider. **B**
- 14.5** Women with preexisting diabetes should ideally be managed in a multidisciplinary clinic including an endocrinologist, maternal-fetal medicine specialist, dietitian, and diabetes education, when available. **B**

Glycemic Targets in Pregnancy.

- 14.6** Fasting and postprandial self-monitoring of blood glucose are recommended in both gestational diabetes mellitus and preexisting diabetes in pregnancy to achieve glycemic control. Some women with preexisting diabetes should also test blood glucose preprandially. **B**
- 14.7** Due to increased red blood cell turnover, A1C is slightly lower in normal pregnancy than in normal nonpregnant women. Ideally, the A1C target in pregnancy is <6% (42 mmol/mol) if this can be achieved without significant hypoglycemia, but the target may be relaxed to <7% (53 mmol/mol) if necessary to prevent hypoglycemia. **B**

Glucose Targets for Women with Type 1 and Type 2 Diabetes.

- Fasting <95 mg/dL (5.3 mmol/L) and either:
 - One-hour postprandial <140 mg/dL (7.8 mmol/L) or
 - Two-hour postprandial <120 mg/dL (6.7 mmol/L)

Management of Gestational Diabetes Mellitus.

- 14.8** Lifestyle change is an essential component of management of gestational diabetes mellitus and may suffice for the treatment of many women. Medications should be added if needed to achieve glycemic targets. **A**
- 14.9** Insulin is the preferred medication for treating hyperglycemia in gestational diabetes mellitus as it does not cross the placenta to measurable extent. Metformin and glyburide should not be used as first-line agents, as both cross the placenta to the fetus. All oral agents lack long-term safety data. **A**
- 14.10** Metformin, when used to treat polycystic ovary syndrome and induce ovulation, should be discontinued once pregnancy has been confirmed. **A**

Management of Preexisting Type 1 Diabetes and Type 2 Diabetes in Pregnancy.

14.11 Insulin is the preferred agent for management of both type 1 diabetes and type 2 diabetes in pregnancy because it does not cross the placenta and because oral agents are generally insufficient to overcome the insulin resistance in type 2 diabetes and are ineffective in type 1 diabetes. **E**

Preeclampsia and Aspirin.

14.12 Women with type 1 or type 2 diabetes should be prescribed low-dose aspirin 60-150 mg/day (usual dose 81 mg/day) from the end of the first trimester until the baby is born in order to lower the risk of preeclampsia. **A**

Pregnancy and Drug Considerations.

- 14.13** In pregnancy patients with diabetes and chronic hypertension, blood pressure targets of 120-160/80-105 mmHg are suggested in the interest of optimizing long-term maternal health and minimizing impaired fetal growth. **E**
- 14.14** Potentially teratogenic medications (i.e., ACE inhibitors, angiotensin receptor blockers, statins) should be avoided in sexually active women of childbearing age who are not using reliable contraception. **B**

Section 15.

Diabetes Care in the Hospital

Hospital Care Delivery Standards.

15.1 Perform an A1C on all patients with diabetes or hyperglycemia (blood glucose >140 mg/dL [7.8 mmol/L]) admitted to the hospital if not performed in the prior 3 months. **B**

Physician Order Entry.

15.2 Insulin should be administered using validated written or computerized protocols that allow for predefined adjustments in the insulin dosage based on glycemic fluctuations. E

Diabetes Care Providers in the Hospital.

15.3 When caring for hospitalized patients with diabetes, consider consulting with a specialized diabetes or glucose management team where possible. E

Glycemic Targets in Hospitalized Patients.

15.4 Insulin therapy should be initiated for treatment of persistent hyperglycemia starting at a threshold ≥ 180 mg/dL (10.0 mmol/L). Once insulin therapy is started, a target glucose range of 140-180 mg/dL (7.8-10.0 mmol/L) is recommended for the majority of critically ill patients and noncritically ill patients.

A

15.5 More stringent goals, such as 110-140 mg/dL (6.1-7.8 mmol/L), may be appropriate for selected patients, if this can be achieved without significant hypoglycemia. **C**

Antihyperglycemic Agents in Hospitalized Patients.

- 15.6** Basal insulin or a basal plus bolus correction insulin regimen is the preferred treatment for noncritically ill hospitalized patients with poor oral intake or those who are taking nothing by mouth. An insulin regimen with basal, prandial, and correction components is the preferred treatment for noncritically ill hospitalized patients with good nutritional intake. **A**
- 15.7** Sole use of sliding scale insulin in the inpatient hospital setting is strongly discouraged. **A**

Hypoglycemia.

- 15.8** A hypoglycemia management protocol should be adopted and implemented by each hospital or hospital system. A plan for preventing and treating hypoglycemia should be established for each patient. Episodes of hypoglycemia in the hospital should be documented in the medical record and tracked. **E**
- 15.9** The treatment regimen should be reviewed and changed as necessary to prevent further hypoglycemia when a blood glucose value of <70 mg/dL (3.9 mmol/L) is documented. **C**

Table 15.1—Levels of hypoglycemia (21)

Level	Glycemic criteria/description
Level 1	Glucose <70 mg/dL (3.9 mmol/L) and glucose ≥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

Perioperative Care.

Many standards for perioperative care lack a robust evidence base. However, the following approach may be considered:

1. Target glucose range for the perioperative period should be 80-180 mg/dL (4.4-10.0 mmol/L).
2. Perform a preoperative risk assessment for patients at high risk for ischemic heart disease and those with autonomic neuropathy or renal failure.
3. Withhold metformin the day of surgery.
4. Withhold any other oral hypoglycemic agents the morning of surgery or procedure and give half of NPH dose or 60-80% doses of long-acting analog or pump basal insulin.
5. Monitor blood glucose at least every 4-6 h while NPO and dose with short- or rapid-acting insulin as needed.

Transition from the Acute Care Setting.

15.10 There should be a structured discharge plan tailored to the individual patient with diabetes. **B**

Section 16.

Diabetes Advocacy

Select Advocacy Statements.

- ***Insulin Access and Affordability Working Group: Conclusions and Recommendations***
- ***Diabetes care in the School Setting***
- ***Care of Young Children with Diabetes in the Child Care Setting***
- ***Diabetes and Driving***
- ***Diabetes and Employment***
- ***Diabetes Management in Correctional Institutions***



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Thank you!