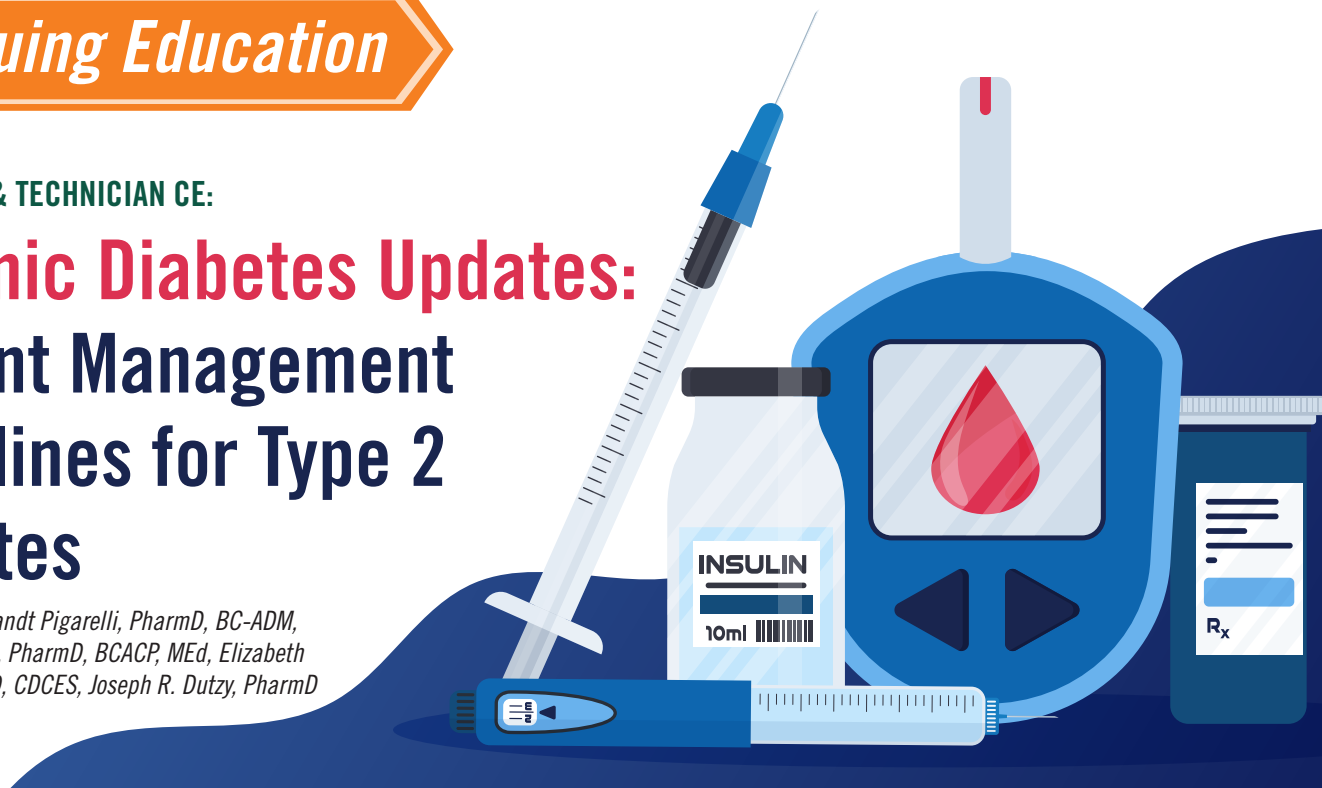


PHARMACIST & TECHNICIAN CE:

Dynamic Diabetes Updates: Current Management Guidelines for Type 2 Diabetes

by Denise L. Walbrandt Pigarelli, PharmD, BC-ADM,
Francesca Johnson, PharmD, BCACP, MEd, Elizabeth
A. Buckley, PharmD, CDCES, Joseph R. Dutzy, PharmD



Although there are subtle differences in current treatment recommendations from various stakeholders, the underlying similarities include ongoing updates based on emerging evidence, a focus on comprehensive, inclusive patient-centered shared decision-making, and the importance of managing comorbidities. Pharmacotherapy recommendations are to be individualized based on social determinants of health, glycemia, and presence of comorbidities and complications. The complications-centric focus includes using agents that reduce the risk of cardiovascular and kidney (cardiorenal) disease progression independent of glycemic status. In addition, the important role of obesity management continues to be more pronounced across all guidelines as a cornerstone of care for persons with diabetes. An overview of the similarities and differences among common diabetes guidelines in the United States are included here.

The American Diabetes Association (ADA) Standards of Care

The American Diabetes Association Standards of Care in Diabetes are published annually in the January supplement to Diabetes Care and are updated continually

CE FOR PHARMACISTS & TECHNICIANS

COMPLETE ARTICLE AND CE EXAM
AVAILABLE ONLINE: WWW.PSWI.ORG

Learning Objectives

- Evaluate the key updates to the 2024 ADA Standards of Care in Diabetes and the impact on therapeutic decision-making
- Assess modifications and updates in the 2023 ACE Algorithm for diabetes management and the impact of these changes on patient care, medication selection, and monitoring practices
- Discuss the similarities and differences among guidelines, especially related to how pharmacists can integrate them collaboratively to promote a comprehensive, patient-centered approach to diabetes management
- Examine the nuances of diabetes management in people with diabetes over age 65 based on the Endocrine Society guidelines for the treatment of diabetes in older adults, with considerations for their specific needs
- Explain the nuances of treating diabetes in youth and during pregnancy

on the ADA website.^{1,2} The Standards are also available via smartphone app from Google Play and the App Store and contain helpful resources such as a hemoglobin A1C (A1C) to estimated average glucose calculator.³ The 2024 Standards included reinforcement of previous changes, and further minor changes to clarify and reflect new evidence.¹ In 2023, the ADA Standards of Care were congruent with the 2022 joint consensus statement by the ADA with the European Association for the Study of Diabetes (EASD) (published in October 2022), which focused more on a holistic, team-based, patient-centered approach including formal self-management training for people living with diabetes.⁴ The

continued use of person-first and inclusive language to help support and empower people with diabetes is highlighted in both guidelines, with an additional focus on social determinants of health.

The joint statement proposed that providers recommend a therapeutic approach with the efficacy to achieve and maintain treatment goals in the following four areas: glycemia, weight, cardiovascular risk factors, and cardiorenal protection.⁴ Regarding glycemic management, medications should be selected that meet the needs, values, and goals of the person with diabetes (Table 1), including consideration for social determinants of health. Typically, initial glucose-lowering therapy for type

2 diabetes consists of metformin and/or other agents that meet needs for glycemic management, with a focus on improving outcomes with compelling indications such as existing atherosclerotic cardiovascular disease (ASCVD), heart failure (HF), or chronic kidney disease (CKD).

The current ADA algorithm (Figure 9.3) for the use of glucose-lowering medications in the management of type 2 diabetes recommends healthy lifestyle behaviors, diabetes self-management education and support (DSMES), and social determinants of health assessment as a starting point for all people with diabetes, and then is split into two pathways.⁵

The left pathway of the algorithm recommends initiating drug therapy for cardiorenal risk reduction in high-risk individuals regardless of glycemic status.⁵ Glucagon-like peptide 1 receptor agonists (GLP-1 RA) and/or sodium-glucose cotransporter 2 inhibitors (SGLT2i) are prioritized based on established ASCVD, high risk for ASCVD (> 55 years of age with two or more risk factors including obesity, hypertension, smoking, dyslipidemia, or albuminuria), HF, or CKD. Sodium-glucose cotransporter 2

inhibitors with labeled indications or published evidence supporting benefit are the preferred agents in persons with HF or CKD. However, due to reduced glycemic benefit of the SGLT2i agents at estimated glomerular filtration rates (eGFR) rates < 45 ml/min, GLP-1 RAs are preferred for glycemic management in persons with more advanced CKD (eGFR < 30 ml/min). GLP-1 RA drugs with labeled indications or published evidence of benefit are recommended at the same level as SGLT2i in persons with ASCVD (established or at risk), or in combination if a person has CKD. Alternatively, pioglitazone may be considered for secondary prevention of ASCVD in combination with either a GLP-1 RA or SGLT2i (with labeled indication or published evidence for benefit) if there is no concomitant diagnosis of heart failure.

The right pathway of the algorithm recommends initiation of drug therapy for glycemic management and for achievement and maintenance of weight management goals.⁵ The first column indicates medications with the greatest ability to lower A1C, including the most potent agents of insulin, tirzepatide (dual GLP-1 RA/glucose-dependent insulinotropic

polypeptide [GIP] agent), semaglutide, high dose dulaglutide, or medication combinations. The next highest A1C-lowering may be achieved with exenatide, metformin, SGLT2i, sulfonyleureas, or pioglitazone; dipeptidyl peptidase 4 inhibitors (DPP4i) and alpha-glucosidase inhibitors have lower ability to reduce A1C. The second column is a notable update for the guidelines to include larger body size/obesity and weight management as a significant consideration. Weight loss recommendations for people with type 2 diabetes were intensified in section 8 of the guidelines and added specifically into Figure 9.3. The initial weight loss target is 5% to 10% of body weight, and a 10-15% loss can be an additional goal for potential diabetes remission. This can be pursued through intensive evidence-based, structured programs with consideration for metabolic surgery when indicated. The glucose-lowering medication with the highest weight loss efficacy is tirzepatide followed by drugs in the GLP-1 RA class: semaglutide > dulaglutide/liraglutide > exenatide. Weight reduction is also possible with agents in the SGLT2i class, though a smaller amount of weight loss is expected.

TABLE 1. General Glycemia Goals for Different Populations^{1,9-10,14,19,20,22}

Target	Youth and Non-pregnant Adults		Older Adults		Pregnant Adults
	AACE ^{9,10}	ADA ^{1,14}	ADA ¹⁹	ES ²⁰	
A1C Individualized	< 6.5%	< 7%	< 7% to 8%	< 7.5% to < 8.5%	< 6%
Fasting Glucose	< 110 mg/dL	80-130 mg/dL	80-180 mg/dL	90-180 mg/dL	70 - 95 mg/dL
One-hour Postprandial Glucose	Not stated		Not stated		110 -140 mg/dL
Two-hour Postprandial Glucose	< 140 mg/dL	< 180 mg/dL	Not stated		100 - 120 mg/dL
Bedtime	Not stated		80-200 mg/dL	90-250 mg/dL	Not stated
CGM Parameters	ADA^{1,14} (non-pregnant adults only; no youth CGM goals)		ADA^{1,14}		ADA²²
Target Range	70 - 180 mg/dL (goal > 70% of time)		70 - 180 mg/dL (goal >50% of time)		63 -140 mg/dL (goal > 70% of time)
Below Range	< 70 mg/dL (goal < 4% of time)		<70 mg/dL (goal < 1% of time)		< 63 mg/dL (goal < 4% of time)
Significantly Below Range	< 54 mg/dL (goal < 1% of time)		<54 mg/dl (goal < 1% of time)		< 54 mg/dL (goal < 1% of time)
Abbreviations: A1C = hemoglobin A1C, AACE = American Association of Clinical Endocrinology, ADA = American Diabetes Association, CGM = continuous glucose monitor, ES = Endocrine Society					

In the context of cardiovascular risk factor management, strategies to detect and optimize risk factors are crucial.⁵ This includes screening, surveillance, and management to meet goals for blood pressure, lipids, antithrombotic needs, and support for tobacco cessation. Cardiorenal protection is also a significant consideration, and initiating a glucose-lowering medication with evidence for protection is recommended regardless of A1C values for individuals with established or high risk for ASCVD, HF, or CKD. Specific agents within the SGLT2i class have gained FDA approval for use in patients with or without diabetes for the indications of HF (dapagliflozin, empagliflozin) and CKD (dapagliflozin, empagliflozin).^{6,7} In addition, new data is emerging regarding the potential impact of GLP-1 RAs in persons with HF.⁸ Table 2 lists the current agents with supporting evidence and FDA approval for current compelling indications within each class.^{1,9-10}

Additional sections of the ADA guideline address two more compelling indications for certain glucose-lowering therapies. Section 4 includes subsections about assessment and management of several diabetes comorbidities, including nonalcoholic fatty liver disease (NAFLD).¹¹ Pioglitazone, liraglutide, and subcutaneous semaglutide are beneficial medications for people with type 2 diabetes and NAFLD. Section 10 is about cardiovascular disease and risk management, and table 10.3B details primary and secondary outcomes for 6 cardiovascular and cardiorenal trials published after the FDA required cardiovascular outcome reporting beginning in 2008.¹² Secondary outcomes for subcutaneous semaglutide and dulaglutide reveal beneficial effects for stroke risk reduction.

The American Association of Clinical Endocrinology (AACE)

Clinical Practice Guidelines and Comprehensive Type 2 Diabetes Management Algorithm

The American Association of Clinical Endocrinology Clinical Practice Guidelines on type 2 diabetes mellitus were updated in 2022, with a new algorithm released in May of 2023.^{9,10} The most recent version is

TABLE 2. Current Agents with Evidence for Cardiorenal Protection^{1,9,10}

ASCVD Evidence		CKD Evidence		HF Evidence	Stroke/TIA Evidence (AACE)
GLP-1 RA: Dulaglutide Liraglutide Semaglutide	SGLT2i: Canagliflozin Dapagliflozin Empagliflozin	SGLT2i: Canagliflozin Dapagliflozin* Empagliflozin* <i>Start regardless of A1C: If eGFR > 20 ml/min and UACR > 30 mg/g</i>	GLP-1 RA: Dulaglutide Liraglutide Semaglutide <i>(Driven by albuminuria outcomes)</i>	SGLT2i: Canagliflozin Dapagliflozin* Empagliflozin* Ertugliflozin	GLP-1 RA: Dulaglutide Semaglutide
					TZD: Pioglitazone
<small>*approved to use even in the absence of diabetes mellitus Abbreviations: AACE = American Association of Clinical Endocrinology, ASCVD = atherosclerotic cardiovascular disease, CKD = chronic kidney disease, eGFR = estimated glomerular filtration rate, GLP-1 RA = glucagon-like peptide 1 receptor agonist, HF = heart failure, SGLT2i = sodium-glucose cotransporter 2 inhibitor, TIA = transient ischemic attack, TZD = thiazolidinedione, UACR = urine albumin-creatinine ratio</small>					

similar to the ADA updates with additional emphasis regarding cardiorenal protection, the prominent role of weight loss, and the importance of prediabetes identification and management to reduce risk of progression to type 2 diabetes.

The main differences between AACE and ADA recommendations for glycemic management include a more aggressive approach by AACE: an optimal A1C goal of < 6.5% (Table 1), the earlier use of dual and triple therapy, and the inclusion of all potential drug therapies (including low efficacy drugs with potential safety concerns) within the AACE algorithm.¹⁰ In addition to the ADA recommended agents within the GLP-1 RA, SGLT2i, DPP4i, and thiazolidinedione (TZD) medication classes, AACE includes sulfonylureas, glinides, colesevelam, bromocriptine, and alpha-glucosidase inhibitors for consideration as part of less preferred dual and triple therapy.^{9,10} The American Association of Clinical Endocrinology indicates these last seven categories and agents are not preferred choices. The AACE 2023 updates separate out medication recommendations into two algorithms for drug therapy choices: a complications-centric algorithm (comparable to the left side of the ADA algorithm), and a glucose-centric algorithm (similar to the right side of the ADA algorithm). In addition, the AACE algorithm includes stroke/transient ischemic attack (pioglitazone, semaglutide or dulaglutide are suggested) and NAFLD as compelling indications to consider (with recommendations to consider pioglitazone).

The AACE Algorithm is an excellent

resource to pare down the wealth of considerations for a clinician to make as part of comprehensive care into eleven separate tools, each addressing specific aspects of care that are congruent with ADA, EASD (Figure 1).¹⁰

Guideline Recommendations for Special Populations

Management of Type 2 Diabetes in Youth

As the prevalence of type 2 diabetes in youth (age 10-18 years) continues to increase at a high rate, the ADA position statement (2018) and the yearly updated Standards of Care sections dedicated to youth are valuable resources.^{13,14} More recent changes in diabetes care guidelines for youth are based on data from the prospective longitudinal Treatment Options for Type 2 Diabetes in Adolescents and Youth trial (TODAY trial) that revealed youth-onset diabetes is different from diabetes in adulthood.^{15,16} Type 2 diabetes in youth tends to be a more aggressive condition with rapidly progressive insulin resistance and decline in beta cell function combined a higher incidence of early complications in young adulthood. The fifteen-year follow-up on the TODAY trial, where the average age of subjects was 26.4 +/- 2.8 years, showed worrisome statistics including:¹⁵

- Arterial stiffness and worsened cardiac function within 2 to 5 years of diagnosis
- Higher rate of treatment failures (predicted by an A1C > 6.2% at study entry)
- 80% incidence of at least one vascular

complication within 15 years

- » 68% incidence of hypertension (19% at study entry)
- » 52% incidence of dyslipidemia
- » 51% incidence of diabetic retinopathy (3.5% macular edema)
- » 55% incidence of diabetic nephropathy (8% at study entry)
- » 32% incidence of nerve disease
- In females: higher rate of preterm deliveries (43%), miscarriage, or fetal demise (25%)¹⁷

The ADA recommends risk-based screening starting at age 10 (or after the onset of puberty) in all overweight/obese youth with one or more additional risk factors for type 2 diabetes.^{14,18} Risk factors include:

- Maternal and/or family history of type 2 diabetes
- Race and ethnicity
- Signs of or health conditions associated with insulin resistance such as hypertension, acanthosis nigricans, polycystic ovary syndrome, etc.

In addition to the traditional screening, a panel of pancreatic autoantibodies should also be considered to rule out type 1 autoimmune diabetes.

Treatment recommendations and glycemic goals for youth are like those for adults (Table 1) and include lifestyle management, DSMES, and pharmacotherapy.¹⁴ Currently, the four FDA-approved medication classes for use in youth are: metformin, insulin, GLP-1RA, and SGLT2i (Table 3). Youth should also be assessed for cardiorenal risk factors, and treatment goals surrounding weight loss, blood pressure, lipids, and other complication management should be set accordingly. In addition, psychosocial care should include regular screening for diabetes distress, and any lower engagement in self-management behavior should be addressed.

Management of Diabetes in Older Adults

The annual ADA Standards of Care include a section titled “Older Adults,” and the Endocrine Society published its own clinical practice guideline in 2019 for the treatment of diabetes for adults over the age of 65.^{19,20} Since nearly 30% of Americans with diabetes are over the age of 65,²¹ it is pertinent to consider these recommendations. Both guidelines provide formal guidance on the importance of

FIGURE 1. AACE Algorithm Overview



assessing the person's overall health and personal values prior to the determination of treatment goals and strategies.^{19,20} The ADA recommends an individualized approach to setting A1C goals for older adults to be less stringent in persons with multiple coexisting chronic illnesses, cognitive impairment, or functional limitations.¹⁹ More aggressive glycemia goals can be considered in otherwise healthy older adults with few coexisting chronic illnesses, intact cognitive function, and functional status (Table 1).

Similarly, the Endocrine Society guideline recommends different clinical targets for fasting, bedtime, and A1C goals based on overall health, person-centered values, and hypoglycemia risk.²⁰

Good health:

- No comorbidities OR 1-2 non-diabetes long-term conditions AND no activities of daily living (ADL) impairments and 0 to 1 instrumental activities of daily living (IADL) impairment
- A1C goal less than 7.5%

Intermediate health:

- 3 or more non-diabetes long-term conditions and/or any one of: mild cognitive impairment or early dementia, 2 or more IADL impairments
- A1c goal less than 8%

Poor health:

- Any one: end-stage medical condition(s), moderate to severe dementia, 2 or more ADL impairments, living in a long-term care facility
- A1C goal less than 8.5%

TABLE 3. Antihyperglycemic Medications for Special Populations^{1,14,19,22}

Drug Class	Approved Agents	Youth	Older Adults	Pregnancy	Notes
Biguanide	Metformin	Initial agent of choice for A1C < 8.5%, with normal kidney function and no acidosis/ketosis	First-line	<ul style="list-style-type: none"> • Second line • Avoid if HTN, preeclampsia, or at risk for intrauterine growth restriction 	<ul style="list-style-type: none"> • Vitamin B12 monitoring with long-term use • Adjust dose per eGFR
Sodium glucose co-transporter 2 inhibitor	Bexagliflozin Canagliflozin Dapagliflozin Empagliflozin Ertugliflozin	Empagliflozin approved to lower blood glucose with diet and exercise in children ≥ 10 years	<ul style="list-style-type: none"> • Second line • Caution with UTI and incontinence • Fracture risk with canagliflozin 	Contraindicated due to increase in miscarriages and congenital malformations	<ul style="list-style-type: none"> • CVD, HF, CKD risk reduction • Caution with volume depletion and rare ketoacidosis • HOLD with severe illness (DKA risk)
Glucagon-like-peptide-1 receptor agonist	Dulaglutide Exenatide Liraglutide Semaglutide	Approved for use: <ul style="list-style-type: none"> • Dulaglutide • Exenatide ER • Liraglutide • Semaglutide: Wegovy® brand only (not Ozempic®) 	<ul style="list-style-type: none"> • Second line • Not preferred in people with unexplained weight loss 	Contraindicated due to reduced fetal growth and decreased weight	CVD risk reduction, potential weight loss
Dipeptidyl peptidase 4 inhibitors	Alogliptin Linagliptin Sitagliptin	Not approved for use	Second-line	Not recommended due to no available human studies	<ul style="list-style-type: none"> • No CVD efficacy • Well-tolerated
Sulfonylurea	Glimepiride Glipizide Glyburide	Not approved for use	Hypoglycemia risk: use cautiously	<ul style="list-style-type: none"> • If used, glyburide preferred within class • Potential risk of neonatal hypoglycemia 	<ul style="list-style-type: none"> • Hypoglycemia risk • Weight gain • Lack of positive CVD outcomes data
Thiazolidinedione	Pioglitazone	Not approved for use	<ul style="list-style-type: none"> • Use cautiously, if at all • Lowest doses to mitigate edema 	Contraindicated due to teratogenic effects	Risks of heart failure, osteoporosis, falls or fractures, and/or macular edema
Basal insulin	Insulin glargine Insulinb degludec	Use with: <ul style="list-style-type: none"> • marked hyperglycemia (BG > 250 mg/dL) • A1C > 8.5% and symptomatic 	<ul style="list-style-type: none"> • Use cautiously • Requires visual and motor skills and cognitive ability 	First-line	Start basal insulin and titrate
Prandial insulin	Regular Insulin aspart Insulin glulisine Insulin lispro		<ul style="list-style-type: none"> • Use cautiously • Requires visual and motor skills, and cognitive ability 		Consider starting 1 dose with largest meal and add other meal doses if needed

Abbreviations: A1C = hemoglobin A1C, BG = blood glucose, CKD = chronic kidney disease, CVD = cardiovascular disease, DKA = diabetes-related ketoacidosis, eGFR = estimated glomerular filtration rate, HF = heart failure, HTN = hypertension, UT = urinary tract infection, UTI= urinary tract infection

Specific Endocrine Society treatment recommendations for older adults are less complex compared to other guidelines but do provide important considerations. The guideline recommends that outpatient diabetes regimens for people aged 65 years and older should be designed specifically to minimize hypoglycemia.²⁰ Minimizing hypoglycemia is particularly important in people older than 65 years since hypoglycemia appears to increase the risk of traumatic falls and has been associated with morbidity and mortality in older adults in post hoc analyses of large clinical trials. Similarly, the ADA guidelines recommend the following: 1) using medication classes with low risk of hypoglycemia, 2) avoiding overtreatment of diabetes, 3) de-intensifying treatment goals, and 4) simplifying complex treatments.¹⁹ To lower the risk of hypoglycemia, the following is recommended by the Endocrine Society: 1) avoidance of sulfonylureas (SUs) and glinides, 2) using insulin sparingly, and 3) simplifying regimens.²⁰ Medication recommendations by class with rationale can be viewed in Table 3.

Management of Diabetes in Pregnancy

Both the ADA and AACE have sections dedicated to the management of diabetes in pregnancy.^{9,22} The 2024 ADA Standards of Care note the increasing prevalence of gestational diabetes mellitus (GDM) in the United States is parallel with the increases in diagnosis of types 1 and 2 diabetes and obesity.²² The term “gestational diabetes” means diabetes that was not known to exist prior to pregnancy. Uncontrolled diabetes is associated with increased risks for maternal complications such as spontaneous abortion and preeclampsia in addition to fetal anomalies, macrosomia, neonatal hypoglycemia, hyperbilirubinemia, and respiratory distress syndrome. Additionally, offspring are at increased risk of obesity, hypertension, and type 2 diabetes later in life.

The main goal of diabetes treatment in pregnancy is to maintain euglycemia without frequent hypoglycemia.²² Although A1C goals should be individualized, optimal outcomes have been observed with an A1C goal of less than 6%. This goal is recommended due to increased red blood cell turnover during pregnancy that results in a slightly lower A1C. An alternate goal

would be A1C less than 7%. Blood glucose targets are also more stringent in GDM compared to non-pregnant adults with type 2 diabetes. For a comparison of the target ranges for diabetes in pregnancy, see Table 1.

Current data support the use of CGM in pregnant people with type 1 diabetes.^{9,22} Although there are no randomized controlled trials to support the use of CGM in type 2 or gestational diabetes, it is a powerful tool to help a person with diabetes manage their care and understand the effects of various factors (e.g. food and exercise choices, stress, sleep, etc.) on their approximate, real-time glucose values.

Few pharmacologic therapies are available for managing diabetes in pregnancy. Currently, insulin is first-line therapy for management of diabetes (type 1, 2, or gestational) because insulin does not cross the placenta.^{9,22} Metformin and glyburide are no longer recommended first-line therapy in pregnancy because they do cross the placenta. See Table 3 for information about other medications in pregnancy.

Another medication consideration involves assessment of preeclampsia risk, which might indicate the necessity of daily low dose aspirin starting at 12 to 16 weeks of gestation.²² People with diabetes of childbearing potential who use reliable contraception may use statins and agents that affect the renin-angiotensin system, although these agents should be avoided during pregnancy.

Family planning is a crucial consideration for people with diabetes, as it involves careful management and coordination to ensure a safe and healthy pregnancy. Individuals with pre-existing diabetes should work closely with their healthcare team to develop a personalized family planning strategy that optimizes blood glucose and minimizes potential risks.²² Effective family planning can help individuals with diabetes achieve their reproductive goals while safeguarding their own and their child's well-being.

Medication considerations are an important aspect of family planning. GLP-1 RA can cause decreased absorption of oral contraceptives due to delayed gastric emptying, which progressively increases with higher GLP-1RA doses and could potentially lead to unplanned pregnancy.^{22,23} In addition, the longer half-life of GLP-1

RA means that even when pregnancy occurs and the drug is discontinued, there is a lingering amount of drug still in the body. For persons of childbearing potential, it is prudent to discuss alternate methods of birth control, specifically when starting or adjusting the dose of a GLP-1 RA. Spacing the oral contraceptive dose from the time of daily GLP-1 RA injections has been suggested.²⁴ Primary and secondary forms of birth control that would not be affected by delayed absorption (intrauterine device, barrier methods, etc.) could be offered. A recent systematic review, however, suggests that overall bioavailability of combined oral contraceptives may not be affected by GLP-1 RA.²⁵

Conclusion

The guidelines reviewed in this article have differences and nuances; however, there are several themes that underscore comprehensive diabetes care. All guidelines emphasize the importance of providing individualized care to people with diabetes by adapting the treatment plan to each person's specific needs based on age, comorbidities, risk of hypoglycemia, and goals of therapy. Since there is not a one-size-fits-all approach to diabetes management, staying informed with guideline updates can enhance the delivery of patient-centered care.

Denise Walbrandt Pigarelli is an Associate Professor (CHS) at the University of Wisconsin-Madison School of Pharmacy in Madison, WI. Francesca Johnson is an Assistant Clinical Professor at Marquette University Department of Physician Assistant Studies in Milwaukee, WI. Elizabeth Buckley is a Professor of Pharmacy Practice at Concordia University Wisconsin School of Pharmacy in Mequon, WI. Joseph Dutzy is an Assistant Professor of Pharmacy Practice at Concordia University Wisconsin School of Pharmacy in Mequon, WI.

Corresponding Author:
Denise Walbrandt Pigarelli -
denise.pigarelli@wisc.edu

PR This article has been peer-reviewed.
The contribution in reviewing is greatly appreciated!

Disclosure: The authors declare no relevant relationships, real or potential, with ineligible companies or product(s) or service(s) mentioned

in the manuscript, including grants, equipment, medications, employment, gifts, and honoraria.

References

1. American Diabetes Association Professional Practice Committee. Standards of care in diabetes—2024. *Diabetes Care*. 2023;47(suppl 1):S1-S308. doi:10.2337/dc24-SINT
2. American Diabetes Association. Standards of care in diabetes—2024. *DiabetesPro*. December 2023. Accessed January 18, 2024. https://diabetesjournals.org/care/issue/47/Supplement_1
3. Standards of Care App | American Diabetes Association. Accessed January 18, 2024. <https://professional.diabetes.org/standards-of-care/standards-care-app>
4. Davies MJ, Aroda VR, Collins BS, et al. Management of hyperglycemia in type 2 diabetes, 2022. A consensus report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetes Care*. 2022;45(11):2753-2786. doi:10.2337/dci22-0034
5. American Diabetes Association Professional Practice Committee. 9. Pharmacologic approaches to glycemic treatment: standards of care in diabetes—2024. *Diabetes Care*. 2023;47(suppl 1):S158-S178. doi:10.2337/dc24-S009
6. Farxiga. Prescribing information. AstraZeneca; 2014. Accessed February 29, 2024. <http://www.azpicentral.com/pi.html?product=farxiga>
7. Jardiance. Prescribing information. Boehringer Ingelheim; 2014. Accessed February 29, 2024. <https://content.boehringer-ingelheim.com/DAM/7d9c411c-ec33-4f82-886f-af1e011f35bb/jardiance-us-pi.pdf>
8. Kosiborod MN, Abildstrom SZ, Borlaug BA, et al. Semaaglutide in patients with heart failure with preserved ejection fraction and obesity. *N Engl J Med*. 2023;389(12):1069-1084. doi:10.1056/NEJMoa2306963
9. Blonde L, Umpierrez GE, Reddy SS, et al. American Association of Clinical Endocrinology clinical practice guideline: developing a diabetes mellitus comprehensive care plan—2022 Update. *Endocr Pract*. 2022;28(10):923-1049. doi: 10.1016/j.eprac.2022.08.002
10. Samson SL, Vellanki P, Blonde L, et al. American Association of Clinical Endocrinology consensus statement: comprehensive type 2 diabetes management algorithm – 2023 update. *Endocr Pract*. 2023;29(5):305-340. doi:10.1016/j.eprac.2023.02.001
11. American Diabetes Association Professional Practice Committee. 4. Comprehensive medical evaluation and assessment of comorbidities: standards of care in diabetes—2024. *Diabetes Care*. 2023;47(suppl 1):S52-S76. doi:10.2337/dc24-S004
12. American Diabetes Association Professional Practice Committee. 10. Cardiovascular disease and risk management: standards of care in diabetes—2024. *Diabetes Care*. 2023;47(suppl 1):S179-S218. doi:10.2337/dc24-S010
13. Arslanian S, Bacha F, Grey M, Marcus MD, White NH, Zeitler P. Evaluation and management of youth-onset type 2 diabetes: a position statement by the American Diabetes Association. *Diabetes Care*. 2018;41(12):2648-2668. doi:10.2337/dci18-0052
14. American Diabetes Association Professional Practice Committee. 14. Children and adolescents: standards of care in diabetes—2024. *Diabetes Care*.

ADDITIONAL RESOURCES

Guidelines included in this Article:

[American Diabetes Association Standards of Care in Diabetes - 2024](#)

[Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the American Diabetes Association \(ADA\) and the European Association for the Study of Diabetes \(EASD\)](#)

[American Association of Clinical Endocrinology Clinical Practice Guideline: Developing a Diabetes Mellitus Comprehensive Care Plan – 2022 Update](#)

[American Association of Clinical Endocrinology Consensus Statement: Comprehensive Type 2 Diabetes Management Algorithm – 2023 Update](#)

2023;47(suppl 1):S258-S281. doi:10.2337/dc24-S014

15. TODAY Study Group, Bjornstad P, Drews KL, et al. Long-term complications in youth-onset type 2 diabetes. *N Engl J Med*. 2021;385(5):416-426. doi:10.1056/NEJMoa2100165
16. TODAY Study Group, Zeitler PA, Hirst K, et al. Clinical trial to maintain glycemic control in youth with type 2 diabetes. *N Engl J Med*. 2012;366(24):2247-2256. doi:10.1056/NEJMoa1109333
17. TODAY Study Group. Pregnancy outcomes in young women with youth-onset type 2 diabetes followed in the TODAY study. *Diabetes Care*. 2021;45(5):1038-1045. doi:10.2337/dc21-1071
18. American Diabetes Association Professional Practice Committee. 2. Diagnosis and classification of diabetes: standards of care in diabetes—2024. *Diabetes Care*. 2023;47(suppl 1):S20-S42. doi:10.2337/dc24-S002
19. American Diabetes Association Professional Practice Committee. 13. Older adults: standards of care in diabetes—2024. *Diabetes Care*. 2023;47(suppl 1):S244-S257. doi:10.2337/dc24-S013
20. LeRoith D, Biessels GJ, Braithwaite SS, et al. Treatment of diabetes in older adults: An Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab*. 2019;104(5):1520-1574. doi:10.1210/jc.2019-00198
21. Statistics About Diabetes | ADA. Accessed September 29, 2022. <https://diabetes.org/about-us/statistics/about-diabetes>
22. American Diabetes Association Professional Practice Committee. 15. Management diabetes in pregnancy: standards of care in diabetes—2024. *Diabetes Care*. 2023;47(suppl 1):S282-S294. doi:10.2337/dc24-S015
23. Caution urged for obesity drugs and birth control pills. *Medscape*. Accessed January 12, 2024. <http://www.medscape.com/viewarticle/997498>
24. MOUNJARO® (tirzepatide) prescribing information. U.S. Approval: 2022. Accessed January 12, 2024. <https://uspl.lilly.com/mounjaro/mounjaro.html#pi>
25. Calvarysky B, Dotan I, Shepshelovich D, Leader A, Diker Cohen T. Drug-drug interactions between glucagon-like peptide 1 receptor agonists and oral medications: a systematic review. *Drug Saf*. Preprint posted online January 25, 2024. doi: 10.1007/s40264-023-01392-3

Assessment Questions

1. According to the American Diabetes Association, what is the initial recommended weight loss goal for patients with Type 2 Diabetes?
 - a. 5-10%
 - b. 10-15%
 - c. 15-20%
 - d. None of the above
2. Which of the following glucagon-like peptide 1 receptor agonists does not decrease chronic kidney disease endpoints?
 - a. Dulaglutide injected weekly
 - b. Exenatide injected weekly
 - c. Liraglutide injected daily
 - d. Semaaglutide injected weekly
3. Which of the following sodium-glucose cotransporter 2 inhibitors does not reduce the risk of atherosclerotic cardiovascular disease?
 - a. Canagliflozin
 - b. Dapagliflozin
 - c. Empagliflozin
 - d. None of the above
4. Which of the following glucagon-like peptide 1 receptor agonists has the best efficacy for weight loss in diabetes treatment?
 - a. Exenatide
 - b. Liraglutide
 - c. Dulaglutide
 - d. Semaaglutide
5. Which of the following medications is recommended for the highest hemoglobin A1C-lowering efficacy?
 - a. Metformin
 - b. Exenatide
 - c. Insulin
 - d. Dapagliflozin

6. According to the American Association of Clinical Endocrinology, which medication is recommended for patients with a comorbidity of stroke?
- Metformin
 - Dapagliflozin
 - Pioglitazone
 - There are no recommendations for stroke
7. Based on the Endocrine Society guideline for the treatment of diabetes for adults older than 65 years, which of the following is recommended to reduce the risk of hypoglycemia?
- If sulfonylureas must be used, glyburide is preferred
 - Use insulin sparingly
 - Multi-drug regimens are preferred
 - None of the above
8. Which of the following medications are NOT approved for youth?
- Empagliflozin
 - Metformin
 - Liraglutide
 - Tirzepatide
9. Which of the following medications is correctly matched with a consideration for use in adults older than 65 years?
- Sitagliptin– associated with heart failure
 - Pioglitazone–be cautious with volume depletion
 - Glipizide- if a sulfonylurea must be used, this is one is preferred
 - Insulin –basal + bolus is the preferred insulin regimen
10. What is the goal for fasting blood glucose in pregnancy?
- 70–95 mg/dL
 - 80-130 mg/dL
 - 110–140 mg/dL
 - 100–120 mg/dL

CE FOR PHARMACISTS & TECHNICIANS

Continuing Education Credit Information



The Pharmacy Society of Wisconsin is accredited by the Accreditation Council for Pharmacy Education as a provider of continuing pharmacy education. Continuing education credit can be earned by completing the self assessment questions. Questions may be completed online. Participants receiving a score of 70% or better will be granted 1 hour (0.1 CEU) credit through CPE Monitor. Accurate birth date (MMDD) and CPE Monitor ID must be provided in order to receive this credit as required by ACPE. This CE offering is offered free-of-charge to all PSW members. Nonmembers are charged \$25.

May/June 2024

Dynamic Diabetes Updates: Current Management Guidelines for Type 2 Diabetes

**ACPE Universal Activity Number:
0175-0000-24-081-H01-PT**

Target Audience: Pharmacists

Activity Type: Knowledge-based

Release Date: May 1, 2024

(No longer valid for CE credit after May 1, 2027)



Submit Your CE Online
www.pswi.org/Education/Journal-CE

REGISTRATION NOW OPEN!

2024

PSW Annual Meeting

August 22-24, 2024

Kalahari Resort & Convention Center

Wisconsin Dells

POWERING

PROGRESS