MedStar Health

# Management of Adult Diabetes Mellitus

Clinical Practice Guideline
MedStar Health

"*These guidelines are provided to assist physicians and other clinicians in making decisions regarding the care of their patients. They are not a substitute for individual judgment brought to each clinical situation by the patient's primary care provider-in collaboration with the patient. As with all clinical reference resources, they reflect the best understanding of the science of medicine at the time of publication but should be used with the clear understanding that continued research may result in new knowledge and recommendations".*

This clinical practice guideline is based on *Standards of Care in Diabetes-2024* found in Diabetes Care Volume 47, Supplement 1, January 2024. MedStar Health Ambulatory Best Practices Committee endorses this guideline.
https://diabetesjournals.org/care/issue/47/Supplement_1

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## INTRODUCTION

1. The prevalence of diabetes in adults is estimated to be 14.7 percent of the United States adult population. Some estimates report that more health care resources are spent on diabetes than any other health condition. In addition to the economic impact, medical complications from diabetes impact quality of life**.**

## GENERAL PRINCIPLES

1. Hyperglycemia is the pathognomonic feature of all forms of diabetes. Treatment aimed at lowering blood glucose levels is mandated by the following proven benefits:
    - **a.** The danger of acute decompensation due to diabetic ketoacidosis or hyperosmolar hyperglycemic non-ketotic syndrome with their accompanying morbidity and mortality is markedly reduced.
    - **b.** The risk of blurred vision, polyuria, polydipsia, fatigue, weight loss with polyphagia, vaginitis or balanitis, days missed from work, emergency room visits, and hospital admissions may be reduced.
    - **c.** The risks of development or progression of diabetic retinopathy, nephropathy, and neuropathy are all greatly decreased. These complications may even be prevented by early normalization of metabolic status.
    - **d.** Targeted blood glucose control has been demonstrated to be associated with a less atherogenic lipid profile and fewer macrovascular events.
2. Strategies for Improving Care from the ADA Guideline
    - **a.** Recommendations
        - A patient-centered communication style that incorporates individualized preferences, assesses literacy and numeracy, and addresses cultural barriers to care should be used.
        - Referral to Diabetes self-management education and support (DSMES) and medical nutrition therapy (MNT) is recommended at five critical times: at the initial diagnosis of diabetes; annually; when the patient does not meet treatment targets; when medical, physical, or psychosocial complications occur; and when transitions in life and care occur.
        - Treatment decisions should be founded on evidence-based guidelines that are tailored to individual patient preferences, prognoses, and comorbidities.
        - Care should be aligned with components of the Chronic Care Model (CCM) to ensure productive interactions between a prepared proactive practice team and an informed patient. The CCM emphasizes patient-centered team care and ongoing collaborative communication and goal setting among all the team members.
        - Care systems should support team-based care, community involvement, patient registries and decision support tools to meet patient needs. Care systems should also support in-person and virtual team-based care.
        - Treatment programs include the following: self-monitoring of blood glucose (SMBG) using a fingerstick blood glucose monitoring device or a continuous glucose monitor (CGM), meal planning, physical activity, when and how to take medication(s) and their benefits and potential side effects, information on the prevention and treatment of hypoglycemia as well as other acute and chronic complications, sick day protocol, and when to call their doctor or go to the emergency department
        - Address psychosocial issues in all aspects of care including self-management, mental health, language barriers, complications, comorbidities, food insecurity, housing stability, financial barriers, and life-stage considerations.

## CRITERIA FOR SCREENING FOR DIABETES/PREDIABETES IN ASYMPTOMATIC ADULTS

1. The primary purpose of a screening program is to identify individuals without symptoms who are likely to meet the diagnostic criteria for diabetes or prediabetes.
2. The ADA recommends the following:
    - **a.** Testing should be considered for all adults of any age who are overweight or obese (BMI $\geq$25 kg/m$^{2,}$

BMI ≥ 23 kg/m$^2$ for Asian Americans) and have one or more additional risk factors listed below. *
- First degree relative w/Diabetes Mellitus
- African American, Native American, Latino, Asian American, Pacific Islander
- Other clinical conditions associated with insulin resistance: severe obesity, acanthosis nigricans
- History of cardiovascular disease
- Polycystic Ovarian Disease
- HDL cholesterol level<35 mg/dL (0.90mmol/L) and/or a triglyceride level >250 mg/dL (2.82 mmol/L)
- Hypertension ≥ 130/80 mmHg or on therapy for HTN
- Physical inactivity

**b.** Women who were diagnosed with gestational diabetes should have lifelong testing at least every three years.

**c.** Patients with previous A1C ≥ 5.7%, Impaired Glucose Tolerance (IGT) or Impaired Fasting Glucose (IFG) (i.e., prediabetes) on previous testing should have yearly testing.

d. Screening for all other individuals should begin at age 35. (*If results are normal, repeat testing should be performed at least every 3 years with consideration of more frequent testing depending on initial results and risk status.)*

**e.** HIV patients should have screening with fasting serum glucose prior to initiating antiretroviral treatment and 3-6 months after starting or changing antiretrovirals. If initial screen is normal, fasting serum glucose should be done yearly.

**f.** Patients taking second-generation antipsychotics should be screened prior to initiating medication and repeated 12-16 weeks after medication initiation (sooner if clinically indicated), and yearly.

**g.** Exposure to other high-risk medications, such as glucocorticoids, statins, thiazide diuretics

**3.** In addition to the above criteria, the ADA now states that clinicians may use an assessment tool, such as the ADA risk test ( https://www.diabetes.org/risk-test) , to assist in determining if diagnostic testing for prediabetes/diabetes should be performed. The website is designed for non-medical persons to "Take the Risk Test" themselves. It asks age, sex, family history of diabetes, personal history of gestational diabetes, h/o HTN, physical activity, height, and weight. Based on these answers a score is given. A score of 5 or higher indicates the person is at increased risk for having type 2 diabetes.

**4.** The USPSTF recommends screening adults who are overweight or obese and who are between 35 and 70 years of age (https://uspreventiveservicestaskforce.org/uspstf/recommendation/screening-for-prediabetes-and-type-2-diabetes )

**5.** There is also a recommendation to screen for asymptomatic type 1 diabetes in first degree relatives (≥ 8yoa) of persons with autoimmune diabetes. The screening should be performed by testing for autoantibodies to insulin, glutamic acid decarboxylase, islet antigen 2, or zinc transporter 8. Having multiple islet autoantibodies is a risk factor for developing diabetes. If multiple autoantibodies are identified, the patient should be referred to a specialized center for further evaluation and/or possible clinical trial or approved therapy (e.g., teplizumab) to potentially delay development of diabetes.

## CRITERIA FOR THE DIAGNOSIS OF DIABETES MELLITUS AND PREDIABETES

**1.** Several ways to diagnose diabetes are possible.

**2.** For the diagnosis of type 2 diabetes A1C, FPG and OGTT are all equally appropriate. *In individuals with classic symptoms of hyperglycemia or hyperglycemic crisis a random plasma glucose ≥ 200mg/dL is sufficient to make the diagnosis of diabetes.*

**3.** If there are significant discrepancies between the A1C and plasma glucose, conditions that affect the A1C should be considered. These include conditions with increased red blood cell turnover (e.g., sickle cell disease, pregnancy (2nd/3rd trimesters & post-partum period), HIV, G6PD deficiency, hemodialysis, recent

blood loss or blood transfusion, erythropoietin use). In these situations, only plasma glucose criteria can be used to diagnose diabetes.

| | A1C[#] | Fasting Plasma Glucose (FPG) | Oral Glucose Tolerance Test (OGTT)[+] | Random Plasma Glucose (RPG) |
|---|---|---|---|---|
| Diabetes | A1C ≥6.5 %*<br><br>*(NGSP certified lab and standardized to DCCT assay)* | FPG ≥126 mg/dl (7.0 mmol/l)*****<br><br>*(Fasting is defined as no caloric intake for at least 8 hrs.)* | Two-hour 75gm OGTT: plasma glucose (2hPG) ≥200 mg/dl*<br><br>*(glucose load containing the equivalent of 75g anhydrous glucose dissolved in water)* | RPG: ≥ 200 mg/dl (11.1mmol/1) plus symptoms of hyperglycemia |
| Pre-diabetes** | A1C 5.7-6.4% | IFG=FPG 100 -≤125 mg/dl | IGT = 2hr PG on the 75gm OGTT: 140-199 mg/dl. | N/A |
| Normal | <5.6% | FPG <100 mg/dl | 2h PG <140 mg/dl | N/A |

*In the absence of unequivocal hyperglycemia diagnosis of diabetes requires two abnormal test results from the same sample (i.e., Fasting plasma glucose and A1C from the same sample) or from two separate samples. If both an A1C and fasting PG are obtained and only one test result meets diagnostic cut point for pre-diabetes, repeat just the test that was abnormal for confirmation of diagnosis.
******Increased risk for diabetes: risk is continuous, extending below the lower limit of the tests range and becoming disproportionately greater at the higher ends of the range.
[#] Point of care A1c testing can be used for screening and diagnosis if restricted to FDA approved devices at labs by trained personnel
[+] There must be carbohydrate intake of at least 150g/day for 3 days prior to OGTT
NGSP-National Glycohemoglobin Standardization Program
DCCT- Diabetes Control and Complications Trial

## PREDIABETES

1. **Diagnosis**
   - **a.** Patients with a predisposition to diabetes (prediabetes) are individuals with impaired fasting glucose (IFG of 100/mg/dL (5.6mmol/L) to 125 mg/dL (6.9 mmol/L)), impaired glucose tolerance (IGT: 2-h PG in the 75-g OGTT 140 mg/dL (7.8mmol/L) to 199 mg/dL (11.0 mmol/L)) or an A1C of 5.7-6.4%.
     - In systematic review of 44,203 individuals from 16 cohort studies with a follow-up interval averaging 5.6 years (range 2.8–12 years), those with A1C between 5.5% and 6.0% had a substantially increased risk of diabetes (5-year incidence from 9% to 25%). Those with an A1C range of 6.0–6.5% had a 5-year risk of developing diabetes between 25% and 50% and a relative risk 20 times higher compared with A1C of 5.0%.
   - **b.** Some pre-diabetes patients already have the characteristic microvascular changes associated with diabetes. Early identification of individuals with pre-diabetes will provide opportunities for lifestyle management and potentially prevent complications related to diabetes.
   - **c.** Targeted screening for prediabetes is recommended for the populations at high risk for development of diabetes. (see "Criteria for Screening for Diabetes/Prediabetes in Asymptomatic Adults" section)
2. **Treatment**
   - **a.** Lifestyle modification is the fundamental treatment and should be reinforced at every visit
   - **b.** ADA recommends referral to an intensive lifestyle intervention program modeled on the Diabetes Prevention Program
   - **c.** Physical activity equivalent to at least 150 minutes (30 minutes on most days of the week) of moderate to vigorous intensity physical activity per week such as walking. Resistance exercise consisting of 2-3 sessions per week on nonconsecutive days is also recommended. For older adults with diabetes flexibility and balance training 2-3 times per week is recommended. Breaking up sedentary time should also be encouraged as it is associated with moderately lower postprandial glucose levels.
   - **d.** Weight loss equivalent to 7% of body weight, reducing caloric intake while maintaining a healthful eating pattern is recommended to promote and maintain weight loss.

- **e.** Limit or avoid intake of sugar-sweetened beverages (from any caloric sweetener including high-fructose corn syrup and sucrose) to reduce risk for weight gain and worsening of cardiometabolic risk profile. Individuals at high risk for type 2 diabetes should be encouraged to achieve the U.S. Department of Agriculture (USDA) recommendation for dietary fiber (14 g fiber/1,000 kcal) and foods containing whole grains (one-half of grain intake).
- **f.** According to the current *Standards of Care in Diabetes 2024*, Metformin therapy for prevention of type 2 diabetes should be considered in those with prediabetes, especially for those aged 25-59 years with BMI ≥35 kg/m2, higher fasting plasma glucose (e.g., ≥110mg/dL), higher A1C (e.g., ≥6.0%) and women with prior gestational diabetes. Long-term metformin use (more than 4 years) may be associated with vitamin B12 deficiency. Annual measurement of B12 levels is recommended.
- **g.** Various other pharmacologic agents (e.g., α-glucosidase inhibitors, glucagon-like peptide 1 receptor agonists, thiazolidinediones, testosterone, insulin) have been evaluated for prevention of type 2 diabetes and have been shown to lower the incidence of diabetes in specific populations. No pharmacologic agent has been approved by the U.S. Food and Drug Administration for prevention of type 2 diabetes. The risk versus benefit of each medication must be weighed carefully, in addition to cost, side effects, and efficacy considerations. Metformin has the longest history of safety data as a pharmacologic therapy for prevention of diabetes.
- **h.** Monitoring for the development of diabetes in those with prediabetes should be performed every year.
- **i.** Screening and treatment of modifiable risk factors for CVD is suggested as prediabetes is associated with increased cardiovascular risk. Statins may increase the risk of developing type 2 diabetes, therefore if statins are used glucose should be regularly monitored. However, in people at high risk of developing type 2 diabetes it is not recommended that statins be discontinued.
- **j.** Tobacco cessation: evaluation for tobacco use and referral for tobacco cessation
- **k.** Patients with prediabetes/insulin resistance and a history of stroke: consider use of pioglitazone as it lowers the risk of stroke and myocardial infarction.
- **l.** Many hospitals and other community organizations offer diabetes prevention programs, education, and support groups. Medicare and Maryland Health Choice Medicaid plans cover diabetes prevention programs for individuals with prediabetics.

**3. Goals of Management**

- **a.** Individuals with prediabetes should have the same lipid and BP goals as those with diabetes. Pharmacotherapy may be considered for cardiovascular risk reduction, decreasing the progression of hyperglycemia and weight management in prediabetes. There is strong evidence that obesity management can delay the progression from prediabetes to type 2 diabetes. *Please see the MedStar Health Identification, Evaluation, and Treatment of Overweight and Obesity in Adults Clinical Practice Guideline.*

## DIABETES

**1. Classification** (4 clinical classes classification criteria, 2024 American Diabetes Association)

- **a. Type 1 diabetes** (autoimmune *B*-cell destruction, usually leading to absolute insulin deficiency)
- **b. Type 2 diabetes** (results from a progressive insulin secretory defect often on a background of insulin resistance)
- **c. Other specific types of diabetes** (due to other causes, e.g., genetic defects in *B*-cell function, genetic defects in insulin action, disease of the exocrine pancreas (pancreatitis, pancreatectomy, cystic fibrosis), drug or chemically induced (such as with glucocorticoid use in the treatment of HIV or after organ transplantation).
- **d. Gestational Diabetes Mellitus** (diagnosed during the second or third trimester of pregnancy that is not clearly overt diabetes prior to gestation)

**2. Initial Comprehensive Diabetes Evaluation**

- **a. Medical History and Physical Examination**

- See below table 4.1 copied from the 2024 Standards of Medical Care in Diabetes. Also, this section can be found at https://diabetesjournals.org/care/issue/47/Supplement_1
- At the initial visit a complete medical evaluation should be done. This should confirm the diabetes diagnosis and classification, evaluate for diabetes complications and comorbid conditions, assess barriers to optimal health/health care and social determinants of health, review previous treatment and risk factor management in patients with established diabetes, start developing with patient a care management plan. Follow-up visits should include the majority of the components of the initial comprehensive medical evaluation.

**3. Laboratory/Other Evaluation**

**a.** A1C, if results not available within past 3 months

**b.** If not performed/available within past year:

- Fasting lipid profile, including total, LDL, HDL cholesterol and triglycerides
- Liver function tests
- Test for proteinuria with spot urine albumin-to-creatinine ratio
- Serum creatinine and eGFR
- TSH in type 1 diabetes, dyslipidemia, or women over age 50 years

c. Consider serum testosterone in men with diabetes with signs/symptoms of hypogonadism

d. Patients with Type 1 diabetes should be screened for celiac disease if they have gastrointestinal symptoms, signs, or other manifestations suggestive of celiac disease

e. Vitamin B12 if on metformin

f. Serum potassium if on ACE, ARB, diuretic

g. Patients with type 2 diabetes or prediabetes with elevated LFTs or fatty liver on imaging should be evaluated for nonalcoholic steatohepatitis and liver fibrosis (see below in *V. Continuing Care* section for more information)

h. Risk of fractures should be assessed in older patients (≥65yo) with diabetes as well as younger patients with diabetes and multiple risk factors every 2-3 years. In addition to the general risk factors for fractures, there are diabetes-specific risk factors. These include retinopathy, nephropathy, lumbar spine or hip T-score ≤ -2, diabetes duration of more than 10yrs, frequent hypoglycemic events, HbA1c >8%, peripheral/autonomic neuropathy, and some diabetes medications (insulin, thiazolidinediones, sulfonylurea)

i. *Most payors provide coverage for Medical Nutritional Therapy (MNT) and/or Diabetes Self-Management Education and Support (DSMES) for diabetes patients with a provider referral/ prescription to a certified diabetes educator. Specify: type of diabetes; duration of education services and number of visits; MNT for nutrition/meal planning; DSMES for other services. See "Resources Available" section below for more information.*

**4. Referrals**

**a.** Eye care professional for annual dilated eye exam

**b.** Family planning for women of reproductive age

**c.** Registered dietitian for Medical Nutrition Therapy (MNT)

**d.** Diabetes Self-Management Education and Support (DSMES)

- For MedConnect users MNT and DSMES services may be requested by ordering a referral to "MedStar Diabetes Educator"

**e.** Dentist for comprehensive periodontal examination

**f.** Audiology if indicated

**g.** Mental health professional, if needed

- Monitor for diabetes distress (Common; refers to emotional response to burdens and worries specific to an individual's experience in having to manage a severe, complicated, and demanding chronic condition such as diabetes. Routinely monitor people with diabetes for diabetes distress, particularly when treatment targets are not met and/or at the onset of

diabetes complications.)
- Refer to qualified mental health professional for further assessment and treatment if indicated.
- American Diabetes Association offers support and tools to help tackle the day-to-day challenges: **ADA Mental Health Toolkit.**
- The ADA Mental Health Provider Referral Directory can help find mental health professionals with expertise in diabetes care: **ADA Mental Health Professional Directory**
- Consider screening for anxiety symptoms, fear of hypoglycemia or other diabetes-related fears.
- Screen for depression at least annually

h. Social or Community Health worker and other community resources if needed
- Community Resources**:** Meeting community needs around social determinants is essential to enhancing patient wellness and delivering quality, patient-centered care.
- The MedStar Health Social Needs Tools within MedConnect enables care teams to efficiently screen patients and provide community referrals at the point of care.
- Social needs Screening**:** Available in MedConnect in the Ambulatory setting visits under Scales and Assessments. Use the second tab for referral documentation.
- Social Needs Tool**:** Located in MedConnect in the dark gray menu bar within a patient's chart. It helps care teams identify and address patients' social risk factors and needs and make referrals to appropriate programs and services for food, shelter, health care, work, financial assistance, and more. It provides instant access to comprehensive, localized listings with hundreds of programs in every zip code across the U.S.
- For non-MedConnect users: Search and connect to support for financial assistance, food pantries, medical care, and other free or reduced cost help at: **Find Help**

**i.** Referral to Podiatry is recommended in the following instances:
- High risk patient (neuropathy, vascular disease, structural deformities, abnormal gait
- History of previous ulcers or infections
- Sensorimotor deficiencies for footwear modifications
- Skin/nail deformities

**j.** Referral to Endocrinology is recommended in the following instances:
- The initial clinical and/or biochemical state is markedly abnormal.
- The response to standard therapy is unsatisfactory (i.e., A1c goal not attained in 6-12 months).
- Metabolic complications exist or arise.
- Problems/challenges with continuous glucose monitor use.
- Insulin pump therapy is being considered.

**k.** Referral to Cardiac or Vascular Specialist should be considered in the following instances:
- EKG with left bundle branch block, myocardial infarction, or change from baseline at any time
- Decline in exercise capacity
- Angina, atypical chest pain or claudication
- Absent or diminished pedal pulses
- Abdominal aortic aneurysm
- Embarking on new exercise program if previously sedentary and/or over 40 years old, or longstanding DM

**l.** Referral to Nephrology is recommended in the following situations
- Estimated GFR is <30mL/min/1.73m$^2$ or continued decrease in estimated GFR
- Continuously increasing urine albumin-to-creatinine ratio
- There is uncertainty regarding the etiology of kidney disease

- Difficult management issues
- Rapidly progressing kidney disease

**m.** Referral to MedStar Diabetes Pathway "Boot Camp"

- Available within MedStar Health for those with type 2 diabetes and an A1c of 8 or higher see attachment for additional information
- This is an intensive virtual 12-week diabetes education and medication management program in which participants use a cellular-enabled blood glucose meter or a continuous blood glucose meter that sends their blood glucose readings to boot camp dashboards which are monitored in real-time by diabetes nurse practitioners and diabetes educators. Participants receive ongoing monitoring and support strategies to improve glycemic control.
- In MedConnect select: **Referral to MedStar Diabetes Pathway/Boot Camp**
- The referral order includes medication management, intense diabetes self-management education and medical nutrition therapy, as well as pre-(if not already available) and post-program A1Cs
- **Patient information:** MedStar Health Diabetes Pathway Patient Information

**5. Diabetes Self-Management: MedStar Health Diabetes Chatbot**

a. Diabetes Self-Management: MedStar Health Diabetes Chatbot

- MedStar now offers a chat-based diabetes education program. To successfully manage their diabetes, patients must learn and gain confidence in specific self-care routines. To expand the reach of diabetes education and support to more Persons with Diabetes and, MedStar Health has developed a digital chat algorithm, or "chatbot," to help participants manage type 2 diabetes. The system is FREE and delivers education and support to participants without needing office visits or insurance forms.
- \Eligibility: Any person with type 2 diabetes, checking their blood sugars at home with a glucometer or a continuous glucose monitor.
- Referral: In MedConnect select: Referral to MedStar Health Diabetes Chatbot o Patient information: MedStar Health Diabetes Chatbot Patient Information

***Summary of the recommendations for the comprehensive diabetes medical evaluations.***
***Table copied from the 2024 Standards of Medical Care in Diabetes (Section 4, pages S55 and S56 table 4.1).***



**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 plans 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** | | | |
| | • Common comorbidities (e.g., obesity, OSA, NAFLD) | ✓ | | |
| | • High blood pressure or abnormal lipids | ✓ | | ✓ |
| | • Macrovascular and microvascular complications | ✓ | | ✓ |
| | • Hypoglycemia: awareness/frequency/causes/timing of episodes | ✓ | ✓ | ✓ |
| | • Presence of hemoglobinopathies or anemias | ✓ | | ✓ |
| | • Last dental visit | ✓ | | ✓ |
| | • Last dilated eye exam | | | ✓ |
| | • Visits to specialists | | | ✓ |
| | • Disability assessment and use of assistive devices (e.g., physical, cognitive, vision and auditory, history of fractures, podiatry) | ✓ | ✓ | ✓ |
| | • Personal history of autoimmune disease | ✓ | | |
| | **Interval history** | | | |
| | • Changes in medical/family history since last visit | | ✓ | ✓ |
| BEHAVIORAL FACTORS | • Eating patterns and weight history | ✓ | ✓ | ✓ |
| | • Assess familiarity with carbohydrate counting (e.g., type 1 diabetes, type 2 diabetes treated with MDI) | ✓ | | ✓ |
| | • Physical activity and sleep behaviors; screen for obstructive sleep apnea | ✓ | ✓ | ✓ |
| | • Tobacco, alcohol, and substance use | ✓ | | ✓ |
| MEDICATIONS AND VACCINATIONS | • Current medication plan | ✓ | ✓ | ✓ |
| | • Medication-taking behavior, including rationing of medications and/or medical equipment | ✓ | ✓ | ✓ |
| | • 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, connected pen and glucose data | ✓ | ✓ | ✓ |
| SOCIAL LIFE ASSESSMENT | **Social network** | | | |
| | • Identify existing social supports | ✓ | | ✓ |
| | • Identify surrogate decision maker, advanced care plan | ✓ | | ✓ |
| | • Identify social determinants of health (e.g., food security, housing stability & homelessness, transportation access, financial security, community safety) | ✓ | | ✓ |
| | • Assess daily routine and environment, including school/work schedules and ability to engage in diabetes self-management | ✓ | ✓ | ✓ |

**Table 4.1 (cont.) - Components of the comprehensive diabetes medical evaluation at initial, follow-up, and annual visits**

| | | 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 | ✓ | | ✓ |
| | • Screen for depression, anxiety, diabetes distress, fear of hypoglycemia, and disordered eating | ✓ | | ✓ |
| | • Consider assessment for cognitive performance* | ✓ | | ✓ |
| | • Consider assessment for functional performance* | ✓ | | ✓ |
| | • Consider assessment for bone pain | ✓ | | ✓ |
| 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 people with type 1 diabetes# | ✓ | | ✓ |
| | ◦ Vitamin B12 if on metformin | ✓ | | ✓ |
| | ◦ Complete blood count (CBC) with platelets | ✓ | | ✓ |
| | ◦ Serum potassium levels in people with diabetes on ACE inhibitors, ARBs, or diuretics+ | ✓ | | ✓ |
| | ◦ Calcium, vitamin D, and phosphorous for appropriate people with diabetes | ✓ | | ✓ |

ABI, ankle-brachial pressure index; ARBs, angiotensin receptor blockers; CGM, continuous glucose monitors; MDI, multiple daily injections; NAFLD, nonalcoholic fatty liver disease; OSA, obstructive sleep apnea; PAD, peripheral arterial disease.

*At 65 years of age or older.

+May be needed more frequently in people with diabetes with known chronic kidney disease or with changes in medications that affect kidney function and serum potassium (see Table 11.1).

#May also need to be checked after initiation or dose changes of medications that affect these laboratory values (i.e., diabetes medications, blood pressure medications, cholesterol medications, or thyroid medications).

^In people without dyslipidemia and not on cholesterol-lowering therapy, testing may be less frequent.

**Should be performed at every visit in people with diabetes with sensory loss, previous foot ulcers, or amputations.

## Goals of Treatment for Diabetes

1. Management and goals should be guided by the assessment of overall health, cardiovascular risk, hypoglycemia risk, diabetes complications and shared decision making.
2. Some barriers to diabetes education and support may be overcome using telemedicine approaches.
3. Glycemic Goals in Adults
    - **a.** Lowering A1C to below or around 7% has been shown to reduce microvascular complications of diabetes and if implemented soon after the diagnosis of diabetes is associated with long-term reduction in macrovascular disease. Therefore, a reasonable A1C goal for many nonpregnant adults is <7% if this can be achieved without significant hypoglycemia.
    - **b.** For those using CGM, the goal is time in range >70%, time below range <4%, and time <54mg/dL<1%.
    - **c.** For those at high risk of hypoglycemia, the goal is time in range of >50% with time below range <1%
    - **d.** Providers might reasonably suggest more stringent A1C goals (such as 6.5%) 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, long life expectancy and no significant CVD.
    - **e.** Less stringent A1C goals (such as 8%) may be appropriate for patients with a history of severe hypoglycemia, limited life expectancy, advanced microvascular or macrovascular complications, extensive comorbid conditions and in those with longstanding diabetes in whom the general goal is difficult to attain despite DSMES, appropriate glucose monitoring, and effective doses of multiple glucose lowering agents including insulin.
    - **f.** Postprandial glucose should be targeted if A1C goals are not met despite reaching pre-prandial glucose goals.
    - **g.** Glycemic goals should be reassessed periodically.
    - **h.** Continuous glucose monitoring or intermittently scanned continuous glucose monitoring should be offered to adults with diabetes on multiple daily insulin injections or continuous subcutaneous insulin infusion.
        - The Ambulatory Glucose Profile (AGP) obtained from continuous glucose monitoring (CGM) devices provides visual cues to assist with interpretation of data and treatment decisions.
        - Time in Range can be used to assess glycemic control; time above and below target glucose are also helpful in evaluating the need for adjustment to the treatment regimen.
        - Many insurances will cover CGM in patients with diabetes. If the practitioner believes that CGM will help the patient achieve better glucose control, it should be prescribed with the possibility that a prior authorization will be required. The Association of Diabetes Care and Education Specialists Danatech website is open access and has excellent information on all the available devices including payer coverage. For CGM Insurance Coverage: **cgm-insurance-coverage-look-up**
        - Users should be educated on factors that may affect accuracy of their device (see below, Table 7.4, Continuous glucose monitoring devices interfering substances, copied from the 2024 Standards of Medical Care in Diabetes, Section 7, page S132)

**Table 7.4—Continuous glucose monitoring devices interfering substances**

| Medication | Systems affected | Effect |
|---|---|---|
| Acetaminophen | | |
| >4 g/day | Dexcom G6, Dexcom G7 | Higher sensor readings than actual glucose |
| Any dose | Medtronic Guardian | Higher sensor readings than actual glucose |
| Ascorbic acid (vitamin C), >500 mg/day | FreeStyle Libre 14 day, FreeStyle Libre 2, FreeStyle Libre 3 | Higher sensor readings than actual glucose |
| Hydroxyurea | Dexcom G6, Dexcom G7, Medtronic Guardian | Higher sensor readings than actual glucose |
| Mannitol (intravenously or as peritoneal dialysis solution) | Senseonics Eversense | Higher sensor readings than actual glucose |
| Sorbitol (intravenously or as peritoneal dialysis solution) | Senseonics Eversense | Higher sensor readings than actual glucose |

## Hypoglycemia

1. Classification of Hypoglycemia
    a. Level 1 Glucose <70mg/dL and ≥54mg/dL
    b. Level 2 Glucose <54mg/dL
    c. Level 3 Any severe event with altered mental status and/or physical status requiring assistance for treatment of hypoglycemia
2. Preferred Treatment
    a. Glucose (15-20g) for conscious person with blood glucose <70mg/dL, however any form of carbohydrate that contains glucose can be used
    b. Fifteen minutes after treatment, if blood glucose is still <70mg/dL treatment should be repeated
    c. When blood glucose pattern begins to trend up, a meal or snack should be eaten
3. All persons with diabetes taking insulin or at increased risk of level 2 or 3 hypoglycemia should be prescribed glucagon
4. Risk and awareness (ability to feel signs and symptoms) of hypoglycemia should be reviewed at every encounter
5. Any episodes of level 3 hypoglycemia should prompt adjustment of the treatment plan and hypoglycemia avoidance education
6. Patients on insulin that have hypoglycemia unawareness or one or more level 2 or 3 hypoglycemic events, should raise their glycemic target for at least several weeks. This assures safety and may allow return of insulin counterregulatory hormone responses to hypoglycemia and improved awareness or sensing of lows.

| **Glycemic Control** | |
|---|---|
| Hemoglobin A1C* | The A1C goal *for patients in general* is <7%.<br>If using ambulatory glucose profile/glucose management indicator to assess glycemia, a parallel goal for many nonpregnant adults is time in range of >70% with time below range <4% and time <54 mg/dL <1%<br>For patients at high risk of hypoglycemia a target of time in range >50% with time below range <1% is recommended<br>The A1C goal *for the individual patient* is an A1C as close to normal as possible without significant hypoglycemia<br>Less stringent A1C goals (such as <8%) may be appropriate for patients with a history of severe or recurrent problematic hypoglycemia, limited life expectancy, advanced microvascular or macrovascular complications, extensive comorbid conditions, or long-standing diabetes in whom the general goal is difficult to attain despite diabetes self-management education, appropriate glucose monitoring, and effective doses of multiple lowering agents including insulin. |
| Pre-prandial plasma glucose | 80–130 mg/dl (4.4–7.2 mmol/l) |
| Postprandial plasma glucose | <180 mg/dl (<10.0 mmol/l) postprandial glucose measurements should be made 1-2hrs after beginning of meal |
| **Other Goals** | |
| Blood pressure | Target blood pressure is SBP<130 and DBP<80 if these can be safely attained<br>All diabetes patients with hypertension (HTN) should monitor their blood pressure at home |
| Lipids*** | For adults not on lipid lowering therapy - screening lipid profile at diabetes diagnosis, at an initial medical evaluation and every 5 years thereafter if under age 40 ; periodically thereafter. Treatment should be based on risk status. (See Table Below for additional information on age >40.) |
| LDL | Goals – see below table "Recommendations for statin treatment in people with diabetes" |
| Triglycerides | <150 mg/dl (<1.7 mmol/l)ᵍ |
| HDL | >40 mg/dl (1.1 mmol/l) for males, and HDL goal > 50mg/dl (1.3mmol/l) in women |

*****Referenced to a nondiabetic range of 4.0–6.0% using a DCCT-based assay; ADA Standards of Medical Care in Diabetes 2022

******Postprandial glucose measurements should be made 1 ½ to 2 hrs. after the beginning of the meal, generally peak levels in patients with diabetes.

******* Lipid treatment: Goals include diet and lifestyle modification with intense lifestyle therapy and optimizing 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).

ᵍFor patients with fasting triglyceride levels ≥500 mg/dL (5.7 mmol/L), evaluate for secondary causes and consider medical
therapy to reduce the risk of pancreatitis.

In patients with ASCVD or other cardiovascular risk factors on a statin with controlled LDL cholesterol but elevated triglycerides (135–499 mg/dL), the addition of icosapent ethyl can be considered to reduce cardiovascular risk.

**Recommendations for statin treatment in people with diabetes**

| Age | Risk factors | Recommended statin intensity* | Monitoring lipid panel |
|---|---|---|---|
| <40 years | None | None**** | |
| | +CVD risk factor(s)** | Moderate | |
| | +10-year ASCVD risk of ≥20% | High (if LDL≥70mg/dL on maximally tolerated statin, consider adding ezetimibe or PCSK9 inhibitor) | Lipid profile at start of lipid lowering therapy, 4-12 wks after beginning or a dose change, annually thereafter/ as needed to monitor for adherence |
| | +Overt CVD*** | High; target LDL<55mg/dL | |
| | +ASCVD and LDL > 55mg/dL on maximum tolerated statin dose | Consider adding additional LDL lowering agents (e.g., ezetimibe or PCSK9 inhibitor | |
| Age 40-75 years | None | Moderate | |
| | +One or more CVD risk factors or 10-year ASCVD risk of ≥20% | High; target LDL <70mg/dL (if LDL≥70mg/dL on maximally tolerated statin, recommend adding ezetimibe or PCSK9 inhibitor) | Lipid profile at start of lipid lowering therapy, 4-12 wks after beginning or a dose change, annually thereafter/ as needed to monitor for adherence |
| | +Overt CVD | High; target LDL<55mg/dL (if LDL>55mg/dL on maximally tolerated statin, recommend adding ezetimibe or PCSK9 inhibitor) | |
| | +Patients with a history of ASCVD who cannot tolerate high-intensity statins | PCSK9 inhibitor or bempedoic acid should be considered | |
| >75 years | If already on statin therapy, it is reasonable to continue. If not on statin therapy, it may be reasonable to begin treatment after shared decision making | If treatment is started, a moderate intensity statin is recommended | |

*In addition to lifestyle therapy.
**CVD risk factors include LDL cholesterol >100 mg/dL (2.6 mmol/L), high blood pressure, smoking, chronic kidney disease, albuminuria, family history of premature ASCVD and overweight and obesity.
***Overt CVD includes those with previous cardiovascular events or acute coronary syndromes.
****Moderate-intensity statin may be considered based on risk-benefit profile and ASCVD risk factors
+ People with diabetes that cannot tolerate statins, bempedoic acid is recommended to decrease cardiovascular event rates

| High-Intensity Statin Therapy* | Moderate-Intensity Statin Therapy* |
|---|---|
| *Lowers LDL-C ≥50%* | *Lowers LDL-C 30-49%* |
| Atorvastatin 40-80 mg<br>Rosuvastatin 20-40 mg | Atorvastatin 10-20 mg<br>Rosuvastatin 5-10 mg<br>Simvastatin 20-40 mg (FDA does not recommend use of simvastatin 80 mg due to increased risk of myopathy)<br>Pravastatin 40-80 mg |

| Initial Approval Date and Reviews: | Most Recent Revision and Approval Date: May 2024 | Next Scheduled Review Date: |
|---|---|---|
| 3/ 2011, 7/ 2013, 3/2014, 5/ 2015, 5/ 2016, 5/ 2017. 5/2018, 5/2019, 5/2020, 5/2021, 5/2022, 5/2023, 5/2024 |  | May 2025 Ambulatory Best Practice Condition: Diabetes Mellitus |

| | |
|---|---|
| | Lovastatin 40 mg<br>Fluvastatin XL 80 mg<br>Pitavastatin 2-4 mg |
| *Once daily dosing | |
| Statin + ezetimibe: Adding ezetimibe to moderate-intensity statin therapy has been shown to provide CV benefit compared with moderate statin therapy alone. This combination is a consideration for individuals with recent ACS and LDL-C ≥50mg/dL or those who cannot tolerate a high-intensity statin.<br>Statin + fibrate: This combination has not been shown to improve ASCVD outcomes and as such, it is NOT recommended<br>Statin + niacin: This combination has not been shown to provide additional CV benefit above statin therapy alone and may increase the risk for stroke. Therefore, this combination is NOT recommended. | |

## Continuing Care

| Service | Recommendations |
|---|---|
| Frequency of return visits | At least quarterly * for type 1 patients. At least semi-annually * for type 2 patients if A1C at goal; quarterly if not at goal.<br>**More frequently when indicated for follow up of DKA, hyperglycemia, hypoglycemia, hypertension, retinopathy, nephropathy, cardiovascular disease, neuropathy, or foot conditions.* |
| Review of Management Plan | During every regular follow up visit |
| Focused physical, including reflexes and monofilament exam | Annually |
| Hemoglobin A1C | Quarterly for type 1 diabetes or insulin using patients and not at A1C goal patients; Every 6 months for type 2 diabetes with A1C≤ 7.0%. |
| Fasting lipid profile | For adults not on lipid lowering therapy - screening lipid profile at diabetes diagnosis, at an initial medical evaluation and every 5 years thereafter if under age 40 (note that for ages 40-75 statin therapy is recommended for all persons with diabetes; see "Recommendations for statin treatment in people with diabetes" above)<br>For adults on lipid lowering therapy - 4-12 wks. after beginning treatment or a dose change, annually thereafter/ as needed to monitor for adherence<br>More frequent testing may be considered on an individual basis (e.g., to monitor for adherence and efficacy) |
| Vaccinations | Follow recommendations of CDC ACIP (Advisory Committee on Immunization Practices). This can be found at **www.cdc.gov/vaccines/** |
| Random urine microalbumin/creatinine | At least once a year, quantitatively assess urinary albumin (e.g., urine albumin-to-creatinine ratio [UACR]) and estimated glomerular filtration rate (eGFR) in patients with type 1 diabetes duration of ≥5 years and in all patients with type 2 diabetes.<br><br>UACR ≥300 mg/g creatinine and/or eGFR 30–60 mL/min/1.73 m2 should be monitored 1-4 times per year depending on severity to guide therapy |

| | |
|---|---|
| Dilated eye exam<br>(by Ophthalmology or Optometry) | Patients with type 1 diabetes should have an initial dilated and comprehensive eye examination within 5 years after the onset of diabetes.<br>Patients with type 2 diabetes should have an initial dilated and comprehensive eye examination shortly after the diagnosis of diabetes.<br><br>Subsequent examinations should be repeated annually. Less frequent exams (i.e., every 2 years) may be considered with the advice of an eye care professional in the setting of a normal eye exam. Examinations will be required more frequently if retinopathy is progressing or patient planning to or becomes pregnant.<br><br>Programs that use retinal photography can be appropriate for retinal screening provided pathways present for timely referral for a comprehensive eye examination when indicated |
| Foot Exam | Patients with type 1 diabetes should be assessed for diabetes-related peripheral neuropathy within 5 years of the diagnosis of diabetes and at least yearly thereafter.<br><br>Patients with type 2 diabetes should be assessed for diabetes-related peripheral neuropathy at the time of diagnosis and at least yearly thereafter.<br><br>Careful history & 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. Inability to feel a 10-g monofilament is consistent with an insensate foot. Examination should include skin and vascular assessment (pulses in legs/feet). |
| Diabetes education | Evaluate annually |
| Medical Nutrition Therapy | Evaluation at time of diagnosis and annually |
| Physical Activity Prescription | Adults with diabetes should be advised to perform at least 150 min/week of moderate-or vigorous-intensity aerobic physical activity (50–70% of maximum heart rate), spread over at least 3 days/week with no more than 2 consecutive days without exercise.<br><br>Evidence supports that all individuals, including those with diabetes, should be encouraged to reduce sedentary time, particularly by breaking up extended amounts of time (>90 min) spent sitting.<br>In the absence of contraindications, adults with type 2 diabetes should be encouraged to perform resistance training at least twice per week. |
| Smoking Cessation Counseling | Advise all patients not to smoke. Include smoking cessation counseling and other forms of treatment as a routine component of diabetes care. e-cigarettes are not recommended as an alternative. |
| Dementia Screening | Screening for early detection of mild cognitive impairment or dementia should be done at least yearly on all persons with diabetes ≥65yoa |
| Ankle-Brachial Index (ABI) | Screening of ABI recommended for patients<br>▪ with symptoms/signs of peripheral vascular disease (PAD)<br>▪ >50 years of age<br>▪ and should be considered in patients <50 who have PAD risk factors |
| Nonalcoholic Fatty Liver Disease (NAFLD)/ Nonalcoholic | Type 2 diabetes and prediabetes patients with either elevated liver enzymes or fatty liver on imaging should be evaluated for nonalcoholic steatohepatitis and |

| | |
|---|---|
| steatohepatitis (NASH) *<br><br>*renamed MASH (metabolic dysfunction-associated steatohepatitis) | liver fibrosis<br>▪ Fibrosis-4 index (FIB-4) is the most cost-effective strategy for the initial screening of people with prediabetes and cardiometabolic risk factors or type 2 diabetes. (**mdcalc.com/calc/2200/fibrosis-4-fib-4-index-liver-fibrosis**).If low risk score, repeat testing in 2-3 years; if intermediate/high FIB-4 additional risk stratification with transient elastography or if unavailable then do blood fibrosis biomarker<br>▪ There are no FDA approved medications for treatment of NASH, however pioglitazone or GLP-1 receptor agonists are the preferred treatment<br>▪ Treatment is weight loss of at least 5%, preferably ≥10% as well as treating hyperglycemia |
| Osteoporosis Screening | Bone mineral density should be monitored with DEXA in adults ≥65 with DM and younger patients with diabetes and multiple risk factors every 2-3years (see diabetes specific risk factors under "Laboratory/Other Evaluation" above<br>In persons with type 2 diabetes a T-score ≤ -2.0 should be interpreted as osteoporosis |
| **Other Treatment Modalities** | |
| ASA | ▪ Use aspirin therapy (75–162 mg/day) as a secondary prevention strategy in those with diabetes with a history of CVD (cardiovascular disease)<br>▪ Per ADA consider aspirin therapy (75–162 mg/ day) as a primary prevention strategy in those with type 1 or type 2 diabetes at increased cardiovascular risk (10-year risk >10%). This includes most men or women with diabetes aged ≥50yr with ≥1 additional major risk factor: family hx of premature ASCVD (atherosclerotic cardiovascular disease), hypertension, smoking, dyslipidemia, or albuminuria. (USPSTF no longer recommends using ASA for primary prevention).<br>▪ Do not use aspirin in pts. < 21 yr. of age because of the increased risk of Reyes syndrome<br>▪ Aspirin is not recommended for those at low CVD risk (women and men under age 50 years with no major CVD risk factors; 10-year CVD risk under 5%). Clinical judgment should be used for those in these age ranges with multiple risk factors.<br>▪ In patients with aspirin allergy and CVD, clopidogrel 75mg/day should be used.<br>▪ Presence of retinopathy is not a contraindication to aspirin therapy as it does not increase the risk of retinal hemorrhage |
| FDA Approved Weight Loss Medications | ▪ Consider in select type 2 diabetes patients with BMI≥27kg/$m^2$ as an adjunct to diet, physical activity, and behavioral counseling<br>▪ If after 3 months response to weight loss medication is <5%, medication should be stopped, and alternative medications evaluated<br>▪ For additional information see guideline *Identification, Evaluation and Treatment of Overweight and Obesity in Adults* |
| Bariatric Surgery | ▪ Should be recommended for BMI ≥40 kg/m2 (BMI ≥37.5 kg/m2 in Asian Americans) & BMI 35.0–39.9 kg/m2 (32.5–37.4 kg/m2 in Asian Americans) in adults who do not achieve durable weight loss and improvement in comorbidities & diabetes control with nonsurgical methods and may be considered for other T2 diabetics.<br><br>▪ People who undergo metabolic surgery should receive long-term medical and behavioral support and routine monitoring of micronutrient, nutritional, |

| | |
|---|---|
| | and metabolic status. |
| Diabetes-Related Neuropathic Pain | ▪ Gabapentinoids, serotonin-norepinephrine reuptake inhibitors, tricyclic antidepressants, sodium channel blockers are recommended as initial pharmacologic treatment. Refer to pain specialist or neurologist when pain control is not achieved. |
| **Service - Other Treatment Modalities** | **Recommendations** |
| *Hypertensive diabetics with coronary artery disease (CAD) or microalbuminuria<br>▪ initial agent of choice- ACE inhibitor or ARB | ▪ Monitor serum potassium levels and renal function.<br>▪ Do not discontinue renin-angiotensin system blockade for minor increases in serum creatinine (≤30%) in the absence of volume depletion.<br>▪ ACEi/ARB are not recommended for the primary prevention of CKD in patients with diabetes who have normal BP, normal UACR (<30 mg/g creatinine), and normal eGFR.<br>▪ Type 2 diabetes patients with chronic kidney disease with albuminuria treated with max tolerated ARB or ACE inhibitor – addition of finerenone is recommended to reduce risk of kidney disease progression and to improve cardiovascular outcomes |
| *Diabetes with CVD or kidney disease<br>▪ SGLT2 inhibitors or GLP-1 receptor agonist with known CVD benefit | SGLT2inhibitors should only be used in patients with an eGFR≥20mL/min/1.73m$^2$ and urinary albumin ≥200mg/g creatinine<br>SGLT2 inhibitor + GLP-1 receptor agonist may both be considered for additive reduction in risk of adverse cardiovascular and kidney events |
| *Diabetes with heart failure (HF)<br>▪ SGLT2 inhibitor with proven HF benefit | |
| *Diabetes with obesity<br>▪ GLP-1 receptor agonist | Consider medications with the potential for weight loss (e.g., GLP-1 receptor agonists) or those that are weight neutral (e.g., DPP4 inhibitors) |
| Diabetes with NASH (MASH) | Pioglitazone or GLP-1 receptor agonists |
| Diabetes with decompensated cirrhosis | Insulin |

Note: This guideline is for reference only and is not intended or designed as a substitute for the reasonable exercise of independent clinical judgment by providers. This guideline is recommended for adults with either insulin dependent or non-insulin dependent diabetes mellitus. Patients younger than 18 years and pregnant females with diabetes are not included.

***see Table 9.2 below taken from *Standards of Medical Care in Diabetes (Section 9, page S167)***

## Pharmacologic Treatment of Diabetes

1. Type 1 diabetes should be treated with multiple daily injections of insulin (basal and prandial) or continuous subcutaneous insulin infusion.
2. The ADA treatment recommendations for type 2 diabetes should take into consideration of the following:
   - **a.** patient comorbidities such as ASCVD, chronic renal disease and heart failure
   - **b.** risk of hypoglycemia
   - c. medication costs and side effects
   - d. effect on weight
   - e. patient preference (*See Table 9.2 and Figure 9.3 below)*
3. The initial treatment of type 2 diabetes generally includes metformin. Metformin should be continued even after insulin therapy is initiated unless contraindicated or not tolerated.

4. In type 2 diabetes with atherosclerotic cardiovascular disease (CVD) or at high risk for atherosclerotic CVD a sodium-glucose cotransporter 2 inhibitor (SGLT-2 inhibitor) and/or a glucagon-like peptide 1 receptor agonist (GLP-1 RA) with demonstrated cardiovascular disease benefit are appropriate for initial treatment as a part of glucose lowering regimen and comprehensive cardiovascular risk reduction independent of A1c.
5. In type 2 diabetes with heart failure a SGLT-2i with proven heart failure benefit is recommended
6. In type 2 diabetes with chronic kidney disease a SGLT-2i with primary evidence of decreasing chronic kidney disease progression is preferred; if SGLT-2i is not tolerated or is contraindicated then use GLP-1 RA with proven CVD benefit. *(See Table 9.2 below for details)*
7. GLP-1 agonist is preferred over insulin when feasible in type 2 diabetes. If insulin is used, it is recommended that it be in combination with a GLP-1 agonist.
8. Consider early start of insulin if A1c>10% or blood glucose levels are very high (≥300mg/dL), if symptoms of hyperglycemia are present, or if there is ongoing catabolism (weight loss).
9. Treatment intensification should not be delayed in patients not meeting goals (*See Figure 9.4 below)*
10. In older adults' glucose targets and pharmacologic treatments might need to be adjusted to minimize hypoglycemia
    a. Simplification of complex treatment regiments, especially those using multiple daily insulin dosing, is recommended to decrease hypoglycemia risk (see *Figure 13.1* below for insulin simplification algorithm)
    b. Avoid thiazolidinediones and longer acting sulfonylureas
    c. Continuous glucose monitoring is recommended for older adults with type 1 diabetes to decrease hypoglycemia (*See Tables 13.1, 13.2 below)*
11. Treatment regimens should be simplified in the presence of cognitive impairment to minimize the risk of hypoglycemia.
12. ***Below are tables/figures copied from the 2024 Standards of Medical Care in Diabetes (Section 9, page S167 Table 9.2, page S166 Figure 9.3, page S171 Figure 9.4; Section 13, Figure 13.1-page S250, Table 13.1-page S248, Table 13.2-page S251).***

**Table 9.2—Medications for lowering glucose, summary of characteristics**

| | Efficacy[1] | Hypoglycemia | Weight change[2] | CV effects | | Renal effects | | Oral/SQ | Cost | Clinical considerations |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Effect on MACE | HF | Progression of DKD | Dosing/use considerations* | | | |
| **Metformin** | High | No | Neutral (potential for modest loss) | Potential benefit | Neutral | Neutral | • Contraindicated with eGFR <30 mL/min per 1.73 m$^2$ | Oral | Low | • GI side effects common; to mitigate GI side effects, consider slow dose titration, extended release formulations, and administration with food<br>• Potential for vitamin B12 deficiency; monitor at regular intervals |
| **SGLT2 inhibitors** | Intermediate to high | No | Loss (intermediate) | Benefit: canagliflozin, empagliflozin | Benefit: canagliflozin, dapagliflozin, empagliflozin, ertugliflozin | Benefit: canagliflozin, dapagliflozin, empagliflozin | • See labels for renal dose considerations of individual agents<br>• Glucose-lowering effect is lower for SGLT2 inhibitors at lower eGFR | Oral | High | • DKA risk, rare in T2DM: discontinue, evaluate, and treat promptly if suspected; be aware of predisposing risk factors and clinical presentation (including euglycemic DKA); discontinue before scheduled surgery (e.g., 3–4 days), during critical illness, or during prolonged fasting to mitigate potential risk<br>• Increased risk of genital mycotic infections<br>• Necrotizing fasciitis of the perineum (Fournier gangrene), rare reports: institute prompt treatment if suspected<br>• Attention to volume status, blood pressure; adjust other volume-contracting agents as applicable |
| **GLP-1 RAs** | High to very high | No | Loss (intermediate to very high) | Benefit: dulaglutide, liraglutide, semaglutide (SQ)<br>Neutral: exenatide once weekly, lixisenatide | Neutral | Benefit for renal endpoints in CVOTs, driven by albuminuria outcomes: dulaglutide, liraglutide, semaglutide (SQ) | • See labels for renal dose considerations of individual agents<br>• No dose adjustment for dulaglutide, liraglutide, semaglutide<br>• Monitor renal function when initiating or escalating doses in patients with renal impairment reporting severe adverse GI reactions | SQ; oral (semaglutide) | High | • Risk of thyroid C-cell tumors in rodents; human relevance not determined (liraglutide, dulaglutide, exenatide extended release, semaglutide)<br>• Counsel patients on potential for GI side effects and their typically temporary nature; provide guidance on dietary modifications to mitigate GI side effects (reduction in meal size, mindful eating practices [e.g., stop eating once full], decreasing intake of high-fat or spicy food); consider slower dose titration for patients experiencing GI challenges<br>• Counsel patients about potential for ileus (semaglutide SQ)<br>• Pancreatitis has been reported in clinical trials but causality has not been established. Discontinue if pancreatitis is suspected<br>• Evaluate for gallbladder disease if cholelithiasis or cholecystitis is suspected |
| **Dual GIP and GLP-1 RA** | Very high | No | Loss (very high) | Under investigation | Under investigation | Under investigation | • See label for renal dose considerations<br>• No dose adjustment<br>• Monitor renal function when initiating or escalating doses in patients with renal impairment reporting severe adverse GI reactions | SQ | High | • Risk of thyroid C-cell tumors in rodents; human relevance not determined<br>• Counsel patients on potential for GI side effects and their typically temporary nature; provide guidance on dietary modifications to mitigate GI side effects (reduction in meal size, mindful eating practices [e.g., stop eating once full], decreasing intake of high-fat or spicy food); consider slower dose titration for patients experiencing GI challenges<br>• Not recommended for individuals with history of gastroparesis<br>• Pancreatitis has been reported in clinical trials but causality has not been established. Discontinue if pancreatitis is suspected<br>• Evaluate for gallbladder disease if cholelithiasis or cholecystitis is suspected |
| **DPP-4 inhibitors** | Intermediate | No | Neutral | Neutral | Neutral (potential risk, saxagliptin) | Neutral | • Renal dose adjustment required (sitagliptin, saxagliptin, alogliptin); can be used in renal impairment<br>• No dose adjustment required for linagliptin | Oral | High | • Pancreatitis has been reported in clinical trials but causality has not been established. Discontinue if pancreatitis is suspected<br>• Joint pain<br>• Bullous pemphigoid (postmarketing): discontinue if suspected |
| **Thiazolidinediones** | High | No | Gain | Potential benefit: pioglitazone | Increased risk | Neutral | • No dose adjustment required<br>• Generally not recommended in renal impairment due to potential for fluid retention | Oral | Low | • Congestive HF (pioglitazone, rosiglitazone)<br>• Fluid retention (edema; heart failure)<br>• Benefit in NASH<br>• Risk of bone fractures<br>• Weight gain: consider lower doses to mitigate weight gain and edema |
| **Sulfonylureas (2nd generation)** | High | Yes | Gain | Neutral | Neutral | Neutral | • Glyburide: generally not recommended in chronic kidney disease<br>• Glipizide and glimepiride: initiate conservatively to avoid hypoglycemia | Oral | Low | • FDA Special Warning on increased risk of CV mortality based on studies of an older sulfonylurea (tolbutamide); glimepiride shown to be CV safe (see text)<br>• Use with caution in persons at risk for hypoglycemia |
| **Insulin** Human | High to very high | Yes | Gain | Neutral | Neutral | Neutral | • Lower insulin doses required with a decrease in eGFR; titrate per clinical response | SQ; inhaled | Low (SQ) | • Injection site reactions<br>• Higher risk of hypoglycemia with human insulin (NPH or premixed formulations) vs. analogs |
| **Insulin** Analogs | | | | | | | | SQ | High | |

CV, cardiovascular; CVOT, cardiovascular outcomes trial; DKA, diabetic ketoacidosis; DKD, diabetic kidney disease; DPP-4, dipeptidyl peptidase 4; eGFR, estimated glomerular filtration rate; GI, gastrointestinal; GIP, glucose-dependent insulinotropic polypeptide; GLP-1 RA, glucagon-like peptide 1 receptor agonist; HF, heart failure; NASH, nonalcoholic steatohepatitis; MACE, major adverse cardiovascular events; SGLT2, sodium–glucose cotransporter 2; SQ, subcutaneous; T2DM, type 2 diabetes mellitus. *For agent-specific dosing recommendations, please refer to manufacturers' prescribing information. [1]Tsapas et al. (104). [2]Tsapas et al. (152). Adapted from Davies et al. (84).

a. MACE=major adverse cardiovascular events

| **Initial Approval Date and Reviews:** | **Most Recent Revision and Approval Date: May 2024** | **Next Scheduled Review Date:** |
|---|---|---|
| 3/ 2011, 7/ 2013, 3/2014, 5/ 2015, 5/ 2016, 5/ 2017. 5/2018, 5/2019, 5/2020, 5/2021, 5/2022, 5/2023, 5/2024 |  | May 2025 Ambulatory Best Practice Condition: Diabetes Mellitus |

13.

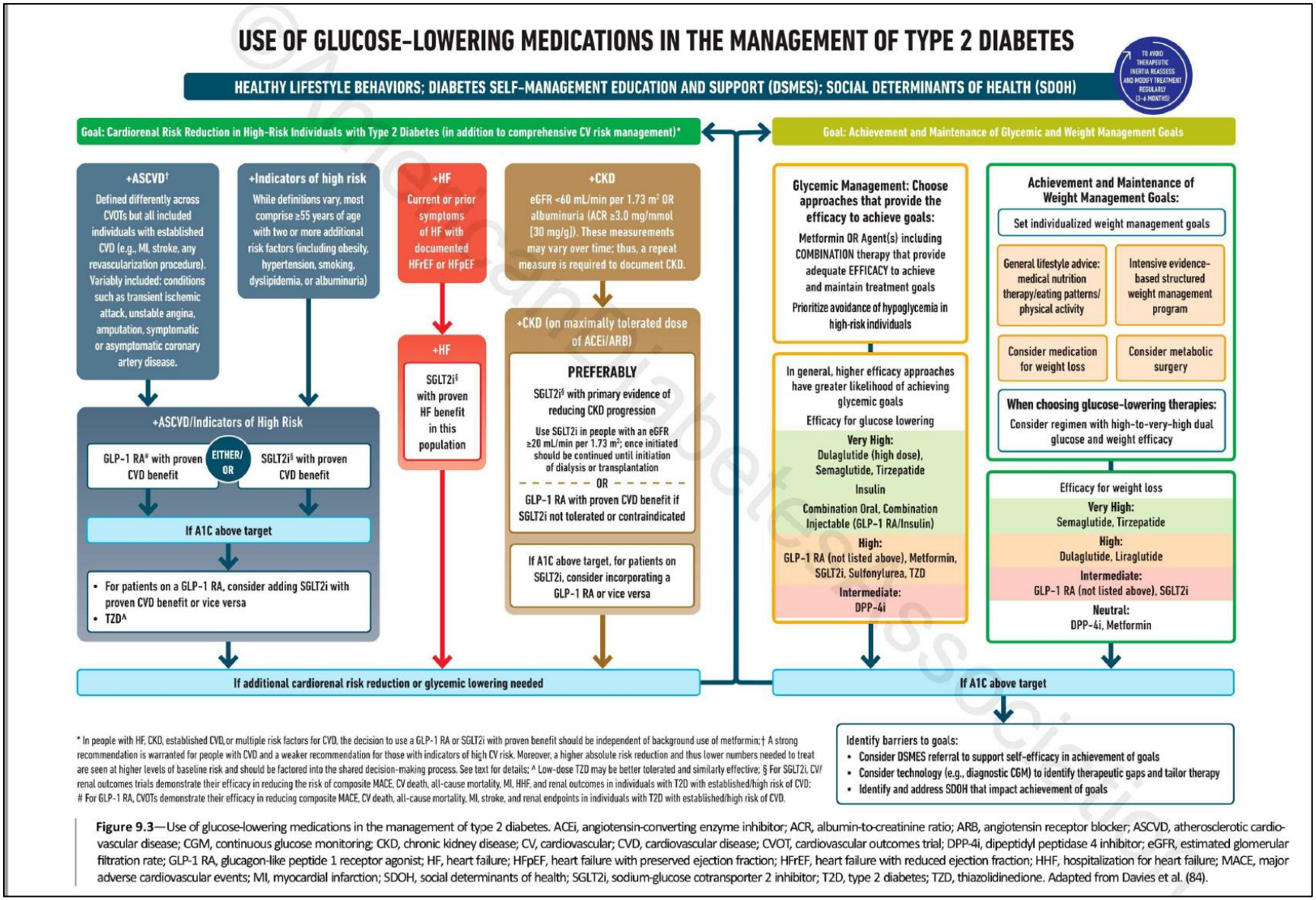


**Figure 9.3**—Use of glucose-lowering medications in the management of type 2 diabetes. ACEi, angiotensin-converting enzyme inhibitor; ACR, albumin-to-creatinine ratio; ARB, angiotensin receptor blocker; ASCVD, atherosclerotic cardiovascular disease; CGM, continuous glucose monitoring; CKD, chronic kidney disease; CV, cardiovascular; CVD, cardiovascular disease; CVOT, cardiovascular outcomes trial; DPP-4i, dipeptidyl peptidase 4 inhibitor; eGFR, estimated glomerular filtration rate; GLP-1 RA, glucagon-like peptide 1 receptor agonist; HF, heart failure; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; HHF, hospitalization for heart failure; MACE, major adverse cardiovascular events; MI, myocardial infarction; SDOH, social determinants of health; SGLT2i, sodium-glucose cotransporter 2 inhibitor; T2D, type 2 diabetes; TZD, thiazolidinedione. Adapted from Davies et al. (84).



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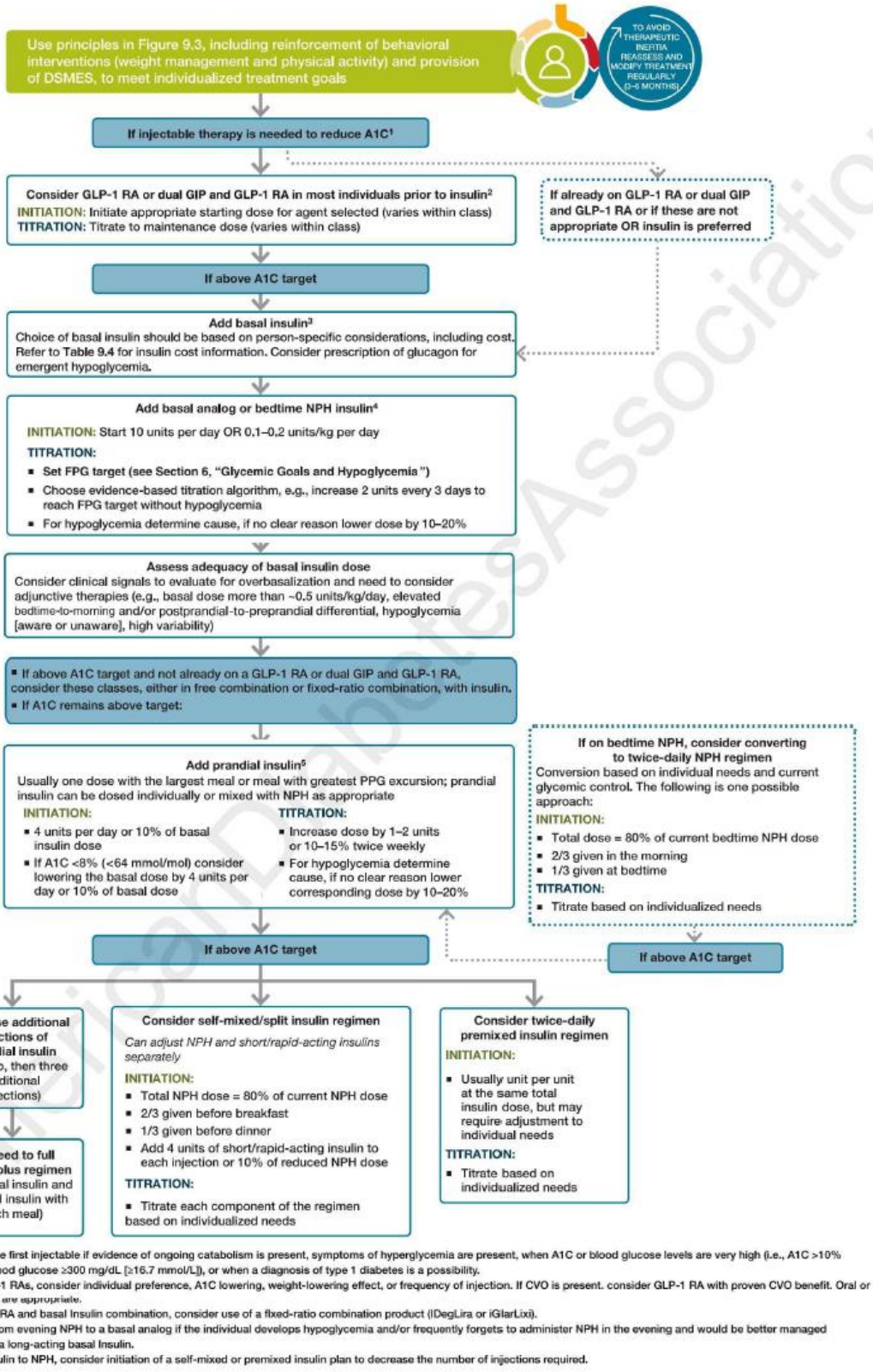
|---|---|---|
| 3/ 2011, 7/ 2013, 3/2014, 5/ 2015, 5/ 2016, 5/ 2017. 5/2018, 5/2019, 5/2020, 5/2021, 5/2022, 5/2023, 5/2024 |  | May 2025 Ambulatory Best Practice Condition: Diabetes Mellitus |




1. Consider insulin as the first injectable if evidence of ongoing catabolism is present, symptoms of hyperglycemia are present, when A1C or blood glucose levels are very high (i.e., A1C >10% [>86 mmol/mol] or blood glucose ≥300 mg/dL [≥16.7 mmol/L]), or when a diagnosis of type 1 diabetes is a possibility.
2. When selecting GLP-1 RAs, consider individual preference, A1C lowering, weight-lowering effect, or frequency of injection. If CVD is present, consider GLP-1 RA with proven CVD benefit. Oral or injectable GLP-1 RAs are appropriate.
3. For people on GLP-1 RA and basal insulin combination, consider use of a fixed-ratio combination product (IDegLira or iGlarLixi).
4. Consider switching from evening NPH to a basal analog if the individual develops hypoglycemia and/or frequently forgets to administer NPH in the evening and would be better managed with an A.M. dose of a long-acting basal insulin.
5. If adding prandial insulin to NPH, consider initiation of a self-mixed or premixed insulin plan to decrease the number of injections required.

**Figure 9.4**—Intensifying to injectable therapies in type 2 diabetes. DSMES, diabetes self-management education and support; FPG, fasting plasma glucose; GLP-1 RA, glucagon-like peptide 1 receptor agonist; dual GIP and GLP-1 RA, dual glucose-dependent insulinotropic polypeptide and glucagon-like peptide 1 receptor agonist; max, maximum; PPG, postprandial glucose. Adapted from Davies et al. (151).

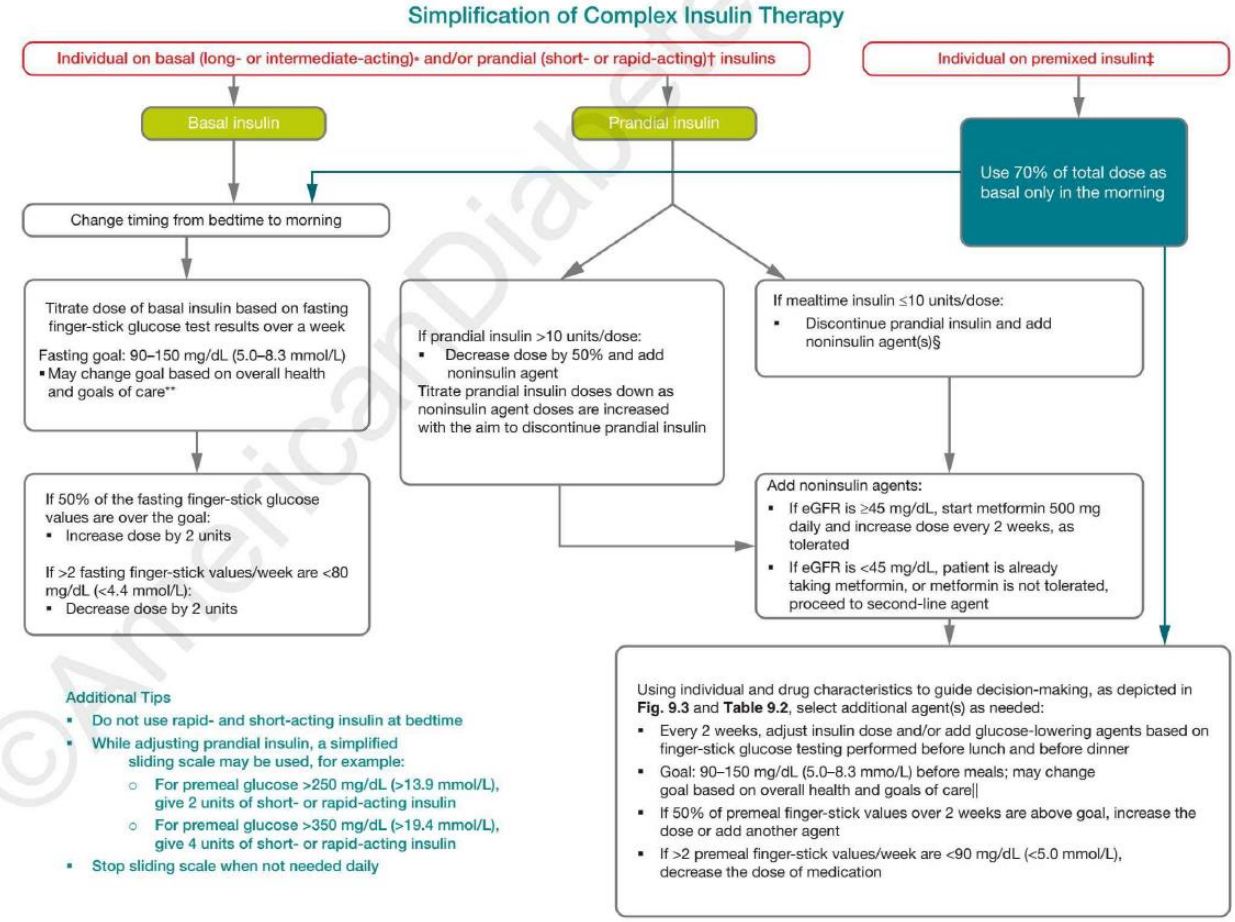



**Figure 13.1**—Algorithm to simplify insulin plans for older adults with type 2 diabetes. eGFR, estimated glomerular filtration rate. *Basal insulins: glargine U-100 and U-300, detemir, degludec, and human NPH. †Prandial insulins: short-acting (regular human insulin) or rapid-acting (lispro, aspart, and glulisine). ‡Premixed insulins: 70/30, 75/25, and 50/50 products. §Examples of noninsulin agents include metformin, sodium–glucose cotransporter 2 inhibitors, dipeptidyl peptidase 4 inhibitors, and glucagon-like peptide 1 receptor agonists. ||See **Table 13.1**. Adapted with permission from Munshi et al. (102).

**Table 13.1—Framework for considering treatment goals for glycemia, blood pressure, and dyslipidemia in older adults with diabetes**

| Characteristics and health status of person with diabetes | 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 | <7.0–7.5% (<53–58 mmol/mol) | 80–130 mg/dL (4.4–7.2 mmol/L) | 80–180 mg/dL (4.4–10.0 mmol/L) | <130/80 mmHg | Statin, unless contraindicated or not tolerated |
| Complex/intermediate (multiple coexisting chronic illnesses† or two or more instrumental ADL impairments or mild to moderate cognitive impairment) | Variable life expectancy. Individualize goals, considering:<br>• Severity of comorbidities<br>• Cognitive and functional limitations<br>• Frailty<br>• Risk-to-benefit ratio of diabetes medications<br>• Individual preference | <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) | <130/80 mmHg | Statin, unless contraindicated or not tolerated |
| Very complex/poor health (LTC or end-stage chronic illnesses‡ or moderate to severe cognitive impairment or two or more ADL impairments) | Limited remaining life expectancy makes benefit minimal | Avoid reliance on A1C; glucose control decisions should be based on avoiding hypoglycemia and symptomatic hyperglycemia | 100–180 mg/dL (5.6–10.0 mmol/L) | 110–200 mg/dL (6.1–11.1 mmol/L) | <140/90 mmHg | Consider likelihood of benefit with statin |

This table represents a consensus framework for considering treatment goals for glycemia, blood pressure, and dyslipidemia in older adults with diabetes. The characteristic categories are general concepts. Not every individual will clearly fall into a particular category. Consideration of individual and caregiver preferences is an important aspect of treatment individualization. Additionally, an individual's health status and preferences may change over time. ADL, activities of daily living; LTC, long-term care. *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, 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 individuals may have five or more (74). ‡The presence of a single end-stage chronic illness, such as stage 3–4 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. Adapted from Kirkman et al. (3).

**Table 13.2—Considerations for treatment plan simplification and deintensification/deprescribing in older adults with diabetes**

| Characteristics and health status of person with diabetes | Reasonable A1C/ treatment goal | Rationale/considerations | When may medication plan simplification be required? | When may treatment deintensification/ deprescribing be required? |
|---|---|---|---|---|
| Healthy (few coexisting chronic illnesses, intact cognitive and functional status) | <7.0–7.5% (<53–58 mmol/mol) | • Individuals can generally perform complex tasks to maintain good glycemic management when health is stable<br>• During acute illness, individuals may be more at risk for administration or dosing errors that can result in hypoglycemia, falls, fractures, etc. | • If severe or recurrent hypoglycemia occurs in individuals on insulin therapy (regardless of A1C)<br>• If wide glucose excursions are observed<br>• If cognitive or functional decline occurs following acute illness | • If severe or recurrent hypoglycemia occurs in indviduals on noninsulin therapies with high risk of hypoglycemia (regardless of A1C)<br>• If wide glucose excursions are observed<br>• In the presence of polypharmacy |
| Complex/intermediate (multiple coexisting chronic illnesses or two or more instrumental ADL impairments or mild to moderate cognitive impairment) | <8.0% (<64 mmol/mol) | • Comorbidities may affect self-management abilities and capacity to avoid hypoglycemia<br>• Long-acting medication formulations may decrease pill burden and complexity of medication plan | • If severe or recurrent hypoglycemia occurs in individuals on insulin therapy (even if A1C is appropriate)<br>• If unable to manage complexity of an insulin plan<br>• If there is a significant change in social circumstances, such as loss of caregiver, change in living situation, or financial difficulties | • If severe or recurrent hypoglycemia occurs in individuals on noninsulin therapies with high risk of hypoglycemia (even if A1C is appropriate)<br>• If wide glucose excursions are observed<br>• In the presence of polypharmacy |
| Community-dwelling individuals receiving care in a skilled nursing facility for short-term rehabilitation | Avoid reliance on A1C, glucose goal 100–200 mg/dL (5.55–11.1 mmol/L) | • Glycemic management is important for recovery, wound healing, hydration, and avoidance of infections<br>• Individuals recovering from illness may not have returned to baseline cognitive function at the time of discharge<br>• Consider the type of support the individual will receive at home | • If treatment plan increased in complexity during hospitalization, it is reasonable, in many cases, to reinstate the prehospitalization medication plan during the rehabilitation | • 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 (LTC or end-stage chronic illnesses or moderate to severe cognitive impairment or two or more ADL impairments) | Avoid reliance on A1C and avoid hypoglycemia and symptomatic hyperglycemia | • No benefits of tight glycemic management in this population<br>• Hypoglycemia should be avoided<br>• Most important outcomes are maintenance of cognitive and functional status | • If on an insulin plan and the individual would like to decrease the number of injections and finger-stick blood glucose monitoring events each day<br>• If the individual has an inconsistent eating pattern | • If on noninsulin agents with a high hypoglycemia risk in the context of cognitive dysfunction, depression, anorexia, or inconsistent eating pattern<br>• If taking any medications without clear benefits |
| At the end of life | Avoid hypoglycemia and symptomatic hyperglycemia | • Goal is to provide comfort and avoid tasks or interventions that cause pain or discomfort<br>• Caregivers are important in providing medical care and maintaining quality of life | • If there is pain or discomfort caused by treatment (e.g., injections or finger sticks)<br>• If there is excessive caregiver stress due to treatment complexity | • If taking any medications without clear benefits in improving symptoms and/or comfort |

Treatment plan simplification refers to changing strategy to decrease the complexity of a medication plan (e.g., fewer administration times and fewer blood glucose checks) and 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. Created using information from Munshi et al. 2016 (102) and 2017 (138). ADL, activities of daily living; LTC, long-term care.

## Resources Available

*https://consumerguide.diabetes.org/*
An ADA resource that can help practitioners and diabetics decide on the appropriate devices
Has information on the various CGMs, insulin pumps, meters, insulin, insulin pens, etc.

*https://www.nei.nih.gov/learn-about-eye-health/eye-conditions-and-diseases*
An online resource with information about eye conditions and diseases. Includes large section on diabetic retinopathy

*https://www.niddk.nih.gov/health-information/diabetes*
Link goes directly to a page with links to multiple topics pertaining to diabetes. There is a section for health professionals and another for non-health professionals.

*https://coveragetoolkit.org/medicare-advantage/mdpp-final-rule/*
Above link is information for Medicare/Medicaid Diabetes Prevention Program (MDPP) —there is information regarding MDPP services, beneficiary eligibility criteria and referrals

*https://innovation.cms.gov/innovation-models/medicare-diabetes-prevention-program*
Above link is a page on CMS.gov that has information on MDPP. For Medicare beneficiaries there is a 1-800 number and another website link for more information. There is also a "Frequently Asked Questions Page" and a place to subscribe to the MDPP listserv to receive updates on this program. Additionally, there is a link to find MDPP suppliers furnishing MDPP services.

https://www.findhelp.org/
Above link helps search for financial assistance, food pantries, medical care, and other free or decreased cost help

Centers for Disease Control and Prevention: Has online resources for professionals and laypersons
https://www.cdc.gov/diabetes/professional-info/index.html

List of the Centers for Disease Control and Prevention-recognized diabetes prevention lifestyle change programs can be found at this website: cdc.gov/diabetes/prevention/find-a-program.html

Diabetes Education: https://www.diabeteseducator.org

Diabetes Technologies: https://www.diabeteseducator.org/danatech/home

ADA Resources:
Diabetes.org:
*https://diabetes.org/*
This site has a lot of information for patients ranging from how diabetes is diagnosed to details about insulin pumps.
Call 1-800-DIABETES (800-342-2383) Monday-Friday 9:00 a.m. to 7:00 p.m. ET
Facebook: American Diabetes Association
Twitter: @AmDiabetesAssn
Instagram: @AmDiabetesAssn
The American Diabetes Association maintains an online version of the Standards of Medical Care in Diabetes, titled Living Standards of Care. If updates to the Standards of Medical Care in Diabetes 2024 are needed they will be posted online as annotations.
Standards of Care App – free app available in App Store for iOS or Google Play for Android. This app has the most up-to-date Standards along with interactive tables and algorithms.

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## References

1. Standards of Care in Diabetes- 2024, American Diabetes Association. Diabetes Care volume 47, supplement 1, January 2024.
2. ACE/ACCE Consensus Statement: Consensus Statement by the American Association of Clinical Endocrinologists and American College of Endocrinology on the Comprehensive Type 2 Diabetes Management Algorithm-2020 Executive Summary
3. Centers for Disease Control and Prevention – National Diabetes Statistics Report

## Attachments

- Oral Diabetes Agents
- Insulins and Other Injectables
- **MedStar Diabetes Institute Resources:**
  - Appendix A: T2DM Insulin Start Dosing Guidelines
  - Appendix B: T2DM Insulin Pen Prescribing
  - Appendix C: Non-Insulin injectables
  - Appendix D: Oral Diabetes Medications
  - Appendix E: T2DM & Obesity Co-management Medications
- **MedStar Diabetes Institute: Perioperative Management of DM Resources:**
  - Appendix F: Perioperative Management of Diabetes Medications
  - Appendix G: Guidelines for Pre-Surgery Management of Diabetes Medications
  - Appendix H: Post Surgery Patient Instructions for Diabetes Medications
- **MedStar Diabetes Institute: Other:**
  - Appendix I: MedStar Diabetes Boot Camp Telehealth Program

## ORAL DIABETES MEDICATIONS

| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| Sulfonylureas | | | | | |
| Glyburide (Glynase® [micronized], and generics) | $55 | Stimulates the release of insulin from the pancreas<br><br>Glipizide immediate release is preferred in patients with moderate to severe renal function impairment | FPG: ⇩ 50-60mg/dl<br>HbA1c: ⇩ 1.5-2% | Glynase (micronized)®: 0.75-12mg/day; max 12mg/day (divide doses >6mg)<br><br>glyburide: 1.25-20mg/day; max 20mg/day (divide doses >10mg) | Common side effects: Hypoglycemia, weight gain, GI upset<br><br>Precautions<br>hepatic/renal impairment<br>increased risk of hypoglycemia with Glucotrol® XL if the patient misses a meal<br>glyburide implicated in negative outcomes post-MI<br>empty Glucotrol® XL tablet shell may appear in stool<br><br>Glyburide – increased risk of prolonged hypoglycemia in the elderly; micronized and conventional tablets are not bioequivalent<br><br>Glimepiride – contraindicated if CrCl <15mL/min<br>Glipizide – preferred in renal impairment due to shorter half-life and inactive metabolite (eGFR < 50 mL/min/1.73 $m^2$ dose with 2.5mg to 20mg/day) |
| Glipizide (Glucotrol XL® and generics) | $78 | | | glipizide (immediate release): 2.5-20mg/day 30 min. prior to meals; max 40mg/day (divide doses >15mg)<br><br>Glucotrol XL®: 2.5-10mg/day with the first main meal; max 20mg/day | |
| Glimepiride (Amaryl® or generics) | $198 | | | 1-4mg/day with the first main meal; max 8mg/day (8mg dose may be administered in 1 or 2 divided doses) | |
| Biguanides | | | | | |
| Metformin (Glumetza® and generics) | $144<br><br>$1014 | Decreases hepatic glucose production and improves insulin sensitivity | FPG: ⇩ 50-60mg/dl<br>HbA1c: ⇩ 1.5-2%<br>⇩ TG, LDL, Chol<br>⇧ HDL | 500-2000mg/day with a meal increasing slowly by 500mg every 1-2 weeks. Administer once or twice daily; max 2550mg/day; divided | Common side effects: Nausea, diarrhea<br>- often resolve after 2-3 weeks of use and minimized by taking |

| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| Available in Liquid form, Riomet®, at a concentration of 500mg/5mL. | | | | doses >2000mg into three times a day dosing)<br><br>Extended-release tablets: 500mg-2000mg/day with evening meal increasing by 500mg weekly; 2000mg/day (if 2000mg/day ineffective, may try 1000mg twice a day or switch to regular release metformin on a mg-per-mg basis)<br>Adjusting for reduced GFR:<br>If eGFR ≥30 to <45 mL/min/1.73 $m^2$: Do not initiate therapy. In patients currently receiving metformin, assess benefits and risks of continuing therapy with close monitoring of renal function; may continue at a reduced dose up to a maximum of 500mg 2x/day and advise patients to stop the drug for nausea, vomiting, or dehydration.<br>If eGFR <30 mL/min/1.73 $m^2$: Do not initiate therapy. If on metformin, discontinue use. | with a meal or using XL formulation<br><br>Vitamin B12 deficiency may occur with chronic use; periodic monitoring is recommended<br><br>Weight neutral but has potential for modest weight loss<br><br>Precautions<br>For patients who will receive intra-arterial contrast or patients with eGFR between 30 and 60 or patients with a history of liver disease or heart failure who will receive intravascular iodinated contrast media, do not administer metformin at the time of or for 48 hours after procedures and resume therapy only when normal renal function returns.<br>Avoid in patients with frequent alcohol use, or liver or kidney disease due to increased risk of lactic acidosis.<br>Avoid in patients with unstable heart failure.<br>Obtain eGFR at least annually in all patients taking metformin. Assess more frequently in patients at increased risk of renal impairment such as the elderly. |
| Alpha-Glucosidase Inhibitors | | | | | |
| Acarbose (generics only) | $105 | Delays dietary absorption of complex carbohydrates thereby lowering postprandial glucose | FPG: little effect<br>HbA1c: ⇩ 0.5-1%<br>PPG: ⇩ 50mg/dl | 25mg three times a day with the first bite of each main meal increasing to 50mg three times a day and then 100mg three times a day after 4-8 weeks; max 100mg three times a | Common side effects: abdominal pain, diarrhea, bloating. Flatulence (Increased intake of food that contains sucrose can |

| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| | | | | day if patient is >60kg and 50mg three times a day if ≤60kg | lead to GI symptoms), ↑ LFTs (with acarbose only) |
| Miglitol (generics only) | $347 | | | 25mg three times a day with the first bite of each main meal increasing to 50mg three times a day after 4-8 weeks and may be increased to 100mg three times a day | Precautions<br>Not recommended for patients with CrCl<25mL/min or SCr>2mg/dL. Asymptomatic / reversible increases in AST and/or ALT have occurred in up to 14% of acarbose-treated patients. Fulminant hepatitis-rare.<br><br>Contraindicated in patients with inflammatory bowel disease, colonic ulceration, or intestinal obstruction.<br><br>Use glucose to treat hypoglycemia – sucrose products are ineffective due to the medication's mechanism of action |
| Thiazolidinediones | | | | | |
| Pioglitazone (Actos® and generics) | $349 | Improves insulin sensitivity and increases peripheral glucose disposal | FPG: ⇩ 50-100mg/dl<br>HbA1c: ⇩ 1-2%<br>⇧ LDL, Chol, HDL | 15-30mg once daily (increase in 15mg increments every 4 to 12 weeks; max 45mg/day) | Common side effects: edema, weight gain, hypoglycemia, diarrhea, ↑ LFTs<br><br>Precautions<br>Not recommended for patients with NYHA class III or IV heart failure, CYP450 drug interactions, or with history of CAD.<br>If patient is stable on medication continue at lower dosage and continue to monitor. |
| Meglitinides | | | | | |

| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| Repaglinide (generics only) | $879 | Stimulates glucose-dependent insulin secretion<br>Short half-life (1 hr.) – quick onset (15-30 min) | FPG: 10-40mg/dl<br>HbA1c: ⇩ 0.5-2%<br>PPG: ⇩ 50mg/dl | 0.5-2mg 15-30 minutes before each meal, depending on a1c; max 4mg/dose and 16mg/day (up to four times a day)<br><br>At least 1 week should elapse between dose adjustments | Common side effects: hypoglycemia, weight gain<br><br>Precautions<br>hepatic and renal impairment, CYP450 drug interactions |
| Nateglinide (generics only) | $156 | | | 60-120mg three times a day 30 minutes prior to each meal; max 120mg/dose and 360mg/day | |
| Dipeptidyl Peptidase IV Inhibitors | | | | | |
| Sitagliptin (brand only - Januvia®) | $688 | inhibits dipeptidyl peptidase IV (DPP-IV) enzymes resulting in prolonged active incretin levels. | HbA1c: ⇩ 0.5-0.6% | 100 mg once daily<br><br>eGFR ≥ 30 to 45 mL/min/1.73 $m^2$: use 50 mg once daily<br>eGFR < 30 mL/min/1.73 $m^2$: use 25mg once daily | Common side effects: headaches, upper respiratory infection<br><br>Precautions<br>Acute and chronic pancreatitis have been reported with DPP-IV inhibitor use; monitor for signs/ symptoms of pancreatitis<br>Cases of fatal and nonfatal hepatic failure have been reported. Monitoring and appropriate therapy interruption is necessary<br>Adjust dose in renal dysfunction for sitagliptin, saxagliptin, and alogliptin<br>No dosage adjustment required for mild-moderate hepatic impairment (sitagliptin, saxagliptin).<br>No dosage adjustment for linagliptin needed for renal or hepatic impairment.<br>(Use not recommended in combination with GLP-1 agonist)<br>Effectiveness of linagliptin is decreased when used in combination with CYP3A4 |
| Saxagliptin (brand only – Onglyza®) | $582 | | | 2.5-5mg once daily<br><br>If eGFR < 45 mL/min/1.73 $m^2$ or if on a CYP3A4/5 inhibitor (ex: azole antifungal, protease inhibitor, clarithromycin) or for patients with ESRD requiring hemodialysis.<br>Use 2.5mg (post dialysis) | |
| Linagliptin (brand only – Tradjenta®) | $630 | | | 5mg once daily | |
| Alogliptin (Nesina® and generics) | $234 | | | 25mg once daily<br><br>CrCl 30 to 60 mL/min: 12.5mg once daily<br><br>CrCl < 30 mL/min: 6.25mg once daily | |

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| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| | | | | | inducers (ex: rifampin) – use alternative therapy |
| Sodium-Glucose-Cotransporter 2 Inhibitors | | | | | |
| Canagliflozin (brand only – Invokana®)<br><br>FDA approved for cardiovascular disease benefit | $718 | Reduces reabsorption of filtered glucose from the tubular lumen and lowers renal threshold for glucose | HbA1C ⇩0.77-1.03%<br>FBG⇩36-43 mg/dl | Initial 100 mg once daily prior to first meal of day; may increase to 300 mg once daily after 4 to 12 weeks; max dose 300 mg once daily.<br>eGFR 30 to <60 mL/min/1.73 $m^2$: max dose 100 mg daily<br>eGFR <30 mL/min/1.73 $m^2$ with Urinary albumin excretion > 300mg/day: initiation not recommended but may continue for patients previously established<br>eGFR < 30 mL/min/1.73 $m^2$ with urinary albumin excretion ≤ 300mg/day, ESRD, and hemodialysis: avoid use | SGLT2 inhibitor use may lead to ketoacidosis. Patients should seek medical attention if they experience any signs or symptoms they may be related to ketoacidosis.<br><br>Common side effects: May increase risk of genital mycotic infections; may cause hypotension due to intravascular depletion in patients with renal impairment; may cause hyperkalemia, may cause dose-related LDL elevation<br><br>No dose adjustment for mild-moderate hepatic impairment (Has not been studied in patients with severe impairment) |
| Dapagliflozin (brand only - Farxiga®)<br><br>FDA approved for cardiovascular disease, heart failure, and chronic kidney disease benefit | $699 | | HbA1C ⇩0.8-0.9%<br>FBG ⇩24-29 mg/dl | Initial 5 mg once daily in the morning with or without food; may increase to 10 mg once daily after 4 to 12 weeks<br>eGFR <45 mL/min/1.73 $m^2$: use not recommended<br>eGFR <25 mL/min/1.73 $m^2$, ESRD, and hemodialysis: avoid use | |
| Empagliflozin (brand only - Jardiance®)<br><br>FDA approved for cardiovascular disease and heart failure benefit | $733 | | HbA1C ⇩0.8%<br>FBG ⇩ 19 -25 mg/dl | Initial: 10 mg once daily; may increase to 25 mg once daily after 4 to 12 weeks<br>eGFR < 20 mL/min/1.73 $m^2$, ESRD, and hemodialysis: avoid use | |
| Ertugliflozin (brand only - Steglatro®) | $428 | | HbA1C ⇩0.7-0.8%<br>FBG⇩ 31-36 mg/dl | Initial 5mg once daily; may increase to15mg once daily after 4 to 12 weeks | |

| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| | | | | eGFR <45 mL/min/1.73 $m^2$: use not recommended<br>ESRD, and hemodialysis: use contraindicated | |
| | Glucagon-Like Peptide-1 Receptor Agonists | | | | |
| Semaglutide (brand only - Rybelsus®) | $1162 | Glucose dependent insulin release, lowers glucagon during hyperglycemia, slows gastric emptying, reduces food intake through increase in satiety. Secondary effect of medication is weight loss or prevention of weight gain as glucose control improves | HbA1C ⇩1.2-1.4% | 3mg once daily for 30 days then increase to 7mg once daily; 3mg dose is not clinically effective (Intended to reduce GI symptoms)<br><br>Can increase to maximum dose of 14mg once daily after 30 days of 7mg once daily<br><br>Take at least 30 minutes before the first food, beverages or other medications in the morning with no more than 4 oz. of plain water only<br><br>Do not split, crush, or chew<br><br>To convert from SQ to PO:<br>0.5mg SQ once weekly dose is equivalent to 7mg or 14mg of PO once daily dose, starting within 7 days of last injection.<br>1mg SQ once weekly dose is equivalent to 14mg PO once daily dose, starting within 7 days of last injection<br><br>To convert from PO to SQ:<br>7mg and 14mg PO once daily dose should be changed to 0.5mg SQ once weekly dose, starting at when next PO dose would be given with close glucose monitoring during transition | Initial doses are meant to reduce gastrointestinal symptoms during titration and are not effective for glycemic control<br><br>Promotes weight loss<br><br>(Use not recommended in combination with DPP-4 Inhibitors)<br><br>Boxed warning: contraindicated in patients with personal or family history of medullary thyroid carcinoma or multiple endocrine neoplasia syndrome type 2<br><br>Common side effects: nausea and abdominal pain, constipation, diarrhea, vomiting, headache (decreased by starting at 3mg dose)<br><br>Monitor for symptoms of acute kidney injury, diabetic retinopathy, cholelithiasis, pancreatitis |
| Combination Medications | | | | | |

| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| Sulfonylurea + Biguanide | | | | | |
| metformin + glyburide (generics only) | $127 | Stimulates the release of insulin from the pancreas; increases the sensitivity of peripheral tissues to insulin; and decreases hepatic glucose production | FPG: ⇩ 50mg/dl<br>HbA1c: ⇩ 2% | Initial treatment: 1.25mg/250mg once daily with meals (twice daily if a1c>9% or FPG >200mg/dL) and increase by 1.25mg/250mg once or twice daily every 2 weeks; max 10mg/2000mg/day<br><br>Previously treated patients: 2.5mg/500-5mg/500mg twice a day with meals and increase by 5mg/500mg; max 20mg/2000mg/day | Precautions/side effects<br>See individual agents<br><br>The starting dose of metformin +glipizide should not exceed the current dose of metformin or glipizide already being taken |
| metformin + glipizide (generics only) | $119 | | | Initial treatment: 2.5mg/250mg once daily or 2.5mg/500mg twice a day with meals if FPG 280-320mg/dL and increase by 1 tablet once daily every 2 weeks; max 10mg/2000mg daily in divided doses<br><br>Previously treated patients: 2.5mg/500mg – 5mg/500mg twice a day with meals and increase in increments not to exceed 5mg/500mg; max 20mg/2000mg daily in divided doses | |
| Thiazolidinedione + Sulfonylurea | | | | | |
| Pioglitazone + Glimepiride (Duetact(R) and generics) | $489 | Improves insulin sensitivity and increases peripheral glucose disposal; Stimulates the release of insulin from the pancreas | | Initial dose should be based on current dose of pioglitazone and/or sulfonylurea.<br>Patients inadequately controlled on glimepiride alone: Initial dose: 30 mg/2 mg or 30 mg/4 mg once daily<br>Patients inadequately controlled on pioglitazone alone: Initial dose: 30 mg/2 mg once daily | Precautions/side effects<br>See individual agents |

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|---|---|---|
| 3/ 2011, 7/ 2013, 3/2014, 5/ 2015, 5/ 2016, 5/ 2017. 5/2018, 5/2019, 5/2020, 5/2021, 5/2022, 5/2023, 5/2024 |  | May 2025 Ambulatory Best Practice Condition: Diabetes Mellitus |

| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| | | | | Maximum dose: Pioglitazone 45 mg/glimepiride 8 mg once daily | |
| Thiazolidinedione + Biguanide | | | | | |
| Pioglitazone + metformin (Actoplus Met® and generics) | $320 | Improves insulin sensitivity and decreases hepatic glucose production | FPG: 33-48mg/dl<br>HbA1c: ⇩0.6-0.8% | Initial dose should be based on current dose of pioglitazone and/or metformin; daily dose should be divided and given with meals. If not switching from individual components, initial dose is 15mg/500mg twice daily or 15mg/850mg once daily<br>Patients inadequately controlled on metformin alone: Initial dose: 15mg/500mg or 15mg/850mg twice daily depending on current dose of metformin.<br>Patients inadequately controlled on pioglitazone alone: Initial dose: 15mg/500mg twice daily or 15mg/850mg once daily<br>Dosing adjustment: Doses may be increased as increments of pioglitazone 15 mg and/or metformin 500-850 mg, up to the maximum dose; doses should be titrated gradually. Guidelines for frequency of adjustment (adapted from rosiglitazone/metformin combination labeling):<br>After a change in the metformin dosage, titration can be done after 1-2 weeks<br>After a change in the pioglitazone dosage, titration can be done after 8-12 weeks<br>Maximum dose: Pioglitazone 45 mg/metformin 2550 mg daily.<br>Metformin daily dose >2000mg better tolerated as 3x/day dosing. | Precautions/side effects<br>See individual agents |
| Dipeptidyl Peptidase IV Inhibitor + Biguanide | | | | | |

| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| Sitagliptin + metformin (brand only - Janumet®, Janumet XR®) | $688 | inhibits dipeptidyl peptidase IV (DPP-IV) enzymes resulting in prolonged active incretin levels and decreases hepatic glucose production and improves insulin sensitivity | FPG: ⇩ 50-60mg/dl<br>HbA1c: ⇩ 1.5-2%<br>⇩ TG, LDL, Chol<br>⇧ HDL | Initial doses should be based on current dose of sitagliptin and metformin; daily doses should be divided and given twice daily with meals (immediate release) or once daily (extended release). Maximum: Sitagliptin 100 mg/metformin 2000 mg daily<br>Patients inadequately controlled on metformin alone: Initial dose: Sitagliptin 100 mg/day plus current daily dose of metformin. Note: Per manufacturer labeling, patients currently receiving metformin 850 mg twice daily should receive an initial dose of sitagliptin 50 mg and metformin 1000 mg twice daily<br>Patients inadequately controlled on sitagliptin alone: Initial dose: Metformin 1000 mg/day plus sitagliptin 100 mg/day. Note: Patients currently receiving a renally adjusted dose of sitagliptin should not be switched to combination product.<br>Dosing adjustment: Metformin component may be gradually increased up to the maximum dose. Maximum dose: Sitagliptin 100 mg/metformin 2000 mg daily | Precautions/side effects<br>See individual agents |
| Linagliptin plus metformin (brand only - Jentadueto®, Jentadueto XR®) | $630 | | | Initial doses should be based on current doses of the components. Should be given in 2 divided doses (immediate release) or once daily (extended release).<br>Patients inadequately controlled on metformin alone: Initial dose: linagliptin 5mg/day plus current daily dose of metformin | |

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| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| | | | | Patients inadequately controlled on linagliptin alone: initial dose: linagliptin 5mg and metformin 1000mg daily<br>When converting from immediate to extended-release dose is 5mg linagliptin and current daily dose of metformin once daily.<br>Dosing Adjustment: Metformin component may be gradually increased to the maximum dose.<br>Maximum dose: Linagliptin 5 mg /metformin 2000 mg daily. | |
| Saxagliptin plus metformin (brand only - Kombiglyze ER®) | $524 | | | Initial doses should be based on current daily dose of the components. Should be administered once daily.<br>Note: Patients requiring saxagliptin 2.5mg and metformin >1000mg/day should not be switched to combination product.<br>Patients inadequately controlled on metformin alone: initial: saxagliptin 2.5-5mg once daily plus current daily dose of metformin.<br>Patients inadequately controlled on saxagliptin alone: initial: 5mg/500mg once daily.<br>Maximum dose: saxagliptin 5mg/metformin 2000mg once daily | |
| Alogliptin plus metformin (Kazano® and generics) | $234 | | | Initial doses should be based on current daily dose of the components.<br>Usual dosing: 12.5mg/500-1000mg twice daily<br>Maximum dose: 12.5mg/1000mg twice daily | |

| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| Alogliptin plus pioglitazone (Oseni® and generics) | $234 | | | Initial doses should be based on current daily dose of the components<br>Patients inadequately controlled on pioglitazone alone: 25mg alogliptin plus current daily dose of pioglitazone once daily<br>Patients inadequately controlled not taking alogliptin: 25mg/15mg or 25mg/30mg once daily<br>Maximum dose: 25mg/45mg once daily | |
| Sodium-Glucose Contransporter-2 Inhibitor + Biguanide | | | | | |
| Canagliflozin plus metformin (brand only - Invokamet®, Invokamet XR®) | $718 | See individual agents | | Initial dose: 50mg/500mg twice daily (IR) or 100mg/1000mg once daily (XR)<br>Max daily dose: 300mg/2000mg<br><br>Patients on metformin: Initial dose: canagliflozin 100 mg plus similar total dose of metformin daily. Note: patients taking metformin ER in the evening should skip the last dose before starting combination product the following morning.<br><br>Patients on canagliflozin: Initial dose: Metformin 1000 mg daily plus similar total dose of canagliflozin daily.<br><br>Patients switching from immediate to extended release: use current total daily dose once daily<br><br>Invokamet®: daily dose is 1 tab twice daily<br><br>Patients on metformin: Initial dose: canagliflozin 50 mg plus similar total dose of metformin daily. | Precautions/side effects<br>See individual agents |

| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| | | | | Patients on canagliflozin: Initial dose: Metformin 500 mg daily plus similar total dose of canagliflozin daily.<br><br>Patients switching from combination therapy of canagliflozin and metformin as separate tablets: Use current total dose. | |
| Dapagliflozin plus metformin (brand only - Xigduo XR®) | $699 | | | Xigduo XR®: Initial daily dose: 5mg/500mg once daily<br>Note: patients taking metformin ER in the evening should skip the last dose before starting the combination product the next morning<br><br>Max daily dose: 10mg/2000mg once daily | |
| Empagliflozin plus metformin (brand only - Synjardy®, Synjardy XR®) | $733 | | | Immediate release: administered in 2 divided doses<br>Extended release: administered once daily<br><br>Patients on metformin: empagliflozin 10mg/day plus similar total daily dose of metformin<br><br>Patients on empagliflozin: metformin 1000mg/day plus similar total daily dose of empagliflozin<br><br>Max daily dose: 25mg/2000mg | |
| Ertugliflozin plus metformin (brand only - Segluromet®) | $428 | | | Patients on metformin: ertugliflozin 5mg/day plus similar total daily dose of metformin in 2 divided doses | |

| Class/Agent | Cost[a] | Mechanism of Action | Efficacy | Typical Dose | Relevant Clinical Information |
|---|---|---|---|---|---|
| | | | | Patients on ertugliflozin: metformin 1000mg/day plus similar total daily dose of ertugliflozin in 2 divided doses<br><br>Max daily dose: 15mg/2000mg | |
| Sodium-Glucose Contransporter-2 Inhibitor + Dipeptidyl Peptidase IV Inhibitor | | | | | |
| empagliflozin plus linagliptin (brand only - Glyxambi®) | $733 | See individual agents | | Initial: Empagliflozin 10 mg/linagliptin 5 mg once daily; may increase to empagliflozin 25 mg/linagliptin 5 mg once daily | Precautions/side effects<br>See individual agents |
| Dapagliflozin plus saxagliptin (brand only - Qtern®) | $678 | | | 5mg dapagliflozin/5mg saxagliptin daily<br><br>Max daily dose: 10mg dapagliflozin/5mg saxagliptin | |
| Ertugliflozin plus sitagliptin (brand only - Steglujan®) | $660 | | | 5mg ertugliflozin/100mg sitagliptin once daily<br><br>Max daily dose: 15mg ertugliflozin/100mg sitagliptin | |
| | Sodium-Glucose Contransporter-2 Inhibitor + Dipeptidyl Peptidase IV Inhibitor + Biguanide | | | | |
| Empagliflozin plus metformin plus linagliptin (brand only – Trijardy XR®) | $733 | | | Patients not taking empagliflozin: empagliflozin 10mg/day, linagliptin 5mg/day, and similar total daily dose of metformin with morning meal<br><br>Patients taking empagliflozin: linagliptin 5mg/day, same total daily dose of empagliflozin, and similar total daily dose of metformin with morning meal<br><br>Max daily dose: 25mg/2000mg/5mg | Precautions/side effects<br>See individual agents |

[a] Wholesale cost for 30-day supply of highest strength of generic unless otherwise specified

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## INSULINS

| Type | Onset | Peak | Duration | Rx/ OTC | Cost[a] |
|---|---|---|---|---|---|
| **Rapid** | | | | | |
| lispro (Humalog®, Admelog®)* | 15-30 minutes | 30-90 minutes | 3-5 hours | Rx | Vial 3mL (300units) $47; 10mL (1000 units) $157<br>Pen 3mL (300 units) $38; 15mL (1500 units) $191 |
| Lispro (Lyumjev®) | 15-20 minutes | 2-3 hours | 4-7 hours | Rx | Vial 3mL (300 units) $99; 10mL (1000 units) $330<br>Pen 3mL (300 units) $128; 15mL (1500 units) $212 |
| Insulin aspart (NovoLog®, Flasp®) † | 10-20 minutes | 40-50 minutes | 5-8 hours | Rx | Vial 10mL (1000 units) $347<br>Pen 3mL (300 units) $134; 15mL (1500 units) $224 |
| Insulin glulisine (Apidra®) | 12-30 minutes | 30-90 minutes | 3-4 hours | Rx | Vial 10mL (1000 units) $102<br>Pen 3mL (300 units) $39; 15mL (1500 units) $66 |
| **Insulin Oral Inhalation – Rapid** | | | | | |
| Afrezza® (contraindicated in patients with COPD or asthma) | 15-30 minutes | 53 minutes | 2-3 hours | RX | 90 units $ 1624 |
| **Short** | | | | | |
| Regular (Humulin R , Novolin R, ReliOn) | 30-60 minutes | 2-4 hours | 6-8 hours | OTC/Rx | Vial 3mL (300 units) $17; 10mL (1000 units) $58<br>Pen 3mL (300 units) $22; 15mL (1500 units) $109 |
| **Intermediate** | | | | | |
| NPH (Humulin N, Novolin N, Novolin N Relion N) | 1-2 hours | 4-12 hours | 10-24 hrs. | OTC | Vial 3mL (3000 units) $17; 10mL (1000 units) $58<br>Pen 3mL (300 units) $22; 15mL (15000 units) $109 |
| **Long** | | | | | |
| Insulin glargine (Lantus® Toujeo®, Semglee®, Rezvoglar®) ‡ | 1-2 hours | (No pronounced peak) | >24 hours | Rx | Vial 10mL (1000 units) $323<br>Pen 3mL (300 units) $97; 15mL (1500 units) $485 |


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| | | | | | |
|---|---|---|---|---|---|
| Insulin glargine (Basaglar®) | 1-2 hours | (No pronounced peak) | >24 hours | Rx | Pen 3mL (300 units) $78; 15mL (1500 units) $392 |
| Insulin detemir (Levemir®) § | 3-4 hours | 6-8 hours | 6-23 hours | Rx | Vial 10mL (1000 units) $129<br>Pen 3mL (300 units) $39; 15mL (1500 units) $194 |
| Insulin glargine 300u/ml (Toujeo®, Toujeo Max®) | Up to 6 hours | 12-20 hours | Up to 36 hours | RX | Pen 1.5mL (450 units) $171; 4.5mL (2025 units) $513<br>Pen Max 3mL (900 units) $343 |
| Insulin degludec 100 or 200 units/mL (Tresiba®) | 1 hour | (No pronounced peak) | >42 hours | Rx | Vial 10mL (1000 units) $142<br>Pen 3mL (300 units) $122 |
| **Combination** | | | | | |
| 70/30 (Humulin 70/30, Novolin 70/30)<br>(70% NPH/30% regular) | 30-60 minutes | 3-12 hours | 12-20 hours | OTC | Vial 3mL (300 units) $17; 10mL (1000 units) $58<br>Pen 3mL (300 units) $34; 15mL (1500 units) $170 |
| Humalog® Mix 75/25<br>(75% lispro protamine/25% lispro)* | 15-30 minutes | 1-3 hours | 10-20 hours | RX | Vial 10mL (1000 units) $103<br>Pen 3mL (300 units) $38; 15mL (1500 units) $191 |
| Humalog 50/50 (50% lispro protamine/50% lispro) * | 15-30 minutes | 1-3 hours | 10-20 hours | RX | Vial 10mL (1000 units) $342<br>Pen 3mL (300 units) $127; 15mL (1500 units) $191 |
| NovoLog® Mix 70/30<br>(70% insulin aspart protamine/30% insulin aspart) † | 10-20 minutes | 1-4 hours | 12-24 hours | RX | Vial 3mL (300 units) $87; 10mL (1000 units) $87<br>Pen 3mL (300 units) $34; 15mL (1500 units) $168 |

[a]Wholesale cost for insulin vial based on available vial strength (3mL/ 10mL), one insulin pen (3mL) or one package of 5 insulin pens (15mL)

*Lispro insulin (Humalog®), Humalog® Mix 75/25, and Humalog® 50/50 should be given 0-15 minutes before a meal or immediately after a meal

†Insulin aspart (NovoLog®) and NovoLog® Mix 70/30 should be given 0-10 minutes before a meal

‡Dosing recommendations for insulin glargine (Lantus®): Note: Insulin glargine should not be mixed with other types of insulin

Switching from once daily NPH to insulin glargine: no change in dosage.

Switching from twice a day NPH to insulin glargine: decrease insulin glargine dose by 20% and titrate to patient's response to reduce incidence of hypoglycemia

§ Novo Nordisk will be discontinuing Levemir flexpen and vial on 12/31/24

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| NON-INSULIN INJECTABLE MEDICATIONS | | | | | |
|---|---|---|---|---|---|
| **Class/Agent** | **Cost[a]** | **Mechanism of Action** | **Efficacy** | **Typical Dose** | **Relevant Clinical Information** |
| **Amylinomimetic Agent** | | | | | |
| Pramlintide (brand only - Symlin®) | $622-$738/pen | Slows the rate of postprandial glucose increase by slowing gastric emptying, suppressing glucagon secretion, and decreasing food intake through increase in satiety. | HbA1c: ⇩0.5- 1%<br>Weight: ⇩1-2kg | Type 1 diabetes: initiate with 15 mcg SQ immediately prior to each main meal and increase by 15 mcg increments every 3 days to 30-60 mcg<br><br>Type 2 diabetes: initiate with 60 mcg SQ immediately prior to each main meal and increase to 120 mcg when tolerated<br><br>Increase dose only when no significant nausea has occurred for 3-7 days.<br>If significant nausea, reduce to prior dose. | Common side effects: hypoglycemia, nausea, diarrhea, vomiting (usually mild)<br><br>Contraindications: gastroparesis, hypoglycemia unawareness<br><br>Do not mix with insulin<br><br>Reduce pre-prandial insulin doses (rapid and short acting insulin and 70/30, 50/50, 75/25) by 50%<br><br>Administer into abdomen or thigh only due to variable absorption through the arm |
| **Glucagon-Like Peptide-1 Receptor Agonist** | | | | | |
| Exenatide (brand only -Byetta®) | $1020/pen | Glucose dependent insulin release, lowers glucagon during hyperglycemia, slows gastric emptying, reduces food intake through increase in satiety. Secondary effect of medication is weight loss or prevention of weight gain as glucose control improves | FPG: 15-25mg/dl<br>HbA1c: ⇩ 1%<br>Weight: ⇩2.5-4kg | 5mcg SQ twice daily within 60 minutes prior to the morning and evening meals. After 1 month, can increase to 10mcg twice daily<br><br>Use not recommended if eGFR< 45 mL/min/1.73 $m^2$ | **Class Warning**: Risk of thyroid tumors<br><br>Contraindicated in patients with a personal or family history of medullary thyroid cancer or Multiple Endocrine Neoplasia Syndrome type 2. Cases of acute pancreatitis have been reported |


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|---|---|---|---|---|---|
| Exenatide extended release (brand only – Bydureon BCise®) | $248/pen | | | 2 mg SQ once weekly without regard to meals (may administer missed dose as soon as noticed as long as the next scheduled dose is at least 3 days away, then resume schedule of every 7 days)<br><br>Converting from immediate release: start ER the day after stopping IR. This may cause high blood glucose for ~2 weeks. | **Class side effects**:<br>Hypoglycemia<br>Nausea, diarrhea, vomiting (usually mild)<br><br>Exenatide, Dulaglutide, Albiglutide<br>Not recommended to be used in patients with gastroparesis or severe gastrointestinal disease. |
| Liraglutide (brand only - Victoza®)<br><br>FDA approved for cardiovascular disease benefit | $326/pen | | FPG: 15-30mg/dl<br>HbA1C ⇩0.8-1.1%<br>Weight: ⇩2.1-2.5kg | 0.6mg SQ daily x 1 week, then 1.2mg SQ daily. 0.6mg dose is not therapeutic. May increase to 1.8mg SQ daily. Allow at least 1 week in between dose increases. Given independent of meals. | Use not recommended in combination with DPP-4 Inhibitors<br><br>Liraglutide: Most common side effects are GI and may be dose related. |
| Dulaglutide (brand only - Trulicity®)<br><br>FDA approved for cardiovascular disease benefit | $293/pen | | FPG: 25-30mg/dl<br>HbA1C ⇩0.7-0.8%<br>Weight: ⇩ 1.4-2.3kg | 0.75 mg SQ once weekly; may increase by 1.5mg increments after at least 4 weeks at previous dose if inadequate response up to a max dose of 4.5mg weekly | Trulicity and Exenatide extended release: single-dose auto-injector pen with hidden needle |
| Semaglutide (brand only – Ozempic®)<br><br>FDA approved for cardiovascular disease benefit | $1162/pen | | FPG: 35-45mg/dl<br>HbA1C ⇩1.2-2.1%<br>Weight: ⇩ 1.2-4.7kg | 0.25mg SQ once weekly for four weeks, then increased to 0.5mg once weekly. Can increase to 1mg once weekly in another 4 weeks if needed (0.25mg dose is not clinically effective)<br><br>To convert from SQ to PO:<br>0.5mg once weekly dose is equivalent to 7mg or 14mg of PO | Exenatide: Can be used in combination with metformin, a sulfonylurea, or both. May need to reduce sulfonylurea dose.<br><br>Anti-exenatide antibodies: Use may be associated with the development of anti-exenatide antibodies. |

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| | | | | once daily dose starting within 7 days of last injection<br>1mg once weekly dose is equivalent to 14mg PO once daily dose starting within 7 days of last injection | Semaglutide: Monitor for symptoms of:<br>Acute kidney injury, diabetic retinopathy, cholelithiasis, pancreatitis |
| Tirzepatide (brand only – Mounjaro®) | $320/pen | | FPG: 40-60mg/dl<br>HbA1C ⇩2.0-2.3%<br>Weight: ⇩ 6.3-7.8kg | 2.5 mg SQ once weekly for four weeks, then increase to 5mg once weekly. Can continue to increase by 2.5mg once weekly increments every 4 weeks if needed up to a maximum dose of 15mg once weekly. (2.5mg dose is not clinically effective) | Tirzepatide: monitor for symptoms of: acute kidney injury, diabetic retinopathy, gallbladder disease, medullary thyroid carcinoma, and pancreatitis |
| **Insulin + Glucagon-Like Peptide-1 Receptor Agonist** | | | | | |
| Insulin degludec plus liraglutide (brand only - Xultophy®) | $311/pen | See individual components | FPG: ⇩ 46-65mg/dl<br>HbA1C ⇩1.2-1.8% | In patients not taking basal insulin or GLP-1 agonist: Initial dose: 10 units/0.36mg SQ once daily<br><br>In patients already taking basal insulin or<br>GLP-1 agonist: Initial dose: 16 units/ 0.58mg SQ once daily;<br>Dose may be titrated up or down every 3-4 days in increments of 2 units/0.072mg<br><br>Maximum daily dose: 50units/1.8mg SQ once daily | See individual components |

| | | | | | |
|---|---|---|---|---|---|
| Insulin glargine plus lixisenatide (brand only - Soliqua®) | $214/pen | See individual components | FPG: ⇩ 59mg/dl<br>HbA1C ⇩1.6% | In patients not taking basal insulin, GLP-1 agonist or taking < 30 units of basal insulin/day: Initial dose: 15 units SQ once daily; Dose may be titrated up or down by 2 to 4 units every week<br><br>In patients already taking basal insulin, with or without a GLP1-agonist: 30 units/10mcg SQ once daily<br><br>Maximum daily dose: 60 units/20mcg | See individual components<br><br>Use alternative treatment if doses below 15 units or above 60 units are required |

[a]Wholesale cost per pen

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**Appendix A:**

## MEDSTAR DIABETES PATHWAY INSULIN START Dosing Guidelines for Type 2 Diabetes

| Type of Insulin | Starting Dose | Timing of dose(s) | Comments |
|---|---|---|---|
| **Basal Insulin**<br>**U-100 glargine**<br>Lantus®<br>Basaglar®<br>Semglee®<br>**detemir**<br>Levemir®<br>**glargine-aglr**<br>Rezvoglar® | 0.2units/kg/day<br><br>*see comment section for special situations | one dose daily at same time of the day* (B, D, or hs) | Large doses ( >50 units/day) should be split into 2 doses which may be given together at the same time of day or as twice daily doses. Remind the patient to rotate sites.<br>Detemir may not last for 24 hours and need to be split into 2 doses/day.<br><br>**√ Special situations**<br><br>• A dose of 0.3 or 0.4 units/kg/day may be considered if marked symptomatic hyperglycemia, BMI > 30 and no obvious lifestyle intervention which might significantly impact BG levels present (such as drinking sugar- sweetened beverages).<br>• Use 0.1units/kg/day if ESRD/CKD stage 4 or the elderly/frail patient.<br>• NPH may require bedtime snack to prevent nocturnal hypoglycemia.<br>• When switching from NPH to a different basal insulin, start with 80% of the total daily NPH dose as the new basal insulin dose given once daily.<br>• When switching from twice daily U-100 basal insulin to U-200 insulin, decrease the TDD by 20%. If once daily U-100 basal to U-200, convert 1:1.<br>• When switching from Toujeo to Basaglar, decrease TDD by 20%<br>• When switching from a premixed insulin (50/50, 70/30, 75/25) to a basal/bolus regimen, give 50% of the TDD as basal and 50% as bolus.<br>• **Tresiba® and Lantus®/Basaglar® have demonstrated CVD benefit**<br><br>*Note, Tresiba® and Toujeo® should only be dosed once daily. Consider either as an option for patients on higher doses of U-100 basal insulin |
| **U-100 degludec**<br>Tresiba® | 0.2units/kg/day<br><br>*see comment section for special situations | one dose daily at same time of the day* (B, D, or hs) | |
| **U-200 degludec**<br>Tresiba® | 0.2units/kg/day<br><br>*see comment section for special situations | one dose daily at same time of the day* (B, D, or hs) | |
| **U-300 glargine**<br>Toujeo® | 0.2units/kg/day<br><br>*see comment section for special situations | one dose daily at same time of the day* (B, D, or hs) | |
| **NPH** | 0.2units/kg/day<br><br>*see comment section for special situations | Split dose-<br>Before breakfast, and dinner or bedtime* | |
| **U-500**<br>*based on algorithm in *Cochran E, Gorden* | HbA1c <8%, decrease TDD of U100 by 10-20% | 200-299 units/d: pre-breakfast & pre-dinner split 60/40 | Consider switching patients to U-500 insulin if they are using >200 units/d of U-100.<br>Dose adjustments based on overall trends, not individual readings: |

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|---|---|---|---|
| *P. The Use of U-500 Insulin in the Treatment of Severe Insulin resistance. Insulin.2008;3:211-218.* | HbA1c>8%, give TDD U500 as 1:1 conversion from U-100 | 300-599 units/d: pre-breakfast, pre-lunch, pre-dinner split 40/30/20<br>600-2000 units/d: before each meal and at bedtime split 30/30/30/10<br>>2000 units/day: consider pump | • 200-299 units/d: if BG is within 50mg/dl above or below target, increase or decrease dose by 5 units/dose. If BG >50mg/dl above or below target, increase or decrease dose by 10 units/dose.<br>• 300-599 units/d: if BG is within 100mg/dl above or below target, increase or decrease dose by 25 units/dose. If BG >100 mg/dl above or below target, increase or decrease dose by 50 units/dose.<br>• >600 units/d: if BG is not at goal, increase or decrease by 50 units/dose.<br>Pen: delivers insulin in 5 unit increments, total 1500 units/pen<br>Vial: prescribe U-500 syringe |

| Type of Insulin | Starting Dose | Timing of dose(s) | Comments |
|---|---|---|---|
| **Premixed Insulin**<br>**70/30, 75/25, 50/50**<br>**Degludec/Aspart**<br>Ryzodeg® | 0.2units/kg/day | Split dose before breakfast and dinner | • Can start with one dose before largest meal of the day.*<br>• Emphasize consistent CHO intake at each meal.<br>• Use for pts requiring a simple regimen if anticipate will need meal insulin.<br>• Ability to fine tune meal and basal doses may be limited with these fixed-dose ratio insulins.<br>• *Also see √ special situations under basal insulin above.*<br>• May require bedtime snack to prevent nocturnal hypoglycemia if pm dose.<br>• Ryzodeg®: start with 10 units once daily at main meal id insulin naïve. Conversion from basal or other premixed insulin (1 or 2 doses/day) is 1:1. If converting from MDI, conversion is 1:1 with main meal and cover other meals with rapid acting insulin |

| | | | |
|---|---|---|---|
| **Mealtime/prandial Insulin**<br>**Aspart**<br>NovoLog®<br>Fiasp®<br>**Lispro**<br>Humalog®<br>Admelog®<br>Lyumjev®<br>**glulisine**<br>Apidra®<br>**U-200 lispro**<br>Humalog®<br>Lyumjev® | 0.1 units/kg/meal | Right before or right after meal* | • Can start with single dose with the largest meal of the day, and then add to each remaining meal as needed.<br>• May need to adjust insulin doses specific to meal sizes if the patient doesn't eat consistently sized meals (i.e. dosing for small, med, large meals)<br>• Fiasp® and Lyumjev® may be taken immediately prior to eating up to 20 minutes after starting the meal. |
| **GLP-1 Analog + Basal Insulin**<br>**Glargine/Lixisenatide**<br>Soliqua 100/33® | Based on current basal dose:<br>• <30 units/day: start 15 units daily (15 units glargine/5mg lixisenatide)<br>• 30-60 units/day: start 30 units daily (30 units glargine/10mg lixisenatide) | Within 1 hour prior to the first meal of the day | • Titrate the dosage 2-4 units every week. The dosage range is between 15 to 60 units.<br>• Missed dose: resume as prescribed with the next scheduled dose. Do not administer an extra dose or increase the dose to make up.<br>• Prior to first use, store in a refrigerator. After first use, store at room temperature. Discard pen 28 days after first use.<br>• No dose adjustments for renal or hepatic impairment – monitor closely for blood sugar and GI adverse events.<br>• See Non-insulin injectables chart for specific GLP-1 precautions |

| | | | |
|---|---|---|---|
| **Degludec/Liraglutide**<br>Xultophy 100/3.6® | • Insulin or GLP-1 naïve: start at 10 units once daily (10 units degludec, 0.36 mg liraglutide)<br>• Currently on basal insulin on GLP-1: discontinue current insulin or GLP-1 & start Xultophy at 16 units once daily (16 units degludec, 0.58 mg liraglutide) | Once daily at the same time of day without regard to food | • Titrate the dose 2 units every 3-4 days. The dosage range is between 10 and 50 units.<br>• Missed dose: resume as prescribed with the next scheduled dose. Do not administer an extra dose or increase the dose to make up.<br>• If more than 3 doses have been missed in a row, reinitiate at the starting dose to prevent side effects.<br>• Prior to first use, store in a refrigerator. After first use, store at room temperature or in the refrigerator. Discard pen 21 days after first use.<br>• Protect pen from direct light.<br>• No dose adjustments for renal or hepatic impairment – monitor closely for blood sugar and GI adverse events.<br>• See Non-insulin injectables chart for specific GLP-1 precautions |

**** to promote adherence to the insulin dosing regimen, discuss timing preference with the patient***



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|---|---|---|
| 3/2011, 7/2013, 3/2014, 5/2015, 5/2016, 5/2017. 5/2018, 5/2019, 5/2020, 5/2021, 5/2022, 5/2023, 5/2024 | | May 2025 Ambulatory Best Practice Condition: Diabetes Mellitus |

## Appendix B:

| Insulin Pen | Dosing Increments | Pen Volume | Total Pen Units | Max Dose/Injection | Pen Colors/Identifiers | Pens/Box | Expiration (once used & stored at room for multi-use pens) |
|---|---|---|---|---|---|---|---|
| **Lantus SoloStar u-100** | 1 unit increments | 3 ml | 300 units | 80 units | Lt gray pen, white/purple/black label, purple push button | 5 pens | 28 days |
| **Basaglar KwikPen u-100** | 1 unit increments | 3 ml | 300 units | 80 units | White pen, green/white label, white push button | 5 pens | 28 days |
| **Semglee Prefilled Pen u-100** | 1 unit increments | 3 ml | 300 units | 80 units | Aqua pen, white/lavender label, lavender push buton | 3 or 5 pens | 28 days |
| **Rezvoglar KwikPen u-100** | 1 unit increments | 3ml | 300 units | 80 units | White pen, green/white label, green push button | 5 pens | 28 days |
| **Levemir FlexTouch u-100** | 1 unit increments | 3 ml | 300 units | 80 units | Dk blue pen, green/white label, green button | 5 pens | 42 days |
| **Tresiba FlexTouch u-100** | 1 unit increments | 3 ml | 300 units | 80 units | Dk blue pen, lt green/white label, lt green button | 5 pens | 56 days |
| **Tresiba FlexTouch u-200** | 2 unit increments | 3 ml | 600 units | 160 units | Dk blue pen, dk green/white label, dk green button | 3 pens | 56 days |
| **Toujeo SoloStar u-300** | 1 unit increments | 1.5 ml | 450 units | 80 units | White pen, green/white label, green push button | 3 pens | 56 days |
| **Toujeo Max SoloStar u-300** | 2 unit increments | 3 ml | 900 units | 160 units | White pen, lt green/dk green label, green push button | 2 pens | 56 days |
| **U-500 KwikPen** | 5 unit increments | 3 ml | 1500 units | 300 units | Lt blue pen, white/lt blue/green label, lt blue push button | 2 pens | 28 days |
| **Apidra SoloStar u-100** | 1 unit increments | 3 ml | 300 units | 80 units | Lt purple pen, white/green/purple label, dk purple button | 5 pens | 28 days |

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|---|---|---|
| 3/2011, 7/2013, 3/2014, 5/2015, 5/2016, 5/2017. 5/2018, 5/2019, 5/2020, 5/2021, 5/2022, 5/2023, 5/2024 |  | May 2025 Ambulatory Best Practice Condition: Diabetes Mellitus |

| Insulin Pen | Dosing Increments | Pen Volume | Total Pen Units | Max Dose/Injection | Pen Colors/Identifiers | Pens/Box | Expiration (once used & stored at room for multi-use pens) |
|---|---|---|---|---|---|---|---|
| **Humalog KwikPen u-100** | 1 unit increments | 3 ml | 300 units | 60 units | Gray pen, white/maroon label, gray button | 5 pens | 28 days |
| **Humalog KwikPen u-200** | 1 unit increments | 3 ml | 600 units | 60 units | Dk gray pen, gray/maroon label, Dk gray button | 2 pens | 28 days |
| **Novolog FlexPen u-100** | 1 unit increments | 3 ml | 300 units | 60 units | Dk blue pen, orange/white label, orange button | 5 pens | 28 days |
| **Fiasp FlexPen u-100** | 1 unit increments | 3ml | 300 units | 80 units | Dk blue pen, yellow/orange label, yellow button | 5 pens | 28 days |
| **Admelog SoloStar u-100** | 1 unit increments | 3ml | 300 units | 80 units | Fuschia/yellow pen, white label, fuschia button | 5 pens | 28 days |
| **Lyumjev KwikPen u-100** | 1 unit increments | 3ml | 300 units | 60 units | Lt gray pen, dark purple/white label, dark purple button | 5 pens | 28 days |
| **Lyumjev KwikPen u-200** | 1 unit increments | 3ml | 600 units | 60 units | Dk gray pen, dark purple checkerd/white label, dark gray button | 2 pens | 28 days |
| **Ryzodeg 70/30 FlexTouch** | 1 unit increments | 3ml | 300 units | 80 units | Dk blue pen, blue/white label, blue button | 5 pens | 28 days |
| **Humalog 75/25 KwikPen** | 1 unit increments | 3 ml | 300 units | 60 units | Dk blue pen, yellow/white label, Dk blue button | 5 pens | 10 days |
| **NovoLog 70/30 FlexPen** | 1 unit increments | 3 ml | 300 units | 60 units | Dk blue pen, blue/white label, Dk blue button | 5 pens | 14 days |
| **Humulin 70/30 KwikPen** | 1 unit increments | 3 ml | 300 units | 60 units | Beige pen, brown/white label, brown button | 5 pens | 10 days |

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| Insulin Pen | Dosing Increments | Pen Volume | Total Pen Units | Max Dose/Injection | Pen Colors/Identifiers | Pens/Box | Expiration (once used & stored at room for multi-use pens) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| **Humalog 50/50 KwikPen** | 1 unit increments | 3 ml | 300 units | 60 units | Gray pen, red/white label, gray button | 5 pens | 10 days |

| Insulin/GLP-1 Pen | Dosing Increments | Pen Volume | Total Pen Units | Max Dose/Injection | Pen Colors/Identifiers | Pens/Box | Expiration (once used & stored at ro temp for multi-use pen |
|---|---|---|---|---|---|---|---|
| **Soliqua 100/33 Pen** | 1 unit increments | 3ml | 300 units | 60 units | Olive pen, white label, orange button | 5 pens | 28 days |
| **Xultophy 100/3.6 Pen** | 1 unit increments | 3ml | 300 units | 50 units | Dark blue pen, pink and white label, pink button | 5 pens | 21 days (regardless if at ro temp or refrigerate |

| GLP-1 Pen | Pen Strengths | Pen Volume | Max Dose/Injection | Pen Colors/Identifiers | Pens/Box | Expiration (once used & stored at room temp for multi-use pens) |
|---|---|---|---|---|---|---|
| **Ozempic FlexPen 0.25/0.5mg** | 0.25mg, 0.5mg | 2mg/pen | 0.25mg/wk=8 doses 0.5mg/wk=4 doses | Lt blue pen, red/white label, white button | 1 pen | 56 days |
| **Ozempic FlexPen 1mg** | 1mg | 4mg/pen | 4 doses/pen | Lt blue pen, aqua/white label, white button | 1 pen | 56 days |
| **Ozempic FlexPen 2mg** | 2mg | 8mg/pen | 4 doses/pen | Lt blue pen, gold/white label, white button | 1 pen | 56 days |
| **Victoza** | 0.6mg, 1.2mg, 1.8mg | 3 ml | 0.6mg/d=30 doses | Lt blue pen, red/white label, blue/black button | 2 or 3 pens | 30 days |

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| | | | | | | |
|---|---|---|---|---|---|---|
| | | | 1.2mg/d=15 doses<br>1.8mg/d=10 doses | | | |
| **Trulicity** | 0.75mg, 1.5mg, 3mg, 4.5mg | 0.75mg, 1.5mg, 3mg, or 4.5mg pen | 1 dose per pen | 0.75mg: white pen with purple & yellow label, green button<br>1.5mg: white pen with purple & blue label, green button<br>3mg: white pen with purple & gray label, green button<br>4.5mg: white pen with purple & green label, green button | 4 pens | N/A |
| **Bydureon** | 2mg | 2mg/pen | 1 dose per pen | Yellow and green | 4 pens | N/A |
| **B-cise** | 2mg | 2mg/pen | 1 dose per pen | White, yellow, green | 4 pens | N/A |
| **Byetta** | 5mcg | 1.2ml | 60 doses/pen=30 days | Yellow and blue | 1 pen | 30 days |

| GIP/GLP-1 Pen | Pen Strengths | Pen volume | Max Dose/Injection | Pen Colors/Identifiers | Pens/Box | Expiration (once used & stored at room temp for multi-use pens) | Important Notes |
|---|---|---|---|---|---|---|---|
| **Mounjaro** | 2.5mg, 5mg, 7.5mg, 10mg, | 2.5mg, 5mg, 7.5mg, 10mg, | 1 dose per pen | 2.5mg: white pen with gray label, purple button<br>5mg: white pen with purple label, purple button | 4 pens | Store in the refrigerator. Once at room temp, pens are good for 21 days. | • Start at 2.5mg weekly for 4 weeks, then increase to 5mg. Increase dose by |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 12.5mg, 15mg | 12.5mg, or 15mg/pen | | 7.5mg: white pen with green label, purple button<br>10mg: white pen with pink label, purple button<br>12.5mg: white pen with blue label, purple button<br>15mg: white pen with orange label, purple button | | | 2.5mg every 4 weeks if needed.<br>• If a dose is missed, take the missed dose as soon as possible within 4 days of the missed dose. If more than 4 days have passed, skip and start on the next usual day for the dose.<br>• Doses should not be taken closer than 3 days apart. |

**How to determine the amount of insulin (in ml) to order supply:**
**for a 1 month or 3 month supply:**
**(TDD x 30 or 90 days)**
**100, 200, or 300**
300: Toujeo, 200: Tresiba U-200 or Humalog U-200, 100: all other insulins TDD= total daily dose of insulin

**How to determine number of pens to order for a 1 or 3 month**

**(TDD x 30 or 90 days)**
**units/pen**

KB 2/2017, 7/2018, 10/2018, 1/19, 7/21, 7/23

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|---|---|---|
| 3/2011, 7/2013, 3/2014, 5/2015, 5/2016, 5/2017. 5/2018, 5/2019, 5/2020, 5/2021, 5/2022, 5/2023, 5/2024 |  | May 2025 Ambulatory Best Practice Condition: Diabetes Mellitus |

**Appendix C:**

## MedStar Diabetes Pathway Non-Insulin Injectables Dosing

| Class | | Strengths Available | Starting Dose | Maximum Dose | Times/Day | Comments |
|---|---|---|---|---|---|---|
| GLP-1 Analog | **Semaglutide** Ozempic® | 0.25, 0.5mg red pen<br>1mg aqua pen<br>2mg gold pen | 0.25mg<br>Start with 0.25mg once a week for 4 weeks then increase to 0.5mg. May increase to 1mg after 4 additional week if inadequate response. | 1mg | 1/week | • No dose adjustments needed for renal or hepatic impairment.<br>• Prior to first use, store in the refrigerator. After initial use, can be stored at room temperature for up to 56 days.<br>• Missed dose: Take as soon as missed dose noticed within 5 days of the missed dose. If more than 5 days, skip the missed dose and resume the usual schedule<br>• **May decrease cardiovascular risk in patient at high risk of cardiovascular disease** |
| | **dulaglutide** Trulicity® | 0.75mg yellow/purple pen<br>1.5mg blue/purple pen<br>3mg gray/purple pen<br>4.5 green/purple pen | 0.75mg<br>Start 0.75mg once a week for first at least 4 weeks then increase to 1.5mg if inadequate response. Increase from 1.5mg to 3mg after at least 4 weeks if inadequate response. Increase from 3mg to 4.5mg after at least 4 weeks if inadequate response. | 4.5mg | 1/week | • No dose adjustments needed for renal or hepatic impairment.<br>• Store in the refrigerator or at room temp for 14 days<br>• Missed dose: Take as soon as missed dose noticed at least 3 days before the next scheduled dose then resume the usual schedule<br>• No statistically significant A1c lowering between 1.5mg/week dose and 3mg or 4.5mg doses however additional appetite suppression and weight loss may be see. |
| | **exenatide extended release** Bydureon® | 2mg | 2mg | 2mg | 1/week | • Avoid use when eGFR<30<br>• Use the pen formulation whenever possible. 1 pen/dose/week<br>• Missed dose: Take as soon as missed dose noticed at least 3 days before the next scheduled dose then resume the usual schedule<br>• If taking warfarin, INR should be monitored more frequently when Bydureon is initiated.<br>• **May decrease cardiovascular risk in patient at high risk of cardiovascular disease** |

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|---|---|---|
| 3/2011, 7/2013, 3/2014, 5/2015, 5/2016, 5/2017. 5/2018, 5/2019, 5/2020, 5/2021, 5/2022, 5/2023, 5/2024 |  | May 2025 Ambulatory Best Practice Condition: Diabetes Mellitus |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **liragludtide** Victoza® | 0.6, 1.2, 1.8mg | 0.6mg<br>Start 0.6mg daily for first week; then go to 1.2mg. If 1.2mg does not result in acceptable BG control, can increase to 1.8mg/day. | 1.8mg | 1/day | • No dose adjustment for renal or hepatic impairment<br>• Take with or without food.<br>• Missed dose: take at next scheduled time. If more than 3 doses missed, restart at 0.6mg dose for 1 week<br>• **May decrease cardiovascular risk in patient at high risk of cardiovascular disease** |
| | **exenatide** Byetta® | 5mcg orange pen<br>10mcg yellow pen | 5mcg twice daily for 1 month | Then increase to 10mcg twice daily | 2 /day | • Avoid use when eGFR<30<br>• Take up to 1 hr before meal. Do not take if not eating.<br>• Missed dose: take at next scheduled time<br>• Each pen contains doses for 30 days.<br>• Take antibiotics or birth control pills at least 1 hour before Byetta. Monitor INR until stable upon initiation or titration of Byetta |

| Class | | Strengths Available | Starting Dose | Maximum Dose | Times/Day | Comments |
|---|---|---|---|---|---|---|
| **GIP/ GLP-1 Analog** | **tirzepatide** Mounjaro® | 2.5mg gray/white pen<br>5mg purple/white pen<br>7.5mg green/white pen<br>10mg pink/white pen<br>12.5mg blue/white pen<br>15mg orange/white pen | 2.5mg<br>Start at 2.5mg weekly for 4 weeks then increase to 5mg weekly. Can increase by 2.5mg increments every 4 weeks as needed. | 15mg | 1/week | • Store in the refrigerator until expiration date or at room temperature for 21 days.<br>• Missed dose: Take as soon as possible within 4 days of missed dose. If more than 4 days have passed, skip and take on usual day of the week. Allow at least 3 days between doses. |

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# CVD benefits: Victoza® > Ozempic® > Bydureon®

- **In general, GLP-1a will be considered to the regimen as next agent of choice when basal insulin therapy has been optimized or when an additional agent is deemed necessary for treatment. In addition, it has been found beneficial in overweight/obese patients due to potential weight loss/neutral effects.**
- **Up to 25% non-responders, therefore, if no response in 6-12 weeks, GLP-1a should be discontinued.**
- **Discontinue the use of DPP-4 inhibitors when starting the GLP-1 due to mechanism duplication and lack of increased efficacy with the combination**
- **DO NOT USE IF: Pt or family hx of Multiple Endocrine Neoplasia (MEN) or medullary thyroid cancer type 2, Gastroparesis, severe renal impairment (see CKD dosing information in table above), hx pancreatitis**
- **May experience GI discomfort/bloating at initiation; often resolves with time. If marked nausea, abd pain or vomiting discontinue use.**
- **Must be aware of signs and symptoms of pancreatitis (e.g., persistent severe abdominal pain, sometimes radiating to the back, may or may not be accompanied by vomiting). If these symptoms occur, they should call MD or go to ED right away.**
- **Increase satiety (feeling full).**
- **Less likely to cause weight gain than several other agents and may lose weight.**
- **Advantages include less complex injection regimen/less shots daily than for multiple daily insulin injections, which may be a key determinant of medication regimen adherence.**
- **GLP-1s cause insulin secretion and as a result may lead to hypoglycemia. Serious hypoglycemia can occur when used with insulin or insulin secretagogue (e.g., SU). Consider lowering insulin or SU dose when starting GLP-1 to prevent hypoglycemia.**


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|---|---|---|
| 3/2011, 7/2013, 3/2014, 5/2015, 5/2016, 5/2017. 5/2018, 5/2019, 5/2020, 5/2021, 5/2022, 5/2023, 5/2024 | © Copyright MedStar Health, 2012 | May 2025 Ambulatory Best Practice Condition: Diabetes Mellitus |

**Appendix D:**

# MedStar Diabetes Pathway Oral Hypoglycemic Medication Dosing Chart

| Class | *generic* Brand | Strengths | Starting Dose | Max Dose | Times/Day | Comments |
|---|---|---|---|---|---|---|
| **Biguanides** | | • **↓ A1c 1%**<br>• **↓ weight**<br>• **Possible CVD benefits**<br>• **CHF neutral** | | | | • **Low hypoglycemic risk**<br>• **Stop metformin prior to surgery, dye study, or if very ill**<br>• **Do not use if unstable CHF, liver disease, or significant EtOH intake**<br>• **eGFR 30-45: do not initiate, ↓ dose by 50%**<br>• **eGFR <30: d/c**<br>• **2 drug therapies with metformin can ↓ A1c an additional 1%** |
| | ***metformin*** Glucophage® | 500, 850, 1000mg | 500-850mg/d | 2550mg/d | 1-2 | • Titrate by 500mg/week or 850mg/week to ↓ GI side effects |
| | ***metformin*** Riomet® | 500mg/5ml liquid (cherry or strawberry flavor) | 500-850mg | 2550mg | 1-2 | • Titrate by 500mg/week or 850mg/week to ↓ GI side effects |
| | ***metformin XR*** Fortamet®, Glucophage® XR, Glumetza® | 500, 1000mg | 500mg | 2000mg | 1-2 | • XR formulation – do not cut pill |
| **Sulfonylureas** | | • **↓ A1c 1-2%**<br>• **Possible weight ↑**<br>• **No effect on CVD or CHF** | | | | • **Do not take if not eating**<br>• **Do not use is patient has sulfa allergy**<br>• **Renal and hepatic disease – use caution**<br>• **Glyburide not recommended due to higher hypoglycemia rates/duration compared to other sulfonylurea medications** |
| | ***glipizide*** Glucotrol® | 5, 10mg | 5mg | 40mg | 1-2 | • Take ½ hour before meal<br>• eGFR <50: start with 2.5mg/d, max 20mg/d |
| | ***glipizide*** Glucotrol® XL | 2.5, 5, 10mg | 5mg | 20mg | 1 | • Take with breakfast<br>• Do not cut. Shell may appear in stool<br>• Use caution with eGFR <50 |
| | ***glimepiride*** Amaryl® | 1,2,4mg | 1-2mg | 8mg | 1-2 if >4mg/d | • Titrate dose every 1-2 weeks<br>• Take with first meal of the day<br>• Split into 2 doses when dose is >4mg/day<br>• Do not use when eGFR <45 |

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| Class | *generic* Brand | Strengths | Starting Dose | Max Dose | Times/Day | Comments |
|---|---|---|---|---|---|---|
| **DPP4 Inhibitors** | | | • **↓ A1c 0.5%**<br>• **Weight neutral**<br>• **No effect on CVD**<br>• **Saxagliptin & alogliptin have possible CHF risk** | | | • **Low hypoglycemic risk**<br>• **Take once a day with or without food**<br>• **Avoid if h/o pancreatitis, gallstones, alcoholism, high TG**<br>• **Do not use in combination with GLP-1 inhibitors due to duplication of mechanism of action and lack of increased efficacy with the combination** |
| | ***sitagliptin***<br>Januvia® | 25, 50, 100mg | 100mg | 100mg | 1 | • CrCl 30-49ml/min: 50mg/d<br>• CrCl <30ml/min or on HD: 25mg/d |
| | ***saxagliptin***<br>Onglyza® | 2.5, 5mg | 2.5-5mg | 5mg | 1 | • eGFR <45: 2.5mg/d<br>• On HD: 2.5mg/d after dialysis<br>• Max dose is 2.5mg daily when used in combination with certain antibiotics, antifungals, and antiretroviral meds |
| | ***linagliptin***<br>Tradjenta® | 5mg | 5mg | 5mg | 1 | • No adjustment for renal disease |
| | ***alogliptin***<br>Nesina® | 6.25, 12.5, 25mg | 25mg | 25mg | 1 | • CrCl 30-59ml/min: 12.5mg/d<br>• CrCl <30ml/min or on HD: 6.25mg/d<br>• D/C & do not retry if LFTs elevated |

| Class | *generic* Brand | Strengths | Starting Dose | Max Dose | Times/Day | Comments |
|---|---|---|---|---|---|---|
| **SGLT-2 Inhibitors** | | • **↓ A1c <1%**<br>• **Weight neutral or ↓** | | | • **Low hypoglycemic risk**<br>• **Avoid in pts with frequent genital mycotic infections & UTIs**<br>• **Ok in pts with 1 kidney with GFR requirements met. May see 25% decline in GFR after starting but should slowly return to baseline** | |
| | ***canagliflozin***<br>Invokana® | 100, 300mg | 100mg | 300mg | 1 | • Take with the first meal of the day<br>• Can increase to 300mg/day if eGFR ≥60<br>• eGFR 45-60: 100mg/day max<br>• eGFR 30-45 with albuminuria > 300mg/day: 100mg/day max<br>• on dialysis: Do not use<br>• Avoid in patients with PVD or foot ulcerations due to increased risk of amputations<br>• **May decrease CV risk in patients at high CV risk**<br>• **May decrease progression of kidney disease** |
| | ***dapagliflozin***<br>Farxiga® | 5, 10mg | 5mg | 10mg | 1 | • Take with or without food<br>• eGFR 30-59: do not initiate therapy<br>• eGFR <30: do not use |
| | ***empagliflozin***<br>Jardiance® | 10, 25mg | 10mg | 25mg | 1 | • Take with or without food<br>• eGFR ≤45: do not use<br>• **May decrease CV risk in patients at high CV risk**<br>• **May decrease progression of kidney disease** |
| | ***ertugliflozin***<br>Steglatro® | 5, 15mg | 5mg | 15mg | 1 | • Take in the morning with or without food<br>• eGFR<30: do not use<br>• eGFR 30-59: do not initiate therapy or continue therapy |
| | ***bexagliflozin***<br>Brenzavvy® | 20mg | 20mg | 20mg | 1 | • Take in the morning with or without food<br>• Avoid in patients with eGFR <30 or on dialysis<br>• Available with prescription at Mark Cuban Cost Plus Drug Company |
| | ***sotagliflozin***<br>Inpefa® | 200, 400mg | 200mg | 400mg | 1 | • SGLT-1 and SGLT-2 inhibitor<br>• Take in the morning not more than 1 hour before the first meal of the day |

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| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | • If dose is more than 6 hours late, skip and start with next dose on the next day<br>• Correct volume status prior to starting medicine<br>• Hold for 3 days prior to surgery<br>• |
| **Thiazolindiones** | | | • **↓ A1c 1-1.5%**<br>• **↑ weight** | | | • **May take several weeks to take effect** |
| | ***pioglitazone***<br>Actos® | 15, 30, 45mg | 15-30mg | 45mg | 1 | • NYHA Class I-II: start at 15mg/d<br>• NYHA Class II-IV: do not use<br>• ↓ insulin dose 10-25% when adding pioglitazone to insulin<br>• D/C if LFTs >3x ULN |

| Class | *generic*<br>Brand | Strengths | Starting Dose | Max Dose | Times/Day | Comments |
|---|---|---|---|---|---|---|
| **Meglitinides** | | | • **↓ A1c 1%**<br>• **↑ weight** | • **Take with meal. Do not using if not eating.** | | |
| | ***repaglinide***<br>Prandin® | 1.5, 1, 2mg | 1-2mg/meal | 4mg/meal<br>(16mg/day) | With meals | • Titrate once weekly<br>• Take with meal<br>• Do not give with gemfibrozil, Plavix, cyclosporine |
| | ***nateglinide***<br>Starlix® | 60, 120mg | 60-120mg/meal | 120mg/meal<br>(360mg/day) | With meals | • Take 1-30 minutes before meal |
| **GLP-1** | | | • **↓ A1c 1-1.4%**<br>• **↓ weight** | • **Take at least 30 minutes prior to 1st food, beverage, or medication of the day with no more than 4oz of plain water** | | |
| | ***semaglutide***<br>Rybelsus® | 3, 7, 14mg | 3mg qam | 14mg qam | Empty stomach | • Start with 3mg daily x 30 days<br>• Increase to 7mg daily<br>• Can increase to 14mg daily after 30 days<br>• Do not take 2 7mg tabs to equal 14mg<br>• 14mg daily can be transitioned to Ozempic 0.5mg weekly the day after the last Rybelsus dose<br>• 0.5mg Ozempic can be transitioned to 7 or 14mg Rybelsus 7 days after last Ozempic dose |

# Diabetes Medication Compatibility

| | Sulfonylurea | Metformin | Pioglitazone | DPP-4 | Meglitinide | SGLT-2 | GLP-1 | Insulin |
|---|---|---|---|---|---|---|---|---|
| Sulfonylurea | | Yes | Yes | Yes | Yes | Yes | Yes | Not Recommended |
| Metformin | Yes | | Yes | Yes | Yes | Yes | Yes | Yes |
| Pioglitazone | Yes | Yes | | Yes | Yes | Yes | Yes | Yes |
| DPP-4 | Yes | Yes | Yes | | Yes | Yes | No | Yes |
| Meglitinide | Yes | Yes | Yes | Yes | | Yes | Yes | Yes |
| SGLT-2 | Yes | Yes | Yes | Yes | Yes | | Yes | Yes |
| GLP-1 | Yes | Yes | Yes | No | Yes | Yes | | Yes |
| Insulin | Not Recommended | Yes | Yes | Yes | Yes | Yes | Yes | |

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**Appendix E:**

## Medstar Type 2 Diabetes & Obesity Co-management Medications Dosing

Incretin analogs and SGLT2-inhibitors may provide dual glucose and weight lowering benefits in the person with T2D and obesity.
When possible, consider both glycemic lowering and weight loss potential in selecting a given agent for co-management of these conditions.

| Class | | Route | Strength(s) | Starting Dose | Maximum Dose | Times/ Day | Avg Weight Loss | Comments |
|---|---|---|---|---|---|---|---|---|
| GLP-1 Analog | **semaglutide** Ozempic® | SC | 0.25, 0.5mg red pen<br>1mg aqua pen<br>2mg gold pen | 0.25mg<br>Start with 0.25mg once a week for 4 weeks then increase to 0.5mg. May increase to 1mg and then 2mg after 4 additional weeks, respectively, if inadequate response. | 2mg | 1 injection/ week | 9.6 – 15% | • No dose adjustments needed for renal or hepatic impairment.<br>• Prior to first use, store in the refrigerator. After initial use, can be stored at room temperature for up to 56 days.<br>• Missed dose: Take as soon as missed dose noticed within 5 days of the missed dose. If more than 5 days, skip the missed dose and resume the usual schedule.<br>• **May decrease cardiovascular risk in patient at high risk of cardiovascular disease** |
| | **semaglutide** Wegovy® | SC | 0.25mg green pen<br>0.5mg red pen<br>1mg orange pen<br>1.7mg blue pen<br>2.4mg black pen | 0.25mg | 2.4mg | 1 injection/ week | 9.6 – 15% | • No dose adjustments needed for renal or hepatic impairment.<br>• Store in the refrigerator in protective carton. Can remove pen from refrigerator prior to injection, up to 28 days.<br>• Missed dose: Take as soon as missed dose noticed as long as the next scheduled dose is more than 2 days away. If the next dose is less than 2 days away, skip the missed dose and resume the usual schedule.<br>• **May decrease cardiovascular risk in patient at high risk of cardiovascular disease** |

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| | | Route | Strength(s) | Starting Dose | Maximum Dose | Times/ Day | Avg Weight Loss | Comments |
|---|---|---|---|---|---|---|---|---|
| **GLP-1 Analog** | **semaglutide** Rybelsus® | PO | 3mg, 7mg, 14mg | 3mg | 14mg | once daily | 9.6 – 15% | • Start with 3mg daily x 30 days then increase to 7mg daily.<br>• Can increase to 14mg daily after 30 days.<br>• Do not take 2 of the 7mg tabs to equal 14mg.<br>• 14mg daily can be transitioned to Ozempic 0.5mg weekly the day after the last Rybelsus dose.<br>• 0.5mg Ozempic can be transitioned to 7 or 14mg Rybelsus 7 days after last Ozempic dose. |
| | **dulaglutide** Trulicity® | SC | 0.75mg yellow/purple pen<br>1.5mg blue/purple pen<br>3mg gray/purple pen<br>4.5 green/purple pen | 0.75mg<br>Start 0.75mg once a week for first at least 4 weeks then increase to 1.5mg if inadequate response. Increase from 1.5mg to 3mg after at least 4 weeks if inadequate response. Increase from 3mg to 4.5mg after at least 4 weeks if inadequate response. | 4.5mg | 1 injection/ week | 8 – 11 lbs | • No dose adjustments needed for renal or hepatic impairment.<br>• Store in the refrigerator or at room temp for 14 days.<br>• Missed dose: Take as soon as missed dose noticed at least 3 days before the next scheduled dose then resume the usual schedule.<br>• No statistically significant A1c lowering between 1.5mg/week dose and 3mg or 4.5mg doses however additional appetite suppression and weight loss may be seen.<br>• **May decrease cardiovascular risk in patient at high risk of cardiovascular disease** |

| | | Route | Strength(s) | Starting Dose | Maximum Dose | Times/ Day | Avg Weight Loss | Comments |
|---|---|---|---|---|---|---|---|---|

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **GLP-1 Analog** | **liraglutide**<br>Victoza® | SC | 1 multidose pen with 0.6, 1.2, 1.8mg doses | 0.6mg<br>Start 0.6mg daily for first week; then go to 1.2mg. Can increase to 1.8mg/day after 1 week. | 1.8mg | 1 injection daily | 6 – 9% | • No dose adjustment for renal or hepatic impairment<br>• Take with or without food.<br>• Missed dose: take at next scheduled time. If more than 3 doses missed, restart at 0.6mg dose for 1 week.<br>• **May decrease cardiovascular risk in patient at high risk of cardiovascular disease.** |
| | **exenatide**<br>Bydureon Bcise® | SC | 2mg single dose pen | 2mg | 2mg | 1 injection/ week | 2 – 6 lbs | • Store pen flat in the refrigerator or at room temperature for up to 4 weeks.<br>• Keep pen at room temperature for 15 minutes prior to injection.<br>• With the orange cap pointed up, shake the pen up and down to mix the medicine for at least 15 seconds or until pen window is uniformly cloudy.<br>• Immediately unlock the pen with the orange cap pointing upwards.<br>• With the pen still pointing up, remove the orange cap.<br>• Immediately inject the medication. Hold the pen against the skin for 15 minutes. You should see the orange rod in the window when the complete dose has been delivered.<br>• Take without regard to food.<br>• Do not use in patients with eGFR <45 |
| | | Route | Strength(s) | Starting Dose | Maximum Dose | Times/ Day | Avg Weight Loss | Comments |

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| 3/2011, 7/2013, 3/2014, 5/2015, 5/2016, 5/2017. 5/2018, 5/2019, 5/2020, 5/2021, 5/2022, 5/2023, 5/2024 |  | May 2025 Ambulatory Best Practice Condition: Diabetes Mellitus |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **GIP/ GLP-1 Analog** | **tirzepatide** Mounjaro® | SC | 2.5mg gray/white pen<br>5mg purple/white pen<br>7.5mg green/white pen<br>10mg pink/white pen<br>12.5mg blue/white pen<br>15mg orange/white pen | 2.5mg<br>Start at 2.5mg weekly for 4 weeks then increase to 5mg weekly. Can increase by 2.5mg increments every 4 weeks as needed. | 15mg | 1 injection/ week | 17 – 20% | • Store in the refrigerator until expiration date or at room temperature for 21 days.<br>• Missed dose: Take as soon as possible within 4 days of missed dose. If more than 4 days have passed, skip, and take on usual day of the week. Allow at least 3 days between doses. |
| **SGLT-2 Inhibitors** | **canagliflozin** Invokana® | PO | 100, 300mg | 100mg | 300mg | once daily | 3 – 5lbs | • Take with the first meal of the day.<br>• Can increase to 300mg/day if eGFR ≥60.<br>• eGFR 45-60: 100mg/day max<br>• eGFR 30-45 with albuminuria > 300mg/day: 100mg/day max<br>• on dialysis: Do not use.<br>• Avoid in patients with PVD or foot ulcerations due to increased risk of amputations.<br>• **May decrease CV risk in patients at high CV risk.**<br>• **May decrease progression of kidney disease.** |
| | **dapagliflozin** Farxiga® | PO | 5, 10mg | 5mg | 10mg | once daily | 3 – 5lbs | • Take with or without food.<br>• eGFR 30-59: do not initiate therapy.<br>• eGFR <30: do not use |

| | | Route | Strength(s) | Starting Dose | Maximum Dose | Times/ Day | Avg Weight Loss | Comments |
|---|---|---|---|---|---|---|---|---|
| | **empagliflozin** Jardiance® | PO | 10, 25mg | 10mg | 25mg | once daily | 3 – 5lbs | • Take with or without food.<br>• eGFR ≤45: do not use. |

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|---|---|---|
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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | • **May decrease CV risk in patients at high CV risk**.<br>• **May decrease progression of kidney disease** |
| **SGLT-2 Inhibitors** | **ertugliflozin**<br>Steglatro® | PO | 5, 15mg | 5mg | 15mg | once daily | 3 – 5lbs | • Take in the morning with or without food.<br>• eGFR<30: do not use.<br>• eGFR 30-59: do not initiate therapy or continue therapy. |
| | **bexagliflozin**<br>Brenzavvy® | PO | 20mg | 20mg | 20mg | once daily | 3 – 5lbs | • Take in the morning with or without food.<br>• Avoid in patients with eGFR <30 or on dialysis.<br>• Available with prescription at Mark Cuban Cost Plus Drug Company. |
| | **sotagliflozin**<br>Inpefa® | PO | 200, 400mg | 200mg | 400mg | once daily | 3 – 5lbs | • SGLT-1 and SGLT-2 inhibitor<br>• Take in the morning not more than 1 hour before the first meal of the day.<br>• If dose is more than 6 hours late, skip and start with next dose on the next day.<br>• Correct volume status prior to starting medicine.<br>• Hold for 3 days prior to surgery. |

KB 10/23

# MDI: Perioperative Management of DM Resources:
# Appendix F: Perioperative Management of Diabetes Medications:

| | | | |
|---|---|---|---|
| **Guideline: Perioperative Management of Diabetes Medications** | | **Version Number: 4.0** | |
| **Department:** MedStar Diabetes Institute | **Original System P&T Approval Date:** | **Revision System P&T Approval Date:** | **Owner:** Carine Nassar, MS, RD, CDCES |
| **Reviewed By:** | | | |
| | | | |
| **Revision Date: 03-14-2024** | **Revision Description: New diabetes medications added, guidance for GLP-1 agonists updated.** | | |
| **Revision Reviewed By:** Anesthesia CPC, Diabetes and Endocrine CPC | | | |

**Purpose:** To provide recommendations regarding diabetes medication management for patients in the perioperative setting.
*Deviation from these guidelines may be warranted based on individual patient condition and physician discretion.*

| Drug | Recommendations | |
|---|---|---|
| **Insulin General Guidelines** | | |
| **Patients with Type 1 diabetes must always take basal Insulin on the day of surgery even when they are fasting or normo-glycemic to avoid ketoacidosis. BG will rise approximately 50mg/dL/hour and ketones will accumulate in as few as 2-3 hours in the absence of insulin 'on board'.**<br><br>**Basal insulin acts between meals and overnight to control BGs when patient is not eating. Basal insulin should be continued during the peri-operative/peri-procedural period.**<br><br>**Bolus short- or rapid-acting insulin is taken with meals to control post-meal glucose excursions and/or as correction dose to correct hyperglycemia). These insulins are not taken on the morning of surgery as the patient will not be eating but may be administered to control hyperglycemia in the perioperative period.**<br><br>**Every effort should be made to schedule early in the day for patients receiving insulin.** | | |
| **Insulin** | **Pre-Op** | **Post-op** |
| **Long-acting Insulin**<br><br>**Degludec (Tresiba)**<br>**Detemir (Levemir)**<br>**Glargine (Lantus, Basaglar, Semglee, Toujeo, Rezvoglar)** | **Night before:**<br>**80%** usual dose<br><br>**Day of surgery: if taken in the morning**<br>**80%** of usual dose | **80% dose till eating**<br>Usually given once daily. Titrate up PRN for fasting hyperglycemia |

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| Drug | Recommendations | |
|---|---|---|
| **Long-Acting Insulin/GLP-1 Combination**<br><br>**Degludec + Liraglutide (Xultophy)**<br>**Glargine + Lixisenatide (Soliqua)** | **Day before surgery:**<br>- If taken in the morning, take 80% of the dose.<br>- If taken in the evening, hold and provide another basal insulin without GLP-1. Give it at 80% of usual basal insulin dose.<br>**Note:** If an alternative basal insulin is not provided, this may lead to hyperglycemia the morning of surgery and correctional insulin will be required.<br><br>**Morning of surgery:** Hold and provide alternative basal insulin without GLP-1 at 80% of the usual basal insulin dose. | **Discharged:** Resume pre-op dosing once patient is eating.<br><br>**Admitted:** Insulin therapy only in immediate post operative period. Transition to home regimen when stable. |
| **Insulin** | **Pre-Op** | **Post-Op** |
| **NPH (Novolin N, Humulin N**) | **Night before: 80%** usual dose<br><br>**Day of Surgery: 50%** of usual dose if blood glucose greater than 100, otherwise hold | **50% of usual dose until eating.**<br>Reassess daily to titrate for stress of procedure |
| **U-500 insulin** | **50%** of usual dose (no guidance in the literature).<br>Patient should be instructed to obtain U-500 dosing from the U-500 prescriber as its dosing is highly individualized | **Discharged and eating: resume usual doses**<br><br>**Admitted:** (no U-500 available) switch to basal/bolus regimen as 25% of total daily dose of U-500 as basal and 25% split into divided doses before meals if. Indicated.<br><br>e.g. if patient on 100 units of U-500 per day pre-op: provide 25 units of glargine/day and 8 units of Lispro at each meal. |
| **Rapid/Short Acting Insulin**<br><br>**inhaled human insulin (Afrezza)**<br>**aspart (Novolog, Fiasp)**<br>**glulisine (Apidra)**<br>**lispro (Humalog, Admelog, Lyumjev)**<br>**regular (Novolin R, Humulin R)** | **HOLD the morning of surgery**<br>EXCEPT for use as correctional coverage | **Resume when eating** |


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| Drug | Recommendations | |
|---|---|---|
| **Pre-Mixed Insulin**<br><br>**NPH/regular 70/30 (Novolin 70/30 or Humulin 70/30)**<br>**NPH/lispro 75/25 (Humalog 75/25)**<br>**NPH/lispro 50/50 (Humalog 50/50)**<br>**NPH/aspart 70/30 (Novolog 70/30)** | **Night before**: 80% dose with dinner.<br><br>**Day of surgery**: If sugar greater than 200, give 50% of usual AM dose. Otherwise hold. | **Discharged and Eating: Resume usual dose**<br><br>**Admitted: 50% of total daily mixed insulin dose as glargine and provide meal time insulin dose as indicated.** |
| **Insulin correction dose algorithm** | **please see Appendix 1** | |
| **Oral Diabetes Medications** | **Preop** | **Post op** |
| **SGLT2 inhibitors** (alone and in combination pills)**.** Due to concerns for development of euglycemic ketoacidosis, these agents should be withheld in advance of schedule surgery.<br><br>ertugliflozin (Steglatro)<br>ertugliflozin + metformin (Segluromet)<br>ertugloflozin + sitaglipin (Steglujan)<br><br>bexagliflozin (Brenzavvy)<br>canagliflozin (Invokana)<br>canagliflozin + metformin (Invokamet)<br>dapagliflozin (Farxiga),<br>dapagloflozin + metformin (Xigduo)<br>dapagliflozin + saxagliptin (Qtern) | Hold 96 hours (4 days prior to surgery) | **Discharged:** Resume once patient able to resume adequate food intake and hydration.<br><br>**Admitted:** Insulin therapy only in immediate post operative period. |


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| Drug | Recommendations | |
|---|---|---|
| empagloflozin (Jardiance)<br>empagloflozin + metformin (Synjardy),<br>empagloflozin + linagliptin (Glyxambi)<br>empagliflozin+ linagliptin+ metformin XR (Trijardy XR)<br>Sotagliflozin (Inpefa)<br><br>**ALERT: HOLDING THE PILLS ABOVE FOR UP 3-4 DAYS PRIOR TO SURGERY MAY LEAD TO BLOOD SUGARS BEING HIGHER THAN USUSAL. INSTRUCT PATIENT TO CHECK THEIR BLOOD SUGARS TWICE A DAY AND CALL THEIR PROVIDER IF THEIR BLOOD SUGARS ARE HIGHER THAN 250 MG/DL.** | Hold 72 hours (3 days prior to surgery) | |
| **All Other Oral Diabetes Medications** | **Day before surgery:**<br>Patient can take all non SGLT2 inhibitor pills<br><br>**Day of surgery:**<br>Hold all diabetes pills | **Discharged:** Resume diabetes pills once patient is eating.<br><br>**Admitted:** Insulin therapy only in immediate post operative period. Transition to home regimen when stable. |
| **Non-insulin injectables (GLP-1 and GLP-1/GIP agonists)** | **Preop** | **Post-op** |
| **Exenatide (Byetta) – Twice daily**<br>**Liraglutide (Victoza) – Once daily**<br><br>**Exenatide ER (Bydureon)- Once weekly**<br>**Dulaglutide (Trulicity)- Once weekly** | <u>Elective Surgeries/procedures requiring anesthesia:</u><br><br>**For patients on daily dosing:** Continue taking the day prior to surgery.<br><br>**For patients on weekly dosing:** Hold last dose prior to the procedure. | **Discharged:** Resume non-insulin injectables once patient is eating.<br><br>**Admitted:** Insulin therapy only in immediate post operative period. Transition to home regimen when stable. |

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| 3/2011, 7/2013, 3/2014, 5/2015, 5/2016, 5/2017. 5/2018, 5/2019, 5/2020, 5/2021, 5/2022, 5/2023, 5/2024 |  | May 2025 Ambulatory Best Practice Condition: Diabetes Mellitus |

| Drug | Recommendations | |
|---|---|---|
| **Semaglutide (Ozempic)- Once weekly**<br>**Tirzepatide (Mounjaro)- Once weekly** | **Morning of surgery:** Hold all non-insulin shots | |
| **Insulin Pump** | | |
| Refer to the Continuous Subcutaneous Insulin Infusion (CSII) Pump Policy.<br>For scheduled surgeries: instruct patient to obtain pre surgical pump management instructions from pump prescriber.<br>For unscheduled/emergencies: consult with endocrinologist where available and/or disconnect pump and initiate subcutaneous insulin injections or insulin drip | | |

**Appendix 1: Correction Dose Insulin Algorithm**

**Correction Dose Insulin Algorithm**

Use rapid-acting insulin analog (lispro, aspart or glulisine) when hyperglycemia is present.
Provide correction dose insulin in conjunction with hydration and treatment of underlying precipitating factors.

| **Low Dose:** < 40 units of insulin/day, weight < 70 kg | | **Medium Dose:** 40-100 units of insulin/day, weight 70-125 kg | | **High Dose:** > 100 units of insulin/day, weight > 125 kg | |
|---|---|---|---|---|---|
| **BG (mg/dL)** | **Dose** | **BG (mg/dL)** | **Dose** | **BG (mg/dL)** | **Dose** |
| 200-249 | 2 units | 200-249 | 3 units | 200-249 | 4 units |
| 250-299 | 3 units | 250-299 | 5 units | 250-299 | 7 units |
| 300-349 | 4 units | 300-349 | 7 units | 300-349 | 10 units |
| > 349 | 5 units | > 349 | 8 units | > 349 | 12 units |

**Appendix 2: Patient instruction Sheet**

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**Appendix G:**

**MEDSTAR HEALTH: GUIDELINES FOR PRE-SURGERY MANAGEMENT OF DIABETES MEDICATIONS**

**Generic Drug Names in Alphabetical Order**

**Note: All diabetes medications can be resumed at their usual dose once patient is eating normally post procedure**

**Table I: Insulin and Insulin/GLP-1 Mixes**

| Drug Name | Before Surgery Instructions | Morning of Surgery Instructions |
|---|---|---|
| Aspart | Take usual dose | Do not take |
| Degludec U-100<br>Degludec U-200 | Day before surgery: Take 80% of the usual dose<br>= _____ units | If basal insulin usually taken in the morning, take 80% of usual dose<br>= _____ units<br><br>If basal insulin usually taken in the evening, continue with 80% of usual dose until eating normally, then go back to usual dose |
| Degludec/liraglutide mix | Day before surgery**:**<br>- If taken in the morning take 80% of the usual dose<br>- If taken in the evening, hold and get a new prescription from your provider for another basal insulin without the GLP-1. Take it at 80% of your usual basal insulin dose.<br><br>Note: If an alternative basal insulin is not provided, this may lead to hyperglycemia the morning of surgery and correctional insulin will be needed. | Morning of surgery: Hold and take alternative basal insulin without GLP-1 at 80% of the usual basal insulin dose.<br><br>Continue with 80% of usual dose until eating normally, then go back to usual dose. |
| Detemir | Day before Surgery: Take 80% of the usual dose<br>= _____ units | If basal insulin usually taken in the morning, take 80% of usual dose<br>= _____ units |



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| | | |
|---|---|---|
| | | If basal insulin usually taken in the evening, continue with 80% of usual dose until eating normally, then go back to usual dose |

| Drug Name | Before Surgery Instructions | Morning of Surgery Instructions |
|---|---|---|
| Glargine U-100<br>Glargine U-300 | Day before surgery: Take 80% of the usual dose<br>= _____units | If basal insulin usually taken in the morning, take 80% of usual dose<br>= _____ units<br><br>If basal insulin usually taken in the evening, continue with 80% of usual dose until eating normally, then go back to usual dose |
| Glargine/Lixisenatide mix * | Day before surgery:<br>- If taken in the morning, take 80% of the usual dose<br>- If taken in the evening, hold and get a new prescription from your provider for another basal insulin without the GLP-1. Take it at 80% of your usual basal insulin dose.<br><br>Note: If an alternative basal insulin is not provided, this may lead to hyperglycemia the morning of surgery and correctional insulin will be needed | Morning of surgery: Hold and take alternative basal insulin without GLP-1 at 80% of the usual basal insulin dose.<br><br>Continue with 80% of usual dose until eating normally, then go back to usual dose |
| Glulisine | Take usual dose | Do not take |
| Inhaled Human Insulin | Take usual dose | Do not take |
| Lispro | Take usual dose | Do not take |
| NPH insulin | Night before surgery: Take 80% of the usual dose<br>= _____units | Morning of surgery: If blood glucose is higher than 100, take 50% (half) of the usual dose = _____units. **If blood glucose is equal or less than 100, don't take.** |

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| | | |
|---|---|---|
| | | After Surgery:Ccontinue with 50% (half) of usual dose = _____ units until eating normally |
| **Drug Name** | **Before Surgery Instructions** | **Morning of Surgery Instructions** |
| NPH/Lispro 50/50<br>NPH/ Lispro 75/25<br>NPH/Lispro 70/30<br>NPH/Regular 70/30 | Night before surgery: Take 80% of the usual dose<br>= _____units | Morning of surgery: If blood glucose is higher than 200, take 50% (half) of usual dose = _____ units. **If blood glucose is equal or less than 200, don't take.**<br><br>After surgery: If eating, restart usual dose. If not eating, take 50% (half) of your usual dose = _____units |
| Regular insulin U-100 | Take usual dose | Do not take |
| Regular insulin U-500 | Day before surgery:<br>Take your usual dose for breakfast and lunch. Take 50% (half) of your usual dose for dinner = _____units<br><br>(Recommend calling U-500 prescriber for specific instructions whenever possible as U-500 dosing is highly individualized) | Morning of Surgery: Take 50% (half) of the usual dose = _____units<br><br>After Surgery: Continue with 50% (half) of usual dose = _____units until eating normally<br><br>(Recommend calling U-500 prescriber for specific instructions whenever possible as U-500 dosing is highly individualized) |



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**Table II: Non-Insulin Agents**

| Drug Name | Before Surgery Instructions | Morning of Surgery Instructions |
|---|---|---|
| Alogliptin | Take usual dose | Do not take |
| Alogliptin/Pioglitazone combination | Take usual dose | Do not take |
| Bexagliflozin | STOP taking 3 days before surgery | Do not take |
| Dulaglutide | Hold last dose prior to surgery | Do not take |
| Canagliflozin | STOP taking 3 days before surgery | Do not take |
| Canagliflozin/metformin combination | STOP taking 3 days before surgery | Do not take |
| Dapagliflozin | STOP taking 3 days before surgery | Do not take |
| Dapagliflozin/metformin combination | STOP taking 3 days before surgery | Do not take |
| Dapagliflozin/saxagliptin combination | STOP taking 3 days before surgery | Do not take |
| Empagliflozin | STOP taking 3 days before surgery | Do not take |
| Empgliflozin/linagliptin combination | STOP taking 3 days before surgery | Do not take |
| Empagliflozin/linagliptin/metformin XR combination | STOP taking 3 days before surgery | Do not take |
| Ertugliflozin | STOP taking 4 days before surgery | Do not take |
| Ertugliflozin/metformin combination | STOP taking 4 days before surgery | Do not take |
| Ertugliflozing/sitagliptin combination | STOP taking 4 days before surgery | Do not take |
| Exenatide<br>Exenatide LR | Take usual dose<br>Hold last dose prior to surgery | Do not take |
| Glimepiride | Take usual dose | Do not take |
| Glimepiride/pioglitazone combination | Take usual dose | Do not take |
| Glipizide | Take usual dose | Do not take |
| Glipizide/metformin | Take usual dose | Do not take |
| Glyburide | Take usual dose | Do not take |
| Glyburide/metformin | Take usual dose | Do not take |
| Linagliptin | Take usual dose | Do not take |
| Linagliptin/metformin combination | Take usual dose | Do not take |
| Liraglutide | Take usual dose | Do not take |
| Metformin<br>Metformin XR | Take usual dose | Do not take |

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|---|---|---|
| Nateglinide | Take usual dose | Do not take |
| **Drug Name** | **Before Surgery Instructions** | **Morning of Surgery Instructions** |
| Pioglitazone | Take usual dose | Do not take |
| Pioglitazone/metformin combination | Take usual dose | Do not take |
| Repaglinide | Take usual dose | Do not take |
| Saxagliptin | Take usual dose | Do not take |
| Saxagliptin/metformin | Take usual dose | Do not take |
| Sitagliptin | Take usual dose | Do not take |
| Sitagliptin/metformin | Take usual dose | Do not take |
| Semaglutide pill<br>Semaglutide injection | Take usual dose<br>Hold last dose before surgery | Do not take |
| Sotagliflozin | STOP taking 3 days before surgery | Do not take |
| Tirzepatide | Hold last dose before surgery | Do not take |

**PROVIDER ALERTS:**
**HOLDING SGLT2s FOR UP 3-4 DAYS BEFORE SURGERY MAY LEAD TO HIGHER BLOOD GLUCOSE THAN USUAL. PLEASE INSTRUCT PATIENTS TO CHECK THEIR BLOOD GLUCOSE AT LEAST TWICE A DAY AND CALL THEIR PROVIDER IF THEIR BLOOD GLUCOSE IS HIGHER THAN 250 MG/DL.**

**HOLDING GLP-1 INJECTIONS FOR 1 WEEK BEFORE SURGERY MAY LEAD TO HIGHER BLOOD GLUCOSE THAN USUAL. PLEASE INSTRUCT PATIENTS TO CHECK THEIR BLOOD GLUCOSE AT LEAST TWICE A DAY AND CALL THEIR PROVIDER IF THEIR BLOOD GLUCOSE IS HIGHER THAN 250 MG/DL.**

**MEDSTAR HEALTH: GUIDELINES FOR PRE-SURGICAL MANAGEMENT OF DIABETES MEDICATIONS**

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**Brand Drug Names in Alphabetical Order**

**Note: All diabetes medications can be resumed at their usual dose once patient is eating normally post procedure**

**Table I: Insulin and Insulin/GLP-1 Mixes**

| Drug Name | Before Surgery Instructions | Morning of Surgery Instructions |
|---|---|---|
| Admelog | Take usual dose | Do not take |
| Afrezza (inhaled insulin) | Take usual dose | Do not take |
| Apidra | Take usual dose | Do not take |
| Basaglar | Day before surgery: Take 80% of usual dose = _____ units | If basal insulin usually taken in the morning, take 80% of usual dose = _____ units<br><br>If basal insulin usually taken in the evening, continue with 80% of usual dose until eating normally, then go back to usual dose |
| Brenzavvy | STOP taking 3 days before surgery | Do not take |
| Fiasp | Take your usual dose | Do not take |
| Humalog | Take usual dose | Do not take |
| Humalog 50/50 | Night before surgery: take 80% of usual dose = _____ units | Morning of surgery: if blood glucose is higher than 200, take 50% (half) of usual dose = _____ units. **If blood glucose equal to or less than 200, don't take.**<br>After surgery: If eating, restart usual dose.<br>If not eating, take 50% (half) of your usual dose = _____units |
| **Drug Name** | **Before Surgery Instructions** | **Morning of Surgery Instructions** |



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| | | |
|---|---|---|
| Humalog 75/25 | Night before surgery: take 80% of usual dose = _____ units | Morning of surgery: if blood glucose is higher than 200, take 50% (half) of usual dose = _____ units. **If blood glucose is equal to or less than 200, don't take**.<br><br>After surgery: If eating, restart usual dose.<br>If not eating, take 50% (half) of your usual dose = _____units |
| Humulin N | Night before surgery: Take 80% of the usual dose<br>= _____ units | Morning of surgery: If blood glucose is higher than 100, take 50% (half) of the usual dose = _____ units. **If blood glucose is equal to or less than 100 don't take.**<br><br>After Surgery: continue with 50% (half) of usual dose = _____ units until eating normally |
| Humulin R | Take your usual dose | Do not take unless instructed by your provider for high sugar |
| Humulin R U-500 | Day before surgery:<br>Take your usual dose for breakfast and lunch. Take 50% of your usual dose for dinner = _____units<br><br>(Recommend calling U-500 prescriber for specific instructions whenever possible as U-500 dosing is highly individualized) | Morning of Surgery: Take 50% (half) of the usual dose = _____units<br><br>After Surgery: continue with 50% (half) of usual dose = _____units until eating normally<br><br>Recommend calling U-500 prescriber for specific instructions whenever possible as U-500 dosing is highly individualized) |
| Humulin 70/30 | Night before surgery: Take 80% of the usual dose<br>= _____units | Morning of surgery: if blood glucose is higher than 200, take 50% (half) of usual dose = _____ units. If blood glucose is equal or less than 200, don't take any.<br>After surgery: If eating, restart usual dose.<br>If not eating, take 50% (half) of your usual dose = _____units |



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| Drug Name | Before Surgery Instructions | Morning of Surgery Instructions |
|---|---|---|
| Lantus | Day before surgery:<br>Take 80% of the usual dose<br>= _____units | If basal insulin usually taken in the morning, take 80% of usual dose<br>= _____ units<br><br>If basal insulin usually taken in the evening, continue with 80% of usual dose until eating normally, then go back to usual dose |
| Levemir | Day before surgery:<br>Take 80% of the usual dose<br>= _____units | If basal insulin usually taken in the morning, take 80% of usual dose<br>= _____ units<br><br>If basal insulin usually taken in the evening, continue with 80% of usual dose until eating normally, then go back to usual dose. |
| Lyumjev | Take usual dose | Do not take |
| Novolin N | Night before surgery: Take 80% of the usual dose<br>= _____units | Morning of surgery: If blood glucose is higher than 100, take 50% (half) of the usual dose = _____units. **If blood glucose is equal or less than 100, don't take.**<br><br>After Surgery: continue with 50% (half) of usual dose = _____ units until eating normally |
| Novolin R | Take usual dose | Do not take |

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| Drug Name | Before Surgery Instructions | Morning of Surgery Instructions |
|---|---|---|
| Novolin 70/30 | Night before surgery: take 80% of usual dose = _____ units | Morning of surgery: if blood glucose is higher than 200, take 50% (half) of usual dose = _____ units. **If blood glucose is equal or less than 200, don't take**.<br><br>After surgery: If eating, restart usual dose.<br>If not eating, take 50% (half) of your usual dose = _____units |
| Novolog | Take your usual dose | Do not take |
| Novolog 70/30 | Night before surgery: take 80% of usual dose = _____ units | Morning of surgery: if blood glucose is higher than 200, take 50% (half) of usual dose = _____ units. **If blood glucose is equal or less than 200, don't take**.<br><br>After surgery: If eating, restart usual dose.<br>If not eating, take 50% (half) of your usual dose = _____units |
| Rezvoglar | Day before surgery:<br>Take 80% of the usual dose<br>= _____units | If basal insulin usually taken in the morning, take 80% of usual dose<br>= _____ units<br><br>If basal insulin usually taken in the evening, continue with 80% of usual dose until eating normally, then go back to usual dose |
| Semglee | Take 80% of the usual dose<br>= _____units | If basal insulin usually taken in the morning, take 80% of usual dose<br>= _____ units<br><br>If basal insulin usually taken in the evening, continue with 80% of usual dose until eating normally, then go back to usual dose |


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| Drug Name | Before Surgery Instructions | Morning of Surgery Instructions<br>After Surgery Instructions |
|---|---|---|
| Soliqua (insulin + GLP-1) | Day before surgery:<br>If taken in the morning take 80% of the usual dose<br>- If taken in the evening, hold and get a new prescription from your provider for another basal insulin without the GLP-1. Take it at 80% of your usual basal insulin dose.<br><br>Note: If an alternative basal insulin is not provided, this may lead to hyperglycemia the morning of surgery and correctional insulin will be needed | Morning of surgery: Hold and take alternative basal insulin without GLP-1 at 80% of the usual basal insulin dose.<br><br>Continue with 80% of usual dose until eating normally, then go back to usual dose |
| Toujeo | Day before surgery:<br>Take 80% of the usual dose<br>= _____units | If basal insulin usually taken in the morning, take 80% of usual dose<br>= _____ units<br><br>If basal insulin usually taken in the evening, continue with 80% of usual dose until eating normally, then go back to usual dose |
| Tresiba U-100 and U-200 | Day before surgery:<br>Take 80% of the usual dose<br>= _____units | If basal insulin usually taken in the morning, take 80% of usual dose<br>= _____ units<br><br>If basal insulin usually taken in the evening, continue with 80% of usual dose until eating normally, then go back to usual dose |
| | | |



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| | | |
|---|---|---|
| Xultophy (insulin + GLP-1) | - If taken in the morning take 80% of the usual dose<br><br>- If taken in the evening, hold and get a new prescription from your provider for another basal insulin without the GLP-1. Take it at 80% of your usual basal insulin dose.<br><br>Note: If an alternative basal insulin is not provided, this may lead to hyperglycemia the morning of surgery and correctional insulin will be needed | Morning of surgery: Hold and take alternative basal insulin without GLP-1 at 80% of the usual basal insulin dose<br><br>Continue with 80% of usual dose until eating normally, then go back to usual dose |

**Table II: Non-insulin agents**

| Drug Name | Before Surgery Instructions | Morning of Surgery Instructions |
|---|---|---|
| Actos | Take usual dose | Do not take |
| ActoplusMet | Take usual dose | Do not take |
| Amaryl | Take usual dose | Do not take |
| Brenzavvy | STOP taking 3 days before surgery | Do not take |
| Bydureon/B-cise | Discuss with provider whether to stop one week before surgery | Do not take |
| Byetta | Take usual dose | Do not take |
| Duetact | Take usual dose | Do not take |
| Farxiga | STOP taking 3 days before surgery | Do not take |
| Glucophage | Take usual dose | Do not take |
| Glucovance | Take usual dose | Do not take |
| Glyxambi | STOP Taking 3 days before surgery | Do not take |
| Inpefa | STOP taking 3 days before surgery | Do not take |


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| Drug Name | Day Before Surgery Instructions | Morning of Surgery Instructions |
|---|---|---|
| Invokana | STOP taking 3 days before surgery | Do not take |
| Jardiance | STOP taking 3 days before surgery | Do not take |
| Janumet | Take usual dose | Do not take |
| Januvia | Take usual dose | Do not take |
| Jentadueto | Take usual dose | Do not take |
| Kazano | Take usual dose | Do not take |
| Kombiglyze | Take usual dose | Do not take |
| Metaglip | Take usual dose | Do not take |
| Mounjaro | Discuss with provider whether to stop one week before surgery. | Do not take |
| Nesina | Take usual dose | Do not take |
| Onglyza | Take usual dose | Do not take |
| Ozempic | Discuss with provider whether to stop one week before surgery | Do not take |
| Prandin | Take usual dose | Do not take |
| Qtern | STOP taking 3 days before surgery | Do not take |
| Rybelsus | Take usual dose | Do not take |
| Segluromet | STOP taking 4 days before surgery | Do not take |
| Starlix | Take usual dose | Do not take |
| Steglatro | STOP taking 4 days before surgery | Do not take |
| Steglujan | STOP taking 4 days before surgery | Do not take |
| Synjardy | STOP taking 3 days before surgery | Do not take |
| Tradjenta | Take usual dose | Do not take |
| Trijardy | STOP taking 3 days before surgery | Do not take |
| Trulicity | Discuss with provider whether to stop one week before surgery | Do not take |
| Victoza | Take usual dose | Do not take |
| Xigduo | STOP taking 3 days before surgery | Do not take |


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**PROVIDER and Patient ALERTS:**

**HOLDING SGLT2s FOR UP 3-4 DAYS BEFORE SURGERY MAY MAKE YOUR BLOOD SUGARS BE HIGHER THAN USUAL. YOU SHOULD CHECK YOUR BLOOD SUGARS AT LEAST TWICE A DAY AND CALL YOUR PROVIDER IF YOUR BLOOD SUGARS ARE HIGHER THAN 250 MG/DL.**

**HOLDING GLP-1 INJECTIONS FOR 1 WEEK BEFORE SURGERY MAY MAKE YOUR BLOOD SUGARS BE HIGHER THAN USUAL. YOU SHOULD CHECK YOUR BLOOD SUGARS AT LEAST TWICE A DAY AND CALL YOUR PROVIDER IF YOUR BLOOD SUGARS ARE HIGHER THAN 250 MG/DL.**

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**Appendix H:**

**MedStar Health/MedStar Diabetes Institute**
**Pre and Post Surgery Patient Instructions for Diabetes Medications**
**(Provider: Please check /highlight the appropriate medications and complete per pre-op guidelines)**

| IF YOU TAKE | | THEN |
|---|---|---|
| Metformin, Pioglitazone, and Dipeptidyl Peptidase-4 (DPP-4) Inhibitors | | |
| **NAME BRAND** | **GENERIC** | DAY BEFORE SURGERY: TAKE YOUR **USUAL DOSE**<br><br>MORNING OF SURGERY: **DO NOT TAKE** YOUR PILLS<br><br>AFTER SURGERY: **RESTART YOUR USUAL DOSE** ONCE EATING NORMALLY |
| Actos | Pioglitazone | |
| ActosplusMet | Pioglitazone/ Metformin | |
| Glucophage | Metformin | |
| Janumet | Sitagliptin/Metformin | |
| Januvia | Sitagliptin | |
| Jentadueto | Linagliptin/Metformin | |
| Kazano | Alogliptin/Pioglitazone | |
| Kombiglyze | Saxagliptin/Metformin | |
| Onglyza | Saxagliptin | |
| Nesina | Alogliptin | |
| Tradjenta | Linagliptin | |
| Sulfonylureas and Glinides | | |
| **NAME BRAND** | **GENERIC** | DAY BEFORE SURGERY: TAKE YOUR **USUAL DOSE**<br><br>MORNING OF SURGERY: **DO NOT TAKE** YOUR PILLS<br><br>AFTER SURGERY: **RESTART YOUR USUAL DOSE** ONCE EATING NORMALLY |
| Amaryl | Glimepiride | |
| | Glipizide | |
| | Glyburide | |
| Duetact | Glimepiride/Pioglitazone | |
| Glucovance | Glyburide/Metformin | |
| Metaglip | Glipizide/Metformin | |
| Prandin | Repaglinide | |
| Starlix | Nateglinide | |

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| Sodium-Glucose CoTransporter-2 (SGLT2) Inhibitors* (Provider/Patient Alert Below) | | |
|---|---|---|
| **NAME BRAND** | **GENERIC** | |
| Brenzavvy | Bexagliflozin | **STOP THESE PILLS 3 DAYS** (72 HOURS) BEFORE SURGERY<br><br>AFTER SURGERY: **RESTART USUAL DOSE** WHEN EATING/DRINKING NORMALLY |
| Farxiga | Dapagliflozin | |
| Glyxambi | Empagliflozin/Linagliptin | |
| Inpefa | Sotagliflozin | |
| Invokana | Canagliflozin | |
| Invokamet | Canagliflozin/metformin | |
| Jardiance | Empagliflozin | |
| Qtern | Dapagliflozin/Saxagliptin | |
| Synjardy | Empagliflozin/metformin | |
| Trijardy | Empagliflozin/linagliptin/ metformin XR | |
| Xigduo | Dapagliflozin/metformin | |
| Steglatro | Ertugliflozin | **STOP THESE PILLS 4 DAYS** (96 HOURS) BEFORE SURGERY<br><br>AFTER SURGERY: **RESTART USUAL DOSE** WHEN EATING/DRINKING NORMALLY |
| Steglujan | Ertugliflozin/sitagliptin | |
| Segluromet | Ertugliflozin/metformin | |
| LONG-ACTING INSULINS | | |
| **NAME BRAND** | **GENERIC** | Current Dose: _____ |
| Basaglar | Glargine | • If you take your basal insulin in the evening, the evening before your surgery take _____ units (80% of current dose)<br><br>• If you take your basal insulin in the morning, the morning of surgery take _____ units (80% of your current dose)<br><br>• After surgery: Continue with _____ units until eating (80% of usual dose) |
| Lantus | Glargine | |
| Levemir | Detemir | |
| Semglee | Glargine | |
| Toujeo | Glargine U-300 | |
| Tresiba | Degludec | |

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|---|---|---|
| *Humulin R U-500* | *Regular Insulin U-500* | Current Dose: _____<br><br>The day before surgery: Take your usual dose for breakfast and lunch and 50% for dinner: _____ units<br><br>The morning of surgery: Take 50% of your usual dose: _____ units<br><br>After surgery: Restart your usual doses once eating normally.<br><br>Please call the provider that prescribes your U-500 dose and ask them for specific instructions on adjusting your dose before and after surgery. |
| *Humulin N, Novolin N* | *NPH insulin* | Current Dose: _____<br><br>**Night before Surgery:** Take _____ units (80% usual dose)<br><br>**Morning of Surgery:** Take _____units (50% of usual dose) if blood glucose **higher than 100**, otherwise don't take<br><br>**After surgery: C**ontinue with units (50% of usual dose) until eating normally |
| LONG-ACTING INSULINS/GLP-1 COMBINATIONS | | |
| Soliqua<br>Xultophy | Glargine/Lixisenatide<br>Degludec/Liraglutide | Current Dose: _____<br><br>Day before surgery:<br>- If taken in the morning take 80% of the usual dose<br>- If taken in the evening, hold and get a new prescription from your provider for another basal insulin without the GLP-1. Take it at 80% of your usual basal insulin dose. |

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| | | |
|---|---|---|
| | | **Note:** If an alternative basal insulin is not provided, this may lead to hyperglycemia the morning of surgery and correctional insulin will be needed.<br><br>Morning of surgery: Hold and take alternative basal insulin without GLP-1 at 80% of the usual basal insulin dose |
| SHORT-ACTING INSULINS | | |
| **NAME BRAND**<br>Admelog<br>Afrezza<br>Apidra<br>Fiasp<br>Humalog<br>Humulin R<br>Lyumjev<br>Novolin R<br>Novolog | **GENERIC**<br>Lispro<br>Inhaled human insulin<br>Glulisine<br>Aspart<br>Lispro<br>Regular<br>Aspart<br>Regular<br>Aspart | Current Dose: _____ units<br><br><u>Day before surgery:</u> Take your usual dose<br><br><u>Morning of surgery</u>: **DO NOT TAKE** your mealtime insulin.<br><br><u>After surgery:</u> **Restart your usual dose** when eating |
| MIXED INSULINS | | |
| **NAME BRAND**<br>Humalog 50/50<br>Humalog 75/25<br>Humulin 70/30<br>Novolin 70/30<br>Novolog 70/30 | **GENERIC**<br>NPH/Lispro 50/50<br>NPH/Lispro 75/25<br>NPH/Regular 70/30<br>NPH/Regular 70/30<br>NPH/Lispro 70/30 | Current morning dose: _____units<br>Current evening dose: _____ units<br><br>Night before surgery: Take _____<br>units (80% of usual evening dose)<br><br>Morning of surgery: If blood sugar is higher than 200, take _____ units (50% of usual dose). Otherwise, don't take it.<br><br>After surgery:<br>- If eating: Restart your usual dose<br>- If not eating: Take _____ (50% of your usual premix dose) |

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| GLP-1/GIP Receptor Agonists * (Provider/Patient Alert Below) | | |
|---|---|---|
| **NAME BRAND** | **GENERIC** | Elective Surgeries/Procedures requiring anesthesia: |
| Byetta (twice daily) | Exenatide | **If you are taking a daily or twice daily shot:** continue taking the day before surgery. |
| Victoza (Once daily) | Liraglutide | **If you are taking a weekly shot:** Hold the last dose before surgery. |
| Bydureon/B-cise | Exenatide LAR | |
| Mounjaro | Tirzepatide | **Morning of surgery:** hold all non-insulin shots. |
| Ozempic | Semaglutide | |
| Rybelsus | Semaglutide | **After Surgery:** restart non-insulin shots once eating normally |
| Trulicity | Dulaglutide | |

**PROVIDER and Patient ALERTS:**

**HOLDING SGLT2s FOR UP 3-4 DAYS BEFORE SURGERY MAY MAKE YOUR BLOOD SUGARS BE HIGHER THAN USUAL. YOU SHOULD CHECK YOUR BLOOD SUGARS AT LEAST TWICE A DAY AND CALL YOUR PROVIDER IF YOUR BLOOD SUGARS ARE HIGHER THAN 250 MG/DL.**

**HOLDING GLP-1 INJECTIONS FOR 1 WEEK BEFORE SURGERY MAY MAKE YOUR BLOOD SUGARS BE HIGHER THAN USUAL. YOU SHOULD CHECK YOUR BLOOD SUGARS AT LEAST TWICE A DAY AND CALL YOUR PROVIDER IF YOUR BLOOD SUGARS ARE HIGHER THAN 250 MG/DL.**

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**CORRECTION DOSE INSULIN ALGORITHM**

**If your blood sugar is running high (200mg/dL or higher), and you have insulin, take a correction dose of rapid-acting insulin** (Aspart, Lispro or Glulisine) **using the table below.**

*Provider to indicate which scale the patient should use.*

☐ Low Dose: <40 units of insulin/day, weight <70 kg

| BG (MG/DL | Dose |
|---|---|
| 200-249 | 2 units |
| 250-299 | 3 units |
| 300-349 | 4 units |

☐ Medium Dose:40-100 units of insulin/day, weight 70-125 kg

| BG (MG/DL | Dose |
|---|---|
| 200-249 | 3 units |
| 250-299 | 5 units |
| 300-349 | 7 units |

☐ High Dose: >100 units of insulin/day, weight > 125 kg

| BG (MG/DL | Dose |
|---|---|
| 200-249 | 4 units |
| 250-299 | 7 units |
| 300-349 | 10 units |

- ✓ **Bring your blood glucose meter, test strips, and a low blood sugar treatment (glucose tablets or small clear juice box – apple or white grape juice) with you on the day of the procedure.**

**Appendix I: MedStar Diabetes Bootcamp**

MedStar Health

# MedStar Diabetes Boot Camp Telehealth Program

## What is the Diabetes Boot Camp?

- An evidence-based, technology driven telehealth program to support our providers and their patients with uncontrolled type 2 diabetes (A1C ≥ 8%) in achieving targeted glycemic control and reduction in health resource utilization.
- Mean absolute reduction of A1C equals 3%.

## What can the patient expect from this telehealth program?

- Patient-centered care by our experienced diabetes specialists.
- Two telehealth visits with the Registered Dietitian/Diabetes Care and Education Specialist to learn the skills and knowledge needed to manage diabetes.
- Nine to twelve weekly visits with the diabetes Nurse Practitioner who will provide diabetes medication management and continue to reinforce diabetes self-managements skills and knowledge.
- Weekly review of blood glucose values with the patient. The patient's monitoring device will be connected to the MedStar Health dashboard to allow real-time blood glucose review with the patient.
- After completion of the 14-week program the patient will be returned to their PCP or endocrinologist with a comprehensive diabetes plan.

**Who is eligible?**

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- Adults with type 2 diabetes and A1C ≥ 8%
- Must have a smart phone or computer to transmit glucose data and perform telehealth visits

**Who is ineligible?**

- Type 1 diabetes
- Active severe untreated mental illness
- Pregnant patients
- Patients on high dose glucocorticoid therapy
- Patients with severe heart failure or receiving treatment for cancer

**How do I order the program?**

- In MedConnect, order “Referral to Diabetes Pathway”

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