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Clinical Practice Guidelines
Diabetes

Objective

The purpose is to guide the appropriate diagnosis and management of Diabetes. This guideline is designed to assist the clinician by providing a framework for decision-making.

Guideline

These are only guidelines, and are based on the best available information at the time of research. These may not be "all inclusive" as new medications and treatments are ever-evolving. These guidelines are updated by MDwise at least biannually as national guidelines are updated.

Care to be provided in accordance with the current recommendation from the American Diabetes Association (ADA)
American Diabetes Association (ADA) Standards of Medical Care in Diabetes 2018

Assessment & Diagnosis

RISK-BASED SCREENING FOR DIABETES OR PREDIABETES IN ASYMPTOMATIC INDIVIDUALS

- For children and adolescents: testing should be considered if they are overweight with a BMI >85th percentile for age, sex, or weight for height >85th percentile or weight >120% of ideal for height.
- For adults: Testing should be considered in overweight or obese suggested BMI of >25 with one or more of the following risk factors:
    - First-degree relative with diabetes
    - High risk ethnicity (African American, Latino, Native American, Asian American, Pacific Islander)
    - History of cardiovascular disease (CVD)
    - Hypertension
    - HDL < 35 mg/dL and/or triglycerides (TG) > 250 mg/dL
    - Women with polycystic ovary syndrome
    - Physical inactivity
- All other patients, testing should begin at age 45 and at least every 3 years thereafter.

Differential Diagnosis

Pre-Diabetes	Type 1 Diabetes	Type 2 Diabetes
• HbA1c 5.7 – 6.4% • FPG 100-125 mg/dL • 2-hour post-prandial during 75 g OGTT 140-199 mg/dL	• Presentation with polyuria/ polydipsia, accompanied by a random plasma glucose ≥ 200mg/ dL. • Presentation with diabetic ketoacidosis is not uncommon. • Presence of islet cell autoantibodies and autoantibodies to GAD, insulin, tyrosine phosphatase 1A-2 and 1A-2ß, or ZnT8	• HbA1C ≥ 6.5%; OR • FPG ≥ 126mg/dL; OR • 2-hour plasma glucose ≥ 200mg/ dL during a 75 g OGTT • Presentation with classic symptoms of hyperglycemia or hyperglycemic crisis, accompanied by a random plasma glucose ≥ 200mg/dL.

HbA1c = hemoglobin A1c; FPG = Fasting Plasma Glucose; OGTT = oral glucose tolerance test; Fasting is defined as no caloric intake for at least 8 hours

** Once a diagnosis of diabetes mellitus has been confirmed, it is imperative that the individual be evaluated for comorbidities and potential complications of hyperglycemia including: cardiovascular disease (hypertension, dyslipidemia, coagulation disorders, coronary heart disease), thyroid dysfunction, nephropathy, retinopathy, neuropathy, obesity, depression, and obstructive sleep apnea.

** Refer to other MDwise guidelines for management and treatment goals of comorbid conditions.

GLYCEMIC CONTROL

- Self-Monitoring of Blood Glucose (SMBG)
    - Individuals receiving multiple insulin injections or using an insulin pump should test their blood glucose ≥ 3 times/day.
        - Target Preprandial Plasma Glucose: 80-130 mg/dL
        - Should be measured before consuming first meal of the day
        - Target Peak Postprandial Plasma Glucose (PPG) < 180mg/dL
        - Should be measured 1-2 hours after a meal
    - Individuals treated with less frequent insulin injections or non-insulin therapies should strongly consider using SMBG.

- HbA1C should be obtained at least twice a year for well-controlled diabetic patients, and four times a year for patients undergoing therapy change(s) or those not meeting their glycemic goals.
    - Target HbA1C <7% for most non-pregnant adults.
    - A lower goal HbA1C (<6.5%) may be considered if it can be achieved without causing significant hypoglycemia or other adverse effects. Appropriate patients might include those with short duration of diabetes, type 2 diabetes treated with lifestyle or metformin only, long life expectancy, or no significant cardiovascular disease.
    - A higher goal HbA1C (<8%) may be considered in patients with a history of severe hypoglycemia, limited life expectancy, advanced micro- or macrovascular complications, extensive comorbid conditions, or those with long- standing diabetes who are unable to attain the standard goal despite diabetes self-management education (DSME), SMBG, and effective doses of multiple glucose-lowering agents.

Treatment

NON-PHARMACOLOGIC THERAPY

- Patients with diabetes should receive effective Diabetes Self-Management Education (DSME) upon diagnosis, annually, when new complicating factors occur, and when there are transitions in care and as needed thereafter.

- Patients with diabetes should receive individualized Medical Nutrition Therapy (MNT) from a registered dietician who is knowledgeable and skilled at providing diabetes specific MNT.

- Weight loss and at least 150 minutes/week of moderate-intensity (50-70% of maximum heart rate) aerobic exercise, spread over at least 3 days/week should be encouraged.
    - Patients receiving insulin or insulin secretagogue therapy should ingest additional carbohydrates prior to exercise if their pre-exercise glucose levels are <100mg/dL to avoid hypoglycemia.

- Immunizations
    - All diabetic patients ≥6 months of age should receive an annual influenza vaccine.
    - All diabetic patients ≥2 years of age should receive the pneumococcal polysaccharide vaccine (PPSV23) at least 8 weeks apart from most recent dose of 13- valent pneumococcal conjugate vaccine (PCV13).
    - Adults with diabetes who are >65 years of age, if previously vaccinated with PPSV23 before age 65, should receive a follow-up dose of PCV13, and then PPSV23 at least 1 year after with at least 5 years from most recent dose PPSV23.
    - Administer tetanus, diphtheria, pertussis (Tdap) vaccination one time as an adult with diabetes.
    - Administer the 3-dose series of hepatitis B vaccination to unvaccinated adults with diabetes.

- Bariatric surgery may be considered for diabetic patients with a BMI ≥ 35 kg/m2, who are unable to achieve proper glycemic control through lifestyle modification and pharmacologic therapy.

PHARMACOLOGIC THERAPY

Drug Class	Place in Therapy	Precautions
Non-Insulin Agents		
Metformin (Glucophage®)	Metformin (Glucophage®) Type 1: Adding metformin to insulin therapy may reduce insulin requirements thereby reducing weight gain/risk of hypoglycemia seen with insulin. May reduce risk of cardiovascular events Type 2: Recommended first-line for all patients if not contraindicated and if tolerated. Consider dual therapy if HbA1c ≥ 9.0% Consider initiating with insulin therapy if HbA1c ≥ 10% or if BG ≥ 300 mg/dL, uncontrolled with three-drug combination	SE: nausea, diarrhea, flatulence, potential vitamin B12 deficiency Contraindicated in GFR < 30 mL/min/1.73m2 Caution in hepatic dysfunction due to risk for lactic acidosis

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Drug Class	Place in Therapy	Precautions
GLP-1 agonists • Exenatide (Byetta®, Bydureon®) • Delaglutide (Trulicity®) • Liraglutide (Victoza®)	Type 1: not FDA-approved Type 2: High efficacy Additional weight loss benefit Additional ASCVD risk benefit with Victoza DO NOT use concurrently with DPP-4 inhibitors	SE: nausea, vomiting, loss of appetite, weight loss Risk with acute pancreatitis, caution with history of pancreatitis
DPP-4 inhibitors • Sitagliptin (Januvia®) • Saxaglyptin (Onglyza®) • Linagliptin (Tradjenta®) • Alogliptin (Nesina®) Combination product: sitagliptin/ metformin (Janumet®)	Type 1: not FDA-approved Type 2: Moderate efficacy No renal adjustment required for Tradjenta DO NOT use concurrently with GLP-1 agonists	SE: flu-like symptoms, headache, GI upset, risk with pancreatitis Risk with acute pancreatitis, caution with history of pancreatitis
SGLT-2 inhibitors • Canagliflozin (Invokana®) • Daptogliflozin (Farxiga®) • Empagliflozin (Jardiance®)	Type 1: not FDA-approved Type 2: Moderate efficacy Additional cardiovascular benefit (ASCVD risk and CHF) with Invokana and Jardiance	SE: hypoglycemia, modest weight loss, risk of urinary tract infection
Sulfonylureas (second generation) • Glipizide (Glucotrol®) • Glimepiride (Amaryl®)	Type 1: not FDA-approved Type 2: High efficacy Add if not at high risk for hypoglycemia May cause weight gain	SE: significant hypoglycemia, weight gain, nausea
Thiazolidinediones • Pioglitazone (Actos®) • Rosiglitazone (Avandia®)	Type 1: not FDA-approved Type 2: High efficacy May increase risk in CHF due to edema May cause weight gain	SE: hepatotoxicity, edema, fractures, nausea, weight gain, vomiting, abdominal pain, fatigue, dark urine

Drug Class	Place in Therapy	Precautions
Insulin		
Long-acting insulin • Glargine (Basaglar®, Lantus®, Toujeo®) • Detemir (Levemir®) • Degludec (Tresiba®)	Type 1: Mainstay of treatment (if not using insulin pump for continuous SQ infusion). Type 2: Consider initiating if HbA1c ≥ 10% or if BG ≥ 300 mg/dL, uncontrolled with three-drug combination. Continue metformin and GLP-1, but discontinue other oral agents upon initiation.	SE: hypoglycemia, weight gain, hypokalemia
Rapid-acting insulin • Lispro (Humalog®, Admelog®) • Aspart (Novolog®, Fiasp® [ultrarapid]) • Glulisine (Apidra®) Short-acting analogs • Human Regular	Type 1: Inject 15 mins prior to or within 20 mins of meal. Fiasp may be injected immediately before consuming a meal. May use as monotherapy in continuous SQ infusion (except Fiasp). Insulin analogs often used to minimize hypoglycemia Type 2: Consider initiating with insulin therapy if HbA1c ≥ 10% or if BG ≥ 300 mg/dL, uncontrolled with three-drug combination, uncontrolled on long-acting basal alone. Continue metformin but discontinue all other non-insulin agents. Start if uncontrolled on long-acting basal insulin (consider decreasing dose of basal upon initiation [50/50 or 70/30 basal-bolus regimen]). Inject 15 mins prior to or within 20 mins of meal. Fiasp may be injected immediately before consuming a meal.	

*Intermediate acting (Human NPH) may be used in place of long-acting insulin, but has higher risk of nocturnal hypoglycemia.
*premixed insulin products include both basal and prandial components and are more cost-effective, but their pharmacodynamic profiles make them less optimal

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MANAGEMENT OF HYPOGLYCEMIA

- Symptom: fatigue, dizziness, shakiness, irritability, confusion, tachycardia, hunger
- If patient is conscious and exhibiting signs or symptoms of hypoglycemia
    - Test plasma blood glucose
        - If plasma blood glucose ≤ 70mg/dL, treat with 10-15 g of oral glucose tablets or fast-acting carbohydrate.
        - If plasma blood glucose ≤ 50 mg/dL, treat with 20-30 g of oral glucose tablets or fast-acting carbohydrate.
        - If plasma glucose level still indicates hypoglycemia 15 minutes after treatment, repeat treatment.
    - Once plasma glucose normalizes, patient should consume a meal or snack to prevent recurrent hypoglycemia.

- If patient is unconscious
    - Administer glucagon. Glucagon rescue kits should be prescribed to all patients with diabetes at high risk for developing hypoglycemia.
    - Symptoms should resolve within 10-15 mins. Follow-up with 10-15 g of oral glucose.
    - If patient not conscious within 10 min, repeat glucagon injection and call for emergency help.
    - Test ketones if available.

MONITORING

- Nephropathy
    - Monitor urine albumin and estimated glomerular filtration rate at least once a year for all patients with type 2 diabetes and in all patients with comorbid hypertension.
    - Patients with type 1 diabetes with a ≥5-year duration should also be assessed at least once a year.

- Retinopathy
    - Patients with type 1 diabetes should be seen by an ophthalmologist or optometrist within 5 years after the onset of diagnosis for an initial dilated and comprehensive eye exam.
    - Patients with type 2 diabetes should be seen by an ophthalmologist or optometrist at the onset of the diagnosis for an initial dilated and comprehensive eye exam.

- Neuropathy
    - All patients with type 2 diabetes and type 1 diabetes with a ≥5-year duration should also be assessed for diabetic peripheral neuropathy.
    - A comprehensive foot evaluation should be performed at least once annually to identify risk factors for ulcers and amputations.

References

American Diabetes Association. 2. Classification and diagnosis of diabetes: Standards of Medical Care in Diabetes—2018. Diabetes Care 2018;41(Suppl. 1): S13–S27 © 2017 by the American Diabetes Association.

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