Type 2 Diabetes Management Clinical Guideline

Document Number: CPG-2024-005 **Effective Date:** January 1, 2024 **Last Revised:** January 1, 2024 **Department:** Clinical Quality / Endocrinology / Primary Care **Approved By:** Chief Medical Officer, Clinical Quality Committee **Review Cycle:** Annual **Evidence Base:** American Diabetes Association Standards of Medical Care in Diabetes (2024)

I. PURPOSE AND SCOPE

A. Purpose

This clinical practice guideline provides comprehensive,evidence-based recommendations for screening, diagnosing, and managing type 2 diabetes mellitus in adults. The objectives are to:

1. Standardize diabetes care across our healthcare system to improve patient outcomes
2. Achieve glycemic control targets while minimizing hypoglycemia and other adverse effects
3. Reduce the risk of microvascular complications (retinopathy, nephropathy, neuropathy)
4. Reduce the risk of macrovascular complications (heart disease, stroke, peripheral artery disease)
5. Integrate evidence-based use of newer diabetes medications with proven cardiovascular and renal benefits
6. Emphasize patient-centered care with shared decision-making
7. Support quality improvement and accreditation requirements (HEDIS, NCQA Diabetes Recognition Program)

B. Scope

Applies to:

- All adult patients (≥18 years) with type 2 diabetes or at risk for diabetes
- All physicians, nurse practitioners, physician assistants, clinical pharmacists, and diabetes educators involved in diabetes care
- Primary care, endocrinology, cardiology, nephrology, and other specialties managing diabetic patients

Does NOT cover:

- Type 1 diabetes (separate guideline)
- Gestational diabetes (see obstetric protocols)
- Pediatric diabetes (separate pediatric guidelines)
- Diabetic ketoacidosis or hyperosmolar hyperglycemic state (acute care protocols)

II. SCREENING AND DIAGNOSIS

A. Screening Recommendations

Who Should Be Screened:

1. **All adults ≥35 years:** Screen every 3 years regardless of risk factors (recent update from age 45 to 35 per ADA 2024)
2. **Adults <35 years with risk factors:**
   Screen earlier and more frequently if:
   - Overweight or obese (BMI ≥25 kg/m², or ≥23 kg/m² in Asian Americans) PLUS one or more of the following:
     - First-degree relative with diabetes
     - High-risk race/ethnicity (African American, Latino, Native American, Asian American, Pacific Islander)
     - History of gestational diabetes mellitus (GDM)
     - Hypertension (≥140/90 mmHg or on therapy)
     - HDL cholesterol <35 mg/dL and/or triglycerides >250 mg/dL
     - Polycystic ovary syndrome (PCOS)
     - Physical inactivity
     - Other conditions associated with insulin resistance (severe obesity, acanthosis nigricans)
     - History of cardiovascular disease

3. **Women with history of GDM:** Screen every 1-3 years for life
4. **Prediabetes:** If screening shows prediabetes, retest annually

Screening Tests:

- **Hemoglobin A1c (HbA1c)** – preferred for convenience (non-fasting, reflects average glucose over 2-3 months)
- **Fasting plasma glucose (FPG)** – requires 8-hour fast
- **2-hour 75-g oral glucose tolerance test (OGTT)** – less commonly used for screening due to inconvenience, but most sensitive

B. Diagnostic Criteria

A diagnosis of **diabetes mellitus** is made if ANY of the following criteria are met (on two separate tests, or the same test repeated on a different day, unless the patient has classic symptoms of hyperglycemia):

Test	Diabetes	Prediabetes	Normal
Hemoglobin A1c	≥6.5%	5.7–6.4%	<5.7%
Fasting Plasma Glucose	≥126 mg/dL	100–125 mg/dL	<100 mg/dL
2-hour Plasma Glucose (OGTT)	≥200 mg/dL	140–199 mg/dL	<140 mg/dL
Random Plasma Glucose	≥200 mg/dL with symptoms*	–	–

*Classic symptoms: Polyuria (excessive urination), polydipsia (excessive thirst), unexplained weight loss, blurred vision

Confirmatory Testing:

- If an asymptomatic patient has one elevated test, repeat the same test or perform a different test on a separate day to confirm
- If the patient has classic symptoms AND random glucose ≥200 mg/dL, diagnosis is confirmed without repeat testing
- Discordant results (e.g., A1c in diabetic range but FPG in prediabetes range): Repeat the test that was in the diabetic range; if still elevated, diagnose diabetes

Considerations for A1c Testing:

- A1c may be less accurate in certain conditions: hemoglobinopathies (sickle cell disease), anemia, recent blood transfusion, severe kidney disease, pregnancy
- In such cases, use glucose-based tests (FPG or OGTT) instead

C. Prediabetes Management

Definition: Intermediate hyperglycemia not yet meeting diabetes criteria (A1c 5.7–6.4%, FPG 100–125 mg/dL, or 2-hr OGTT 140–199 mg/dL)

Risk: ~5-10% per year progress to diabetes; increased risk of CVD

Management:

1. **Lifestyle Intervention (First-line):**

- Goal: Achieve ≥7% body weight loss through reduced calorie intake and increased physical activity
- Refer to Diabetes Prevention Program (DPP) or similar structured lifestyle program (if available)
- Evidence: DPP showed 58% reduction in progression to diabetes with intensive lifestyle intervention

2. **Metformin:**

- Consider metformin for prediabetes prevention, especially in patients with:
  - BMI ≥35 kg/m²
  - Age <60 years
  - History of gestational diabetes

- Dose: Metformin 850 mg twice daily or 1000 mg twice daily (as tolerated)
- Evidence: Reduced diabetes incidence by 31% in DPP trial

3. **Annual Monitoring:**

- Recheck A1c or FPG annually to detect progression to diabetes
- Reinforce lifestyle measures at each visit

III. GLYCEMIC TARGETS

A. General A1c Goal

For most non-pregnant adults with type 2 diabetes: A1c <7.0%

Rationale:

- A1c <7% has been shown to reduce microvascular complications (retinopathy, nephropathy, neuropathy) by ~25-40%
- Macrovascular benefit is less robust but present, especially with long-term control from early in disease

A1c and Average Glucose Correlation:

- A1c 7% ≈ average glucose ~154 mg/dL
- A1c 8% ≈ average glucose ~183 mg/dL
- A1c 6% ≈ average glucose ~126 mg/dL

B. Individualized A1c Targets

A1c goals should be **individualized** based on patient factors:

Patient Characteristics	Reasonable A1c Goal
Younger, newly diagnosed, no CVD, long life expectancy, motivated	<6.5% or even <6.0% (if achieved without hypoglycemia or

	burdensome treatment)
Typical patient, established diabetes, willing/able to do intensive management	<7.0%
History of severe hypoglycemia, limited life expectancy, advanced complications, extensive comorbidities, long-standing diabetes with difficulty reaching goal	<8.0% (or even less stringent)

Considerations for Stricter Goals (<6.5%):

- Short disease duration
- Long life expectancy (>15 years)
- No significant CVD
- Patient motivated and able to achieve with lifestyle and/or metformin without hypoglycemia

Considerations for Less Strict Goals (<8% or <8.5%):

- History of severe hypoglycemia
- Hypoglycemia unawareness
- Advanced microvascular or macrovascular complications
- Multiple comorbid conditions
- Limited life expectancy (<5-10 years)
- Long-standing diabetes that is difficult to control despite multiple medications
- Patient preference and resources

Reassessment: Goals should be reassessed regularly as patient circumstances change (e.g., development of complications, changes in health status).

C. Glucose Monitoring Targets

Self-Monitoring of Blood Glucose (SMBG): For patients on insulin or sulfonylureas (medications causing hypoglycemia), recommend regular SMBG to detect and prevent hypoglycemia.

Recommended preprandial (before meals) and bedtime glucose targets:

- **Preprandial (fasting and before meals):** 80-130 mg/dL
- **Postprandial (1-2 hours after start of meal):** <180 mg/dL

For patients NOT on hypoglycemia-causing medications:

- SMBG is less critical but can still be useful to understand how food, activity, and medications affect glucose
- Frequency individualized (e.g., periodic checks, or when feeling symptoms)

Continuous Glucose Monitoring (CGM):

- Increasingly used in type 2 diabetes, especially for patients on intensive insulin regimens
- Provides real-time glucose data and trend arrows
- "Time in range" (TIR) is a newer metric: Goal is >70% of time with glucose 70-180 mg/dL
- May improve A1c and reduce hypoglycemia in motivated patients willing to use the technology

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IV. LIFESTYLE MANAGEMENT

Lifestyle modification is the foundation of type 2 diabetes management and should be emphasized at every visit.

A. Medical Nutrition Therapy (MNT)

Recommendation: All patients with diabetes should receive individualized MNT, preferably from a registered dietitian nutritionist (RDN) experienced in diabetes care.

Goals:

- Achieve and maintain a healthy body weight
- Attain individualized glycemic, blood pressure, and lipid goals
- Delay or prevent complications

No Single "Diabetes Diet": Multiple eating patterns are acceptable (Mediterranean, low-carb, plant-based, DASH). Emphasis is on:

- Whole, minimally processed foods
- Non-starchy vegetables (fill half the plate)
- Whole grains over refined grains
- Lean proteins (fish, poultry, beans, nuts)
- Healthy fats (olive oil, avocado, nuts)
- Limit added sugars and refined carbohydrates
- Portion control

Carbohydrate Management:

- Carbohydrate intake is the primary factor affecting postprandial glucose
- Educate on carbohydrate counting, use of glycemic index, or plate method (¼ plate protein, ¼ plate starch, ½ plate non-starchy vegetables)
- Avoid sugar-sweetened beverages (soda, juice, sweet tea, energy drinks)

Specific Recommendations:

- **Mediterranean Diet:** Emphasize olive oil, nuts, fish, fruits, vegetables; associated with improved glycemic control and CV outcomes
- **Low-Carbohydrate Diets:** Can be effective for weight loss and glycemic control; typically 50-130 g carbs/day (or even lower in ketogenic diets). Monitor lipids and renal function if very low carb.
- **Plant-Based Diets:** High in fiber, low in saturated fat; beneficial for diabetes and CV health

Referral: Refer all newly diagnosed diabetic patients to an RDN for MNT. Also refer when A1c is not at goal or patient has questions about diet.

B. Weight Management

Goal: Achieve 5-10% weight loss (or more if needed to reach healthy BMI).

Impact: Even modest weight loss (5-7% of body weight) significantly improves glycemic control, blood pressure, and lipids.

Strategies:

- Reduced calorie intake (500-750 kcal/day deficit)
- Increased physical activity
- Behavioral therapy and support (individual or group counseling, apps, weight management programs)

Pharmacotherapy for Weight Loss: For patients with BMI ≥27 and not achieving weight loss with lifestyle alone, consider:

- **GLP-1 receptor agonists** (semaglutide, liraglutide) – dual benefit of glucose lowering and weight loss
- **Orlistat, phentermine-topiramate, naltrexone-bupropion** – FDA-approved weight loss medications (discuss risks/benefits)

Bariatric Surgery: For patients with type 2 diabetes and:

- BMI ≥40 kg/m², OR
- BMI ≥35 kg/m² with obesity-related comorbidities, especially if diabetes is difficult to control with medications

Benefits: Bariatric surgery (gastric bypass, sleeve gastrectomy) can lead to remission or significant improvement in diabetes in many patients, along with weight loss and improvement in

other comorbidities. Consider referral to bariatric surgery program for evaluation.

C. Physical Activity

Recommendation:

- **Aerobic Exercise:** At least 150 minutes per week of moderate-intensity activity (such as brisk walking, cycling, swimming), spread over at least 3 days per week with no more than 2 consecutive days without activity
- **Resistance Training:** 2-3 sessions per week on non-consecutive days (improves insulin sensitivity and glycemic control)
- **Reduce Sedentary Time:** Encourage patients to break up prolonged sitting (stand/walk for a few minutes every 30 minutes)

Benefits:

- Improves insulin sensitivity
- Lowers blood glucose
- Aids weight loss/maintenance
- Reduces cardiovascular risk
- Improves mood and well-being

Safety Considerations:

- Screen for cardiovascular disease (patients with known CVD or multiple risk factors may need stress test before initiating vigorous exercise)
- Advise patients on insulin or sulfonylureas to monitor blood glucose and carry fast-acting carbs to treat hypoglycemia during/after exercise
- Assess for diabetic complications (retinopathy, peripheral neuropathy, foot ulcers) which may influence exercise recommendations

D. Smoking Cessation

Recommendation: All patients who smoke should be advised to quit smoking at every visit and offered cessation assistance.

Resources:

- Behavioral counseling (individual or group)
- Nicotine replacement therapy (patch, gum, lozenge)
- Prescription medications (varenicline, bupropion)
- Referral to tobacco quitline or cessation program

Rationale: Smoking dramatically increases cardiovascular risk in diabetes. Smoking cessation is

one of the most impactful interventions for reducing complications.

E. Diabetes Self-Management Education and Support (DSMES)

Recommendation: All patients with diabetes should participate in DSMES at diagnosis and as needed thereafter.

DSMES Programs:

- Accredited by ADA or AADE (Association of Diabetes Care & Education Specialists)
- Led by certified diabetes care and education specialists (CDCES)
- Cover topics: nutrition, physical activity, medications, glucose monitoring, problem-solving, coping skills, reducing complications

Benefits: Patients who complete DSMES have better A1c, improved self-care behaviors, better quality of life, and lower healthcare costs.

Access: Refer patients to our hospital's DSMES program or community-based programs. Most insurance plans cover DSMES (Medicare covers up to 10 hours of initial training and 2 hours annually ongoing).

V. PHARMACOLOGIC THERAPY

A. General Approach

Treatment Algorithm:

1. At diagnosis, initiate **metformin** (unless contraindicated) along with lifestyle modifications
2. If A1c not at goal after ~3 months, add a second agent
3. Continue to intensify therapy (adding agents) every 3 months until A1c goal is achieved
4. Choice of add-on agents is guided by patient-specific factors: presence of ASCVD, heart failure, CKD, risk of hypoglycemia, weight concerns, cost, patient preference

Patient-Centered Approach: Engage patients in shared decision-making; discuss medication benefits, risks, cost, and route of administration (oral vs. injectable).

B. Metformin (First-Line Agent)

Mechanism: Decreases hepatic glucose production, improves insulin sensitivity

Efficacy: Lowers A1c by ~1-1.5%

Benefits:

- Effective and inexpensive (available as generic)
- Weight-neutral or modest weight loss
- Does NOT cause hypoglycemia (when used alone)
- Long-term safety data
- Possible cardiovascular benefits (UK Prospective Diabetes Study showed reduced MI in metformin group)

Dosing:

- **Starting dose:** 500 mg once or twice daily with meals (or 850 mg once daily)
- **Titration:** Increase by 500 mg every 1-2 weeks as tolerated
- **Target dose:** 2000 mg/day (divided BID, e.g., 1000 mg twice daily) – maximum effective dose is ~2000-2550 mg/day

Extended-release (XR) formulation: May have fewer GI side effects; dosed once daily

Side Effects:

- **GI upset:** Nausea, diarrhea, abdominal discomfort (most common; ~30% of patients) – usually transient; minimized by starting low, titrating slowly, and taking with food
- **Vitamin B12 deficiency:** Long-term use can reduce B12 absorption; check B12 level periodically (every 2-3 years), supplement if needed
- **Lactic acidosis (rare):** Risk in patients with severe renal impairment, liver disease, hypoxia, or acute illness

Contraindications/Cautions:

- **eGFR <30 mL/min/1.73m²:** Discontinue metformin (risk of lactic acidosis)
- **eGFR 30-45:** Use with caution, consider dose reduction
- **eGFR ≥45:** Safe to use
- Temporarily hold metformin before procedures with IV contrast (restart 48 hours after if renal function stable)
- Avoid in acute illness with risk of renal impairment (severe infection, dehydration, shock)

Monitoring: Check renal function (serum creatinine, eGFR) at baseline and at least annually.

C. When to Add a Second Agent

If A1c remains above goal after 3 months on metformin + lifestyle: Add a second agent. Choice depends on patient-specific factors.

D. Second-Line and Add-On Agents

The choice of second agent should be individualized:

1. GLP-1 Receptor Agonists (GLP-1 RAs)

Examples:

- **Semaglutide** (Ozempic 0.5-2 mg SQ weekly, or Rybelsus 7-14 mg oral daily)
- **Dulaglutide** (Trulicity 0.75-4.5 mg SQ weekly)
- **Liraglutide** (Victoza 1.2-1.8 mg SQ daily)
- **Exenatide extended-release** (Bydureon 2 mg SQ weekly)

Mechanism: Mimic incretin hormone GLP-1; stimulate insulin secretion (glucose-dependent), suppress glucagon, slow gastric emptying, reduce appetite

Efficacy: Lower A1c by 1-1.5% (semaglutide up to 1.5-2%)

Benefits:

- **Weight loss** (average 3-5 kg, semaglutide can achieve 6-10 kg)
- **Cardiovascular benefit:** Several GLP-1 RAs (liraglutide, semaglutide, dulaglutide) have shown reduction in major cardiovascular events (MI, stroke, CV death) in CVD outcome trials
- **No hypoglycemia** (when used without insulin or sulfonylureas)

Side Effects:

- **GI:** Nausea, vomiting, diarrhea (common, especially when initiating; usually improve over weeks)
- **Pancreatitis (rare):** Avoid in patients with history of pancreatitis
- **Thyroid C-cell tumors (in rodents):** Contraindicated if personal or family history of medullary thyroid cancer or MEN 2 syndrome

Route: Mostly injectable (once-weekly preferred for convenience); semaglutide also available as oral (Rybelsus)

Cost: Expensive (branded); may require prior authorization

Indication:

- **Preferred second agent** if patient has established atherosclerotic CVD (prior MI, stroke, PAD) or high CV risk
- **Also preferred** if weight loss is a goal

2. SGLT2 Inhibitors (Sodium-Glucose Co-Transporter 2 Inhibitors)

Examples:

- **Empagliflozin** (Jardiance 10-25 mg daily)
- **Canagliflozin** (Invokana 100-300 mg daily)
- **Dapagliflozin** (Farxiga 5-10 mg daily)
- **Ertugliflozin** (Steglatro 5-15 mg daily)

Mechanism: Block glucose reabsorption in the kidney, causing glucose excretion in urine (lowers blood glucose independent of insulin)

Efficacy: Lower A1c by 0.5-1%

Benefits:

- **Weight loss** (2-3 kg on average)
- **Blood pressure reduction** (modest, ~3-5 mmHg SBP due to mild diuretic effect)
- **Cardiovascular benefit:** Empagliflozin, canagliflozin, and dapagliflozin have shown reduction in CV death and heart failure hospitalization in outcome trials
- **Renal protection:** Slow progression of chronic kidney disease (especially canagliflozin and dapagliflozin approved for CKD treatment)
- **No hypoglycemia**

Side Effects:

- **Genital mycotic infections** (yeast infections) – common (~10%), more in women; treat with antifungal
- **Urinary tract infections** (mild increase)
- **Dehydration/Orthostatic hypotension** (due to diuretic effect)
- **Diabetic ketoacidosis (rare):** "Euglycemic DKA" (ketoacidosis with relatively normal glucose); risk factors include very low carb diet, prolonged fasting, acute illness, surgery. Educate patients; discontinue if acutely ill.
- **Fournier's gangrene (very rare):** Necrotizing fasciitis of perineum; seek immediate care if perineal pain/swelling

Contraindications/Cautions:

- **eGFR <30** (or <45 for some agents): Not effective; do not initiate. (May continue if already on and eGFR drops, for CV/renal benefit even if glucose-lowering effect is diminished)
- Not for type 1 diabetes (risk of DKA)

Indication:

- **Preferred second agent** if patient has heart failure (especially HFrEF) or CKD (eGFR 20-60 with albuminuria)
- **Also preferred** if weight loss and BP reduction are goals
- **Also preferred** if patient has established ASCVD (alternative or in combination with GLP-1 RA)

3. DPP-4 Inhibitors (Dipeptidyl Peptidase-4 Inhibitors)

Examples:

- **Sitagliptin** (Januvia 100 mg daily, dose-adjust for renal impairment)
- **Linagliptin** (Tradjenta 5 mg daily)
- **Saxagliptin** (Onglyza 2.5-5 mg daily)
- **Alogliptin** (Nesina 25 mg daily)

Mechanism: Inhibit DPP-4 enzyme, increasing levels of incretin hormones (GLP-1 and GIP), which stimulate insulin and suppress glucagon

Efficacy: Lower A1c by 0.5-0.8% (modest)

Benefits:

- **Weight-neutral**
- **No hypoglycemia**
- **Well-tolerated** (few side effects)
- **Oral**

Side Effects:

- Generally well-tolerated
- Possible increased risk of heart failure hospitalization with saxagliptin (not seen with other DPP-4i)
- Pancreatitis (rare)
- Joint pain (rare)

Indication:

- Reasonable second or third agent if patient cannot tolerate or afford GLP-1 RA or SGLT2i
- Useful in elderly or frail patients (no hypoglycemia, easy to use)

Limitation: Modest A1c reduction; no proven CV or renal benefit.

4. Thiazolidinediones (TZDs) - Pioglitazone

Example: Pioglitazone (Actos 15-45 mg daily)

Mechanism: Improve insulin sensitivity (activate PPAR-gamma in adipose tissue and muscle)

Efficacy: Lower A1c by 0.5-1.4%

Benefits:

- **No hypoglycemia**
- Durable glucose-lowering effect
- May reduce CV events (PROACTIVE trial showed reduction in secondary endpoint of MI/ stroke)

Side Effects:

- **Weight gain** (2-4 kg, due to fluid retention and adipose expansion) – significant drawback
- **Edema/Heart failure:** Causes fluid retention; contraindicated in NYHA Class III-IV heart failure
- **Bone fractures:** Increased risk in women (possibly due to effects on bone metabolism)
- **Bladder cancer:** Possible association (controversial; avoid if history of bladder cancer)

Contraindications: Heart failure, bladder cancer

Indication:

- Third-line agent (due to side effects), may use if cost is a major concern (generic, inexpensive)
- Can be useful for very insulin-resistant patients

Note: Rosiglitazone (Avandia) is another TZD but less commonly used due to CV safety concerns.

5. Sulfonylureas

Examples:

- **Glipizide** (5-20 mg daily or BID)
- **Glyburide** (1.25-10 mg daily or BID) – generally avoided in elderly due to long half-life and hypoglycemia risk
- **Glimepiride** (1-8 mg daily)

Mechanism: Stimulate insulin secretion from pancreatic beta cells

Efficacy: Lower A1c by 1-1.5%

Benefits:

- Effective
- **Inexpensive** (generic)
- Oral, once or twice daily

Side Effects:

- **Hypoglycemia** (significant risk, especially in elderly, with renal impairment, or if meals skipped)
- **Weight gain** (1-2 kg)
- May accelerate beta-cell decline (theoretical concern, not definitively proven)

Indication:

- May consider as second or third agent if cost is a major barrier and patient can manage hypoglycemia risk
- **Generally not preferred** due to hypoglycemia and weight gain, especially when safer alternatives available

6. Insulin Therapy

Indications for Insulin:

- A1c ≥10% at diagnosis (consider dual therapy or insulin)
- Markedly symptomatic hyperglycemia (polyuria, polydipsia, weight loss, possible ketones) – start insulin immediately
- After progression of disease: when other agents are insufficient to achieve glycemic control
- Type 2 diabetes with beta-cell failure (many patients eventually need insulin)

Types of Insulin:

Basal Insulin (Long-acting):

- **Glargine (Lantus, Basaglar):** Once daily, ~24-hour duration
- **Detemir (Levemir):** Once or twice daily
- **Degludec (Tresiba):** Once daily, ultra-long (>42 hours)
- Provide steady background insulin to control fasting glucose

Prandial/Bolus Insulin (Rapid-acting):

- **Lispro (Humalog), Aspart (Novolog), Glulisine (Apidra):** Injected before meals to cover postprandial glucose
- Allow for flexible dosing based on carb intake

Premixed Insulin:

- Combinations of basal and prandial (e.g., 70/30 insulin: 70% NPH, 30% regular)
- Convenient but less flexible

Starting Insulin:

- **Basal insulin** is typically started first (add to oral agents)
- **Starting dose:** 10 units once daily (or 0.1-0.2 units/kg)
- Titrate every 3-7 days based on fasting glucose (goal fasting glucose 80-130 mg/dL)
- Increase by 2 units if fasting glucose >130; decrease if <70 or hypoglycemia

If basal insulin alone is insufficient:

- Add prandial insulin (basal-bolus regimen) before the largest meal initially, then before other meals as needed
- OR switch to premixed insulin twice daily

Insulin Pump: Continuous subcutaneous insulin infusion; mostly used in type 1 diabetes but can be used in type 2 if needed

Side Effects:

- **Hypoglycemia** – educate patients on recognition and treatment (15 g fast-acting carbs)
- **Weight gain**
- Injection site reactions

Patient Education:

- Insulin injection technique
- Timing of doses
- Blood glucose monitoring (essential when on insulin)

- Hypoglycemia prevention and treatment
- Sick day management

VI. MEDICATION SELECTION BASED ON PATIENT FACTORS

Algorithm for Add-On Therapy (after metformin):

If Patient Has Established ASCVD (Atherosclerotic Cardiovascular Disease):

Preferred: GLP-1 RA with proven CV benefit (liraglutide, semaglutide, dulaglutide) **Alternative/ Additional:** SGLT2i with proven CV benefit (empagliflozin, canagliflozin)

If Patient Has Heart Failure (especially HFrEF):

Preferred: SGLT2i (empagliflozin, dapagliflozin, canagliflozin)

If Patient Has Chronic Kidney Disease (eGFR <60 or UACR ≥30):

Preferred: SGLT2i (if eGFR ≥20) – renal protective, slows CKD progression **Alternative:** GLP-1 RA (if SGLT2i contraindicated)

If Primary Goal is Weight Loss:

Preferred: GLP-1 RA (especially high-dose semaglutide) or SGLT2i

If Primary Concern is Hypoglycemia Risk (elderly, lives alone, prior severe hypoglycemia):

Avoid: Sulfonylureas, insulin (if possible) **Preferred:** DPP-4i, GLP-1 RA, SGLT2i (no hypoglycemia risk)

If Cost is Major Concern:

Consider: Sulfonylurea (generic, cheap) or TZD (pioglitazone, generic) – but discuss side effects
Metformin is already inexpensive

If Patient Prefers Oral Medication:

Options: DPP-4i, SGLT2i, pioglitazone, sulfonylurea, oral semaglutide (Rybelsus)

VII. MONITORING AND FOLLOW-UP

A. A1c Monitoring

Frequency:

- **Every 3 months** if not at goal or if therapy has been changed
- **Every 6 months** if at goal and stable

Action:

- If A1c not at goal after 3 months on a new medication, intensify therapy (increase dose or add another agent)

B. Self-Monitoring of Blood Glucose (SMBG)

Who Should Do SMBG:

- **All patients on insulin** (dose adjustments based on glucose)
- **Patients on sulfonylureas or other medications causing hypoglycemia** (to detect low glucose)
- **Any patient wanting to understand impact of food, activity, and medications**

Frequency (Individualized):

- Patients on multiple daily insulin injections: Before meals and bedtime (3-4 times/day or more)
- Patients on basal insulin only: Fasting glucose daily (to guide titration)
- Patients NOT on hypoglycemia-causing agents: Less frequent (e.g., periodic checks, or when

symptomatic)

Target Ranges (as noted earlier):

- Preprandial: 80-130 mg/dL
- Postprandial: <180 mg/dL

Education: Teach proper technique, meter use, logging, and when to call provider

C. Continuous Glucose Monitoring (CGM)

Indications:

- Patients on intensive insulin therapy (especially multiple daily injections or pump)
- Patients with hypoglycemia unawareness or frequent hypoglycemia
- Patients with highly variable glucose

CGM Metrics:

- **Time in Range (TIR):** % of time glucose is 70-180 mg/dL (Goal >70%)
- **Time below range:** <70 mg/dL (Goal <4%) and <54 mg/dL (Goal <1%)
- **Time above range:** >180 mg/dL (Goal <25%)
- **Glucose Management Indicator (GMI):** Estimated A1c based on CGM data

Our Practice: Increasingly prescribing CGM for motivated patients on insulin; improves glycemic control and patient satisfaction.

D. Laboratory Monitoring

Baseline (at diagnosis):

- A1c, fasting glucose
- Lipid panel (total cholesterol, LDL, HDL, triglycerides)
- Liver function tests (AST, ALT)
- Serum creatinine and eGFR
- Urinalysis, urine albumin-to-creatinine ratio (UACR)
- Vitamin B12 (if on metformin >1 year)
- TSH (if symptoms of thyroid disease)

Ongoing (annual or per medication):

- A1c every 3-6 months as above

- **Annual:**
  - Lipid panel (if on statin, may be less frequent once stable)
  - Serum creatinine, eGFR
  - Urine albumin-to-creatinine ratio (to screen for diabetic nephropathy)
  - Liver function (if on thiazolidinediones or as indicated)
  - Vitamin B12 (if on metformin long-term)
- **As needed:** Electrolytes if on diuretics or medications affecting potassium

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VIII. MANAGEMENT OF CARDIOVASCULAR RISK FACTORS

Diabetes is a major cardiovascular risk factor. Managing BP, lipids, and aspirin use is as important as glycemic control.

A. Blood Pressure Management

Target BP: <130/80 mmHg for most patients with diabetes

Preferred Medications:

- **ACE inhibitor or ARB** – first-line in diabetic patients with hypertension (renal protective)
- Add CCB or thiazide diuretic if needed for BP control

See Hypertension Management Guideline for details.

B. Lipid Management

Statin Therapy:

Statins significantly reduce cardiovascular events in diabetic patients.

Recommendations:

- **All patients with diabetes aged 40-75 years:** Moderate-intensity statin (e.g., atorvastatin 10-20 mg, rosuvastatin 5-10 mg, simvastatin 20-40 mg)
- **If age 40-75 AND high CV risk (established ASCVD, multiple risk factors, LDL ≥70):** High-

intensity statin (atorvastatin 40-80 mg, rosuvastatin 20-40 mg)
- **Age <40 or >75:** Consider statin if additional CV risk factors or long diabetes duration

LDL Goal:

- General: <100 mg/dL
- If ASCVD: <70 mg/dL (some guidelines say <55 mg/dL for very high risk)

Add-On Therapy (if LDL not at goal on maximally tolerated statin):

- Ezetimibe (Zetia) 10 mg daily – lowers LDL by additional ~20%
- PCSK9 inhibitors (evolocumab, alirocumab) – injectable, expensive, for very high-risk patients

Triglycerides:

- If fasting triglycerides >500 mg/dL, treat to prevent pancreatitis (fibrate or omega-3 fatty acids)
- If TG 200-499 on statin, consider adding icosapent ethyl (Vascepa) – shown to reduce CV events

C. Antiplatelet Therapy (Aspirin)

Aspirin for Primary Prevention:

- **Consider aspirin 75-162 mg daily** in patients with diabetes who are at high CV risk (10-year ASCVD risk >10%, or multiple risk factors) and without contraindications (bleeding risk)
- Shared decision-making (benefits vs. bleeding risk)

Aspirin for Secondary Prevention:

- **Aspirin 75-162 mg daily** recommended for all diabetic patients with known ASCVD (prior MI, stroke, PAD) unless contraindicated

Contraindications: History of GI bleed, allergy to aspirin, high bleeding risk

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IX. SCREENING FOR COMPLICATIONS

Type 2 diabetes can lead to microvascular (retinopathy, nephropathy, neuropathy) and macrovascular (CVD, stroke, PAD) complications. Regular screening allows early detection and intervention.

A. Diabetic Retinopathy

Screening:

- **At diagnosis:** Comprehensive dilated eye exam by an ophthalmologist or optometrist
- **Ongoing:** Annually if no retinopathy; more frequently (every 6 months or sooner) if retinopathy is present

Treatment:

- Optimizing glucose, BP, and lipid control slows progression
- Advanced retinopathy requires laser photocoagulation, anti-VEGF injections, or surgery (refer to retina specialist)

B. Diabetic Nephropathy

Screening:

- **Annual urine albumin-to-creatinine ratio (UACR)** – detects albuminuria (early sign of kidney damage)
- **Annual serum creatinine and eGFR** – assess kidney function

Classification:

- **Normal:** UACR <30 mg/g
- **Moderately increased albuminuria (microalbuminuria):** UACR 30-300 mg/g
- **Severely increased albuminuria (macroalbuminuria):** UACR >300 mg/g
- **CKD stages:** Based on eGFR (Stage 1: eGFR ≥90, Stage 2: 60-89, Stage 3: 30-59, Stage 4: 15-29, Stage 5: <15)

Management:

- If albuminuria or CKD present: Ensure on ACE-I or ARB (renal protective)
- Consider SGLT2i (slows CKD progression)
- Optimize BP (<130/80, or even lower if tolerated) and glucose control
- If eGFR <30, consider referral to nephrology

C. Diabetic Neuropathy

Screening:

- **Annual comprehensive foot exam:** Visual inspection, 10-g monofilament test (to assess protective sensation), vibration sense, ankle reflexes
- Assess for symptoms: Numbness, tingling, burning, pain in feet/legs (distal symmetric polyneuropathy – most common form)

Management:

- Optimize glucose control (slows progression)
- Foot care education (inspect feet daily, proper footwear, avoid walking barefoot, prompt treatment of wounds)
- **Neuropathic pain treatment:**
    - First-line: Pregabalin (Lyrica), gabapentin, duloxetine (Cymbalta), or tricyclic antidepressants (amitriptyline)
    - Topical: Capsaicin cream, lidocaine patches
    - Avoid opioids if possible

Autonomic Neuropathy:

- Can affect GI (gastroparesis), CV (orthostatic hypotension, resting tachycardia), GU (erectile dysfunction, bladder dysfunction)
- Manage symptomatically

D. Cardiovascular Disease

Screening:

- Assess CV risk at every visit (blood pressure, lipids, smoking status, family history)
- ECG at baseline (to detect silent MI or LVH)
- Consider stress test or cardiac imaging if:
    - Symptoms of chest pain, dyspnea
    - Abnormal ECG
    - PAD or carotid artery disease
    - 10 years diabetes duration and planning to start vigorous exercise

E. Peripheral Artery Disease (PAD)

Screening:

- Ask about claudication (leg pain with walking)
- Palpate pulses (dorsalis pedis, posterior tibial)
- Ankle-brachial index (ABI) if symptoms or absent pulses

Management:

- Antiplatelet therapy, statin, smoking cessation, exercise, revascularization if severe

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X. SPECIAL SITUATIONS

A. Hospitalized Patients (Inpatient Glycemic Management)

Glycemic Targets (Non-Critically Ill):

- Preprandial glucose: <140 mg/dL
- Random glucose: <180 mg/dL

Critically Ill (ICU):

- Target glucose 140-180 mg/dL (tighter control 110-140 not beneficial and increases hypoglycemia risk)

Preferred Treatment: Insulin (IV insulin infusion in ICU, or subcutaneous basal-bolus regimen on floors)

Transition: Resume outpatient diabetes medications 1-2 days before discharge; adjust insulin as needed

Note: Detailed inpatient diabetes protocol is separate from this guideline.

B. Sick Day Management

Educate Patients:

- **Never stop insulin** (even if not eating much, basal insulin is still needed)
- Monitor blood glucose more frequently (every 4-6 hours)
- Stay hydrated

- Test urine for ketones if glucose >250 mg/dL (especially type 1 or insulin-deficient type 2)
- Adjust insulin doses per provider guidance (may need more insulin during illness)
- **Temporarily hold** metformin and SGLT2 inhibitors during acute illness (risk of lactic acidosis and DKA, respectively; restart after recovery)
- Seek medical attention if unable to keep fluids down, persistent high glucose, ketones, or signs of infection

C. Perioperative Management

Before Elective Surgery:

- A1c <8% preferred (if higher, consider delaying non-urgent surgery to optimize control)
- Hold metformin on day of surgery (restart post-op when eating and renal function stable)
- Hold SGLT2 inhibitors 3 days before surgery (DKA risk)
- Continue basal insulin at reduced dose (typically 75-80% of usual dose)
- Hold prandial insulin and other oral agents on day of surgery

Intraoperative/Postoperative:

- Glucose target 100-180 mg/dL
- Use IV insulin infusion or subcutaneous insulin per anesthesia/surgical protocols

D. Older Adults and Frail Patients

Considerations:

- Less stringent A1c goals (<8% or even <8.5%) to avoid hypoglycemia and treatment burden
- Avoid medications with high hypoglycemia risk (sulfonylureas, insulin if possible, or use cautiously with simplified regimens)
- Simplified regimens (once-daily medications preferred)
- Assess for cognitive impairment, depression, polypharmacy
- Enlist caregiver support as needed

XI. PATIENT EDUCATION AND SUPPORT

A. Diabetes Self-Management Education and Support (DSMES)

Refer all patients to accredited DSMES program:

- At diagnosis
- When not meeting goals
- When complications develop
- When transitions in care occur
- At least annually for ongoing support

Topics Covered:

- Healthy eating, physical activity, medication management, blood glucose monitoring, problem-solving, coping, reducing complications risk

B. Nutrition Counseling

Refer to RDN for individualized MNT (covered earlier).

C. Mental Health and Psychosocial Support

Diabetes Distress:

- Common (affects ~30-40% of patients) – feelings of frustration, burnout, overwhelm related to diabetes management
- Screen routinely (simple question: "How much distress do you feel related to managing your diabetes?")
- Address with empathy, problem-solving, simplifying regimen, DSMES, or referral to mental health professional if needed

Depression:

- ~20-30% of people with diabetes have comorbid depression (higher than general population)
- Screen annually with PHQ-2 or PHQ-9
- Treat depression (antidepressants, psychotherapy); improves both mental health and diabetes self-care

D. Shared Decision-Making

Engage patients in all treatment decisions:

- Discuss goals, options, risks/benefits, costs, and patient preferences
- Elicit patient's priorities (avoiding injections? Losing weight? Minimizing hypoglycemia?)
- Build a collaborative care plan

XII. QUALITY METRICS AND PERFORMANCE IMPROVEMENT

A. Key Performance Indicators (Diabetes Quality Measures)

Our organization tracks:

1. **A1c Control (<7% or <8%):**
   % of diabetic patients with A1c <7% (or <8% for less stringent goal patients)
   - National goal: >70% with A1c <8%

2. **A1c Testing:**
   % of diabetic patients who have had an A1c test in past 6 months (or past year)
   - Goal: 100%

3. **Blood Pressure Control (<140/90):**
   % of diabetic patients with BP <140/90
   - Goal: >80%

4. **LDL Control or Statin Use:**
   % of diabetic patients age 40-75 on statin therapy
   - Goal: >90%

5. **Annual Eye Exam:**
   % of diabetic patients who had retinal eye exam in past year
   - Goal: >90%

6. **Annual Kidney Screening:**
   % who had UACR and serum creatinine checked in past year
   - Goal: >90%

7. **Annual Foot Exam:**
   % who had comprehensive foot exam
   - Goal: >90%

8. **Smoking Cessation Counseling:**
   % of diabetic patients who smoke and received cessation counseling
   - Goal: 100%

B. Registry and Outreach

- Maintain a diabetes patient registry (EHR-based) to identify patients not meeting goals or overdue for screenings

- Proactive outreach (phone calls, letters, patient portal messages) to schedule appointments or tests

C. Team-Based Care

- Multidisciplinary diabetes care team: Physicians, APPs, RNs, diabetes educators, pharmacists, dietitians, social workers
- Collaborative practice agreements allowing nurses/pharmacists to adjust medications per protocol
- Group visits and shared medical appointments for education and peer support

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XIII. REFERENCES

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XIV. APPENDICES

Appendix A: Patient Diabetes Action Plan Template

Appendix B: Sick Day Management Instructions for Patients

Appendix C: Insulin Titration Protocol

Appendix D: Foot Care Education Handout

Appendix E: Hypoglycemia Treatment Guideline (Rule of 15)

Appendix F: List of Generic Diabetes Medications and Costs

Appendix G: DSMES Referral Form

END OF GUIDELINE

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Document Control:

- Version: 1.0
- Effective: January 1, 2024
- Next Review: January 1, 2025 (annual review for guideline updates)