Primary Care Provider Guidelines for the Management of Adults at Risk for or with Type 2 Diabetes Mellitus

July 2014
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Introduction

The Primary Care Provider Management Guidelines for Adults at Risk for or with Type 2 Diabetes Mellitus (Guidelines) was developed to serve as a tool for the primary care provider and health care team in diagnosis, treatment, care management, and self-management support for adults at high risk for or with Type 2 diabetes mellitus (T2DM). Excluded from the Guidelines are: Type 1 diabetes mellitus, prenatal and gestational diabetes; and children and adolescents. The focus will be on adults (over 18), and older adults (over 65).

The Guidelines are mainly aligned and translated from the current (2014) Standards of Medical Care in Diabetes from the American Diabetes Association. Special considerations were provided to assist primary care providers in individualizing care and medical goals to meet the unique needs of the older adult.

These guidelines are not intended to replace medical judgment or clinical decision-making, and should be adjusted to the needs of each individual. Patient goals should be individualized for age, comorbidities and complications, life expectancy, culture and individual/family preference, psychosocial factors, and other risks identified by the primary care provider.

The Guidelines were developed in four main sections:

Section I: Summary of Guidelines. This section provides a summary of the key points and highlights from Sections II and III. Summary includes:
- Diagnosing and Testing for Type 2 Diabetes and Prediabetes
- General Therapeutic goals (glycemic, blood pressure, lipids)
- Pharmacologic Therapy
- Preventing Complications and Comorbidities
- Lifestyle Management and Diabetes Self-Management Education (DSME)
- Special Considerations for Older Adults

Section II: Outline of ADA’s Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes. Additional resources and recommendations were added to supplement the ADA’s guidelines, including new lipid and hypertension guidelines, lifestyle management, and the care of the older adult with diabetes.
- Criteria for the Diagnosis of Type 2 Diabetes and Prediabetes
- Glycemic Control Individualized to the Patient
- Cardiovascular Risk Reduction and CVD management
- Prevention of Microvascular Complications (Nephropathy, Retinopathy, Neuropathy, Foot Care)
- Immunizations

Section III: Lifestyle Management and Self-Management Education. This section provides general recommendations on lifestyle management and self-care behaviors.
- Lifestyle Management: Nutrition, Physical Activity, Smoking, and Alcohol
- Diabetes Self-Management Education and Support

Sections IV-V: References and Resources. Additional resources: consumer resource guide for diabetes; how to get reimbursement for ADA and AADE accredited DSMT programs; and the Diabetes Medication Quick Reference Tool—a newly developed tool intended for clinicians to quickly reference all current FDA approved diabetes medications.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>AADE</td>
<td>American Association of Diabetes Educators</td>
</tr>
<tr>
<td>A1C</td>
<td>Glycohemoglobin (Hemoglobin A1C)</td>
</tr>
<tr>
<td>ADA</td>
<td>American Diabetes Association</td>
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<tr>
<td>ABI</td>
<td>Ankle-Brachial Index</td>
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<tr>
<td>ARB</td>
<td>Angiotensin Receptor Blocker</td>
</tr>
<tr>
<td>ASCVD</td>
<td>Atherosclerotic Cardiovascular Disease</td>
</tr>
<tr>
<td>CAN</td>
<td>Cardiovascular Autonomic Neuropathy</td>
</tr>
<tr>
<td>CCB</td>
<td>Calcium Channel Blockers</td>
</tr>
<tr>
<td>CDE</td>
<td>Certified Diabetes Educator</td>
</tr>
<tr>
<td>CGM</td>
<td>Continuous Glucose Monitoring</td>
</tr>
<tr>
<td>CKD</td>
<td>Chronic Kidney Disease</td>
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<tr>
<td>CVD</td>
<td>Cardiovascular Disease</td>
</tr>
<tr>
<td>DASH</td>
<td>Dietary Approaches to Stop Hypertension</td>
</tr>
<tr>
<td>DCCT</td>
<td>Diabetes Control and Complications Trial</td>
</tr>
<tr>
<td>DM</td>
<td>Diabetes Mellitus</td>
</tr>
<tr>
<td>DPN</td>
<td>Diabetic Polyneuropathy</td>
</tr>
<tr>
<td>DBP</td>
<td>Diastolic Blood Pressure</td>
</tr>
<tr>
<td>DSME</td>
<td>Diabetes Self-Management Education</td>
</tr>
<tr>
<td>eGFR</td>
<td>Estimated Glomerular Filtration Rate</td>
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<tr>
<td>ESRD</td>
<td>End Stage Renal Disease</td>
</tr>
<tr>
<td>FPG</td>
<td>Fasting Plasma Glucose</td>
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<tr>
<td>GDM</td>
<td>Gestational Diabetes Mellitus</td>
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<tr>
<td>GFR</td>
<td>Glomerular Filtration Rate</td>
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<tr>
<td>HCP</td>
<td>Health Care Professional</td>
</tr>
<tr>
<td>HBV</td>
<td>Hepatitis B Vaccine</td>
</tr>
<tr>
<td>IFG</td>
<td>Impaired Fasting Glucose</td>
</tr>
<tr>
<td>IGT</td>
<td>Impaired Glucose Tolerance</td>
</tr>
<tr>
<td>LOPS</td>
<td>Loss of Protective Sensation</td>
</tr>
<tr>
<td>MDI</td>
<td>Multiple Dose Insulin</td>
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<tr>
<td>MNT</td>
<td>Medical Nutrition Therapy</td>
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<tr>
<td>NGSP</td>
<td>National Glycohemoglobin Standardization Program</td>
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<tr>
<td>NPDR</td>
<td>Nonproliferative Diabetic Retinopathy</td>
</tr>
<tr>
<td>OGTT</td>
<td>Oral Glucose Tolerance Test</td>
</tr>
<tr>
<td>PAD</td>
<td>Peripheral Arterial Disease</td>
</tr>
<tr>
<td>PDR</td>
<td>Proliferative Diabetic Retinopathy</td>
</tr>
<tr>
<td>PG</td>
<td>Plasma Glucose</td>
</tr>
<tr>
<td>POC</td>
<td>Point of Care</td>
</tr>
<tr>
<td>RCT</td>
<td>Random Clinical Trial</td>
</tr>
<tr>
<td>SBP</td>
<td>Systolic Blood Pressure</td>
</tr>
<tr>
<td>SMBG</td>
<td>Self-Monitoring of Blood Glucose</td>
</tr>
<tr>
<td>T2DM</td>
<td>Type 2 Diabetes Mellitus</td>
</tr>
<tr>
<td>TZA</td>
<td>Thiazolidinedione</td>
</tr>
<tr>
<td>VEGF</td>
<td>Anti-Vascular Endothelial Growth Factor</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
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</tbody>
</table>
Section I. Summary of Management Guidelines

For full outline and review of 2014 ADA guidelines see Sections II and III of this report

A. Diagnosing and Testing for Type 2 Diabetes (T2DM) and Prediabetes
   • Four test options for the diagnosis of diabetes: A1C; FPG; 2-hr PG; or Random PG
      - A1C  >  6.5 % (do not use POC testing for diagnosis); or,
      - FPG  >  126mg/dL; or,
      - 2-hr PG  >  200 mg/dL post OGTT challenge; or,
      - Random PG  >  200 mg/dL with symptoms (polyuria, polydipsia, and unexplained weight loss).
   • Three test options for diagnosis of prediabetes: A1C; or FPG; or 2 hr PG
      - FPG 100-125 mg/dL (defined as impaired fasting glucose (IFG)); or,
      - 2-hr PG  >  140-199 mg/dL (defined as impaired glucose tolerance (IGT)); or,
      - A1C 5.7%-6.5% (considered prediabetes).
   • Testing/frequency: Use same tests and assays in screening and ongoing management of diabetes. In the absence of unequivocal hyperglycemia, results should be repeated for confirmation, using same testing method.
      - If normal, repeat at least every 3 years.
      - More frequent testing depending on initial test results and risk factors.
      - With prediabetes, test yearly.
      - Consider testing all with BMI  > 25 (overweight or obese) with one or more additional risk factors (physical inactivity; family history; high-risk race/ethnicity; history of gestational diabetes; hypertension; abnormal lipid profiles; CVD history; conditions associated with insulin resistance).
      - If no risk factors, begin testing at 45 years of age.
      - Frequency of A1C:
        - 2 times a year in patients who are meeting treatment targets/have stable glycemic control
        - Quarterly in patients not meeting glycemic targets, or has changed therapy.
        - Use point-of-care (POC) testing for A1C for more timely treatment changes.

B. General Therapeutic Goals
   • Individualize glycemic goals based on: age/life expectancy, comorbid conditions, diabetes duration, hypoglycemia unawareness, individual patient considerations, known CVD/advanced micro-vascular complications.
      - A1C <7%: for non-pregnant adults
      - A1C < 6.5%: stringent A1C for selected individuals (short diabetes duration, long life expectancy, no significant CVD)
      - A1C <8%: less stringent A1C goals (history of severe hypoglycemia status, limited life expectancy, advanced microvascular/macrovascular complications, extensive comorbid
Section I. Summary of Management Guidelines

conditions, long standing diabetes duration despite effective doses of multiple oral and insulin agents and, appropriate self-monitoring and education)
  o Fasting PG: 70-130 mg/dL
  o Peak postprandial PG made 1-2 h after beginning of the meal: < 180 mg/dL
- Blood pressure: < 140 mmHg systolic and < 80 mmHg diastolic (Note: see full report for new JNC8 Guidelines)
- Lipids:
  o LDL cholesterol: under 100 mg/dL;
  o HDL cholesterol: over 40 mg/dL for men and over 50 mg/dL for women; and,
  o Triglycerides: under 150 mg/dL (Note: See Section II for AHA/ACC guidelines).

C. Pharmacologic Therapy for T2DM
- Glycemic targets and therapies must be individualized.
- Diet, exercise, and education remain the foundation of all T2DM treatment programs.
- Use stepwise and patient-centered approach to guide choice of drug therapy. Consider: efficacy, hypoglycemia risk, effects on weight, side effects, costs, and patient preference.
- Metformin: Preferred initial therapy if tolerated and not contraindicated.
- Consider Insulin therapy (with or without other agents) with newly diagnosed patients who are markedly symptomatic and/or with elevated blood glucose or A1C.
- If noninsulin monotherapy at maximum tolerated does not achieve or maintain A1C after 3 months, add a second oral two-drug combination.
- If combination therapy that includes basal insulin fails to achieve A1C after 3-6 months, proceed to more complex insulin strategy, usually in combination with 1-2 non-insulin.

D. Preventing Complications and Comorbidities
- **Hypoglycemia:** Individuals at risk for hypoglycemia should be asked about symptomatic and asymptomatic hypoglycemia at each encounter.
  o Hypoglycemia unawareness or one or more episodes of severe hypoglycemia should trigger re-evaluation, consideration for short-term relaxation of glycemic targets, and/or less stringent glycemic control regimen.
  o Glucagon should be prescribed for all individuals at significant risk of severe hypoglycemia. Instruct family and caregivers on use of glucagon kits, self-management to raise blood glucose.
- **Cardiovascular Disease and Management:** CVD risks should be assessed at least annually.
  o Asymptomatic patients: routine CAD screening not recommended. Treatment of CVD risk factors is the focus.
  o Overt CVD: consider ACE inhibitor therapy (ACEI). Use aspirin and statin to reduce CV event risk.
  o Prior MI: continue use of beta-blockers for ≥2 years after event.
  o Symptomatic heart failure: avoid TZDs.
  o May use Metformin in stable heart failure in the presence of normal renal function. Avoid in unstable or hospitalized heart failure.
  o Consider aspirin therapy with increased CVD risk. Use aspirin therapy with history of CVD.
- **Blood Pressure/Hypertension (HTN):** Blood pressure (BP) measurement at every routine visit. Elevated blood pressure should be confirmed on a separate day.
Section I. Summary of Management Guidelines

- With DM and HTN: Systolic blood pressure (SBP) goal of <140 mmHg
  - Lower SBP (<130 mmHg) appropriate for certain individuals (younger)
- With DM: Diastolic blood pressure (DBP) goal of <80 mmHg
- Recheck blood pressure if "white coat" hypertension is suspected. Recommend home monitoring of blood pressure.
- For BP > 120/80 mg Hg: Advise on lifestyle therapy to reduce blood pressure.
- For confirmed: BP > 140/80 mm Hg: Lifestyle therapy: Weight loss (if overweight), DASH-style diet including sodium restriction, potassium increase; moderate alcohol intake; increased physical activity
- Pharmacologic therapy for DM and HTN: ACEI or ARB; usually requires 2 or more agents
  - Monitor serum creatinine/eGFR and serum potassium with ACEI, ARB, or diuretics 1-2 weeks after initiation and periodically thereafter.

- Retinopathy: Initial dilated and comprehensive eye exam by a trained eye care provider (ophthalmologist or optometrist) T2DM: shortly after diagnosis. If no retinopathy for one or more eye exams, consider exams every 2 years. If retinopathy: annual exam.
  - If retinopathy progresses or visual changes reported: more frequent exams.

- Dyslipidemia/Lipid management: Measure fasting lipids at least annually. Every 2 years for low-risk lipid values (LDL-C <100mg/dL; HDL-C >50 mg/dL; and, TG <150 mg/dL
  - Goals:
    - No overt CVD: LDL-C <100 mg/dL
    - Overt CVD: LDL-C < 70 mg/dL, with high dose statin
  - Treatment - Lifestyle interventions/modification:
    - Medical nutrition therapy (MNT), increased physical activity, weight loss (if indicated), and smoking cessation
    - Nutrition intervention: MNT referral, reduce saturated fat, trans fat, cholesterol intake; increase omega-3 fatty acids, viscous fiber (oats, legumes, and citrus), and plant stenols/sterols intake.
    - Add statin therapy to lifestyle modification regardless of baseline lipid levels for patients with:
      - Overt CVD; No CVD, aged >40 yrs, > 1 CVD risk factor; No CVD, aged < 40 yrs, if LDL-C>100 mg/dL, or if multiple CVD Risk factors (hypertension, smoking, dyslipidemia, albuminuria, family history of CVD)
      - Triglyceride levels <150 mg/dL and HDL-C>40 mg/dL in men and >50 mg/dL in women are desirable. However, LDL-C targeted statin therapy remains preferred strategy.

- Nephropathy: Annually measure urine albumin excretion starting at diagnosis.
  - At least annually, serum creatinine with estimated GFR (eGFR) should be assessed in all adults with diabetes, regardless of the degree of urine albumin excretion.
  - Treatment: ACEI and ARB are not recommended in patients with normal blood pressure, and albumin excretion <30 mg/24h for primary prevention; use ACEI or ARB (not in combination) with modestly (>30) and higher levels of urinary excretion (> 300); monitor for elevations in serum creatinine and potassium when ACEIs, ARBs or diuretics.
  - Reducing dietary protein is not recommended for people with diabetes and diabetic kidney disease (albuminuria > 30 mg/24 h).
Section I. Summary of Management Guidelines

- Reasonable to continue monitoring urine albumin excretion to assess response to treatment and disease progression.
- When eGFR is < 60 mL, evaluate and manage complications of CKD.
- Consider referral to nephrologist for uncertainty about the etiology of kidney disease, difficulty management issues, or advanced kidney disease.

- **Neuropathy:** Screen all patients for distal peripheral neuropathy (DPN), starting at diagnosis, and at least annually thereafter using simple clinical tests.
  - Assess for loss of sensation in limbs, symptoms of pain, tingling, paresthesia, weakness or gait instability.
  - Electrophysiological testing (EMG, quantitative sensory test) or neurologist referral rarely needed except with atypical clinical features.
  - Assess for signs and symptoms of cardiovascular autonomic neuropathy (CAN) at diagnosis. Standard cardiovascular reflex testing is easy to perform; rarely need sophisticated testing.
  - Assess for cause of severe or atypical neuropathy other than diabetes.
  - Consider medications for the relief of specific symptoms related to painful DPN, and autonomic neuropathy as they improve quality of life.

- **Foot Care:** At least annually; comprehensive foot examination to identify risk factors predictive of ulcers and amputations.
  - General inspection of skin integrity, musculoskeletal deformities; pedal pulses; test for loss of protective sensation (monofilament plus testing any one of the following: vibration, pinprick sensation, ankle reflexes, or vibration perception.
  - Initial peripheral arterial disease (PAD) screening: history for claudication, and pedal pulses.
  - Consider obtaining ankle-brachial index (ABI).
  - Consider referral to foot care specialists for high risk patients; foot ulcers and wound care; and, further vascular assessment for patients with significant claudication or a positive ABI.
  - Patient/caregiver education: Provide general foot self-care education.

- **Immunizations:**
  - **Influenza vaccine** annually to all diabetic patients;
  - **Pneumococcal Polysaccharide Vaccine** to all diabetic patients, a one-time revaccination is recommended for individuals aged > 65 yrs who have been immunized > 5 years ago; and, individuals with nephrotic syndrome, chronic renal disease, and other immunocompromised states; and,
  - **Hepatitis B Vaccine (HBV)** to unvaccinated adults with diabetes who are aged 19–59 yrs; and consider administering to unvaccinated adults with diabetes who are aged ≥ 60 yrs.

- **Psychosocial:** Psychosocial evaluation should be an integral component of initial assessment and ongoing care.
  - Assess newly diagnosed diabetes and new diagnosed complication from diabetes for: ability to cope; level of social support; and external sources of stress (e.g., financial, social, emotional, mental health disorders).
  - Assess any changes in treatment or self-care behaviors.
  - Utilize screening instruments: PHQ-2/PHQ-9; Diabetes distress tool; CAGE or AUDIT; and Geriatric Depression Scale.
  - Consider referral to mental health specialist.
E. **Lifestyle Management and Diabetes Self-Management Education:**

- **Nutrition:** Evidence suggests that there is not an ideal percentage of calories from carbohydrate, protein, and fat for all people with diabetes; macronutrient distribution should, therefore, be based on individualized assessment of current eating patterns.
  - Monitoring carbohydrate intake remains a key strategy in achieving glycemic control.
  - A variety of eating patterns have been shown to be effective in managing diabetes, including Mediterranean-style Dietary Approaches to Stop Hypertension (DASH)-style, plant-based (vegan or vegetarian), lower-fat, and lower-carbohydrate patterns.
  - Restriction of dietary protein is no longer routinely recommended in people with diabetic kidney disease.
  - Increase foods containing long-chain omega-3 fatty acids (from fatty fish) and omega-3 linoleic acid.
  - Consider referring for MNT at diagnosis.

- **Physical Activity:** Exercise 150 minutes per week of moderate-intensity aerobic activity; encourage individuals to perform at least 2 sessions of resistance training per week as part of the minimum of 150 minutes of exercise per week.

- **Smoking:** Assess patient’s smoking status on a routine basis. If patient smokes, use brief counseling including the use of quit lines.

- **Alcohol:** Assess alcohol use; Limit alcohol to one (women) or two (men) drinks a day.

F. **Diabetes Self-Management Education (DSME)**

- Individuals should receive DSME delivered by a multidisciplinary team with a comprehensive plan of care when their diabetes is diagnosed and as needed thereafter.
- DSME should be provided according to the National Standards for Diabetes Self-Management and Support.
- Effective self-management and quality of life are the key outcomes.
- DSME should address psychosocial issues
- DSME programs are appropriate venues for people with prediabetes.
- Refer to a diabetes education, preferably a CDE in a ADA recognized or AADE accredited program.

G. **Special Considerations for Older Adults with Diabetes:**

- Older adults who are functional, cognitively intact, and have significant life expectancy should be managed and treated similarly to younger adults.
- Consider relaxing or adjusting therapeutic goals (glycemic, blood pressure, lipids) for older adults by three major classification of older adults: 1) healthy (few chronic diseases, intact cognitive/functional status); (2) complex/intermediate health (multiple chronic illnesses or 2+ ADL impairment or mild/moderate cognitive impairment); and, or (3) very complex/poor health (long-term care or end-stage chronic illness to severe cognitive and functional impairment).
- Other CVD factors should be treated in older adults with consideration of timeframe of benefit versus life expectancy.
- Screening for diabetes complications should be individualized with attention to complications that would lead to functional impairment.
- Attention to medication selection measuring benefit-to-risk ratio is essential to promote efficacy, medication adherence, and safety.
- DSME/T should be individualized and tailored to the individual’s unique medical, functional/physical status, cultural, and social situation. Assess burden of treatment on patients and caregivers. Consider preferences and attempt to reduce treatment complexity.
- Overly restrictive eating patterns (self-imposed or provider-directed) may contribute additional risk for older adults with diabetes.
- Consider that many patients may have low health literacy and numeracy skills or may be overwhelmed by the presence of multiple co-morbidities.
# Section II. Outline of ADA Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes

## 1.0 – Criteria for the Diagnosis of Type 2 Diabetes (T2DM) and Prediabetes

<table>
<thead>
<tr>
<th>Care Components</th>
<th>Testing, Frequency, Guidelines</th>
<th>References</th>
</tr>
</thead>
</table>
| **1.1 – Diagnosis of Diabetes**  | - Hemoglobin A1C (A1C); or  
- Fasting plasma glucose (FPG); or  
- 2-hr plasma glucose (PG); or  
- Random plasma glucose (PG)                                                                                                                                                     | ADA (2014). Standards of Medical Care in Diabetes – 2014. *Diabetes Care*, 37 (suppl 1), S14-S80. ([Click here](#))  |
| Four test options for diagnosis | Perform in lab using NGSP-certified method and standardized to DCCT assay.  
Fasting is defined as no caloric intake for at least 8 hrs.  
2-hr (PG) ≥ 200mg/dL (11.1 mmol/L) during OGTT; or  
Random PG ≥ 200 mg/dL (11.1 mmol/L)                                                                                                                                              | Kirkman et al. (2012). Diabetes in Older Adults. *Diabetes Care*, 35(12), 2650-2664. ([Click here](#)) |
| A1C ≥ 6.5%*; or                  |                                                                                                                                                                                                                                     |                                                                                                  |
| FPG ≥ 126mg/dL (7.0 mmol/L); or  |                                                                                                                                                                                                                                     |                                                                                                  |
| 2-hr PG                          | Performed as described by the WHO, using glucose load of 75g.  
Patients with classic symptoms of hyperglycemia/hyperglycemia crisis                                                                                                                                                            |                                                                                                  |
| Random PG ≥ 200 mg/dL (11.1 mmol/L) |                                                                                                                                                                                                                                     |                                                                                                  |

| **1.2 – Diagnosis of Prediabetes** | - A1C; or  
- FPG; or  
- 2-hr PG | ADA (2014). Standards of Medical Care in Diabetes – 2014. *Diabetes Care*, 37 (suppl 1), S14-S80. ([Click here](#))  
Kirkman et al. (2012). Diabetes in Older Adults. *Diabetes Care*, 35(12), 2650-2664. ([Click here](#)) |
| Three test options               | Considered prediabetes |                                                                 |
| A1C: 5.7%-6.4%                   | Defined as Impaired Fasting Glucose (IFG)                                                                                                                                                                                            |                                                                                                  |
| FPG: 100-125 mg/dL (5.6—6.9 mmol/L) | Defined as Impaired Glucose Tolerance (IGT)                                                                                                                                         |                                                                                                  |
| 2-hr PG: ≥ 140-199mg/dL (7.8-11mmol/L) during OGTT | |                                                                 |

*In the absence of unequivocal hyperglycemia, results should be repeated. In general, it is preferable the same test be repeated for confirmation. Examples: if A1C is 7.0% and repeat is 6.8%, diabetes is confirmed; if two different tests (A1C and FPG) are above threshold, diabetes is confirmed; however, with discordance of two different tests (one above and another normal) then repeat test that is above threshold. Tests near margins of diagnostic threshold, HCP might opt to follow closely and repeat in 3-6 months.*

**“Prediabetes” is a term used for individuals with IFG and/or IGT, considered high risk for future development of diabetes as well as cardiovascular disease (CVD). IFG and IGT are associated with obesity, dyslipidemia, and hypertension.**

- **Special Considerations for Older Adults:**
  - The benefits of identifying prediabetes and T2DM in older adults will depend on chronological age, actual health status, age of onset and life expectancy (Kirkman et al., 2012).
### 2.0 – Glycemic Control Individualized to the Patient

**Care Components**

<table>
<thead>
<tr>
<th>Testing, Frequency, Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>If normal, repeat test at least every 3 years.</td>
</tr>
<tr>
<td>More frequent testing depending on initial test results, and risk factors.</td>
</tr>
<tr>
<td><strong>Frequency of A1C testing:</strong></td>
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<tr>
<td>- 2 times a year in patients who are meeting treatment targets/have stable glycemic control</td>
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<tr>
<td>- Quarterly in patients not meeting glycemic targets, or those who have changed therapy.</td>
</tr>
<tr>
<td>- Use point-of-care (POC) testing for A1C for more timely treatment changes.</td>
</tr>
<tr>
<td>With prediabetes, test yearly.</td>
</tr>
<tr>
<td>Consider testing all with BMI ≥ 25 (overweight or obese) with one or more additional risk factors*.</td>
</tr>
<tr>
<td>If no risk factors: begin testing at age 45 yrs.</td>
</tr>
</tbody>
</table>

**Special considerations:**
- At risk BMI may be lower in some ethnic groups**.
- Certain medications are known to increase risk for T2DM (ex. glucocorticoids, antipsychotics).

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*Additional risk factors include: physical inactivity; first-degree relative with diabetes; high-risk race/ethnicity (African American, Latino, Native American, Asian American, Pacific Islander); women who delivered baby >9 lb or diagnosed with GDM; hypertension (≥140/90 mmHg or on therapy); HDL cholesterol <35 mg/dL and/or TG>250 mg/dL; A1C ≥5.7%, IGT, or IFG in previous testing; history of CVD; conditions associated with insulin resistance (obesity, polycystic ovarian syndrome, acanthosis nigricans).**

** Lower BMI cut points suggest diabetes risk in some racial/ethnic groups. Incidence rate of diabetes conferred by BMI cutoff value: 30kg/m² for non-Hispanic white, 24 kg/m² in South Asians, 25kg/m² in Chinese, and 26 kg/m² in African Americans.

**Special Considerations for Older Adults:**
- The benefits of identifying prediabetes and asymptomatic T2DM in older adults depend on whether primary or secondary preventive interventions would likely be effective and timely, when considering patient’s life expectancy (Kirkman et al., 2012).

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ADA (2014). Standards of Medical Care in Diabetes – 2014. *Diabetes Care, 37 (suppl 1), S14-S80.* ([Click here](http://example.com))

Erickson et al. (2012). New-onset treatment-dependent diabetes mellitus and hyperlipidemia associated with atypical antipsychotic use in older adults without schizophrenia or bipolar disorder. *Journal of the American Geriatrics Society, 60(3), 474-479.* ([Click here](http://example.com))

Kirkman et al. (2012). Diabetes in Older Adults. *Diabetes Care, 35(12), 2650-2664.* ([Click here](http://example.com))
### 2.2 – Preventing/Delaying T2DM

<table>
<thead>
<tr>
<th>Patients with prediabetes</th>
<th>Testing, Frequency, Guidelines</th>
<th>References</th>
</tr>
</thead>
</table>
| • IGT, IFG, or A1C 5.7%-6.4% | • Refer patients with prediabetes to ongoing support program targeting:  
  o Weight loss of 7% body weight  
  o Increase in physical activity to at least 150 min/week of moderate activity  
  • Consider metformin for prevention of T2DM especially for those with:  
    o BMI > 35 kg/m²  
    o Age < 60 yrs  
    o Women with prior GDM  
  • Monitor annually for development of diabetes  
  • Screen for and treat modifiable risk factors for CVD. | ADA (2014). Standards of Medical Care in Diabetes – 2014. *Diabetes Care*, 37 (suppl 1), S14-S80. (Click here)  

**Special Considerations for Older Adults:**
- A large study (Diabetes Prevention Program) showed increased efficacy with lifestyle intervention in older (≥ 60 yrs) than younger participants. 10 year follow-up showed 49% diabetes risk reduction in older participants. (Knowler et al., 2009).

### 2.3 – Glycemic Goals for T2DM

| Individualize goals based on: | A1C < 7%: for nonpregnant adults  
A1C < 6.5%: stringent A1C goals for selected individuals* (short diabetes duration, long life expectancy, no significant CVD)  
A1C <8%: less stringent A1C goals (history of severe hypoglycemia status, limited life expectancy, advanced microvascular/macrovascular complications, extensive comorbid conditions, long standing diabetes duration despite effective doses of multiple oral insulin agents; and, appropriate self-monitoring and education).  
Fasting PG: 70-130 mg/dL  
Peak postprandial PG made 1-2 h after beginning of the meal**: < 180 mg/dL | ADA (2014). Standards of Medical Care in Diabetes – 2014. *Diabetes Care*, 37 (suppl 1), S14-S80. (Click here)  
Inzucchi et al. (2012). Management of Hyperglycemia in Type 2 Diabetes: A Patient-Centered Approach. *Diabetes Care*, 35(6), 1364-1379. (Click here)  
Page 1366, Figures 1: Approach to management of hyperglycemia (Click here)  
Kirkman et al. (2012). Diabetes in Older Adults. *Diabetes Care*, 35(12), 2650-2664. (Click here) |

*Age/life expectancy  
Comorbid conditions  
Diabetes duration  
Hypoglycemia unawareness  
Individual patient considerations  
Known CVD/advanced micro-vascular complications
**Section II. Outline of ADA Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes**

### Care Components | Testing, Frequency, Guidelines | References
--- | --- | ---

**Special Consideration for Women of Childbearing Age:**
- Pre-conception counseling should be incorporated in the routine diabetes clinic visit for all women of childbearing potential.
- Achieve the lowest A1C as possible without excessive hypoglycemia.
- Assure effective contraception until stable and acceptable glycemia is achieved.
- Women with diabetes who are contemplating pregnancy should be evaluated and, if indicated, treated for diabetic retinopathy, nephropathy, neuropathy, and CVD.

**Special Considerations for Older Adults:**
- Consider health status, defined by the presence and number of comorbidities or impairments of functional and cognitive status (Kirkman et al., 2012).
  - Healthy: <7.5%
  - Complex/Intermediate: < 8.0%
  - Very complex/poor health: <8.5%

*More stringent targets may be appropriate if it can be achieved without significant hypoglycemia or adverse events.

**If A1C goals are not met despite reaching preprandial glucose goals, postprandial glucose may be targeted. Recommend 1-2 hours after the start of the meal.

† Three major classes of older patients (Kirkman et al., 2012):
  1) healthy (few chronic disease, intact cognitive/functional status);
  2) complex/intermediate (multiple chronic illnesses or 2+ instrumental ADL impairment or mild/moderate cognitive impairment);
  3) very complex/poor health (long-term care or end-stage chronic illness or moderate to severe cognitive impairment or 2+ ADL dependencies)

### 2.4 – Pharmacologic Therapy for T2DM

**Use stepwise and patient-centered approach to guide choice of drug therapy.**
Consider: efficacy, hypoglycemia risk, effects on weight, side effects, costs, and patient preference.

Shared decision making has been advocated as an approach to improving the

- At diagnosis, counsel patients regarding lifestyle modifications (healthy diet, weight loss, exercise).
- Metformin: preferred initial therapy if tolerated and not contraindicated.
- Consider insulin therapy (with or without other agents) with newly diagnosed patients with markedly symptomatic and/or elevated blood glucose or A1C.
- If noninsulin monotherapy at maximum tolerated does not achieve or maintain A1C after 3 months, add a second oral two-drug combination.

**ADA (2014). Standards of Medical Care in Diabetes – 2014. Diabetes Care, 37 (suppl 1), S14-S80. (Click here)**

**Inzucchi et al. (2012). Management of Hyperglycemia in Type 2 Diabetes: A Patient-Centered Approach. Diabetes Care, 35(6), 1364-1379. (Click here)**

Page 1371, Figure 2: General
## Section II. Outline of ADA Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes

### Care Components
- Quality preference-sensitive medical decisions. Key components of the shared decision-making approach are:
  1. Establishing an ongoing partnership between patient and provider;
  2. Information exchange;
  3. Deliberation on choices; and
  4. Deciding and acting on decisions (Inzucchi et al., 2012).

### Testing, Frequency, Guidelines
- If combination therapy that includes basal insulin has failed to achieve A1C target after 3-6 months, proceed to more complex insulin strategy, usually in combination with 1-2 non-insulin agents.
- Considerations: CVD; HTN (see section 3.2).

### Key points and guiding principles:
- Glycemic targets and therapies must be individualized.
- Diet, exercise, and education remain the foundation of all T2DM treatment programs.
- Unless contraindicated or not tolerated, metformin is optimal first-line drug.
- After metformin, limited data to guide treatment. Combination therapy (see below) is reasonable for aiming to minimize side effects.
- Ultimately, many patients will require insulin therapy alone or in combination.
- Avoid using insulin as a threat or describing it as a failure or punishment.
- All treatment decisions should be made in conjunction with patient’s preference, needs, and values.
- Cardiovascular risk reduction must be a major focus of therapy.
- Life expectancy is a central concept in geriatric diabetes care. Those with limited life expectancy (<5 or <10 years) unlikely to benefit from “intensive” glucose control.

#### Special Considerations for Older Adults (Kirkman et al., 2012):
- Attention to medication selection measuring benefit-to-risk ratio is essential to promote efficacy, medication adherence, and safety*.

### References
- Recommendations for monotherapy, two-drug, three-drug combinations and insulin strategies (Click here)
- John M. Eisenberg Center for Clinical Decisions and Communications. (2011). Comparing Medications for Adults with Type 2 Diabetes (AHRQ Publication No. 11-EHC038-3). Houston, TX: U.S. (Click here)
- Therapeutic Research Center (TRC). (2012). PL Detail-Document, Stepwise Approach to Selecting Treatments for Type 2 Diabetes. Pharmacist’s Letter/Prescriber’s Letter. (Click here)
- Kirkman et al. (2012). Diabetes in Older Adults. Diabetes Care, 35(12), 2650-2664. (Click here)

*Note: See Section V, Diabetes Medication Quick Reference Tool:
- This tool is intended for clinician to quickly reference all current FDA approved diabetes medications

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*Choose antihyperglycemic therapies carefully, considering polypharmacy. Avoid glyburide. Metformin can be used safely, but must be reduced in Stage III CKD, and avoided in Stage IV CKD. Assess renal function with eGFR, not serum creatinine alone (Kirkman et al., 2012)
**General stepwise approach to selecting treatment for Type 2 Diabetes** (Figure 2, Inzucchi et al., 2012):

**Step 1.** At diagnosis counsel patients regarding lifestyle modifications (healthy diet, weight loss, exercise)

**Step 2.** At diagnosis or soon after diagnosis, add metformin (MET), initial drug therapy (lowers A1C: 1%-1.5%)

**Step 3.** If target A1C is not achieved after three months consider a two drug combination by adding a second agent (based on patient and drug characteristics).

**Step 4.** If target A1C is not achieved after another 3 months, consider three-drug combination by adding a third agent.

**Step 5.** If combination therapy that includes basal insulin has failed to achieve HbA1c target after 3-6 months, proceed to more complex insulin strategy, usually in combination with 1-2 non-insulin agents.

**Glossary:**

- **DDP-4:** dipeptidyl peptidase-4: Drug name: sitagliptin (Januvia), saxagliptin (Onglyza), linagliptin (Tradjenta)
- **GLP-1:** glucagon-like peptide-1: Drug name: exenatide (Byetta), exenatide ER (Bydureon), liraglutide (Victoza)
- **SU:** sulfonylurea: Drug name: Glipizide (Glucotrol), glimepiride (Amaryl), Glyburide (not preferred)
- **TZD:** thiazolidinedione: Drug name: Prioglitazone (Actos)

### 2.5 – Glucose Monitoring

Two primary techniques are available for health providers and patients to assess the effectiveness of the glycemic control management plan:

- **Self-monitoring of blood glucose (SMBG)**
- **Continuous glucose monitoring (CGM)**

**SMBG:**

- May be helpful to guide treatment decisions and/or self-management goals. Best when prescribed as part of larger educational context.
- When prescribing SMBG, ensure patients receive instruction and regular evaluation of technique.
- More useful tool for intensive insulin regimens such as multiple-dose insulin or insulin pump therapy. Recommend prior to meals and snacks, occasionally postprandially, at bedtime, prior to exercise, when they suspect low blood glucose, after treating low blood glucose until they are normoglycemic, and prior to critical tasks such as driving.
### Section II. Outline of ADA Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes

#### Care Components

<table>
<thead>
<tr>
<th>Testing, Frequency, Guidelines</th>
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<tbody>
<tr>
<td>CGM:</td>
<td>ADA (2014). Standards of Medical Care in Diabetes – 2014. <em>Diabetes Care, 37 (suppl 1), S14-S80.</em> (<a href="#">Click here</a>)</td>
</tr>
<tr>
<td>• CGM may be a supplemental tool to SMBG in those with hypoglycemia unawareness and/or frequent hypoglycemic episode.</td>
<td>Kirkman et al. (2012). Diabetes in Older Adults. <em>Diabetes Care, 35(12), 2650-2664.</em> (<a href="#">Click here</a>)</td>
</tr>
</tbody>
</table>

#### 2.6 – Treatment of Hypoglycemia

**Assessment:**
- Individuals at risk for hypoglycemia should be asked about symptomatic and asymptomatic hypoglycemia at each encounter.
- Hypoglycemia unawareness or one or more episodes of severe hypoglycemia should trigger re-evaluation.

**Intervention:**
- Glucagon should be prescribed for all individuals at significant risk of severe hypoglycemia.
- Glucagon (Glucose 15-20g) should be given for all conscious individuals. After 15 minutes of treatment, if SMBG shows continued hypoglycemia, the treatment can be repeated.
- Instruct family and caregivers on use of glucagon kits, and periodic checks of expiration date.
  - Pure glucose is the preferred treatment, but any form of carbohydrate that contains glucose will raise blood glucose.
- Patients with one or more episodes of severe hypoglycemia may benefit from at least short-term relaxation of glycemic targets, and/or less stringent glycemic control regimen.

**Special Considerations for Older Adults:**
- Ongoing assessment of cognitive function for elderly. If low cognition and/or declining cognition is found, instruct patient, family, and/or caregiver on hypoglycemia management.
- Assess the burden of treatment on patients and caregivers. Consider preferences and attempt to reduce treatment complexity.
### 3.0 – Cardiovascular Risk Reduction and CVD Management

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<th>Care Components</th>
<th>Testing, Frequency, Guidelines</th>
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<tbody>
<tr>
<td><strong>3.1 – CVD Screening and Treatment</strong></td>
<td></td>
<td>ADA (2014). Standards of Medical Care in Diabetes – 2014. Diabetes Care, 37 (suppl 1), S14-S80. <a href="https://www.diabetes.org">Click here</a></td>
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</tbody>
</table>
| Cardiovascular disease (CVD) is the major cause of morbidity, mortality for those with diabetes. Common conditions coexisting with T2DM (hypertension, dyslipidemia) are clear risk factors for CVD, and diabetes itself confers independent risk. Benefits are observed when individual CVD risk factors are controlled to prevent/slow CVD in people with diabetes. | **Screening:**  
- In all patients with diabetes, CVD risks should be assessed at least annually  
- Asymptomatic patients: routine CAD screening not recommended. Treatment of CVD risk factors is the focus. |  
| **Treatment:**  
- Overt CVD:  
  - Consider ACE inhibitor therapy (ACEI)  
  - Use aspirin and statin to reduce CV event risk (see sections 3.3-3.4)  
- Prior MI: continue use of beta-blockers for ≥2 years after event  
- Symptomatic heart failure: avoid TZDs  
- Metformin considerations for heart failure:  
  - May use in stable heart failure in presence of normal renal function  
  - Avoid in unstable or hospitalized heart failure | ADA (2014). Standards of Medical Care in Diabetes – 2014. Diabetes Care, 37 (suppl 1), S14-S80. [Click here](https://www.diabetes.org) |

### 3.2 – Hypertension/Blood Pressure Management

Hypertension (HTN) is a common morbidity of diabetes, with prevalence depending on type of diabetes, age, obesity, and ethnicity. Pharmacologic therapy should be comprised of a regimen that includes either an ACE inhibitor (ACEI) or and angiotensin receptor blocker (ARB). If one class is not tolerated, substitute with another class. If BP is refractory despite medication adherence to optimal doses of three different classes, plus diuretic, consider secondary forms of HTN.

<table>
<thead>
<tr>
<th>Care Components</th>
<th>Testing, Frequency, Guidelines</th>
<th>References</th>
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</thead>
</table>
| **Screening:**  
  - Blood pressure (BP) measurement at every routine visit; elevated BP should be confirmed on a separate day. | ADA (2014). Standards of Medical Care in Diabetes – 2014. Diabetes Care, 37 (suppl 1), S14-S80. [Click here](https://www.diabetes.org) |
| **Targets/Goal:**  
- With DM and HTN: Systolic blood pressure (SBP) goal of <140 mmHg  
- Lower SBP (<130 mmHg) appropriate for certain individuals (younger)  
- With DM: Diastolic blood pressure (DBP) goal of <80 mmHg  
- Recheck BP if “white coat” hypertension is suspected. Recommend home monitoring of BP. |  
| **Treatment for BP > 120/80 mm Hg:**  
  - Advise on lifestyle modifications to reduce BP. |  
| Sacks et al. (2001). Effects on Blood Pressure of Reduced Dietary Sodium and the Dietary Approaches to Stop Hypertension (DASH) Diet. The New England Journal of Medicine, 344, 3-10. [Click here](https://www.nejm.org)  
### Section II. Outline of ADA Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes

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<th>Care Components</th>
<th>Testing, Frequency, Guidelines</th>
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| Most patients with HTN require multi-drug therapy to reach treatment goals. | **Treatment for confirmed BP > 140/80 mm Hg:**  
- Lifestyle therapy: Weight loss (if overweight), DASH-style diet* including sodium restriction, potassium increase; moderate alcohol intake; increased physical activity  
- Pharmacologic therapy for DM and HTN:  
  - ACEI or ARB  
  - Usually requires 2 or more agents  
  - Administer one or more at bedtime**  
  - Monitor serum creatinine/eGFR and serum potassium with ACEI, ARB, or diuretics 1-2 weeks after initiation and periodically thereafter.  
  - **Special Considerations for Older Adults:**  
    - Consider level of health status:  
      1) Healthy  
      2) Complex/intermediate: <140/80 mm Hg;  
      3) Very complex/ poor health: <150/90.  
    - Isolated systolic HTN more common in the older adult. Lower gradually to reduce risk of hypotensive symptoms (Joslin, 2007).  
    - Recheck at home if “white coat” HTN is suspected. | Joslin Diabetes Center and Joslin Clinic. (2007, February 02).  
Guideline for the Care of the Older Adult with Diabetes. ([Click here](#))  
Joslin Diabetes Center and Joslin Clinic. (2007, February 02).  
Guideline for the Care of the Older Adult with Diabetes. ([Click here](#))  

*Demonstrated evidence of reduced CVD events and mortality if at least one antihypertensive medication was given at bedtime.

**Special Considerations for Older Adults:**  
- Consider level of health status:  
  1) Healthy  
  2) Complex/intermediate: <140/80 mm Hg;  
  3) Very complex/ poor health: <150/90.  
- Isolated systolic HTN more common in the older adult. Lower gradually to reduce risk of hypotensive symptoms (Joslin, 2007).  
- Recheck at home if “white coat” HTN is suspected.  

---

### 3.3 Dyslipidemia/Lipid Management

| Increased prevalence of lipid abnormalities in T2DM contribute to a higher risk of CVD. | **Screening:**  
- Measure fasting lipids at least annually  
- Measure every 2 years for low-risk lipid | ADA (2014). Standards of Medical Care in Diabetes – 2014. *Diabetes Care, 37* (suppl 1), S14-S80. ([Click here](#)) |

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*DASH study in nondiabetic individuals has shown antihypertensive effects similar to pharmacological monotherapy. Lifestyle therapy consists of reducing sodium intake (<1500mmg/day) and excess body weight; increasing consumption of fruits, vegetables (8-10 servings/day), and low-fat dairy products (2-3 servings/day); reducing alcohol intake (2/day for men, 1/day for women); and increasing physical activity (Sacks et al., 2001; Evert et al., 2013).*
<table>
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<tr>
<th>Care Components</th>
<th>Testing, Frequency, Guidelines</th>
<th>References</th>
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<tr>
<td></td>
<td>o LDL-C &lt;100mg/dL,</td>
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<tr>
<td></td>
<td>o HDL-C&gt;50 mg/dL,</td>
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<tr>
<td></td>
<td>o Triglycerides (TG) &lt;150 mg/dL</td>
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**Targets/Goals:**
- No overt CVD: LDL-C <100 mg/dL
- Overt CVD: LDL-C < 70 mg/dL, with high dose statin
- If targets are not achieved on maximum statin therapy, a reduction in LDL-C of ~30-40% from baseline is an alternative goal.

**Treatment:**
- Lifestyle modifications:
  - MNT, increased physical activity, weight loss (if indicated), and smoking cessation
- Nutrition intervention: MNT referral, reduce saturated fat, trans fat, cholesterol intake; Increase omega-3 fatty acids, viscous fiber (oats, legumes, and citrus), and plant stenols/sterols intake;
- Add statin therapy to lifestyle modification regardless of baseline lipid levels for patients with:
  - Overt CVD
  - No CVD, aged >40yrs, > 1 CVD risk factor*
  - No CVD, aged < 40yrs, if LDL-C>100 mg/dL or if multiple CVD Risk factors
- Triglyceride levels <150 mg/dL and HDL-C>40 mg/dL in men and >50 in women are desirable. However, LDL-C targeted statin therapy remains preferred strategy.
- Combination therapy is not broadly recommended**.

**Special Considerations for Older Adults:**
- Consider in all older adults with life expectancy at least equal to the timeframe for prevention trials.
**CVD risk factors**: HTN, smoking, dyslipidemia, albuminuria, family history of CVD.

**Combination therapy** (statin and a fibrate or statin and niacin) may be effective for treatment for all three lipids, but associated with an increased risk for abnormal transaminase levels, myositis, or rhabdomyolysis.

†On November 26, 2013, ADA recognized the release new ACC/AHA Cholesterol Treatment Guidelines (ADA, 2013). The ADA’s Professional Practice Committee plans to review the changes as they relate to patients with diabetes and prediabetes, and will address in the 2015 Standards of Care. ADA reported underlying similarities and differences between ADA’s current Standards of Care and the revised 2013 ACC/AHA Cholesterol Treatment guidelines. Both the current ADA recommendation and new ACC/AHA guidelines: 1) Emphasize the importance to well-being and cardiovascular risk reduction through lifestyle, healthy diet and exercise, and weight management; 2) Recognize the value of high intensity statin therapy added to lifestyle therapy for patients with diabetes and overt CVD, regardless of lipid levels; and, 3) Recognize risk assessment as a process and that guidelines do not replace clinical judgment and patients’ circumstance. The ADA will consider whether moderate-dose statins should be used for primary prevention in all patients aged 40-75 yrs, regardless of lipid levels or other CVD factors. Diabetes patients often have a unique pattern of dyslipidemia that may require specific consideration. Also noted, no distinction between patients with Type 1, Type 2, or other forms of diabetes.

### 3.4 – Antiplatelet Therapy

**Aspirin** has been shown to be effective in reducing cardiovascular morbidity and mortality in high-risk patients with previous MI or stroke.

**Primary Prevention**:
- Consider aspirin therapy 75-162 mg/day for those with T2DM and increased CVD risk (10-year risk > 10%)*
- Clinical judgment required in men aged <50 yrs, women aged < 60 yrs with multiple other risk factors (e.g. 10-year risk 5-10%)
- Not recommended for low CVD risk (10-year risk <5%): potential for bleeds offsets benefits.

**Secondary Prevention**:
- Use aspirin therapy 75-162 mg/day in those with diabetes with a history of CVD.

**Special Considerations**:
- With CVD and documented aspirin allergy, clopidogrel (75 mg/day) should be used.
- Use of aspirin therapy (75-162 mg/day) and clopidogrel (75 mg/day) is reasonable for up to one year after an acute coronary syndrome.

*Includes most men aged >50 yrs or women aged >60 yrs with at least one additional major risk factor (family history of CVD, hypertension, smoking, dyslipidemia, or albuminuria).
### Section II. Outline of ADA Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes

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<th>Care Components</th>
<th>Testing, Frequency, Guidelines</th>
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<tr>
<td><strong>3.5 – Smoking Cessation</strong> <em>(Refer to Section III, 1.4 Smoking)</em></td>
<td>Routine and thorough assessment of tobacco use is key to preventing smoking and encouraging cessation.</td>
<td>ADA (2014). Standards of Medical Care in Diabetes – 2014. <em>Diabetes Care, 37</em> (suppl 1), S14-S80. <em>(Click here)</em></td>
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**Assessment:**
- At every visit, assess the use of tobacco and level of nicotine dependence
### 4.0 – Prevention of Microvascular Complications

<table>
<thead>
<tr>
<th>Care Components</th>
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<tr>
<td><strong>4.1 – Nephropathy Screening and Treatment</strong></td>
<td></td>
<td>ADA (2014). Standards of Medical Care in Diabetes – 2014. <em>Diabetes Care, 37 (suppl 1)</em>, S14-S80. (<a href="#">Click here</a>)</td>
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Diabetic nephropathy occurs in 20-40% of patients with diabetes and is the single leading cause of ESRD (end-stage renal disease).

**General recommendations:** To reduce the risk or slow the progression of nephropathy, optimize glucose control and BP control.

**Screening:**
- Annually measure urine albumin excretion starting at diagnosis.
  - Normal <30
  - ↑ urinary albumin excretion ≥ 30/24 hr.
  - Because of variability, collect 2-3 abnormal specimens within 3-6 months before considering abnormal.
  - Exercise within 24 hrs, infection, fever, CHF, marked hyperglycemia and hypertension may elevate urinary albumin excretion over baseline.
- At least once annually, serum creatinine with estimated GFR (eGFR) should be assessed in all adults with diabetes, regardless of the degree of urine albumin excretion.

**Treatment:**
- ACEI and ARB are not recommended in patients with normal blood pressure, and albumin excretion <30 mg/24h for primary prevention
- Use ACEI or ARB (not in combination) with modestly elevated (30-299 mg/day) and higher levels (>300 mg/day) of urinary albumin excretion.
- When using ACEIs, ARBs or diuretics, monitor for elevations in serum creatinine and potassium.
- Reducing dietary protein is not recommended for people with diabetes and diabetic kidney disease (albuminuria > 30 mg/24 h)
- Reasonable to continue monitoring urine albumin excretion to assess response to treatment and disease progression
- When eGFR is < 60 mL, evaluate and manage complications of CKD*
- Consider referral to nephrologist for uncertainty about the etiology of kidney disease, difficult management issues, or advanced kidney disease.
Section II. Outline of ADA Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes

Care Components | Testing, Frequency, Guidelines | References
---|---|---

Note new nomenclature to emphasize the continuous nature of albuminuria as a risk factor, the old terms “microalbuminuria” (30-299 mg/24h) and “macroalbuminuria” (>300 mg/24h) will no longer be used. Replaced with “persistent albuminuria” (30-299 mg/24h) and “higher levels” (>300 mg/24h). Normal albumin excretion is currently defined as <30 mg/24 h.

❖ Stages of Chronic Kidney Disease
- Stage 1: Kidney damage with Normal or ↑ GFR  >90 mL/min/1.73 m² body surface area
- Stage 2: Kidney damage with mildly ↓ GFR  60-89
- Stage 3: Moderately ↓ GFR  30-59
- Stage 4: Severely ↓ GFR  15-29
- Stage 5: Kidney Failure  <15 or dialysis

❖ Management of CKD in Diabetes by GFR < 60 mL/min/1.73 m² body surface area*

<table>
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<tr>
<th>GFR</th>
<th>Recommendations</th>
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| 45-60 | Referral to a nephrologist if possibility for nondiabetic kidney disease exists  
Consider medication dose adjustment  
Monitor every 6 months: eGFR  
Monitor at least yearly: electrolytes, bicarbonate, hemoglobin, calcium, phosphorus, parathyroid hormone  
Assure vitamin D sufficiency  
Consider bone density testing  
Referral for dietary counseling |
| 30-44 | Monitor every 3 months: eGFR  
Monitor every 3-6 months: electrolytes, bicarbonate, parathyroid hormone, hemoglobin, albumin  
Consider need for dose adjustment of medications |
| <30 | Referral to a nephrologist |

4.2 – Retinopathy Screening and Treatment

Diabetic retinopathy is the most frequent cause of new cases of blindness in adults. Glaucoma, cataracts, and other eye disorders occur earlier and more frequently in people with diabetes.

Diabetic retinopathy is a major microvascular complication of diabetes, strongly correlated to the duration of diabetes.

General recommendations: Optimize glycemic control and BP control to reduce the risk or slow the progression of retinopathy.

Screening:
- Initial dilated and comprehensive eye exam by a trained eye care provider (ophthalmologist or optometrist)
  - Shortly after diagnosis of T2DM
  - If no retinopathy for one or more eye exams, consider exams every 2 years.
  - If retinopathy is found: annual exam
  - If retinopathy progresses or visual changes reported: more frequent exams
- Fundus photographs: good screening tool but must be interpreted by a trained eye care provider. Not a substitute for a comprehensive eye exam.
- Results of eye examinations should be documented and transmitted to the referring health care professional.

ADA (2014). Standards of Medical Care in Diabetes – 2014. Diabetes Care, 37 (suppl 1), S14-S80. (Click here)
### Section II. Outline of ADA Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes

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<td><strong>Treatment:</strong></td>
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</table>
| • Promptly refer patients with any level of macular edema, severe non-proliferative diabetic retinopathy (NPDR) or any proliferative diabetic retinopathy (PDR) to eye care provider knowledgeable and experienced in the treatment of diabetic retinopathy.  
  o Reinforce the need for frequent follow-up visits with eye care provider  
• Laser photocoagulation therapy indicated to reduce risk of vision loss for high risk PDR, NPDR, and clinically significant macular edema  
• Anti-VEGF therapy indicated for diabetic macular edema |
| **Special Consideration:**  | Presence of retinopathy is not a contraindication to aspirin therapy for cardio protection. |            |

#### 4.3 – Neuropathy Screening and Treatment

**Screening:**
- All patients for DPN, starting at diagnosis and at least annually thereafter, using simple clinical tests.  
- Assess for loss of sensation in limbs, symptoms of pain, tingling, paresthesia, weakness or gait instability (Joslin, 2012).  
- Electrophysiological testing (EMG, quantitative sensory test) or referral to neurologist rarely needed except with atypical clinical features  
- Assess for signs and symptoms of cardiovascular autonomic neuropathy (CAN) at diagnosis. Standard cardiovascular reflex testing is easy to perform; rarely need sophisticated testing.  
- Assess for cause of severe or atypical neuropathy other than diabetes*.  

**Treatment:**
- Consider medications for the relief of specific symptoms related to painful DPN, and autonomic neuropathy as they improve quality of life**.

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[Click here](click here)
**Section II. Outline of ADA Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes**

### Care Components

<table>
<thead>
<tr>
<th>Testing, Frequency, Guidelines</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>* e.g. neurotoxic medications, alcohol abuse, vitamin B12 deficiency (long duration of metformin), renal disease, chronic inflammatory demyelinating neuropathy, inherited neuropathies, and vasculitis.</td>
<td>ADA (2014). Standards of Medical Care in Diabetes – 2014. <em>Diabetes Care, 37</em> (suppl 1), S14-S80. <a href="https://www.diabetes.org">Click here</a></td>
</tr>
<tr>
<td><strong>DPN symptoms, and especially neuropathic pain, can be severe with quick onset. Symptoms are associated with lower quality of life, limited mobility, depression, and social dysfunction. Effective treatments are limited, so treatment decision should follow a trial-and-error, step-wise approach with careful attention to symptom relief, medication adherence, and side effects.</strong></td>
<td>Boulton et al. (2008). Comprehensive Foot Examination and Risk Assessment: A report of the Task Force of the Foot Care Interest Group of the American Diabetes Association, with endorsement by the American Association of Clinical Endocrinologists. <em>Diabetes Care, 31</em>(8), 1679-1685. <a href="https://www.diabetes.org">Click here</a></td>
</tr>
</tbody>
</table>

### 4.4 – Foot Care

**Major causes of morbidity, disability, and quality of life issues in people with diabetes include: amputation, foot ulcers, diabetic neuropathy and peripheral arterial disease (PAD). Loss of perception and reduced vibration perception predict ulcer.**

Early detection and management of risk factors can prevent and delay adverse outcomes. Risk factors include: history of amputation, past foot ulcer, peripheral neuropathy, foot deformity, peripheral vascular disease, visual impairment, diabetic nephropathy, poor glycemic control, and cigarette smoking.

**Examination:**
- At least annually, comprehensive foot examination* to identify risk factors predictive of ulcers and amputations.
  - General inspection for skin integrity, musculoskeletal deformities; pedal pulses; test for loss of protective sensation (LOPS) (10-g monofilament plus any one of the following tests:
    - Vibration using 128 Hz tuning fork,
    - Pinprick sensation,
    - Ankle reflexes, or
    - Vibration perception threshold)**.

**Screening:**
- Initial PAD screening: history for claudication and pedal pulses
- Consider obtaining ankle-brachial index (ABI) †.

**Consider referral to foot care specialists:**
- For ongoing preventive care and life-long surveillance: patients who smoke, have LOPS and structural abnormalities, or have history of prior lower-extremity complications.
- For foot ulcers ‡ and wound care.
- For further vascular assessment for patients with significant claudication or a positive ABI. Consider exercise, medications, and surgical options.

**Patient/Caregiver Education:**
- Educate high risk patients on:
  - Implications of LOPS,
  - Importance of daily monitoring,
  - Proper care of the foot (nail and skin care),
  - Selection of foot wear.
- With LOPS:
### Section II. Outline of ADA Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes

<table>
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<tr>
<th>Care Components</th>
<th>Testing, Frequency, Guidelines</th>
<th>References</th>
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<tbody>
<tr>
<td></td>
<td>o Educate on using hand palpation, and</td>
<td><strong>ADA published screening recommendations and practical descriptions of how to perform components of the comprehensive foot examination (Boulton et al., 2008).</strong></td>
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<td></td>
<td>o Visual inspection.</td>
<td><strong>Any of the five can be used to detect LOPS, although normally the monofilament and one other is recommended. One or more abnormal tests would suggest LOPS, while at least two normal tests (without any abnormal test) would rule out LOPS.</strong></td>
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<tr>
<td></td>
<td>o Educate caregivers on proper foot care for patients with visual, physical and/or cognitive restraints that will impair self-assessment of foot condition.</td>
<td>† Consider ABI in patients over 50 yrs old, and under 50 yrs old with PAD risk factors (smoking, hypertension, hyperlipidemia, or duration of diabetes &gt; 10 years).</td>
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</table>
## 5.0 – Immunizations

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<tr>
<th>Care Components</th>
<th>Testing, Frequency, Guidelines</th>
<th>References</th>
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<tr>
<td><strong>5.1 – Immunizations</strong></td>
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<tr>
<td>Influenza and pneumonia are common, preventable infectious diseases associated with high mortality and morbidity in the elderly and in people with chronic diseases.</td>
<td>Annually provide an influenza vaccine to all diabetic patients.</td>
<td></td>
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<tr>
<td><strong>Pneumococcal Polysaccharide Vaccine</strong></td>
<td></td>
<td>CDC (2014). Vaccines and Immunizations: Recommendations and Guidelines. (<a href="#">Click here</a>)</td>
</tr>
<tr>
<td>People with diabetes may be at increased risk of the bacteremic form of pneumococcal infection and have been reported to have a high risk of nosocomial bacteremia, which has a mortality rate as high as 50%.</td>
<td>Administer to all diabetic patients. A one-time revaccination is recommended for:</td>
<td>- The CDC Advisory Committee on Immunization Practices recommends influenza and pneumococcal vaccines for all individuals with diabetes.</td>
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<tr>
<td>o Individuals aged &gt; 65 yrs who have been immunized &gt; 5 years ago. o Individuals with nephrotic syndrome, chronic renal disease, and other immunocompromised states, such as after transplantation.</td>
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<td><strong>Hepatitis B Vaccine (HBV)</strong></td>
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<td>CDC analyses suggest that, excluding persons with HBV-related risk behaviors, acute HBV infection is about twice as high among adults with diabetes aged 23 yrs and over compared with adults without diabetes.</td>
<td>Administer to unvaccinated adults with diabetes who are aged 19–59 yrs as soon as possible after a diagnosis is made. Consider administering to unvaccinated adults with diabetes who are aged ≥ 60 yrs.</td>
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</table>
## Section II. Outline of ADA Standards of Medical Care for Adults at Risk for or with Type 2 Diabetes

### 6.0 – Mental Health and Emotional Well-Being

#### Care Components

**6.1 – Psychosocial Assessment and Care**

Emotional well-being is an important part of diabetes care and self-management. Psychological and social problems can impair the individual’s or family’s ability to carry out diabetes care tasks and therefore compromise health status.

Depression affects about 20-25% of adults with diabetes. Depression increases the risk of all-cause mortality and may increase the risk of macrovascular events among adults with T2DM at high risk for cardiovascular events (Sullivan et al., 2012).

Diabetes-related distress is distinct from clinical depression and its prevalence is reported as 18-45%, with an incidence of 38-48% over 18 months. High levels of distress linked to: A1C, self-efficacy, dietary and exercise behavior and medication taking.

#### Testing, Frequency, Guidelines

**Screening**: Psychosocial evaluation should be an integral component of initial assessment and ongoing care.

- Assess newly diagnosed diabetes patients and newly diagnosed complication from diabetes for:
  - Ability to cope with emotional impact and lifestyle changes
  - Level of social support
  - External sources of non-diabetics stress (e.g., financial, social, emotional, mental health disorders)

- Assess any changes in treatment, or self-care behaviors such as:
  - Insulin initiation
  - Diabetes burnout/lack of adherence
  - Symptoms of depression
  - A1C >10%
  - Exaggerated fear of hypoglycemia or recurrent DKA
  - Family conflict related to diabetes
  - Substance abuse

- **Screening instruments**:
  - Depression: PHQ-9/PHQ-2*, Diabetes Distress Scale
  - Substance abuse: CAGE, AUDIT

#### References

ADA (2014). Standards of Medical Care in Diabetes – 2014. Diabetes Care, 37 (suppl 1), S14-S80. ([Click here](#))

Sullivan et al. (2012). Depression Predicts All-Cause Mortality: Epidemiological evaluation from the ACCORD HRQL substudy. Diabetes Care, 35, 1708-1715. ([Click here](#))

Joslin Diabetes Center and Joslin Clinic. (2012, May 16). Clinical Guideline for Adults with Diabetes. ([Click here](#))

Joslin Diabetes Center and Joslin Clinic. (2007, February 02). Guideline for the Care of the Older Adult with Diabetes. ([Click here](#))


Fisher et al. (2008). Development of a brief diabetes distress screening instrument. Annals of Family Medicine, 6(3), 246-252. ([Click here](#))

<table>
<thead>
<tr>
<th>Babor, T.F., Higgins-Biddle, J.C., Saunders, J.B., Monteiro, M.G. (2001). AUDIT: The Alcohol Use Disorders Identification Test, Guidelines for Use in Primary Care. (WHO/MSD/MSB/01.6a). (Click here)</th>
</tr>
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</table>

*PHQ-2: first 2 items of PHQ-9 (e.g., Over the last 2 weeks, how often have you been bothered by any of the following problems? 1. Little interest or pleasure in doing things; 2. Feeling down, depressed, or hopeless)*
Section III. Lifestyle Management and Self-Management Education (DSME)

1.0 – Lifestyle Management

The majority of individuals with T2DM are overweight or obese (~80%). Intensive lifestyle intervention can improve fitness, glycemic control, and cardio-vascular risk factors for relatively small changes in body weight (Inzucchi et al., 2012).

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<tr>
<th>Care Components/Recommendations</th>
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<tr>
<td><strong>1.1 – Nutrition</strong></td>
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<td><strong>Recommendation:</strong></td>
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<td>• Evidence suggests that there is not an ideal percentage of calories from carbohydrate, protein, and fat for all people with diabetes. Therefore, macronutrient distribution should be based on individualized assessment of current eating patterns, preferences, and metabolic goals.</td>
<td>ADA (2014). Standards of Medical Care in Diabetes – 2014. <em>Diabetes Care</em>, 37 (suppl 1), S14-S80. (<a href="http://www.diabetesjournals.org">Click here</a>)</td>
</tr>
<tr>
<td>• Individuals who have prediabetes or diabetes should receive individualized medical nutrition therapy (MNT) as needed to achieve treatment goals.</td>
<td>Evert et al. (2013). ADA Position Statement: Nutrition Therapy Recommendations for the Management of Adults with Diabetes. <em>Diabetes Care</em>, 1-22. (<a href="http://www.diabetesjournals.org">Click here</a>)</td>
</tr>
<tr>
<td>• A variety of eating patterns (combinations of different foods or food groups) are acceptable for the management of diabetes. Personal preference (e.g., tradition, culture, religion, health beliefs and goals, economics) and metabolic goals should be considered when recommending one eating pattern over another.</td>
<td>Kirkman et al. (2012). Diabetes in Older Adults. <em>Diabetes Care</em>, 35(12), 2650-2664. (<a href="http://www.diabetesjournals.org">Click here</a>)</td>
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<tr>
<td>• Carbohydrates: Monitoring carbohydrate intake, whether by carbohydrate counting or experience-based estimation, remains a key strategy in achieving glycemic control (Evert et al., 2013).</td>
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<td>o Collaborative goals should be developed with the individual with diabetes.</td>
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<td>o The amount of carbohydrates and available insulin may be the most important factor influencing glycemic response after eating and should be considered when developing the eating plan.</td>
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<td>o Carbohydrate intake from vegetables, fruits, whole grains, legumes, and dairy products should be advised over intake from other carbohydrate sources, especially those that contain added fats, sugars, or sodium.</td>
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<td>o People with diabetes should consume at least the amount of fiber and whole grains recommended for the general public.</td>
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<td>▪ Increase intake to 14 g fiber/1,000 kcals daily or about 25 g/day for adult women and 38 g/day for adult men.</td>
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<td>• Protein (Evert et al., 2013):</td>
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<td>o For people with diabetes and diabetic kidney disease (either micro- or macroalbuminuria), reducing the amount of dietary protein below the usual intake is not recommended because it does not alter glycemic measures, cardiovascular risk measures, or the course of glomerular filtration rate (GFR) decline.</td>
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<td>o In individuals with type 2 diabetes, ingested protein appears to increase insulin response without increasing plasma glucose concentrations. Therefore, carbohydrate sources high in protein should not be used to treat or prevent hypoglycemia.</td>
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</table>
Fats: Fat quality appears to be far more important than quantity. The type of fatty acids consumed is more important than total fat in the diet in terms of supporting metabolic goals and influencing the risk of CVD (Evert et al., 2013).
  - Individuals with diabetes should be encouraged to moderate their fat intakes to be consistent with their goals to lose or maintain weight.
  - A Mediterranean-style, MUFA (monounsaturated fatty acids)-rich eating pattern may benefit glycemic control and CVD risk factors and can therefore be recommended as an effective alternative to a lower fat, higher-carbohydrate eating pattern.
  - The recommendation for the general public to eat fish (particularly fatty fish) at least two times (two servings) per week is also appropriate for people with diabetes.

Sodium: The recommendation for the general population to reduce sodium to 2,300 mg/day is also appropriate for people with diabetes (Evert et al., 2013).
  - For individuals with both diabetes and hypertension, further reduction in sodium intake should be individualized.

Supplements for diabetes management: There is no clear evidence of benefit from vitamin or mineral supplementation in people with diabetes who do not have underlying deficiencies (Evert et al., 2013).

Special Considerations (Evert et al., 2013):
- A simple diabetes meal planning approach such as portion control or healthful food choices may be better suited to individuals with type 2 diabetes identified with health and numeracy literacy concerns.
  - This may also be an effective meal planning strategy for older adults.

Special Considerations for Older Adults (Kirkman et al., 2012):
- Older adults may be at risk for undernutrition due to anorexia, altered taste and smell, swallowing difficulties, oral/dental issues, and functional impairments leading to difficulties in preparing or consuming food. Overly restrictive eating patterns, either self-imposed or provider-directed, may contribute additional risk for older adults with diabetes. The Mini-Nutritional Assessment (MNA; http://www.mna-elderly.com/), specifically designed for older adults, is simple to perform and may help determine whether referral to a registered dietitian for medical nutrition therapy (MNT) is needed (Kirkman et al., 2012).

1.2 – Eating Patterns Reviewed

Mediterranean Style (Evert et al., 2013):
- Includes abundant plant food (fruits, vegetables, breads, other forms of cereals, beans, nuts and seeds); minimally processed, seasonally fresh, and locally grown foods; fresh fruits as the typical daily dessert and concentrated sugars or honey consumed only for special occasions; olive oil as the principal source of dietary lipids; dairy products (mainly cheese and yogurt) consumed in low to moderate amounts; fewer than 4 eggs/week; red meat consumed in low frequency and amounts; and wine consumption in low to moderate amounts generally with meals.

(Note: Mostly studied in the Mediterranean region, has been observed to improve cardiovascular risk factors (i.e., lipids, blood pressure, triglycerides) in individuals with diabetes and lower combined end points for CVD events and stroke when supplemented with mixed nuts)
Vegetarian and Vegan (Evert et al., 2013):
- The two most common ways of defining vegetarian diets in the research are vegan diets (diets devoid of all flesh foods and animal-derived products) and vegetarian diets (diets devoid of all flesh foods but including egg [ovo] and/or dairy [lacto] products). Features of a vegetarian-eating pattern that may reduce risk of chronic disease include lower intakes of saturated fat and cholesterol and higher intakes of fruits, vegetables, whole grains, nuts, soy products, fiber, and phytochemicals.

Low Fat (Evert et al., 2013):
- Emphasizes vegetables, fruits, starches (e.g., breads/crackers, pasta, whole grains, starchy vegetables), lean protein, and low-fat dairy products. Defined as total fat intake, 30% of total energy intake and saturated fat intake, 10%.

Low Carbohydrate (Evert et al., 2013):
- Focuses on eating foods higher in protein (meat, poultry, fish, shellfish, eggs, cheese, nuts and seeds), fats (oils, butter, olives, avocado), and vegetables low in carbohydrate (salad greens, cucumbers, broccoli, summer squash). The amount of carbohydrate allowed varies with most plans allowing fruit (e.g., berries) and higher carbohydrate vegetables; however, sugar-containing foods and grain products such as pasta, rice, and bread are generally avoided. There is no consistent definition of “low” carbohydrate. In research studies, definitions have ranged from very low-carbohydrate diet (21–70 g/day of carbohydrates) to moderately low-carbohydrate diet (30 to 40% of calories per day from carbohydrates).

DASH (Evert et al., 2013):
- Emphasizes fruits, vegetables, and low-fat dairy products, including whole grains, poultry, fish, and nuts and is reduced in saturated fat, red meat, sweets, and sugar-containing beverages. The most effective DASH diet was also reduced in sodium.

(Note: Six vegetarian and low-fat vegan studies in individuals with type 2 diabetes were reviewed. Studies ranged in duration from 12 to 74 weeks, and the diets did not consistently improve glycemic control or CVD risk factors except when energy intake was restricted and weight was lost. Diets often did result in weight loss.)

(Note: In the Look AHEAD trial, an energy-reduced low-fat eating pattern was encouraged for weight loss, and individuals achieved moderate success. However, in a systematic review and in four studies and in a meta-analysis published since the systematic review, lowering total fat intake did not consistently improve glycemic control or CVD risk factors. Benefit from a low fat eating pattern appears to be more likely when energy intake is also reduced and weight loss occurs.)

(Note: Despite the inconclusive results of the studies evaluating the effect of differing percentages of carbohydrates in people with diabetes, monitoring carbohydrate amounts is a useful strategy for improving postprandial glucose control. Evidence exists that both the quantity and type of carbohydrate in a food influence blood glucose level, and total amount of carbohydrate eaten is the primary predictor of glycemic response.)

(Note: In people without diabetes, the DASH eating plan has been shown to help control blood pressure and lower risk for CVD and is frequently recommended as a healthful eating pattern for the general population. Limited evidence exists on the effects of the DASH eating plan on health outcomes specifically in individuals with diabetes; however, one would expect similar results to other studies using the DASH eating plan.)
1.3 – Physical Activity

Physical activity (PA) should be an integral component of the diabetes care plan to optimize glucose control, decrease cardiovascular risk factors, and achieve or maintain optimal body weight.

Recommendations (Colberg et al., 2010):
- Before undertaking exercise more intense than brisk walking, sedentary persons with type 2 diabetes will likely benefit from an evaluation by a physician. ECG exercise stress testing for asymptomatic individuals at low risk of CAD is not recommended but may be indicated for higher risk.
- At least 150 min/week of moderate to vigorous aerobic exercise spread out during at least 3 days during the week, with no more than 2 consecutive days between bouts of aerobic activity.
- In addition to aerobic training, persons with type 2 diabetes should undertake moderate to vigorous resistance training at least 2–3 days/week.
- Encourage patients to increase their total daily unstructured PA.
- Flexibility training may be included but should not be undertaken in place of other recommended types of PA.
- Efforts to promote PA should focus on developing self-efficacy and fostering social support from family, friends, and health care providers.

Medication effects on exercise responses (Colberg et al., 2010):
- Medication dosage adjustments to prevent exercise-associated hypoglycemia may be required by individuals using insulin or certain insulin secretagogues.
- Most other medications prescribed for concomitant health problems do not affect exercise, with the exception of β-blockers, some diuretics, and statins.

Exercise with long-term complications of diabetes (Colberg et al., 2010):
- Known CVD is not an absolute contraindication to exercise.
  - Individuals with angina classified as moderate or high risk should likely begin exercise in a supervised cardiac rehabilitation program.
- PA is advised for anyone with PAD (peripheral arterial disease).
- Individuals with peripheral neuropathy and without acute ulceration may participate in moderate weight-bearing exercise.
  - Comprehensive foot care including daily inspection of feet and use of proper footwear is recommended for prevention and early detection of sores or ulcers.
  - Moderate walking likely does not increase risk of foot ulcers or reulceration with peripheral neuropathy.
- Individuals with CAN (cardiovascular autonomic neuropathy) should be screened and receive physician approval and possibly an exercise stress test before exercise initiation.
  - Exercise intensity is best prescribed using the HR reserve method with direct measurement of maximal HR.
- Individuals with uncontrolled proliferative retinopathy should avoid activities that greatly increase intraocular pressure and hemorrhage risk.
- Exercise training increases physical function and QOL in individuals with kidney
disease and may even be undertaken during dialysis sessions.
  o The presence of microalbuminuria per se does not necessitate exercise restrictions.

- **Special Considerations** (Colberg et al., 2010):
  - Individuals with type 2 diabetes may engage in PA, using caution when exercising with BG levels exceeding 300 mg/dl (16.7 mmol/l) without ketosis, provided they are feeling well and are adequately hydrated.
  - Users of insulin and insulin secretagogues are advised to supplement with carbohydrate as needed to prevent hypoglycemia during and after exercise.

- **Special Considerations for Older Adults** (Kirkman et al., 2012):
  - Older adults with diabetes who are otherwise healthy and functional should be encouraged to exercise to targets recommended for all adults with diabetes. Even patients with poorer health status benefit from modest increases in physical activity.

ADA (2014). Standards of Medical Care in Diabetes – 2014. *Diabetes Care, 37 (suppl 1)*, S14-S80. ([Click here](#))

Colberg et al. (2010). Exercise and Type 2 Diabetes: the American College of Sports Medicine and the American Diabetes Association: Joint position statement. *Diabetes Care, 33(12)*, e147-e167. ([Click here](#))

Kirkman et al. (2012). Diabetes in Older Adults. *Diabetes Care, 35(12)*, 2650-2664. ([Click here](#))
### 1.4 – Smoking

Smoking causal relationship to T2DM. In fact, smokers are 30–40% more likely to develop T2DM than nonsmokers. And people with diabetes who smoke are more likely than nonsmokers to have trouble with insulin dosing and with controlling their disease (see DHHS, 2014).

Routine and thorough assessment of tobacco use is key to preventing smoking and encouraging cessation.

Studies of people with diabetes consistently demonstrate that smokers (and those exposed to secondary smoke) have an increased risk of CVD, premature death, and microvascular complication of diabetes.

**Assessment:**
- At every visit, assess the use of tobacco and level of nicotine dependence.

**Recommendations:**
- Advise the patient not to smoke or use tobacco products.
- Brief counseling in smoking cessation (e.g., use of quit lines), have shown efficacy and cost effectiveness.
- Add pharmacological therapy to counseling for patients motivated to quit.

**Special Considerations:**
- Although some patients may gain weight in the period shortly after smoking cessation, recent research has demonstrated that this weight gain does not diminish the substantial CVD risk benefit realized from smoking cessation (Clair et al., 2013).

### 1.5 – Alcohol

If adults with diabetes choose to drink alcohol, they should be advised to do in moderation:
- One drink per day or less for adult women
- Two drinks per day or less for adult men

Clinical approach to patients who drink too much (NIAAA, 2005):
- Ask about alcohol use
- Assess for alcohol use disorders
- CAGE and/or AUDIT (Alcohol Use Disorders Identification Test)
- Advise and assist in at-risk drinking and alcohol use disorders
- At follow-up: continue support

**Special Considerations** (Evert et al., 2013):
- Education and awareness regarding the recognition and management of delayed hypoglycemia is warranted (alcohol consumption may place people with diabetes at increased risk for delayed hypoglycemia, especially if taking insulin or insulin secretagogues).
### 2.0 – Diabetes Self-Management Education (DSME)

#### Care Components/Recommendations

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>References</th>
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<tr>
<td>Diabetes self-management education (DSME) is the ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. This process incorporates the needs, goals, and life experiences of the person with diabetes and is guided by evidence-based standards. The overall objectives of DSME are to support informed decision-making, self-care behaviors, problem-solving and active collaboration with the health care team and to improve clinical outcomes, health status, and quality of life (Haas et al., 2012).</td>
<td>ADA (2014). Standards of Medical Care in Diabetes – 2014. <em>Diabetes Care</em>, 37 (suppl 1), S14-S80. (<a href="#">Click here</a>)</td>
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<tr>
<td>• People with diabetes should receive DSME and diabetes self-management support (DSMS) according to National Standards for Diabetes Self-Management Education and Support when their diabetes is diagnosed and as needed thereafter (Haas et al., 2012).</td>
<td>Kirkman et al. (2012). Diabetes in Older Adults. <em>Diabetes Care</em>, 35(12), 2650-2664. (<a href="#">Click here</a>)</td>
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<td>• Refer to a recognized or accredited program. Look for educators (preferably CDEs) who identify their program as earning recognition status in the ADA Education Recognition Program or accreditation status in the AADE Accredited Diabetes Education Program. Both programs meet the Center for Medicare &amp; Medicaid Services’ (CMS) criteria for reimbursement for DSME/T*.</td>
<td>Glazier et al. (2006). A Systematic Review of Interventions to Improve Diabetes Care in Socially Disadvantaged Populations. <em>Diabetes Care</em>, 29(7), 1675-1688. (<a href="#">Click here</a>)</td>
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<tr>
<td>• DSME has been shown to be most effective when delivered by a multidisciplinary team with a comprehensive plan of care (Haas et al., 2012).</td>
<td>American Diabetes Association. (n.d.). <em>Education Recognition Program</em>. (<a href="#">Click here</a>)</td>
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<td>• Effective self-management and quality of life are the key outcomes of DSME and DSMS and should be measured and monitored as part of care.</td>
<td>American Association of Diabetes Educators. (n.d.). <em>AADE Diabetes Education Accreditation Program</em>. (<a href="#">Click here</a>)</td>
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<td>• DSME and DSMS should address psychosocial issues, since emotional well-being is associated with positive diabetes outcomes.</td>
<td>Disparities National Coordinating Center (2013). Diabetes Self-Management Education/Training Reimbursement Toolkit. (see <a href="#">section V</a>)</td>
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<tr>
<td>• DSME and DSMS programs are appropriate venues for people with prediabetes to receive education and support to develop and maintain behaviors that can prevent or delay the onset of diabetes.</td>
<td>Disparities National Coordinating Center (2013). <em>Diabetes Resource Guide</em>. (see <a href="#">section V</a>)</td>
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**Special Considerations for Older Adults** (Kirkman et al., 2012):
- DSME should be individualized and tailored to the individual’s unique medical, cultural, and social situation.
- May need to account for possible impairments in sensation (vision, hearing), cognition, and functional/physical status.
- Care partners—family, friends, or other caregivers—should be involved to increase the likelihood of successful self-care behaviors.
- Even in the absence of cognitive impairment, educators should consider that many patients may have low health literacy and numeracy skills or may be overwhelmed by the presence of multiple co-morbidities.
### Section III. Lifestyle Management and Self-Management Education (DSME)

<table>
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<tr>
<th>Special Considerations for Socially Disadvantaged Adults (Glazier et al., 2006):</th>
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<td>- Key strategies include cultural tailoring of the intervention, community educators or lay people leading the intervention, one-on-one interventions with individualized assessment and reassessment, incorporating treatment algorithms, focusing on behavior-related tasks, providing feedback, and high-intensity interventions (&gt;10 contact times).</td>
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*To earn recognition/accreditation status, staff must develop a diabetes education curriculum using the National Standards for Diabetes Self-Management Education, demonstrate continuous quality improvement, and pay an application fee. To learn more about achieving ADA Recognition and AADE Accreditation, refer to the Disparities National Coordinating Center’s Diabetes Self-Management Education/Training Reimbursement Toolkit (see section V).*
Section IV. References

Section II, 1.0 – Criteria for the Diagnosis of Type 2 Diabetes and Prediabetes:

   http://care.diabetesjournals.org/content/37/Supplement_1/S14.full.pdf+html. DOI: 10.2337/dc14-S014

   http://care.diabetesjournals.org/content/35/12/2650.full. DOI: 10.2337/dc12-1801

Section II, 2.0 – Glycemic Control Individualized to the Patient:

   http://care.diabetesjournals.org/content/37/Supplement_1/S14.full.pdf+html. DOI: 10.2337/dc14-S014


   http://care.diabetesjournals.org/content/35/12/2650.full. DOI: 10.2337/dc12-1801

   http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(09)61457-4/fulltext. DOI: 10.1016/S0140-6736(09)61457-4

   http://care.diabetesjournals.org/content/35/6/1364.long. DOI: 10.2337/dc12-0413

Section IV. References

7. *Diabetes Medication Quick Reference Tool*. See Section V.

Section II, 3.0 – Cardiovascular Risk Reduction and CVD Management:

Section IV. References


Section II, 4.0 – Prevention of Microvascular Complications:


Section II, 5.0 – Immunizations:


Section II, 6.0 - Mental Health and Emotional Well-Being:


[http://care.diabetesjournals.org/content/35/8/1708.full.pdf](http://care.diabetesjournals.org/content/35/8/1708.full.pdf). DOI: 10.2337/dc11-1791

[https://www.joslin.org/docs/Adult_guidelines_-_edits_05_16_2012-update_0213_(2).pdf](https://www.joslin.org/docs/Adult_guidelines_-_edits_05_16_2012-update_0213_(2).pdf)

[http://www.joslin.org/docs/Guideline_For_Care_Of_Older_Adults_with_Diabetes.pdf](http://www.joslin.org/docs/Guideline_For_Care_Of_Older_Adults_with_Diabetes.pdf)


[http://www.annfammed.org/content/6/3/246.full.pdf+html](http://www.annfammed.org/content/6/3/246.full.pdf+html). DOI: 10.1370/afm.842


[http://home.uchicago.edu/~tmurray1/research/articles/at%20least%20read/development%20and%20validation%20of%20a%20geriatric%20depression%20screening%20scale_a%20preliminary%20report.pdf](http://home.uchicago.edu/~tmurray1/research/articles/at%20least%20read/development%20and%20validation%20of%20a%20geriatric%20depression%20screening%20scale_a%20preliminary%20report.pdf).

### Section III, 1.0 - Lifestyle:

[http://care.diabetesjournals.org/content/37/Supplement_1/S14.full.pdf+html](http://care.diabetesjournals.org/content/37/Supplement_1/S14.full.pdf+html). DOI: 10.2337/dc14-S014

[http://care.diabetesjournals.org/content/early/2013/10/07/dc13-2042.full.pdf+html](http://care.diabetesjournals.org/content/early/2013/10/07/dc13-2042.full.pdf+html). DOI: 10.2337/dc13-2042


**Section III, 2.0 – Diabetes Self-Management Education:**


1. 1688. http://care.diabetesjournals.org/content/29/7/1675.full.pdf+html. DOI: 10.2337/dc05-1942


Section V. Resources

Diabetes Self-Management Education/Training Reimbursement Toolkit

The purpose of this toolkit is to provide QIOs, healthcare professionals, and other key stakeholders with vital information on the implementation and reimbursement for accredited DSMT programs that meet CMS guidelines for Medicare reimbursement.

Diabetes Resource Guide for Consumers

These resources will help consumers learn more about diabetes—what it is, how to lower the risk of diabetes, what to do if one has the disease, and how to manage on a day-to-day basis. The sections are set up so that consumers can pick and choose what they want or need to know.

Diabetes Medication Quick Reference Tool
This tool (the following pages) is intended to help clinicians quickly reference all current FDA approved diabetes medications. The tool is a table listing each diabetes medication by class and mechanisms of action, and includes information regarding dosing, A1C response, organ function (renal dosing), monitoring, and safety (contraindications, black box warnings, and adverse effects).
## Diabetes Medications Reference

### Non-Insulin Diabetes (Type 2) Agents - Oral and Injectable

<table>
<thead>
<tr>
<th>Generic (Brand)</th>
<th>Mechanism of Action</th>
<th>Expected A1c Δ</th>
<th>Weight gain?</th>
<th>Dosing/ Administration</th>
<th>Half Life</th>
<th>Contraindications</th>
<th>Warnings</th>
<th>Notes</th>
<th>Monitoring**</th>
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</thead>
<tbody>
<tr>
<td><strong>Biguanides (Oral)</strong></td>
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<tr>
<td>Metformin (Glucophage)</td>
<td>Decreases hepatic glucose production; decreases intestinal absorption of glucose, and improves insulin sensitivity (increases peripheral glucose uptake and utilization)</td>
<td>~1.5 2</td>
<td>Neutral to loss 2</td>
<td>Initial dose: 500 mg twice daily or 850 mg once daily</td>
<td>4-9 hrs 1</td>
<td>B12 deficiency 41, neuropathy, diarrhea, nausea/vomiting, flatulence, asthma, indigestion, abdominal discomfort, headache 3</td>
<td>Renal dysfunction for any reason (SCr &gt;1.5 mg/dL, males, ≥1.4 mg/dL females, or abnormal CrCl); metabolic acidosis; hypersensitivity; hold for contrast media 1</td>
<td>BBW: Risk of lactic acidosis (correlated to renal function). Suspect lactic acidosis if acidic but without evidence of ketoacidosis. 1</td>
<td>Do not initiate in patients above 80 years old unless normal renal function is established; titrate every 1-2 weeks to prevent diarrhea</td>
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<td></td>
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<td></td>
<td>ER 500-2000 mg once daily, titrate slowly to mitigate GI s/s 1</td>
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<td></td>
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<td>Take with meals to avoid GI upset 1</td>
<td></td>
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<td></td>
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<td></td>
<td>ER tablet: take with evening meal</td>
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<tr>
<td><strong>Sulfonylureas (Oral)</strong></td>
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<tr>
<td>Glimepiride (Amaryl)</td>
<td>Stimulates insulin release, reduces glucose output from liver, increases insulin sensitivity 12-16</td>
<td>~1.5 2</td>
<td>Weight gain 2</td>
<td>1-2 mg daily with first meal of the day 11</td>
<td>5-9 hrs 13</td>
<td>Hypoglycemia (especially in the elderly and with renal insufficiency); glyburide not recommended CrCl&lt;50 mL/min), dizziness, asthenia, headache, nausea 2,18</td>
<td>DKA 13, Increased risk of cardiovascular mortality 12-17; use with caution in patients with hepatic impairment (gliptide only) 14</td>
<td>Patients with G6PD deficiency may be at increased risk of hemolytic anemia 12-17; stress related states may necessitate discontinuation of therapy 12-17</td>
<td>S/S of hypoglycemia (fatigue, sweating, numbness of extremities) 12-17</td>
</tr>
<tr>
<td>Glipizide (Glucotrol, Glipizide XL)</td>
<td>Decreases hepatic glucose production; decreases intestinal absorption of glucose, and improves insulin sensitivity 12-16</td>
<td>~1.5 2</td>
<td>Weight gain 2</td>
<td>5 mg daily with first meal of the day 14</td>
<td>2-5 hrs 14</td>
<td></td>
<td>DKA, DM1</td>
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<td>DiaBeta: 1.25-2.5 mg daily with first meal of the day 15</td>
<td>DiaBeta: 10 hrs; Glynase: 4 hrs 15</td>
<td>concomitant use with bosentan, DKA, DM1</td>
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<tr>
<td>Glyburide (Diabeta, Glynase Pres Tab, Micronase)</td>
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<td>Glynase: 0.75-1.5 mg daily with first meal of the day</td>
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<tr>
<td>Tolazamid (Tolinase)</td>
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<td>100-250 mg daily with first meal of the day 16</td>
<td>7 hrs 16</td>
<td></td>
<td>DKA, DM1 16</td>
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<tr>
<td><strong>Meglitinides (Oral)</strong></td>
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<tr>
<td>Repaglinide (Prandin)</td>
<td>Blocks ATP dependent K+ channels, depolarizes membrane causing Ca 2+ entry, causing insulin release from beta cells; glucose dependent 4,5</td>
<td>~1-1.5 2</td>
<td>Weight gain 5,9</td>
<td>0.5 mg (2, 3 or 4 times) daily 15 minutes prior to meal 8</td>
<td>1 hr 6</td>
<td>Hypoglycemia, URI, sinusitis, nausea, diarrhea, arthralgia, back pain, headache 10</td>
<td>DKA, DM1, concurrent gemfibrozil 6</td>
<td>Care should be taken in those susceptible to glucose lowering effects 6,9</td>
<td>Concurrent use with NPH insulin not indicated 6,9</td>
</tr>
<tr>
<td>Nateglinide (Starlix)</td>
<td></td>
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<td></td>
<td>120 mg three times daily 15 minutes prior to meal 9</td>
<td>1.5 hrs 8</td>
<td>Upper Respiratory Infection (URI) 11</td>
<td>DKA, DM1 9</td>
<td>Adjuvant therapy with metformin, combination with sulfonylureas not recommended 9</td>
<td>Weight; lipid profile 9</td>
</tr>
<tr>
<td><strong>Thiazolidinediones (Oral)</strong></td>
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<tr>
<td>Pioglitazone (Actos)</td>
<td>PPAR γ agonist —increases the number of gene products involved in glucose and lipid metabolism; causes sodium reabsorption 4,5</td>
<td>~0.5-1.4 2</td>
<td>Weight gain, possibly from fluid retention 4,5</td>
<td>15-30 mg daily without regard for meals 4</td>
<td>3-7 hrs parent drug 17-24 hrs total 6</td>
<td>URI, headache, sinusitis, myalgia, pharyngitis, edema, hypoglycemia 4,6</td>
<td>Class III/IV heart failure 4,5</td>
<td>BBW - Not recommended for use in any patient with symptomatic heart failure. 4</td>
<td>Potential increased risk of bladder cancer 4; do not initiate in those with hepatic dysfunction, hematologic effects, may decrease Hgb/Hct</td>
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<tr>
<td>Rosiglitazone (Avandia)</td>
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<td></td>
<td>4 mg daily without regard for meals 5</td>
<td>3-4 hrs 5</td>
<td>URI, injury, headache, edema 5,7</td>
<td>Class III/IV heart failure 4,5</td>
<td>BBW—Not recommended for use in any patient with symptomatic heart failure. 5</td>
<td>Hematologic effect—may reduce Hgb/Hct; use with caution in patients with hepatic dysfunction 5</td>
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<td>a-glucosidase inhibitors (Oral)</td>
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<tr>
<td>Acarbose (Precose)</td>
<td>Competitive inhibitor of α-amylase and intestinal brush border of a-glycosidases, resulting in delayed hydrolysis of carbohydrates and therefore less absorption of glucose 19,20</td>
<td>~0.5-0.8 2</td>
<td>Neutral, may counteract weight gain of sulfonylurea 21,22</td>
<td>Initial: 25 mg daily with the first bite of each main meal; increase by 25 mg every 1-2 months 19</td>
<td>2 hrs 19</td>
<td>GI (flatulence, bloating, abdominal discomfort, and diarrhea) symptoms tend to begin at start of medication 19,20</td>
<td>DKA or cirtosis; inflammatory bowel disease; colonic ulceration, history or symptoms of partial intestinal obstruction, or a patient who has issues with disorders of digestion or absorption, or if gas would deteriorate condition of patient 19,20</td>
<td>Rarely elevated serum amniotransferase levels (acarbose only, at highest dose) 19, not recommended in patients with renal impairment 19,20</td>
<td>Serum transaminases every 3 months for first year and periodically afterward; renal function; BP 19</td>
</tr>
<tr>
<td>Miglitol (Glyset)</td>
<td></td>
<td></td>
<td></td>
<td>Initial: 25 mg daily with the first bite of each main meal; increase by 25 mg every 1-2 months 20</td>
<td>2 hrs 20</td>
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</tr>
</tbody>
</table>
# GLP1 Agonist (Injectable)

<table>
<thead>
<tr>
<th>Generic (Brand)</th>
<th>Mechanism of Action</th>
<th>Expected A1c Δ</th>
<th>Weight Loss</th>
<th>Dosing/ Administration</th>
<th>Half Life</th>
<th>Adverse Events*</th>
<th>Contraindications</th>
<th>Warnings</th>
<th>Notes</th>
<th>Monitoring**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exenatide (Byetta, Bydureon (ER))</td>
<td>Incretin analog (glucagon like peptide 1 agonist) which increases glucose dependent insulin, decreases inappropriate glucagon secretion, increases β-cell growth/replication, slows gastric emptying, and decreases food intake</td>
<td>~0.5-1% (IR); ~1.5-1.9% (ER)</td>
<td>loss due to reduced in-take</td>
<td>Bydureon (ER): 2 mg subQ once every 7 days; Byetta: 5 mg subQ twice daily within 60 minutes before morning and evening meal for 1 month, then 10 mg subQ once daily</td>
<td>2.4 hrs (IR); 2 weeks (ER)</td>
<td>nausea, vomiting, dyspepsia</td>
<td>medullary thyroid carcinoma (personal or family history, for Bydureon and liraglutide only); multiple endocrine neoplasia syndrome type 2 (for Bydureon and liraglutide only)</td>
<td>Black Box Warning - dose/duration dependent thyroid tumors have developed in animal studies (Bydureon and liraglutide only)</td>
<td>Reports of acute pancreatitis (both hemorrhagic and necrotizing); not for DM1; not for patients with gastroparesis or severe gastrointestinal disease; not recommended in severe renal impairment (CrCl &lt;30 mL/min)</td>
<td>renal function</td>
</tr>
<tr>
<td>Liraglutide (Victoza)</td>
<td>Initial 0.6 mg subQ daily for one week; then 1.2 mg subQ daily for one week; may increase to 1.8 mg/day subQ without regard to meals; do not mix with other medications</td>
<td>13 hrs</td>
<td>nausea, diarrhea, vomiting, constipation, headache</td>
<td></td>
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<td></td>
<td>Acute pancreatitis reported; little experience in hepatic impairment; use with caution in severely impaired patients; not for DM1; insulin secretagogues may cause hypoglycemia; may reduce the rate and extent of absorption of orally administered drugs</td>
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<tr>
<td>Alibegluide (Tanzeum)</td>
<td>Average weight loss of 1.4 kg due to reduced intake</td>
<td>7.0-9.9%</td>
<td>Initial 60 mg subQ once weekly, may increase to 50 mg administer with or without meals on the same day every week</td>
<td>5 days</td>
<td>upper respiratory tract infection (URTI), diarrhea, nausea, and injection site reaction</td>
<td>medullary thyroid carcinoma (personal or family history, multiple endocrine neoplasia syndrome, history of pancreatitis)</td>
<td>Black Box Warning - risk of thyroid C-cell tumors</td>
<td>REMS - serious risks include potential risk of medullary thyroid carcinoma and acute pancreatitis. Due to these risks, alibegluide is not recommended as first-line therapy for patients inadequately controlled on diet and exercise.</td>
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</tr>
</tbody>
</table>

# Dipotidyl peptidase IV inhibitors (Oral)

<table>
<thead>
<tr>
<th>Generic (Brand)</th>
<th>Mechanism of Action</th>
<th>Expected A1c Δ</th>
<th>Weight Loss</th>
<th>Dosing/ Administration</th>
<th>Half Life</th>
<th>Adverse Events*</th>
<th>Contraindications</th>
<th>Warnings</th>
<th>Notes</th>
<th>Monitoring**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitagliptin (Januvia)</td>
<td>Inhibits DPP-IV (dipeptidyl peptidase 4) which results in prolonged incretin levels. Incretin increases insulin synthesis, decreases glucagon secretion (which results in decreased hepatic glucose production). Incretin is inactivated by DPP IV</td>
<td>~0.5-1%</td>
<td>neutral</td>
<td>100 mg daily without regard for meals; see renal dose adjustment</td>
<td>12 hrs</td>
<td>Nasopharyngitis</td>
<td>Pancreatitis - reports of hemorrhagic and necrotizing</td>
<td>Not for DKA; no info on HF; no info on hepatic impairment; use caution in renal impairment; not for DM1; concomitant use of insulin secretagogue may increase risk of hypoglycemia</td>
<td>Renal function</td>
<td></td>
</tr>
<tr>
<td>Saxagliptin (Onglyza)</td>
<td></td>
<td></td>
<td></td>
<td>5 mg daily without regard for meals; see renal dose adjustment</td>
<td>2.5 hrs</td>
<td>URI, UTI, Headache</td>
<td>not for DM1; not for DKA</td>
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<tr>
<td>Linagliptin (Tradjenta)</td>
<td></td>
<td></td>
<td></td>
<td>5 mg daily without regard for meals</td>
<td>12 hrs</td>
<td>Nasopharyngitis</td>
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<tr>
<td>Alogliptin (Nesina)</td>
<td></td>
<td></td>
<td></td>
<td>25 mg daily with or without food</td>
<td>21 hrs</td>
<td>Headache, nasopharyngitis</td>
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<tr>
<td>Generic</td>
<td>A1c Δ</td>
<td>Weight Loss</td>
<td>Dosing/ Administration</td>
<td>Half Life</td>
<td>Adverse Events*</td>
<td>Contraindications</td>
<td>Warnings</td>
<td>Notes</td>
<td>Monitoring**</td>
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<tr>
<td>Generic (Brand)</td>
<td>Mechanism of Action</td>
<td>Expected A1c Δ</td>
<td>Weight Loss</td>
<td>Dosing/ Administration</td>
<td>Half Life</td>
<td>Adverse Events*</td>
<td>Contraindications</td>
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<tr>
<td>Sitagliptin (Januvia)</td>
<td>Inhibits DPP-IV (dipeptidyl peptidase 4) which results in prolonged incretin levels. Incretin increases insulin synthesis, decreases glucagon secretion (which results in decreased hepatic glucose production). Incretin is inactivated by DPP IV</td>
<td>~0.5-1%</td>
<td>neutral</td>
<td>100 mg daily without regard for meals; see renal dose adjustment</td>
<td>12 hrs</td>
<td>Nasopharyngitis</td>
<td>Pancreatitis - reports of hemorrhagic and necrotizing</td>
<td>Not for DKA; no info on HF; no info on hepatic impairment; use caution in renal impairment; not for DM1; concomitant use of insulin secretagogue may increase risk of hypoglycemia</td>
<td>Renal function</td>
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<tr>
<td>Saxagliptin (Onglyza)</td>
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<td>5 mg daily without regard for meals; see renal dose adjustment</td>
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<td>25 mg daily with or without food</td>
<td>21 hrs</td>
<td>Headache, nasopharyngitis</td>
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### Contraindications

- Pancreatitis
- Neutral
- Not for DM1; not for DKA
- لهذا بواسطة figure

### Warnings

- Not for DKA; no info on HF; no info on hepatic impairment; use caution in renal impairment; not for DM1; concomitant use of insulin secretagogue may increase risk of hypoglycemia

### Notes

- Renal function

### Monitoring**

- Renal function

---

**Note:** The table above summarizes information on the use of various GLP1 agonists and DPP-IV inhibitors, including their mechanism of action, expected changes in A1c, weight loss, dosing administration, half-life, adverse events, contraindications, warnings, and monitoring requirements. The information is based on the provided text and relevant knowledge. Further details and specific conditions should be consulted with a healthcare provider.
### Contraindications

1. Type 1 diabetes mellitus
2. Severe renal impairment (eGFR <30 mL/minute/1.73 m²)
3. End-stage renal disease or patients on dialysis.

### Warnings

1. Use with caution in patients with history of hypoglycemia.
2. Prior to therapy: hypoglycemic history and body weight; during therapy: urine sugar and acetone, pre-post prandial glucose, blood glucose, electrolytes, lipid profile.

### Notes

- Use with caution in patients with history of hypoglycemia.
- Prior to therapy: hypoglycemic history and body weight; during therapy: urine sugar and acetone, pre-post prandial glucose, blood glucose, electrolytes, lipid profile.

### General Resources


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### Table: Antidiabetic Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Generic (Brand)</th>
<th>Mechanism of Action</th>
<th>Expected Δ% A1c</th>
<th>Weight gain?</th>
<th>Dosing/ Administration</th>
<th>Half Life</th>
<th>Adverse Events* &gt;5%</th>
<th>Contraindications</th>
<th>Warnings</th>
<th>Notes</th>
<th>Monitoring**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pramlintide (Symlin)</td>
<td>Synthetic analog of human amylin co-secreted with insulin by pancreatic beta cells; reduces postprandial glucose increases via the following mechanisms: 1) prolongation of gastric emptying time; 2) reduction of postprandial glucagon secretion; 3) reduction of caloric intake through centrally-mediated appetite suppression.</td>
<td>~0.5:&lt;sup&gt;35&lt;/sup&gt;</td>
<td>loss:&lt;sup&gt;36&lt;/sup&gt;</td>
<td>Initial: Type 1: 1.15 mcg subQ immediately prior to meals (&gt;2500 kcal or ≥30 g of carbs); may titrate to 30-60 mcg subQ daily:&lt;sup&gt;35,36&lt;/sup&gt; Initial: Type 2 60 mcg subQ immediately prior to meals (&gt;2500 kcal or ≥30 g of carbs); may titrate to 120 mcg subQ daily:&lt;sup&gt;35,36&lt;/sup&gt; SubQ without regard to meals; do not mix with other medications; administer oral medications either 1 hr before or 2 hrs after pramlintide.&lt;sup&gt;35&lt;/sup&gt;</td>
<td>1 hr:&lt;sup&gt;35&lt;/sup&gt;</td>
<td>Nausea, headache, anorexia, vomiting, abdominal pain, fatigue, dizziness, coughing, pharyngitis (placebo+insulin vs Symlin+insulin)&lt;sup&gt;36&lt;/sup&gt;</td>
<td>Confirmed diagnosis of gastroparesis, hypoglycemia unawareness.&lt;sup&gt;35&lt;/sup&gt;</td>
<td>Black Box Warning - concomitant use with insulin has been associated with an increased risk of insulin-induced severe hypoglycemia.&lt;sup&gt;35&lt;/sup&gt;</td>
<td>Use with caution in patients with history of hypoglycemia.&lt;sup&gt;35&lt;/sup&gt;</td>
<td>Prior to therapy: hypoglycemic history and body weight; during therapy: urine sugar and acetone, pre-post prandial glucose, blood glucose, electrolytes, lipid profile.&lt;sup&gt;35&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Sodium glucose co-transporter 2 (SGLT2) inhibitor (New Drug, Recent FDA approval)</td>
<td>Canagliflozin (Invokana)</td>
<td>Lowers glucose levels in the blood stream by inhibiting SGLT2 receptors in the kidney. This allows glucose to pass in the kidney and be eliminated in the urine.</td>
<td>0.9% - 1.1%:&lt;sup&gt;37&lt;/sup&gt;</td>
<td>loss:&lt;sup&gt;37&lt;/sup&gt;</td>
<td>100 mg daily in the morning with or without food, may increase to 300 mg daily if eGFR is ≥60 mL/minute/1.73 m².&lt;sup&gt;38&lt;/sup&gt;</td>
<td>10.6 hrs; 300 mg; 13 hrs:&lt;sup&gt;38&lt;/sup&gt;</td>
<td>UTI, genital mycotic infection, hyperkalemia, increase LDL.&lt;sup&gt;38&lt;/sup&gt;</td>
<td>Severe renal impairment (eGFR &lt;30 mL/minute/1.73 m²); end-stage renal disease or patients on dialysis. 38/42</td>
<td>New Drug approved April 2013. None at this time</td>
<td>The severity of UTI and genital mycotic infection is mild to moderate. However, BUN is elevated up to 49.5 - 57 compare to placebo. &lt;sup&gt;37&lt;/sup&gt;</td>
<td>BUN, SCr, weight</td>
</tr>
<tr>
<td></td>
<td>Dapagliflozin (Farxiga)</td>
<td>None at this time</td>
<td>loss:&lt;sup&gt;42&lt;/sup&gt;</td>
<td>5 mg daily in the morning with or without food, may increase to 10 mg daily.&lt;sup&gt;42,43&lt;/sup&gt;</td>
<td>13 hrs:&lt;sup&gt;42&lt;/sup&gt;</td>
<td>UTI, genital mycotic infections, nasopharyngitis, hypovolemia, increase LDL.&lt;sup&gt;42&lt;/sup&gt;</td>
<td></td>
<td></td>
<td>New Drug approved January 2014. None at this time</td>
<td>Can cause initial hypotension especially in elderly patients, patients on loop diuretics and renal impairment patients. Can cause mild hypoglycemia with insulin and other antidiabetic medications.&lt;sup&gt;42&lt;/sup&gt;</td>
<td>BUN, SCr, LDL, BP</td>
</tr>
</tbody>
</table>

*greater than placebo and occurring in greater than 5% of patients - as monotherapy **in addition to HbA1c and blood glucose

BBW=black box warning; BP=blood pressure; BUN=blood urea nitrogen; CrCl=creatinine clearance; DKA=diabetic ketoacidosis; DM1=diabetes mellitus type 1; eGFR=estimated glomerular filtration rate; ER=extended release; GI=gastrointestinal; HF=heart failure; IR=immediate release; LFT=liver function test; LDL=low density lipoprotein; NPH=neutral protamine Hagedorn; REMS=Risk Evaluation & Mitigations Strategies; Scr=serum creatinine; SubQ=subcutaneous; S/S=signs/symptoms, URI=upper respiratory tract infection, UTI=urinary tract infection

Δ=change


<sup>37</sup>http://care.diabetesjournals.org/content/37/Supplement_1/S14.full.pdf+html.
References


This document is intended for educational purposes only as a quick reference guide to commonly used diabetes drugs. Information contained herein is condensed and incomplete. Please refer to full prescribing information and additional reference materials for detailed information on a specific drug or drug use, dosing in special populations and drug use in patients with specific medical conditions. DFMC/DFDC are not responsible for any omissions or errors. This document is not intended to override a clinician’s judgment in individual patient management.

Delmarva Foundation would like to thank the following students for their assistance in the creation of this reference: John Taktajian, Frederick Frimpong, Duyen Nguyen, Desiree Massari, Quyen Tran, Amy Chen, Christie Dunton.

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### Insulins

<table>
<thead>
<tr>
<th>Generic (Brand)</th>
<th>Onset</th>
<th>Peak</th>
<th>Duration</th>
<th>Half life</th>
<th>Dose Adjustments</th>
<th>Appearance</th>
<th>May it be mixed?</th>
<th>When to administer</th>
<th>Additional monitoring to HbA1c and plasma glucose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin lispro (Humalog)</td>
<td>Rapid</td>
<td>0.25-0.9hrs&lt;sup&gt;1&lt;/sup&gt;</td>
<td>0.5-2.9hrs&lt;sup&gt;1&lt;/sup&gt;</td>
<td>≤5hrs&lt;sup&gt;1&lt;/sup&gt;</td>
<td>-1hr&lt;sup&gt;1&lt;/sup&gt;</td>
<td>CrCl 10-50mL/min adminster 75% of dose; CrCl &lt;10mL/min administer 50% of dose&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Clear, colorless&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Yes from the vial only, rapid acting (clear) insulin must be added to the syringe first&lt;sup&gt;1,3,4&lt;/sup&gt;</td>
<td>Within 15 minutes before a meal&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Insulin aspart (Novolog)</td>
<td>Rapid</td>
<td>0.2-0.3hrs&lt;sup&gt;3&lt;/sup&gt;</td>
<td>1-3hrs&lt;sup&gt;3&lt;/sup&gt;</td>
<td>3-5hrs&lt;sup&gt;3&lt;/sup&gt;</td>
<td>81min&lt;sup&gt;3&lt;/sup&gt;</td>
<td>No adjustments needed&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Clear, colorless&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Within 5-10 minutes before a meal&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Electrolytes, potassium&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Insulin glulisine (Apidra)</td>
<td>Rapid</td>
<td>0.2-0.5hrs&lt;sup&gt;4&lt;/sup&gt;</td>
<td>1.6-2.9hrs&lt;sup&gt;4&lt;/sup&gt;</td>
<td>3-4hrs&lt;sup&gt;4&lt;/sup&gt;</td>
<td>42min&lt;sup&gt;4&lt;/sup&gt;</td>
<td>No adjustments needed&lt;sup&gt;4&lt;/sup&gt;</td>
<td>Clear, colorless&lt;sup&gt;4&lt;/sup&gt;</td>
<td>15 minutes before or within 20 minutes of starting a meal&lt;sup&gt;4&lt;/sup&gt;</td>
<td>Electrolytes, potassium&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Insulin regular (Humulin R, Novolin R)</td>
<td>Short</td>
<td>0.5hrs&lt;sup&gt;5&lt;/sup&gt;</td>
<td>2.5-5hrs&lt;sup&gt;5&lt;/sup&gt;</td>
<td>U-100: 4-12hrs</td>
<td>1.5hrs&lt;sup&gt;5&lt;/sup&gt;</td>
<td>CrCl 10-50mL/min administer 75% of dose; CrCl &lt;10mL/min administer 25-50% of dose&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Clear, colorless&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Yes from the vial only, insulin regular should be added to the syringe first&lt;sup&gt;5&lt;/sup&gt;</td>
<td>30-60 minutes before a meal&lt;sup&gt;5&lt;/sup&gt;</td>
</tr>
<tr>
<td>Insulin NPH (Humulin N, Novolin N)</td>
<td>Intermediate</td>
<td>1-2hrs&lt;sup&gt;6&lt;/sup&gt;</td>
<td>4-12hrs&lt;sup&gt;6&lt;/sup&gt;</td>
<td>14-24hrs&lt;sup&gt;6&lt;/sup&gt;</td>
<td>4.4hrs&lt;sup&gt;6&lt;/sup&gt;</td>
<td>No adjustments needed&lt;sup&gt;6&lt;/sup&gt;</td>
<td>Cloudy or milky&lt;sup&gt;6&lt;/sup&gt;</td>
<td>Yes, NPH should be drawn up after all other types of insulins&lt;sup&gt;6&lt;/sup&gt;</td>
<td>Before every use the vial should be rolled between the palms to get good consistency of the suspension. Administered once to twice daily.&lt;sup&gt;6&lt;/sup&gt;</td>
</tr>
<tr>
<td>Insulin glargine (Lantus)</td>
<td>Long</td>
<td>3-4hrs&lt;sup&gt;7&lt;/sup&gt;</td>
<td></td>
<td>10.8-32hrs (~24 hrs)&lt;sup&gt;9&lt;/sup&gt;</td>
<td>24hrs&lt;sup&gt;9&lt;/sup&gt;</td>
<td>No adjustments needed&lt;sup&gt;9&lt;/sup&gt;</td>
<td>Clear, colorless&lt;sup&gt;9&lt;/sup&gt;</td>
<td>No&lt;sup&gt;9&lt;/sup&gt;</td>
<td>Once daily, anytime of day, but always at the same time every day&lt;sup&gt;9&lt;/sup&gt;</td>
</tr>
<tr>
<td>Insulin detemir (Levemir)</td>
<td>Long</td>
<td>3-4hrs&lt;sup&gt;10&lt;/sup&gt;</td>
<td>3-9hrs&lt;sup&gt;10&lt;/sup&gt;</td>
<td>6-23hrs (dose dependent)&lt;sup&gt;10&lt;/sup&gt;</td>
<td>5-7hrs (dose dependent)&lt;sup&gt;10&lt;/sup&gt;</td>
<td>No adjustments needed&lt;sup&gt;10&lt;/sup&gt;</td>
<td>Clear, colorless&lt;sup&gt;10&lt;/sup&gt;</td>
<td>No&lt;sup&gt;10&lt;/sup&gt;</td>
<td>Once to twice daily. When given twice daily administer 12 hours from morning dose or with the evening meal&lt;sup&gt;10&lt;/sup&gt;</td>
</tr>
<tr>
<td>70% insulin aspart protamine suspension</td>
<td>30% insulin aspart injection (Novolog 70/30)</td>
<td>10-20min&lt;sup&gt;11&lt;/sup&gt;</td>
<td>1-4hrs&lt;sup&gt;11&lt;/sup&gt;</td>
<td>18-24hrs&lt;sup&gt;11&lt;/sup&gt;</td>
<td>-8-9hrs&lt;sup&gt;11&lt;/sup&gt;</td>
<td>No adjustments needed&lt;sup&gt;11&lt;/sup&gt;</td>
<td>Cloudy or milky&lt;sup&gt;11&lt;/sup&gt;</td>
<td>No&lt;sup&gt;11&lt;/sup&gt;</td>
<td>Usually twice daily. Administer within 15 minutes before or after a meal. Vial should be rolled between the palms to achieve proper consistency&lt;sup&gt;11&lt;/sup&gt;</td>
</tr>
<tr>
<td>75% insulin lispro protamine</td>
<td>25% insulin lispro (Humalog 75/25)</td>
<td>Mixed</td>
<td>0.25-0.9hrs&lt;sup&gt;12&lt;/sup&gt;</td>
<td>1-6.9hrs&lt;sup&gt;12&lt;/sup&gt;</td>
<td>14-24hrs&lt;sup&gt;12&lt;/sup&gt;</td>
<td>Cannot be calculated&lt;sup&gt;12&lt;/sup&gt;</td>
<td>No adjustments needed&lt;sup&gt;12&lt;/sup&gt;</td>
<td>Cloudy or milky&lt;sup&gt;12&lt;/sup&gt;</td>
<td>No&lt;sup&gt;12&lt;/sup&gt;</td>
</tr>
<tr>
<td>50% insulin lispro protamine</td>
<td>50% insulin lispro (Humalog 50/50)</td>
<td>Mixed</td>
<td>0.8-4.9hrs&lt;sup&gt;12&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70% insulin NPH</td>
<td>30% insulin regular (Humulin 70/30, Novolin 70/30)</td>
<td>Mixed</td>
<td>0.9hrs&lt;sup&gt;14&lt;/sup&gt;</td>
<td>2-12hrs&lt;sup&gt;14&lt;/sup&gt;</td>
<td>18-24hrs&lt;sup&gt;14&lt;/sup&gt;</td>
<td>Cannot be calculated&lt;sup&gt;14&lt;/sup&gt;</td>
<td>No adjustments needed&lt;sup&gt;14&lt;/sup&gt;</td>
<td>Cloudy or milky&lt;sup&gt;14&lt;/sup&gt;</td>
<td>No&lt;sup&gt;14&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

### Initial Dosing Guidelines

- **Start low, and go slow**<sup>16</sup>
- 1 unit for every 10g of carbohydrate<sup>16</sup>
- Once-daily Insulin Therapy: starting dose: 0.1-0.25 units/kg/day<sup>17</sup>
- Multi-dose Insulin Therapy: starting dose: 0.3-0.5 units/kg/day<sup>17</sup>
- Typical starting regimen: Insulin glargine 10 units at bedtime ± mealtime coverage<sup>16</sup>
Sample Dosing Regimens:

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