A Sugar Cubed Approach: An Update and Comparison of the American Diabetes Association (ADA), the American Association of Clinical Endocrinologists (AACE), and American Geriatric Society (AGS) Diabetes Management Guidelines

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This knowledge-based activity is targeted for all pharmacists and is acceptable for 1.0 hour (0.1 CEU) of continuing education credit. This course requires completion of the program evaluation and at least a 70 percent grade on the program assessment questions.

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Description
The following is a comprehensive summary of the individual guidelines provided by the American Association of Clinical Endocrinologists (AACE), the American Diabetes Association (ADA), and the American Geriatrics Society (AGS). The summary will focus on the ADA guidelines and highlight specific differences between the other organizations’ guidelines. In addition, recommendations will be made to help guide pharmacists to the most appropriate guidelines to use for a specific patient. Information designated by orange boxes denotes a difference in recommendations by the AACE. Information in blue boxes emphasizes a difference in recommendations by the AGS.

Objectives
At the conclusion of this article, the participant should be able to:
1. Recognize the differences between the guidelines provided by the ADA, AACE, and AGS for diabetes management.
2. Explain appropriate diagnostic criteria for patients with Type 1, Type 2, and Gestational Diabetes.
3. Apply clinical information from appropriate guidelines for proper treatment of patients with diabetes.
4. Identify and treat potential complications of diabetes based on patient specific parameters.
5. Select the appropriate guideline to use based on patient specific characteristics.

Classification of Diabetes
The ADA classifies diabetes into one of four clinical classes: type 1 diabetes, type 2 diabetes, gestational diabetes mellitus (GDM) and diabetes due to other causes (ex: genetic defects in beta cell function, genetic defects in insulin action, drug or chemical induced, etc.)¹. Type 1 diabetes is an autoimmune disease in which antibodies are directed against beta cells of the pancreas, ultimately resulting in an absolute insulin deficiency. Type 2 diabetes is resultant from a progressive insulin secretory defect on the background of insulin resistance. Gestational diabetes is a condition in which pregnant women without a previous diagnosis of diabetes exhibit above normal blood glucose levels.

There are a number of patients not meeting the criteria for diagnosis of diabetes but are classified as having a condition known as prediabetes. These patients are at an increased risk of developing diabetes mellitus and cardiovascular disease. The diagnosis of prediabetes is made based on the presence of impaired fasting glucose (IFG) and/or impaired glucose tolerance (IGT), which are associated with obesity, dyslipidemia, and hypertension.
Historically, diabetes has been diagnosed using either a patient’s fasting plasma glucose (FPG) or the 2-hour value (2-h PG) in a 75 gram oral glucose tolerance test (OGTT). However, in 2010 the ADA adopted hemoglobin A1C (HgA1C) as a third diagnostic indicator of diabetes, given the diagnostic test is performed using a method certified by the National Glycohemoglobin Standardization Program and standardized or traceable to the Diabetes Control and Complications Trial reference assay. Point-of-care HgA1C testing has not yet been validated as a sufficiently accurate means of diagnosing diabetes. Table 1 shows the criteria for the diagnosis of diabetes.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting Plasma Glucose</td>
<td>≤ 99 mg/dL</td>
<td>Normal</td>
</tr>
<tr>
<td>(no caloric intake for at least 8 hours)</td>
<td>100-125 mg/dL</td>
<td>Impaired Fasting Glucose</td>
</tr>
<tr>
<td></td>
<td>≥ 126 mg/dL</td>
<td>Diabetes*1</td>
</tr>
<tr>
<td>Glucose</td>
<td>≤ 139 mg/dL</td>
<td>Normal</td>
</tr>
<tr>
<td>(2 hour value of 75g OGTT)</td>
<td>140-199 mg/dL</td>
<td>Impaired Glucose Tolerance</td>
</tr>
<tr>
<td></td>
<td>≥ 200 mg/dL</td>
<td>Diabetes*1</td>
</tr>
<tr>
<td>Hemoglobin A1C</td>
<td>≤ 5.6%*2</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td>5.7-6.4%*2</td>
<td>Pre-Diabetes</td>
</tr>
<tr>
<td></td>
<td>≥ 6.5%</td>
<td>Diabetes*1</td>
</tr>
</tbody>
</table>

*1 In the absence of unequivocal hyperglycemia, a repeat test should be completed to rule out laboratory error.

*2 The AACE specifies a HgA1C of ≤ 5.4% as normal, and 5.5-6.4% as high risk for developing diabetes.

Regardless of which diagnostic test is used, a definitive diagnosis cannot be made until a repeat test, performed on a different day, confirms the results of the first test. This practice helps rule out the chance of making a diagnosis based on laboratory error. It is preferred that the same test be repeated for confirmation to increase the chance of concurrence. However, if two different tests are performed and the results of both are above the threshold of diabetes, a positive diagnosis should be made.

The AACE guidelines do not recommend the HgA1C test as a valid tool for making a definitive diagnosis of diabetes, but rather a screening tool to help identify individuals in need of more specific testing.

ADAPTED FROM: Endocrin Pract. 2011;17 (Suppl 2).
Conversely, if two tests are performed and the results are discordant, the test with a result above the diagnostic threshold should be repeated. Diagnosis is then made on the basis of the confirmed test.

It is possible to have a test result above the diagnostic threshold on an initial test, and below the threshold on a repeat test. This is most likely for 2-h PG, somewhat less likely for FPG, and least likely for HgA1C. In this case, if laboratory error is not suspected, it is acceptable to monitor the patient closely and repeat testing in 3-6 months.

**RECOMMENDATIONS FOR SCREENING**
The ADA provides recommendations for diabetes screening in asymptomatic patients. A summary of these recommendations is shown in figure 1.

*Figure 1. Diabetes Testing in Asymptomatic Patients.*

<table>
<thead>
<tr>
<th>Adults</th>
<th>1. Overweight (BMI $\geq 25$ kg/m$^2$) $^1$ AND have ONE or more of the following risk factors:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Physical Inactivity</td>
</tr>
<tr>
<td></td>
<td>• First-degree relative with diabetes</td>
</tr>
<tr>
<td></td>
<td>• High-risk race/ethnicity (African American, Latino, Native American, Asian American, Pacific Islander)</td>
</tr>
<tr>
<td></td>
<td>• Women who delivered a baby weighing $&gt; 9$ lbs. or who were diagnosed with GDM</td>
</tr>
<tr>
<td></td>
<td>• Hypertension (blood pressure $\geq 140/90$ mm/Hg or on therapy for hypertension)</td>
</tr>
<tr>
<td></td>
<td>• HDL cholesterol level $&lt; 35$ mg/dL and/or triglyceride level $&gt; 250$ mg/dL</td>
</tr>
<tr>
<td></td>
<td>• Women with PCOS</td>
</tr>
<tr>
<td></td>
<td>• A1C $\geq 5.7%$, IGT, or IFG on previous testing</td>
</tr>
<tr>
<td></td>
<td>• Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)</td>
</tr>
<tr>
<td></td>
<td>• History of CVD</td>
</tr>
<tr>
<td></td>
<td>2. Those at risk for type 1 diabetes (prior transient hyperglycemia, relatives with type 1 diabetes) $^2$</td>
</tr>
<tr>
<td></td>
<td>3. In the absence of the above criteria, testing should begin at the age of 45 years</td>
</tr>
<tr>
<td></td>
<td>4. If results are normal, testing should be repeated at least every 3 years, with consideration of more frequent testing depending on initial results (e.g., those with prediabetes should be tested yearly) and risk status</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Children</th>
<th>Patients meeting the following criteria should be tested beginning at age 10 or at onset of puberty (if puberty occurs at a younger age) and should repeat testing every 3 years:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Overweight (BMI $&gt; 85^{th}$ percentile for age and sex, weight for height $&gt; 85^{th}$ percentile, or weight $&gt; 120%$ of ideal for height) AND have TWO or more of the following risk factors:</td>
</tr>
<tr>
<td></td>
<td>o Family history of type 2 diabetes in first- or second-degree relative</td>
</tr>
<tr>
<td></td>
<td>o Race/ethnicity (African American, Latino, Native American, Asian American, Pacific Islander)</td>
</tr>
<tr>
<td></td>
<td>o Signs of insulin resistance or conditions associated with insulin resistance (acanthosis nigricans, hypertension, dyslipidemia, PCOS, or birth weight small for gestational age)</td>
</tr>
<tr>
<td></td>
<td>o Maternal history of diabetes or GDM during the child’s gestation</td>
</tr>
</tbody>
</table>

$^1$At risk BMI may be lower in some ethnic groups
$^2$Testing for type 1 diabetes is done by measurement of islet autoantibodies

*Adapted From: Diabetes Care. 2012;35 (Suppl 1).*
The ADA has special recommendations for both screening and diagnosis of gestational diabetes. Because of the high number of pregnant women with undiagnosed type 2 diabetes, those with risk factors (see Figure 1) should be tested at the first prenatal visit using standard diagnostic criteria. If a diagnosis is made at this initial visit it should be type 1 or type 2, not gestational, diabetes.

For pregnant women without risk factors for diabetes and not previously known to have diabetes, screening should be done at 24-28 weeks gestation using the 75-g oral glucose tolerance test. The testing should be done in the morning after an overnight fast of at least 8 hours. A fasting plasma glucose as well as one and two hour measurements should be taken. Diagnostic criteria for GDM are shown in Table 2. Note that the diagnostic thresholds for gestational diabetes are different from that of type 1 and type 2 diabetes.

Table 2. Diagnosis of GDM in Pregnant Women.

<table>
<thead>
<tr>
<th>Result</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 92 mg/dL</td>
<td>Normal</td>
</tr>
<tr>
<td>≥ 92 mg/dL</td>
<td>GDM</td>
</tr>
<tr>
<td>&lt; 180 mg/dL</td>
<td>Normal</td>
</tr>
<tr>
<td>≥ 180 mg/dL</td>
<td>GDM</td>
</tr>
<tr>
<td>&lt; 153 mg/dL</td>
<td>Normal</td>
</tr>
<tr>
<td>≥ 153 mg/dL</td>
<td>GDM</td>
</tr>
</tbody>
</table>

Note: Repeat tests are NOT necessary for positive diagnosis of GDM

Adapted from: Diabetes Care. 2012;35 (Suppl 1).

Women with GDM should be screened 6-12 weeks post-partum for persistent diabetes using the non-pregnant criteria and a test other than HgA1C. Additionally, women with a history of GDM should have lifelong screening for the development of diabetes or prediabetes at least every three years. Those found to have prediabetes should receive lifestyle interventions or metformin to prevent diabetes.

PREVENTION / DELAY OF TYPE 2 DIABETES

The ADA recommends lifestyle modifications and/or pharmacologic therapy for patients with prediabetes to help prevent/delay the development of type 2 diabetes. Initial preventative measures include medication nutrition therapy. Metformin and/or insulin glargine therapy for the prevention of type 2 diabetes may also be considered, especially for those with a BMI > 35 kg/m², age < 60 years, and/or history of GDM. Finally, the ADA notes that follow-up counseling appears to be important for success in preventing type 2 diabetes.

The AACE concurs with ADA recommendations regarding the prevention of type 2 diabetes, and adds that caloric intake reduction along with increased physical activity proves beneficial as well. Pharmacologic therapy should be tried only after lifestyle changes for 3 to 6 months have failed to produce necessary improvement. In addition to metformin therapy, acarbose or thiazolidinediones (TZDs) may be appropriate to prevent the development of type 2 diabetes.
DIABETES CARE

Initial evaluation

A medical history is necessary to determine the status of a patient's diabetes condition. A physical examination with appropriate lab tests is also essential at this point to provide the most optimal care.

Management

The patient, family, physician, and other health care providers should all be included in helping to assist in the patient’s diabetic management. Diabetic self-management education (DSME) is essential in every patient’s diabetic care support. DSME is a comprehensive lifetime educational program, which provides patients with an understanding of their condition in order to effectively manage their diabetes. Effective self-management and quality of life are the key outcome measures for DSME. Patients that participate in DSME are more likely to practice the best treatment recommendations and therefore will have lower healthcare costs.

Glycemic Control

Glucose Monitoring

Blood glucose self-monitoring is often appropriate for patients using insulin therapy. Patients using multiple doses of insulin per day or utilizing insulin pump therapy are recommended to test ≥ 3 times daily. Self-monitoring can be used as a guide if insulin doses are less frequent. Self-monitoring of blood glucose is also recommended to achieve postprandial targets. Interstitial glucose monitoring is often appropriate for use in patients with frequent hypoglycemic episodes or in those willing to wear a monitor the majority of the day.

Patients with diabetes should have their HgA1C tested ≥ 2 times/year if at their treatment goal, or 4 times/year if not at goal.

AGS states that geriatric patients often self-monitor to prevent hypoglycemic events; however, testing depends on physician preference, cognitive ability, frailty, and willingness to self-monitor. In geriatrics, the AGS recommends HgA1C testing for patients not at goal at least every six months, and if the patient has been at a stable HgA1C for several years, yearly monitoring may be appropriate.

Treatment goals per each guideline are compared in Table 3.
Table 3. Treatment Goals in Diabetes.

<table>
<thead>
<tr>
<th></th>
<th>ADA</th>
<th>AACE/ACE</th>
<th>AGS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normal Patient</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HgA1C</td>
<td>&lt; 7%</td>
<td>&lt; 6.5%</td>
<td>&lt; 7%, but individualized</td>
</tr>
<tr>
<td>Pre-prandial glucose</td>
<td>70-130 mg/dL</td>
<td>≤ 110 mg/dL</td>
<td>-</td>
</tr>
<tr>
<td>Peak postprandial glucose</td>
<td>&lt; 180 mg/dL</td>
<td>&lt; 140 mg/dL</td>
<td>-</td>
</tr>
<tr>
<td><strong>Pregnancy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-prandial</td>
<td>≤ 95 mg/dL</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1h postmeal</td>
<td>≤ 140 mg/dL</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2h postmeal</td>
<td>≤ 120 mg/dL</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Pregnancy with Pre-existing Diabetes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-meal, bedtime, and overnight glucose</td>
<td>60-99 mg/dL</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Peak postprandial glucose</td>
<td>100-129 mg/dL</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>HgA1C</td>
<td>&lt; 6%</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Hospitalized Patients</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critically Ill patients on insulin</td>
<td>140-180 mg/dL</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Non-critically Ill patients on insulin</td>
<td>Pre-meal &lt; 140 mg/dL Random &lt; 180 mg/dL</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from: Endocrin Pract. 2011;17 (Suppl 2); JAGS. 2003;51 (Suppl 2), 65-80; Diabetes Care. 2012;35 (Suppl 1).

Pharmacotherapy

**Type 1 Diabetes**

Current guidelines for patients with type 1 diabetes include the use of multiple dose insulin injections. Specifically, the use of basal and prandial insulin three to four times a day or the use of continuous insulin infusion therapy (insulin pump) is recommended. It is also acceptable to match carbohydrate intake, pre-meal blood glucose and anticipated activity to prandial insulin, or use insulin analogs.

**Type 1 Diabetes in Children**

It is appropriate at this time to treat children with type 1 diabetes with the same guidelines as adults, adjusting where clinically appropriate.

**Type 2 Diabetes**

At diagnosis, the ADA has a recommended guideline to follow for treatment initiation. In asymptomatic patients, this guideline recommends initiating metformin therapy (unless contraindicated) along with lifestyle modifications. For patients with symptomatic hyperglycemia, insulin therapy is often the treatment of choice. If, after 3-6 months of treatment, a patient has not achieved their HgA1C goal, the addition of an oral agent, incretin mimetic, or insulin may be considered. Figure 2 depicts the ADA recommendations for initiation of therapy in patients with type 2 diabetes.

In comparison, the AACE categorizes the medications into two classes, targeting either FPG or 2-h PG to aid in therapeutic decision making.
Figure 2. Guidelines for the initiation of therapy in type 2 diabetes patients per the ADA.

**REMEMBER**
- *Tier 1: Therapies with the best supporting evidence for use*
- *Tier 2: Therapies with less supporting evidence*
- **SU: Sulfonylurea**
- ADA does not recommend glyburide
- Lifestyle changes throughout
- Begin with insulin if: HgA1C > 10%, FPG

Adapted From: Diabetes Care 2009; 32:193-203.

If insulin is indicated for a T2DM patient, long-acting basal insulin is the recommended first line therapy by AACE[^2]. Insulin glargine and insulin detemir are preferred over intermediate-acting NPH due to a lower risk of hypoglycemia. For patients requiring postprandial blood glucose control, rapid-acting insulin analogues are preferred over regular human insulin due to a more rapid onset and offset of action and a lower risk of hypoglycemia. Premixed insulin (fixed combination of shorter- and longer-acting components) analogue therapy may be considered for patients in which adherence is an issue. However, these preparations do not allow for dosage flexibility and have a higher risk for hypoglycemia than basal insulin or basal-bolus insulin therapy. Basal-bolus insulin allows for flexibility and is recommended for patients requiring intensive insulin therapy. Figure 3 provides an algorithm for the initiation of insulin therapy in patients with type 2 diabetes.
When targeting postprandial glucose, metglitinides and/or α-glucosidase inhibitors, short- or rapid-acting insulin, or metformin may be considered. Incretin-based therapies (DPP-4 inhibitors and glucagon-like peptide 1 [GLP-1] receptor agonists) also target postprandial glucose and decrease the risk for hypoglycemia. Pramlintide can be used as adjunct therapy to help with postprandial glucose control and weight reduction².

Adapted From: Diabetes Care 2009; 32:193-203.
Most patients with an initial HgA1C level greater than 7.5% will require combination therapy using agents with complementary mechanisms of action\(^1\). The AACE algorithm provided in Table 4 outlines treatment choices on the basis of the current HgA1C level. Table 5 provides an overview of antidiabetic drugs and their characteristics.

*Table 4. AACE/ACE Diabetes Treatment Recommendations.*

*Adapted From: Endocrin Pract. 2011;17 (Suppl 2)*

**Type 2 Diabetes in Children**

Diet and lifestyle modifications are indicated as first line; metformin or insulin may be introduced if glucose remains uncontrolled. Metformin is currently the only approved oral agent for children with type 2 diabetes\(^1\). The FDA has approved a pediatric dose of metformin in children aged 10-16 years for the management of type 2 diabetes. Children \(\geq 17\) years should use adult dosing for metformin\(^6\).

**Diabetes in Pregnant Women**

All women with pre-existing diabetes (type 1 or type 2) and previous or current gestational diabetes should receive regular or rapid acting insulin as preferred therapy. Continuous insulin infusion or long-acting insulin can be used to provide basal insulin levels. The ADA recommends that metformin and glyburide only be used in the setting of a controlled trial.

The AACE states that although not the current drug of choice, metformin has been used in pregnant women with diabetes and shown few fetal adverse events\(^2\). The use of glyburide has been proven safe and efficacious in pregnancy, as it does not cross the placenta.
### Table 5. Characteristics of Antidiabetic Drugs.

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>HgA1C Reduction (with metformin)</th>
<th>Risk of Hypoglycemia</th>
<th>Adverse Drug Reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metformin</td>
<td>Biguanide 1.5-2%</td>
<td>Neutral</td>
<td>Severe risk in renal and hepatic insufficiency, and CHF; weight loss</td>
</tr>
<tr>
<td>Sitagliptin</td>
<td>DPP4 Inhibitor 0.4-0.8% (1.2-1.4%)</td>
<td>Neutral</td>
<td>Modify dose in renal insufficiency</td>
</tr>
<tr>
<td>Liraglutide</td>
<td>Incretin mimetic 1%</td>
<td>Neutral</td>
<td>Increased risk of pancreatitis and thyroid tumors; weight loss</td>
</tr>
<tr>
<td>Glipizide</td>
<td>Sulfonylurea 1.5-2%</td>
<td>Moderate</td>
<td>Moderate risk in renal and hepatic insufficiency</td>
</tr>
<tr>
<td>Nateglinide</td>
<td>Metglitinides (short-acting secretagogue) 1%</td>
<td>Mild</td>
<td>Moderate risk in hepatic insufficiency</td>
</tr>
<tr>
<td>Pioglitazone</td>
<td>Thiazolidinedione 0.5-1.5%</td>
<td>Neutral</td>
<td>CI in Class 3 and 4 CHF; increased risk of bladder cancer; mod. weight gain</td>
</tr>
<tr>
<td>Colesevelam</td>
<td>Bile acid sequesterants 0.4%</td>
<td>Neutral</td>
<td>Moderate GI symptoms</td>
</tr>
<tr>
<td>Bromocriptine</td>
<td>DA agonist 0.5%</td>
<td>Neutral</td>
<td></td>
</tr>
<tr>
<td>Insulin</td>
<td></td>
<td></td>
<td>Moderate risk in renal insufficiency; mild weight gain</td>
</tr>
</tbody>
</table>

*Adapted From: Endocrin Pract. 2011;17 (Suppl 2).*

### Diabetes in Older Adults

All three guidelines recommend treatment of older adults with diabetes be based on patient specific parameters. According to the AGS, HgA1C goal in geriatric patients should be < 7%, however this should be individualized based on patient status, such as, age, life expectancy, cognitive impairment and other comorbid conditions. Older adults with diabetes should not be treated with chlorpropamide, as it has an increased risk of hypoglycemia due to a long half-life. Decreased renal function often limits the use of metformin in the elderly population due to an increased risk of lactic acidosis. Metformin is contraindicated in patients with serum creatinine (sCr) of ≥ 1.5 mg/dL in men and ≥ 1.4 mg/dL in women.

Polypharmacy is often a problem for the geriatric population. Many older adults with diabetes are on several diabetic medications, some of which are costly to the patient. It is important that the primary care provider document each medication the patient is prescribed and compliant with, and inform the patient of the benefits and risks of each medication. Medication lists should be updated at every patient visit to ensure safety and efficacy of medications, as well as evaluate for overprescribing or underutilization of medications.
**Medication Nutrition Therapy (MNT)**

Weight loss is recommended for all overweight patients who have or are at risk for diabetes\(^1\). A calorie restricted diet low in carbohydrates and fat or a Mediterranean diet are recommended. Physical activity modifications are also beneficial for patients with diabetes, or those at risk for development of the disease.

For patients at risk for developing type 2 diabetes, moderate weight loss (7% body weight) is the current recommendation. This can be achieved with regular physical activity (150 min/week) and dietary modifications, including, increasing dietary fiber (14 g/day) and whole grains, as well as limiting sugar-containing beverages. Additional considerations for dietary management of diabetes include: monitoring carbohydrate intake, decreasing saturated fats to < 7% of total calories, minimizing intake of trans fats, limiting alcohol intake to ≤ 1 drink for women and ≤ 2 for males, and including a dietician in patient’s diet plan to ensure proper food choices.

**Physical Activity**

Recommendations for physical activity are ≥ 150 min/week of moderate-intensity exercise (50–70% of maximum heart rate), spread over at least three days per week with no more than two consecutive days without exercise. Resistance training ≥ 2 times a week is also recommended. If the patient is unable to follow these guidelines, physical activity should be implemented as tolerated.

**Psychosocial Assessment and Care**

For patients with diabetes, it is acceptable to include an assessment of psychological and social well-being as a part of their diabetes evaluations. The possibility of psychosocial problems should be considered if diabetes self-management is poor, as these problems can decrease the ability for self-care.

**Intercurrent Illness**

Illness, trauma, or surgery can precipitate poor glucose control leading to diabetic ketoacidosis (DKA). It is important that during these situations, blood glucose is monitored more closely to help prevent situations such as DKA from occurring.

**Hypoglycemia**

The current ADA and AACE guidelines recommend that hypoglycemia be treated with glucose delivering 15-20 grams of carbohydrate (or carbohydrate, glucose containing foods)\(^1,2\). If no improvement in blood glucose is seen within 15 minutes, an additional 15-20 grams of carbohydrate should be taken. Glucagon should be prescribed for use in emergency situations to all patients with diabetes who are at an increased risk for hypoglycemia. If hypoglycemia is caused by a sulfonylurea or high dose insulin, the patient may need to be hospitalized for observation due to an increased risk of prolonged hypoglycemia. If hypoglycemia is due to an α-glucosidase inhibitor along with insulin or an insulin secretagogue, oral glucose, not a complex carbohydrate, must be given because α-glucosidase inhibitors inhibit the breakdown and absorption of complex carbohydrates and disaccharides.
**Bariatric Surgery**

A BMI ≥ 35 kg/m² in patients with type 2 diabetes allows for the consideration of bariatric surgery, especially with other comorbid conditions or symptomologies. Bariatric surgery has shown to improve weight loss in the obese patient, and increase the chances of remission of T2DM.

**Immunizations**

The ADA currently recommends a yearly influenza vaccine to every patient ≥ 6 months old. The ADA also recommends the administration of the pneumococcal polysaccharide vaccine to all patients with diabetes ≥ 2 years of age. A one-time revaccination is recommended for individuals > 64 years of age if previously vaccinated > 5 years ago. Administration of Hepatitis B vaccines to patients with diabetes should be per CDC protocol.

**PREVENTION AND MANAGEMENT OF COMPLICATIONS**

**Hypertension and Blood Pressure Control**

**Screening**

The ADA recommends blood pressure (BP) screenings at each visit. In order to confirm a diagnosis of hypertension in patients with diabetes, a systolic blood pressure (SBP) > 130 mmHg or diastolic blood pressure (DBP) > 80 mmHg must be verified at a second visit.

*Annual 24 hour ambulatory blood pressure monitoring is recommended by AACE in order to assess for white coat hypertension, masked hypotension, and nighttime non-dipping status. The ADA recognizes the value of ambulatory blood pressure monitoring in certain patients, however they do not recommend routine use of this method.*

Blood pressure goals in patients with diabetes include systolic blood pressure (SBP) of < 130 mmHg and diastolic blood pressure (DBP) of < 80 mmHg. Certain patients may have either a higher or lower blood pressure goal based on individual response, medication therapy tolerance, and specific patient characteristics.

**Treatment**

Treatment options are stratified based on the patient's initial blood pressure readings. For patients with SBP 130-139 mmHg or DBP 80-89 mmHg, lifestyle modifications are recommended and these patients should be assessed after three months for the necessity of pharmacologic therapy.

Lifestyle modifications include weight loss (if necessary), the Dietary Approaches to Stop Hypertension (DASH) diet, moderation of alcohol and sodium intake and increased physical activity. The DASH diet consists of increased consumption of fruits, vegetables, and low-fat dairy products.

For patients with a SBP ≥ 140 mmHg or DBP ≥90 mmHg, both lifestyle changes and pharmacologic therapies should be recommended. Multiple drug therapy, with at least two drug classes at maximal doses is typically required to achieve blood pressure goals in patients with diabetes. One of the drug classes utilized should be either an angiotensin converting enzyme inhibitor (ACE-I) or an angiotensin receptor blocker (ARB) because of the renal-protective effects of these drug classes. At least one of the
anti-hypertensive medications should be given at bedtime. Patients taking an ACE-I, ARB, or diuretic should have kidney function and potassium levels monitored regularly.

**Selection of medications** should be based on disease specific considerations such as albuminuria, cardiovascular disease (CVD), heart failure, post-myocardial infarction (MI) status, possible metabolic adverse events, pill burden, adherence, and cost. Additionally, the AACE provides recommendations for the prevention and management of complications in patients with pre-diabetes, stating that hypertension in prediabetes should be managed in the same fashion as diabetes.

**Special Considerations**

For pregnant diabetes patients with chronic hypertension, goals include SBP 110-129 mmHg and DBP 65-79 mmHg. ACE-I and ARBs are contraindicated during pregnancy. Antihypertensive medications that have been demonstrated to be safe and effective in pregnancy include: methyldopa, labetalol, clonidine, diltiazem, and prazosin.

**Dyslipidemia**

**Screening**

All patients with diabetes should have fasting lipid panels evaluated at least annually. For patients with undesirable lipid levels, more frequent monitoring may be required.

The ADA states that for patients with low-risk lipid values should be screened every two years. Low-risk lipid values include low-density lipoprotein (LDL) < 100 mg/dL, high-density lipoprotein (HDL) > 50 mg/dL, and triglycerides (TG) < 150 mg/dL.

In patients with an LDL level at goal, but TG levels > 200 mg/dL, AACE recommends utilization of non-HDL levels and apolipoprotein B as a screening and monitoring tool. AACE mentions the utilization of other tests that may help with risk-stratification and follow-up, including, C-reactive protein, lipoprotein(a), lipoprotein-associated phospholipase A2, LDL particle number, and LDL size.
Goals

Patients with diabetes have increased prevalence of dyslipidemias, which confers a greater risk for cardiovascular disease. Pharmacologic therapy has been shown to decrease the risk of negative outcomes in patients with CVD and is effective as a primary prevention strategy in patients without CVD.

Appropriate lipid goals per the ADA and AACE are provided in Table 6. If treated patients are unable to reach these goals on optimized therapy, a 30-40% reduction in LDL from baseline may be an appropriate alternative goal.

AACE provides additional non-HDL and apolipoprotein B goals for patients with diabetes who have achieved their LDL goal but whose TG remain >200mg/dL.

Table 6. Lipid Goals in Patients with Diabetes

<table>
<thead>
<tr>
<th></th>
<th>ADA</th>
<th>AACE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LDL goal in diabetes patients</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overt CVD</td>
<td>&lt; 70 mg/dL</td>
<td></td>
</tr>
<tr>
<td>No CVD</td>
<td>&lt; 100 mg/dL</td>
<td></td>
</tr>
<tr>
<td>TG</td>
<td>&lt; 150 mg/dL</td>
<td></td>
</tr>
<tr>
<td>HDL</td>
<td>&gt; 40 mg/dL (Males)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; 50 mg/dL (Females)</td>
<td></td>
</tr>
<tr>
<td><strong>Non-HDL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overt CVD or 2+ risk factors</td>
<td>-</td>
<td>&lt; 100 mg/dL</td>
</tr>
<tr>
<td>No CVD and minimal risk factors</td>
<td>-</td>
<td>&lt; 130 mg/dL</td>
</tr>
<tr>
<td><strong>Apolipoprotein B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overt CVD or 2+ risk factors</td>
<td>-</td>
<td>&lt; 80 mg/dL</td>
</tr>
<tr>
<td>No CVD and minimal risk factors</td>
<td>-</td>
<td>&lt; 90 mg/dL</td>
</tr>
</tbody>
</table>

Adapted From: Diabetes Care. 2012;35 (Suppl 1); Endocrin Pract. 2011;17 (Suppl 2).

Treatment

Treatment decisions are based on risk level for CVD and can include lifestyle modifications and pharmacologic therapy. Lifestyle modifications include: reduced saturated and trans fat and cholesterol consumption, increased omega-3 fatty acids, soluble fiber and plant sterols, weight loss, and increased physical activity. Figure 4 depicts the rationale for initiation of statin therapy in certain patients based on the ADA and AACE guidelines.
Figure 4. Statin Initiation in Patients with Diabetes.

If goals are not achieved using optimized statin therapy, other lipid lowering agents may be considered, such as bile acid sequesterants, cholesterol absorption inhibitors, or niacin.

**Pregnancy**

Statins are contraindicated in pregnancy^6^.

**Hypertriglyceridemia**

Severe hypertriglyceridemia (> 500 mg/dL) may require immediate treatment with lifestyle modifications (very low fat diet) and pharmacologic therapy (fibrate, fish oil, or niacin) to prevent acute pancreatitis^1^.

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Adapted From: Diabetes Care. 2012;35 (Suppl 1); Endocrin Pract. 2011;17 (Suppl 2).
Antiplatelet Agent

Screening

Use of antiplatelet agents for primary prevention of CHD is based on 10-year risk assessment\(^1\).

Treatment

Aspirin therapy (75-162 mg/day) should be considered for patients with a 10-year cardiovascular risk > 10%, which includes most men > 50 years and women > 60 years with at least one major risk factor (family history of CVD, HTN, smoking, dyslipidemia, or albuminuria).

Aspirin is not recommended as primary prevention for CVD in diabetes patients with a low CVD risk (< 5% 10 year risk) due to an increased bleeding risk. For patients with moderate CVD risk (5-10% 10 year risk), clinical judgment is needed to assess the necessity of aspirin use.

For patients with a documented aspirin allergy, clopidogrel 75 mg/day may be utilized. After an acute coronary syndrome, aspirin (75-162 mg/day) with clopidogrel (75 mg/day) is appropriate for up to one year.

AACE recommends the use of aspirin in patients with proven CVD. Additionally, adenosine diphosphate antagonists may be beneficial as adjuvant therapy, especially in patients with peripheral vascular disease\(^2\). The panel does not provide any specific recommendations for the use of aspirin as primary prevention of CVD in patients with diabetes due to conflicting evidence.

AGS guidelines recommend the use of aspirin (75-325 mg daily) in older adults with diabetes provided they are not on other anticoagulant therapy and do not have any contraindications to aspirin\(^4\).

Smoking Cessation

Screening

All patients should be assessed for smoking habits as well as willingness to quit\(^1\).

Treatment

Smoking cessation counseling and other therapies should be utilized as appropriate.
Cardiovascular Disease (CVD)

Screening

Routine screening of asymptomatic patients for CVD is not recommended because it does not improve outcomes for patients in which CVD risk factors are managed appropriately.

AACE recognizes that screening for CVD in type 2 diabetes patients does not improve outcomes; however, screening with coronary calcification scores may be useful to identify patients for whom intensification of glycemic control may be appropriate.

Treatment

For patients with known CVD, ACE-I, aspirin and statin therapy should be utilized to reduce the risk of cardiovascular events.

For patients with a prior MI, β-blocker (βB) therapy should be utilized for at least two years post-MI. Longer-term use of βB, even in the absence of hypertension, may be reasonable if well tolerated.

Thiazolidinedione TZD therapy should be avoided in patients with symptomatic heart failure. Metformin may be utilized in patients with stable congestive heart failure (CHF) as long as renal function is normal; however, metformin should be avoided in CHF patients whom are unstable or hospitalized.

Nephropathy

Screening

An annual test assessing urine albumin excretion should be conducted in type 2 diabetes patients at diagnosis and in type 1 diabetes patients 5 years after diagnosis. Additionally, sCr should be measured at least annually in patients with diabetes and glomerular filtration rate (GFR) should be estimated to assess for chronic kidney disease (CKD).

Urine Albumin Excretion (mcg/mg creatinine)

<table>
<thead>
<tr>
<th>Category</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt; 30</td>
</tr>
<tr>
<td>Microalbuminuria</td>
<td>30-299</td>
</tr>
<tr>
<td>Macroalbuminuria</td>
<td>≥ 300</td>
</tr>
</tbody>
</table>

AACE states that the measurement of albumin to creatinine ratio from a random urine sample is acceptable for screening and an abnormal test may demonstrate the need for a 24-hour urine collection. Screening of urine albumin without comparison of urine creatinine is not recommended and promotes error. Before beginning therapy for nephropathy, albuminuria test should be confirmed at a second visit.

Goals

In order to reduce the risk and slow the progression of nephropathy, glucose and blood pressure control should be optimized.

Additionally, AACE recommends inhibition of the renin-angiotensin-aldosterone system, lipid control, and smoking cessation to further reduce the risk and slow the progression of nephropathy.
**Treatment**

ACE-Is or ARBs should be utilized for the treatment of both micro- and macroalbuminuria\(^1\). Monitoring of potassium and sCr should be conducted in patients on ACE-Is, ARBs, or diuretics. In order to assess response to therapy and progression of disease, urine albumin excretion should be monitored.

For patients with diabetes in the early stages of CKD, reducing protein intake (0.8-1 g/kg/day) may help to improve renal function. For patients with diabetes in later stages of CKD, protein intake should be reduced to 0.8 g/kg/day.

> **AACE recommends an initial reduction in protein intake to 0.8 g/kg/day for patients with early CKD and a further reduction to 0.6g/kg/day in patients with continuing renal decline\(^2\).**

Patients with an estimated GFR < 60 mL/min should be evaluated for potential complications of CKD and managed according to the National Kidney Foundation guidelines for the management of CKD in diabetes\(^1\). Referral to a specialist may be appropriate.

> **AACE also recommends referral to a nephrologist if a diagnosis of non-diabetic kidney disease is suspected\(^2\). For diabetes patients with end-stage renal disease (ESRD), renal transplant is the preferred therapy because outcomes appear to be superior to dialysis.**

**Retinopathy**

**Screening**

An ophthalmologist or optometrist should conduct a comprehensive and dilated eye exam for patients with type 1 diabetes > 10 years old within 5 years of diagnosis and for patients with type 2 diabetes at diagnosis\(^1\). Follow-up exams should be conducted annually, however less frequent exams may be appropriate after one or more normal eye exams and more frequent exams may be required as retinopathy progresses.

> **AGS recommends that patients at high risk for eye disease should be screened at least annually, while other patients can be screened every two years\(^4\). High-risk patients include patients with symptoms of eye disease present, evidence of retinopathy, glaucoma or cataracts, HgA1C 8%, type 1 diabetes, or BP > 140/80 mmHg.**

Women with pre-existing diabetes who are pregnant or planning to become pregnant should receive a comprehensive eye exam in the first trimester and be closely followed throughout the pregnancy and one-year postpartum\(^1\).

High-quality fundus photographs may be useful as a screening tool to detect clinically significant diabetic retinopathy, however these should not be used as a substitute for the comprehensive eye exam. In addition to screening for retinopathy, comprehensive eye exams may also aid in the detection of other complications including cataracts, glaucoma and macular degeneration.

> **AACE recommends screening of patients on VEG-F therapy for retinopathy more than once annually\(^2\).**
Goals

Utilization of screening tools helps to detect clinically significant retinopathy before vision impairment occurs\(^1\). Glucose and blood pressure control should be optimized in order to reduce the risk or slow the progression of retinopathy.

Treatment

Patients with macular edema and proliferative or non-proliferative diabetic retinopathy should be referred to an ophthalmologist for management. Laser photocoagulation may be used to reduce the risk of vision loss.

Retinopathy is not a contraindication to aspirin use for cardioprotection, as it does not increase the risk of retinal hemorrhage.

Neuropathy

Screening

Screening for diabetic peripheral neuropathy (DPN) should be utilized for all patients at diagnosis of type 2 diabetes and 5 years after diagnosis of type 1 diabetes and then annually thereafter. Screening should be conducted using simple clinical tests, including: pinprick sensation, vibration perception, monofilament test, and assessment of ankle reflexes. Utilizing a combination of more than one test improves the sensitivity for detecting DPN. Electrophysiological tests should only be conducted if clinical features are atypical.

Screening for cardiovascular autonomic neuropathy (CAN) should be conducted for all patients at diagnosis of type 2 diabetes and 5 years after diagnosis of type 1 diabetes.

AACE recommends the use of cardiovascular reflex tests in patients with signs and symptoms of CAN, including tachycardia, orthostatic hypotension, and poor exercise tolerance\(^2\).

Older adults with diabetes should be evaluated for pain during the initial period after diagnosis using the physical exam and target patient history\(^4\). Older adults are less likely to report symptoms of pain and are often undertreated. Further evaluation of cause of pain should be conducted and treated appropriately.

Treatment

Medication to relieve specific symptoms related to painful DPN and autonomic neuropathy are recommended in order to improve patient quality of life\(^3\).

AACE recommends utilization of therapies that improve glucose, lipid, and blood pressure control as well as therapies that reduce oxidative stress, tricyclic antidepressants (TCAs), anticonvulsants, and serotonin or norepinephrine reuptake inhibitors\(^2\). Exercise and balance training may be beneficial in patients with neuropathies. Figure 5 provides a guideline for the management of neuropathic pain.

Large fiber neuropathies may be managed with: strength, gait, and balance training (to prevent falls and fractures), pain management, orthotics to prevent or correct foot deformities, tendon lengthening, and other surgical interventions.

Small fiber neuropathies may be managed with: foot protection, supportive shoes with orthotics, regular foot, and shoe inspection, prevention of heat injury, pain management medications, and emollient creams.
Foot Care

Screening
Patients with diabetes should receive annual comprehensive foot exams to identify risk factors, which may predict ulcers and amputations. Foot exams should include inspection, assessment of pedal pulses, and testing for loss of protective sensations. Claudication history and assessment of pedal pulses should be used to screen for peripheral artery disease (PAD). Ankle-brachial index (ABI) may be utilized, as many patients with PAD are asymptomatic.

Treatment
All patients with diabetes should be instructed on general foot self-care. Patients who smoke, have a loss of protective sensation, structural abnormalities, or a history of prior lower extremity complications should be referred to a foot care specialist.

Patients with significant claudication or a positive ABI test should be referred for vascular assessment. Exercise, medications, and surgical options should be considered as appropriate for PAD.

AACE does not provide guidelines for foot care management.

ASSESSMENT OF COMORBID CONDITIONS

Hearing Impairment
Hearing impairment is seen more commonly in patients with diabetes. Additionally, high-frequency hearing loss in patients with diabetes is associated with a history of CHD and peripheral neuropathy. Low-frequency hearing loss is associated with low HDL and poor reported health status.

Sleep Disorders
Daytime drowsiness is a common symptom of a sleep disorder. Treatment of obstructive sleep apnea (OSA) with continuous positive airway pressure (CPAP) has shown improvement in BP control and quality of life in diabetic patients. Evidence on improvement in glycemic control is controversial. If restless leg syndrome (RLS) or OSA is suspected, referral to a specialist may be appropriate.

Fatty Liver Disease
Interventions to improve metabolic abnormalities (weight loss, glycemic control, treatment with drugs for hyperglycemia, and dyslipidemia) are beneficial for fatty liver disease as well as diabetes.

Low Testosterone in Men
Screening and treatment of asymptomatic patients is not recommended.

Periodontal Disease
Comprehensive assessment and treatment of identified disease is indicated in patients with diabetes. The evidence that treatment improves glycemic control is controversial.
Cancer

Patients with diabetes have an increased risk of cancer of the liver, pancreas, endometrium, colon/rectum, breast, and bladder. Patients should receive the recommended age and sex appropriate cancer screenings. Additionally, reducing modifiable risk factors (obesity, smoking, and physical activity) should be conducted.

Fractures

Fracture history and risk factors should be assessed in older diabetes patients and bone mineral density (BMD) testing should be conducted based on a patient’s age and gender.

For at risk patients, prevention strategies should be applied, including adequate calcium and vitamin D intake and avoiding medications that may decrease BMD, such as glucocorticoids. For type 2 diabetes patients with fracture risk factors, TZDs should be avoided.

Cognitive Impairment

There has been a link seen between hyperglycemia and cognitive impairment and further research is being conducted.

Older adults with diabetes should be assessed for cognitive impairment using a standardized screening tool, such as the Mini-Mental Status Exam (MMSE), upon diagnosis and with any significant decline in clinical status. Difficulty with self-care can be an indicator of decline in clinical status. Diabetes has been associated with a decrease in cognitive function in older adults, including decreased memory, learning, or verbal skills.

For older adults with evidence of cognitive impairment, reversible conditions, which may cause or exacerbate the impairment, should be identified and treated. Older adults with cognitive impairment should be screened for depression, vitamin B12 deficiency, and hypothyroidism as potential causes of cognitive impairment. Additionally, the patient’s medications should be reviewed to identify potential causative agents.

Depression

Screening for depression is recommended at diagnosis, medical status changes, and when self-management is poor. Screening should also be conducted for diabetes related stress, anxiety, eating disorders, and cognitive impairment.

Untreated clinical depression may contribute to poor self-care, poor adherence, and poor glycemic control. Referral to a mental health specialist familiar with diabetes may be necessary for treatment of depression.

AGS recommends using the Geriatric Depression Scale or a two-question screen for evaluation of depression in older adults with diabetes. For older adults with diabetes who present with new-onset or recurrent depression, treatment or referral should be within two weeks of presentation. Patients receiving therapy for depression should be evaluated within 6 weeks of initiation for improvement in target symptoms.
ADDITIONAL CONSIDERATIONS IN OLDER ADULTS WITH DIABETES

Urinary Incontinence

During annual screenings, older adults with diabetes should be evaluated for symptoms of urinary incontinence. Risk factors for urinary incontinence are common in older adults with diabetes.

Reversible causes of urinary incontinence should be identified and treated. General causes of urinary incontinence in older adults include urinary tract infection (UTI), urine retention, fecal impaction due to an autonomic insufficiency, restricted mobility, and certain medications. For older adults with diabetes, polyuria, neurogenic bladder, prolapse, cystocele, atrophic vaginitis, and vaginal candidiasis may further contribute to urinary incontinence.

Injurious Falls

Older adults with diabetes should be questioned regarding recent falls. Potential risk factors for falls in older adults with diabetes include: frailty and functional disability, visual impairment, peripheral neuropathy, hypoglycemia, and polypharmacy. For patients with evidence of falls, a basic fall evaluation should be conducted, including assessment of injuries and evaluation of reversible causes of the fall (medications or environmental factors). AGS provides a Guideline for the Prevention of Falls in Older Persons.

CONCLUSION

Management of diabetes involves a multidisciplinary approach to optimize patient care. Diabetes care is multifaceted, involving preventative measures, glycemic control, and management of complications and comorbid conditions. The current guidelines have been derived from evidence-based medicine and may not be optimal for all patients. The ADA, AACE and AGS guidelines provide practitioners with tools to aid in the management of diabetes; however practitioners must be able to individualize treatment based on patient specific characteristics.

REFERENCES

8. The seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure. JAMA 2004;289(19).

GLOSSARY OF TERMS AND ABBREVIATIONS
- 2-h PG: 2-hour Value; A patient’s measured plasma glucose level 2 hours into a 75g oral glucose tolerance test
- AACE: American Association of Clinical Endocrinologists
- ABI: Ankle-brachial index; measured by dividing the systolic blood pressure in the ankle by the systolic blood pressure in the arm; a lower blood pressure in the ankle is indicative of peripheral arterial disease
- Acanthosis nigricans: a skin disorder in which there is darker, thick, velvety skin in body folds and creases
- ACE-I: Angiotensin Converting Enzyme Inhibitor
- ADA: American Diabetes Association
- Adenosine diphosphate antagonists: clopidogrel
- AGS: American Geriatric Society
- Apolipoprotein B: apolipoproteins are responsible for carrying cholesterol to tissues; apolipoprotein B acts as the LDL ligand for LDL receptors; higher levels of apolipoprotein B are associated with heart disease
- ARB: Angiotensin Receptor Blocker
- Bariatric surgery: weight loss surgery in the obese population including several different invasive procedures to help assist in the reduction of food intake or absorption
- B: Beta blocker
- BMD: Bone Mineral Density
- BMI: Body Mass Index
- BP: Blood Pressure
- CAN: Cardiovascular Autonomic Neuropathy
- CHD: Coronary Heart Disease
- CHF: Congestive Heart Failure
- CKD: chronic kidney disease
- Claudication: discomfort or pain in the legs that occurs when walking and is relieved with rest
- Comorbid conditions: disease states that exist at the same time, but independently from another condition. In diabetes, this would include cardiovascular diseases, nephropathy, and retinopathy, as well as several other disease states.
- CPAP: Continuous Positive Airway Pressure
- C Reactive Protein: marker of inflammation
- CVD: Cardiovascular Disease
- DASH: Dietary Approaches to Stopping Hypertension diet
- DBP: Diastolic Blood Pressure
- DKA: Diabetic ketoacidosis; a condition in which the body doesn’t use glucose as a fuel source, (because there is not enough insulin to be used) but uses fat instead, and toxic levels of ketones from the breakdown of the fats build up in the body
- DPN: Diabetic peripheral neuropathy
• DSME: Diabetes Self Management Education; the process of teaching patients how to manage their diabetes, including optimizing metabolic control, preventing complications, and keeping diabetic costs minimal.
• ESRD: End-stage renal disease
• FPG: Fasting Plasma Glucose; A patient's measured plasma glucose value after a fast of least 8 hours
• GDM: Gestational Diabetes; a condition in which pregnant women without a previous diagnosis of diabetes exhibit above normal blood glucose levels
• Geriatric Depression Scale: a 30-item assessment used to identify depression in elderly patients
• HDL: High-density lipoprotein
• HgA1C: Hemoglobin A1C
• HTN: Hypertension
• IFG: Impaired Fasting Glucose; A condition in which a patient's measured plasma glucose level is consistently above what is considered normal, yet not high enough for the patient to be diagnosed with diabetes
• IGT: Impaired Glucose Tolerance; A condition in which a patient's measured 2 hour value in a 75g oral glucose tolerance test is consistently above what is considered normal, yet not high enough for the patient to be diagnosed with diabetes
• Interstitial glucose monitoring: continuous blood glucose monitoring in the interstitial fluid, often monitored with a continuous blood glucose monitor
• Islet antibodies:
• Ketonuria: ketones in the urine
• LDL: Low-density lipoprotein
• LFTs: Liver Function Tests
• Mediterranean diet: a healthier diet plan including fruits, vegetables, fish, and other healthy fats, originating in the countries surrounding the Mediterranean Sea.
• MI: Myocardial Infarction
• MMSE: Mini-Mental Status Exam
• MNT: Medication Nutrition Therapy
• Nighttime non-dipping status: failure to reduce blood pressure during sleep
• NPH insulin: Neutral Protamine Hagedorn insulin
• OGTT: Oral Glucose Tolerance Test; A medical test in which glucose is given and blood samples are taken at set time points to measure how quickly glucose is cleared from the blood
• OSA: Obstructive sleep apnea
• PAD: Peripheral Artery Disease
• Polyuria: urinating multiple times per day, rather frequently.
• Postprandial: after meals
• Pre-prandial: before meals
• RLS: Restless Leg Syndrome
• SBP: Systolic Blood Pressure
• sCr: Serum Creatinine
• TCA: Tricyclic Antidepressants
• TG: Triglycerides
• Type 1 Diabetes: an autoimmune disease in which antibodies are directed against beta cells of the pancreas
• Type 2 Diabetes: a progressive insulin secretory defect on the background of insulin resistance
• TZD: Thiazolidinediones
• UTI: Urinary tract infection