Diabetes is the leading cause of end-stage renal disease and blindness in the United States,¹ and increases the risk of cardiovascular disease (CVD) and lower-extremity amputations. The prevalence of diagnosed diabetes among adults in New York City (NYC) is 9.7%; the nationwide prevalence is 8.3%.²³ In NYC, the prevalence of diabetes differs strikingly across racial and ethnic groups: 13.2% for blacks, 12.9% for Hispanics, 11.3% for Asian/Pacific Islanders, and 6.4% for whites.² Disparities also exist by income level: prevalence is 16.3% among individuals with the lowest household incomes, compared with 4.0% in individuals in the households with the highest incomes.²

Only 10% of New York City adults with diabetes have blood glucose (sugar), blood pressure, and cholesterol—the key risk factors associated with complications—under control.⁵

**PROMOTING HEALTHIER CHOICES TO PREVENT AND MANAGE DIABETES**

Structured lifestyle modification programs that focus on increased physical activity, healthy food choices, and modest weight loss slow the progression of diabetes among people at risk and improve control of diabetes (Box and Resources—Lifestyle Modification).⁶–¹⁰

**KEY LIFESTYLE MODIFICATIONS FOR PREVENTING AND MANAGING TYPE 2 DIABETES**⁴

- Smoking cessation
- Physical activity: 150 min/week of moderate-intensity activity, such as brisk walking
- Healthy food choices: calorie restriction, portion control, and reduction of sugar-sweetened beverages, saturated and trans fats, and sodium
- Weight management: loss of 5% to 10% of body weight if overweight and maintenance of a healthy weight
The Diabetes Prevention Program, a 16-session structured lifestyle modification program, resulted in a 58% reduction in the risk of developing diabetes among overweight individuals who were at risk for diabetes (prediabetes). This program has been successfully adapted into a community-based program at the YMCA, and plans to make it available on a larger scale are under way.\textsuperscript{11,12}

Counsel all patients at risk for diabetes or who have diabetes on key lifestyle changes (Box, page 17). Helping patients to set small, achievable goals over time is essential to any lifestyle change program. Refer patients to structured lifestyle change programs if any are available.

**SCREENING FOR ASYMPTOMATIC DIABETES IN ADULTS**

Screening your patients for diabetes is important since it is estimated that up to 200,000 adults in NYC have undiagnosed diabetes.\textsuperscript{5} Screen adults with sustained blood pressure >135/80 mm Hg (either treated or untreated),\textsuperscript{13} and consider screening other adults who either are ≥45 years of age or who have a body mass index (BMI) ≥25 kg/m\textsuperscript{2} AND 1 or more of the following additional risk factors for diabetes:\textsuperscript{4}

- First-degree relative with diabetes
- Sedentary lifestyle
- Member of high-risk population (African American, Latino, Native American, Asian American, or Pacific Islander)
- Woman with a history of gestational diabetes or delivery of a baby >9 lb
- Dyslipidemia (high-density lipoprotein [HDL] cholesterol <35 mg/dL, triglycerides >250 mg/dL)
- CVD history
- History of impaired fasting glucose or glucose tolerance or A1C ≥5.7%
- Woman with polycystic ovarian syndrome
- Conditions associated with insulin resistance (ie, acanthosis nigricans)

**Screening Methods**

The A1C assay has recently been added to the list of acceptable methods for diagnosing diabetes, given improvements in standardization of the assay, its preanalytic stability, low within-person variance, and ease of application compared with glucose testing (Table 1).\textsuperscript{14,15}

In asymptomatic persons, positive test results should be confirmed with a repeat test, ideally by the same method, on a different day.\textsuperscript{14,16} For individuals with normal test results, consider repeat screening every 3 years, or more frequently, depending on risk factors.\textsuperscript{4}

**Special Considerations Regarding A1C**

If a patient has hemoglobinopathy with normal red cell turnover (eg, sickle cell trait), work with the clinical laboratory to ensure that they use an A1C assay that won’t be affected.\textsuperscript{14,15} Hemoglobin variants are more common in certain racial and ethnic groups (hemoglobin S and C in African Americans and hemoglobin E in Southeast Asians) and should be suspected when results of self-monitoring blood glucose (SMBG) have a low correlation with A1C results, an A1C result is different than expected, A1C >15%, or a patient’s A1C test result is radically different from a previous test result following a change in laboratory A1C test methods.\textsuperscript{17} If a patient has abnormal red cell turnover (eg, pregnancy or anemia from hemolysis or major blood loss) or has had a recent transfusion, the A1C is not reliable and glucose values should be used.\textsuperscript{4,14,15}

**MANAGING DIABETES: CONTROL THE ABCS**

Controlling the ABCS (A1C, Blood pressure, Cholesterol, and Smoking) can significantly improve quality of life, decrease mortality, and reduce risk of complications.\textsuperscript{16,23} Check glycemic, blood pressure, and lipid control every 2 to 3 months and intensify therapy until treatment goals are met (Table 2).

**A1C**

Every 1% drop in A1C can reduce the risk of microvascular complications by at least 37%.\textsuperscript{16,24} (See Box on page 20 for guidance.) A1C can be expressed as an estimated average glucose that corresponds to the values patients see with fingerstick monitoring.\textsuperscript{25} If the laboratory reports this information, you can use it during patient education encounters.

---

**TABLE 1. DIAGNOSING DIABETES\textsuperscript{14}**

<table>
<thead>
<tr>
<th>Test</th>
<th>At Risk for Diabetes (Prediabetes)</th>
<th>Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycated hemoglobin (A1C)\textsuperscript{a}</td>
<td>5.7% – 6.4%</td>
<td>≥6.5%</td>
</tr>
<tr>
<td>Fasting plasma glucose (FPG)</td>
<td>100 – 125 mg/dL</td>
<td>≥126 mg/dL</td>
</tr>
<tr>
<td>75-g oral glucose tolerance test (OGTT) 2-hour</td>
<td>140 – 199 mg/dL</td>
<td>≥200 mg/dL</td>
</tr>
<tr>
<td>Random plasma glucose (RPG)</td>
<td>No criterion</td>
<td>≥200 mg/dL and symptoms of severe hyperglycemia (eg, polyuria, polydipsia, unexplained weight loss)</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Performed using a laboratory test method that is certified by the National Glycohemoglobin Standardization Program and standardized to the Diabetes Control and Complications Trial assay.

Note: In the absence of symptomatic hyperglycemia, diagnosis should be confirmed by repeat testing.
### TABLE 2. CLINICAL PRACTICE RECOMMENDATIONS FOR DIABETES TREATMENT

<table>
<thead>
<tr>
<th>Activity</th>
<th>Frequency</th>
<th>Goal/Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Laboratory</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| A1C | Every 3-6 months | **<7.0%**<sup>a</sup>  
- LDL <100 mg/dL<sup>b</sup>  
- HDL >40 mg/dL for men and >50 mg/dL for women  
- Triglycerides <150 mg/dL |
| Fasting lipid profile | Annual | Detect early kidney disease using a “spot” urine albumin-to-creatinine ratio. A reading of >30 µg Alb/mg creatinine is abnormal. |
| Urine microalbumin/creatinine ratio | Annual | |
| **Physical Exam** | | |
| Blood pressure | Every visit | **<130/80 mm Hg**<sup>c</sup>  
BMI should be ≥18.5 and <25. Advise weight reduction to optimize BMI.  
Standardize foot exam forms and use monofilaments; prevent ulcers, infections, and lower-extremity amputations. |
| Weight and BMI | Every visit | |
| Foot exam<sup>d</sup> | Annually, or every visit if high-risk | |
| **Medications** | | |
| Aspirin therapy | Ongoing | 75-162 mg/day. Consider for all patients who have CVD. |
| **Immunizations** | | |
| Influenza | Annual | |
| Pneumococcal | Once | Revaccinate if the patient is currently aged ≥65 and was vaccinated when aged <65 and >5 years have lapsed. Some conditions also require revaccination, eg, chronic renal failure. |
| **Referrals** | | |
| Dilated retinal exam | Annual | Refer to eye care professional to detect retinopathy. |
| Dental care | Every 6 months | Refer for dental exam. |
| Diabetes education | As needed | Refer to CDE to review medications, meal planning, and self-care plan (Resources). |
| **Risk Reduction** | | |
| Tobacco use | Annual/ongoing | Document tobacco use status and assist smokers to quit (Resources). |
| Depression | Annual/ongoing | Assess for depression using an evidence-based tool like the PHQ-2 or PHQ-9 (Box, page 20). |
| Sexual functioning | Annual/ongoing | Discuss functioning and therapy options with both male and female patients. |
| Preconception | Initial/ongoing | Target A1C as close to normal (<7%) as possible and evaluate medications.  
- Set up a self-care plan and individualized goals.  
- Follow up to assess progress. |
| Self-management care plan | Every visit | |

Adapted from the New York State Diabetes Campaign Diabetes Care Guide.<sup>26</sup>

<sup>a</sup>A less stringent goal for A1C may be indicated in individuals with a history of severe hypoglycemia, limited life expectancy, advanced microvascular or macrovascular complications, or extensive comorbid conditions, and in those with long-standing diabetes in whom the general goal is difficult to achieve despite various interventions.<sup>4</sup>

<sup>b</sup>Lower goals may be considered for patients with overt CVD.<sup>4,27</sup>

<sup>c</sup>Treatment target may be modified in the future to reflect recent results from a clinical trial.<sup>29</sup>

<sup>d</sup>Perform a comprehensive foot exam annually, including inspection, assessment of foot pulses, and testing for loss of protective sensation, using a 10-g monofilament pressure sensation test plus any one of the following tests: vibration using 128-Hz tuning fork, pinprick sensation, ankle reflexes, or vibration perception threshold.<sup>4</sup>

BMI, body mass index; CDE, certified diabetes educator; CVD, cardiovascular disease; HDL, high-density lipoprotein; LDL, low-density lipoprotein; PHQ, patient health questionnaire.
Self-monitoring of blood glucose is indicated for patients taking insulin. It may also be indicated for other patients, such as those taking oral agents that might cause hypoglycemia (e.g., sulfonylureas, glinides) or those who will benefit from seeing firsthand the impact of a change in medication, diet, or physical activity on blood sugar control.

**Blood Pressure**

For every 10-mm Hg reduction in systolic blood pressure, the risk of myocardial infarction is reduced by 11%, retinopathy or nephropathy by 13%, and any diabetes-related death by 15%.18 ACE inhibitors are generally recommended as first-line therapy for hypertension in patients with diabetes, with or without a thiazide diuretic, given their renoprotective functions.30 Many patients with diabetes will require multiple drugs for adequate blood pressure control. Current Joint National Committee (JNC 7) guidelines recommend a treatment target of <130/80 mm Hg for patients with diabetes.

**Cholesterol**

Improved control of low-density lipoprotein (LDL) cholesterol can reduce cardiovascular complications in people with diabetes by 30% to 40%.14 Prescribe statins to treat to LDL-cholesterol goal (<100 mg/dL).4 To raise HDL levels, consider nicotinic acid, but be aware that it may worsen glycemic control, requiring adjustment of diabetes medications, and it may need to be discontinued if liver enzymes increase. If triglyceride levels remain ≥500 mg/dL after glycemia is controlled, prescribe fibric acid derivatives.9

**Smoking Cessation**

Nearly 1 in 5 people (18%) with diabetes smoke.3 Ask every patient about smoking status and advise every smoker to quit by:

- Providing brief counseling and pharmacotherapy to help patients become tobacco free (Resources—Tobacco CHI).
- Educating patients about the risk of cancer and CVD resulting from exposure to direct and secondhand smoke.
- Encouraging patients to maintain a smoke-free home.32

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**Depression**

More than 1 in 5 people (21%) with diabetes report a history of depression, a condition that can interfere with adherence to treatment.23 Use the Patient Health Questionnaire (PHQ-2) (Box) to identify patients who need further evaluation and possible treatment.

**PATIENT HEALTH QUESTIONNAIRE (PHQ-2)**

Over the past 2 weeks, have you been bothered by:

- Little interest or pleasure in doing things?
- Feeling down, depressed, or hopeless?

A “yes” to either question requires further evaluation with the Patient Health Questionnaire-9 (PHQ-9) (Resources—Depression CHI).

**Medication Adherence**

Discuss possible barriers to medication adherence at every visit and review the patient’s medications to reconcile discrepancies and eliminate unneeded medication. Demonstrate to patients how to use medication logs and glucose diaries (for those who perform SMBG) at home to facilitate adherence and treatment adjustments. Reduce the complexity of medication regimens by using once-daily pills, combination pills (especially when generics are available), and prefilled insulin pens whenever possible. Prescribe generics and write prescriptions for longer durations (90-day vs 30-day supply) to reduce the cost of medications and the need for repeat visits to the pharmacy.14 (Resources—Adherence CHI)

**SUMMARY**

Physicians play a critical role in preventing and controlling diabetes. You can improve your patients’ health by screening patients who may be at risk for diabetes; counseling on and referring patients to lifestyle modification programs that address diet and exercise; and controlling the ABCS in patients with diabetes.

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**NYC A1C REGISTRY**

Since 2006, laboratories serving NYC have been required to report results of A1C tests to the NYC Department of Health and Mental Hygiene. The information collected is housed in an A1C Registry that enables the Health Department to develop programs and tools for providers and patients to help support diabetes management. The following services are being gradually introduced across the city to providers:

- Quarterly reports to medical directors and individual providers that list their patients by A1C level to identify those at high risk
- Quarterly reports to medical directors and individual providers that summarize overall glycemic control in their practice compared with a citywide benchmark
- Letters encouraging patients who have high A1C results or are overdue for testing to return care

<table>
<thead>
<tr>
<th>TABLE 3. NONINSULIN THERAPIES FOR GLUCOSE MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agent</strong></td>
</tr>
<tr>
<td><strong>PREFERRED THERAPY</strong></td>
</tr>
<tr>
<td>First-line</td>
</tr>
<tr>
<td><strong>Biguanides</strong></td>
</tr>
<tr>
<td>Metformin (Glucophage, Glucophage XR)</td>
</tr>
<tr>
<td>Second-line</td>
</tr>
<tr>
<td><strong>Sulfonylureas</strong></td>
</tr>
<tr>
<td>Glyburide (Diabeta, Glynase, Micronase)</td>
</tr>
<tr>
<td>Glipizide (Glucotrol, Glucotrol XL)</td>
</tr>
<tr>
<td>Glimepiride (Amaryl)</td>
</tr>
<tr>
<td><strong>ALTERNATE THERAPY</strong></td>
</tr>
<tr>
<td>Thiazolidinediones</td>
</tr>
<tr>
<td>Pioglitazone (Actos)</td>
</tr>
<tr>
<td>GLP-1 Agonists</td>
</tr>
<tr>
<td>Exenatide (Byetta; injections 2 times a day)</td>
</tr>
<tr>
<td>Liraglutide (Victoza; daily injection)</td>
</tr>
<tr>
<td>Alpha-Glucosidase Inhibitors</td>
</tr>
<tr>
<td>Acarbose (Precose)</td>
</tr>
<tr>
<td>Miglitol (Glyset)</td>
</tr>
<tr>
<td>Glinides</td>
</tr>
<tr>
<td>Repaglinide (Prandin)</td>
</tr>
<tr>
<td>Nateglinide (Starlix)</td>
</tr>
<tr>
<td>Amylin Mimetic</td>
</tr>
<tr>
<td>Pramlintide (Symlin; injections 3 times a day)</td>
</tr>
<tr>
<td>DPP-4 Inhibitors</td>
</tr>
<tr>
<td>Sitagliptin (Januvia)</td>
</tr>
<tr>
<td>Saxagliptin (Onglyza)</td>
</tr>
</tbody>
</table>

Use of brand names is for informational purposes only and does not imply endorsement by the New York City Department of Health and Mental Hygiene. Specific side effects vary by individual drug. Consult prescribing information for more details.

*Refer to the prescribing information for each agent to determine renal impairment.

ALT, alanine aminotransferase; CHF, congestive heart failure; CVD, cardiovascular disease; GI, gastrointestinal; G6PD, glucose-6-phosphate dehydrogenase; IBD, inflammatory bowel disease; NYHA, New York Heart Association; URI, upper respiratory tract infection.
RESOURCES
American Association of Diabetes Educators:
http://www.diabeteseducator.org/DiabetesEducation/Find.html
American Diabetes Association:
http://www.diabetes.org
Bureau of Tobacco Control. Tools to Help You and Your Loved Ones Quit Smoking:
City Health Information: Improving Medication Adherence:
City Health Information: Detecting and Treating Depression in Adults:
City Health Information: Treating Tobacco Addiction:
Diabetes in New York City. Public Health Burden and Disparities:
National Center for Chronic Disease Prevention and Health Promotion. Diabetes Public Health Resource:
http://www.cdc.gov/diabetes

LIFESTYLE MODIFICATION
American Heart Association. Live Better With the Simple 7:
Diabetes Prevention Program Lifestyle Change Study Documents:
www.bsc.gwu.edu/dpp/lifestyle/dpp_part.html
New York City Department of Health and Mental Hygiene. Obesity Action Kit:

REFERENCES
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