



# City Health Information

May/June 2010

The New York City Department of Health and Mental Hygiene

Vol. 29(3):17-24

## PREVENTION AND CONTROL OF TYPE 2 DIABETES IN ADULTS

- Screen for diabetes with A1C ( $\geq 6.5\%$ ), fasting plasma glucose, or oral glucose tolerance tests, using currently recommended cutoffs (Table 1).
- Screen patients with blood pressure  $>135/80$  mm Hg for diabetes.
- Counsel your overweight and obese patients with diabetes and those at risk for developing diabetes on physical activity, healthy food choices, and weight loss, and refer them to structured lifestyle modification programs.
- Prevent diabetes-associated complications by controlling the ABCS (hemoglobin A1C, Blood pressure, Cholesterol, and Smoking).

Diabetes is the leading cause of end-stage renal disease and blindness in the United States,<sup>1</sup> 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%.<sup>2,3</sup> 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.<sup>2</sup> 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.<sup>2</sup>

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.<sup>5</sup>

### 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**).<sup>6-10</sup>

#### KEY LIFESTYLE MODIFICATIONS FOR PREVENTING AND MANAGING TYPE 2 DIABETES<sup>4</sup>

- 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).<sup>6</sup> 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.<sup>11,12</sup>

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.<sup>5</sup> Screen adults with sustained blood pressure >135/80 mm Hg (either treated or untreated),<sup>13</sup> and consider screening other adults who either are ≥45 years of age or who have a body mass index (BMI) ≥25 kg/m<sup>2</sup> AND 1 or more of the following additional risk factors for diabetes:<sup>4</sup>

- 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**).<sup>14,15</sup>

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

### 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.<sup>14,15</sup> 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.<sup>17</sup> 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.<sup>4,14,15</sup>

### 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.<sup>18-23</sup> 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%.<sup>19,24</sup> (See **Box** on page 20 for guidance.) A1C can be expressed as an estimated average glucose that corresponds to the values patients see with finger-stick monitoring.<sup>25</sup> If the laboratory reports this information, you can use it during patient education encounters.

**TABLE 1. DIAGNOSING DIABETES<sup>14</sup>**

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

<sup>a</sup>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**

Activity	Frequency	Goal/Recommendation
<b>Laboratory</b>		
A1C	Every 3-6 months	<7.0% <sup>a</sup>
Fasting lipid profile	Annual	<ul style="list-style-type: none"> <li>• LDL &lt;100 mg/dL<sup>b</sup></li> <li>• HDL &gt;40 mg/dL for men and &gt;50 mg/dL for women</li> <li>• Triglycerides &lt;150 mg/dL</li> </ul>
Urine microalbumin/creatinine ratio	Annual	Detect early kidney disease using a “spot” urine albumin-to-creatinine ratio. A reading of >30 µg alb/mg creatinine is abnormal.
<b>Physical Exam</b>		
Blood pressure	Every visit	<130/80 mm Hg <sup>c</sup>
Weight and BMI	Every visit	BMI should be ≥18.5 and <25. Advise weight reduction to optimize BMI.
Foot exam <sup>d</sup>	Annually, or every visit if high-risk	Standardize foot exam forms and use monofilaments; prevent ulcers, infections, and lower-extremity amputations.
<b>Medications</b>		
Aspirin therapy	Ongoing	75-162 mg/day. Consider for all patients who have CVD.
<b>Immunizations</b>		
Influenza	Annual	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.
Pneumococcal	Once	
<b>Referrals</b>		
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 ( <b>Resources</b> ).
<b>Risk Reduction</b>		
Tobacco use	Annual/ongoing	Document tobacco use status and assist smokers to quit ( <b>Resources</b> ).
Depression	Annual/ongoing	Assess for depression using an evidence-based tool like the PHQ-2 or PHQ-9 ( <b>Box</b> , 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.
Self-management care plan	Every visit	<ul style="list-style-type: none"> <li>• Assess patient’s understanding of diabetes care and treatment.</li> <li>• Set up a self-care plan and individualized goals.</li> <li>• Follow up to assess progress.</li> </ul>

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>28</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.

## CONTROLLING A1C

### • Preferred Treatment Plan:

**Step 1: Lifestyle management and metformin.** If metformin is contraindicated, start sulfonylurea or insulin.

**Step 2:** Add sulfonylurea or basal insulin.

**Step 3:** Start or intensify insulin.

- If there are contraindications to or barriers for metformin and sulfonylurea, use **alternate therapies (Table 3)**.
- Assess progress at every visit and adjust treatment until glycemic control is achieved (**Table 2**).<sup>29</sup>

*If a patient has evidence of severe insulin deficiency manifested by severe hyperglycemia (FPG >250, RPG >300, or A1C >10%) accompanied by weight loss, dehydration, or ketonuria, begin treatment with insulin and lifestyle modification. Once symptoms subside and glucose levels decrease, oral agents (Table 3) can be added with the possible discontinuation of insulin.*

Self-monitoring of blood glucose is indicated for patients taking insulin.<sup>4</sup> It may also be indicated for other patients, such as those taking oral agents that might cause hypoglycemia (eg, 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%.<sup>18</sup> ACE inhibitors are generally recommended as first-line therapy for hypertension in patients with diabetes, with or without a thiazide diuretic, given their reno- and cardioprotective functions.<sup>4,30</sup> Many patients with diabetes will require multiple drugs for adequate blood pressure control.<sup>4</sup> 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%.<sup>4,31</sup> Prescribe statins to treat to LDL-cholesterol goal (<100 mg/dL).<sup>4</sup> 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.<sup>4</sup>

## Smoking Cessation

Nearly 1 in 5 people (18%) with diabetes smoke.<sup>2</sup> 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.<sup>32</sup>

## Depression

More than 1 in 5 people (21%) with diabetes report a history of depression, a condition that can interfere with adherence to treatment.<sup>2,33</sup> 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.<sup>34</sup> (**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. ♦

### 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 to care.

For more details, please visit:

[www.nyc.gov/html/doh/html/diabetes/diabetes-nycar.shtml](http://www.nyc.gov/html/doh/html/diabetes/diabetes-nycar.shtml).

**TABLE 3. NONINSULIN THERAPIES FOR GLUCOSE MANAGEMENT**

Agent	Expected Decrease in A1C	Hypoglycemia With Monotherapy	Weight	Considerations
<b>PREFERRED THERAPY</b>				
<b>First-line</b>				
<b>Biguanides</b> Metformin (Glucophage, Glucophage XR) Begin metformin using a low dose (500-850 mg 1 time a day with a meal) and titrate to 850-1000 mg 2 times a day over a period of 3 to 4 weeks to minimize gastrointestinal side effects and optimize compliance. <sup>29</sup>	1.0%–2.0%	No	Weight neutral or modest weight loss (2-5 lb)	GI side effects; use with caution if the patient has CHF. <b>Do not use in the presence of renal insufficiency,<sup>a</sup> excessive alcohol intake, or liver disease. Hold if undergoing intravenous dye study.</b>
<b>Second-line</b>				
<b>Sulfonylureas</b> Glyburide (Diabeta, Glynase, Micronase) Glipizide (Glucotrol, Glucotrol XL) Glimepiride (Amaryl)	1.0%–2.0%	Yes	Weight gain	May need to adjust dose if renal <sup>a</sup> or liver disease is present. May cause hemolytic anemia with G6PD deficiency. Evidence of increased cardiovascular mortality with older generations of this drug class.
<b>ALTERNATE THERAPY</b>				
<b>Thiazolidinediones</b> Pioglitazone (Actos)	0.5%–1.4%	No	Weight gain	Fluid retention, exacerbation of CHF, bone fractures. Rosiglitazone (Avandia), another drug in this class, may be associated with increased risk of CVD. <b>Do not use in patients with NYHA class III or IV CHF or active liver disease (ALT &gt;2.5 normal limit).</b>
<b>GLP-1 Agonists</b> Exenatide (Byetta; injections 2 times a day) Liraglutide (Victoza; daily injection)	0.5%–1.0%	No	Weight loss	Frequent GI side effects; not studied in combination with insulin. <b>Do not use in patients with severe renal impairment,<sup>a</sup> GI disease including gastroparesis, or a history of pancreatitis.</b>
<b>Alpha-Glucosidase Inhibitors</b> Acarbose (Precose) Miglitol (Glyset)	0.5%–0.8%	No	Weight neutral	Frequent GI side effects. <b>Do not use in patients with GI disease (IBD, colonic ulceration, partial intestinal obstruction or predisposition to obstruction), severe renal disease,<sup>a</sup> or liver disease.</b>
<b>Glinides</b> Repaglinide (Prandin) Nateglinide (Starlix)	0.5%–1.5%	Yes	Weight gain	Requires dosing prior to meals. <b>Use with caution in patients with moderate-to-severe liver disease. Do not use gemfibrozil with repaglinide.</b>
<b>Amylin Mimetic</b> Pramlintide (Symlin; injections 3 times a day)	0.5%–0.8%	Yes	Weight loss	For types 1 and 2 on insulin. Frequent GI side effects. <b>Do not use if the patient has gastroparesis.</b>
<b>DPP-4 Inhibitors</b> Sitagliptin (Januvia) Saxagliptin (Onglyza)	0.5%–0.8%	No	Weight neutral	Allergic or hypersensitivity reactions may occur; adjust dose for moderate-to-severe renal impairment. <sup>a</sup> Evidence of hypersensitivity reactions and increased URIs. <b>Do not use if the patient has a history of pancreatitis.</b>

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.

<sup>a</sup>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:

<http://www.nyc.gov/html/doh/html/smoke/smoke2-cess.shtml>

City Health Information: Improving Medication Adherence:

<http://www.nyc.gov/html/doh/downloads/pdf/chi/chi28-suppl4.pdf>

City Health Information: Detecting and Treating Depression in Adults:

<http://www.nyc.gov/html/doh/downloads/pdf/chi/chi26-9.pdf>

City Health Information: Treating Tobacco Addiction:

<http://www.nyc.gov/html/doh/downloads/pdf/chi/chi27-1.pdf>

Diabetes in New York City. Public Health Burden and Disparities:

[http://www.nyc.gov/html/doh/downloads/pdf/epi/diabetes\\_chart\\_book.pdf](http://www.nyc.gov/html/doh/downloads/pdf/epi/diabetes_chart_book.pdf)

National Center for Chronic Disease Prevention and Health Promotion. Diabetes Public Health Resource:

<http://www.cdc.gov/diabetes>

National Diabetes Education Program. Making Systems Changes for Better Diabetes Care:

<http://www.betterdiabetescare.nih.gov>

National Institute of Diabetes and Digestive and Kidney Diseases:

<http://www2.niddk.nih.gov>

New York City A1C Registry:

<http://www.nyc.gov/html/doh/html/diabetes/diabetes-nycar.shtml> or call 212-788-4125

New York City Department of Health and Mental Hygiene. Diabetes Prevention and Control:

<http://www.nyc.gov/html/doh/html/diabetes/diabetes.shtml>

New York Department of Health and Mental Hygiene Medical Adherence Action Kit:

<http://www.nyc.gov/html/doh/html/csi/csi-medication-adherence.shtml>

New York City Health and Nutrition Examination Survey:

<http://www.nyc.gov/html/doh/html/hanes/hanes.shtml>

New York State Diabetes Campaign. Reversing the Epidemic:

<http://www.fulldiabetescare.org>

## LIFESTYLE MODIFICATION

American Heart Association. Live Better With the Simple 7:

<http://mylifecheck.heart.org/Multitab.aspx?NavID=3&CultureCode=en-US>

Diabetes Prevention Program Lifestyle Change Study Documents:

[www.bsc.gwu.edu/dpp/lifestyle/dpp\\_part.html](http://www.bsc.gwu.edu/dpp/lifestyle/dpp_part.html)

New York City Department of Health and Mental Hygiene.

Obesity Action Kit:

[www.nyc.gov/html/doh/html/csi/csi-obesity.shtml](http://www.nyc.gov/html/doh/html/csi/csi-obesity.shtml)

New York City Department of Health and Mental Hygiene. Physical Activity and Nutrition:

[www.nyc.gov/html/doh/html/cdp/cdp\\_pan\\_know.shtml](http://www.nyc.gov/html/doh/html/cdp/cdp_pan_know.shtml)

New York State Smokers Quitline:

[www.nysmokefree.com](http://www.nysmokefree.com) or call 866-NY-QUITS or 866-697-8487

Smoke Free:

[www.smokefree.gov](http://www.smokefree.gov)

## REFERENCES

- Centers for Disease Control and Prevention. National Diabetes Fact Sheet: General Information and National Estimates on Diabetes in the United States, 2007. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2008. [www.cdc.gov/diabetes/pubs/factsheet07.htm](http://www.cdc.gov/diabetes/pubs/factsheet07.htm). Accessed May 18, 2010.
- New York City Department of Health and Mental Hygiene. Epidemiology Services. EpiQuery: NYC Interactive Health Data System. [www.nyc.gov/html/doh/html/epi/epiquery.shtml](http://www.nyc.gov/html/doh/html/epi/epiquery.shtml). Accessed May 18, 2010.
- Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System Survey Data. Prevalence and Trends Data, Nationwide (States, DC, and Territories)—2008 Diabetes. <http://apps.nccd.cdc.gov/brfss/display.asp?cat=DB&yr=2008&qkey=1363&state=US>. Accessed May 18, 2010.
- American Diabetes Association. Standards of medical care in diabetes—2010. *Diabetes Care*. 2010;33(suppl 1):S11-S61.
- Thorpe LE, Upadhyay UD, Chamany S, et al. Prevalence and control of diabetes and impaired fasting glucose in New York City. *Diabetes Care*. 2009;32(1):57-62.
- Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346(6):393-403.
- Pan XR, Li GW, Hu YH, et al. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance: the Da Qing IGT and Diabetes Study. *Diabetes Care*. 1997;20(4):537-544.
- Tuomilehto J, Lindstrom J, Eriksson JG, et al; for the Finnish Diabetes Prevention Study Group. Prevention

## REFERENCES

- of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med.* 2001;344(18):1343-1350.
9. Wolf AM, Conaway MR, Crowther JQ, et al. Translating lifestyle intervention to practice in obese patients with type 2 diabetes: improving control with activity and nutrition (ICAN) study. *Diabetes Care.* 2004;27(7):1570-1576.
  10. The Look AHEAD Research Group. Reduction in weight and cardiovascular disease risk factors in individuals with type 2 diabetes: one-year results of the Look AHEAD trial. *Diabetes Care.* 2007;30(6):1374-1383.
  11. Ackerman RT, Finch EA, Brizendine E, Zhou H, Marrero DG. Translating the Diabetes Prevention Program into the community. The DEPLOY Pilot Study. *Am J Prev Med.* 2008;35(4):357-363.
  12. Abelson R. An insurer's new approach to diabetes. *The New York Times.* April 14, 2010:B1.
  13. US Preventive Services Task Force. Screening for type 2 diabetes mellitus in adults: US Preventive Services Task Force Recommendation Statement. *Ann Intern Med.* 2008;148(11):846-854.
  14. American Diabetes Association. Diagnosis and classification of diabetes mellitus. *Diabetes Care.* 2010;33(suppl 1):S62-S69.
  15. The International Expert Committee. International Expert Committee report on the role of the A1C assay in the diagnosis of diabetes. *Diabetes Care.* 2009;32(7):1327-1334.
  16. Selvin E, Crainiceanu CM, Brancati FL, Coresh J. Short-term variability in measures of glycemia and implications for the classification of diabetes. *Arch Intern Med.* 2007;167(14):1545-1551.
  17. National Institutes of Health. National Institute of Diabetes and Digestive and Kidney Diseases. Sickle Cell Trait and Other Hemoglobinopathies and Diabetes: Important Information for Physicians. <http://diabetes.niddk.nih.gov/dm/pubs/hemovari-A1C/>. Accessed May 18, 2010.
  18. Adler AI, Stratton IM, Neil HA, et al. Association of systolic blood pressure with macrovascular and microvascular complications of type 2 diabetes (UKPDS 36): prospective observational study. *BMJ.* 2000;321(7258):412-419.
  19. Stratton IM, Adler AI, Neil HA, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. *BMJ.* 2000;321(7258):405-412.
  20. Gaede PH, Lund-Andersen H, Parving HH, Pedersen O. Effect of a multifactorial intervention on mortality in type 2 diabetes. *N Engl J Med.* 2008;358(6):580-591.
  21. UK Prospective Diabetes Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. *Lancet.* 1998;317(7160):703-713.
  22. UK Prospective Diabetes Group. Intensive blood-glucose control with sulphonylureas and insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet.* 1998;352(9131):837-853.
  23. The Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med.* 1993;329(14):977-986.
  24. The Diabetes Control and Complications Trial Research Group. The relationship of glycemic exposure (HbA1C) to the risk of development and progression of retinopathy in the Diabetes Control and Complications Trial. *Diabetes.* 1995;44(8):968-983.
  25. Nathan DM, Kuenen J, Borg R, Zheng H, Schoenfeld D, Heine RJ; for the A1C-derived Average Glucose (ADAG) Study Group. Translating the A1C assay into estimated average glucose values. *Diabetes Care.* 2008;31(8):1473-1478.
  26. New York State Diabetes Campaign, an initiative of the New York State Health Foundation. Diabetes Care Quick Guide. [www.fulldiabetescare.org/images/pdf/HTCQuickCareGuide.pdf](http://www.fulldiabetescare.org/images/pdf/HTCQuickCareGuide.pdf). Accessed May 18, 2010.
  27. Grundy SM, Cleeman JI, Merz NB, et al; for the Coordinating Committee of the National Cholesterol Education Program. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines. *Circulation.* 2004;110(2):227-239.

## REFERENCES

28. The ACCORD Study Group. Effects of intensive blood-pressure control in type 2 diabetes mellitus. *N Engl J Med*. 2010;362(17):1575-1585.
29. Nathan DM, Buse JB, Davidson MB, et al. Medical management of hyperglycemia in type 2 diabetes: a consensus algorithm for the initiation and adjustment of therapy. A consensus statement of the American Diabetes Association and the European Association for the Study of Diabetes. *Diabetes Care*. 2009;31(12):1-11.
30. Chobanian AV, Bakris GL, Black HR, et al; for the National Heart, Lung, and Blood Institute Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure; National High Blood Pressure Education Program Coordinating Committee. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC report. *JAMA*. 2003;289(19):2560-2572.
31. National Institutes of Health, National Heart, Lung, and Blood Institute. Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) Final Report. [www.nhlbi.nih.gov/guidelines/cholesterol/atp3full.pdf](http://www.nhlbi.nih.gov/guidelines/cholesterol/atp3full.pdf). Accessed May 18, 2010.
32. Tran N. Treating tobacco addiction. *City Health Information*. 2008;27(1):1-8.
33. Gonzalez JS, Peyrot M, McCarl LA, et al. Depression and diabetes treatment nonadherence: a meta-analysis. *Diabetes Care*. 2008;31(12):2398-2403.
34. Kansagra SM, Angell SY, Starr B, Silver LD. Improving medication adherence. *City Health Information*. 2009;28(suppl 4):1-8.

NOTICE TO READERS: The NYC DOHMH will no longer offer continuing education credits (CME/CNE) after July 2010. We are exploring options for offering the credits in the future. We apologize for any inconvenience.

**RECEIVE CHI BY E-MAIL:** Each time **City Health Information** is published you will receive a link to the issue in PDF format.

To subscribe, visit [www.nyc.gov/html/doh/html/chi/chi.shtml](http://www.nyc.gov/html/doh/html/chi/chi.shtml).

**DOHMH JOB OPENINGS:** We seek doctors, nurses, administrators, social workers, and other public health professionals. Visit [www.nyc.gov/health/careers](http://www.nyc.gov/health/careers) to view openings.



## City Health Information

May/June 2010 The New York City Department of Health and Mental Hygiene Vol. 29(3):17-24

2 Lafayette Street, 20th Floor, CN-65, New York, NY 10007 (212) 676-2188

**NYC**  
Health  
[nyc.gov/health](http://nyc.gov/health)

**Michael R. Bloomberg**  
Mayor

**Thomas Farley, MD, MPH**  
Commissioner of Health and Mental Hygiene

**Division of Epidemiology**  
Carolyn Greene, MD, Deputy Commissioner  
Ram Koppaka, MD, PhD, Senior Advisor

**Division of Health Promotion and Disease Prevention**  
Andrew Goodman, MD, MPH, Deputy Commissioner  
Deborah R. Deitcher, MPH, Director of Communications

**Bureau of Chronic Disease Prevention and Control**  
Lynn D. Silver, MD, MPH, Assistant Commissioner  
Shadi Chamany, MD, MPH, Director, Diabetes Prevention and Control Program

**Special Consultant**  
David M. Nathan, MD

**Bureau of Public Health Training**  
Peggy Millstone, Director, Scientific Communications  
Peter Ephross, Medical Editor  
Colleen Quinn, Medical Editor  
Rhoda Schlamm, Medical Editor

Copyright ©2010 The New York City Department of Health and Mental Hygiene  
E-mail *City Health Information* at: [nycdohrp@health.nyc.gov](mailto:nycdohrp@health.nyc.gov)  
Suggested citation: Chamany S, Silver LD, Nathan D. Prevention and control of type 2 diabetes in adults. *City Health Information*. 2010;29(3):17-24.

PRST STD  
U.S. POSTAGE  
PAID  
NEW YORK, N.Y.  
PERMIT NO. 6174