

# An Evaluation of the Current Type 2 Diabetes Guidelines: Where They Converge and Diverge

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In providing the best care for patients, health care providers (HCPs) rely on clinical experience and judgment, published literature, and evidence-based clinical guidelines to direct decisions and serve as benchmarks for achieving optimal patient outcomes. Several published guidelines are available to support HCPs in caring for patients with type 2 diabetes. These include recommendations from the American Diabetes Association (ADA),<sup>1</sup> the World Health Organization (WHO),<sup>2</sup> the American Association of Clinical Endocrinologists (AACE),<sup>3</sup> the Indian Health Service (IHS),<sup>4</sup> and the Center for Medicaid and Medicare Services (CMS).<sup>5</sup> These guidelines are kept current through periodic review of available literature and research to ensure that they are up to date and based on the latest available evidence.

Practicing clinicians and the various guideline development committees have diverse perspectives regarding how best to incorporate published research findings into clinical practice when managing patients with a disease as complex as type 2 diabetes. We conducted an evaluation to identify consistencies and discrepancies among the guidelines for nonpregnant adults with type 2 diabetes in the areas of screening, diagnosis, management, and prevention.

## Screening

The ADA, WHO, and IHS guidelines recommend that adults be evaluated

for type 2 diabetes if they are overweight (BMI  $\geq 25$  kg/m<sup>2</sup>) and have one or more of the following risk factors: first-degree relative with diabetes, women who delivered a baby weighing  $> 9$  lb, diagnosis of hypertension  $> 140/90$  mmHg, diagnosis of polycystic ovarian syndrome, history of gestational diabetes mellitus (GDM), or acanthosis nigricans (Table 1).<sup>1,2,4</sup> However, several minor differences do exist among the guidelines. The ADA<sup>1</sup> recommends that adults with prediabetes be screened annually and that adults who are  $\geq 45$  years of age without preexisting conditions be screened every 3 years. The WHO<sup>2</sup> recommends that adults with a history of vascular disease be screened for diabetes every 3 years.

In comparison, the AACE guideline<sup>3</sup> recommends that adults be assessed for diabetes if they have any of the following criteria: findings of impaired glucose tolerance (IGT) or impaired fasting glucose (IFG) from previous testing, a history of cardiovascular disease (CVD), high-risk ethnicity (non-white ancestry), physical inactivity, or are on antipsychotic therapy for schizophrenia or severe bipolar disease (Table 1). The main difference between the AACE guidelines and those of the other three organizations is that AACE does not include a BMI  $> 25$  kg/m<sup>2</sup> in adults as a risk factor indicating the need for diabetes screening. Only the AACE guideline recommends that adults who are taking antipsychotic medications be screened for diabetes.<sup>3</sup>

Compared to the other four sets of guidelines, CMS recommendations carry more restrictive criteria for recommending diabetes screening because this guideline targets reimbursement for the Medicaid and Medicare patient populations. Under the CMS guidelines, diabetes screening is a covered benefit for individuals who have been diagnosed with hypertension, hyperlipidemia, IGT, or IFG or who are obese (BMI  $\geq 30$  kg/m<sup>2</sup>).<sup>5</sup> Screening is also a covered benefit for individuals with at least two of the following risk factors: age  $\geq 65$  years, overweight (BMI  $> 25$  but  $< 30$  kg/m<sup>2</sup>), family history of diabetes, history of GDM, or delivery of an infant weighing  $> 9$  lb.<sup>5</sup>

## Diagnosis

The five sets of guidelines compared<sup>1-5</sup> are largely in accord with each other in terms of diagnosis criteria for type 2 diabetes. For nonpregnant adults, diagnosis is based on either a fasting plasma glucose (FPG) level  $\geq 126$  mg/dl or a 2-hour plasma glucose level  $\geq 200$  mg/dl in an oral glucose tolerance test (OGTT) using a 75-g glucose load (Table 2). These tests should be repeated in the absence of unequivocal hyperglycemia.

One major difference among these guidelines is that ADA, AACE, and IHS guidelines include an A1C  $\geq 6.5\%$  as a diagnostic criterion for type 2 diabetes, whereas WHO and CMS guidelines do not.<sup>1-5</sup> Also, only the WHO guidelines include patients

with a random plasma glucose  $\geq 200$  mg/dl and classic symptoms of hyperglycemia or hyperglycemic crisis as a diagnostic criterion for type 2 diabetes.<sup>2</sup>

### Management

Patients with type 2 diabetes require long-term management plans. All five sets of guidelines are in agreement that patients can benefit from medical nutrition therapy and diabetes self-management education (Table 3).<sup>1-5</sup> Type 2 diabetes is a lifelong disease requiring patients to have advanced management skills. Diabetes education has proven to be a beneficial tool to aid patients in achieving their management goals; it helps improve patients' knowledge, which in turn may help to improve glycemic control, long-term diabetes management, and weight management.<sup>6</sup>

For medical management, only the ADA guidelines specifically recommend initiating metformin therapy at the time of diagnosis for patients in whom it is not contraindicated.<sup>1</sup> The AACE guidelines recommend several medications that can lower FPG and postprandial glucose, but it does not prioritize which medication should be initiated first at the time of diagnosis.<sup>3</sup> Metformin often is the medication of choice for patients newly diagnosed with type 2 diabetes; it helps to decrease glucose production in the liver, increases the body's sensitivity to insulin, and does not cause weight gain.<sup>1</sup> However, depending on patient-specific factors, starting on an oral agent from a different drug class, such as a sulfonylurea, may be appropriate for patients with elevated FPG.<sup>3</sup>

In addition to starting glucose-lowering medications that affect glucose metabolism, the ADA, WHO, AACE, and IHS guidelines also recommend initiating aspirin therapy.<sup>1-4</sup> Patients with increased

**Table 1. Type 2 Diabetes Screening Criteria**

	ADA*	AACE†	WHO‡	IHS	CMS§
Overweight (BMI $\geq 25$ kg/m <sup>2</sup> )	★		★	★	
First-degree relative with diabetes	★	★	★	★	★
Women who delivered a baby weighing $> 9$ lb	★	★	★	★	★
Hypertension ( $> 140/90$ mmHg)	★	★	★	★	★
HDL cholesterol $< 35$ mg/dl or triglyceride level $> 250$ mg/dl	★	★	★	★	★
IGT or IFG on previous testing	★	★	★		★
Polycystic ovarian syndrome	★	★	★	★	
History of GDM	★		★	★	
Acanthosis nigricans	★		★	★	
History of CVD	★	★		★	
High-risk race/ethnicity	★	★	★		
Physical inactivity	★	★			
Age $\geq 65$ years					★
Antipsychotic therapy for schizophrenia or severe bipolar disease		★			
History of vascular disease			★		
Those with prediabetes should be tested annually	★				
A1C $\geq 5.7\%$	★				
If results are normal, repeat test every 3 years	★		★		

\*In the ADA guidelines, adults should be screened if they are overweight and have one of the above criteria. In the absence of the above criteria, testing begins at the age of 45 years. In the ADA guidelines, high-risk ethnicity includes African American, Latino, Native American, Asian American, and Pacific Islander.

†The AACE guidelines do not specify that hypertension must be  $> 140/90$  mmHg. They also do not note which populations constitute high-risk race/ethnicity, noting only non-white ancestry.

‡The WHO guidelines include in the high-risk race/ethnicity category Australian aboriginal, Mauritian, Arab, Pacific Islander, migrant Asian Indian, Chinese, and indigenous Americans.

§For CMS, screening is covered for patients who have hypertension or hyperlipidemia. Screening is also covered for patients with previously documented IFG or IGT.

**Table 2. Type 2 Diabetes Diagnosis Criteria**

	ADA	AACE	WHO	IHS	CMS
A1C ≥ 6.5%	★	★		★	
FPG ≥ 126 mg/dl (fasting = no caloric intake for at least 8 hours)	★	★	★	★	★
2-hour plasma glucose ≥ 200 mg/dl during an OGTT with a 75-g glucose load	★	★	★	★	★
In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥ 200 mg/dl	★	★		★	★
All tests should be repeated in the absence of unequivocal hyperglycemia	★	★	★	★	★

cardiovascular risk are strongly encouraged to begin an aspirin regimen to lower their risk.<sup>1</sup> Patients who have several risk factors for CVD, such as smoking, hypertension, hyperlipidemia, and age > 50 years for men or > 60 years for women, should begin taking low-dose aspirin.<sup>7</sup> The ADA, AACE, and IHS guidelines also recommend that patients begin taking a statin regardless of their baseline lipid levels unless contraindicated.<sup>1,3,4</sup> Clinical judgment should be used when considering starting patients with either of these medications.

For a target glycemic goal, the ADA, WHO, and IHS guidelines recommend an A1C < 7%.<sup>1,2,4</sup> The

**Table 3. Type 2 Diabetes Management**

	ADA	AACE*	WHO†	IHS‡	CMS§
Medical nutrition therapy	★	★	★	★	★
Diabetes self-management education	★	★	★	★	★
Aspirin therapy	★	★	★	★	
Diabetic nephropathy: annual test of serum creatinine and urine albumin	★	★	★	★	
Retinopathy: exam right after diagnosis, annually thereafter	★	★	★	★	
Foot care: daily inspection and annual comprehensive foot exam	★	★		★	★
A1C testing twice yearly or four times yearly for patients not at target	★	★		★	
Blood pressure checked at every routine diabetes visit	★		★	★	
Fasting lipid profile obtained at least annually	★		★	★	
Initiation of statin therapy regardless of baseline levels unless contraindicated	★	★		★	
Bariatric surgery (considered for adults with a BMI > 35 kg/m <sup>2</sup> and type 2 diabetes, especially if the diabetes or associated comorbidities are difficult to control with lifestyle and pharmacological therapy)	★	★		★	
Diabetic neuropathy: screening for distal symmetric polyneuropathy should occur at diagnosis and annually thereafter	★			★	
Limit intake of alcohol to a moderate amount (≤ 1 drink/day for women and ≤ 2 drinks/day for men)	★			★	

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**Table 3. Type 2 Diabetes Management, continued from p. 135**

Immunizations (influenza, pneumococcal polysaccharide, and hepatitis B vaccinations)	★			★	
Peripheral arterial disease screening				★	
Tuberculosis screening				★	
Initiate metformin with lifestyle interventions unless metformin is contraindicated	★				
Initiate insulin from the outset in patients with markedly symptomatic or elevated blood glucose or A1C levels	★				
If noninsulin monotherapy at maximum tolerated doses does not achieve or maintain the A1C target within 3–6 months, add a second oral agent, a glucagon-like peptide-1 receptor agonist, or insulin	★				
<b>Consider assessing for the following common diabetes-associated conditions:</b>					
Hearing impairment	★				
Obstructive sleep apnea	★	★		★	
Fatty liver disease	★			★	
Low testosterone in men	★			★	
Periodontal disease	★			★	
Cancers (liver, pancreas, endometrium, colon/rectum, breast, and bladder)	★			★	
Fractures	★				
Cognitive impairment	★				
Depression		★		★	
<p><i>*In the AACE guidelines, there is no emphasis on annual comprehensive foot exams. There is a recommendation to check blood pressure and lipid levels, but no guidance regarding how often to do so. AACE recommends two types of bariatric surgery, depending on the patient's BMI: laparoscopic-assisted gastric binding for those with a BMI &gt; 30 kg/m<sup>2</sup> and roux-en-Y gastric bypass for those with a BMI &gt; 35 kg/m<sup>2</sup>. AACE does not recommend a specific pharmacological agent to initiate at the time of diagnosis. Instead, it listed medications that will affect FPG (TZDs, sulfonylureas, metformin, incretin enhancers, and long-acting insulin) and postprandial glucose (glinides and/or α-glucosidase inhibitors, short- or rapid-acting insulins, metformin, and incretin-based therapies. AACE only recommends screening for obstructive sleep apnea in men &gt; 50 years of age.</i></p> <p><i>†The WHO guidelines only recommend the initiation of statin therapy if a patient's LDL cholesterol level is high.</i></p> <p><i>‡The IHS guidelines recommend Zoster and tetanus/diphtheria vaccines.</i></p> <p><i>§The CMS guidelines recommend a foot exam every 6 months.</i></p>					

AACE guidelines recommend an A1C ≤ 6.5%.<sup>3</sup> Some individual patients such as those with a longer life expectancy, few comorbid conditions, and little to no history of hypoglycemia may benefit from stricter A1C goals, whereas others

such as many elderly patients would benefit from a less stringent A1C goal. Physicians should incorporate these factors when determining the most appropriate individualized A1C goal for their patients. A comparison of the blood glucose, blood pressure,

and lipid targets recommended in the ADA, WHO, AACE, and IHS guidelines is provided in Table 4.<sup>1-4</sup> CMS did not provide specific target goals for these categories.

Diabetes is associated with several micro- and macrovascular

**Table 4. Comparison of Blood Glucose, Blood Pressure, and Lipid Targets**

	ADA*	AACE†	WHO	IHS
<b>A1C goals</b>				
< 7% for nonpregnant adults	★		★	
< 6.5% for individuals with:				
• Short duration of diabetes	★			
• Long life expectancy	★			
• No significant CVD	★			
< 8% for individuals with:				
• History of severe hypoglycemia	★	★		
• Limited life expectancy	★	★		
• Advanced micro- or macrovascular complications	★	★		
• Extensive comorbid conditions	★	★		
• Longstanding diabetes in whom the general goal is difficult to attain despite self-management education, appropriate glucose monitoring, and effective doses of multiple glucose-lowering agents, including insulin	★	★		
<b>Blood pressure goals</b>				
< 130/80 mmHg	★	★	★	★
<b>Lipid goals</b>				
Triglycerides < 150 mg/dl	★	★	★	★
HDL cholesterol > 40 mg/dl in men, > 50 mg/dl in women	★	★	★	
LDL cholesterol < 100 mg/dl in patients without overt CVD	★	★	★	★
LDL cholesterol < 70 mg/dl in patients with overt CVD	★	★		★
Non-HDL cholesterol < 130 mg/dl for patients with no CVD or minimal cardiovascular risk		★		★
Non-HDL < 100 mg/dl for patients with established CVD or > 2 major CVD risk factors		★		★
Total cholesterol < 200 mg/dl			★	
*In the AACE guidelines, the usual A1C goal is 6.5% and the less stringent A1C goal is 7–8%.				
†In the WHO guidelines, the HDL goal is > 45 mg/dl for men and > 55 mg/dl for women.				

complications. Current recommendations are to monitor serum creatinine and urine albumin annually for early detection of diabetic nephropathy.<sup>1–4</sup> Annual eye exams are recommended for early detec-

tion of diabetic retinopathy.<sup>1–4</sup> Furthermore, the ADA, AACE, and IHS guidelines recommend that patients inspect their feet daily and have an annual comprehensive foot exam.<sup>1,3,4</sup> This exam should consist of

a complete foot inspection, including assessment of foot structure, skin integrity, vascular status, and pedal pulses; testing for loss of sensation using a 10-g monofilament, and any one of the following

tests: vibration sensation using a 128-Hz tuning fork, ankle reflexes, pinprick sensation, or vibration perception threshold.<sup>1,4</sup> However, only the ADA and IHS guidelines recommend screening for distal symmetric polyneuropathy at diagnosis and screening annually for diabetes neuropathy.<sup>1,4</sup>

In patients with chronic diseases, immunizations should be kept up to date to minimize the risk for complicating infections. The ADA and IHS guidelines recommend that patients living with diabetes have an annual influenza vaccine. The pneumococcal vaccine and the hepatitis B vaccination series are also recommended.<sup>1,4</sup> These recommendations overlap with current recommendations from the Centers of Disease Control and Prevention (CDC).<sup>8</sup> In addition, the CDC and IHS recommend that patients living with diabetes be immunized with Zoster and tetanus/diphtheria vaccines.<sup>4,8</sup>

### Prevention

When screening for type 2 diabetes, some patients may be identified as having early signs of the disease but not meeting the criteria for diagnosis. At this stage, patients may be considered to have prediabetes. Often, they have IGT (2-hour OGTT values between 140 and 199 mg/dl), IFG (FPG between 100 and 126 mg/dl), or an A1C of 5.7–6.4%.<sup>1</sup>

To prevent people with prediabetes from progressing to type 2 diabetes, the ADA, WHO, AACE, and IHS guidelines suggest lifestyle interventions such as physical activity for at least 150 minutes/week and smoking cessation.<sup>1–4</sup> Three of these four sets of guidelines (all but the IHS guidelines) recommend weight loss of at least 5–10% of body weight (Table 5). The CMS guidelines do not provide specific recommendations for the prevention of type 2 diabetes. In the Diabetes Prevention

**Table 5. Type 2 Diabetes Prevention**

	ADA	AACE	WHO	IHS
Physical activity at least 150 minutes/week	★	★	★	★
Smoking cessation	★	★	★	★
5–10% weight loss	★	★	★	
Metformin therapy*	★	★		
TZD therapy		★		
Limited intake of sugar-sweetened beverages	★			
Reduced calories and intake of dietary fat; increased intake of dietary fiber and whole grains	★			

\* *The use metformin therapy differs in ADA and AACE guidelines. In the ADA guidelines, metformin can be considered for patients with IGT, IFG, or an A1C of 5.7–6.4%; a BMI > 35 kg/m<sup>2</sup>, age < 60 years, or (for women) previous GDM. Under the AACE guidelines, metformin (or a TZD) can be considered for younger patients who are at moderate to high risk for developing diabetes; patients with additional risk factors, including hypertension, dyslipidemia, or polycystic ovarian syndrome; patients with a family history of diabetes in a first-degree relative; and patients who are obese.*

Program (DPP) study, lifestyle intervention with a goal of at least 7% weight loss along with physical activity of at least 150 minutes/week reduced the risk of developing type 2 diabetes.<sup>9</sup> Participants in the lifestyle intervention group decreased their risk of developing type 2 diabetes by 58% compared to 31% in the metformin group. In a 10-year follow-up of the DPP, participants in the lifestyle intervention group maintained a 34% reduced risk of developing type 2 diabetes compared to 18% in the metformin group.<sup>10</sup> The data from this study show that weight loss plays a significant role in decreasing patients' risk for developing type 2 diabetes.

ADA<sup>1</sup> and AACE<sup>3</sup> recommend starting metformin when prediabetes is identified, but criteria for initiating this therapy differ between the two sets of guidelines. Details for the specific criteria outlined in each can be found in Table 5.

In terms of completeness, the ADA guidelines offer more suggested actions that HCPs could propose for their patients, including reducing their intake of sugar-sweetened beverages, reducing their total daily calories and dietary fat intake, and increasing their intake of dietary fiber through fruits and whole grains.<sup>1</sup>

### Summary

For well-studied chronic disease states, there are often several sets of recommendations providing guidance for HCPs. New research is constantly being published and leads to periodic revisions or updates to such guidelines. However, there will always be some similarities and some differences among different sets of guidelines. HCPs must note these similarities and differences and then rely on clinical judgment to provide the best possible care for patients. In choosing among the various practice

guidelines for diabetes care, HCPs should consider the individualized needs of their patients based on each patient's medical history, comorbid conditions, age, and other factors. Above all, the patients must be the focal point of the decision-making process to increase the likelihood of success.

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