**HEMOGLOBIN A1C**

**Criteria for the diagnosis of diabetes:**

* A1C ≥ 6.5%. This test should be performed in a laboratory using a method that is NGSP certified and standardized to the DCCT assay.\*

OR

* FPG ≥126 mg/dl (7.0 mmol/l). Fasting is defined as no caloric intake for at least 8 h.\*

OR

* 2-h plasma glucose ≥ 200 mg/dl (11.1 mmol/l) during an OGTT. The test should be performed as described by the World Health Organization, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.\*

OR

* In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥ 200 mg/dl (11.1 mmol/l).

**\*Categories of increased risk for diabetes (prediabetes):**

* FPG 100-125 mg/dl (5.6-6.9 mmol/l): IFG

OR

* 2-h plasma glucose in the 75-g OGTT 140-199 mg/dl (7.8-11.0 mmol/l): IGT

OR

* A1C 5.7-6.4%

**Criteria for testing for diabetes in asymptomatic adult individuals:**

1. Testing should be considered in all adults who are overweight (BMI ≥ 25 kg/m2) and have additional risk factors:
	* Physical inactivity
	* First-degree relative with diabetes
	* High-risk race/ethnicity (e.g., African American, Latino, Native American, Asian American, Pacific Islander)
	* Women who delivered a baby weighing > 9 lb. or were diagnosed with GDM
	* Hypertension (≥140/90 mmHg or on therapy for hypertension)
	* HDL cholesterol level <35 mg/dl (0.90 mmol/l) and/or a triglyceride level >250 mg/dl (2.82 mmol/l)
	* Women with polycystic ovarian syndrome (PCOS)
	* A1C ≥ 5.7%, IGT, or IFG on previous testing
	* Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)
	* History of CVD
2. In the absence of the above criteria, testing for diabetes should begin at age 45 years.
3. If results are normal, testing should be repeated at least 3-year intervals, with consideration of more frequent testing depending on initial results and risk status.

**Summary of glycemic recommendations for many nonpregnant adults with diabetes:**

* A1C < 7.0%\*
* Preprandial capillary plasma glucose 70-130 mg/dl\*

 (3.9-7.2 mmol/l)

* Peak postprandial capillary plasma glucose <180 mg/dl

 (<10.0 mmol/l)

* Goals should be individualized based on:
	+ Duration of diabetes
	+ Age/life expectancy
	+ Comorbid conditions
	+ Known CVD or advanced microvascular complications
	+ Hypoglycemia unawareness
	+ Individual patient considerations
* More or less stringent glycemic goals may be appropriate for individual patients
* Postprandial glucose may be targeted if A1C goals are not met despite reaching preprandial glucose goals.

**2012 HEDIS Measures:**

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| **DIABETES****Comprehensive Diabetes Care (18-75 years)** |
| HbA1c Testing | Percent of members with one HbA1c test during year |
| HbA1c Poor Control* >9%
 | Percent of members with HbA1c result of higher than 9.0 |
| HbA1c Good Control* <7%
 | Percent of members with HbA1c result of lower than 7.0 |
| Eye Exam* Retinal
 | Percent of members who have had an annual retinal exam in the measurement year, or have had a negative exam in the year prior |
| LDL-C Screening | Percent of members who have had an LDL-C screening |
| LDL-C Control* <100 mg/dL
 | Percent of members who have had an LDL-C lower than 100 mg/dL |
| Medical Attention for Nephropathy | Percent of members who have had attention to the presence of nephropathy |
| Blood Pressure Control* <140/80 mmHg
 | Percent of members with acceptable BP<140/80 mm Hg |

**Discussion**

In 2009, the International Expert Committee that included representatives of the ADA, the International Diabetes Federation (IDF), and the European Association for the Study of Diabetes (EASD) recommended use of A1C to diagnose diabetes, with a threshold of ≥6.5%. In 2010 the ADA adopted this criterion. The A1C has several advantages over Fasting Plasma Glucose and Oral Glucose Tolerance Testing, including greater convenience, since fasting is not required; evidence to suggest greater preanalytical stability; and less day-to-day perturbations during periods of stress or illness.

As with most diagnostic tests, a test result diagnostic of diabetes should be repeated to rule out laboratory error, unless the diagnosis is clear on clinical grounds, such as a patient with hyperglycemic crisis or classic symptoms of hyperglycemia and a random plasma glucose ≥ 200 mg/dl. It is preferable that the same test be repeated for confirmation, since there will be greater likelihood of concurrence in this case. However, if the different tests (such as A1C and FPG) are both above the diagnostic thresholds, the diagnosis of diabetes is also confirmed. If two different tests are available in an individual and the results are discordant, the test whose result is above the diagnostic cut point should be repeated, and the diagnosis is made on the basis of the confirmed test. That is, if a patient meets the diabetes criterion of the A1C (two results ≥ 6.5%) but not the FPG (<126 mg/dl or 7 mmol/l), or vice versa, that person should be considered to have diabetes.

Several prospective studies that used A1C to predict the progression to diabetes demonstrated a strong, continuous association between A1C and subsequent diabetes. Those with an A1C between 5.5 and 6.0% had a substantially increased risk of developing diabetes with 5-year incidences ranging between 9-25%. An A1C range of 6.0-6.5% had a 5-year risk between 25-50% and relative risk 20 times higher compared to an A1C of 5.0%. Baseline A1C was a stronger predictor of subsequent diabetes and cardiovascular events than fasting glucose. Hence, it is reasonable to consider an A1C range of 5.7% - 6.4% as identifying individuals with high risk for future diabetes, a state that may be referred to as “prediabetes”. These individuals should be informed of their risk and counseled about effective strategies to lower that risk. Interventions should be most intensive and follow-up most vigilant for those with A1C’s above 6.0%, who should be considered to be at high risk.

Based on the results of clinical trials and the known risk of progression of “prediabetes” to diabetes, persons with A1C of 5.7-6.4% should be counseled on lifestyle changes with goals of 7% weight loss and moderate physical activity of at least 150 min/week. Regarding the more difficult issue of drug therapy for diabetes prevention, a consensus panel felt that Metformin should be the only drug considered. For other drugs, the issues of cost, side effects, and lack of persistence in effect in some studies led the panel to not recommend their use in diabetes prevention.

Because A1C is thought to reflect average glycemia over several months and has strong predictive value for diabetes complications, A1C testing should be performed routinely in all patients with diabetes, at initial assessment and then as part of continuing care. Measurement approximately every 3 months determines whether a patient’s glycemic targets have been reached and maintained. Some patients with stable glycemia well within target range may do well with testing only twice a year, while unstable or intensively managed patients (e.g., pregnant type 1 patients) may be tested more frequently than every 3 months. A1C does not provide a measure of glycemic variability or hypoglycemia. For patients prone to glycemic variability (especially type 1 patients, or type 2 patients with severe insulin deficiency), glycemic control is best judged by the combination of results of self-monitoring of blood glucose (SMBG) testing and A1C. The A1C may also serve to check on the accuracy of the patient’s meter (or the patient’s reported SMBG results) and the adequacy of the SMBG testing schedule.

Lowering the A1C to around 7% or below has been shown to reduce microvascular and neuropathic complications of diabetes and, if implemented soon after the diagnosis of diabetes, is associated with long-term reduction in macrovascular disease. Therefore, a reasonable goal for most non-pregnant adults is an A1C ≤ 7%. Because several randomized trials suggest a small but incremental benefit in microvascular outcomes with A1C values closer to normal, providers might reasonably suggest more stringent A1C goals for selected individual patients, if this can be achieved without significant hypoglycemia or other adverse effects of treatment. Such patients might include those with short duration of diabetes, long life expectancy, and no significant cardiovascular disease. Conversely, less stringent A1C goals may be appropriate for patients with a history of severe hypoglycemia, limited life expectancy, advanced microvascular or macrovascular complications, extensive comorbid conditions and those with longstanding diabetes in whom the general goal is difficult to attain despite appropriate glucose monitoring and effective doses of multiple glucose-lowering agents including insulin.

**References:**

American Diabetes Association, “Standards of Medical Care in Diabetes – 2011”, Diabetes Care, January 2011, Vol. 34, no. supplement 1, 511-561.

NCQA Healthcare Effectiveness Data and Information Set (HEDIS), “HEDIS and Quality Measurement, 2012 HEDIS Measures”, National Committee for Quality Assurance, 2011.