

# Understanding A1C Targets and Possible Factors for Discordance

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CAPSULE

The glycated hemoglobin test, also referred to as HbA1C, is a measure of the proportion of hemoglobin molecules that have been glycated and reflects the plasma glucose concentration in the past 120 days (life span of erythrocytes).

The HbA1C goal should be individualized based upon patient characteristics, including age, treatment burden, hypoglycemia risk, longevity, complications, comorbidities, preferences, and capability/motivation of the patient (Table 1).<sup>1</sup>

Randomized controlled trials in patients with type 1 and early type 2 diabetes have demonstrated that an HbA1C target of 7% or less reduces microvascular complications. However, the effect of glucose control on macrovascular disease is modest, and observed only with early implementation and prolonged follow-up (10 years or more).<sup>2</sup>

HbA1C results are not affected significantly by acute fluctuations in blood glucose concentrations, such as with illness or after meals, and may not reflect recent changes in treatment regimens nor recent changes in glycemic control.<sup>1</sup> HbA1C is lower in Caucasians compared to other racial and ethnic groups when accounting for average glucose derived by other methods.

However, the prognostic value in predicting complications is similar across race or ethnicity, and targets do not differ by race or ethnicity. If the HbA1C is felt to be unreliable or discordant with glucose monitoring (see Table 2), alternative markers of glycemic control, such as fructosamine, glycated albumin, or continuous glucose monitoring can be considered.<sup>3</sup> Table 2 was developed by Cardi-OH as a resource to guide clinicians in identifying explanations for possible A1C discordance.

For more information, access Cardi-OH's expanded resource on [glucose monitoring](#).

**Table 1. Glucose Targets Based on Patient Characteristics<sup>1</sup>**

Health Status	A1C (%)	Fasting/premeal (mg/dl)	Peak Postprandial (mg/dl)	Bedtime (mg/dl)
<b>General Population</b>				
<b>Healthy*</b>	7.0	80-130	180	*
<b>Older Adults</b>				
<b>Healthy</b>	7.5	90-130	*	90-150
<b>Intermediate</b>	8.0	90-150	*	100-180
<b>Poor</b>	8.5	100-180	*	110-200

\*Targets should be individualized based upon patient characteristics, including age, treatment burden, hypoglycemia risk, longevity, complications, comorbidities, preferences, and patient capability/motivation.

**Table 2. Patient Conditions Associated with A1C Discordance**

<b>Falsely Decreased A1C<sup>3</sup></b> (A1C result is lower than expected based on glucose monitoring)	<b>Falsely Increased A1C</b> (A1C result is higher than expected based on glucose monitoring)
Hemoglobin variants	Hemoglobin variants
Acute blood loss*	Chronic kidney disease (low erythropoietin)
Hemolytic anemia*	Iron-deficiency anemia*
Vitamin C	Hypertriglyceridemia
Vitamin E	Hyperbilirubinemia
Pregnancy	Uremia
Hemodialysis	Chronic alcohol use
Blood transfusion	Chronic salicylate use
Erythropoietin/hydroxyurea treatment	Chronic opiate use
	Age (0.1% per decade after age 30)

\*Any condition which affects red blood cell turnover can affect the HbA1C regardless of assay used. The effect on the HbA1C may also depend on the timing and type of treatment (e.g., erythropoietin will acutely increase red blood cell turnover in patients with chronic kidney disease and HbA1C may shift from falsely high to falsely low). Other variables may be assay-dependent.

## REFERENCES

- American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care* 2020;43(1): S1-S52.
- Holman RR, Paul SK, Bethel MA, et al. 10-year follow-up of intensive glucose control in type 2 diabetes. *N Engl J Med*. 2008;359(15):1577-1589.
- Sacks DB, Arnold M, Bakris GL, et al. Guidelines and recommendations for laboratory analysis in the diagnosis and management of diabetes mellitus. *Clin Chem*. 2011;57(6):e1-e47. doi:10.1373/clinchem.2010.161596.