

Clinical Use of Hemoglobin A_{1c} to Improve Diabetes Management

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For more than 25 years, the hemoglobin A_{1c} (A1C) test has been the most widely accepted outcome measure for evaluating glycemic control in individuals with diabetes. The test provides an index of a patient's average blood glucose level during the past 2–3 months¹ and is considered to be the most objective and reliable measure of long-term metabolic control.^{2,3} The Diabetes Control and Complications Trial established that maintaining A1C levels as close as possible to the normal range results in considerable reductions in long-term health complications.⁴ Thus, as the “gold standard” measure of diabetes control, this test provides important feedback to health care professionals and patients. It follows that patients' understanding of this test and its implications for long-term health risk is essential.

RESEARCH FINDINGS

Research has shown that regular measurement of A1C over the long term can identify patients with poor glycemic control and facilitate their improvement.⁵ The established relationship between A1C measurements and long-term complications,⁴ as well as the association between regular A1C testing and improved metabolic control,⁵ underscore the importance of determining the extent of patients' understanding of this important test and how its results are used in the clinical setting.

Patient Knowledge of A1C

Relatively few studies have examined diabetic patients' knowledge and understanding of A1C testing. Findings from

one recent study conducted in Norway⁶ revealed that the majority (82.6%) of 201 adult patients with type 1 diabetes knew what their last A1C was, and most patients (90%) knew what a satisfactory A1C value would be. But a significant number of patients (42%) reported they had low knowledge of A1C testing in general. Furthermore, 25% of patients did not think that treatment intensification should occur at an A1C value of 10%.

A recent cross-sectional study examined the relationship between patients' knowledge of their recent A1C values and diabetes self-management.⁷ In this study, an ethnically diverse sample of 663 patients with type 2 diabetes in the United States completed the survey. Results showed that 66% of patients did not know their last A1C results, with only 25% able to accurately report the value. Knowledge of A1C results was associated with higher educational levels and ratings of good provider communication, as well as better understanding of diabetes care, but not with diabetes management attitudes or self-management behaviors. These findings are consistent with another study⁸ in which just 24% of patients who reported having a recent A1C test actually knew the result when compared with the medical chart.

One study⁹ examined knowledge about A1C in youths with type 1 diabetes. Sixty-four low-income minority youths (11–16 years of age) with type 1 diabetes were recruited from a specialty clinic. Youths were interviewed concerning their knowledge of the A1C test and the health risks associated with particular

A1C values. Only 14% of the youths were able to accurately describe the A1C test. Just 11, 7.8, and 7.8% correctly identified the A1C ranges for good, fair, and poor glycemic control, respectively. Very few youths (1.6–3.2%) knew the blood glucose values corresponding to specific A1C results. Only a small number of youths correctly estimated the short- and long-term risks associated with A1C values of 7 and 12%. In this sample, there was a significant lack of knowledge concerning the meaning and implications of the A1C test.

A1C Feedback to Patients

The most frequently used assay to measure A1C is high-performance liquid chromatography. Although this is the standard reference method, the disadvantage of it is that the results are not available at the time of the patient visit, and patients are typically told about their test results days later with either a letter or follow-up phone call. With this delay in communicating health feedback, opportunities in the clinical encounter for decision-making and changes in regimen prescriptions may be missed.

With recent technological advances, immediately available accurate and reliable A1C results can be obtained during the clinical encounter with a benchtop analyzer (DCA 2000; Bayer, Elkhart, Ind.). A controlled study was conducted to evaluate the effects on subsequent glycemic control of immediate feedback of A1C levels.¹⁰ In this randomized study of 201 patients (both type 1 and type 2 diabetic patients with insulin treatment), one group received immediate feedback,

while the other group received delayed feedback via phone call or letter. Patients were followed for 1 year. Results indicated that immediate A1C feedback helped to improve subsequent glycemic control at 6 and 12 months, although this study did not identify any specific changes in behavior that were responsible for the improved glycemic control.

Another more recent randomized prospective study¹¹ examined the effects of rapid A1C feedback on clinical decision making and subsequent glycemic control in patients with type 2 diabetes recruited from an urban primary care setting. The study focused on whether rapid A1C feedback would lead to improved intensification of treatment regimens as well as improved A1C results at follow-up. Of 597 patients initially recruited for a baseline evaluation, 440 had one follow-up visit, and 275 had two follow-up visits over the course of the study period. Results showed that rapid availability of A1C values resulted in more frequent intensification of therapy when A1C was > 7%. In addition, for patients with two follow-up visits, A1C decreased significantly in the rapid feedback group but not in the control group.

These findings are similar to a previous report¹² that showed that immediate availability of A1C results enhanced clinical decision making in an urban sample of African-American patients. Other recent studies^{13,14} have shown that presenting A1C results graphically to patients may not only help them understand what the results mean, but also improve their glycemic control.

CLINICAL IMPLICATIONS

These research findings indicate that health care providers should not assume their patients understand the A1C test because several studies have indicated that most patients do not know their most recent A1C values or the meaning of those values. The research has also demonstrated that it is better to have immediate feedback of A1C results during the clinical encounter because this gives the opportunity for enhanced clinical

decisions, intensification of treatment regimens, and better subsequent glycemic control.

Based on these findings, it is clear that clinicians should actively discuss A1C results with their patients. This means taking the time to explain the importance of the test and then provide graphic illustrations of what the numbers mean in terms of average blood glucose levels. It is important for patients to understand the concept that the test averages all the daily blood glucose excursions during the previous 2–3 months. Examples should be provided that show what specific A1C values would correspond to specific average blood glucose values. Clinicians should discuss individual patients' glycemic goals, not just on a long-term, but also on a daily basis. Patients should clearly understand the relationship between high A1C results and health risks, but this should be explained in the context of the importance of having good daily glycemic profiles, which can be so important to quality of life by reducing the variability of blood glucose during the day.

Providing A1C results to patients gives clinicians an opportunity to motivate patients to more effectively manage their diabetes, as well as to positively reinforce those who are already effectively managing their diabetes. Ideally, this should be done at the time of the clinical encounter. If immediate A1C testing is not available, then having the test conducted before the patient encounter would be preferable so the results could be discussed and utilized during the patient visit.

It is important to remember that knowledge of A1C test results is an important prerequisite for effective diabetes self-management but is not sufficient to achieve good diabetes self-management behaviors and good glycemic control. Providing information can help increase knowledge, but it does not necessarily lead to the behavior changes required for effective diabetes management. Studies^{15–17} indicate that clinicians should establish a collaborative relation-

ship with their patients, encourage their active engagement in the decision-making process, and explore with them their goals for diabetes management, the barriers they perceive, and the confidence they feel in order to enhance their self-efficacy and improve their motivation for effective self-management of diabetes.

CONCLUSIONS

The A1C test provides crucial information about glycemic control in patients with diabetes, but it often is not used skillfully in clinical practice. Most patients do not understand the test and are not aware of their recent A1C results. Clinicians have the opportunity to use the A1C test as part of the clinical encounter to engage their patients, discuss their glycemic goals, and work collaboratively with them to improve diabetes self-management.

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