

**Article:**

Tianyu Cao, Michael Fang, Amelia S Wallace, Natalie Daya Malek, Arielle Valint, Dan Wang, Justin B Echouffo-Tcheugui, Scott L Zeger, Elizabeth Selvin.

Patterns of One-Year Change in HbA_{1c} and Continuous Glucose Monitoring (CGM) Metrics in Older Adults with Type 2 Diabetes.

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Guest: Tianyu Cao is a PhD student in the Department of Epidemiology at the Johns Hopkins Bloomberg School of Public Health in Baltimore, Maryland.

Bob Barrett:

This is a podcast from *Clinical Chemistry*, a production of the Association for Diagnostics & Laboratory Medicine. I'm Bob Barrett.

Hemoglobin A_{1c} is routinely used in clinical practice to assess long-term glycemic control, typically the last 8 to 12 weeks. With the increase in popularity of continuous glucose monitors that calculate average glucose and time in range, patients now have multiple different ways to monitor their glucose control. Typically, these metrics all agree readings universally improve as glycemic status improves. This isn't always the case though.

A substantial number of patients have discordant readings where decreased hemoglobin A_{1c} indicates lower average blood sugar but increasing continuous glucose monitor results suggest the opposite trend. A research article in the October 2026 issue of *Clinical Chemistry* continues this story in an often overlooked patient population, older adults. How often are discordant hemoglobin A_{1c} and continuous glucose monitor results observed, and perhaps more importantly, when discordance is observed which result is right?

Today we'll chat with the article's author. Tianyu Cao is a Ph.D. student in the Department of Epidemiology at the Johns Hopkins Bloomberg School of Public Health. His research focuses on diabetes and cardiovascular epidemiology. He is interested in using continuous glucose monitoring and other ambulatory technologies to improve health among people with diabetes. So let's start with this.

Both hemoglobin A_{1c} and continuous glucose monitoring metrics, such as time and range, reflect glycemic status and people often talk about their high correlations. Could you tell us why the two measures should be used together rather than just focusing on either one of them separately?

Tianyu Cao:

Yes of course. Thank you for that question. So as you mentioned, both hemoglobin A_{1c}, or HbA_{1c}, or CGM reflect a person's glucose status. However, the two measures actually have different underlying mechanisms and have different

sources of variation. They can provide complementary information in improving the assessment of glucose.

HbA_{1c} is a measure of average glucose levels over the past two or three months as we all know. So it's a measure of long-term glucose control but does not provide information on glucose variability or hypoglycemia, which CGM offers by measuring the interstitial glucose levels every 5 to 15 minutes. The two measures have different sources of variation and more importantly those sources of variations are often independent of each other, meaning that the measurements accuracy of HbA_{1c} and CGM are often influenced by different factors.

So for example, HbA_{1c} can be affected by any conditions that influence the turnover of red blood cell, including anemia and kidney disease. On the other side, the accuracy of CGM can be affected by like certain medications, by sensor and placement issues, and CGM is just generally less accurate at low glucose levels.

So relying on either measure alone can be, or might be, misleading and we'll give you one example, right. So suppose one adult with type 2 diabetes visits the clinic, receives some treatment for glucose lowering and it comes back in around six months or a year later. The HbA_{1c} has increased by more than 0.5 percentage point.

Now oftentimes this may trigger more intensive treatment strategies such as to be put on insulin, which may increase the risk of hypoglycemia. However, maybe the CGM will tell you something different. Maybe the TR, or time in range, has remained relatively stable or even has improved over time and that increase in HbA_{1c} be observed with due to other reasons, other non-glycemic related reasons. You simply cannot tell this if only HbA_{1c} was measured and there is a risk of overtreatment.

And lastly, going back to your question about the high correlations. I think it is, well, first important to recognize that the correlations, or the correlations that has been reported in similar studies, are often measured at the population level, which does not explain individual level variations. And also those correlations were mostly based on cross-sectional studies or measurements taken at a single time point which cannot tell us about how the measurements or their relationship would change over time.

Bob Barrett:

We see the participants in this study were on average 82-years-old, which is substantially older than participants in most CGM studies. Why is it important to study the discordance between hemoglobin A_{1c} and CGM metrics in this older population?

Tianyu Cao: Yes, I think first of all I will start by saying that any conditions that may affect the measurement accuracy of either HbA_{1c} or CGM can lead to discordance, right. But in older populations those conditions are probably more common because some of the conditions are just age related. Like for example, kidney diseases is substantially more prevalent at older ages and is often more severe.

Even aging itself has been shown to be associated with the discrepancy between HbA_{1c} and serum glucose levels. So as a result the discordance between HbA_{1c} and CGM metrics may be more prevalent in this population and also larger in this magnitude. In older population, there's often a high risk of hypoglycemia and their glucose targets often needs to be individualized due to the frequent comorbidities and polypharmacy.

But HbA_{1c} does not provide information on glucose variability or hypoglycemia and thus relying on it alone can be insufficient because you are essentially missing some information, right, which can even be misleading in some situations. So older population is relatively more vulnerable to diabetes related conditions and intensive treatment. The additional information provided in the combined use of CGM and HbA_{1c} may help to improve individualized diabetes management.

Bob Barrett: When hemoglobin A_{1c} and CGM metrics show discordant or even opposite changes, which one should people trust and what would you suggest doing next?

Tianyu Cao: Yes. Thank you. That's a wonderful question. First of all, I would encourage people to talk with health care providers, right. That should probably always be the first thing coming to mind when there's a question or answer about those measurements. But from my perspective, I think it is very important to not assume which measurement is more accurate than the other.

I think oftentimes when discordant happens this suggests that some sort of information or more investigation is needed before any decision-making process. I would probably first suggest checking for the accuracy or integrity of CGM data because factors like sensor placement issues or even whether you have one device long enough can all affect the reliability of CGM.

And similarly I would suggest like checking for conditions that may affect the accuracy of HbA_{1c} or CGM, right. We have mentioned some of the related conditions such as anemia, kidney disease, medication, or even variance in the hemoglobin structure. So all those factors and conditions can

lead to discordance between the two measurements. But of course it's not always feasible or possible to check for all the conditions which may require an extensive amount of effort.

So it depends on the situation, I think people may choose to retake the measurements. And if the discordance persisted, I think it will be necessary to confirm with an alternative measure of glycemia. And preferably measures that share a different sources of variation compared to CGM or HbA_{1c} such as fructosamine. I think the bottom line here is that I would suggest people to see such discordance as an independent piece of information that can be used to improve the management of diabetes.

Bob Barrett: Well finally you found that discordant changes were common among participants with and without insulin use. What are the implications for people with diabetes who are not receiving insulin therapy?

Tianyu Cao: Yes. First, I suggest that the discordance between HbA_{1c} and CGM was not entirely explained by insulin use status, which is often associated with a higher glucose variability. The second implication is actually similar like what we have discussed, right. So CGM and HbA_{1c} provide additional and complementary information about glucose status in this population.

And the latter might be particularly relevant or important now because the use of CGM has been expanded to the broader population with diabetes. Starting in 2025, the American Diabetes Association, or ADA, has recommended the use of CGM in adults with type 2 diabetes who are not treated with insulin, to improve individualized management of diabetes.

And then after, in 2026, the recommendation was expanded to all people with diabetes when CGM use helps to support the management of diabetes. So although those are relatively new recommendations and there are currently limited data in this population, the recommendation levels were not very high. But prior studies have shown that the use of CGM in adults with type 2 diabetes who are not treated with insulin can improve the quality of life and reduce hemoglobin A_{1c}.

So in this context, I think our results really further suggest the potential value of CGM use in this population.

Bob Barrett: That was Tianyu Cao from Johns Hopkins University in Baltimore, Maryland. He wrote a research article in the October 2026 issue of *Clinical Chemistry* highlighting discordance between hemoglobin A_{1c} and continuous glucose monitors. And he has been our guest in this podcast on that topic. I'm Bob Barrett. Thanks for listening.