Clinical Chemistry

Within-Person and Between-Sensor Variability in Continuous Glucose Monitoring Metrics

Article:
Elizabeth Selvin, Dan Wang, Mary R Rooney, Michael Fang, Justin B Echouffo-Tcheugui, Scott Zeger, Joseph Sartini, Olive Tang, Josef Coresh, R Nisha Aurora, and Naresh M Punjabi.
Within-Person and Between-Sensor Variability in Continuous Glucose Monitoring Metrics
Clin Chem 2023; 69(2): 180-188. https://doi.org/10.1093/clinchem/hvac192

Guest: Dr. Elizabeth Selvin is a Professor of Epidemiology and Medicine at the Johns Hopkins Bloomberg School of Public Health in Baltimore, MD.

Bob Barrett: This is a podcast from *Clinical Chemistry*, a production of the American Association for Clinical Chemistry. I'm Bob Barrett. Continuous glucose monitoring, or CGM, is growing increasingly popular for the management of patients with diabetes and CGM use has benefited patients by improving glycemic control and reducing the number of hypoglycemic episodes. The accuracy of CGM devices has improved in recent years and currently available devices summarize time spent in the desirable glucose range while noting excursions above and below these limits. As CGM devices are relatively new, little is known about the variability of these devices in an individual person over time. Similarly, it is unknown whether CGM devices from different manufacturers consistently agree or if they generate wildly different estimates of plasma glucose. If CGM data are used to guide clinical decision making, an understanding of within- and between-sensor variability will be essential. A new research article, appearing in the February 2023 issue of *Clinical Chemistry,* tackles this problem head on.

A clinical researcher who has devoted her career to improving the lives of persons with type 2 diabetes explains applications of continuous glucose monitoring, summarizes performance characteristics of two different sensors, and discusses the implications of these findings for CGM use in clinical practice. In this podcast, we are pleased to be joined by the lead author of this article, Dr. Elizabeth Selvin, a Professor of Epidemiology and Medicine at the Johns Hopkins Bloomberg School of Public Health. She leads research projects that combine epidemiology with clinical practice, with a focus on diabetes screening and diagnosis. So, Dr. Selvin, your study looked at continuous glucose monitoring, or CGM, of different sensors in people with type 2 diabetes. What were your main motivations for conducting this study?

Elizabeth Selvin: Well, continuous glucose monitors have revolutionized the lives of many people with type 1 diabetes, but these sensors are also increasingly being used in people with type 2 diabetes. So we undertook this study with two main goals in mind. First, we were really interested to compare two

different sensors worn on the same people at the same time, to answer the question "Do sensors from different manufacturers give the same results?" And then second, we were interested in comparing how measurements from the same sensor in the same person might change over time in people with type 2 diabetes.

Bob Barrett: This sounds fascinating. So tell me, how did the two sensors compare? And did the results from the different sensors change a lot over time?

Elizabeth Selvin: So, main conclusion from our study is that the two CGM sensors worn on the same person at the same time can actually give very different results. Only about 70% of the readings from one sensor were within 20% of the readings on the other sensor. And then when we averaged all the glucose measurements from the two different sensors over the two weeks that the participants wore these sensors, so that's over 1000 measurements for each of the different sensors, the mean glucose typically differed by a plus or minus 13 milligrams per deciliter. And then we also saw that there were changes over time. So especially when we assess the rates of hypoglycemia in these participants.

Bob Barrett: What do your data mean for the use of CGMs out there in clinical practice?

Elizabeth Selvin: Our study helps to establish the expected random variability that we might see both within and across CGM sensors in patients with type 2 diabetes.

Bob Barrett: And just as an aside here, are the results similar for people with type 1 diabetes or does it make a difference at all?

Elizabeth Selvin: I think actually what we're seeing is similar to what we see in people with type 1 diabetes. We know that these different sensors, I think we just haven't done the comparisons, and we need to do this research both in people with type 1 and type 2 diabetes.

Bob Barrett: Well, finally, Dr. Selvin, can you tell us what you think are some of the next steps in this field? What's coming up?

Elizabeth Selvin: There's been a lot of emphasis on the strengths of continuous glucose monitoring technology. And don't get me wrong, continuous glucose monitoring is an amazing technology, has a lot of major strengths, and it's made a big difference for many patients. But I'm also concerned that we're not looking critically enough at this really important technology. So I think the best way to improve care of patients is to put continuous glucose monitoring technology to rigorous tests, reveal its strengths and its weaknesses, and use this information to optimize care for patients with diabetes.

Bob Barrett: That was Dr. Elizabeth Selvin from the Johns Hopkins Bloomberg School of Public Health. She and her team evaluated the within- and between-sensor variability of continuous glucose monitors. Her work was published in the February 2023 issue of *Clinical Chemistry* and we thank her for being a guest in this podcast. I'm Bob Barrett. Thank you for listening.