



# Beyond A1C: Time in Range and Other Metrics

## Preface

Anne L. Peters, Guest Editor

Continuous glucose monitoring (CGM) and the metrics surrounding its use have become increasingly integrated into the world of diabetes management. However, these tools require that people have access to the devices and providers who can help interpret them. I remember when I first heard about time in range (TIR) as a concept from Dr. Richard M. Bergenstal. Initially, I was a bit dubious. I was used to looking at my beloved “spaghetti graphs” and viewing the individual colorful linear representations of each day layered on top of each other; I knew how to analyze data *my way*. But over time, I became a convert. It was important to aggregate data into a standard format to make it more universally acceptable. And inherent in TIR is nearly everything that is needed to understand a patient’s diabetes status—both what is working well and what needs addressing. Other metrics contribute to the analysis, and each person can develop his or her own approach to evaluating and using the data.

One of the strengths of TIR (and other CGM-derived metrics) is that they are easily accessible to the person with diabetes. No longer does a patient need to wait for a quarterly appointment with a provider. CGM devices can be programmed to display weekly TIR results, so people have a more frequent assessment of their glycemic control. This ability allows them to self-adjust therapy or to reach out to a diabetes care provider for help.

The first article in this *Diabetes Spectrum* From Research to Practice section focusing on CGM-derived metrics of glycemic control is written by the two leaders in this field. Dr. Bergenstal and Dr. Roy W. Beck have tirelessly championed the use of the TIR and the ambulatory glucose report as a standardized way to report CGM data. They have authored many articles in this area and provide, in their article starting on p. 102, thoughtful, reasoned analyses that provide the scientific background and rationale for moving beyond A1C as the gold-standard parameter for assessing glycemic control.

In our second article (p. 109), Dr. Grazia Aleppo, who has had extensive experience using CGM clinically as well as in

research trials, summarizes the clinical use of TIR and its associated metrics in a helpful and user-friendly manner. I learn something new from Dr. Aleppo every time I interact with her, and this review is no exception.

Pregnancy is another area in which the use of CGM-derived metrics may become very important. Although many of us use CGM in our patients who are pregnant, how we interpret the resulting data and use parameters such as TIR varies. In our third article (p. 119), Drs. Jennifer A. Wyckoff and Florence M. Brown clearly summarize what we know, as well as what we do not yet know, about the role of TIR in pregnancy.

CGM-derived outcomes are not just changing diabetes clinical care; researchers are also adopting TIR as an end point and finding that, in many ways, it expands our ability to study responses of people with diabetes to various therapies. In the article starting on p. 133, Drs. Joseph G. Timmons, James G. Boyle, and John R. Petrie explore the role of TIR in research and make a strong case for its utility.

Children, particularly adolescents, are not simply little adults, and nowhere is this more apparent than in diabetes care. Specific considerations for the application of TIR in youth are eloquently discussed by Dr. Iman Al-Gadi and her colleagues in their article starting on p. 139. It is important to understand what is reasonable to expect in this population, in which challenges are multiple and change with the age and circumstances of each patient.

Our final article, by Dr. Dominic Ehrmann and his colleagues (p. 149), focuses on an important aspect of all that we do in treating people with diabetes: the need to understand how our interventions affect our patients’ well-being and mental health. These authors comprehensively discuss the potential associations between CGM-derived glycemic parameters and patient-reported outcomes such as well-being, diabetes distress, and fear of hypoglycemia. They note the somewhat frustrating lack of consistent evidence supporting benefit on these crucial outcomes to date and discuss potential benefits that have not been measured

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adequately. They point to studies currently underway using CGM in combination with the technique of ecological momentary assessment as having the potential to shed much-needed light on the important issue of how glycemia and well-being may affect each other.

It has been great fun working with these esteemed colleagues to produce this special article collection. The final result is as clear and useful a review of TIR as I have encountered anywhere. I hope readers find it both enlightening and inspirational. We have a lot to learn about these metrics and their association with long-term outcomes, as well as how to encourage best practices for their

use more widely in general practice. TIR and related CGM-derived glycemic parameters are powerful tools for clinicians, researchers, and, most importantly, patients and can hopefully continue to help us monitor and improve outcomes as the use of CGM expands and its technology evolves.

**DUALITY OF INTEREST**

A.L.P. serves on advisory boards for Abbott Diabetes Care, Bio-Rad, Eli Lilly, Medscape, Novo Nordisk, and Zealand; has received research support from Dexcom and Insulet and donated devices from Abbott Diabetes Care; and holds stock options for Omada Health and Teladoc. No other potential conflicts of interest relevant to this article were reported.