Diabetes, Metabolic Syndrome and Obesity Dovepress

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COMMENTARY

Techniques for Implementing Continuous Glucose Monitoring in Primary Care: Key CGM Updates and Highlights from the EASD2024 Conference [Podcast]

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Abstract: This article discusses innovations, advancements, and discoveries in continuous glucose monitoring (CGM) that were presented at the European Association for the Study of Diabetes 2024 Conference in Madrid, Spain, held in September 2024. Specifically, the author will discuss data from studies that discuss the impact of CGM on hemoglobin A1C in people with type 2 diabetes; the impact of CGM use in hospitalization settings for people with diabetes; the effectiveness of CGM in those who have undergone cardiac surgery; the efficacy of real-time CGM in adults hospitalized with diabetic ketoacidosis; time in rage in older individuals; and new devices for glucose sensing.

Keywords: continuous glucose monitoring, CGM, diabetic ketoacidosis, DKA, hemoglobin A1c, hospitalization, hypoglycemia, hyperglycemia, primary care, real-world evidence, cardiac surgery, type 2 diabetes

This Podcast was sponsored by Springer Healthcare.

Dr Jennifer Green

00:35. Hello everyone, you are listening to a Podcast to Practice, brought to you by Springer Health Care IME. Podcast to Practice brings you expert-led, independent, medical educations discussions, inspiring healthcare professionals to maximise their learning and make measurable changes in their own clinical practice. This podcast is part of an independent medical education programme entitled "Techniques for implementing continuous glucose monitoring in primary care" and supported by an independent education grant from Abbott.

01:09. My name is Jennifer Green, and I am an endocrinologist and professor of medicine at Duke University in Durham, North Carolina. I'd like to welcome you to this independent medical education program on CGM device updates, in which I will share with you some of the exciting innovations, advancements, and discoveries in continuous glucose monitoring, or CGM, that were presented at the European Association for the Study of Diabetes, or EASD, 2024 annual meeting held in Madrid, Spain, between September 9 and 13 of 2024. The good news is that there were many intriguing sessions on CGM usage and CGM data at EASD this year. But, for today, I will focus on just a few key sessions which in particular I feel are most likely to impact your practice.

Numerous of these presentations further explored the effects of CGM use in people with Type 2 diabetes, treated with or without insulin; assessed the efficacy and utility of CGM use in hospitalized individuals with diabetes; defined the correlation between various CGM glucose parameters and the risk of diabetes complications or pregnancy outcomes in Type 1 diabetes; and also gave us a glimpse into what the future of CGM devices is likely to be. So I am going to start

Received: 31 October 2024
Accepted: 31 October 2024
Published: 28 November 2024

with some of the information and data from studies assessing the impact of CGM use in people with Type 2 diabetes, who were either on or not on insulin therapy as part of their diabetes management regimen.

02:58. The Impact of CGM Use in People with Type 2 Diabetes

The first was presented by Dr Bergenstal from the International Diabetes Center in the US and was described The Impact of Continuous Glucose Monitoring on Hemoglobin A1C in People with Type 2 Diabetes.[1] And this was a real-world analysis of the impact of CGM on haemoglobin A1C within a broad Type 2 diabetes population in the United States with and without the use of insulin therapy. And the authors decided to study this because there just was not much data, particularly regarding the impact of CGM use in people not using insulin.

So they used the Optum de-identified Market Clarity Database, which has information on nearly 80 million individuals, and they performed a retrospective analysis on that group of individuals and identified a subgroup of about 6,000 patients who were continually involved in their health plan, and who had haemoglobin A1C values during the time periods of interest and were treated with non-insulin medicines, basal insulin, or prandial insulin therapy.

So these individuals would have started a CGM for the first time between June of 2019 and January of 2022. And what they found when they looked at the outcomes in this group of 6,000 people was that haemoglobin A1C values decreased by 0.9% at about 3 months after starting CGM in the people who were not on insulin, were on basal insulin alone, or were on prandial insulin therapy. And this was all considered to be significant. The haemoglobin A1Cs also remained lower in those three groups throughout the 12 months of follow up, generally ranging between 1% and 1.1% lower than baseline, again, all being significant differences from baseline.

So those haemoglobin A1C improvements were noted for each treatment group and also in individuals who had medication changes made and those who did not have medication changes made over the 12 months after they started the CGM device. So these findings suggest that use of CGM improves glycaemic control for all medically treated people with Type 2 diabetes, regardless of their baseline therapy and regardless of whether or not they were using insulin.

Another presentation from the same group, presented by Dr Garg from Colorado in the United States, looked at the impact of starting continuous glucose monitoring on hospitalizations in that same group of individuals with Type 2 diabetes.[2] And again, this was a real-world analysis and was intended to further explore the impact of starting CGM on hospitalizations within a very broad population of people with Type 2 diabetes, as it has been shown that the increasing prevalence of diabetes in the United States continues to drive consistent increase in health care-related costs.

So again, this was a retrospective analysis using the Optum Market Clarity Database. And this analysis identified roughly 23,000 to 25,000 individuals with Type 2 diabetes who were either not on insulin, were on basal insulin, or were on prandial insulin therapy. And what they particularly were interested in assessing was the impact of starting CGM in those individuals on rates of all-cause hospitalization, acute diabetes-related hospitalizations, and acute diabetes-related emergency room visits during the 6 and 12 months after which the CGM device was started.

So these authors found that reductions were noted in all-cause hospitalizations at 6 and 12 months, this post-index period in all three treatment groups, ranging from 10% to 14% in people who were not on insulin, between 23% and 25% in those on basal insulin, and between 19% and 25% of individuals who are on prandial insulin, respectively.

There were significant reductions in acute diabetes-related hospitalizations and ER visits in all three of those groups. And the group concluded that the current study found that the use of CGM in real-world settings in people with Type 2 diabetes treated with non-insulin and insulin regimens alike was associated with significant reductions in all-cause hospitalizations and diabetes-related hospitalizations and emergency room visits and, in turn, although not specifically studied in these analyses, may reduce overall health care costs.

08:04. The Use of CGM in Hospitalized Patients

I am going to move on now to summarize some of the presentations, looking specifically at the use of CGM to monitor glucose in new settings and in particular focusing on the use of CGM in hospitalized patients. The first was presented by Dr Rakotoarisoa from Strasbourg in France, and she presented the results of a prospective observational study of real-time CGM in people with diabetes who were hospitalized but not in the ICU setting, so on the regular hospital wards.[3] And they were interested in exploring the impact of CGM monitoring in hospitalized patients with diabetes.

In this study, they enrolled individuals, again, in the hospital, not in the ICU, who were at least 18 years old. And those people enrolled had real-time CGM monitoring during their hospitalization, and the data were transmitted to a bedside iPad, allowing the providers to adapt doses of insulin treatment combined, again, with their standard, otherwise usual clinical care. And the CGM metrics that they were most interested in, as you might expect, is the percent time-in-range, the time below range and above range, and the time above high range, that is, a time spent with glucose above 250 milligrams per decilitre.

So these individuals were enrolled in 2023. There were 167 patients enrolled with a mean age of 58. About a quarter of them had Type 1 diabetes, and the remainder had Type 2 diabetes, 53% of them were hospitalized for urgent situations or emergent situations. But again, they were not in the intensive care unit.

So, after 6 days of hospitalization and use of CGM to monitor glucose, these individuals' time-in-range improved significantly from 64% to 81% without a significant change in their time below range. There were also significant reductions in time above range. There was an improvement from 28% to 15%. And the time in the very high range, so again above 250 milligrams per decilitre, significantly reduced from 9% to 3.5%.

For people specifically with Type 1 diabetes who were hospitalized, those individuals had a significant improvement in their time-in-range between day 1 and day 6, respectively, improving from 24.5% to 54% and 73.5%, again, at day 1 and day 6. So there was very significant improvement, specifically in the individuals with Type 1 diabetes using CGM in the hospital. And these authors concluded that the addition of real-time CGM glucose monitoring, along with otherwise appropriate clinical care, was associated with improved glucose management in hospitalized people with diabetes who were not in the ICU setting.

11:23. The Use of CGM Monitoring in Individuals Undergoing Cardiac Surgery

Now, along similar lines, a presentation by Dr Moon from South Korea assessed the effectiveness of real time CGM monitoring in individuals hospitalized who had undergone cardiac surgery.[4] And this was a randomized controlled trial performed at a single centre. And in this study, participants with either diabetes or prediabetes were randomly assigned to real-time CGM or control blood glucose monitoring one day after they underwent cardiac surgery. In the control group, glucose management was performed based upon point-of-care fingerstick blood glucose monitoring, but they also had a blinded CGM placed so that the CGM data could be compared between groups.

The primary outcome of this study was time in the target range, the ideal range of glucose levels between 100 and 180 milligrams per decilitre for seven days starting one day after surgery. So there were 54 randomized participants, 52 of whom completed the study. They were, on average, about 64 years old, had an A1C of 6.3. About 60% had diabetes, and 40% had prediabetes.

So there was no significant difference between the use of real-time CGM and fingerstick blood glucose levels in the achievement of time-in-range between 100 and 180. The groups achieved 75% and 71.6%, respectively, time-in-range with either modality of blood glucose monitoring.

However, there were some differences noted in the achievement of other desirable ranges of blood glucose control. And the real time CGM group had greater percentages of time spent in the range between 70 and 180 milligrams per decilitre in between the range of 100 and 150 milligrams per decilitre and between 70 and 140 milligrams per decilitre compared to the fingerstick blood glucose group.

The individuals using real-time CGM also had improvements in their coefficient of variation, so they had less variability of blood glucose levels. And their mean glucose significantly improved overall compared to monitoring and adjustment of therapy-based on fingerstick blood glucose levels. So these authors concluded that in patients with diabetes and prediabetes undergoing cardiac surgery, that the use of post operative real-time CGM for glucose monitoring and therapeutic decision-making was found to be an effective and safe strategy for glucose management. So we may see more of this in the future.

14:16. The Use of CGM in Adults Hospitalized with Diabetic Ketoacidosis

And finally, a presentation by Dr Bogun from New York in the United States assessed the efficacy of real-time CGM in adults hospitalized with diabetic ketoacidosis.[5] And this is an area about which there is essentially no data. So the authors

describe this as being the first trial to assess the utility and accuracy of real-time CGM blood glucose monitoring when patients are being actively treated for DKA admission and after the insulin drip was discontinued.

So in individuals hospitalized with DKA, of whom there were 52, they compared real-time CGM glucose readings with those obtained from point-of-care fingerstick blood glucose testing as well as glucose levels from blood draws, the basic metabolic panel data. And what they found was that during the IV insulin treatment period, so the active treatment period for DKA, the mean and median absolute relative differences between the CGM and point-of-care testing were 18.4% and 14.4%, respectively, and that the ARD after DKA resolution ranged from 19.2% to 13.7%, respectively, again, for the mean and median absolute relative differences between CGM and point-of-care testing.

There were similar differences between the CGM data and the BMP glucose values after resolution of DKA. Now, they compared the real-time CGM data to both the point-of-care glucose values and the basic metabolic panel glucose values and found that the Clarke Error Grid Analysis suggested that during both the acute insulin infusion and after the insulin infusion was discontinued, that 97% of the matched CGM point-of-care glucose values and 96% of the matched CGM basic metabolic panel glucose values were in zones A and B, which means that there would have been no effect on clinical action or perhaps an altered clinical action but with little or no effect on clinical outcome.

So this is reported to be the first data from the use of real-time CGM in hospitalized adults with DKA. And the authors suggest that the findings indicate that CGM technology might be a reliable tool for hospital use during acute insulin treatment and after the resolution of DKA in adults with Type 1 or Type 2 diabetes. However, I would suggest that further studies are needed to evaluate this modality of glucose testing and the management of DKA, both in larger numbers of individuals, and to better understand the accuracy and comparability of CGM data to other traditional means of glucose testing.

17:30. Time-in-Range or Outside Range in Older Individuals

Now, moving on to time-in-range or outside-of-range in older individuals, Professor Smati from France presented additional results from the hypo age study.[6] And they were looking in particular at the frequency and predictors of hyperglycaemia in older patients with Type 2 diabetes on insulin therapy using CGM and, in particular for these analyses, sought to compare the impact of time spent in hyperglycaemia or hypoglycaemia on one-year mortality.

So the individuals enrolled in this study were enrolled at multiple centres. And ultimately, these analyses included 146 individuals aged 75 and older with Type 2 diabetes and who had been treated with insulin for at least six months. All of the patients underwent ambulatory blinded CGM for 28 consecutive days. And the individuals were assessed to identify which factors were associated with time above a very high range. That is, over 250 milligrams per decilitre. And also, the cumulative incidence of one-year mortality was estimated in this group.

So in this group of individuals, who had a mean age of 81.5 years, and of whom over 70% were considered to have very complex medical problems, these individuals at baseline were found to have a haemoglobin A1C of 7.9%. And 43 of the individuals enrolled had very high glucose levels, again, above 250 at least 10% of the time.

Compared to patients who had less than 10% time spent above 250, those with the higher blood glucose levels were older. They had a lower BMI, had a higher A1C, and were less likely to be healthy from a geriatric perspective. And the authors also found that spending greater than 10% of time with blood glucose levels above 250 milligrams per decilitre, of course, was associated with a higher A1C and a higher BMI, but was also inversely associated with one-year survival.

So again, individuals with at least 10% of their time spent with a blood glucose above 250 milligrams per decilitre were more likely to die within the subsequent year than people who did not spend that much time in the very high blood glucose range. Interestingly, the time spent below the desirable, or target range, was not associated with either an increase or decrease in mortality at 1 year.

So the authors conclude that an increased time above blood glucose 250 milligrams per decilitre is associated with mortality and that this may be warranted. So reducing the time spent with blood glucose over 250 may then be warranted as a goal for Type 2 management in older patients, potentially to reduce the risk of mortality. Although, again, this was not an interventional study and needs additional confirmation in either other data sets or ideally in interventional trials.

21:09. The Future Potential of CGM Devices

And I will just conclude with a mention of one presentation that gives some insight into the potential future of CGM devices. Dr Christiansen from Biolinq described a new device for glucose sensing, which is designed to provide calibration-free intradermal glucose monitoring using a sensor microarray, which at present, is worn on the forearm.[7]

Because the sensors for this device are placed in the skin itself, the placement does not require an introducer needle. He also noted that because there are multiple microsensors in the device, the life span of the sensing device may be longer. And because there are multiple samples taken, the accuracy of the glucose monitoring may be improved as well.

Apparently, there's minimal latency between dermal interstitial fluid glucose and blood or subcu interstitial fluid glucose levels, which makes this location of monitoring desirable. He reported that at this stage of development of the sensor, the mean absolute relative difference, or MARD, was 10.1% compared to venous blood in the 388 participants who were studied, suggesting reasonably accurate tracking of glucose levels. Also of note, this device has a built-in accelerometer and so was able to record and integrate data regarding physical activity with the blood glucose data and trends.

The take-home messages for me from the EASD were, I think, presentations supporting the broader use of CGM devices in people with Type 2 diabetes, either on or not on insulin therapy, to improve glycaemic control and to potentially significantly reduce the utilization of expensive health care due to ER visits or hospitalizations.

I think the data regarding the utilization of real-time CGM data in various sets and types of hospitalized patients, so patients not in the ICU, patients who've undergone cardiac surgery, and even patients hospitalized with an acute DKA event, is exciting but definitely warrants further study. And I think we are likely to see much more of this in the future. And then again, a little bit of insight into the types of devices that we may see in the future that differ from what are currently available for use.

So I'd like to remind you that there are a number of available resources to help clinicians and practices get started using CGM in their practice. So I hope you check out Springer Health Care IME's CME-accredited interactive infographics and tutorials where I, along with Dr Rozalina McCoy and Dr Eugene Wright, take a deeper dive into the most important considerations for CGM use in primary care.

So thank you for listening to this podcast update. Stay tuned for the next podcast, where we will continue talking about recent updates in the CGM field. Also, thank you for listening to Podcast To Practice brought to you by Springer Health Care IME. For more information on our educational programs available, visit IME.SpringerHealthCare.com.

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Acknowledgments

This podcast is supported by an independent educational grant from Abbott.

This podcast series is part of a wider, accredited independent educational program 'Techniques for implementing continuous glucose monitoring in primary care'. The program provides a comprehensive understanding of the clinical landscape of newly released and updated CGM technology, appropriate patient selection criteria for identifying patients with type 2 diabetes that are good candidates for CGM, and how to interpret and apply data readouts to inform clinical decisions. Formats alongside the podcasts include interactive infographics and tutorials.

Disclosure

The author of this podcast manuscript meets criteria for authorship as recommended by the International Committee of Medical Journal Editors.

The author has received grant/research support from: Merck, Roche, Lilly, Boehringer Ingelheim, and Bluedrop. She has served as a consultant/advisory board member for: AstraZeneca, Novo Nordisk, Pfizer, Bayer, Anji, Boehringer Ingelhiem, Valo, Lilly, and Vertex.

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