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Driving Population Health Outcomes with Connected Continuous Glucose Monitors

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Karen Earle, MD, Chief of Endocrinology and Director of Diabetes Services, California Pacific Medical Center, and Chief of Division of Medical and Surgical Specialties, Sutter West Bay Medical Group

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"Continuous glucose monitoring (CGM) gives patients the information that they need to understand what's happening with their diabetes. When are their glucose levels high? Where are the problem areas? And what can they do besides taking medications—like exercise and changes to their meal plan—that can help them achieve their goals?"

— Karen Earle, MD, Sutter West Bay Medical Group

As diabetes' human and financial costs continue to climb, and clinical inertia challenges providers and patients alike, continuous glucose monitoring (CGM) can help—particularly when delivered via a cloud-based diabetes management system and with digital health apps and other technologies. Dr. Karen Earle, chief, Department of Endocrinology, and medical director, Diabetes Services, at California Pacific Medical Center, shared research and insights demonstrating CGM in action for patient care and population health.

Clinical Inertia, Recent Trends, and the Need for New Approaches

Dr. Earle began the discussion with a patient anecdote: a series of explanations for why his A1C was not at goal. In the first visit, it was his birthday last month, with a big party. "Give me three more months." In the next visit, he indulged over the holidays with his family, so his A1C was not at goal. "Give me three more months." In the next visit, he'd just gotten back from a cruise. "And before you know it, it's been over a year, and this patient has not been at goal for an extended period of time."

"This is what we call clinical inertia, what we're trying to avoid, and I'm going to give you some techniques to work on that," Dr. Earle said.

She briefly reviewed trends in diabetes treatment and outcomes over the past 20 years. Despite initial gains, recent figures have not been heading in the right direction. Glycemic outcomes declined in 2015-2018 compared to 2007-2010,[1] and today, 37.3 million people live with diabetes—the vast majority (90%-95%) with type 2 diabetes. One in

every four healthcare dollars is spent caring for people with diabetes, making it the most expensive chronic condition.[2]

Dr. Earle explained that the current model of diabetes care doesn't really work for all patients. First of all, A1C measurements alone may be inadequate for helping patients and providers understand and manage a patient's diabetes. A1C readings representing a single point in time don't indicate much about the timing or frequency of hypoglycemia or glucose variability. Furthermore, these readings are unreliable for several populations, including patients with hemolytic anemia or iron deficiencies, patients who are pregnant, and patients who have kidney disease.

Furthermore, diabetes requires continuous care. "We might only see our patients in the office every three months. But they're dealing with diabetes every day, they're making choices about what they eat, whether or not they're going to exercise, and if they take their medications. So, the majority of care happens in between their office visits," Dr. Earle said.

Gaining Clarity through Connected Continuous Glucose Monitoring

CGM enables patients and providers alike to see the patterns blood glucose monitors often miss, with great promise for treatment plans and patient care.

Dr. Earle discussed the Dexcom G6 CGM device, a Class II-designated device which enables up to 288 readings a day.[3] Graphs showing patterns of hypoglycemia and hyperglycemia plus customizable alerts strengthen the ability of providers and patients to not just manage but get ahead of problems.

"Rather than fixing the hypoglycemia once it occurs, if you have enough notification, you can prevent the hypoglycemia completely," Dr. Earle said. Furthermore, as a patient, you can share information with up to 10 followers, which means that "someone else is looking out for you" if you're traveling or if you live alone. "There's robust clinical evidence of improved glycemic outcomes with this device," she said.

Figure 1: An Individual's Glycemic Control and Treatment Plan Should Not Be Defined by A1C Alone

A1C (%)	mg/dL	95% CI
5	97	(76-120)
6	126	(100-152)
7	154	(123-185)
8	183	(147-217)
9	212	(170-249)
10	240	(193-282)
11	269	(217-314)
12	298	(240-347)

01 May underestimate or overestimate an individual's average glucose *(example: A1C of 7% could represent a range between 123 -185 mg/dL)*[2]

02 Does not indicate the extent or timing of hypoglycemia or hyperglycemia[2]

03 Does not reveal glycemic variability[2]

04 Limited utility for insulin dosing decisions[2]

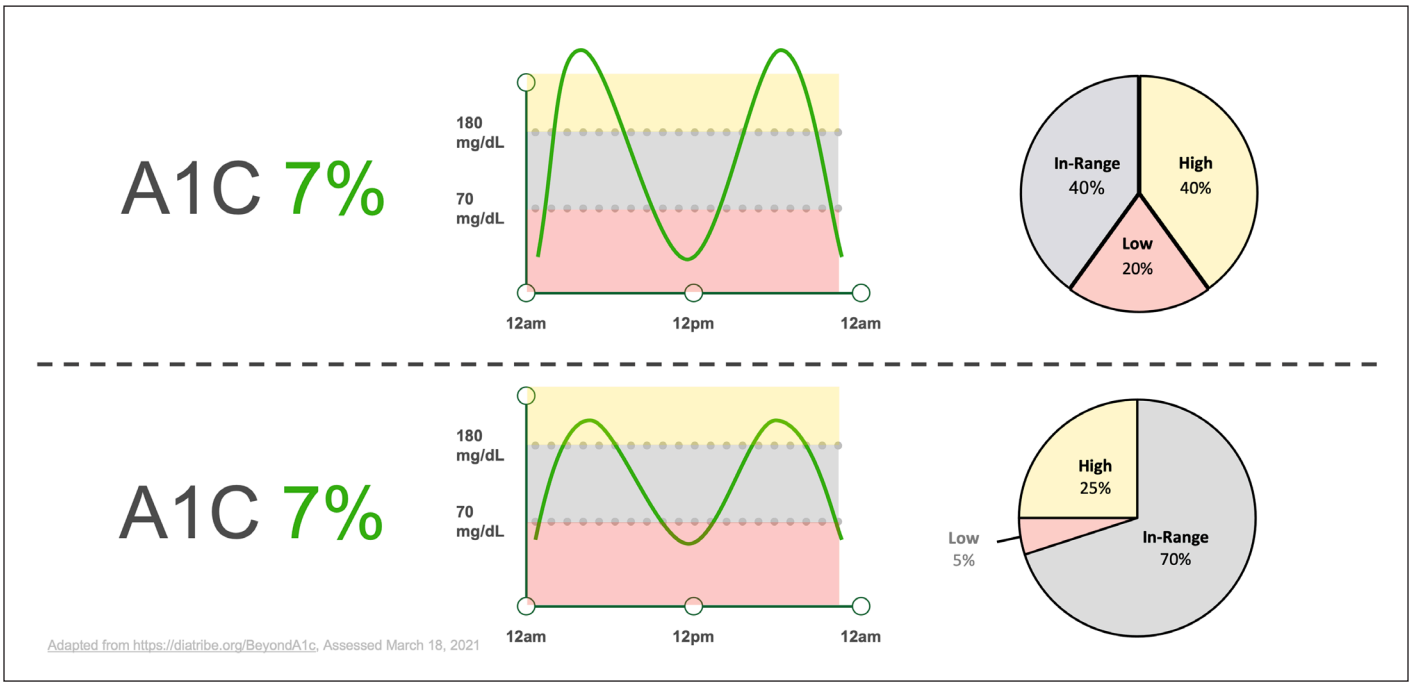
05 Unreliable in patients with hemolytic anemia, hemoglobinopathies, or iron deficiency[2]

06 Underestimates A1C in those with end stage kidney disease or during pregnancy[2]

07 Correlation with mean glucose can vary among races[2]

Adapted from: Nathan et al. 2008.
1. Nathan DM et al. Diabetes Care. 2008;31(8):1473-1478. 2. Battelino et al. Diabetes Care 2019;42(8):1593-1603.1593-160 3. American Diabetes Association Professional Practice Committee. Glycemic targets: Standards of Medical Care in Diabetes—2022. Diabetes Care 2022;45(Suppl. 1):S83–S96

Figure 2: Same A1C but CGM Patterns Drive Different Treatment Plans



Dexcom Clarity is the clinic software, and Dr. Earle uses it in her practice every single day to look at patient data—both the "nitty gritty" of an individual day and patterns over time—and help patients make decisions. "I find these reports incredibly helpful and review them with every patient who's wearing a CGM," she said.

As a cloud-based diabetes management system, providers can use Clarity during in-person and telehealth visits and patients can access it on their smartphones or computers during the time between. "It really helps them understand what's going on," Dr. Earle said. "I have found my patients who look at Clarity on a regular basis are able to make some changes on their own in between office visits and not just wait for me to tell them that they need to make a change to their insulin dose or their medications or their exercise regimen."

Furthermore, CGM devices, by tracking time in range (TIR), provide vital insights into patient health beyond individual A1C readings. "There's been some post hoc analysis that indicates that TIR is a significant number," Dr. Earle said. "Just as A1C is linked to outcomes, TIR is correlated with diabetes complications." In the area of kidney disease, for example, a 10% increase in TIR was associated with a 19% reduction in urinary albumin excretion.[4]

Finally, adopting CGM early on supports the timely optimization of diabetes treatment. Dr. Earle shared research showing that:

- Early and appropriate therapy improves a patient's chance of reaching A1C goals.
- Patients with type 2 diabetes who achieve targets soon after diagnosis are more likely to keep glucose in target range.
- Reaching A1C targets in the first year of treatment results in sustained, long-term health improvements, even when control waned over time.
- Managing glucose levels early in diagnoses reduce the chance of complications.[5]

"We don't want to wait to get our patients to goal. We

want to jump on in, and one of the tools they can use is CGM to really see what's going on," Dr. Earle said.

Real-time continuous glucose monitoring is recommended in the 2022 American Diabetes Association's Standards of Care and Recommendations for diabetes management. According to the ADA standards, it should be offered for diabetes management in adults on multiple daily injections or insulin infusions and can be used for diabetes management in adults with diabetes on basal insulin. Periodic CGM use can be helpful for diabetes management in circumstances where continuous use of CGM is neither desired nor available. The standards also encourage the use of digital coaching and digital self-management.

"I encourage all of my patients to utilize the Clarity app and look at and celebrate their data, so when they go from 40% time in range to 60% time in range, that's amazing, and they should be proud of themselves."

CGM and Population Health

"Population health is a management program that's really trying to address needs at all points along the continuum of health and well-being, so it's participation, engagement, and targeted intervention," Dr. Earle said. "It's also really important to consider cost-effective care for our patients, and I have data that supports the cost-effectiveness of continuous glucose monitors."

In a study by **Kaiser Permanente** in Oakland, CA, real-time continuous glucose monitoring (RT-CGM) in patients with type 1 diabetes and insulin-treated type 2 diabetes was associated with a significant reduction in A1C (of 0.4%). There were greater improvements for patients with type 2 diabetes, with a 51% reduction in hypoglycemia-related emergency department visits or hospitalizations. "That's a lot of money when you start thinking about ER visits and hospitalizations," Dr. Earle pointed out. Cost savings can also come from the operational side. The Kaiser Permanente study also noted an 18% increase in members meeting the HEDIS measure for A1C.[6]

CGM reduced clinical utilization levels at **Intermountain Health** as well. With the Dexcom G6 RT-CGM contributing to a mean A1C reduction of 0.6% over six months, the organization experienced fewer emergency department visits, fewer total visits, and fewer labs ordered. This added up to $417 per member per month cost savings for Select Health participants over 6 months and $426 per member per month for Medicare Advantage patients. What's more, 90% of Dexcom G6 RT-CGM users felt the device enhanced self-care, giving the device a 92.9 average rating for "helpfulness."[7]

Similar to the Kaiser study, a retrospective analysis of 571 patients with type 2 diabetes, 90% treated with insulin, demonstrated an average per-member, per month cost reduction of $424 after initiating RT-CGM, in part related to reductions in diabetes-related inpatient medical costs.

"Patients are improving outcomes, saving money, and they're happy," Dr. Earle remarked. "They like this device, and they want to keep using it."

CGM and the Onduo Virtual Diabetes Clinic

The Onduo Virtual Diabetes Clinic remotely prescribes medication and connected glucose monitoring, including the Dexcom RT-CGM, along with remote lifestyle coaching and virtual endocrinology consultations. It's "a really innovative model for personalizing care and optimizing management for patients with type 2 diabetes," Dr. Earle said.

She shared one study, a retrospective evaluation of 740 patients with type 2 diabetes in 21 states, evaluating its potential for lowering A1C levels. By the end of the 4.2-month study, there was a 2.3% mean A1C reduction in patients with a baseline A1C > 9%, as well as a significant A1C reduction for people with T2D with baseline A1C > 7%. "Patients who weren't doing well and weren't monitoring their diabetes much were able to achieve tremendous reductions in their A1Cs," Dr. Earle said.

The study also showed Onduo to be an effective telehealth model for patients with type 2 diabetes.[8] "This is something patients could do and that they liked," Dr. Earle said.

Another study examined patient attitudes toward remote glucose monitoring as well as impact on A1C. Some patients wore the Dexcom CGM all the time, others intermittently based on their treatment plan. Not only did participants rate the intervention a mean satisfaction score of 4.5 out of 5:

- 94.7% of participants felt comfortable inserting the sensor remotely
- Participants with a baseline A1C > 7% saw a 0.6% reduction in A1C
- Participants with a baseline A1C > 9% saw a 2.6% reduction in A1C[9]

"You get real-time feedback on how your healthcare choices are impacting your glucose levels," Dr. Earle said of the Onduo/Dexcom program. And this feedback makes a lasting impact. "Once you figure out that pasta raises your glucose level for four hours, you're going to think twice about eating that pasta, even if you're not wearing the CGM, because you understand the impact on your glucose levels."

CGM and Digital Health Apps

As patients use CGM to track their insulin usage and TIR, digital health apps can help them make healthy lifestyle choices. The Dexcom CGM device securely and seamlessly connects to over 52 digital health apps and devices, including:

- The Under My Fork app, which helps the patients look at their food and identify post-meal spikes from different meals and impact on their glucose levels
- Garmin, which connects CGM data with a patient's watch
- Blue Star, an FDA-cleared, award-winning digital coaching assistant that provides AI-generated diabetes information in the moment

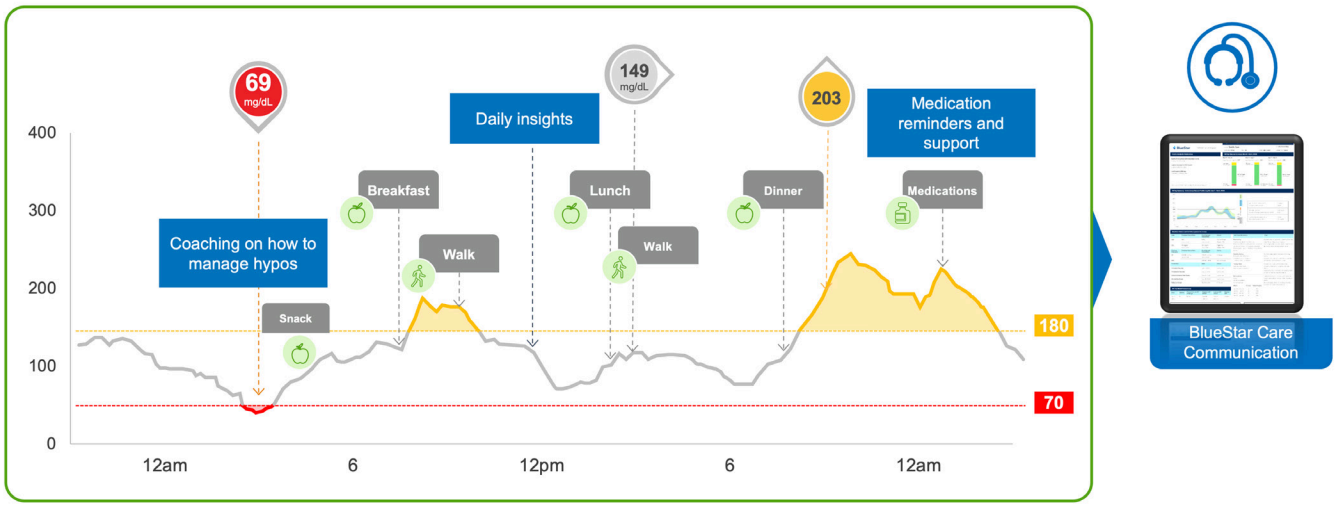
How effective are these apps, paired with CGM, in driving patient outcomes? In a pilot study, a large employer offered a program of Dexcom G6 CGM and Bluestar analytics to patients with type 2 diabetes who were not on insulin. The app includes a food module, medication tracking, and the ability to track and analyze activity data, symptoms, psychosocial information, and labs.

With all of this support, patients:

- Reduced A1C by 3.1%
- Increased TIR by 20%-30%
- Lost 11 pounds
- Used the system up to 25 times per week[10]

"There's a lot of value in these systems for patients, providers, and payers," Dr. Earle declared and shared feedback. A patient found it "a lot easier to monitor

Figure 3: Combine RT CGM and FDA-Cleared, Digital Health Coaching to Transform Data into Knowledge and Action



Source: Dexcom T2D pilot study. Similar observations using Dexcom CGM have been published in: Vigersky RA et al. *Diabetes Care*. 2012;35(1):32-8. doi: 10.2337/dc11-143; Ehrhardt NM et al. *J Diabetes Sci Technol*. 2011;5(3):668-75 doi: 10.1177/193229681100500320; Cox DJ et al. *Diabetes Care*. 2016;39(5):e71-3. doi: 10.2337/dc15-2836

my diet with the CGM, especially since I get such great post-prandial feedback." For providers, the CGM facilitates patient engagement and meaningful conversations. For payers, the CGM contributes to clinical efficacy and reduced costs.

"Knowledge is power," Dr. Earle concluded. "Understanding what's happening day to day can really make improvements for our patients." This includes communicating to patients that "they don't have three more months" and that the time to take action is now.

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9. Participants wore either the Dexcom G6 Continuous Glucose Monitoring (CGM) System or the Dexcom G5 Mobile Continuous Glucose Monitoring (CGM) System for this study. Bergenstal RM, et al. Remote Application and Use of Real-Time Continuous Glucose Monitoring by Adults with Type 2 Diabetes in a Virtual Diabetes Clinic. Diabetes Technol Ther. 2020. doi : 10.1089/dia.2020.0396
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