

# Continuous Glucose Monitoring: Updated 2023

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## Introduction

Diabetes is a chronic and complicated disease in which glycemic management must be accompanied by lifestyle modifications to improve clinical outcomes and quality of life. Technology-enabled health care has been among the top 3 types of quality improvement interventions found to be effective in improving diabetes care. (Rodriguez et al 2022) Advantages of this technology is not limited to increased efficiency, cost saving, or overall patient satisfaction. (Isaacs et al 2020) Continuous glucose monitoring (CGM) has been at the forefront of this technology because of its broad application across different settings. CGM is particularly beneficial for persons with diabetes (PWD) with variable glycemic management because the data from CGM highlights areas that need treatment intervention. By preventing hypoglycemia, improving glycemic control, and increasing overall time in range (TIR), CGM is an effective tool for PWD to actively manage their diabetes. Both professional- and personal-use CGM (whether intermittently scanned or real-time CGM) provides patient-centered data that clinicians and PWD can use to make actionable treatment decisions. (Miller 2020) Clinical guidelines stress the importance of proper education, support, and follow-up when using CGM technology. Utilization of CGM without these factors in place can be overwhelming as well as a barrier to optimal patient care. (ElSayed et al 7. 2023)

## National Organization Recommendations

The American Association of Clinical Endocrinology (AACE) consensus statement strongly recommends the use of CGM in PWD to reach their goals safely. It further suggests that both real-time and intermittently scanned CGM should be offered to PWD who are treated with insulin and those who are at risk for hypoglycemia. AACE also states that intermittently scanned CGM can be a useful tool for those newly diagnosed with type 2 diabetes and who have a low risk for hypoglycemia. (Sampson et al 2023) Similarly, the American Diabetes Association (ADA) Standards of Care 2023 recommends CGM for all PWD using insulin. The choice of the device should be made based on patients' circumstances, desires, and needs. (ElSayed et al 7. 2023)

AACE and the ADA also highlight the benefits of CGM as a useful tool for guiding medical nutrition therapy and physical activity, preventing hypoglycemia, and adjusting medications. The ADA recommends that due to the limitations of HbA1c, clinicians should exercise judgment when using HbA1c as the sole basis for assessing

glycemic control and recommends the inclusion of CGM metrics such as glucose variability (GV) and TIR and that CGM metrics can be used as a surrogate for HbA1c. (Sampson et al 2023)

The Centers for Medicare & Medicaid Services (CMS) expanded CGM eligibility in April 2023 to include coverage for PWD on 1 injection of insulin and for those with a history of "problematic hypoglycemia." (Moreau 2023)

Problematic hypoglycemia is defined as:

- Recurrent (more than 1) level 2 hypoglycemic events (< 54 mg/dL (3.0 mmol/L) that persist despite multiple (more than 1) attempts to adjust the medication(s) and/or modify the diabetes treatment plan; or
- A history of one level 3 hypoglycemic event (< 54 mg/dL (3.0 mmol/L) characterized by an altered mental and/or physical state requiring third-party assistance for treatment of hypoglycemia

These changes align with AACE CGM recommendations. (Sampson et al 2023) This likely will increase CGM utilization in the Medicare population and decrease health care disparities.

## CGM Updates

Smart insulin pens integrated with CGM have emerged as new technology that assists patients in calculating bolus doses easily. The integrated data includes the insulin doses administered as well as CGM metrics. This technology has shown to be beneficial to patients with diabetes and health care providers because it guides treatment decisions. Hybrid closed-loop systems that utilize CGM in the algorithm have increased evidence demonstrating the effectiveness of this therapy. (Yoo & Kim 2023)

Currently, use of CGM in the inpatient setting is not approved by the FDA. However, during the COVID-19 pandemic, CGM was used in hospitals with emergency use authorization. This led to AACE revising their recommendations to include initiation of CGM in the inpatient setting for patients at high risk of hypoglycemia. (McCall et al 2023)

This year, both the DEXCOM G7 and the FreeStyle Libre 2 and

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FreeStyle Libre 3 were approved by the FDA for adjunctive use in pregnancy. The CONCEPTT trial was instrumental in highlighting the value of real-time CGM in pregestational diabetes mellitus. Results from this trial revealed mild improvement in HbA1c without increased hypoglycemia. It also showed decrease in large-for-gestational-age births, neonatal hypoglycemia, and overall hospital length of

stay. Cost effectiveness of CGM in pregnancy was offset by improved maternal and fetal outcomes. Target ranges for pregnancy with type 1 diabetes mellitus should be considered because they are different than those in the nonpregnant PWD. (ElSayed et al 15. 2023)

See Table 1 for a list of CGMs.

**TABLE 1** CONTINUOUS GLUCOSE MONITORS USED IN PRACTICE

CGM system	Dexcom G6	Dexcom G7	Eversense® E3	Freestyle Libre 3	Freestyle Libre 2	Guardian™ Sensor 3
Company	Dexcom	Dexcom	Senseonics and Ascensia Diabetes Care	Abbott	Abbott	Medtronic
Sensor	Yes	Yes	Yes, inserted by HCP	Yes	Yes	Yes
Warm up period	2 hours	30 minutes	24 hours	1 hour	1 hour	2 hours
Sensor wear time	10 days	10 days	180 days	14 days	14 days	7 days
Transmitter	Yes, approximately 90-day battery life	Yes, built into the sensor.	Yes, removable, rechargeable	Yes, built into sensor	Yes, built into sensor	Yes, 1 year, rechargeable
Receiver	Yes, or you can use compatible device	Yes, or you can use compatible device	Compatible device	Yes, or can use compatible device	Yes, or can use compatible device	Compatible device
Alerts	Yes	Yes	Yes	Yes	Yes	Yes
Non-adjunctive Indication (can make treatment decisions without a BGM)	Yes	Yes	No, BGM required every 12 hours for the first 21 days then 1–2 times per day	Yes	Yes	No, BGM required 2–4 times per day
Adult MARD	9.8%	8.2%	8.5%	8.9%	9.2%	8.7%–10.6%
Integration with insulin pump	Yes	Yes	No	No	No	Yes
How often system measures blood glucose levels	Every 5 minutes	Every 5 minutes	Every 5 minutes	Every 1 minute	Every 1 minute	Every 5 minutes
Age of approved indication (years)	≥2	≥2	≥18	≥4	≥4	≥2
Approved for use in pregnancy (pre-existing diabetes and Gestational Diabetes Mellitus (GDM))	No	Yes	No	Yes	Yes	No

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## Ongoing management and support with use of technology has increased access and promoted connectivity. This is especially true when using CGM for best outcomes for the PWD.

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### Education and Support When Using CGM

Education plays an important role in diabetes management. Participation in diabetes education programs have shown improved best practices and lower overall health care costs. Ongoing management and support with use of technology has increased access and promoted connectivity. This is especially true when using CGM for best outcomes for the PWD. (Miller 2020) In 1 study, a 15.3% increase in TIR was noted in participants who had structured education regarding use of real-time CGM. Two other studies revealed a significant decrease in HbA1c in CGM users who received education when using intermittently scanned CGM compared with the group without education. (Yoo & Kim 2023) Many CGM companies are now offering remote patient education resources that the care team can refer to for patient support.

The ICC (Identify, Configure, Collaborate) model can serve as the basis to include technology in diabetes care. Informed decision-making and tool integration in practice can optimize the use of technology for PWD. Therapeutic inertia can be overcome by optimizing the care plan with collaboration between the PWD and the health care team. (MacLeod et al 2021) In a similar symbiotic fashion to support the PWD, the health system and practice that provide care for the PWD should be equipped with organizational capabilities, care team engagement, resource capacity, and cultural adaptivity to ongoing changes as clinicians continue to learn how to manage diabetes.

Understanding the CGM data report and its key metrics provides insight into glucose trends and facilitates an action plan for best outcomes for the PWD. (Bergental et al 2022) Providing the PWD the proper education on trend arrows will help them reach their glucose target safely and appropriately by change in activity level, food intake or actions to prevent hypoglycemia. (Miller 2020) The PWD also has access to data showing historical glucose trends and arrows to indicate the direction their glucose is going to achieve a safe glucose level. The DATAA (Download data, Assess safety, Time in Range, Areas to Improve, and Action plan) tool utilizes principles of motivational interviewing. It is helpful in guiding discussion of CGM data with the PWD. (Isaacs et al 2020) The role of education is important to ensure confirmation of a true asymptomatic hypoglycemia event using a blood glucose reading before changing insulin doses or modifying carbohydrate intake. (ElSayed et al 15. 2023)

Education is also needed on factors that can affect CGM accuracy. The ADA 2023 standards urge the need for education regarding potential interfering substances such as acetaminophen, alcohol,

high doses of vitamin C (> 500 mg/day), hydroxyurea, mannitol, and tetracycline, which can affect CGM accuracy. Hence, medications for the PWD must be routinely reviewed by a health care provider to identify if these factors may be present and educate on the need for additional blood glucose monitoring in these instances. (ElSayed et al 7. 2023)

### Disparities and Barriers With CGM Use

Racially and ethnically diverse populations have higher rates of diabetes and associated complications in the US. (Isaacs et al 2021) Both high prevalence of diabetes and poor clinical outcomes are strongly associated with low socioeconomic status. Low socioeconomic status is associated with poorer quality of health care and limited access to clinicians, which deters access for eligible patients to receive CGMs and effective diabetes education services. African-American Medicare beneficiaries were found to have less knowledge and skills for diabetes self-management compared with White beneficiaries. African-American and Hispanic Medicare beneficiaries were also less knowledgeable regarding their coverage for diabetes testing supplies and benefits compared with White beneficiaries. (Isaacas et al 2021)

Insurance requirements and documentation have historically exacerbated disparities in obtaining CGM devices. With Medicare lifting the requirement to document blood glucose monitoring 4 times per day, this expectantly will broaden access for CGM coverage. However, there continues to be significant access issues for the Medicaid population to obtain CGM because each state has different prerequisites for coverage. Currently, 15 states cover CGM only for type 1 diabetes, and some states require patients to be under the care of an endocrinologist. (Isaacas et al 2021) In rural areas, access to an endocrinologist may be a hindrance to receiving CGM. Many primary care clinicians lack the staffing to complete the lengthy documentation needed for insurance approval. A qualitative study found while many primary care clinicians feel that it would be beneficial to prescribe CGM, many lack the training and education to understand insurance coverage and confidently implement CGM use in their practices. (Oser et al 2022)

It is also important to acknowledge patient-related barriers to the use of CGMs. These may include hesitancy to wear a sensor, alarm fatigue, and misconceptions or inadequate information regarding the device. Although there are a plethora of education modules and tutorials to support patients using CGMs, common barriers arise in clinical practice. For example, patients can develop skin dermatitis or experience sensors falling off prematurely. (Pralhad et al 2021)

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Since the most commonly cited barrier to the use of CGMs among clinicians and patients is insurance reimbursement and cost or co-payment, advocacy for expanding coverage will lessen the disparities associated with access to diabetes technology and overall diabetes management. (Lanning et al 2020)

### Role of the Care Manager

The care manager plays an integral role in supporting patients who use CGMs. With telehealth expanding in necessity and popularity, the ADA now endorses mobile apps and digital coaching services to deliver diabetes education, which is proven to be just as effective as in-person care. (ElSayed et al 5. 2023) PWD and health care professionals should engage in collaborative patient-centered care with shared decision-making to achieve diabetes treatment goals while improving quality of life. Health care professionals should refrain from using judgmental language and instead choose positive strength-based words for building a therapeutic relationship. (ElSayed et al 5. 2023) Care managers can help identify appropriate candidates for CGMs and collaborate with physicians and payers to help overcome the barrier of insurance reimbursement. In addition, care managers can ensure that PWD and their caregivers can interpret the glucose data to increase self-efficacy with their diabetes self-management skills.

Care managers are positioned to be a valuable resource to educate PWD with implementing CGM, understanding the data, sharing the data with providers and caregivers, and offering ongoing support and troubleshooting. The care management team also plays a key role in identifying any financial, cultural, or social barriers with diabetes self-management education and support and assisting with community resources, communicating with the health care team, and advocating for patients.

### Potential Considerations of CGM Use in Different Populations

CGM should be considered for use as a prevention tool in lifestyle modifications and weight management. (Ehrhardt & Al Zaghaf 2019) Preliminary studies have demonstrated an improvement in TIR in individuals with prediabetes who are using CGMs via mobile health apps. CGMs offer clinicians the ability to tailor individualized therapeutic diet recommendations based on postprandial glycemia. The future of nutrition science will be based on precision nutrition or counseling patients based on their unique metabolic responses to meal composition. CGMs have enabled researchers to gain a deeper understanding of various factors that affect postpran-

dial glycemic responses, including the gut microbiome, timing of meals, and sleep. (Greenhill 2020)

One study showed promising results: the use of CGMs in a prediabetic population helped drive dietary changes by helping the patient visualize the effect of carbohydrates on their blood glucose. (Yost et al 2020) The use of CGMs was a tangible way for patients to understand the relationship between their meal compositions and blood glucose level, while increasing their awareness of perceived risk of diabetes. Ultimately, the use of CGMs coupled with dietary counseling can drive patients to elucidate the relationship between diet, activity, stress, and sleep levels to promote weight loss and prevent type 2 diabetes. (Yost et al 2020) Current research and trends involve patients wearing CGM while tracking food intake and exercise on mobile apps with immediate feedback from health care professionals to improve glycemia. (Mao et al 2022)

### Conclusion

Technology confers many benefits to PWD, for CGM technology is rapidly evolving to ease the burden of glucose monitoring and improve quality of life. CGMs are effective in reducing HbA1c levels, rates of hypoglycemia, and acute diabetes events such as emergency department visits and hospitalizations that reduce health care costs. (ElSayed et al 7. 2023) The clinical benefits of CGMs ultimately depend on support and training from the multidisciplinary team. Care managers play a critical role in helping PWD interpret their CGM data to implement lifestyle changes. Selection and use of mobile healthcare apps and CGMs should be individualized to the patient, respecting the PWD's goals, values, and barriers. Care managers can assist with adherence to CGMs and refer to appropriate resources for timely assistance. Expanded insurance coverage for CGMs will be a significant step toward addressing inequity among PWD and improving clinical outcomes. (Isaacs et al 2021) ■

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### Questions

- Technology has improved diabetes care by which of the following?**
  - Increasing efficiency
  - Saving money
  - Increasing patient satisfaction
  - All of the above
- Continuous glucose monitoring (CGM) is beneficial for people with diabetes for which of the following reasons?**
  - Preventing hypoglycemia
  - Improving glycemic control
  - Improving time in range
  - All of the above
- To be effective using CGM, clinical guidelines stress which of the following?**
  - Proper education
  - Support
  - Follow-up
  - All of the above
- According to clinical guidelines, CGM should be offered to people with diabetes being treated with insulin and those at risk for hypoglycemia.**
  - True
  - False
- Which of the following factors should be considered when a person with diabetes selects a CGM device?**
  - Patient characteristics
  - Desire
  - Needs
  - All of the above
- Benefits of CGM include which of the following?**
  - Guiding medical nutrition therapy
  - Preventing hypoglycemia
  - Adjusting medication
  - All of the above
- CGM metrics such as glucose variability and time in range (TIR) can be used as a surrogate to HbA1c when assessing glycemic control.**
  - True
  - False
- Some of the barriers to using a CGM device include which of the following?**
  - Reimbursement
  - Availability of knowledgeable providers
  - Diabetes educators
  - All of the above
- Which of the following CGM devices have been approved for adjunctive use in pregnancy?**
  - DEXCOM G7
  - FreeStyle Libre 2
  - FreeStyle Libre 3
  - All of the above
- The case manager offering structured education in diabetes management has been shown to:**
  - Lower overall health care costs
  - Increase TIR
  - Decrease HbA1c
  - All of the above
- The health system and practice providing care for the person with diabetes should be equipped with:**
  - Organizational capabilities
  - Care team engagement
  - Cultural adaptability
  - All of the above
- Mobile applications and digital coaching services to deliver diabetes education have proven to be just as effective as in-person care.**
  - True
  - False
- The role of the case manager working with a patient using a CGM device includes:**
  - Education
  - Understanding the data
  - Supporting the patient and caregivers
  - All of the above



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## Continuous Glucose Monitoring: Updated June 2023

### Objectives

1. State the impact technology has had on diabetes care.
2. State 2 national guidelines for using continuous glucose monitoring (CGM).
3. State the role of the case manager in patients with diabetes with a CGM.

### Answers

Please indicate your answer by filling in in the letter:

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_ 5. \_\_\_\_\_ 6. \_\_\_\_\_ 7. \_\_\_\_\_ 8. \_\_\_\_\_ 9. \_\_\_\_\_ 10. \_\_\_\_\_ 11. \_\_\_\_\_ 12. \_\_\_\_\_ 13. \_\_\_\_\_

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