

Is Continuous Glucose Monitoring for Everyone? Consideration of Psychosocial Factors

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As biotechnological devices become a more expected part of everyday diabetes management, consideration of psychosocial factors in the use of these devices is of growing importance. Continuous glucose monitoring (CGM) is the newest technology. However, little is known about how and which patients can most effectively use CGM devices. CGM is a real-time sensor through which interstitial glucose values—not blood glucose values—are provided and alarms signal high or low glucose levels, and arrows show the direction of change in glucose level. CGM offers not only individual glucose readings every 1–5 minutes, but also tracings of glucose patterns throughout a period of days. Therefore, CGM offers a great deal of information that patients can learn to use in their diabetes self-care. However, because of cost, training time, and possible medical contraindications, health care professionals need to ascertain which patients can most effectively use CGM by further understanding the emotional, cognitive, and behavioral characteristics of patients who want to use this technology. Through this understanding, providers will be able to assess and assist patients in managing expectations of and psychosocial barriers to effective CGM use.

Psychosocial research on CGM is limited and has almost exclusively focused on children and adolescents. Results have indicated neither adverse nor beneficial psychological effects with regard to anxiety, quality of life, or treatment adherence,¹ improvement in mean A1C, and high satisfaction with CGM.² In

an attempt to answer the question, “Is CGM for everyone?” this article presents clinically informed observations of psychosocial factors and case studies.

Helping patients set realistic expectations for CGM use is necessary before they can make an informed decision about CGM or successfully use it. Patients must first understand that CGM will not cure their diabetes, nor will it diminish needed diabetes self-care activities. In research on another biotechnological device, the insulin pump, Ritholz et al.³ found that patients with higher A1C values expected the pump to improve glycemic control like a “magic pill” without their active involvement, whereas patients with lower A1C values understood that they were the agents of change and thereby conceptualized the insulin pump as a tool that assisted with their self-care. When patients begin using CGM, it is important to present CGM as a tool to assist in effective diabetes management and to help prevent the disappointment that comes from unrealistic expectations.

Another important factor that needs to be considered and evaluated is how patients react to and cope with the amount of information that CGM supplies. One must consider the possibility of information overload because the presentation of continual glucose numbers and patterns is the very nature of CGM. Therefore, patients must be able to process and use this amount of information and not become overwhelmed or frustrated by it. One way to consider patients’ responses is to think about how they handle

other numbers and data, as well as their level of anxiety and need for perfection. Because patients also are exposed to glucose values not previously seen, two issues must be kept in mind when introducing CGM and teaching patients to use it: 1) How will patients cope with seeing glycemic excursions of which they were previously unaware? and 2) Can glucose numbers become too present in patients’ lives, creating a ubiquitous sense of diabetes that may feel entrapping?

An additional issue that may increase anxiety and frustration for patients using CGM involves the lag time between CGM (interstitial glucose) and fingerstick (blood glucose) numbers. When food is digested, glucose first goes to the blood; it appears 6–18 minutes later in the interstitial fluid.⁴ Therefore, interstitial glucose values always lag behind blood glucose values. If patients are trying to determine the presence of hypoglycemia or determine their glucose levels post-hypoglycemia, they must check their blood glucose to ascertain when to treat or stop treating hypoglycemia. This need to rely on fingerstick glucose levels may create frustration or a perceived sense of undependability in CGM.

It is essential, therefore, to assess emotional, cognitive, and behavioral characteristics for each patient before initiating CGM. The following cases illustrate situations that require careful attention to individual psychosocial factors before beginning patients on CGM: 1) fear of hypoglycemia, 2) fear of hyperglycemia, 3) high levels of anxiety, and 4) insulin restriction for weight loss. Caution is advised before recommending CGM

for patients who use insulin restriction for weight loss because how these patients may use CGM information is not clear.

Fear of hypoglycemia influences behavior and self-management of diabetes.⁵ It sometimes creates the need for patients to avoid hypoglycemia at all costs and to keep their blood glucose levels above recommended targets to make sure that they do not experience a low blood glucose reaction. Fear of hypoglycemia also creates difficulty in differentiating anxiety from hypoglycemia; patients may become anxious and assume they are becoming hypoglycemic. CGM may be helpful in addressing this situation because of the built-in warning mechanisms for hypoglycemia (i.e., auditory hypoglycemic alarms and visual directional arrows alerting CGM users to high or low glucose levels and showing the direction of glucose change). However, the question arises of whether patients with this kind of anxiety could effectively use CGM.

Case Study 1: Fear of Hypoglycemia

Fran is a 25-year-old woman who has had type 1 diabetes for 10 years. She checks her blood glucose 20 times a day and greatly fears low blood glucose. Her A1C is 9.5%. She also often has panic attacks and cannot discriminate between symptoms of anxiety and symptoms of hypoglycemia. In fact, she treats these symptoms even when her blood glucose is well above the hypoglycemic range. She reports that when she “feels low,” she needs to treat despite the fact that her blood glucose levels are not in a hypoglycemic range.

Fran starts CGM to improve her diabetes management. After using CGM for a year, her A1C still remains high at 9.7%. She reports that she could not trust the accuracy of the CGM numbers. She says the discrepancy between blood glucose numbers and interstitial glucose numbers created too much anxiety for her. However, we must bear in mind that Fran actually does not trust blood glucose numbers, either. She treated hypoglycemia even when her blood glucose was not in the hypoglycemic range. Fran’s fears remained high, and her difficulty

managing her anxiety and fear of hypoglycemia interfered with her effective use of CGM.

Before Fran can benefit from CGM, she must be able to differentiate her anxiety from hypoglycemia, and she must be able to trust data from CGM. At this time, Fran trusts only her subjective experience, and she is too anxious to incorporate the warning alarms and directional arrows of CGM into her self-management.

Fear of hyperglycemia describes attributions of patients who present with recurrent hypoglycemia. Because hypoglycemia is often a common reason for beginning CGM, health care providers may see these patients as likely candidates for effective CGM use. However, there is a need to further understand what is causing the frequent hypoglycemia and to determine how CGM will affect this occurrence. The following question arises: Will CGM assist in decreasing the frequency of hypoglycemia, or does fear of hyperglycemia encourage over-bolusing of insulin, therefore resulting in recurrent hypoglycemia? Does CGM information help support this behavior?

Case Study 2: Fear of Hyperglycemia

Marjorie is a 38-year-old woman who has had type 1 diabetes for 12 years. Her A1C is 5.8%. She has had four severe hypoglycemic episodes in a month, and she was taken to the hospital for treatment each time. She reports wanting “normal blood sugars.” When asked about her episodes of severe hypoglycemia, she responds with an extreme lack of emotion and manifests a sense of detachment with regard to these events.

Marjorie starts CGM. She reports not liking CGM because she finds the alarms “annoying.” She is particularly bothered by the nighttime alarms that, she reports, “interrupt” her sleep. When observing Marjorie’s 24-hour tracings, one notices that Marjorie is in the severely hypoglycemic range (≤ 40 mg) for most of her sleeping time. However, she does not want or appreciate the CGM alarms. She also reports not liking being

“hooked up” to CGM. She states she already wears an insulin pump and does not want to be “like the bionic woman.” The one benefit that she sees in CGM is that it notifies her of the spikes in her glucose levels, and she is able to treat these by extra bolusing insulin nine times during the day (observed on her tracing). Marjorie will say that, “once in a while the hypoglycemic alarm stopped me from ending up in the hospital,” but she does not believe that makes continued use of CGM worthwhile.

Marjorie discontinues CGM. In spite of her difficulties with CGM, her treatment team was able to learn a great deal about her self-management. For example, Marjorie’s treatment team became aware of her extra bolusing of insulin behaviors, but they were not able to understand the basis for these behaviors. Is it solely a fear of hyperglycemia, or are there other reasons that recurrent severe hypoglycemic episodes do not bother Marjorie? One needs to work with Marjorie in setting appropriate treatment goals and to help her realize that an A1C of 5.8% may not be appropriate if it includes so many severe hypoglycemic events. In addition, professional behavioral counseling should focus on helping Marjorie understand her beliefs and feelings about hypoglycemia and hyperglycemia and developing strategies that would enable her to change her behavior.

Just as case studies provide us with information about problematic situations, they also allow us to observe effective treatment. The final case presented here is of a man who is quite able to use CGM despite a slight amount of anxiety. This patient is someone who clearly processes and integrates CGM information in a productive manner. He also is someone whom we may term a “technophile” (i.e., he likes information and is not overwhelmed by excessive amounts of data).

Case Study 3: CGM Success

Lawrence is a 36-year-old man who has had type 1 diabetes for 4 years. His A1C is 9.2%. He has an engineering background and reports that

his father had type 1 diabetes and developed renal failure and retinopathy. He also is the single parent of a 10-year-old girl. He first starts using an insulin pump and then CGM.

He reports that before beginning CGM, he read the manual five or six times to ensure that he really understood it. He states, "I want to understand how things work. I like all the data. It helps me understand and worry less." Here, we see that CGM information is able to effectively decrease Lawrence's anxiety. He also reports, "The alarms give me a sense of security." We see Lawrence trusts the information and is able to use it in such a way that he feels more secure and in charge of his diabetes.

Interestingly, when observing Lawrence's 2-week CGM glucose tracings, we see an average interstitial glucose level of 123 mg with only one interstitial glucose level < 60 mg. Lawrence is a very effective CGM user. His effectiveness is determined by a variety of psychosocial factors. He has an engineer's innate ability and training to process and use CGM data; he is highly motivated by his father's history and his present single-parent status; and he is the kind of person who strives for understanding and is able to use CGM data in that effort.

Is CGM for everyone? Before we can answer this question, we need to assess patients' individual psychosocial factors, expectations, and how they process and adapt to CGM information. We also need to develop educational programs that incorporate these aspects when we teach about CGM. We further need to help patients understand and appreciate that their active participation is the essential ingredient in successful CGM use. They are the agents of change; CGM can help them make more informed treatment decisions, but it will not do the work for them. We cannot state that CGM is for everyone. In this early stage of CGM technology, we do not have a clear picture of the psychosocial predictors of successful CGM use. However, it is important for health care professionals to understand that perfectionism is impossible in diabetes.⁶ As we face this marriage of biotechnology and diabetes management, we must always bear in mind that, "As machines become more and more efficient and perfect, so it will become clear that imperfection is the greatness of man."⁷

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