

# Lighten Your Lows with CGM

By Gary Scheiner MS, CDE

Given that the topics of hypoglycemia and continuous glucose monitoring (CGM) take center stage in this issue of Review, it makes sense to pour the two together in a large beaker, stir, and see what happens. Voila! No explosion. No noxious odor. In fact, they seem to form a nice, stable mixture.

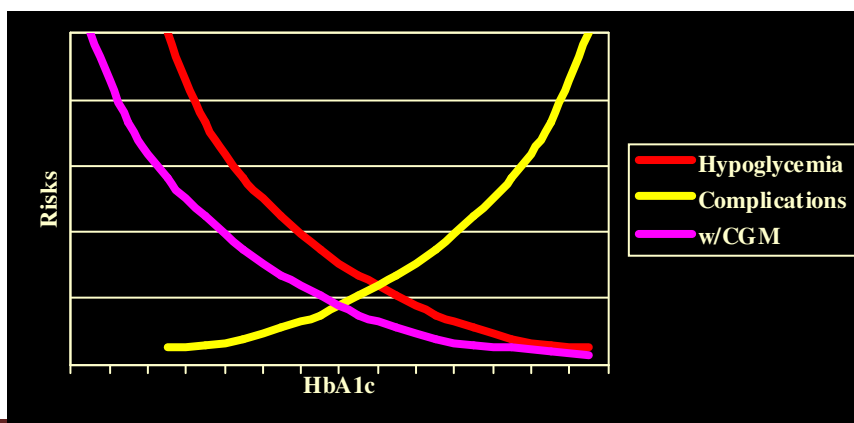
Hypoglycemia is often called the greatest limiting factor in intensive diabetes management. Were it not for the risk of hypoglycemia, we could simply load patients up on insulin and keep blood glucose from ever rising too high. Unfortunately, hypoglycemia does exist, and it creates a number of serious risks to individual safety and quality of life.

With our current state of technology, it is not realistic to achieve tight blood glucose control without *any* episodes of hypoglycemia. The tighter the control, the more frequent and severe hypoglycemia usually becomes. Given that managing A1c and limiting glycemic excursions are in everyone's best interest (ACCORD notwithstanding), CGM is a logical and practical way to "shift the curve" in favor of tight control while *reducing* hypoglycemia risk. (see graph below)

Even though the data generated by the various CGM systems is not perfect (there is, on average, a 15% difference between the sensors' data and simultaneous fingerstick measurements), it is usually close enough to get a feel for approximately where the blood glucose is. More importantly, the trends on the graphs are fairly reliable – if they show a rise, the glucose is likely rising. If they show a drop, the glucose is almost sure to be dropping. And the alarms will capture most lows long before the wearer can "feel" them on their own.

## EARLY DETECTION OF LOWS

Research has shown that use of the low glucose alarm system is integral for reducing the frequency, severity and duration of hypoglycemia (Chase HP, et al. *Pediatrics*. 2001;107:222-226; Bode B, et al. *Diabetes Technol Ther*. 2004;6:105-113). The low alarm systems in CGMs act sort of like the warning track near the outfield fence on a baseball field. They are there to provide a clear message that danger is just ahead. In fact, two of the FDA-approved CGM systems (Medtronic Guardian and Freestyle Navigator) have *predictive* alarms that can project whether hypoglycemia is likely to occur based on the current glucose level and rate of change.



The optimal A1c is at the point where risks of hypoglycemia and complications intersect. Use of continuous glucose monitoring reduces the risk of hypoglycemia at every level of control, thus "shifting" the risk curve to a lower A1c level.

The precise level for setting the low glucose alert should be based on the individual patient. Clearly, presence of hypoglycemia unawareness and a history of severe hypoglycemia dictates use of a higher setting. However, keep in mind that there is a 5-10 minute “lag time” with all CGM systems. When the blood glucose is dropping, the CGM will tend to generate a higher reading than the actual blood glucose. For this reason, a low alert of 80 mg/dl (4.4 mmol) or higher is recommended.

Due to the potential for occasional inaccuracy, patients should be instructed to perform fingerstick readings when low glucose alerts occur, and treat accordingly. Although they may not detect every low, CGMs will provide an early warning for the vast majority. This makes it considerably safer to work, drive, exercise, take exams and, as mentioned above, aim for tighter overall control.

## FORECASTING

Simply knowing that one’s blood glucose is 90 mg/dl (5 mmol) is often not enough. Is it rising? Dropping? If so, how quickly? Having this type of information allows individuals to make appropriate decisions regarding food intake and insulin dosing at critical times of day. CGMs provide on-screen short-term graphs indicating recent trends in glucose levels. Some (Freestyle Navigator, Medtronic Guardian and sensor-augmented pump) also provide trend arrows indicating the current rate of change in glucose levels. Knowing where blood glucose is *headed*, and not just where it is at the moment, is key to hypoglycemia prevention.

## SIDE EFFECTS

Proper use of CGM can eliminate a number of other potential sources of hypoglycemia. CGM can be utilized to fine-tune basal insulin levels, whether delivered via pump or injections. The long-term CGM graphs should clearly indicate whether glucose levels are holding steady

overnight and between meals. Rising or falling glucose in a fasting state indicates a need to adjust the basal insulin level.

Many CGM users learn about the specific effects of exercise and sports by viewing their CGM during and afterwards. The knowledge gained can help in the development of strategies for preventing exercise-induced hypoglycemia. Retrospective analysis of CGM can be utilized to fine-tune mealtime boluses (insulin:carb ratios) and correction boluses, which can also help to reduce hypoglycemia risk.

Now, don’t get the idea that CGM will solve every hypoglycemia-related issue. There are occasional false negatives, data inaccuracies and gaps (including warm-up periods) to be concerned about. Timely SMBG continues to be a necessity for patient safety and management.

*Editor’s note: Gary Scheiner is a Certified Diabetes Educator with a private practice near Philadelphia. He provides diabetes self-management education and blood glucose control consulting for individuals throughout the U.S. and abroad through his web site ([www.integrateddiabetes.com](http://www.integrateddiabetes.com)) and toll-free hotline (877-735-3648). Feel free to contact him by phone or e-mail ([gary@integrateddiabetes.com](mailto:gary@integrateddiabetes.com)) with questions or for more information.*