

The Katrina Aftermath
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Summary Prepared by Rob Lindsay, MD

Continuous Glucose Monitoring

There was, of course, quite a bit of information on continuous glucose monitoring as we slowly emerge into the new technology. There were several different sections presented. On Sunday there was a seminar on “Continuous Glucose Monitoring- Translating Sensor Data Into Practice”. Heather Lamar is a CDE who presented on basal insulin and meal adjustments. I do not want to go through all that she said but she pointed out that continuous glucose monitoring is a paradigm shift in diabetes management in that we are going from blood glucose values to glucose trends. She emphasized that the hourly trend graph was the most important thing in patients learning how to better control their diabetes. She pointed out that continuous glucose monitoring offers immediate feedback on lifestyle events so that our patients can learn from them and it boosts their confidence considerably as they go along (*if they are paying attention*). She emphasized that consistency is really the key in diabetes management and thus the standard deviation measurement is very helpful. Optimally, patients should try to keep their average glucose deviation less than 30%. *This means basically that from day-to-day patients are achieving the same degree of control. Again consistency is the key.* She once again emphasized that information from continuous glucose monitoring shows that the bolus should always be given ten to fifteen minutes before eating. *As if I haven't told you this in the past!* Michael Riddell, a research exercise physiologist talked about physical activity adjustments. He felt that the continuous glucose monitor provided valuable information for adjusting basal rates and carbohydrate corrections with exercise and felt that this might provide a stimulus for exercise since many patients fear exercise primarily due to fear of hypoglycemia. He again emphasized that CGM lags behind blood glucose monitoring with exercise and so that the trend mode is of greatest importance. He felt that most patients have a drop in blood sugar with exercise. He felt that the responses are reproducible in children and so that we can learn from earlier experience to prevent later problems. He presented the following chart which shows how much to change bolus insulin before exercise.

Change in Bolus Insulin

Intensity of Exercise	30 minutes	60 minutes
25	25%	50%
50	50%	75%
95	75%	100%

The intensity of exercise is all relative and each individual needs to learn how to gage this intensity. I think that this chart might be useful for those of you who like to do running or aerobic sports such as basketball or swimming. His final tidbit was that the best way to determine basal insulins is to skip meals. By skipping meals sequentially over several days, the basal rates can be calculated fairly easily. Finally my friend Tim

Wysocki from Florida talked about behavioral medicine issues. He talked about the benefits of CGM for various age groups. The pediatric studies showed that it can be significantly beneficial. It does not appear to have adverse effects on quality of life and both parents and youths are very satisfied with its use. The JDRL trial looked at Hgb A1c levels in children on CGM. Overall there was a drop in Hgb A1c over six months from 8% to 7.5%. The patients between 8 and 15 years of age and 15 and 25 years of age did not have a significant drop but their change was equal to that as was found in adults when the monitor was used six days per week. The younger children had a significant drop in Hgb A1c. He pointed out several important aspects for pediatric use: 1) The patient must want to wear it and to use it. If he does not, it will accomplish nothing, 2) He pointed out that kids sometimes become fed up with parents snooping and questioning which can result from CGM use, 3) Some patients felt that it made diabetes "an even bigger part of my life," 4) He also pointed out that CGM does not work well with patients with oppositional or defiant behavior. He felt that there were three variables that determine the frequency of use of CGM and its benefits: 1) pain, discomfort and inconvenience, 2) social complications and family conflict, 3) patients having appropriate expectations. His recommendations were that we must be realistic with what CGM can do. It does not answer all questions. He also felt that patients and parents needed to understand the time and effort required for it to work properly. He felt that it was very necessary for parents and care providers to keep it positive when talking about results. If we just use it for another form of nagging, it will not be effective. He felt that CGM does not have to be used all the time but was uncertain how much it had to be used in order for it to make enough difference. *(There is more study that is needed on this question.)* He felt that the systems worked much better if the alarms were left turned on whenever possible. When patients start to turn off the alarms because they are annoying, they pay less attention to their control. He said that it was very important that patients and parents learn to cope with getting much more glucose information. *Again the question of information overload.* He concluded by pointing out that in young children, parents are the monitors with CGM whereas with pre-teens they are the executives and with teens they are the consultants. *If we keep our roles in mind, we may achieve much better results.*

At the Council on Youth meeting, Dr. Gwalski gave more information on the JDRF CGMS study in children. In this JDRF funded trial they used all three brands currently available and four hundred and fifty-one children were studied. Three hundred and twenty-two of them had a Hgb A1c of greater than 7% and the other 129 had a Hgb A1c of less than 7% at the onset of the study. One hundred and fourteen of the children were 8 to 14 years of age, 110 were 15 to 24 years of age and 98 adults were 25 or older. The 8 to 14 year olds were most likely to improve but it was not a statistically significant change. Less than 10% were able to drop to a Hgb A1c level of 7% or have a decrease of 0.5%. There was no significant change in the 15 to 24 year age group. The teens were less likely to wear the monitor as long as asked. If they wore the monitor at least six days per week, however, there was a significant decrease in Hgb A1c. He reported that the ADA standard of care is that CGM is recommended for adults and may be helpful in children. Many of the major plans are now covering CGM including Aetna, Cigna, Humana, United Health Care and in our area IHC. Approximately 75% of the patients are getting insurance coverage.

Not surprisingly there were several abstracts presented on CGMS. The JDRF study group looked at the optimal periodic sampling intervals to assess long-term glycemic control using continuous glucose monitoring. They followed 134 individuals with Type I diabetes ranging anywhere from 8 to 72 years of age with a mean baseline Hgb A1c of 7.3%. They found that a three day sampling period appears to be too short and that a sampling period of at least fourteen days every three months is needed in order to truly achieve the benefit desired.

A group from California looked at the SEVEN system from DexCom which is the next generation of their seven day real time continuous glucose monitoring system. They found that 86% of the sensors lasted seven days and that the data capture of 89% of the readings was significantly improved relative to the earlier DexCom SEVEN system. Seventy-three point eight percent of the results were in the Clarke error grid A region and 22.1% were in the D region. *From earlier years you will remember that this is the way that people judge accuracy. Ninety-five point nine percent in the A and B region is excellent.* The median difference between a monitor and self-blood glucose monitoring was about 12%. The time lag was estimated at five plus or minus ten minutes when compared to blood samples. Their conclusion was that “the performance and new features of the next generation SEVEN system compares favorably to the current SEVEN system in terms of accuracy, precision, sensor life, rate of change and data capture with a short lag time”. Another group from California looked at the freestyle navigator CGM system. When compared to lab glucose values, the mean absolute difference was 14.5%. Seventy-seven point one percent were in the Clarke grid zone A. Performance of the meter remained constant over all five days, with 80.7% of the data in zone A on day 1 and 74.1% in zone A on day 5. *You must remember that the navigator is designated only for 5-day use.* Hypoglycemic events were detected by threshold or projected alarm 91.6% of the time. *Both of these studies show that these systems are much more accurate than they had been in the past and should give us more confidence in their use. With each new generation things seem to be improving.* Finally a group from the Joslin Clinic in Boston looked at the psychosocial impact of real time continuous glucose monitoring in Type I diabetics. They looked at 49 Type I patients anywhere from 8 to 40 years of age. After six months use of the CGM, adults reported higher quality of life, less burden, fewer depressive symptoms and less anxiety than a control group who was doing blood glucose monitoring alone. Parents of youths in the continuous glucose monitoring group reported less fear of hypoglycemia. Interestingly the youth on continuous glucose monitoring reported more depressive symptoms than the youth in the blood glucose monitoring group. They concluded that the children on continuous glucose monitoring do not appear to derive psychological benefit from continuous glucose monitoring which is likely related to additional demands placed upon them for calibrations, alarms etc.

They pointed out that attention to psychosocial factors and management of patient's expectations may facilitate implementation of continuous glucose monitoring and improve outcomes. *This study is a bit sobering because it goes to show that nothing is golden in all regards. Obviously we will need to pick our patients and our parents carefully when trying continuous glucose monitoring.*

BALDO

by Cantu & Castellanos

