Abstracts provide latest findings on glucose monitoring

Yesterday afternoon, eight presenters shared results from recent studies during an Oral Session titled "New Concepts in Glucose Monitoring – SMBG and Continuous." The two-hour session featured a range of abstracts that examined various monitoring-related questions.

The studies demonstrated the latest information on monitoring technology and how it plays a role in controlling A1C levels and reducing the risks of hyper- or hypoglycemia. Here's a look at the highlights from each abstract.

Multiple CGMS sensors

Allen King, MD, of the Diabetes Care Center in Salinas, California, kicked off the session by presenting findings from a study that looked at the simultaneous use of multiple CGMS® Gold sensors.

"What our abstract shows," Dr. King said, "is that when using one system to simultaneously record glucose change trends, there isn't a high degree of correlation from one site to another."

In the study, 10 subjects received three sensors — one in the right abdomen, one in the left abdomen, and one in the left, upper arm. The sensors were calibrated and chronologically aligned.

Results were only interpreted if they received 24 hours of acceptable data simultaneously from all three sensors.

Dr. King said he and his colleagues were a little surprised by what they discovered.

"We were hoping to see a much greater agreement between sensors," he said. "Although the sensor glucose measurements showed reasonable point-to-point glucose correlation, the direction and rates of change often disagreed."

Reducing glucose variability

The second abstract presented showed how important continuous monitoring can be to reducing glucose variability — and thus the risk of hypo- or hyperglycemia.

Boris Kovatchev, PhD, of the University of Virginia, shared the results of a 40-day study of 123 subjects with type 1 or insulin-treated type 2 diabetes mellitus using the FreeStyle Navigator® continuous glucose monitoring system.

"For the first 20 days, people did not see the results," Dr. Kovatchev said. "Then they continued for another 20 days unblinded. The point was to see what happens if continuous glucose information is provided to the patient."

During the first 20 days, Dr. Kovatchev said there were no changes in average glucose or glucose variability. However, as soon as patients started seeing the results, changes became apparent.

"The changes were kind of surprising," Dr. Kovatchev said. "Average glucose did not change, but glucose variability was reduced within a week of the device being unblinded, as were the risks for both hypoglycemia and hyperglycemia."

Dr. Kovatchev speculated that if continuous monitoring can reduce glucose variability — and therefore the risk of hyper- and hypoglycemia — then practitioners can begin to push for better glucose control because they will not have to accommodate such large swings of blood glucose.

Self-monitoring and improved A1C

Common sense suggests that frequent self-monitoring of blood glucose would lead to better glycemic control. However, studies have yet to prove this theory.

Yesterday, however, Glen Murata, MD, of the New Mexico Veterans Affairs Health Care System, shared results from a study that confirmed that self-monitoring was associated with better A1C levels.

Dr. Murata began by explaining why past attempts to show a correlation had not worked. The reason, he said, is that the relationship between A1C and monitoring is confounded by glycemic risk factors and treatment intensity.

In his study, subjects on oral hypoglycemic agents were assigned to one of five disease trajectories according to their clinical status at the end of the two-year observational period. By separating patients this way, the study was able to control for confounding issues, such as initial treatment. The groups: no medication changes; increased doses of initial oral hypoglycemic agent; new OHA; both interventions; and conversion to insulin.

"There are dozens of confounders, and it is not possible to measure them all," Dr. Murata said. "But our approach is that if you aggregate patients based on the physician's response, you can control for it."

He said the results show that self-monitoring is associated with improved glycemic control, but that benefit could not be demonstrated until the analysis was stratified by disease trajectory.

Self-monitoring in CSII patients

Self-monitoring blood glucose is a mandatory component of successful intensive diabetes management, especially in insulin-treated patients. However, limited data exist from clinical trials about the relationship between the frequency of self-monitoring and hemoglobin A1C outcomes in patients receiving continuous subcutaneous insulin infusions (CSII).

Lutz Heinemann, PhD, of the Profil Institute for Metabolic Research in Neuss, Germany, presented results from an international survey that examined the relationship between the frequency of self-monitoring and A1C levels in CSII patients. The results showed lower frequencies of blood glucose monitoring correlated with considerably higher A1C levels.

In this large population of CSII users, glucose control was highly correlated with the number of daily blood glucose measurements. This finding supports previously available data on the correlation between self-monitoring frequency and glycemic control.

Meal detection

Another study looked at using continuous glucose monitoring to detect a meal. Eyal Dassau, PhD, of the University of California, Santa Barbara, said the ability to use a meal detection algorithm has safety and quality-of-life implications, particularly in children and adolescents, which is why the Juvenile Diabetes Research Foundation provided financial support for the study.

"Adolescents often forget to bolus before eating, which results in very high glucose levels a couple of hours after a meal, which is something we'd like to avoid," Dr. Dassau said.

The study he presented looked at whether glucose rate-of-change data from a continuous glucose monitor could detect a meal. Dr. Dassau said the results indicated that the use of a meal detection algorithm will trigger a model for predictive control of insulin dosing during a meal before there has been a major elevation in blood glucose levels.

"So we are offering a safety net," he said. "If a patient does not declare a meal, we can detect a sharp rise in glucose and then take an action. The combined efforts of the meal detection algorithm and fast-acting insulin will provide the necessary means to improve the quality of life for patients with diabetes."

Bruce Buckingham, MD, made the initial suggestion to assess rate-of-change data at the onset of a meal as a means of developing a meal detection algorithm, and assisted with the clinical analysis of results. Patient data was provided from clinical studies at Stanford University and from DirecNet.

Sensor-augmented pump therapy

Irl Hirsch, MD, of the University of Washington, said that while a study of sensor-augmented pump therapy may have failed to reach its primary endpoint, valuable information was still gleaned from it.

The goal of the study was to evaluate the effectiveness of the MiniMed Paradigm® 722 system, which combines an insulin pump with a real-time continuous glucose monitor. Study leaders expected to see significant drops in A1C, Dr. Hirsch said.

"In retrospect, I could have predicted this," he said. "Many of the study subjects had poorly controlled type 1 diabetes when we began, and people who do not have good control are often not paying attention to basics. That's the bad news."

The good news, he said, is that when they separated the study participants who complied by wearing the pump at least 60 percent of the time, they saw significant reductions in A1C.

"So even though the study as a whole didn't meet the A1C endpoint, we learned what types of patients would benefit from this, and we will use that information as we go on and do further studies to determine who are the best patients to use this technology," Dr. Hirsch said.

An important secondary finding is that patients who were compliant in using the sensor had reduced hypoglycemia, Dr. Hirsch added.

Self-monitoring frequency

Since recommendations regarding the frequency of self-monitoring of blood glucose vary widely, the German Diabetes Center in Düsseldorf recently conducted a study to compare self-monitoring regimens with varied frequency.

"There is considerable uncertainty in the scientific community as to the recommendations on self-measurement of blood glucose in patients with type 2 diabetes, especially in patients who do not require insulin," said Werner A. Scherbaum, MD. "Actual guidelines suggest up to 11 self-monitoring measurements a week."

Dr. Scherbaum said the center's study was aimed at investigating the optimal frequency of self-monitoring in non-insulin treated patients with type 2 diabetes. For the study, participants were divided into two groups. One group self-monitored once per week and the second group self-monitored four times per week. All participants kept a blood glucose diary.

"The patients studied got along very well with one measurement per week, which is as efficient as four measurements a week, provided that the patients are close to glycemic target," Dr. Scherbaum said. "This is without a deterioration of metabolic control and also without a negative effect on the quality of life in these patients."

Dr. Scherbaum said the results are in contrast to most guidelines, which are based on consensus conferences or observational studies rather than on data supported by experimental clinical trials.

Seven-day sensor

The final presentation of the session looked at the accuracy of the DexCom seven-day continuous glucose sensor compared to YSI (Yellow Springs Instrument).

Howard Zisser, MD, of the Sansum Diabetes Research Institute, said at the time of the study, continuous glucose sensors were only approved for three days. That changed May 31, when seven-day sensors were approved.

"A lot of the original decision to go with three-day sensors was based on when patients change pumps," Dr. Zisser said. "There was also unfounded concern about infection."

However, he said this study showed that sensors not only were effective for seven days, they actually became more accurate as time progressed.

The study evaluated data from the sensors on days 1, 4, and 7, and drew intravenous samples to compare results using the Clark Error Grid and other standard measures of accuracy.

Overall, the study showed that the seven-day system was safe and effective when used as a complement to self-monitoring, Dr. Zisser said. dD

67th scientificsessions
diabetesDispatch
The ADA *Diabetes Dispatch* is published by TriStar Publishing, Inc., as a service to the members of the American Diabetes Association.

TriStar Publishing, Inc.
6240 West 135th St.
Overland Park, KS 66223
Phone: 913-491-4200
Fax: 913-491-4202

www.tristarpub.com