Monitoring Now More Frequent

Hypoglycemia *from page 1*

a consistent response to milder cases as well, the DPSC developed the protocol for use when a patient's blood glucose drops below 70 mg/dL (see box).

To see how well the protocol was working, Dr. Korytkowski and her colleagues examined the non–critical care patient data for 1 month in 2001, before implementation of the protocol, and for the same month in 2004, following implementation, counting nadir blood glucose in each 4-hour period to avoid overcounting of events. They found there had been a 48% decrease in severe hypoglycemic events (blood glucose less than 40 mg/dL), a 38% drop in moderate hypoglycemic events (blood glucose 40-49 mg/dL), and an 8% reduction in mild hypoglycemic events (blood glucose 50-69 mg/dL). They observed a 43% decline in combined moderate and severe hypoglycemic events.

Moreover, since the introduction of the hypoglycemia protocol in 2001, the number of hypoglycemic events treated by the hospital's rapid-response team has dropped from a high of 29 episodes per 1,000 patient-days/month to 22 episodes per 1,000 patient-days/month, according to Dr. Korytkowski. She and her colleagues plan to publish these results in the near future.

"It's hard to attribute it directly to the hypoglycemia treatment protocol . . . but we've tracked the frequency of events, and it does look like there's a decrease in the amount of time people spend with severe low blood sugar," she said. The frequency of bedside glucose monitoring has also increased, and the number of instances requiring the care of the rapid-response team has dropped.

The initial version of the protocol took 6 months to develop and was examined and commented on by departments throughout the hospital. It was approved by each department as well as by the medical executive committee.

The protocol eventually expanded to include orders for insulin, postsurgical guidelines for diabetic patients, a protocol for hyperglycemia in critical care units, and others. "I think that developing the protocol for hypoglycemia unmasked some of the other issues that were related to diabetes management," she said.

The patient safety committee reviews all cases of hypoglycemia that activate the rapid-response team but considers those for which blood glucose drops to less than 40 mg/dL (regardless of mental state) to be severe.

Dr. Michael DeVita, associate medical director for quality and safety at UPMC, noted that the hospital had seen "a series of poorly managed patients" when it came to hypoglycemia in patients with diabetes. Now, thanks to the use of the protocol, "We have much better glycemic management," he said. "I'd rather be hospitalized here for diabetes than anywhere in the country."

He emphasized that it is not the glucose level that triggers the rapid-response team in hypoglycemia cases. "We're looking for changes in respiration, consciousness, blood pressure, pulse. … Those are very similar criteria to others that have been described in the literature." ■

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Diabetes Patient Safety Committee members Dr. Michael Devita, Michelle Noschese, Dr. Mary Korytkowski, and Amy Donihi discuss recent cases.

Protocol Can Be Started by Nurse

The UPMC hypoglycemia treatment protocol need not be administered by a physician but can be initiated by the bedside nurse, noted Dr. Korytkowski. For all patients covered by the protocol, the responder is required to contact a physician and to recheck glucose 15 minutes after the initial treatment.

In each of three categories of blood glucose and patient consciousness level, the protocol lists treatment options and required steps.

For example, for alert patients with blood glucose less than 50 mg/dL, the initial options are to give the patient an 8-ounce glass of milk, to give two tubes of glucose gel if the patient can swallow thick liquids, or, if the patient can't take anything by mouth, to give 50 mL 50% dextrose solution intravenously (1 ampule). Intravenous dextrose 5% in water can be started at 100 mL/hour if the episode is prolonged.

If the patient is unable to swallow and there is no intravenous access, 1 mg of glucagon can be used intramuscularly, followed as soon as possible by oral carbohydrates or intravenous dextrose.

In patients with blood glucose near the upper end of the 70 mg/dL limit who are still conscious, the treatment "may be something as simple as a glass of orange juice," Dr. Korytkowski said.

Diabetic Ketoacidosis Treatments Vary Widely Among Hospitals in Denmark

BY MELINDA TANZOLA
Contributing Writer

Management practices for treating diabetic ketoacidosis (DKA) vary widely among 59 internal medicine departments in Denmark, according to results of a questionnaire-based study in press in an upcoming issue of Diabetes Research and Clinical Practice.

The study identified 24 different insulin regimens and 21 fluid protocols used at the responding departments (Diab. Res. Clin. Pract. 2006 [Epub doi:10.1016/j.diabres.2006.10.013]). "In many cases, the treatment routines employed are not supported by evidence from clinical trials," wrote lead author Dr. Otto M. Henriksen of the endocrine section at Bispebjerg Hospital, University of Copenhagen, and colleagues.

Overall, 32% of departments managed all patients with DKA in an intensive care unit, whereas 22% used a general medical unit and 32% used an acute medical admission unit.

Most respondents administered an initial regular insulin dose of 10-20 U (median, 16 U) followed by a lower-dose hourly administration of 4-10 U/hour (median, 6 U/hour) of regular insulin. The most common criterion for stopping intensive insulin was resolution of acidosis, used by 76% of departments, followed by the ability to eat and drink (42%), resolution of ketosis (31%), and near-normoglycemia (25%); 53% waited until patients attained at least two of these individual criteria.

Almost all of the respondents used isotonic saline for hydration; 83% administered separate potassium infusions of isotonic potassium-sodium-chloride, and 10% used isotonic potassium chloride.

The recommended fluid administration volumes for the first 8 hours of treatment ranged from 3,750 to 7,700 mL, with a median of 4,800 mL. A mean of 44% of the total volume was derived from potassium supplementation (range, 29%-56%).

More than two-thirds of departments relied on degree of acidosis alone to determine bicarbonate use; 36% used an arterial pH below 7.1 as their threshold to initiate treatment. Another 11% of departments supplemented degree of acidosis with clinical criteria.

In terms of acidosis monitoring, 39% of departments used arterial punctures, 30% used venous blood samples, and 20% used an interchangeable method. Ketosis was most often monitored using a urine dipstick (77%).

Rates of serious complications within the prior 5 years, which were based solely on respondents' recollections, were significantly lower than would be expected from a national registry and included five deaths, four cerebral edemas, and three thromboembolic events.

"The results do suggest that treatment of DKA is perceived as relatively uncomplicated regardless of routine management guidelines," the researchers concluded. They proposed that national, evidence-based guidelines could reduce durations of hospitalization and increase the cost-effectiveness of DKA treatments. ■

Pioglitazone Benefits Type 2 Patients by Lowering Free Fatty Acids

Pioglitazone appears to augment insulin sensitivity in overweight patients with type 2 diabetes by suppressing plasma levels of free fatty acids, reported Dr. Mireille J. Serlie of the Academic Medical Center, Amsterdam, and her associates.

"Our results indicate that dietary interventions aimed at lowering plasma-free fatty acids may be necessary to achieve the best effect of pioglitazone on peripheral insulin sensitivity," the investigators said (J. Clin. Endocrin. Metab. 2006 Oct. 24 [Epub doi:10.1210/jc.2006-1518]).

Dr. Serlie and her associates studied the issue in 8 overweight patients with type 2 diabetes that was moderately controlled on a single oral medication. Patients were allowed to take statins (but not fibrates) and antihypertensive drugs. All patients served as their own controls.

The six men and two postmenopausal women took pioglitazone 30 mg/day for 4 months, which enhanced insulin sensitivity and significantly lowered plasma free fatty acid levels. When these levels were then induced to rise to pretreatment levels during an experiment, pioglitazone's insulin-sensitizing effect was nullified, the researchers said.

This study shows that lowering plasma levels of free fatty acids "is crucial in the insulin-sensitizing effect of pioglitazone," they noted.

Dr. Serlie reported no conflicts of interest. Co-author Hans P. Sauerwein reported receiving lecture fees from Eli Lilly & Co., which provided the drug used in the study.

—Mary Ann Moon

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