ICU Insulin Infusion Protocol Gains Ground

There is still a 'culture of hyperglycemia,' with a fear of hypoglycemia, or even of low normal.

BY MIRIAM E. TUCKER
Senior Writer

WASHINGTON — More hospitals are implementing standardized insulin infusion protocols, many of which emulate the Yale protocol, Dr. Philip A. Goldberg said at a consensus conference sponsored by the American Association of Clinical Endocrinologists, American College of Endocrinology, and the American Diabetes Association.

Dr. Goldberg, a postdoctoral fellow at Yale University, New Haven, Conn., said the protocol was introduced in 2001 after the publication of the landmark Leuven, Belgium study (N. Engl. J. Med. 2001;345:1359-67). Until then, the "state of the art" in the intensive care unit had been to tolerate blood glucose levels as long as they did not exceed 200 mg/dL and to rarely address plasma glucose elevations. Glucose levels were rarely checked in nondiabetic patients, and existing "sliding scale" insulin orders took into account only the current blood glucose. In contrast, the Yale protocol incorporated two other essential elements: The velocity of change (based on both the current and previous values) and the current infusion rate. "If you don't incorporate all three of those, your drip will not be successful," he said.

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In the first 69 insulin drips used in 52 medical ICU patients with a baseline mean glucose of 299 mg/dL, the median time to achieve target blood glucose levels of 100-139 mg/dL (now 90-119 mg/dL) was 9 hours, and the median drip duration was 61 hours. The protocol worked equally well in diabetic and nondiabetic patients, and was not influenced by the severity of illness.

The protocol was complex enough to achieve strict glycemic control in critically ill patients and practical enough to be implemented by busy ICU nurses without the need for continuous expert supervision (Diabetes Care 2004;27:461-7). Importantly, the protocol also was readily accepted by the nursing staff, with 73% rating it as "very easy" or "somewhat easy" to use.

"It's only complex the first two or three times you do it. Once you actually run an ICU nurse through this protocol a few times, it's not complex at all compared to the other things they're doing," said Dr. Goldberg.

Since then, other institutions have created their own versions of the Yale protocol—some including computerized algorithms—with similar success rates. "Everybody's institution has different local climates and needs to adjust these things … It's nice to see that people are taking our drip, adapting it to their local environment, and having some success with it," Dr. Goldberg noted.

And in 2004, the Yale group again updated its protocol following the publication of the first American Association of Clinical Endocrinologists' national guideline on inpatient diabetes and metabolic control (Endocr. Pract. 2004;10:77-82) and the American Diabetes Association's technical review (Diabetes Care 2004;27:553-91). The blood glucose targets were lowered to 90-119 mg/dL and the IV bolus was increased by about 40% to gain more rapid control.

In 54 consecutive cardiothoracic ICU patients, mean blood glucose levels were another 12-13 mg/dL lower on average with the new protocol and with no concomitant increases in hypoglycemia. Similarly, mean glucose level was 118 mg/dL among 47 consecutive medical ICU patients receiving 63 drips. With the old protocol, levels averaged 123 mg/dL. The new protocol halved to 4.5 hours the median time to reach a glucose level below 140 mg/dL (the old target).

These results would have been impossible without "buy in" from the nursing staff, Dr. Goldberg emphasized. "The ICU nurses are the ones who are doing this. You have to recognize that up front."

A major barrier still to be overcome is the long-held fear of hypoglycemia. Many hospital personnel believe that levels of 150-200 mg/dL are "normal" and that anything below 100 mg/dL is cause for concern. "There is a 'culture of hyperglycemia,' with a fear of hypoglycemia, or even of low normal," he said.

To address these concerns, inservice training at Yale consists of 35 minutes addressing the "why" of the protocol and just 10 minutes for the "how." The trainers review the published data and reinforce the message that most hypoglycemic episodes are benign and treatable.

It's also important to acknowledge to the nursing staff that the infusions will cause them extra work, Dr. Goldberg said. Some of the impact can be minimized with efficient use of ancillary staff, additional glucose meters, and use of lines in place for other reasons to sample venous or arterial blood for glucose measures.

Continuous glucose monitoring systems—currently approved for use only in diabetic outpatients—might also prove useful in the ICU setting. In a preliminary study, the Yale group found good correlation between values obtained with Medtronic Minimed's CGMS system and capillary glucose levels in 22 medical ICU patients (Diabetes Technol. Ther. 2004;6:339-47). ■

Metabolic Syndrome Linked to Carotid Thickening in Women

BY DEEANNA FRANKLIN
Associate Editor

Metabolic syndrome predicts a worsening of intima-media thickness in the carotid artery of elderly women, according to findings from a 12-year population-based study.

Maija Hassinen and her colleagues at the Kuopio Research Institute of Exercise Medicine in Finland randomly selected 299 women, aged 50-60 years, from a large risk-factor survey. The women were followed from 1982 to 2003, at which point complete data were available on 101 women, who were then aged 70-80 years.

Patients were considered to have metabolic syndrome if they met at least three of the following criteria from the National Cholesterol Education Program: high blood pressure (130/85 mm Hg or greater, and/or drug treatment), high blood glucose levels (110 mg/dL or greater), HDL cholesterol levels less than 50 mg/dL, triglycerides of at least 150 mg/dL, and a waist circumference greater than 88 cm.

The women had an average of 1.5 risk factors for metabolic syndrome at baseline. Of the 13 women with metabolic syndrome at baseline, their mean carotid intima-media thickness (IMT) was 18% greater than in those without metabolic syndrome (1.21 mm vs. 1.03 mm), said Ms. Hassinen and colleagues (Arch. Intern. Med. 2006;166:444-9).

By the end of the study all participants had an average of 2.3 metabolic risk factors, and 46% had metabolic syndrome. For all participants, waist circumference increased by 10%, body mass index increased by 2%, and glucose levels rose by 11% over the 12-year period. Additionally, their levels for LDL cholesterol dropped by 16%, HDL cholesterol decreased by 21%, and systolic and diastolic blood pressure levels decreased by 8% and 19%, respectively. The use of medications for hypercholesterolemia rose from 7% to 36%, and for hypertension from 23% to 56%. The mean carotid IMT for participants rose from 1.05 mm to 1.27 mm, for a 21% increase.

Of the 88 women who did not have metabolic syndrome at baseline, 34 had developed incident metabolic syndrome. After adjusting for factors such as age, prevalent cardiovascular disease, physical activity, smoking, LDL cholesterol levels, carotid IMT, and a baseline National Cholesterol Education Program score for metabolic risk, the mean carotid IMT in these 34 women was two times greater than it was for the 54 women without incident metabolic syndrome. Furthermore, "the more metabolic risk factors that occurred during the 12-year period, the greater the increase in the mean carotid IMT," said Ms. Hassinen and her colleagues.

The researchers concluded that "incident metabolic syndrome and the increasing number of metabolic risk factors [were] able to predict the progression of carotid IMT in elderly women," and thus provide "additional information regarding the progression of preclinical atherosclerosis beyond conventional risk factors and can therefore improve the prediction of clinical [cardiovascular disease]."

Because of the rapidly growing elderly population in many Western countries, "carefully planned health promotion programs and treatments for the metabolic syndrome are urgently needed," they concluded. ■

Depression in Diabetic Patients Intensifies With Rise in CHD Risk

DENVER — Increased risk of coronary heart disease is significantly associated with stronger symptoms of depression in diabetic adults, Susan M. Barry-Bianchi, Ph.D., reported in a poster presented at the annual meeting of the American Psychosomatic Society.

Dr. Barry-Bianchi, of the Behavioural Cardiology Research Unit at the University Health Network in Toronto, and her colleagues recruited 353 patients for the study from an ongoing investigation, the Community Outreach and Health Risk Reduction Trial. The average patient age was 56 years.

The average score on the Beck Depression Inventory (BDI) was 11.1 among the 184 patients at high risk for coronary heart disease (CHD), compared with 8.8 among the 169 patients at low risk for CHD, Dr. Barry-Bianchi wrote. The 10-year absolute risk for CHD was nearly 22% for high-risk patients and 9% for the low-risk patients. CHD risk for each patient was determined using the Framingham index.

Given the significant difference in the depression levels based on the risk for developing heart disease, depression and CHD risk should be evaluated jointly, when investigating morbidity and mortality in diabetic patients, the investigators suggested. Additionally, treatment of CHD risk factors in diabetic patients may correspond with a reduction in depressive symptoms and improved overall health.

In addition, the results supported previous findings of increased depression among women and patients with low levels of emotional support. Women demonstrated a significantly higher average BDI score, compared with men (11.4 vs. 8.4). Patients with low reported levels of emotional support demonstrated a significantly higher average BDI score, compared with those who reported more support (12 vs. 8).

—Heidi Splete