

Hyperglycemia During Acute Illness May Predict Increased Risk for Type 2 Diabetes CME

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Target Audience

This article is intended for primary care clinicians, intensivists, endocrinologists, hospitalists, and other specialists who care for critically ill hospitalized patients.

Goal

The goal of this activity is to provide medical news to primary care clinicians and other healthcare professionals in order to enhance patient care.

July 15, 2010 - Patients with hyperglycemia during an acute illness who are not diagnosed with diabetes before or during hospitalization should be considered at increased risk for the development of diabetes, according to the results of a study reported online July 8 in *Critical Care*.

“Critical illness is commonly complicated by hyperglycaemia caused by mediators of stress and inflammation,” write Ivan Gornik, from University Hospital Centre Rebro in Zagreb, Croatia, and colleagues. “Severity of disease is the main risk factor for development of hyperglycaemia, but not all severely ill develop hyperglycemia and some do even in mild disease. We hypothesised that acute disease only exposes a latent disturbance of glucose metabolism which puts those patients at higher risk for developing diabetes.”

The study sample consisted of medical patients with no history of endocrine disorder or impaired glucose metabolism who were admitted to an intensive care unit (ICU) between July 1998 and June 2004. On the basis of at least twice-daily glucose measurements, patients were characterized as having hyperglycemia (glucose level ≥ 7.8 mmol/L) or normoglycemia.

Within 6 weeks after hospital discharge, patients underwent oral glucose tolerance testing, and those with unknown diabetes or prediabetes were excluded, as were those who received corticosteroid treatment and those who were terminally ill. Follow-up continued for at least 5 years, with oral glucose tolerance tests performed annually.

In the normoglycemic group, 14 (3.5%) of 398 patients who completed 5-year follow-up went on to have type 2 diabetes vs 33 (17.1%) of 193 patients in the hyperglycemic group. For patients with hyperglycemia during hospitalization, the relative risk for type 2 diabetes during the 5 following years was 5.6 (95% confidence interval [CI], 3.1 - 10.2).

“Patients with hyperglycaemia during acute illness who are not diagnosed with diabetes before or during the hospitalization should be considered a population at increased risk for developing diabetes,” the study authors write. “They should, therefore, be followed-up, in order to be timely diagnosed and treated.”

Limitations of this study include small sample size, possible lack of generalizability to surgical patients, lack of a universal definition of hospital-acquired hyperglycemia, and lack of measurement of hemoglobin A1c level during hospitalization or follow-up.

“Hyperglycaemia occurring during critical illness in non-diabetic medical patients is associated with increased risk of developing diabetes in the five-year period after the discharge,” the study authors conclude. “Stress and inflammation during acute illness seem to reveal an inherent disorder of glucose metabolism which in the following years leads to development of diabetes.”

The study authors have disclosed no relevant financial relationships.

Crit Care. Published online July 8, 2010. [Abstract](#)

Clinical Context

Hyperglycemia is a well-known condition observed during critical illness and has been reported as transient, resolving after the event. The term *hospital-acquired hyperglycemia* has been used to describe hyperglycemia unrelated to a disorder of glucose metabolism and is diagnosed after the acute illness. It is uncertain if the presence of hospital-acquired hyperglycemia predisposes to a future diagnosis of diabetes or is a marker for diabetes.

This is a longitudinal observational study conducted in patients in the medical ICU with hyperglycemia who were observed for a minimum of 5 years, to examine its association with future diabetes and impaired glucose metabolism.

Study Highlights

- ◆ The study was conducted on patients admitted to a medical ICU.
- ◆ Inclusion criteria were no history of diabetes, impaired fasting glucose (IFG), impaired glucose tolerance (IGT), or other endocrine condition.
- ◆ Excluded were patients receiving corticosteroids or those who had acute pancreatitis.
- ◆ Included patients had venous glucose levels monitored twice daily (6 AM and 6 PM) in the ICU. Insulin was used to treat hyperglycemia.
- ◆ The threshold for hyperglycemia was set at more than 7.7 mmol/L.
- ◆ All patients received nutrition, which could be oral, enteral, or parenteral; the targeted caloric intake was 15 kcal/kg/day.
- ◆ Patients were divided into 3 subgroups according to primary diagnosis: sepsis (severe sepsis and septic shock), acute coronary syndrome (myocardial infarction and unstable angina), or other admission diagnoses.
- ◆ Patients who tested positive on an oral glucose tolerance test 4 to 6 weeks after discharge were diagnosed with an abnormality of glucose metabolism and were excluded from follow-up, as were those with malignant diseases or other end-stage disease precluding long-term follow-up.
- ◆ The remaining patients with hyperglycemia were followed up annually and were evaluated with an oral glucose tolerance test.
- ◆ Hemoglobin A1c level was not used to evaluate patients for a diagnosis of diabetes or IGT.
- ◆ Those who received a diagnosis of diabetes, IFG, or IGT were referred to an endocrinologist and were not followed up further.
- ◆ Diabetes, IFG, and IGT were defined according to criteria of the American Diabetes Association, and acute coronary syndromes were defined by criteria of the American College of Cardiology and the American Heart Association.
- ◆ There were 2207 admissions to the medical ICU, of whom 90.6% of patients were discharged alive and were considered for inclusion in the study.
- ◆ After exclusion, a total of 360 patients with hyperglycemia and 669 without hyperglycemia were included in follow-up.
- ◆ Planned follow-up of 5 years was completed for 591 patients (193 with hyperglycemia and 398 without hyperglycemia).

- ◆ For all patients, mean age at baseline was 58 years, 55% were men, and mean body mass index was 27.3 kg/m².
- ◆ Those with hyperglycemia were more likely to have a positive family history of diabetes (13.3% vs 8.9%) and to have a higher body mass index at baseline (29.4 kg/m² vs 26.8 kg/m²).
- ◆ At 5 years of follow-up, 66 patients (18.3%) in the hyperglycemic group and 102 (15.2%) in the normoglycemic group died.
- ◆ The rate of diabetes in the hyperglycemic group was 17.1% vs 3.5% in the normoglycemic group, with a relative risk of 5.6 for diabetes (95% CI, 3.1 - 10.2).
- ◆ The risk for IFG and IGT was 24.4% in the hyperglycemic group and 12.3% in the normoglycemic group, with a relative risk of 2.3 (95% CI, 1.6 - 3.4).
- ◆ The authors concluded that hyperglycemia during a critical illness was associated with a future risk of being diagnosed with diabetes or glucose intolerance and advocated that patients with hyperglycemia during critical illness be observed and screened for diabetes.

Clinical Implications

- ◆ Hyperglycemia during a critical illness is associated with a higher risk for subsequent diagnosis with diabetes as well as a positive family history of diabetes and a higher body mass index vs normoglycemia during the illness.
- ◆ The risks for IFG and IGT are increased in patients with hyperglycemia during a critical illness