

## CURRENT STANDARDS OF CARE FOR INPATIENT GLYCEMIC MANAGEMENT AND METABOLIC CONTROL: IS IT TIME FOR DEFINITE STANDARDS AND TARGETS?

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### ABSTRACT

**Objective:** To review the available literature on the presence of diabetes in the inpatient population and its effect on outcomes.

**Results:** Diabetes is a progressively worsening epidemic in the United States. Patients with diabetes have a disproportionate representation among the inpatient population in this country, and their share of total health-care costs is both disproportionate and growing rapidly. Patients with diabetes are often admitted to the hospital not primarily because of their diabetes but rather because of the need for treatment of the end-stage complications of diabetes, such as cardiovascular, cerebrovascular, and peripheral vascular disease as well as diabetic nephropathy and retinopathy, or because of unrelated illnesses for which diabetes is a complication. Diabetes is a frequent comorbid condition and increases the duration of hospitalization by 1 to 2 days. Numerous organizations have issued guidelines for outpatient diabetes management and metabolic control and have updated them periodically; however, no such guidelines or standards have been formulated for inpatient diabetes management.

**Conclusion:** In view of a rapidly growing body of evidence suggesting that enhanced glycemic control decreases morbidity and mortality in patients with hyperglycemia, such as those with new-onset diabetes, as well as in patients with previously established diabetes, the creation of clearly defined standards and targets for inpatient management of hyperglycemia and metabolic control seems important for improvement of outcomes in hospitalized patients with diabetes. (*Endocr Pract.* 2004; 10[Suppl 2]:11-13)

#### Abbreviation:

HCUP = Healthcare Cost and Utilization Project

### INTRODUCTION

Data regarding the burden of diabetes on inpatient populations are somewhat difficult to ascertain because diabetes is reflected in multiple codes in the *International Classification of Diseases, Ninth Revision*, and patients with diabetes are oftentimes not admitted to the hospital primarily as a result of diabetes as the principal diagnosis. Instead, diabetes may or may not be coded as a comorbid condition complicating a primary admission diagnosis, such as acute myocardial infarction.

### DIABETES AS A COMORBID CONDITION

A recent, systematic effort to focus on the effect of various diseases and comorbid conditions on health-care delivery in the United States has been provided by the Healthcare Cost and Utilization Project (HCUP), a multi-state health-care data system organized by the US government and sponsored by the Agency for Healthcare Research and Quality. In 1997, 22 various state organizations contributed data to the HCUP for analysis (1). These data revealed that diabetes is consistently among the top 10 comorbidities for all hospital discharges in age-groups older than 17 years. The peak age-group for appearance of diabetes as a comorbid condition was 65 to 79 years, in which it was the 4th most common comorbid condition. Similarly, diabetes had important contributions in the age-groups 45 to 64 years and older than 80 years.

Interestingly, diabetes is present in a large number of uninsured patients. In terms of principal diagnoses, diabetes mellitus with complications was the 9th most common principal discharge diagnosis among uninsured patients in the HCUP database. It accounted for 7.5% of all hospital admissions among uninsured patients. Overall, diabetes was the 4th most common comorbid condition among all hospital discharges in the United States (found in 9.5% of hospital discharges or more than 3,375,000 patients who were dismissed from the hospital with diabetes).

### DURATION OF HOSPITALIZATION

Surveys by various agencies, such as the Centers for Disease Control and Prevention, have been performed

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through the National Center for Health Statistics (2)—for example, their national hospital discharge survey for the years 1990 to 2001. In these surveys, the mean length of stay in the hospital for patients with diabetes, regardless of primary diagnosis, was increased by approximately 1 to 2 days compared with the mean length of hospital stay in patients without diabetes. Only patients with serious mental illness and malignant neoplasms had longer hospital stays than did patients with diabetes. All other first-listed diagnoses were associated with shorter durations of hospital stay.

The increased length of hospital stay observed for patients with diabetes may be the result, at least in part, of problems associated with fluctuating blood glucose control in comparison with those who have excellent maintenance of glycemic control, as found in the final data analysis of the University Health System Consortium (3). With regard to diabetes management, the consortium found that, in patients with acute myocardial infarction, fluctuating blood glucose levels (glucose <60 mg/dL or >250 mg/dL) increased the duration of hospitalization from 4.1 to 6.7 days. Similar increases were found in patients who underwent coronary artery bypass grafting and even in patients who had community-acquired pneumonia. Thus, poor glycemic control and conditions associated with it clearly increased the duration of hospitalization by at least 2 days in this consortium of high-level tertiary care referral system hospitals.

### RATE OF HOSPITALIZATION AND ASSOCIATED COSTS

Overall, patients with diabetes have a twofold to fourfold increase in rates of hospitalization in comparison with the nondiabetic patient population, and the cost for inpatient care of patients with diabetes admitted for general medical conditions, such as infection, is double that seen for the chronic complications of diabetes (4-6). Thus, the principal inpatient cost of diabetes is not necessarily attributable to its chronic complications but rather related to its tendency to complicate other general medical conditions (7). As a result, the estimated mean cost for hospitalization of a patient with diabetes was \$23,500 in comparison with \$12,000 for a patient without diabetes (8).

### RECENT TRENDS

A recently conducted survey of patient discharges for a 4-year period at the Methodist Hospital in Houston, Texas, the principal university hospital affiliated with Baylor College of Medicine, revealed an interesting pattern of diabetes assessment (those patients with a discharge diagnosis of diabetes, coded as 250.00 or 250.01) (9). Approximately 10% of the total admissions had a diagnosis of diabetes with these codes in 2000 and 2001,

but this proportion increased to more than 12% in 2002 and 2003. Although in approximately 20% of patients admitted with a diagnosis of diabetes a lipid profile was obtained, only about 13% had a hemoglobin A1c ordered and documented. This greater than 50% increase in the use of lipid testing in comparison with glycemic evaluations suggests a fundamental lack of focus on hyperglycemia as an issue in the hospitalized patient with diabetes. Interestingly, because cardiovascular and cerebrovascular disorders are the most prevalent conditions that prompt hospital admission in patients with diabetes, it is not surprising to see a frequent evaluation of lipid profiles at the time of admission, although the lack of emphasis on glycemic evaluations is remarkable.

### CONCLUSION

As the result of the continual increases in the prevalence of excess weight and obesity in the United States, an increasing incidence of diabetes is clearly evident in this country. Many authorities now cite diabetes as approaching epidemic proportions in various segments of the American population. In light of the substantial costs associated with diabetes care and the fundamental lack of standards for inpatient diabetes management, a concern arises that containment of health-care costs and improvements of outcomes for patients with diabetes necessitate an evaluation of our information base regarding glycemic control and outcomes in patients with diabetes. Because the University Health System Consortium (3) clearly showed that fluctuating glycemic control prolongs hospitalizations and delays hospital discharges by lengthening hospital stays by at least 2 days for each diagnosis, some systematic evaluation seems necessary to determine what levels of glycemic control may reduce these prolonged hospitalizations, decrease the cost of care for patients with diabetes, and improve outcomes for these patients.

The purposes of a consensus conference are to ascertain the scientific database available for review, to have a detailed discussion of the available evidence, and to formulate recommendations to improve future outcomes in patients—in this instance, patients with diabetes. Now is the time for establishing standards for management of inpatient diabetes.

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