Hypoalbuminemia Predicts Acute Stroke Mortality: Paul Coverdell Georgia Stroke Registry

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Background: Mortality remains unacceptably high among patients hospitalized for acute stroke. Additional knowledge about factors that contribute to mortality after stroke is important for instituting therapies to lower mortality. We sought to determine the factors that predict mortality in patients hospitalized for acute stroke. *Methods:* In all, 1477 consecutively admitted patients with acute stroke in 34 hospitals in the state of Georgia participating in the Paul Coverdell Georgia Stroke Registry during a 3-month period (December 1, 2001-February 28, 2002) were identified by retrospective chart review using primary or secondary *International Classification of Diseases, Ninth Revision* codes. Of patients, 31% were black, 65% were white, and 58% were women. We determined inhospital mortality after admission for acute stroke in this representative group of patients. *Results:* There were 154 (10%) inhospital deaths among the 1477 patients admitted with acute stroke. Univariate analysis showed that mortality was associated with older age ($P = .0008$), stroke type ($P = .0051$), Glasgow Coma Scale score less than 9 ($P < .0001$), decreased serum albumin ($P = .0001$), elevated creatinine ($P = .0067$), and elevated blood glucose ($P = .0063$). In the multivariate analysis, independent risk factors for mortality after acute stroke included older age ($P = .004$), stroke type ($P = .0007$), Glasgow Coma Scale score less than 9 ($P < .0001$), and decreased serum albumin ($P = .0003$). There was no relationship between race and inhospital mortality ($P = .9041$). In addition, there was no association between independent predictors and race. *Conclusion:* In addition to previously recognized predictors of inhospital mortality, we found hypoalbuminemia to be an independent predictor of mortality in a biracial cohort of patients with acute stroke. **Key Words:** Acute stroke—mortality—risk factors—inhospital—hypoalbuminemia.

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Stroke remains the third leading cause of death in the United States. Each year approximately 700,000 people in the United States are affected by stroke and on average someone dies of a stroke every 3 minutes.[1,2] Estimates of inhospital mortality are 5% for acute ischemic strokes and 30% for acute hemorrhagic strokes.[3] Other studies put estimates of inhospital mortality from stroke at 7% to 14%.[4,5]

In general, early inhospital mortality from stroke is usually directly related to the stroke itself, whereas factors related to hospitalization and complications of being hospitalized influence death later in the course of acute stroke. Identifying factors that influence inhospital mortality from stroke may help in early identification of

patients at high risk and substantially decrease the number of avoidable deaths from acute stroke.

Previous studies have identified factors such as stroke severity, ischemic stroke subtype, hemorrhagic stroke, older age, impairment of consciousness, and hyperglycemia as predictors of mortality from acute stroke.[6-13] However, these factors have varied depending on the population of patients being studied and may even differ between men and women among the same population of patients.[14] Some studies have evaluated factors affecting inhospital mortality in a nonpopulation-based sample of patients from a single institution during a period of time or a small select group of patients from a single institution.[15-17]

We thereby sought to identify factors that influence stroke mortality among patients admitted for acute stroke in a representative sample of hospitals in the state of Georgia.

Methods

Hospital Selection

The Paul Coverdell Georgia Stroke Registry (PCGSR) was one of 4 sites initially funded by the Centers for Disease Control and Prevention in 2001 to design and implement a registry prototype. Hospital selection was intended to create a representative sample from the state. In Georgia, approximately one third of the hospitals were randomly selected using a simple random sampling procedure.[18] The 8 largest hospitals in the state, in terms of stroke volume, were selected with certainty. Of the remaining hospitals, 52 hospitals were randomly selected using a random sort method. Of the selected hospitals, two thirds agreed to participate, yielding 34 registry hospitals in Georgia (Fig 1). Sampling weights were adjusted for nonparticipation, to help reduce the bias observed by including data from accommodating hospitals.

Data Collection

Data were collected retrospectively by identifying all patient charts after discharge during a 3-month period (December 1, 2001-February 28, 2002) with primary or secondary *International Classification of Diseases, Ninth Revision* codes (430, 431, 432.9, 433-436) and abstracted centrally by trained nurse abstractors at the state's peer review organization–the Georgia Medical Care Foundation. Patients were included if acute stroke symptoms or signs were present on admission. Data collection included demographic and clinical variables suggested by an external expert panel[19] and further developed and defined by the 4 state registry prototype sites (Georgia, Massachusetts, Michigan, and Ohio) and Centers for Disease Control and Prevention representatives.

Centrally abstracted information included age, sex, race, smoking status, atrial fibrillation on admission and coexisting disease (myocardial infarction, previous stroke, heart failure, hypertension, diabetes, and hyperlipidemia), first measured serum albumin, creatinine, hemoglobin, and blood glucose. Stroke type (ischemic, intracerebral hemorrhage [ICH], subarachnoid hemorrhage [SAH], or transient ischemic attack), initial Glasgow Coma Scale (GCS) score, and inhospital death were also ascertained. Serum albumin measurement was carried out according to standard methods in the different laboratories and the analyzed albumin level was the first measured serum albumin level recorded for each patient.

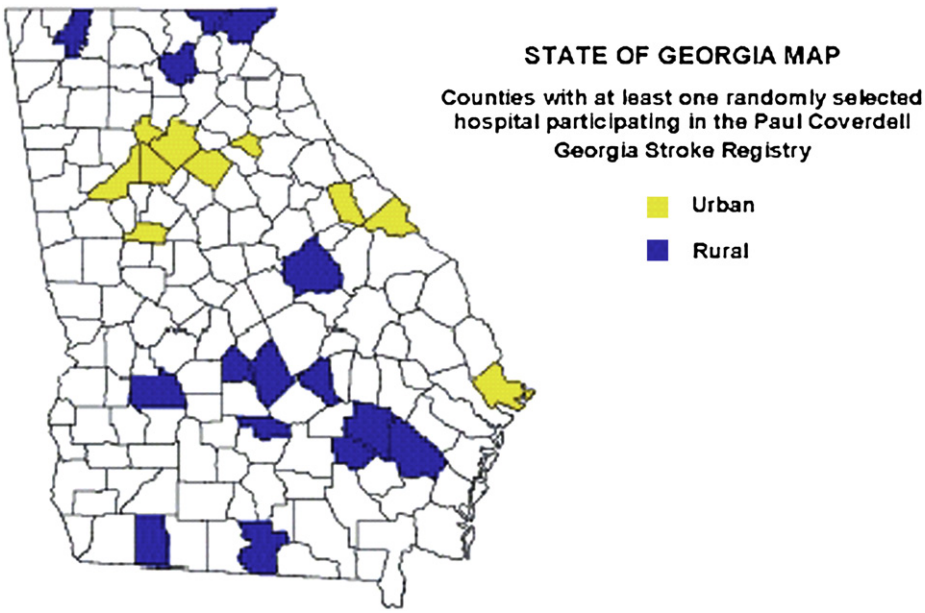

Figure 1. *Location of representative sample of hospitals across the state of Georgia that comprise PCGSR.*