

Predicting 30-Day Case Fatality of Primary Inoperable Intracerebral Hemorrhage Based on Findings at the Emergency Department

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Background: Early survival of patients with intracerebral hemorrhage (ICH) depends on several factors, including the location and size of the hematoma and the level of consciousness on admission. The aim of our study was to estimate the case fatality of primary inoperable ICH 30 days after the event in our hospital and to identify clinical and laboratory characteristics, recordable at the Emergency Department (ED), which could predict death at 30 days. *Methods:* Clinical and laboratory data on all patients with primary ICH admitted to our hospital were retrospectively collected. *Results:* Between January 2011 and June 2013 191 patients with primary ICH were admitted to our hospital. The 30-day case fatality rate was estimated to be 31.9%, as 61 patients died within 30 days after the ICH. Five variables were independently associated with 30-day case fatality: each decreased point at the Glasgow Coma Scale (GCS) is associated with a 1.3-fold increase in the odds of death at 30 days; infratentorial location and intraventricular extension are associated with a 5.5-fold and a 4.7-fold increase in the odds of death at 30 days, respectively; each centimeter of the maximum diameter of the hematoma and each point increase of the international normalized ratio (INR) are associated with a 1.9-fold and a 3.5-fold increase in the odds of death at 30 days, respectively. *Conclusions:* GCS score on admission, infratentorial location of the hematoma, intraventricular extension of the hematoma, INR on admission, and maximum diameter of the hematoma are the 5 variables that are independently associated with 30-day case fatality of primary inoperable ICH. EDICH is introduced as a new grading scale, which includes laboratory and clinical findings at the ED and has predicting value of the 30-day case fatality. **Key Words:** Intracerebral hemorrhage—predicting factors—30-day case fatality—stroke—EDICH.

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Introduction

Intracerebral hemorrhage (ICH) is the second most common type of stroke after ischemic strokes. Spontaneous ICH represents 8%-25% of strokes.^{1,2} The overall incidence of ICH is estimated to be 24.6 per 100,000 person years.³ Median case fatality at 30 days is 40.4%;³ however, it ranges from 13%⁴-61%,⁵ with most deaths occurring within the first 48 hours.⁶

Prognostic factors of case fatality at 30 days include the location and size of the hematoma, level of consciousness,

patient's age, comorbidities, and preceding anticoagulation and antiplatelet therapy.⁷⁻⁹ The "ICH score" is a simple 6-point clinical grading scale that has been devised to predict mortality after ICH.¹⁰ The "FUNC score" is an 11-point clinical grading scale that identifies patients with ICH who will attain functional independence and, thus, can provide guidance in clinical decision-making and patient selection for clinical trials.¹¹ Both these scales incorporate several—clinical only—components that may be independent predictors of outcome.

The aim of our study was to estimate the case fatality of primary inoperable ICH 30 days after the event in our hospital and to identify clinical and laboratory characteristics, recordable at the Emergency Department (ED), which could predict death at 30 days.

Subjects and Methods

Participants

This is a hospital-based retrospective study conducted at Evangelismos General Hospital, which is the largest Greek hospital located in Athens, Greece. Our cohort consisted of all patients admitted to the Department of Neurology between January 2011 and June 2013 with a primary diagnosis of ICH confirmed with computed tomography scanning of the brain on admission. All patients included in this study had received neurosurgical evaluation on admission and for none of them intervention was deemed necessary at this point.

Approval was gained from the local Research Ethics Committee to review the case notes of this group of patients.

Data Recorded

All variables used for outcome model development were extracted from data available at the time of initial ICH evaluation in the ED. Demographics included age and sex. Risk factors included history of hypertension, diabetes mellitus, smoking, alcohol abuse, anticoagulant use, and antiplatelet use. Clinical characteristics at the ED included the Glasgow Coma Scale (GCS) score at presentation to the ED and parameters based on the brain computed tomography on admission: location (basal ganglia, lobar, cerebellar, thalamic, brainstem, and multiple) and consequent characterization of infratentorial or supratentorial origin of the ICH, intraventricular extension, and maximum diameter of the hematoma. Laboratory findings included baseline blood tests: hematocrit, hemoglobin, platelet count, serum glucose, serum urea, serum creatinine, serum potassium, serum sodium, and international normalized ratio (INR).

Statistical Analyses

A database was developed using the Statistical Package for Social Science (version 16.0 for Mac; SPSS, Chicago, IL). Frequencies and descriptive statistics were examined for

each variable. Comparisons between patients who died and patients who survived were made using the Student *t* tests for normally distributed continuous data, the Mann–Whitney *U* test for non-normally distributed data, and the chi-square test for categorical data.

When statistically significant differences were found, correlations were carried out to identify variables that could be entered into a logistic regression model to identify determinants of 30-day case fatality of ICH. When variables were correlated, the most clinically relevant variable was selected for inclusion in the model. The variables were entered as independent variables and death at 30 days was entered as the dependent variable.

An outcome risk stratification scale (the EDICH grading scale) was developed based on the parameters associated with 30-day case fatality in the logistic regression model, with weighting based on the strength of independent association of each variable. Receiver operating characteristic (ROC) analysis was calculated to assess the utility of the EDICH score to predict death within 30 days. The area under the curve and its 95% confidence intervals for the ROC curve were calculated.

A value of *P* less than .05 was considered to be statistically significant.

Results

Study Population and 30-Day Case Fatality

Our study population included 191 patients with ICH, of which 78 were female (40.8%) and 113 (59.2%) were male. Mean age was 70.0 ± 13.2 years. The most frequent location was lobar (39.8%), followed by basal ganglia (37.2%), when the least frequent location was cerebellar (4.2%).

The 30-day case fatality rate was estimated to be 31.9%, as 61 patients died within 30 days after the ICH. Both patients who underwent neurosurgical intervention did not survive. For none of the patients of the total population withdrawal of care was decided at any point of their care and none of the patients, or next of kin when appropriate, had requested a "do not resuscitate."

Univariate Analysis

Table 1 summarizes the demographic characteristics, the risk factors, and the clinical characteristics, all recordable at the ED, for the cohort in total and the 2 groups (patients who survived/patients who died) separately.

There were no statistically significant differences regarding the age and the gender between the 2 groups. However, patients who died were using more frequently anticoagulants (23.0% versus 11.5%, *P* = .040) and antiplatelets (27.9% versus 10.8%, *P* = .003). Regarding the clinical characteristics, patients who died had a decreased level of consciousness, as measured by the GCS score, at admission (9.2 versus 14.0, *P* < .001). Moreover, patients

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