iScore for Predicting Institutional Care after Ischemic Stroke: A Population-Based Study

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Background: We assessed whether the iScore could predict the need for poststroke institutional care. *Methods:* Patients with acute ischemic stroke living in Dijon, France, were recorded between 2006 and 2011, using a population-based stroke registry. The iScore was calculated for each patient. A logistic regression model was used to assess the performance of the iScore for predicting the need for placement in a care institution. The discrimination and calibration of the model were assessed using the *c* statistic and the Hosmer–Lemeshow goodness-of-fit test, respectively. *Results:* Of the 1199 patients recorded, 124 were excluded because of early death and 95 because of missing for variables included in the iScore. Of the remaining 980 patients, 522 (53.3%) returned home and 458 (46.7%) required placement in a care institution. The median iScore was 123 (interquartile range, 97-148), and the proportion of patients who required placement in a care institution increased with each quintile of risk score. The discrimination of the model was good with a *c* statistic of .75 (95% confidence interval, .72-.78), as was calibration ($P = .35$). *Conclusions:* The iScore could be useful for predicting the need for placement in a care institution in ischemic stroke patients. Further studies are required to confirm this finding. **Key Words:** Stroke—stroke outcome—epidemiology—stroke registry—predictors—discharge planning.

Introduction

Recent improvements in the management of acute ischemic stroke have led to increasing the number of patients who survive after the event, especially, elderly people because of the progressive aging population. Among stroke survivors, 45%-75% are unable to return home at once and need to be discharged to either a rehabilitation facility or a nursing home, with consequences in terms of both quality of life and economic costs for the society.[1-7] From a health care organization point of view, better identifying the need for poststroke institutional care is a difficult but great challenge so as to adjust necessary resources in terms of number of beds and health care professionals, to estimate costs, and to make projection on future needs. Although several predictors of not being discharged to home have been identified including age, stroke severity, and cognitive impairment,[1,4,7–9] no reliable score to predict poststroke care requirements is available currently. The iScore system has been demonstrated to be useful for predicting 30-day mortality, the effectiveness of thrombolytic therapy, and functional outcome, when applied to ischemic stroke patients.[10-17] We recently externally validated this score in patients included in the population-based registry of Dijon, France.[17] The aim of this study was to assess

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Received August 26, 2014; revision received October 31, 2014; accepted November 14, 2014.

The Dijon Stroke Registry is supported by the French Institute for Public Health Surveillance (InVS) and Inserm.

The authors have nothing to disclose.

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1052-3057/$ - see front matter

http://dx.doi.org/10.1016/j.jstrokecerebrovasdis.2014.11.010

whether the iScore could also be of interest for predicting the need for poststroke institutional care in ischemic stroke survivors.

Methods

Study Population

All patients with a stroke diagnosed between January 1, 2006, and December 31, 2011, among the residents of the city of Dijon, France (151,543 inhabitants), were identified from the population-based Dijon Stroke Registry.[1,17] This registry complies with epidemiologic criteria for stroke incidence studies.[18] To ensure exhaustiveness, case collection relies on both hot and cold pursuit procedures so as to identify hospitalized and not-hospitalized patients in the catchment area, as described elsewhere.[1,17] Stroke was defined according to the World Health Organization diagnostic criteria,[19] and only ischemic stroke patients were considered for the present study.

Data Collected and iScore Calculation

The following variables were recorded to assign a score to each patient, as previously described[11]: age, sex, preadmission dependence, cancer, atrial fibrillation, congestive heart failure, renal dialysis, stroke subtype (lacunar, nonlacunar, and undetermined), blood glucose on admission, and stroke severity. In our database, stroke severity was quantified using the National Institutes of Health Stroke Scale. It was therefore converted to the Canadian Neurological Scale in accordance with previously reported methods,[20] so as to calculate the iScore. Other vascular risk factors were collected as previously described.[1,17]

Outcomes Measured

Outcome was poststroke care requirement. We distinguished between patients who returned home and those who required placement in a care institution including either an inpatient rehabilitation institution, a convalescent home (defined as an establishment where patients receive temporary care with no specific rehabilitation program before either going back home or being admitted to a long-term nursing home), or a long-term nursing facility. In our community, the medical attitude toward making decision on patients' destination of discharge relies on a multidisciplinary approach involving both the neurologists and the neurorehabilitation physicians, based on clinical evaluation and testing by physiotherapists, occupational therapists, and speech therapists. Admission to the most appropriate health care facility is guided by clinical criteria found in the national conference of experts.[21] The selection of moderately impaired patients for rehabilitation based on the assumption that these patients may be more likely to benefit from this type of management, which is a controversial matter with regard to data suggesting that rehabilitation could improve outcome in even severely disabled stroke patients by reducing poststroke mortality.

Table 1. *Risk scoring system to calculate the iScore*

Variables	30-day score
Age, y	+Age (y)
Sex	
Female	0
Male	+10
Risk factors	
Atrial fibrillation	+10
Congestive heart failure	+10
Comorbid conditions	
Cancer	+10
Renal dialysis	+35
Preadmission dependence	+15
Stroke type	
Lacunar	0
Nonlacunar	+30
Undetermined	+35
Stroke severity	
CNS ≥8 (NIHSS ≤8)	0
CNS 5-7 (NIHSS, 9-13)	+40
CNS 1-4 (NIHSS, 14-22)	+65
CNS 0 (NIHSS ≥23)	+105
Glucose on admission, mmol/L	
<7.5	0
≥7.5	+15

Abbreviations: CNS, Canadian Neurological Scale; NIHSS, National Institutes of Health Stroke Scale.

Statistical Analysis

Individual scores were calculated according to the published risk scoring system (Table 1).[11] A logistic regression model was used to assess the performance of the iScore for predicting poststroke need for placement in a care institution. Receiver operator characteristic analysis was performed, and the *c* statistic representing the area under

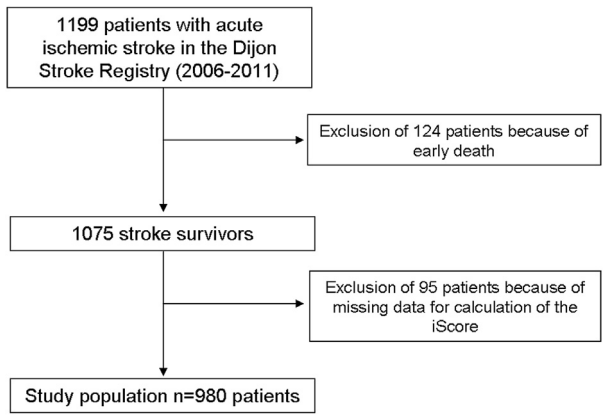

Figure 1. *Study flow chart.*