Prediction of Stroke Outcome Using Standardised Stroke Scales: a European Validation Study

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Introduction and Purpose

- Accurate prediction of stroke outcomes is necessary for appropriate care provision, patients’ management, and for stratification of patients to clinical trials
- Several prognostic models of stroke outcomes have been developed and used in research and clinical practice. Some of these are based on a single scale or the sub components of a scale. Others are more complex including clinical variables along with radiological features, or other composite measures.
- We aim to determine differences in prognostic value of several standardised well validated stroke severity measures, to examine their performance in different European populations and to assess the importance of within scale items and their predictive capacity.

Methods

Data were collected on 2033 first ever stroke patients between 2004 and 2006, from population-based stroke registers in France (Dijon), Italy (Sesto-Florentino), Lithuania (Kaunas), UK (London), Spain (Menorca) and Poland (Warsaw). Logistic regression models were used to predict outcomes. Models’ discrimination was estimated by the area under the Receiver Operating Characteristic curve (AUC). Commonly used models including Barthel Index plus age, National Institute for Health Stroke Scale (NIHSS) plus age and the Six Simple Variables (SSV) model were investigated. A simpler version of the SSV model was developed and validated. Prediction for subgroups identified by age, gender, incontinence and admission to stroke unit was examined.

Results

Five variables model was developed and validated excluding pre stroke living conditions from the six simple variables (age, verbal component of Glasgow Coma Scale, arm power, ability to walk, pre stroke dependency and pre stroke living conditions) as it was found to be of little relevance in predicting independent survival after stroke. The AUC for prediction of one year survival ranged between 0.82(0.03) to 0.92(0.02) and model calibration using Homer-Lemeshow showed good fit. Other models with fairly good prediction were: Barthel index in the acute phase of stroke, plus age and the NIHSS plus age.

Comparing the prediction of independent survival at 3 months and one year for four European centres with London, prediction was based on five simple variables (FSV) model

The five simple variables (FSV) are: age, verbal component of Glasgow Coma Scale, arm power, ability to walk, pre stroke dependency

- The FSV’s model provided an area under curve (AUC) of at least 80%
- The 3 months prediction is just as good as the one year prediction

Conclusions / recommendations

- A simple predictive model comprising five variables provided very good prediction of independent survival at 3 months and one year following stroke for all five centres studied
- The model provided highly precise estimates, was superior to other well validated measures and has good potential for use in patients management and in trials
- The model performance for a range of subgroups: age >75 or not, being incontinent or not and by gender, has shown an equally good prediction for all the subgroups examined.
- Although the use of population-based stroke registers suggests potentially good generalisability for these estimates, external validation using independent data would nonetheless be invaluable.