Predicting Prognoses in Patients with Acute Stroke

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This guide is one in a series that offers evidence-based tools to assist family physicians in improving their decision making at the point of care.

A collection of Point-of-Care Guides published in *AFP* is available at http://www.aafp.org/afp/poc.

Clinical Question

What is the long-term prognosis for patients with acute stroke?

Evidence Summary

A number of clinical decision models and scoring systems have been developed and validated to assist physicians in assessing the prognosis of patients with acute stroke. This assessment can be helpful to patients, families, and physicians as they plan for long-term care and prepare advance directives. The National Institutes of Health Stroke Scale (NIHSS) predicts seven-day and three-month prognoses and is widely used in the research setting. The NIHSS is available at http://www.ninds.nih.gov/disorders/stroke/strokescales.htm.

In a prospective study of 1,281 patients with acute stroke, a good or excellent outcome at three months was observed in 95 percent of patients with an NIHSS score of 0 to 3 points, 87 percent with 4 to 6 points, 78 percent with 7 to 10 points, 56 percent with 11 to 15 points, 42 percent with 16 to 22 points, and only 18 percent with 23 or more points.[1] However, the NIHSS has 13 items, is fairly complex, and requires training for accurate use and good reproducibility.

Other models are simpler and potentially more useful at the point of care. Guy's prognostic score (G-score), a simplification of the Guy's Hospital score, includes patient age and five clinical signs. It has been prospectively validated in several populations, but most of the validation studies are at least 10 years old.[2] Because of changes in the care of patients with acute stroke, this article presents only models validated since 2000.

The six simple variable model has been prospectively validated in a study of dietary management in 2,955 patients with stroke at 112 hospitals in 16 countries.[3] The mean age of patients was 73 years, and about one half were men; more than 90 percent of patients were independent in daily activities before the stroke. Separate six simple variable models were created to predict survival free of dependency at six months *(Table 1)*, overall survival at six months, and probability of being alive and at home within six months.[3] The models had good accuracy, with an area under the receiver operating characteristic curve of 0.79. The models tended to be somewhat pessimistic in patients with severe strokes and optimistic in patients with milder strokes. The models require calculations but can be put into a spreadsheet fairly easily.

A simpler model was developed in 223 patients with acute stroke in an Australian teaching hospital and was validated in 217 patients at the same hospital *(Table 2)*.[4] The mean age of patients in the validation group was 69 years, and 58 percent were men. Although easier to use at the point of care, the model has not been prospectively validated in other populations and should be used with caution.

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Table 1. Six Simple Variable Model for Predicting the Probability of a Good Outcome Six Months After Acute Stroke

Variable	*Points*
Age (years)	
50	–2.55
55	–2.81
60	–3.06
65	–3.32
70	–3.57
75	–3.82
80	–4.08
85	–4.34
Living alone	
Yes/unknown	+0.661
No	+1.322
Independent before the stroke	
Yes/unknown	–2.744
No	–5.488
Normal GCS verbal score	
Yes	–2.16
No/unknown	–4.32
Able to lift arms	
Yes	–2.106
No/unknown	–4.212
Able to walk	
Yes	–1.311
No/unknown	–2.622
Constant	+12.34
Total:	_____

NOTE: *A good outcome is defined as survival free of dependence. Probability of independent survival = exp(total score)/(1+ exp[total score]).*

GCS = Glasgow Coma Scale.

Example: A 60-year-old patient living alone was independent before a stroke. The patient has a normal GCS verbal score, but is unable to lift the arms or walk. The patient's total score is –1.797 (–3.06 + 0.661 – 2.744 – 2.16 – 4.212 – 2.622 + 12.34). Because exp(–1.797) = 0.1657, the probability of independent survival is 0.1657/(1 + 0.1657) = 0.14 or 14%. Note that you can find answers to exp(x) calculations by searching Google for exp(x), where x is the number (i.e., enter exp(–1.797) into the Google search engine).

Information from reference 3.

Table 2. Model for Predicting One-Year Mortality Risk In Patients with Acute Stroke

Variable	*Points*
Urinary incontinence	9
Dysphagia (moderate or severe)	7
Both sides of the brain affected	4
Hyperthermia (body temperature > 99.5°F [37.5°C])	4
History of ischemic heart disease	3
History of peripheral vascular disease	3
Unconscious on admission	3
History of diabetes mellitus	2
Total:	_____

NOTE: *This model has been prospectively validated in the original study population, but not in other settings.*

Interpretation: Patients with a score of 10 points or greater had a 60% one-year mortality (high risk); patients with a score of less than 10 points had an 11% one-year mortality; no patient with a score of 15 points or greater survived at one year.

Example: A patient with an acute stroke has hyperthermia and a history of diabetes, but no other risk factors. The patient has a score of 6 points (4 + 2) and is considered at low risk.

Information from reference 4.