Prediction of outcome after ischemic stroke

The value of clinical scores

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Emergency administration of IV thrombolysis is the standard of care for patients with acute ischemic stroke and without contraindications. Keeping this obvious statement in mind is necessary when thinking about the practical value of an expanding number of scores proposed for early prognostication after an ischemic stroke. In this issue of *Neurology*®, Saposnik et al.[1] present the Stroke Prognostication using Age and NIH Stroke Scale (SPAN-100), a new score for prediction of outcome after IV thrombolysis.

The SPAN index is calculated by adding the patient's age in years to the NIH Stroke Scale (NIHSS) score upon presentation. Those with a score ≥100 are categorized as SPAN-100 positive. The investigators used the data from the National Institute of Neurological Disorders and Stroke tissue plasminogen activator (tPA) stroke trial to examine the predictive value of this score. In this cohort, SPAN-100–positive patients had extremely poor outcomes, which were not improved by IV thrombolysis. Among these patients, symptomatic intracranial hemorrhage occurred in 16.7% after receiving tPA (vs 7.6% with placebo), and three-quarters were severely disabled or dead at 3 months despite thrombolysis; only 5.6% had a favorable outcome. The main caveat is that the analysis was performed on a small sample of 62 SPAN-100–positive patients, including 36 who received thrombolysis.

There has been a rapid proliferation of scores for acute strokes (table), all of which are designed to predict clinical outcome of hospitalized ischemic stroke patients in general, and patients who received IV thrombolysis in particular.[2–5] Other scores have been designed to gauge the risk of hemorrhage after thrombolysis.[6–9] What is then better about the SPAN-100 compared with other scores? The answer is simplicity. The SPAN-100 relies on only 2 readily accessible pieces of information that are always available in the emergency department. More complex scores incorporate other variables that can add to their predictive power but at the expense of becoming less practical.

Age and severity of deficits at presentation are well known to be primary determinants of stroke outcome.[10] In fact, these 2 factors have been consistently included in previous predictive scores. The contribution of the SPAN-100 is the confirmation of their synergistic effect on prognosis and the quantification of complications and functional outcome when both variables are considered together and the sum is essentially dichotomized using an easy-to-remember cut-off number of 100. However, it requires solid validation on independent cohorts before its application can be recommended in clinical practice.

Patients older than 80 years and those with very severe deficits (i.e., very high NIHSS score) were excluded from some previous thrombolysis trials, such as European Cooperative Acute Stroke Study 3. However, International Stroke Trial 3 recently confirmed what previous series had suggested: patients older than 80 years benefit from thrombolysis.[11] Meanwhile, patients with very severe deficits presenting early to the emergency department should be treated because their chances of favorable recovery are otherwise minimal. Thus, the real question when considering the use of the SPAN index is whether we should deny IV tPA to elderly patients with severe strokes who score greater than 100. The same question applies to other scores predicting outcome after thrombolysis. Should any score predicting very poor outcome despite thrombolysis, or a high risk of hemorrhage with thrombolysis, be deemed sufficient to withhold IV tPA administration? Some might propose pursuing endovascular therapy in these cases but, unlike IV thrombolysis, endovascular interventions are not supported by solid evidence, cannot be currently considered standard of care, are invasive and very expensive, and are typically offered to younger patients with better potential for successful rehabilitation.

Certainly these scores offer valuable prognostic information and deserve attention. They will be particularly useful for risk adjustment when outcome-based metrics are collected to assess our performance. They may also guide eligibility criteria for future trials. But, as pointed out by the authors of the SPAN-100 study, age and NIHSS score should never become the only factors when deciding how to treat acute stroke patients. Clinical judgment remains the most essential decision path for the effective practice of medicine. Aided by a critical

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Table Selected scores to predict outcome after ischemic stroke

Score	End point	Components	Risk assessment
Stroke-TPI[2]	Functional outcome after thrombolysis	Age, sex, DM, NIHSS score, previous stroke, SBP, OTT	Logistic regression equations
iScore[3]	Functional outcome in hospitalized stroke patients	Age, sex, smoking, preadmission dependency, AF, CHF, previous MI, cancer, renal failure on dialysis, glucose at presentation, stroke severity,[a] stroke subtype	5 risk categories by quintiles of risk score
DRAGON[4]	Functional outcome after thrombolysis	Age, prestroke mRS score, HDMCA sign or early infarction on CT, glucose at presentation, NIHSS score, OTT	Increasing risk of poor outcome for scores 0–10
SPAN-100[1]	Functional outcome after thrombolysis	Age + NIHSS score	Cutoff at 100
ASTRAL[5]	Functional outcome of stroke patients evaluated in the ED	Age, NIHSS score, time from onset to admission, LOC, range of visual fields, glucose at presentation	Integer-based point-scoring system
Postthrombolysis Risk Score[6]	Risk of ICH after thrombolysis	Age >60 y, NIHSS score >10, glucose >8.325 mmol/L, platelets <150,000/mm^3	Increasing risk of ICH for scores 0–4
HAT[7]	Risk of ICH after thrombolysis	DM or glucose at presentation ≥200 mg/dL, NIHSS score, hypodensity on CT	Increasing risk of ICH for scores 0–5
SEDAN[8]	Risk of ICH after thrombolysis	Age, NIHSS score, HDMCA signs, early infarct signs on CT, glucose at presentation	Increasing risk of ICH for scores 0–6
SITS-ICH Risk Score[9]	Risk of ICH after thrombolysis	Age, body weight, history of HTN, use of aspirin/clopidogrel, NIHSS score, SBP, glucose at presentation, OTT	Increasing risk of ICH for scores 0–12

Abbreviations: AF = atrial fibrillation; CHF = congestive heart failure; DM = diabetes mellitus; ED = emergency department; HDMCA = hyperdense middle cerebral artery sign; HTN = hypertension; ICH = intracranial hemorrhage; LOC = level of consciousness; MI = myocardial infarction; mRS = modified Rankin scale; NIHSS = NIH Stroke Scale; OTT = onset of symptoms to treatment; SBP = systolic blood pressure.
[a] Defined by the Canadian Neurological Scale.

assessment of the available evidence and considering the preferences of the patient, it is our clinical judgment that should determine treatment decisions in emergency situations.

DISCLOSURE

The authors report no disclosures relevant to the manuscript. Go to Neurology.org for full disclosures.

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