

Critical Appraisal

As simple as ABCD

Identifying patients at high risk of stroke soon after a transient ischemic attack

Devin R. Harris, MD, CCFP(EM), MHSC

Rothwell PM, Giles MF, Flossmann E, Lovelock CE, Redgrave JN, Warlow CP, et al. A simple score (ABCD) to identify individuals at high early risk of stroke after transient ischaemic attack. *Lancet* 2005;366:29-36.

Research question

Which patients are at high risk of stroke soon after a transient ischemic attack (TIA) and, therefore, require emergency assessment?

Type of article and design

Retrospective database analysis to derive and validate a prognostic score for 7-day risk of stroke after TIA. The risk score was derived from a population-based cohort and then validated in 3 separate cohorts.

Relevance to family physicians

Family physicians are often the first caregivers to see patients after they have TIAs. Recent evidence shows that risk of stroke after TIA is much higher than once believed; up to 8% of patients have strokes within 7 days.¹⁻³ There are guidelines for evidence-based management of patients after TIA.⁴ Despite these guidelines, primary care physicians' management of these patients has been highly variable, largely due to an inability to determine which patients are at high risk.⁵ This study developed and validated a prognostic risk score that predicts which patients are at high risk of stroke within 7 days of having TIAs.

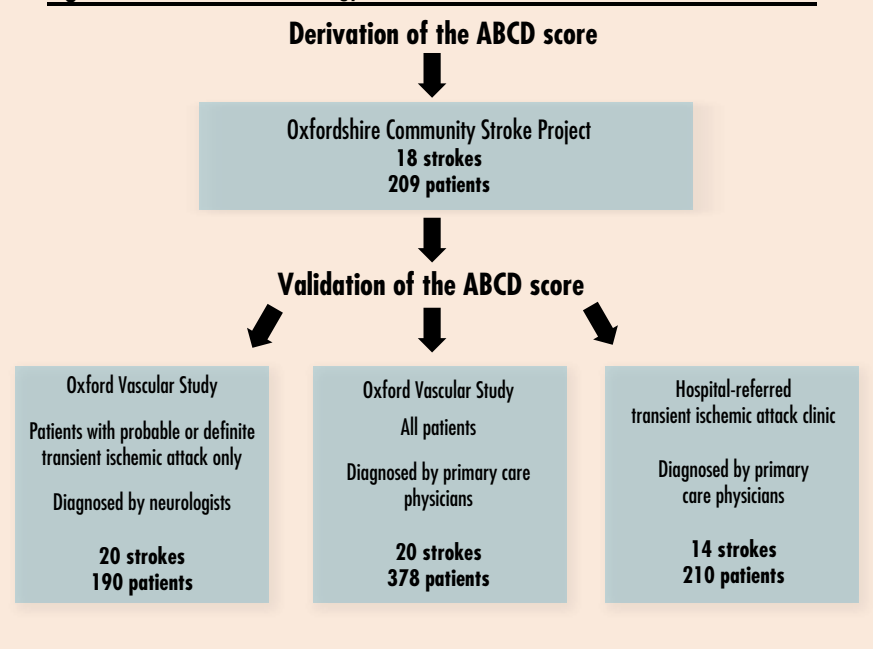
Overview of study and outcomes

This study from Oxford, England, had 2 stages: derivation of the risk score

and subsequent validation of the score in 3 separate cohorts (Figure 1). The risk score was derived using a population-based cohort of 209 patients with probable or definite TIA diagnosed by neurologists during the Oxfordshire Community Stroke Project.⁶ Five potential predictive variables (risk factors) were tested: age, clinical features (motor weakness and speech disturbance), duration of symptoms, diabetes, and hypertension. The 7-day risk of stroke was determined in relation to each variable to decide which were important predictors. Risk factors were given values of 0 or 1 for those with 2 categories (eg, age <60—0 or ≥60—1) and 0, 1, or 2 for those with 3 categories (eg, duration of symptoms <10 minutes—0, 10 to 59 minutes—1, or ≥60 minutes—2).

The risk score was then validated in 3 separate cohorts from 2 populations. First, the risk score was tested on 190 patients in the Oxford Vascular Study

Figure 1. Outline of methodology for derivation of the ABCD score



Dr Harris is a Clinical Assistant Professor in the Department of Emergency Medicine at St Paul's Hospital and the University of British Columbia in Vancouver, BC.

(OXVASC) who had been diagnosed with probable or definite TIA by a stroke neurologist. The OXVASC study was a population-based study of all incident or recurrent TIAs and strokes in 90542 patients registered with 63 family physicians in practices involved in the Oxfordshire Community Stroke Project.⁷ The risk score was applied in the OXVASC cohort to determine whether it was predictive of stroke within 7 days. The second validation stage was to test the risk score on all 378 TIA patients in the OXVASC study, including all patients referred by primary care physicians, not just those diagnosed with probable or definite TIA by neurologists. The final validation stage was to examine the risk score in another cohort comprising 210 consecutive patients referred by primary care physicians to a hospital-based TIA clinic. The predictive ability of the risk score was tested in all 3 groups.

Results

Of the 5 potential predictive variables, 4 (age 60 years or older, clinical features, duration of symptoms, and hypertension) were predictive of stroke within 7 days. The resulting risk score was, therefore, 1 for age 60 years or older; 1 for raised blood pressure (systolic >140 mm Hg or diastolic ≥90 mm Hg); 2, 1, or 0 for clinical features (2 for unilateral weakness, 1 for speech disturbance without weakness, and 0 for other); and 2, 1, or 0 for duration of symptoms in minutes (2 for ≥60, 1 for 10 to 59, and 0 for <10). The score was termed “ABCD” (age, blood pressure, clinical features, and duration).

The ABCD score was highly predictive of 7-day risk of stroke during the first validation stage involving the OXVASC probable or definite TIA cohort ($P < .0001$) (Table 1). It was also predictive of 7-day risk of stroke in the other 2 validation cohorts, the OXVASC “all-referal” patients ($P < .0001$) and the hospital-referred TIA clinic patients ($P < .007$). In all 3 validation stages, no strokes were observed in patients with an ABCD score

lower than 4. Patients with a score of 6 had a 7-day risk of stroke as high as 35.5%.

Analysis of methodology

The ABCD score is a simple, practical prognostic way to determine which patients are at high risk of stroke within 7 days of having TIAs. The study has some limitations, however. First, the derivation cohort consisted of a very small number of patients (only 18 of 209 patients had strokes within 7 days). Due to this small size and, therefore, limited statistical power, the authors only studied 5 factors that were already proven in the literature to be predictive of short-term risk of stroke after TIA. Ideally, multiple risk factors would have been collected prospectively, studied concurrently, and then examined with respect to their predictive significance.⁸ It could be argued that important predictive factors of stroke after TIA have not been included in this risk score.

A second limitation is that the derivation and validation cohorts were very similar. The generalizability of the ABCD score might be limited by this fact, and the score might not perform well in other populations.

A final limitation is that the ABCD score was derived from a historical cohort and validated in 3 other historical cohorts. Robust predictive instruments should be derived from prospective observational trials in which data can be collected in a standardized fashion, minimizing biases that might occur in retrospective studies. Despite these limitations, the ABCD score performed extremely well in predicting 7-day risk of stroke after TIA. It now needs validation in other settings before it is widely adopted.

Application to clinical practice

The ABCD score provides a guideline for primary care physicians in determining which patients are at high 7-day risk of stroke and, therefore, require urgent investigation and management. The score performed

Table 1. Summary of results from the validation stages of the ABCD score


ABCD SCORE	OXFORD VASCULAR STUDY (DIAGNOSED BY NEUROLOGIST) N = 190		OXFORD VASCULAR STUDY (DIAGNOSED BY PRIMARY CARE PHYSICIAN) N = 378		HOSPITAL-REFERRED TRANSIENT ISCHEMIC ATTACK CLINIC N = 210	
	EVENTS N (% OF EVENTS)	% RISK* (95% CONFIDENCE INTERVAL)	EVENTS N (% OF EVENTS)	% RISK* (95% CONFIDENCE INTERVAL)	EVENTS N (% OF EVENTS)	% RISK* (95% CONFIDENCE INTERVAL)
≤3	0	0	0	0	0	0
4	1 (5)	2.2 (0-6.4)	1 (5)	1.1 (0-3.3)	5 (36)	9.1 (1.5-16.7)
5	8 (40)	16.3 (6.0-26.7)	8 (40)	12.1 (4.2-20.0)	4 (29)	11.8 (0.9-22.6)
6	11 (55)	35.5 (18.6-52.3)	11 (55)	31.4 (16.0-46.8)	5 (36)	23.8 (5.6-42.0)
TOTAL	20 (100)	10.5 (6.2-14.9)	20 (100)	5.3 (3.0-7.5)	14 (100)	6.7 (3.3-10.0)

*Percentage risk indicates the number of strokes experienced by patients with an ABCD score of x divided by the total number of patients with an ABCD score of x.

just as well in 2 undifferentiated populations of patients with suspected TIA (primary care physicians' diagnosis) as in a cohort of patients with probable or definite TIA diagnosed by neurologists.

Once patients are diagnosed as high-risk (ABCD score ≥ 4), the question is what to do with them. The authors of the ABCD score suggest that all patients with a score of 6 require not only emergency investigation and treatment but also hospitalization. This recommendation is reasonable, considering their risk (>30%), but might not be feasible in the current Canadian health care system. The study does reinforce that TIAs are not benign events and that renewed focus should be directed to investigating these patients with electrocardiography, carotid ultrasonography, computed tomography, or magnetic resonance imaging and to treating them with antiplatelet agents, antihypertensive agents, anticoagulants for atrial fibrillation, or carotid endarterectomy.⁴

Bottom line

- The 6-point ABCD score, based on 1 point for being 60 or older; 1 point for having elevated blood pressure (systolic >140 mm Hg or diastolic ≥ 90 mm Hg); 0 to 2 points for certain clinical features (unilateral weakness—2, speech disturbance without weakness—1, other—0); and 0 to 2 points for duration of symptoms in minutes (2 points for ≥ 60 , 1 point for 10 to 59, and 0 points for <10) was highly predictive of 7-day risk of stroke in 3 independent cohorts.
- Patients with an ABCD score <4 had no events within 7 days; those with an ABCD score of 6 had up to a 35.5% chance of stroke within 7 days.
- The ABCD score was derived from a very small subset of patients and validated in 3 very similar cohorts, making it difficult to generalize these results to all practices. Further validation of the score is needed.
- The study highlights the need for urgent evaluation and treatment of patients after TIA. Further research is essential to investigate interventions that might reduce risk of stroke after TIA. 

Acknowledgment

Dr Harris is supported by a Clinician Investigator Grant from the Department of Family Practice at the University of British Columbia in Vancouver and by a Doctoral Research Award from the Canadian Institutes of Health Research and is a Senior Graduate Trainee of the Michael Smith Foundation for Health Research.

References

1. Hill MD, Yiannakoulis N, Jeerakathil T, Tu JV, Svenson LW, Schlopflocher DP. The high risk of stroke immediately after a transient ischemic attack. A population-based study. *Neurology* 2004;62:2015-20.

Points saillants

- L'échelle ABCD de 6 points, selon laquelle 1 point est donné pour avoir 60 ans ou plus, 1 point pour une pression artérielle élevée (systolique >140 mm Hg ou diastolique ≥ 90 mm Hg); de 0 à 2 points pour certaines caractéristiques cliniques (faiblesse unilatérale—2, trouble du langage sans faiblesse—1, autre—0); et de 0 à 2 points pour la durée en minutes des symptômes (2 points pour ≥ 60 , 1 point pour 10 à 59 et 0 point pour <10) était un facteur fortement prédictif d'un risque d'AVC dans 3 cohortes distinctes.
- Les patients dont les points ABCD étaient <4 n'avaient aucun incident dans les 7 jours suivants; ceux ayant des points ABCD de 6 avaient jusqu'à 35,5% de risque d'un AVC dans les 7 jours suivants.
- Les points ABCD étaient tirés d'un très petit sous-ensemble de patients et validés dans 3 cohortes très semblables, rendant difficile de généraliser ces résultats à toutes les pratiques. Il faudrait valider l'échelle de points de manière plus approfondie.
- L'étude fait valoir la nécessité d'une évaluation et d'un traitement urgent des patients après un AIT. Il est essentiel de faire d'autres recherches pour examiner les interventions susceptibles de réduire les risques d'AVC après un AIT.

2. Coull AJ, Lovett JK, Rothwell PM; Oxford Vascular Study. Population based study of early risk of stroke after transient ischemic attack or minor stroke: implications for public education and organization of services. *BMJ* 2004;328:326-8.
3. Johnston SC, Gress DR, Browner WS, Sidney S. Short-term prognosis after emergency department diagnosis of TIA. *JAMA* 2000;284:2901-6.
4. Sacco RL, Adams R, Albers G, Alberts MJ, Benavente O, Furie K, et al. Guidelines for prevention of stroke in patients with ischemic stroke or transient ischemic attack. AHA/ASA Guideline. *Stroke* 2006;37:577-617.
5. Goldstein LB, Bian J, Bonito AJ, Lux LJ, Matchar DB. New transient ischemic attack and stroke: outpatient management by primary care physicians. *Arch Intern Med* 2000;160:2941-6.
6. Dennis M, Bamford J, Sandercock P, Warlow CP. Prognosis of transient ischemic attacks in the Oxfordshire Community Stroke Project. *Stroke* 1990;21:848-53.
7. Rothwell PM, Coull AJ, Giles MF, Howard SC, Silver LE, Bull LM, et al. Changes in stroke incidence, mortality, case-fatality, severity, and risk factors in Oxfordshire from 1981-2004: the Oxford Vascular Study. *Lancet* 2004;363:1925-33.
8. Harrell FE, Lee KL, Mark DB. Multivariable prognostic models: issues in developing models, evaluating assumptions and accuracy, and measuring and reducing errors. *Stat Med* 1996;15:361-87.

Critical Appraisal reviews important articles in the literature relevant to family physicians. Reviews are by family physicians, not experts on the topics. They assess not only the strength of the studies but the "bottom line" clinical importance for family practice. We invite you to comment on the reviews, suggest articles for review, or become a reviewer. Contact Coordinator **Michael Evans** by e-mail michael.evans@utoronto.ca or by fax 416 603-5821.