Frequent inaccuracies in ABCD(2) scoring in non-stroke specialists' referrals to a daily Rapid Access Stroke Prevention service., *Journal of the Neurological Sciences*, 332, (1-2), 2013, p30-4

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Abstract

The 'accuracy' of age, blood pressure, clinical features, duration and [diabetes](#) (ABCD²) scoring by non-stroke specialists referring patients to a daily Rapid Access Stroke Prevention (RASP) service is unclear, as is the accuracy of ABCD² scoring by trainee residents.

In this prospective study, referrals were classified as 'confirmed TIAs' if the stroke specialist confirmed a clinical diagnosis of possible, probable or definite TIA, and 'non-TIAs' if patients had a TIA mimic or completed stroke. ABCD² scores from referring physicians were compared with scores by experienced stroke specialists and neurology/geriatric medicine residents at a daily RASP clinic; inter-observer agreement was examined.

Data from 101 referrals were analysed (mean age = 60.0 years, 58% male). The median interval between referral and clinic assessment was 1 day. Of 101 referrals, 52 (52%) were 'non-TIAs': 45 (86%) of 52 were 'TIA mimics' and 7 (14%) of 52 were completed strokes. There was only 'fair' agreement in total ABCD² scoring between referring physicians and stroke specialists ($\kappa = 0.37$). Agreement was 'excellent' between residents and stroke specialists ($\kappa = 0.91$). Twenty of 29 patients scored as 'moderate to high risk' (score 4–6) by stroke specialists were scored 'low risk' (score 0–3) by referring physicians.

ABCD² scoring by referring doctors is frequently inaccurate, with a tendency to underestimate stroke risk. These findings emphasise the importance of urgent specialist assessment of suspected TIA patients, and that ABCD² scores by non-stroke specialists cannot be relied upon in isolation to risk-stratify patients. Inter-observer agreement in ABCD² scoring was 'excellent' between residents and stroke specialists, indicating short-term training may improve accuracy.

Keywords TIA; Stroke; ABCD²; Prevention; Risk stratification; Inter-observer agreement

1. Introduction

Accurate risk-stratification models for patients with a suspected transient ischaemic attack (TIA) should facilitate reliable identification, urgent investigation and treatment of those at highest risk of recurrent TIA or stroke. The original 6-point, age, blood pressure, clinical features and duration of symptoms (ABCD) score was designed by experienced vascular neurologists for use by 'non-stroke specialists' to identify patients with suspected TIA who warranted urgent specialist investigation and treatment [1]. The authors reported that those with low scores (<5) had a 7-day stroke risk of 0.4%, whereas those with scores of 5 or 6 had a

7-day stroke risk of 12.1% and 31.4%, respectively. The score was subsequently refined to include a point for the presence of diabetes (ABCD²). Based on this 7-point ABCD² score, patients with scores of 0–3 are considered to be at 'low risk' (1% stroke risk over 48 h) and those with scores of ≥ 4 at 'higher risk'; the latter group was subdivided into 'moderate risk' (score of 4–5: 4.1% stroke risk over 48 h) and 'high risk' (score of 6–7: 8.1% stroke risk over 48 h) [2]. Based on these data, the Royal College of Physicians, UK Stroke Guidelines recommend assessment of patients with ABCD² scores ≥ 4 within 24 h and patients with lower scores (ABCD² 0–3) within at most 7 days [3].

The predictive value of ABCD² scoring by stroke specialists as a risk-stratification tool was initially validated in two different patient populations in the UK and USA [2]. However, two studies have suggested that ABCD² scoring may not on its own reliably predict recurrent stroke risk in patients with suspected TIAs assessed in emergency departments in Canada [4] and Australia [5]. In the Canadian study,

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emergency department physicians underestimated the ABCD² score in one-third of patients when compared with scores by stroke specialists [4]. A recent meta-analysis further suggests that in low-risk settings, ABCD² may not strongly predict level of risk [6]. Furthermore, there are data to suggest that a prior history of TIA within the past 7 days and large artery atherosclerosis may be more important markers of recurrent stroke risk at 7 days than ABCD² scoring [7]. Nonetheless, a community-based study in Italy reported that ABCD² scores reliably predict early (2-day) and late (90-day) stroke risk for those with TIAs diagnosed by a neurologist, with areas under the receiver operating characteristic curve (AUROC) of 0.85 and 0.69, respectively; the authors reported that an ABCD² score ≥ 4 had 100% sensitivity and 42% specificity for predicting stroke recurrence at 2 days, and no patients with scores <4 had recurrent stroke within 90 days [8]. A recent meta-analysis of 16 studies reported a pooled AUROC of 0.72 (0.63 to 0.8) for ABCD² scoring when predicting 7-day stroke risk following TIA [9]. Further refinements of the ABCD² scoring system have improved risk stratification of patients presenting with suspected TIA by including data on the presence or absence of ischaemia/infarction on diffusion MRI (ABCD²i) [10] and brain imaging coupled with carotid artery imaging (ABCD²i) [11].

An important emerging issue is the discordance that may exist between ABCD² scores by referring doctors, usually emergency department physicians or general practitioners (GPs), and stroke specialists. It is unclear whether 'non-stroke specialists' are using the updated ABCD² score accurately in these settings where many patients with suspected TIA initially attend, and where risk stratification is usually performed on clinical grounds only, without access to carotid or brain imaging. We have previously published data from a weekly Rapid Access Stroke Prevention (RASP) service indicating that there was only 'fair agreement' in scoring with the original ABCD scoring system between non-stroke specialists and a vascular neurologist who subsequently assessed all patients referred with suspected TIA (median duration of 6 days from referral to specialist assessment) [12]; similar findings were suggested for ABCD² scoring in two more recent studies [4,13]. Furthermore, data from the aforementioned Canadian study suggested that the predictive value of ABCD² scoring appeared better when performed by coordinating centre stroke specialists than by the referring emergency department physicians [4].

2. Aims and hypotheses

The aims of this study were to analyse data from patients referred to a daily RASP service in whom initial ABCD² scoring was prospectively performed by a referring physician to assess the 'accuracy' of ABCD² scoring by non-stroke specialists in 'specialist-confirmed' and 'non-confirmed TIAs.' We also aimed to assess the range of other diagnoses that were subsequently established by the stroke specialist to assess the prevalence of 'TIA mimics' amongst patients referred to a daily RASP service. Based on our previous experience, we hypothesised that there would be considerable disagreement in ABCD² scoring between the referring physicians and stroke specialists, that there would be a high proportion of TIA mimics referred by GPs and non-stroke specialists, but we anticipated high levels of agreement between the stroke specialists and residents after short-term training [12].

3. Methods

At our University Teaching Hospital, there is a daily one-stop 'Rapid Access Stroke Prevention' (RASP) clinic/service, co-directed by a consultant vascular neurologist and a consultant in geriatric and stroke medicine, who each run the clinic on alternate weeks. Referrals of any patients with 'suspected TIA(s)' are accepted from GPs, the emergency department and other medical/surgical services. To facilitate referrals and admissions, if appropriate, referring GPs and

emergency department physicians are provided with a clear referral pathway that involves completion of a Web-based referral proforma, which is urgently screened by the attending consultant each day. On the proforma, the referring doctor is clearly advised to record certain 'high-risk features' to prompt referral for same day assessment and possible admission by the acute RASP team on-call, including residual neurological symptoms or signs, recurrent TIAs (>1 in past month), atrial fibrillation, recent myocardial infarction, known ipsilateral carotid stenosis, monocular amaurosis fugax, suspected carotid or vertebral dissection or suspected TIA on anticoagulant therapy. If none of these high-risk features are present, physicians are provided with clear instructions to complete the ABCD² scoring system printed on each referral proforma. Physicians are also prompted to refer patients to our acute stroke team on call for urgent assessment and admission if the patient has had a completed stroke. Patients with 'high-risk clinical features' or an ABCD² score ≥ 4 are seen for urgent same day assessment $\pm$ admission by a member of the RASP team. Patients presumed to be at lower risk and who had an ABCD² score of 0–3 are allocated the next available RASP clinic appointment with a view to assessment within 24 h. No formal training in ABCD² scoring was provided to referring physicians prior to the conduct of this study because all components of the score were clearly listed on the referral proforma.

All consecutive referrals of patients with suspected TIAs who had ABCD² scoring performed by their referring physician between February 2010 and July 2011 were eligible for inclusion in this study. All data were prospectively recorded on an electronic database by the study coordinator (DB).

At the RASP clinic, all patients had a pre-booked vascular risk factor blood profile, ECG, chest radiograph and colour Doppler ultrasound of cervical arteries and underwent a detailed clinical neurovascular assessment. Prior to review of any investigation results, the assessing consultant clinically categorised each patient as a 'possible, probable or definite TIA' or 'non-TIA' based on history and examination findings and prospectively performed ABCD² scoring in each case, blinded to ABCD² scoring by the referring physician, in an attempt to reflect the conditions of assessment by the referring physician who may not have had access to any investigations at the time of their initial assessment. An initial clinical diagnosis of stroke was also made by the attending stroke specialist on clinical grounds, where appropriate, if the patient had a sudden onset of focal neurological symptoms that lasted for ≥ 24 h and that was presumed to be of non-traumatic, vascular origin. In 98 of 101 cases, ABCD² scoring was also performed by a trainee resident rotating through the RASP service, blinded to the other ABCD² scores, using the same ABCD² score sheet as referring physicians. The ABCD² score was based on the index event only and not subsequent events; in any case, an interval event occurred in only 1 of 101 referred patients. All assessing study staff used the blood pressure recorded by the referring physician on the referral proforma at the time of initial assessment for 'B' scoring. The 'C' and both 'D' components were scored by the residents and consultants based on their individual prospectively documented clinical assessments.

For the purpose of this study, referrals was defined as 'confirmed TIAs' if an experienced stroke specialist subsequently made a clinical diagnosis of possible, probable or definite TIA and 'non-TIAs' if an alternative clinical diagnosis was established, or if the patient had a completed stroke, which should have prompted urgent admission according to our locally agreed protocols.

All patients diagnosed with a TIA or stroke underwent a detailed clinical neurovascular assessment according to European Stroke Organisation guidelines [14]. All information regarding vascular risk factors and medication intake was collected prospectively, as described previously [15]. Results of routine haematological, coagulation, biochemical and blood glucose testing were collected prospectively. CT and/or MRI of brain and colour Doppler ultrasound of carotid and

vertebral arteries were performed in all patients. Magnetic resonance or computed tomography angiography was performed when deemed appropriate by the treating physician. A chest radiograph, electrocardiograph (ECG), 24-h ECG recording and transthoracic echocardiography or transoesophageal echocardiography with contrast injection and Valsalva were obtained in all patients.

Ethical approval for this study was obtained from the Local Research Ethics Committee at St. James's Hospital and AMNCH, Dublin.

4. Statistical analysis

Minitab 16 (Minitab Ltd, Coventry UK) was used for descriptive statistical calculations. Inter-observer agreement in ABCD² scoring between the referring physicians, residents and stroke specialists was assessed in the entire data set, and in the 'confirmed TIA' and 'non-TIA' subgroups with Cohen's unweighted kappa statistic (κ). A kappa value of 0–0.20 indicates poor agreement, 0.21–0.40 fair agreement, 0.41–0.60 moderate agreement, 0.61–0.80 good agreement and 0.81–1.00 very good/excellent agreement.

5. Results

Data on 101 consecutive new patients who were referred with fully completed ABCD² proformas between February 2010 and June 2011 were analysed. The median time from symptom onset and RASP clinic assessment was 4 days; the median time between the referring physician's assessment and RASP clinic assessment was only 1 day, with 70% of patients seen on the same day or next day. Only 1 patient (with an ABCD² score of 2) had a recurrent TIA between the initial medical assessment and referral for clinic assessment 3 days later; there were no interval strokes. Seventy-one percent of patients were referred by GPs, 27% by emergency department staff, and 3 patients (2%) by other hospital consultants. The demographics and other details of the cohort are shown in Table 1.

Overall, 48% ($n = 49$) of patients were clinically diagnosed as having had a possible, probable or definite TIA and were defined as 'confirmed TIA' referrals for the purpose of this study. Fifty-two percent ($n = 52$) of referrals were classified as 'non-TIAs,' of whom 86% ($n = 45$) were diagnosed with a TIA mimic, and importantly, 14% ($n = 7$) had a completed stroke that should have promoted urgent same day admission (Table 2). The median interval between symptom onset and initial referring physician assessment was 3 days, and between symptom onset and RASP, clinic assessment was 4 days in these seven patients with completed stroke. Six of 7 patients with completed stroke had unilateral weakness and one had residual apraxia.

Table 2

Diagnoses mimicking TIAs, along with actual scores or ranges of ABCD² scores.

TIA Mimics ($n = 45$)	Number (%)	Range ABCD ²
Migraine	15 (33)	0–4
Presyncope/Syncope	10 (22)	0–3
Seizure diathesis	3 (7)	1–3
BPPV/vestibular neuronitis	3 (7)	2–3
Refractive error	3 (7)	0–3
Musculoskeletal	2 (4)	1–3
Anxiety	2 (4)	0–2
Trigeminal Neuralgia	1 (2)	2
Radiculopathy	1 (2)	3
Conversion disorder	1 (2)	4
Codeine toxicity	1 (2)	5
Other 'non-TIA'	3 (7)	1–3

The mean ABCD² scores were similar in 'confirmed TIAs' vs. 'non-TIAs' amongst referring physicians (2.24 [SD = 0.98] vs. 2.38 [SD = 1.17]) and stroke specialists (2.69 [SD = 1.29] vs. 2.39 [SD = 1.43]). In the entire data set, 19 patients were classified as 'low risk' (ABCD² 0–3) by the referring physician but 'moderate risk' (ABCD² score 4–5) when assessed by the stroke specialist, and all should have been referred for urgent same day assessment according to our local hospital protocol. Another 8 patients were scored as 'moderate risk' by each assessor. Two patients were classified as low ($n = 1$) or moderate risk ($n = 1$) by the referring physician but 'high risk' (ABCD² score 6) by the stroke specialist. One patient was deemed to be moderate risk by the referring physician but low risk by the stroke specialist. Therefore, in the entire data set, 20 of 29 moderate or high-risk patients (ABCD² score ≥ 4) were underscored as 'low risk' by the referring physician (Table 4). In the 'confirmed TIA' data set, 12 of 16 patients scored as 'moderate' or 'high risk' by the stroke specialist had been underscored as 'low risk' by the referring physician.

The stroke specialist only agreed with the referring physician's total ABCD² score in 51% of cases ($\kappa = 0.38$). As in our earlier study [12], the 'C' (75% agreement, $\kappa = 0.51$) and 'Du' (59% agreement, $\kappa = 0.31$) components were the components of the scoring system with least agreement between the referring physician and the stroke specialist (Table 3). The residents agreed with the referring physician's total ABCD² score in 51% of cases ($\kappa = 0.38$). However, there was excellent inter-observer agreement between the study residents and the stroke specialists (complete concordance for total ABCD² score = 93%; $\kappa = 0.91$; Table 3).

When we examined the two components of the scoring system that caused the greatest discordance between observers, during assessment of Clinical features, referring physicians failed to identify hemiparesis in 9 of 20 cases in whom it was present and inaccurately

Table 1

Patient characteristics and time intervals between symptom onset, initial medical assessment and first assessment at the RASP Clinic, and selected ABCD² data for the entire cohort, 'confirmed TIAs' (definite, probable or possible TIA) and 'non-TIAs' (TIA mimics or completed stroke), as recorded by the stroke specialist at the RASP clinic. Data for 'B' scoring were based on blood pressure readings by the referring physician. P-values refer to comparison of demographic and clinical characteristics between 'confirmed TIA' and 'non-TIA' data sets.

	Entire data set ($n = 101$)	Confirmed TIAs ($n = 49$)	Non-TIAs ($n = 52$)	P-value
Male (%)	42%	33%	51%	0.105
Mean age in years (SD)	60 (14.3)	63 (12.9)	57 (15.1)	0.047
Median interval (days) between symptom onset and initial referring physician assessment	4	3	5	0.294
Median interval (days) between initial referral and RASP clinic assessment	1	1	1	0.267
Mean systolic blood pressure in mmHg (SD)	139.9 (18.7)	134.9 (19.3)	138.9 (19.1)	0.257
Mean diastolic blood pressure in mmHg (SD)	79.5 (10.3)	79.4 (10.4)	79.6 (10.4)	0.995
Clinical features: unilateral weakness	20 (19.8%)	13 (26.5%)	10 (19.2%)	0.478
Clinical features: speech disturbance only	12 (11.9%)	10 (20.4%)	2 (3.8%)	0.013
Duration of symptoms (≥ 60 min)	39 (38.6%)	15 (30.6%)	24 (46.2%)	0.152
Duration of symptoms (10–59 min)	23 (22.8%)	13 (26.5%)	10 (19.2%)	0.478
Duration of symptoms (<10 min)	39 (38.6%)	21 (42.9%)	18 (34.6%)	0.420
Diabetes (%)	6 (5.9%)	3 (6.1%)	3 (5.8%)	1.000

Table 3

Levels of agreement for total ABCD² scoring and individual components of the ABCD² scoring system between referring physicians and study stroke specialists, referring physicians and residents, and between stroke specialists and residents. Data are presented as percentage complete agreement between the two assessors (%); kappa values (κ) in square parentheses.

	Total	A	B	C	Du	Di
Agreement between referring physician and stroke specialist—entire cohort	51% [0.38]	90% [0.96]	87% [0.73]	75% [0.51]	59% [0.39]	99% [0.92]
Agreement between referring physician and stroke specialist—'confirmed TIA' cohort	49% [0.36]	98% [0.96]	90% [0.78]	80% [0.65]	59% [0.36]	98% [0.85]
Agreement between referring physician and stroke specialist—'non-TIA' cohort	52% [0.40]	98% [0.96]	85% [0.69]	71% [0.31]	60% [0.39]	100% [1.00]
Agreement between referring physician and resident—entire cohort	51% [0.38]	97% [0.94]	84% [0.68]	79% [0.50]	61% [0.42]	99% [0.90]
Agreement between resident and stroke specialist—entire cohort	93% [0.91]	99% [0.98]	98% [0.96]	97% [0.93]	94% [0.91]	100% [1.00]

identified hemiparesis in 4 of 14 cases in whom it was not present after careful questioning by the stroke specialist. Furthermore, 21 cases were defined as having 'speech disturbance only' and given 1 point by the stroke specialist; the referring physician disagreed with the stroke specialist in 11 of these 21 patients and assigned 0 points for 'other features' in nine cases and 2 points for 'hemiparesis' in two patients. Duration of symptoms was also inaccurately scored by referring physicians and overestimated in 26 and underestimated in 17 of 101 cases.

6. Discussion

This prospective study revealed that only 48% of referrals to a daily RASP service had a clinical diagnosis of TIA by the attending vascular neurologist or stroke specialist when assessed at a median interval of 1 day after referral. Fifty-two percent of referrals had another neurological diagnosis or completed stroke. These data indicate a significant degree of uncertainty amongst referring physicians in diagnosing of TIA or stroke and emphasise the need for urgent specialist assessment of all patients with suspected TIA, with access to neurological expertise, when planning RASP services. Other studies have reported variable rates of 'stroke specialist-confirmed TIAs' in patients referred to TIA clinics, ranging from 15% to 65%, of GP referrals [8,16] and from 62% to 82% of emergency department referrals [5,17].

One of the main findings in the present study was that there was only 'fair' agreement in overall ABCD² scoring between referring physicians and stroke specialists. The two components that were least accurately scored were 'clinical features' and 'duration of symptoms,' and non-specialists were more likely to overestimate the duration of symptoms. Interestingly, there was even some discordance in scoring the apparently 'objective' measures of age, blood pressure and diabetes, most likely reflecting a combination of human error and misinterpretation of scoring criteria (Table 3); 'B' scoring was discordant in 13% of cases, even though all study assessors used the blood pressure recorded by the referring physician. More importantly, 20 of 29 moderate or high-risk patients (ABCD² score ≥ 4) in the overall data set, and 12 of 16 in the 'confirmed TIA' data set were underscored as 'low risk' by the referring physician. These findings in combination with the lack of identification of persistent clinical signs consistent with a stroke in 7 patients is very concerning because these patients should all have been

referred for acute, same-day assessment and treatment according to our local referral pathway. Six of these 7 patients had unilateral weakness that should have been identified. Completed stroke rates in patients referred with suspected TIA have been reported to be lower in the aforementioned studies (3–5%) [6,8,16].

As outlined above, referring physicians are clearly advised to refer patients with 'high-risk clinical features,' independent of any ABCD² scoring, directly to our emergency department for assessment by the RASP team. Therefore, the patient cohort analysed in this study should have been mainly comprised of patients who did not have these high-risk 'clinical criteria.' The low level of accuracy of ABCD² scoring by referring physicians may be even more relevant for RASP services that do not specify such high-risk clinical features as criteria for admission regardless of ABCD² risk stratification. Although only one patient in our series had a recurrent TIA between initial assessment and RASP review, the risk of interval events is likely to be greater in centres with a longer interval of up to 1 week to specialist assessment of 'presumed lower risk' patients [3] if one accepts the ABCD² risk-stratification score calculated by a non-stroke specialist alone. It has been suggested that ABCD² scoring may be even more useful for referring physicians than experienced stroke specialists at predicting the risk of recurrent vascular events [18,19], perhaps because it is better at identifying TIAs than TIA mimics [20]. However, this suggestion is not borne out in our cohort because there were no differences in mean ABCD² scores between 'confirmed TIAs' and 'non-TIAs' amongst either referring physicians or stroke specialists. Therefore, in our opinion, these data indicate that ABCD² scores by non-stroke specialists cannot be relied upon to accurately risk-stratify referrals to a RASP clinic, and additional 'high-risk criteria' should be included in referral proformas to prompt referral for urgent assessment in suspected TIA patients regardless of their ABCD² score.

The 'excellent' inter-observer agreement between hospital residents (some with little or no neurology experience) and stroke specialists implies that brief, focused educational exposure significantly improves accuracy of ABCD² scoring. Formal training of GPs and other referring physicians should be considered where ABCD² scoring is included as part of the referral pathways; the impact of such training on the accuracy of ABCD² scoring deserves further study.

Based on these and prior data [12], we recommend urgent assessment of all patients with suspected TIAs by a stroke specialist to confirm a diagnosis of TIA and more accurately assess the risk of recurrent vascular events. It is preferable for non-stroke specialists to over-diagnose TIA and refer these patients for urgent specialist assessment rather than discouraging referrals with the inadvertent effect of missing TIAs and under-estimating the risk of subsequent stroke, with attendant adverse clinical and medicolegal outcomes. Early accurate diagnosis by an experienced vascular neurologist or stroke specialist of another neurological condition mimicking a TIA can also avoid unnecessary neurovascular workup and facilitate early, focused, cost-effective investigation and treatment. These data have implications for planning outpatient stroke prevention services. For example, based on the current Irish population of 4.59 million (Census of Ireland, 2011), and the recently reported incidence of first ever TIA of 0.46 per 1,000 person-years from the North Dublin

Table 4

Cross tabulation of the number of patients assigned a particular total ABCD² score (range 1–7) by their referring physician and stroke specialist. The cells on the grey diagonal indicate scores that were concordant between the referring physician and the stroke specialist.

Referring physician	ABCD ² Score	Stroke specialist								All
		0	1	2	3	4	5	6	7	
	0	5	0	1	0	0	0	0	0	6
	1	2	8	3	1	3	0	0	0	17
	2	1	6	18	3	6	0	0	0	34
	3	0	4	5	14	7	3	1	0	34
	4	0	0	0	1	4	1	1	0	7
	5	0	0	0	0	1	2	0	0	3
	6	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0
	All	8	18	27	19	21	6	2	0	101

Population Stroke Study [21], one would expect to see approximately 2,111 first ever TIAs per annum, but would need to have clinic capacity to assess twice this number of referrals per year.

This study had some limitations. As each patient underwent ABCD² rescoring by only one consultant stroke specialist, this study was not designed to assess inter-observer agreement between experienced specialists from different sub-specialties. However, the excellent inter-observer agreement between the stroke specialist and study residents makes it likely that there would have been high levels of agreement between different stroke sub-specialists also. The 'gold standard' for TIA diagnosis in this study was the clinical diagnosis reached by an experienced vascular neurologist or stroke physician in the RASP clinic. Diffusion-weighted (DW) MRI was not obtained routinely in all patients, but 'DWI-positivity' is not the 'gold standard' for TIA diagnosis either, because only 33% to 49% of confirmed TIAs had an abnormal DWI in prior series [11,22–27]. Although additional variables, including imaging evidence of carotid stenosis or recent infarction on MRI may significantly improve risk stratification in secondary care, a 'low-tech,' easily applicable risk-stratification system is still relevant to primary care and economically disadvantaged settings, where access to the relevant investigations is limited or non-existent. Nevertheless, regardless of whether ABCD², ABCD²I or ABCD²I scoring is to be used for the estimation of recurrent stroke risk in individual stroke centres, this and our prior study indicate that all components of these scoring systems need to be re-scored by a stroke specialist at the time of hospital assessment if ABCD² scoring or one of its derivatives is to be of value.

7. Conclusions

There was only fair agreement in ABCD² scoring between referring physicians and stroke specialists, and importantly, a significant degree of under-scoring of moderate to high-risk TIA patients in whom subsequent stroke risk was potentially underestimated. However, agreement in ABCD² scoring between consultant stroke specialists and hospital residents was markedly better. Therefore, ABCD² scoring by non-stroke specialists cannot be used in isolation to reliably risk-stratify patients with suspected TIAs, but short-term training has the potential to improve accuracy of scoring by referring physicians.

Conflict of interest

The authors report no conflicts of interest.

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Ethical approval for this study was obtained from the Local Research Ethics Committee at St. James's Hospital and AMNCH, Dublin.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.jns.2013.05.030>.

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