ORIGINAL ARTICLE

Can risk stratification of transient ischaemic attacks improve patient care in the emergency department?

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Introduction: The ABCD scoring system has been described as a simple way of predicting stroke in the first 7 days after a transient ischaemic attack (TIA). The aims of our pilot study were to find out if emergency department (ED) doctors could use the scoring system effectively and if this system would influence admission rates and patient selection.

Method: The ED notes were reviewed over a 3-month period. The ABCD (age, blood pressure, clinical features, duration) scoring system was retrospectively applied to each patient who presented with a TIA (pre-education (Pre) group). Doctors were then educated on the use of the scoring system, and the system was used for a further 3 months. Patients with high scores were admitted, and those with low scores were reviewed at the hospital's TIA clinic. The authors reviewed the notes retrospectively and each patient was scored again, based on the information available (post-education (Post) group). The number of appropriate admissions was compared using the χ^2 test.

Results: 37 patients matched the inclusion criteria in the Pre group and 38 patients in the Post group. Baseline characteristics of the groups were similar. There was a significant reduction in the number of patients admitted in the Post group, but the appropriateness of the admission was significantly greater ($p < 0.01$). There were no inappropriate discharges in the Post group.

Conclusions: The ABCD scoring system for identifying high-risk patients after TIA is a useful aid in determining which patients require admission from the ED. Its use results in a significant reduction in the number of admissions without any inappropriate discharges.

A transient ischaemic attack (TIA) is the only warning that a stroke may be imminent, and is thought to precede ischaemic stroke in 15–26% of patients.^{1–3} Patients are most at risk of stroke in the first 7 days after a TIA (up to 10% of patients with a TIA will have a stroke in this time, most in the first 2 days).^{2–4} For the emergency doctor, it is often difficult to predict which patients will develop stroke after TIA. Management appears to be dependent on local guidelines and personal preference. Until recently there was little consensus as to whether this treatment should be on an inpatient or outpatient basis.² This confusion was related to the fact that there was little published research about the short-term risk factors for stroke after a TIA.^{2–3} Recently, however, Rothwell *et al* derived a simple, validated, risk scoring system (ABCD; age, blood pressure, clinical features, duration) to predict stroke in the first seven days after a TIA (table 1).⁵ In this study, patients with low scores had a negligible risk of stroke in the first 7 days after a TIA. Those with high scores were at high risk of stroke within a week. It was thought that high-risk patients could be identified using this system, and receive emergency investigation and treatment in hospital.⁵

The two aims of our study were (1) to assess whether emergency department (ED) doctors could use the scoring system effectively and (2) to see if this system would influence admission rates and make selection for admission more accurate.

METHODS

This was a prospective non-blinded study, which ran from 1 September 2005 for 6 months in the ED of the Royal Victoria Hospital, Belfast.

First, all attendances to the ED over a 3-month period were monitored. The notes of those patients who were diagnosed with TIA were reviewed. Baseline characteristics of age, sex,

history of diabetes, and history of antiplatelet or anticoagulant use were recorded. A record was kept of whether a bedside glucose test had been performed and if the patient had been admitted or discharged to the TIA clinic. The ABCD scoring system was retrospectively applied to each patient by an ED specialist registrar or consultant (the authors) (table 1). This group was known as the pre-education (Pre) group.

The ED doctors were then given education on TIA and its risk factors, and asked to apply the ABCD scoring system to each patient whom they diagnosed as having a TIA; the system was used for a further 3 months. Patients with a score of 5 or 6 were admitted and those with lower scores were reviewed at the hospital's TIA clinic. The notes were reviewed retrospectively by us, and baseline characteristics collected. We scored each patient again to ensure the ED doctors were using the scoring system appropriately. This group was known as the post-education (Post) group.

Statistical analysis

Statistical analysis (χ^2) was performed with the SPSS software package (SPSS Inc, Chicago, Illinois, USA), with $p < 0.05$ considered significant and $p < 0.01$ considered highly significant.

RESULTS

Over the study period, 37 patients in the Pre group and 38 patients in the Post group fitted the inclusion criteria. The baseline characteristics are shown in table 2 and the documentation of relevant drug history, history of diabetes and blood glucose in figure 1.

Abbreviations: ABCD, age, blood pressure, clinical features, duration; AHA, American Heart Association; ED, emergency department; TIA, transient ischaemic attack

Table 1 ABCD scoring system⁵

Definition	Score
Age	
≥60 years	1
Blood pressure	
SBP >140 mmHg OR DBP ≥90 mmHg on arrival	1
Clinical features	
Unilateral weakness of one or more of: face, hand, arm or leg†	2
Speech disturbance (dysarthria or dysphasia or both), no weakness‡	1
Other symptoms	0
Duration (minutes)	
≥60	2
10–59	1
≤10	0
Maximum score (highest risk)	6

DBP, diastolic blood pressure; SBP, systolic blood pressure.

†The definition of limb weakness requires a clear description of loss of power as opposed to "heaviness" or "clumsiness" in the absence of definite weakness.

‡If both weakness and speech disturbance are present, then score is 2.

In the Pre group, 25 patients were admitted and 12 discharged to the TIA clinic (68 vs 32%). In the Post group, 9 patients were admitted and 29 discharged to the TIA clinic (24 vs 76%) (fig 2) (25, 12 X 9, 29; degrees of freedom (d.f.) = 1, $\chi^2 = 14.57$, $p < 0.001$).

The ABCD scoring system was calculated for the patients in the Pre and Post group, as shown in table 3. Of the 25 patients admitted from the Pre group, 9 admissions were deemed appropriate when the ABCD scoring system was applied (table 3) and 16 were deemed inappropriate (36% vs 64%). One discharge was inappropriate. In the Post group, eight admissions were deemed appropriate and one was inappropriate (89% vs 11.1%). There were no inappropriate discharges (9, 8 X 16, 1; d.f. = 1, $\chi^2 = 7.404$, $p < 0.01$) (fig 3).

The notes of the Post group patients were reviewed and we applied the ABCD scoring system to each patient. The total score for each patient was the same as that calculated by the ED medical staff initially treating the patient.

DISCUSSION

The care and treatment of patients with stroke has undergone significant change in recent years. Drivers for change have included the National Stroke Guidelines and strand 5 of the National Service Framework for Older People, and the clinical research supporting them.^{6,7}

Stroke has a huge effect on people's lives. It begins as a medical emergency, and ends as the single biggest cause of severe disability, and as the third most common cause of death.^{3,6}

A TIA has been known for some time to be the harbinger of future stroke. Until recently, however, surprisingly little medical and public attention had been focused on it or its management.

This historical lack of interest may have been due to the fact that the risk of TIA preceding stroke was underestimated in early studies.⁸ Some confusion surrounded the definition of TIA. The classic definition was chosen by consensus in the 1970s, before the advent of sophisticated MRI techniques, and depended on an accurate history of events. The new definition is tissue-based (MRI findings) rather than time-based. This may have affected the results of more recent epidemiological studies.³ Most studies in the past focused on the long-term risk factors for stroke, which is not immediately helpful to the ED doctor.^{2,5}

There still appears to be no clear consensus among doctors about how these patients should be managed, with some hospital trusts admitting all patients, whereas others refer them to clinics, which often have a waiting times of several months.⁶

Table 2 Baseline characteristics of patients presenting after transient ischaemic attack in the Pre and Post groups

Characteristic	Pre	Post
Patients (n)	37	38
Sex (M/F)	21/16	20/18
Age range (years)	34–87	30–87
Mean age (years)	62	60
Patients >60 years (n)	57	47
SBP >140 mmHg or DPB >90 mmHg on presentation	21	22

DBP, diastolic blood pressure; SBP, systolic blood pressure.

For ED doctors this arrangement remains unsatisfactory. It was therefore encouraging to review the paper by Rothwell *et al*,⁵ which addressed the problem of risk stratification for early stroke after TIA. It developed, applied and validated a simple scoring system. The study itself was well run and the results highly reproducible. In this population-based cohort of 188 patients with suspected TIA, the risk of stroke in the first 7 days increased exponentially from 0% for a score of 0 to 35.5% for a score of 6. The authors suggested that the early risk of stroke after TIA was highly predictable and that the scoring system could be used to decide which patients were high risk and warranted urgent inpatient admission.

In our prospective study, we analysed two consecutive groups of patients who attended the ED. Although each was a small group (37 and 38 patients), the baseline characteristics were well matched. The documentation of clinically relevant data improved greatly with education of medical staff, although there was still room for improvement. Documentation of antiplatelet use increased from 62% to 86%, anticoagulant use 8% to 87%, blood glucose check from 38% to 50% and history of diabetes from 54% to 74%.

The ABCD scoring system was easily interpreted; our scores and those calculated by the ED doctors were the same for all patients. Application of the scoring system resulted in a very significant reduction in the number of patients admitted. Although significantly fewer patients were admitted in the Post group, there was a highly significant increase in the appropriateness of admission.

By highlighting at-risk patients, it is hoped that a more proactive approach to investigation may be adopted, similar to that recommended by the American Heart Association (AHA), which advises urgent blood tests, ECG and CT/MRI on presentation to the ED. After this, the need for carotid

Figure 1 Documentation before (Pre) and after (Post) education of doctors about transient ischaemic attack and the ABCD scoring system. BM, blood glucose.

Figure 2 Disposal of patients attending the emergency department after suspected transient ischaemic attack.

ultrasonography, echocardiography and magnetic resonance angiography is considered.³

Our study showed a 44% increase post-education in the number of people discharged to the TIA clinic after TIA, with no inappropriate discharges. With more patients being discharged, questions arise. First, what is the sequence/timing of outpatient investigation? Second, should ED doctors commence drug treatment, such as antiplatelet drugs, antihypertensive drugs or statins while awaiting further investigation? In the UK, the timing of investigations remains contentious, owing to financial constraints and access to outpatient investigations. Local guidelines in Northern Ireland advise blood tests, ECG after review at the TIA clinic, and carotid ultrasonography and/or echocardiography only after CT scanning.¹ This seems a considerable delay for baseline investigations. In the ED, it would seem prudent to consider laboratory investigations for fibrin breakdown products, erythrocyte sedimentation rate, urea and electrolytes, autoantibodies and anticardiolipin antibodies, as well as coagulation and thrombophilia screening and an ECG before discharge.⁸

There are no firm guidelines regarding whether ED doctors should begin statin or antihypertensive treatment prior to full investigation. However, both local Northern Ireland guidelines and the AHA strongly advise obtaining a CT scan before commencing antiplatelet treatment.^{1,3}

Limitations of the ABCD scoring system

Potential weaknesses in the scoring system were debated during the study. First, the scoring system does not include diabetes as a risk factor. Johnston *et al* found diabetes to be a highly significant independent risk factor for stroke in the first 90 days after TIA.² However, these figures were not prospec-

Figure 3 Appropriateness of disposal of patients related to ABCD risk stratification.

tively validated. In the study of Rothwell *et al*, diabetes became significant only when it was added to a logistic regression model containing the four components of the ABCD score. It was not an independent risk factor.⁵

Second, for patients who present with symptoms suggestive of a “stuttering/crescendo” TIA, the scoring system advises taking the longest episode for duration. However, if these episodes are all short-lived and the patient is <60 years old, they may have a low score and therefore be discharged instead of admitted as high risk. This is of particular relevance to the young patient presenting with cerebral vasculitis, which needs urgent investigation.⁹ Rothwell *et al* advise, in these cases, that the scoring system is used as a guide only (personal communication).

Third, the scoring system does not make allowance for a TIA as a complication of thromboembolic disease such as bacterial endocarditis or atrial fibrillation. Studies suggest that 6–32% of patients presenting with TIA have a cardiac source of emboli.³ Consequently, it may be prudent not to apply the scoring system to these patients.

Fourth, how do you stratify the patient who presents with symptoms suggestive of a TIA and is receiving anticoagulant treatment? Should these patients be admitted for urgent CT scan in view of the increased risk of haemorrhagic stroke? Rothwell *et al* do not comment on this in their original article. They verbally advise that all patients on “warfarin”, irrespective of ABCD score, should be admitted (personal communication).

The scoring system is also of limited use in the patient who presents with symptoms suggestive of a TIA affecting the posterior circulation.

Despite these weaknesses, the ABCD scoring system is a useful aid to diagnosis. It has recently been incorporated into pathways of care for TIA and stroke in the Northern Ireland CREST guidelines, drawn up by stroke teams, general practitioners and ED doctors.¹ It has also been integrated into the forthcoming DH UK guidelines on TIA and stroke (personal communication).

Limitations of the study

The study numbers were small, and no blinding was carried out. The scoring system was applied retrospectively to the sample population. If we, the authors, had reviewed the patients at the time of presentation, this may have altered results and lessened the potential for misdiagnosis or misclassification. The patients’ follow-up case notes were not reviewed to confirm diagnosis. Further studies, including the long-term follow-up of patients, would be of interest to see if stroke or death was prevented or reduced in the admitted patients and to ensure no detrimental outcome occurred for discharged patients.

Table 3 ABCD scores obtained in each group

Score	Pre group (n)	Post group (n)
0	3	4
1	7	3
2	5	6
3	8	11
4	10	6
5	3	6
6	1	2

CONCLUSION

The ABCD scoring system for identifying high-risk patients after TIA is a useful aid in determining which patients require admission from the ED. When used in this study, there was a significant reduction in the number of admissions without any inappropriate discharges. It would appear that scoring system is easily transferable to the ED setting. It appears to be very safe for patients, but does not remove the need for access to a TIA clinic within the subsequent 7 days.

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