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Clinical Study

A retrospective analysis of inpatient compared to outpatient care for the management of patients with transient ischaemic attack

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ABSTRACT

The management of transient ischaemic attacks (TIA) involves rapid evaluation and treatment to reduce the risk of subsequent stroke. In this study we compared the investigation, management and outcome of TIA in those patients who had been admitted to hospital and in those who were evaluated on an outpatient basis. We retrospectively reviewed all patients presenting to the emergency department during a 2.5-year period with a diagnosis of TIA. Follow-up data were obtained by accessing the outpatient records of local neurologists and general practitioners. Patients managed on an outpatient basis were compared to those who were admitted for further evaluation. A total of 140 patients were available for analysis: 40% of presentations were evaluated on an outpatient basis. Admitted patients had higher mean $ABCD^2$ scores (4.4 *versus* [*vs.*] 3.6). They were significantly more likely to receive carotid ultrasonography (95% *vs.* 73%), 24-hour electrocardiographic monitoring (40% *vs.* 13%) and lipid evaluations (89% *vs.* 58%) than those managed as outpatients. The 7-day and 90-day stroke rates were 2% and 6% respectively. No patients with a score of $\leqslant 2$ suffered subsequent stroke. As expected, patients with higher $ABCD^2$ scores were more likely to be admitted for further evaluation. Outpatients were investigated less assiduously, but therapeutic management was similar in the two groups. This suggests that inpatient care is superior to outpatient management for high-risk patients but dedicated, specialist outpatient care remains a model worthy of further consideration.

1. Introduction

Transient ischaemic attacks (TIA) are important predictors of subsequent stroke and therefore require urgent evaluation. The risk of early stroke after TIA has been estimated to be around 10%, with half of these occurring in the first 48 hours.[1,2] Hospitalisation for TIA has been recommended for those patients at high risk of early stroke based on their $ABCD^2$ score to facilitate more rapid investigation and management.[3,4] It is often presumed that admission is the optimal mode of managing high-risk patients. However, hospitalisation is expensive and there is evidence that urgent-access "TIA-clinics" are more cost-effective.[5] Debate therefore continues regarding the role of hospitalisation in this setting.[6,7] The current study was set up to inform the debate by looking at investigation, management, and outcome of patients with TIA as a function of whether or not they were admitted to hospital or managed on an outpatient basis.

2. Methods

2.1. Patients

An analysis was performed on the hospital records of all patients with TIA presenting to the emergency department of The Canberra Hospital over a 2.5-year period from April 2006 to December 2008. Patients with a discharge diagnosis of TIA were identified using 10 *Diagnostic and Statistical Manual of Mental Disorders* (DSM) criteria (G45.0–G45.9). The records of these patients were subsequently screened for diagnostic accuracy by obtaining further information about their presentation (history, contemporaneous examination and subsequent clinical course) by a consultant neurologist. Patients were excluded from further study if they had been misclassified as having a TIA, either because their symptoms had not resolved within 24 hours (when they met the criteria for a stroke) or because they had a clear non-TIA diagnosis (for example [e.g.], seizure, migraine, syncope, delirium or transient global amnesia). Patients with inadequate discharge documentation were also excluded. This study was approved by the ACT Health Human Research Ethics Committee.

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2.2. Data acquisition

In addition to screening hospital notes, further information was obtained by accessing the outpatient records of local neurologists and general practitioners.

Information was obtained for all patients in relation to baseline demographic data and cerebrovascular risk factors (age, hypertension, diabetes, smoking history, hypercholesterolemia, atrial fibrillation, and history of previous stroke or TIA). In addition, the $ABCD^2$ scores at presentation were calculated.

Records were screened to determine whether or not relevant investigations had been performed and, if so, what the time interval between presentation and investigation was. Relevant investigations comprised basic blood tests (full blood count [FBC], urea and electrolytes [UEC], cholesterol, blood sugar level [BSL] and erythrocyte sedimentation rate [ESR]), neuroimaging (carotid ultrasonography, CT scans and MRI), and cardiac tests (12-lead electrocardiograph [ECG] and 24-hour Holter monitoring).

In addition, patients' records were assessed to determine whether they had received specific interventions directed at secondary prevention of stroke and, if so, the waiting time for these interventions to take place. These interventions comprised prescription of antiplatelet, antihypertensive and cholesterol-lowering therapy, carotid endarterectomy and/or anticoagulation.

Finally, general practitioners and neurologists were contacted and their records were screened to determine whether patients had suffered a subsequent stroke or death within 90 days of their presentation. Follow-up outcome data were sought until December 2011.

2.3. Data analysis

Patients were divided into two groups: (i) those who were admitted to hospital and so received "inpatient" care; and (ii) those that who were discharged from the emergency department and so received "outpatient" care. Two further comparisons were then made. The first involved assessing whether or not patients were "true" inpatients or outpatients: because of the inability to find a bed in the hospital in a timely manner, several patients for whom admission had been requested received most of their necessary investigation (e.g. CT scan, blood tests and carotid ultrasonography) in the emergency department before they were sent home. For the purposes of this secondary analysis, these patients were reclassified as "true" inpatients as opposed to "true" outpatients, in whom most of their investigation was performed after discharge from the emergency department. A second analysis looked at whether management had involved a neurologist or not.

2.4. Statistical analysis

Analysis was performed using Minitab version 16.0 statistical software (Minitab, State College, PA, USA). Comparison of means was carried out using Welch's *t*-test and comparison of attribute data was performed using Fisher's exact test.

3. Results

The initial search yielded 156 patients who had apparently been diagnosed as having had a TIA during the 2.5 years. Of these, 16 were excluded due to incorrect diagnosis. This left 140 patients for further analysis. Of these, 85 (60%) were managed as inpatients (that is, admitted to a hospital ward) and 55 (40%) were discharged to be managed as outpatients. Demographic features, cardiovascular risk factors, rates of investigation, intervention, and 90-day rates of stroke and death are shown (Tables 1 and 2). The average $ABCD^2$ score at presentation for all patients was 4.1, with most patients presenting with a score of between 4 and 5.

Table 1
Demographics of patients with transient ischaemic attack (TIA) as a function of presentation and investigation status

	Inpatients $n = 85$ (%)	Outpatients $n = 55$ (%)	*p*-value
Average age (years)	75	70	
Average $ABCD^2$ score	4.4	3.6	0.002
No. with $ABCD^2$ score $\geqslant 3$	77 (91)	41 (75)	0.01
Risk factors			
Age $\geqslant 65$ years	68 (80)	39 (71)	
Hypertension	57 (67)	25 (45)	0.009
Diabetes mellitus	23 (27)	10 (18)	
Smoking	11 (13)	6 (11)	
Hypercholesterolaemia	28 (33)	11 (20)	
AF	17 (20)	10 (18)	
Previous CVA/TIA	27 (32)	19 (35)	

AF = atrial fibrillation, CVA = cerebrovascular accident.

Table 2
Management of patients with transient ischaemic attack (TIA) and outcome as a function of presentation and investigation status

	Inpatients $n = 85$ (%)	Outpatients $n = 55$ (%)	*p*-value
Investigations			
Full blood count	85 (100)	53 (96)	
Urea and electrolytes	85 (100)	53 (96)	
Cholesterol	76 (89)	32 (58)	0.0001
Blood sugar level	82 (96)	53 (96)	
Erythrocyte sedimentation rate	15 (18)	5 (9)	
CT scan	84 (99)	54 (98)	
Carotid ultrasound	81 (95)	40 (73)	0.0001
MRI	25 (29)	13 (24)	
Electrocardiogram	85 (100)	54 (98)	
Holter monitor	34 (40)	7 (13)	0.0001
Treatment			
Antiplatelet	74 (87)	44 (80)	
Antihypertensive	54 (64)	29 (53)	
Cholesterol-lowering	54 (64)	25 (45)	0.04
Carotid endarterectomy	7 (8)	0 (0)	0.04
Anticoagulation	11 (13)	9 (16)	
Outcome (90-day)			
Stroke	7 (8)	2 (4)	
Death	4 (5)	1 (2)	
Stroke or death	10 (12)	3 (5)	

3.1. Inpatients compared to outpatients

There were no significant baseline differences between groups with the exception of hypertension and $ABCD^2$ score (Tables 1 and 2). Inpatients had a significantly higher mean $ABCD^2$ score (4.4 *versus* [vs.] 3.6) and proportion of patients with a score $\geqslant 3$ ($p = 0.002$; $p = 0.01$, respectively). Fig. 1 shows the distribution of $ABCD^2$ scores of inpatients and outpatients.

With regard to investigations, basic blood tests (FBC, UEC and BSL) were performed in almost all patients. ESR was performed only if thought to be relevant, but there was no difference between inpatient and outpatient groups. Inpatients, as compared to the outpatient group, were significantly more likely to have their cholesterol measured (89% *vs.* 58%, $p < 0.0001$), to receive carotid ultrasonography (95% *vs.* 73%, $p < 0.0001$) and to have further cardiac evaluation with 24-hour Holter monitoring (40% *vs.* 13%,