PACIFIC JOURNAL OF MEDICAL SCIENCES
{Formerly: Medical Sciences Bulletin}
ISSN: 2072 – 1625

Pac. J. Med. Sci. (PJMS)
www.pacjmedsci.com. Email: pacjmedsci@gmail.com.

AUDIT OF TRANSIENT ISCHAEMIC ATTACK (TIA) INPATIENT MANAGEMENT: A RETROSPECTIVE ASSESSMENT

SHYH P. TEO

Hutt Hospital, High Street, Lower Hutt 5010 New Zealand; RIPAS Hospital, Bandar Seri Begawan, Brunei Darussalam

Short Running Title: Inpatient TIA Audit

Email: shyhpoh.teo@moh.gov.bn

Submitted: December 2019; Accepted: February 2020

AUDIT OF TRANSIENT ISCHAEMIC ATTACK (TIA) INPATIENT MANAGEMENT: A RETROSPECTIVE ASSESSMENT

SHYH P. TEO

Hutt Hospital, High Street, Lower Hutt 5010 New Zealand; RIPAS Hospital, Bandar Seri Begawan, Brunei Darussalam

Short Running Title: Inpatient TIA Audit

Email: shyhpoh.teo@moh.gov.bn

Submitted: December 2019; Accepted: February 2020

ABSTRACT:
The aim of this retrospective study was to audit the management of transient ischaemic attack (TIA) patients admitted in 2012 compared to a previous audit (2009 to mid-2010). Data were obtained by reviewing the electronic clinical records of patients. Data on patient demographics, patient assessment and management according to TIA guidelines were collected. A total of 61 patients were admitted to hospital with primary diagnosis of TIA. One in four patients had an alternative diagnosis. TIA severity (ABCD2 score) was not calculated in 13% of the patients. Most patients had computed tomography (CT) brain imaging performed. Antiplatelet therapy was not adjusted in 10% of patients. Carotid doppler ultrasound was not considered in 20% of the patients. Most of the carotid dopplers were done within one week. Only 6.6% of the patients were referred for carotid endarterectomy. Blood pressure medications were not optimised in 57.4% of the patients. Only 27.9% were prescribed statin therapy. Not all patients had documented ECG findings or discussion regarding anticoagulation. There was a 32.8% 3-month readmission rate. In 2012 several aspects of TIA guideline management were not done appropriately compared to the previous audit. The areas of improvement identified in this assessment include optimising antiplatelet therapy and blood pressure management, as well as timely carotid ultrasound for anterior circulation TIA. Further education and reiteration of guideline-based TIA management is recommended. A follow-up audit of the service is warranted.

Keywords: Inpatients, Secondary Prevention, Stroke, Transient ischaemic attack, Audit of Transient Ischaemic Attack (TIA) Inpatient Management

INTRODUCTION:

Transient ischaemic attack (TIA) is defined as "stroke symptoms and signs that resolve within 24 hours" [1]. After a TIA, there is a high risk of developing a stroke, up to 12% at 7 days and up to 20% at 90 days. Half of these strokes occur within the first 48 hours after TIA [2]. Unfortunately, up to 85% strokes following TIA are fatal or disabling [3].

The findings by Rothwell et al (EXPRESS study) demonstrated benefits of early assessment and treatment [4]. Rapid assessment clinics within 24 hours of TIA symptoms with immediate commencement of aspirin and statin with management of reversible risk factors reduced the 90-day risk of recurrent stroke from 10.3% to 2.1%. Urgency of assessment and intervention is appropriately emphasized in TIA management guidelines [1, 5]. However, translating these guidelines into action remains challenging for clinicians. A New Zealand National Acute Stroke Services audit in 2009 identified that only half of the district health boards have rapid access TIA clinics [6]. A similar survey done in Australia found variable access to rapid TIA clinics, causing delays in treatment [7].

In Hutt Hospital, TIA referrals are sent for urgent outpatient review or admitted by the on-call medical team. Patients with high risk TIAs are more likely to be admitted. The aim of this audit was to review management of TIA patients admitted to Hutt Hospital in 2012. A previous similar audit was done for the period January 2009 to June 2010, which serves as a comparison to review trends in TIA management.

METHODS:

This was a retrospective audit of the management of TIA patients admitted to Hutt Hospital between 1st January 2012 and 31st December 2012, in comparison to a similar audit carried out between January 2009 and June 2010. The patient list in 2012 was obtained through screening International Classification of Diseases (ICD) Codes of patients discharged with a primary diagnosis of TIA. Electronic records, including admission, discharge and follow-up clinic letters were reviewed. All patients were followed up in Outpatient Clinic by a stroke physician within 3 months of the admission.

Radiological images were not reviewed to rule out changes on diffusion weighted magnetic resonance imaging i.e. stroke rather than TIA, which may have been performed after discharge from hospital. For this audit, patient symptoms were confirmed as a true diagnosis of TIA if stated by the stroke physician on follow-up review, rather than discharge diagnosis. Patients with a change in diagnosis or considered unlikely to have TIA were excluded from analysis.

Basic demographic information was collected. Clinical symptoms were classified into typical and atypical symptoms. Typical symptoms included dysphasia, unilateral weakness, unilateral altered sensation, visual symptoms and unsteadiness. Atypical symptoms included confusion, bilateral visual change, dizziness or lightheadedness, headache, amnesia and generalized weakness or sensory symptoms [8]. The affected cerebral circulation, whether cerebral imaging was done acutely and severity grade using ABCD2 score were identified. The following key interventions were assessed for management of TIA: optimising anti-platelet therapy, timely carotid dopplers (and timely surgery if appropriate), blood pressure management, statin therapy and anticoagulation in the setting of atrial fibrillation [8]. Length of stay and 30-day readmission rates was calculated.

RESULTS:

Patient Characteristics:

A total of 81 patients were admitted with a primary diagnosis of TIA in 2012. After discharge and review in TIA Outpatient Clinic, 20 (24.7%) patients were deemed unlikely to be TIA. The patients excluded were due to various reasons; four patients had migraines, three patients had non-specific unwellness with atypical symptoms, two had hypoglycaemia and the remainder had alternative diagnoses such as delirium, dementia, arrhythmia and angina. Thus 61 patients were selected for further analysis.

Of the 61 patients in 2012, 26 (42.6%) were male and 35 (57.4%) were female. The median age for all the patients was 74 years, with a range of 29 to 98 years. Table 1 shows the proportions of TIA mimics and basic patient demographics for the two study periods.

Table 2 summarises the presenting symptoms of these patients. There were 10 patients with two typical symptoms and three patients with two atypical symptoms. The most frequent typical symptom was unilateral weakness in 32 (52.5%), followed by dysphasia in 15 (24.6%) patients. The most frequent atypical symptoms were confusion, dizziness or lightheadedness and headache. There were 38 (62.3%) patients who did not have any atypical symptoms.

The ABCD2 score was not calculated or documented in 8 (13.1%) patients. A patient had ABCD2 Score 1, but admitted due to a history of ventricular arrhythmia. There were 47 (77.0%) patients with ABCD2 Scores four or greater. There were 46 (75.4%) patients with anterior circulation TIA, while 12 (19.7%) had posterior circulation TIA. In 3 (4.9%) patients, it was unclear which part of the cerebral circulation was affected from review of clinical records.

Table 1: Patients for analysis and baseline demographics for study periods 2009 to mid-2010 and 2012.

	2012	2009 to mid-2010
Primary diagnosis of TIA on discharge summary	81	108
Patients unlikely to have TIA after stroke physician review	20 (24.7%)	26 (24.1%)
Patients included in analysis	61 (75.3%)	82 (75.9%)
Median Age (Range) in years	74 (29 – 98)	71 (30 – 99)
Gender: Male	26 (42.6%)	38 (46.3%)
Gender: Female	35 (57.4%)	44 (53.7%)

Table 2: Presenting symptoms of patients admitted for TIA in 2012

Presenting Symptoms	**Number of patients (%)**
Typical Symptoms:	
Unilateral weakness	32 (52.5%)
Dysphasia	15 (24.6%)
Unilateral altered sensation	12 (19.7%)
Unsteadiness	9 (14.8%)
Visual symptoms	3 (4.9%)
Atypical Symptoms:	
Confusion	8 (12.9%)
Dizziness / lightheadedness	8 (12.9%)
Headache	8 (12.9%)
Generalised weakness / sensory disturbance	1 (1.6%)

Figures in table are cumulative, thus do not add up to 61 (100%)

Investigations and Management:

With regards to head imaging, 44 (72.1%) had an inpatient CT brain done, while 4 (6.6%) patients had Magnetic Resonance Imaging (MRI) brain performed. There were 7 (11.5%) patients who had both CT and MRI brain, while 6 (9.8%) had no head imaging done in hospital. Of these, three had recent CT brain done within a month prior to admission, hence imaging was not repeated. A patient had atypical symptoms and MRI brain was requested as outpatients. A patient with St Jude aortic valve replacement but sub-therapeutic warfarin was presumed as embolic phenomenon. The other patient had dementia with multiple comorbidities.

Table 3 shows the management of TIA in-patients with regards to antiplatelet therapy, carotid dopplers performed and timeliness of scan and surgery, hypertension and statin therapy for both study periods.

As shown in Table 3, 72.1% in 2012 had appropriate adjustments to antiplatelet therapy and 35 (57.4%) had carotid dopplers performed, compared to 58 (70.7%) in the earlier audit. One in five did not have a carotid Doppler; no reasons were documented. In the remaining 9 patients without carotid dopplers, the documented reasons for not performing the test were as follows: 3 had CT angiogram and 3 had recent ultrasounds which ruled out significant stenosis. There were two patients who were not surgical candidates; one with dementia, another had labile blood pressure. A patient had previous arterial thrombosis and required anticoagulation.

Of those who had carotid dopplers, 25 (71.4%) had their ultrasound scan done in less than three days and 7 (20%) patients between four and seven days. There were 4 (6.6%) patients referred for carotid endarterectomy, while 34 (55.7%) patients did not have clinically relevant carotid stenosis so were not referred.

There were 4 (6.6%) patients in 2012 referred for carotid endarterectomy, compared to 12 (14.6%) in 2009 to mid-2010. Two patients had delay in getting surgery. The first patient had dopplers in two days, but represented in ten days for symptomatic bradycardia. Surgery was performed 27 days after TIA.

The other patient did not have Dopplers done after TIA and represented with another cerebrovascular event in one and half months. Dopplers were performed on day 49, or 64 days after first TIA before undergoing carotid endarterectomy.

Table 3: Antiplatelet, carotid dopplers and surgery (if appropriate), hypertension and statin therapy

	2012	2009 to mid-2010
Antiplatelet therapy initiated or up-titrated		
Yes	44 (72.1%)	69 (84.1%)
No – reason documented	11 (18.0%)	13 (15.9%)
No – No reason documented	6 (9.8%)	0 (0%)
Carotid Doppler		
Done	35 (57.4%)	58 (70.7%)
Not Done – No reason documented	12 (19.7%)	11 (13.4%)
Not Done – Posterior Circulation	4 (6.6%)	3 (3.7%)
Not Done – Known Stenosis	1 (1.6%)	5 (6.1%)
Not Done – Other	9 (31.1%)	5 (6.1%)
Median time to Ultrasound Scan (Range) – days	1 (0 -35)	0 to 3 days*
Referred for carotid endarterectomy	4 (6.6%)	12 (14.6%)
Time to surgery	2 to 4 weeks	2 to 4 weeks*
Hypertension		
Yes	14 (22.6%)	33 (40.2%)
No – No reason documented	35 (57.4%)	41 (50.0%)
No – Postural hypotension	7 (11.5%)	3 (3.7%)
No – BP<120/70	4 (6.6%)	4 (4.9%)
No – Episode of hypotension	1 (1.6%)	1 (1.2%)
Statin therapy		
Started / up-titrated during admission	17 (27.9%)	34 (41.5%)
Continued statin therapy	34 (55.7%)	31 (37.8%)
No – Age >85 years	6 (9.8%)	3 (3.7%)
No – No reason documented	4 (6.6%)	14 (17.1%)

**For the period 2009 to mid-2010, duration was coded as ranges of days rather than exact number of days.*

A total of 14 (22.6%) patients had medications adjusted for hypertension in 2012, in comparison to 33 (40.2%) patients in the earlier study. Postural hypotension was identified in 7 (11.5%) in 2012 versus 3(3.7%) previously. Statin therapy was up-titrated in 17 (27.9%) in 2012, versus 34 (41.5%) previously.

Hypertension medications were up-titrated in 14 (22.6%) compared to 33 (40.2%) in 2009 to mid-2010. Postural hypotension was identified in 7 (11.5%) compared to 3 (3.7%) previously. Statin therapy was appropriately introduced or adjusted in 27.9% of patients.

Anticoagulation was commenced in 4 (6.5%) patients. There were 44 (71.0%) patients with normal sinus rhythm so anticoagulation was not indicated. In 2 (3.2%) patients with atrial fibrillation, they were considered high falls risk; hence anticoagulation was not started due to risk of bleeding from possible fall injuries. A patient with TIA and atrial fibrillation (AF) was not commenced anticoagulation due to advanced dementia. There were five (8.1%) patients already on anticoagulation. In 4 (6.5%), ECG findings were not documented on electronic records. One patient had atrial fibrillation but it was unclear why anticoagulation was not considered.

Outcomes:

Median length of inpatient stay was one day, with a range of 0 to 13 days. There were five patients with length of stay 4 days or greater. One patient in hospital for 13 days had dementia, requiring complex discharge planning for residential care. There were two patients with unsteady gait and recurrent falls, requiring further assessment and rehabilitation for a week. There were two patients who had confusion and cognitive impairment, with safety concerns identified during multidisciplinary assessment, having lengths of stay four and six days respectively.

There were 20 (32.8%) patients readmitted within 3 months, of which 5 had further TIA and one patient sustaining a stroke, with an overall further cerebrovascular complication rate of 9.8%. In contrast, for the period 2009 to mid-2010, there were 20 (24.4%) readmissions within 3 months, with 8 (9.8%) being further TIA or stroke.

DISCUSSION:

This study reviewed management of TIA patients in 2012. Comparison was made to a similar study done for 2009 to mid-2010 to review trends in inpatient TIA management.

One in four patients was excluded after review by the stroke physician, who disagreed with the diagnosis of TIA. This is a high rate of inaccurate diagnoses, which may result in some patients having unnecessary tests and treatment for TIA. A study found that this occurred in more than half of the referrals to TIA clinic [9], which may affect timely

assessment and treatment of patients with actual TIAs.

The ABCD2 score was not completed in 13.1% patients. This information is crucial in triaging urgency of review. Guideline recommendations classify patients as high risk if: ABCD2 scores 4 or more, crescendo TIAs, atrial fibrillation and those on anticoagulation, as these patients should be seen urgently within 24 hours. If ABCD2 scores less than 4 or present more than one week after TIA symptoms, these are deemed low risk and require assessment and investigations within 7 days [1,5].

About 10% of the patients in 2012 did not have head imaging performed. New Zealand guidelines state 'all people with TIA should have brain imaging', with the caveat that 'patients with severe comorbidities may not be appropriate for scanning if the results would not change management' [1,5]. MRI with diffusion weighted imaging is the modality of choice, with the ability to pick up ischaemia or infarction in some patients. The low uptake of MRI in 18% reflects access to scans, with most patients having CT brain instead.

Antiplatelet therapy is important for secondary prevention of TIA. Aspirin naïve patients should be loaded with 300mg, followed up 75 to 150mg daily. If there are already on aspirin, dipyridamole may be added, or changed to clopidogrel alone [1,5]. Almost 10% did not have their antiplatelet regimen adjusted after TIA.

Carotid imaging should be considered for anterior circulation TIA. A consensus document published after identifying delays in carotid ultrasound and carotid endarterectomy (if warranted) recommend carotid dopplers if there was anterior circulation TIA with corresponding anterior circulation symptoms and the patient was a reasonable surgical candidate. This should be done within 24 hours if ABCD2 score was greater than 3, crescendo TIA or ongoing non-disabling stroke symptoms; otherwise it should be done within 7 days [10]. Ultrasound carotids were not performed in almost 20% of patients. The proportion of patients who had carotid dopplers performed reduced from 70% in 2009 to 57% in 2012. Of those done, about 90% were performed within one week, which was similar between the two periods.

Only 6.6% were referred for carotid endarterectomy. This may reflect the lower rate of carotid imaging performed in 2012. Surgery should preferably be done within 2 weeks, or within 48 – 72 hours for crescendo TIA or high grade stenosis [1,5]. If it is more than 2 weeks since symptom onset and ipsilateral stenosis of 70 – 99%, carotid endarterectomy should be triaged within 4 weeks [10]. Two patients had a delay to carotid endarterectomy; one was appropriate as symptomatic bradycardia required treatment which may otherwise

increase surgical risk. Unfortunately, the other patient did not have a timely carotid ultrasound, and represented to hospital with a stroke before having the scan and subsequent carotid endarterectomy. This case illustrates the importance of identifying embolic sources, which if untreated could result in devastating strokes.

With regards to hypertension, treatment is recommended unless there are contraindications. While the absolute target blood pressure is uncertain, guidelines advise benefit with a reduction of 10/5 mm Hg, with normal blood pressure assumed to be less than 120/80 [1,5]. Only 23% of TIA patients had blood pressure medications adjusted in 2012, compared to 40.2% for the earlier period. However, there was increased identification of orthostatic hypotension (from 3.7% to 11.5% in 2012). Awareness should be raised regarding the importance of hypertension management in TIA patients, and routine checks for orthostatic hypotension with up-titration of treatment.

Statins should be introduced or up-titrated after TIA to a target low density lipoprotein (LDL) cholesterol below 2.5; with caution advised for elderly or frail patients [1,5]. A meta-analysis identified an association between statin therapy at stroke onset and improved outcome in terms of functional independence and survival [11]. While there is evidence of benefit with statin from trial data, further consensus on treating older, frail patients are required [12].

In this study, statin therapy was not adjusted in 6.6% patients. 55.7% were already on a statin when presenting with TIA, suggesting improved adherence to cardiovascular guidelines. The proportion of those not on statin aged above 85 years increased from 3.7% to 9.8%. However, the age distributions between both periods are similar. A more cautious approach may have been adopted over time, including monitoring for postural hypotension.

Finally, anticoagulation is recommended for patients with TIA in the setting of atrial fibrillation, unless there are contraindications [1,5]. An audit completed in Northland, New Zealand identified poor utility of warfarin in 42%, with 10% of those on warfarin prior to stroke having sub-therapeutic international normalised ratio (INR) levels. The authors urged clinicians to consider anticoagulation in these patients, with the need to thoroughly monitor INR [13]. In this study, four patients did not have their ECG findings recorded electronically to decide whether anticoagulation was appropriate. This may hinder primary care doctors from considering anticoagulation as well.

In terms of outcomes, 32.8% were readmitted within 3 months, mostly due to non-neurological events. 10% were readmitted with further cerebrovascular events. A study looking

at 30-day readmission rates identified a 10% readmission rate; mostly due to other medical reasons [14]. It is unclear why there is a higher rate of readmission in our group, which may be an area of further review.

There were several limitations of this study. It was a retrospective review of clinical notes. Analysis was limited to TIA patients admitted to hospital; other high risk TIAs who were not admitted may have been excluded.

CONCLUSIONS:

The main findings are as follows: there was large proportion of patients with atypical symptoms or stroke mimics. There was also a high risk of readmission within 3 months. Areas of improvement include adjustment in antiplatelet therapy, blood pressure management and timely carotid ultrasound for anterior circulation TIA. The need for improvement in TIA management is ongoing, which was also illustrated in a Canterbury Initiative TIA audit [15].

Comparison of two different periods shows trends or changes in quality of patient management. It was interesting to identify some reduction in guideline-based management of TIA patients. Further education and reiteration of TIA management is required, and a further audit is warranted to ensure appropriate management of these patients.

REFERENCES:

1. Guideline for the assessment and management of people with recent transient ischaemic attack (TIA). Wellington: Stroke Foundation of New Zealand, 2008.
2. Wu C, McLaughlin K, Lorenzetti D, Hill MD, Manns BJ, Ghali WA. Early risk of stroke after transient ischemic attack: a systematic review and meta-analysis. Arch Intern Med 2007;167:2417-22.
3. Johnston S, Gress D, Browner W, Sidney S. Short-term prognosis after emergency department diagnosis of TIA. JAMA 2000;284:2901-6.
4. Rothwell P, Giles M, Chandratheva A, Marguardt L, Geraghty O, Redgrave JN, Lovelock CE, Binney LE, Bull LM, Cuthbertson FC, Welch SJ, Bosch S, Alexander FC, Silver LE, Gutnikov SA, Mehta Z. Effect of urgent treatment of transient ischaemic attack and minor stroke on early recurrent stroke (EXPRESS study): a prospective population-based sequential comparison. Lancet 2007;370:1432-42.
5. Gommans J, Barber P, Fink J. Preventing strokes: the assessment and management of people with transient ischaemic attack. N Z Med J 2009;122:1-11.
6. Child N, Barber A, Fink J, Jones S, Voges K, Vivian M. New Zealand National Acute Stroke Services audit 2009: organization of acute stroke services in New Zealand. N Z Med J 2011;124:13-20.
7. Price C, Blacker D, Grimley R, Dewey HM, Gerraty RP, Koblar SA, Denisenko SM, Storey CE, Bladin CF, Hill KM. National survey of management of transient ischaemic attack in Australia: Take Immediate Action. Med J Aust 2009;191:17-20.
8. Easton J, Saver J, Albers G, Chaturvedi S, Feldmann E, Hatsukami TS, Higashida RT, Johnston SC, Kidwell CS, Lutsep HL, Miller E, Sacco RL. Definition and

evaluation of transient ischemic attack: a scientific statement for healthcare professionals from the American Heart Association / American Stroke Association Stroke Council; Council on Cardiovascular Surgery and Anesthesia; Council on Cardiovascular Radiology and Intervention; Council on Cardiovascular Nursing and the Interdisciplinary Council on Peripheral Vascular Disease. Stroke 2009;40:2276-93.

9. Ranta A. The next step: implementing the new transient ischaemic attack guidelines across health sectors in New Zealand. N Z Med J 2009;122:7-10.
10. Ranta A, Naik D, Cariga P, Matthews T, McGonigal G, Thomson T, Bourke J, Mossman S, Thompson T, Holmberg P, Evans R, Abernethy D, Lee Y, Ramanathan A, Favot D, Clulow T, Haas L. Carotid endarterectomy: a Southern North Island regional consensus statement. N Z Med J 2010;123:58-74.
11. Chroinin D, Asplund K, Asberg S, Callaly E, Cuadrado-GOdia E, Diez-Tejedor E, Di Napoli M, Engelter ST, Furie KL, Giannopoulos S, Gotto AM, Hannon N, Honsson F, Kapral MK, Marti-Fabregas J, Martinez-Sanchez P, Milionis HJ, Montaner J, Muscari A, Pikija S, Probstfield J, Rost NS, Thrift AG, Vemmos K, Kelly PJ. Statin therapy and outcome after ischemic stroke: systematic review and meta-analysis of observational studies and randomized trials. Stroke 2013;44:448-456.
12. Furie K, Kasner S, Adams R, Albers GW, Bush RL, Fagan SC, Halperin JL, Johnston SC, Katzan I, Kernan WN, Mitchell PH, Ovbiagele B, Palesch YY, Sacco RL, Schwamm LH, Wassertheil-SMoller S, Turan TN, Wentworth D. AHA/ASA Guideline. Guidelines for the prevention of stroke in patients with stroke or transient ischemic attack. A guideline for healthcare professionals from the American Heart Association / American Stroke Association. Stroke 2011;42:227-276.
13. Bang A, McGrath N. The incidence of atrial fibrillation and the use of warfarin in Northland, New Zealand stroke patients. N Z Med J 2011;124:28-32.
14. Bhattacharya P, Khanal D, Madhavan R, Chaturvedi S. Why do ischemic stroke and transient ischemic attack patients get readmitted? J Neurol Sci 2011;307:50-4.
15. Child N, Fink J, Jones S, Voges K, Vivian M, Barber PA. New Zealand national acute stroke services audit: acute stroke care delivery in New Zealand. N Z Med J 2012;125:44-51.