

An Analysis of Transient Ischemic Attack Practices: Does Hospital Admission Improve Patient Outcomes?

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Introduction: Immediate treatment has been shown to decrease the recurrence of cerebrovascular accidents following transient ischemic attacks (TIA), prompting the use of a specialized neurologic emergency department (Neuro ED) to triage patients. Despite these findings, there is little evidence supporting the notion that hospital admission improves post-TIA outcomes. Through the lens of a Neuro ED, this retrospective chart review of TIA patients examines whether hospital admission improves 90-day outcomes. *Materials and Methods:* Two hundred sixty charts of patients discharged with TIA diagnosis were reviewed. These charts encompassed patients with TIA who presented to a main emergency department (ED) or Neuro ED from January 2014 to April 2015. Demographic information, admission ABCD² scores, admission National Institutes of Health Stroke Scale scores, and admission Modified Rankin Scale, and reason for any return visits within 90 days were collected. *Results:* This review shows that patients triaged by the Neuro ED were admitted at a lower rate than those seen by the standard ED. Further, patients triaged by the Neuro ED experienced lower readmission and recurrence of stroke or TIA within 90 days. *Conclusions:* These results provide preliminary support for the notion that discharging appropriate TIA patients, with adequate follow-up, will not adversely affect the recurrence of TIA or stroke within 90 days. **Key Words:** Transient ischemic attack—stroke—cerebrovascular accident—emergency department.

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Introduction

The risk of recurrent cerebrovascular events following a transient ischemic attack (TIA) is 13.4% in the first month and increases to 17.3% in the first 3 months, likely

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because of the presence of unstable atherosclerotic plaques or other risk factors, such as untreated atrial fibrillation.^{1,2} This particularly high possibility of ischemic stroke within 3 months of TIA has prompted emergency departments (EDs) to investigate different ways to minimize adverse outcomes.³ Current research reveals that predictors including resting heart rate or tissue data obtained from diffusion-weighted images have been effective in anticipating recurrent incidences of stroke post-TIA.^{4,7}

In the past decade, a trend to admit patients with TIAs to hospitals has emerged. From 2000 to 2010, the admission rate for patients with TIA presenting to an ED has increased from 70% to 91%.⁸ Durrani-Tariq et al (2013) posit that this is due to evidence suggesting the significant short-term risk of stroke following TIA. Similarly, another analysis of ED data from 2001 to 2011 highlights the increase in ED visits, TIA admitted, and transfers to other hospitals occurring over that time period.⁹ Data collected from a national database for the years 2006-2008

show that 63.5% of patients visiting the ED were admitted and 36.5% were discharged.¹⁰ However, this same study found evidence that the decision to admit patients correlates with median household income, insurance status, and ED-affiliated hospital type, factors unrelated to risk of recurrent stroke.¹⁰

Furthermore, despite overwhelming evidence that admission rates for TIA patients have increased in recent years, little evidence exists regarding the effect that hospital admission has on readmissions and outcomes. This study begins to examine that question by retrospectively reviewing TIA triage in a dedicated neurologic emergency department (Neuro ED) compared with TIA triage in a general ED. Readmission within 90 days is one metric for a hospital's ability to appropriately triage, diagnose, and treat the cause of the TIA. By comparing readmission rates, symptoms at readmission, and discharge diagnoses, this study aims to determine whether hospital admission improves post-TIA prognoses.

Methods

This retrospective review maintained ethical standards set by the institutional review board and adhered to institutional guidelines. A chart review was conducted for all patients who presented with TIA between January 2014 and April 2015 to the Neuro ED or main ED of a comprehensive stroke center. Two hundred sixty charts were reviewed. Following chart reviews, 117 patients who returned to the hospital within 90 days of TIA were selected and divided into two groups: patients discharged from the ED and patients admitted to the hospital. Additional preliminary analyses included grouping patients based on visit to our specialized Neuro ED ($n = 26$) and visit to the main ED ($n = 91$).

Treatment guidelines for the Neuro ED, including pre-hospital stroke alerts, maintaining an area in the ED managed by emergency medicine physicians with additional neurologic education, and utilizing a designated cerebrovascular neurointervention suite, have been described in a previous publication.¹¹ The Transient Ischemic Attack Rapid Assessment is one protocol in effect as part of the Neuro ED.

Assessment of all patients included a history and physical examination. Some patients required additional brain imaging. A National Institutes of Health Stroke Scale (NIHSS) score was assigned upon admission. ABCD² scores were calculated for all patients seen in the Neuro ED. Based on ABCD² scores received in the Neuro ED, patients were either admitted to the hospital or discharged with instructions for close follow-up by a designated neurologist in an outpatient clinic. Any return visits to the hospital within 90 days were noted for all patients, along with reason for return and diagnosis at return visit, if applicable.

Statistics

All statistics were performed using IBM SPSS Version 22 (IBM Corp, Armonk, NY, USA). Descriptive statistics, independent samples *t*-tests, and chi-square analyses were used when appropriate.

Results

Two hundred sixty TIA patient charts obtained from January 2014 to April 2015 were reviewed. One hundred seventy six of these patients who presented to the ED with TIA were subsequently admitted to the hospital, whereas 84 were discharged from the hospital. Of the 260 TIA patients, 117 returned to the hospital within 90 days; of those, 58% were initially admitted to the hospital and 42% were discharged (Table 1). Of the 117 patients who returned to the hospital within 90 days, 40% returned for neurologic reasons, with 9% returning for TIA, stroke, or cerebrovascular accident (Fig 1). For all patients regardless of reason, 36% were admitted upon return. Of the 47 patients who returned for neuro-related reasons, 24 were admitted. The mean age of patients returning to the hospital within 90 days of presenting with TIA was 69 years for the admitted group, with a standard deviation of 14, and 60 years for the discharge group, with a standard deviation of 16. There was a significant difference in age between the groups ($t[115] = -3.1$, $P = .002$). Table 1 shows the demographic information of the groups of admitted and discharged patients.

No difference was found in the NIHSS score (chi-square $P = .30$), indicating that the patient populations were similar at admission. Table 2 shows patients grouped by NIHSS score, initial workup, and risk category (from ABCD² rankings).

Twenty six of the 117 patients who returned to the hospital within 90 days were seen in our specialized department for neurologic emergencies (Neuro ED).¹¹ Interestingly, trends in these 26 patients differed from those seen in the main ED. Thirty-five percent (9 of 26) of Neuro ED patients were admitted to the hospital, whereas 64% (59 of 91) of the main ED patients were admitted (chi-square $P = .006$). Overall, 11 (9%) of the 117 who returned to the hospital within 90 days of initial TIA were diagnosed with cerebrovascular accident, stroke, or TIA. Ten

Table 1. TIA patients in the admitted and discharged categories with respect to age and sex

Demographics	All	Admitted	Discharge
Total (patients)	117	68	49
Female	69	41	28
Male	48	27	21
Age (mean \pm SD)	66 \pm 16	69 \pm 15	60 \pm 16

Abbreviations: SD, standard deviation; TIA, transient ischemic attacks.

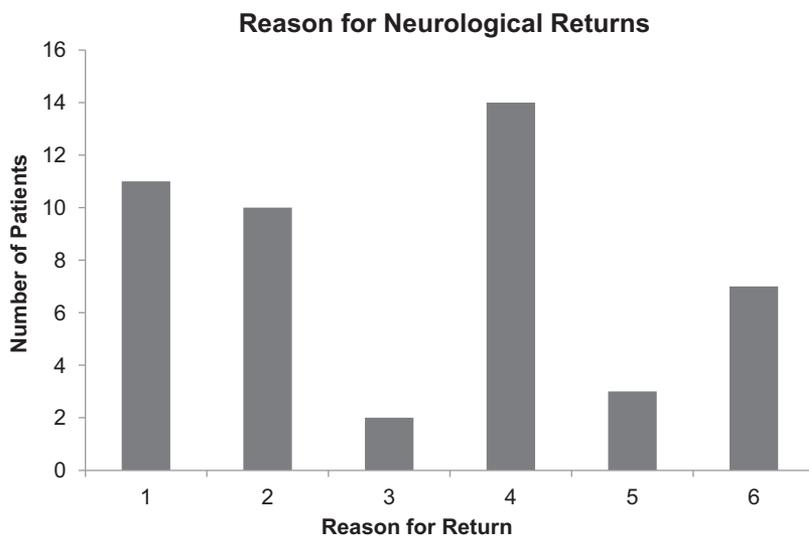


Figure 1. Forty-seven patients who returned to the hospital within 90 days of TIA, categorized by reason for neurologic return. Bar 1 represents patients returning for CVA, TIA, or stroke, Bar 2 for follow-up (imaging, laboratory work, clinic visit), Bar 3 for migraine or headache, Bar 4 for other, Bar 5 for psychological disorders, and Bar 6 for seizures. Abbreviations: CVA, cerebrovascular accidents; TIA, transient ischemic attacks.

Table 2. Percent of TIA patients in the admitted and discharged categories with respect to NIHSS, ABCD² score risk category, and administration of a diagnostic MRI, CT, and CTA

Diagnostic tool	Admitted (%)	Discharged (%)	Total (%)
NIHSS ≤ 3	83	97	89
Low-risk ABCD ²	46	61	52
Moderate-risk ABCD ²	40	34	38
High-risk ABCD ²	13	5	10
Diagnostic MRI	84	75	80
Diagnostic CT	96	71	85
Diagnostic CTA	61	31	48

Abbreviations: CT, computed tomography; CTA, computed tomography angiography; MRI, magnetic resonance imaging; NIHSS, National Institutes of Health Stroke Scale; TIA, transient ischemic attacks.

Low risk ABCD² scores are 1-3, moderate risk are 4-5, and high risk are 6-7.

of these 11 patients were initially seen in the main ED, whereas one of the 11 was seen in the Neuro ED. Therefore, the Neuro ED return with stroke rate was less than that of the main ED rate.

Discussion

Standards of care implemented by the Neuro ED in our regional medical center have improved the care provided for neurologic patients since January 2011.^{12,13} Time to treatment is a large factor in predicting outcomes for neurologic emergencies, in particular strokes and TIAs.¹⁴⁻¹⁶ For this reason, triaging neurologic emergencies through immediate identification, notification, diagnosis, and treatment likely benefit patient outcomes beyond just improving time to treatment.¹¹⁻¹³

Some data suggest that early initiation of evaluation and prescription of treatment for patients presenting to EDs with TIAs can improve the 90-day prognoses.^{15,16} The risk of a stroke recurring 90 days after TIA was reduced by 80% in non-admitted patients treated quickly upon arrival to the ED.¹⁵ A parallel study involving two phases of urgent care in a special outpatient clinic mirrored these results, while also showing subsequent reduction in hospital bed-days, acute costs, and 6-month disability.¹⁴ "Rapid access" stroke prevention clinics were able to use ABCD² scores to triage patients with TIAs, resulting in a lower 90-day stroke rate. In one study, stroke patients were triaged based on risk level determined by ABCD² score. All patients received the same standard of care; however, high risk (ABCD² ≥ 6) followed up with a neurologist within 7 days of the index TIA, moderate risk (ABCD² = 4 or 5) within 7-14 days, and low risk (ABCD² < 4) more than 14 days. The ABCD² scores obtained in this study predicted a 90-day post-TIA stroke rate of 9.2%, but with the urgent care practices implemented by the ED the overall 90-day stroke risk was actually 3.2%. This decrease in stroke rate occurred without requiring patients to be admitted to the hospital.¹⁶ To further explain this observation, our examination takes into account whether or not admitting TIA patients plays a role in improved prognosis within a 90-day period.

Our review found an overall TIA admission rate of 67%, based on this data, supporting the general trend observed in the literature.¹⁰ We then analyzed trends in 117 patients who returned to the hospital for various reasons within 90 days of initial TIA. Our data indicate that Neuro ED patients were admitted at a lower rate than those who entered through the regular ED. The Neuro ED patients also experienced less recurrence of TIA or stroke within 90 days. Beyond supporting the use of a specialized ED system, this study provides preliminary support for the notion that discharging appropriate TIA patients with

adequate follow-up will not adversely affect the recurrence of TIA or stroke within 90 days. The Neuro ED allows physicians to identify high-risk patients and admit them to the hospital. For low-risk patients, as indicated by ABCD² scores, this system allows for a timely output workup and neurology appointment within 48 hours. Further, we showed that admission for TIA does not necessarily prevent return for TIA or stroke within 90 days. Despite admission and proper workup, a high percentage of patients still returned to the hospital within 90 days. The high 90-day return rate of patients who were admitted for TIA suggests that admission may not improve post-TIA outcome.

The main limitation of this study is that it is a retrospective chart review. We showed a repeated stroke and TIA rate of 9% in returning patients, but this number may be an underestimation as returning patients may have received treatment at another institution for stroke or TIA. Subsequently, our findings in the Neuro ED are preliminary. Future studies will prospectively examine the population of TIA patients in our Neuro ED to more accurately answer this question. A specific evaluation of outpatients' 90-day outcomes has been attempted before, but ultimately did not present conclusive findings regarding a specific comparison of outpatient and inpatient prognoses.¹⁷ Prospective examination of 90-day follow-ups for a greater number of TIA patients may help support the notion that a specialized Neuro ED along with outpatient management can improve TIA patient outcomes. In addition, outpatient follow-up and fewer patient admissions would reduce hospital costs.

Research shows that early identification and treatment of stroke risk factors are crucial in improving long-term and 90-day outcomes. This is a preliminary review to attempt to identify if hospital admission improves outcome in TIA patients.¹⁸ Ultimately, we aim to exemplify this type of immediate treatment through continued implementation of our Neuro ED policies, while also contributing to literature that guides optimal post-TIA care.

Conclusions

Rapid assessment of TIA patients by a Neuro ED likely improves the 90-day prognosis of TIA patients. However, the decision to admit these patients, based on ABCD² score-assigned risk levels, does not result in better outcomes. Further prospective analyses are needed to determine the direct relationship between hospital admission or ED discharge and 90-day outcome following TIA.

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