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## Clinical Review

### CAN I SEND THIS PATIENT WITH STROKE HOME? STRATEGIES MANAGING TRANSIENT ISCHEMIC ATTACK AND MINOR STROKE IN THE EMERGENCY DEPARTMENT

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**Abstract—Background:** While transient ischemic attack and minor stroke (TIAMS) are common conditions evaluated in the emergency department (ED), there is controversy regarding the most effective and efficient strategies for managing them in the ED. Some patients are discharged after evaluation in the ED and cared for in the outpatient setting, while others remain in an observation unit without being admitted or discharged, and others experience prolonged and potentially costly inpatient admissions. **Objective of the Review:** The goal of this clinical review was to summarize and present recommendations regarding the disposition of TIAMS patients in the ED (e.g., admission vs. discharge). **Discussion:** An estimated 250,000 to 300,000 TIA events occur each year in the United States, with an estimated near-term risk of subsequent stroke ranging from 3.5% to 10% at 2 days, rising to 17% by 90 days. While popular and easy to use, reliance solely on risk-stratification tools, such as the ABCD2, should not be used to determine whether TIAMS patients can be discharged safely. Additional vascular imaging and advanced brain imaging may improve prediction of short-term neurologic risk. We also review various disposition strategies (e.g., inpatient vs. outpatient/ED observation units) with regard to their association with neurologic outcomes, such as 30-day or 90-day stroke recurrence or new stroke, in addition to other outcomes, such as hospital length of stay and health care costs. **Conclusions:** Discharge from the ED for rapid outpatient follow-up may be a safe and effective strategy for some forms

of minor stroke without disabling deficit and TIA patients after careful evaluation and initial ED workup. Future research on such strategies has the potential to improve neurologic and overall patient outcomes and reduce hospital costs and ED length of stay. © 2017 Elsevier Inc. All rights reserved.

**Keywords—**TIA; minor stroke; clinical review

#### INTRODUCTION

Stroke is the leading cause of serious disability and the fifth leading cause of death in the United States, with nearly 800,000 new cases annually (1). The public health burden of stroke is high, and is anticipated to increase dramatically by 2030 (2). Ischemic stroke makes up nearly 87% of all strokes (3). One of the major precursors of ischemic stroke is a transient ischemic attack (TIA), defined as a “transient episode of neurological dysfunction caused by focal brain, spinal cord, or retinal ischemia, without acute infarction” (4). There are an estimated 250,000 to 300,000 TIA events occurring each year in the United States, with a median survival of 8 years. The estimated near-term risk of subsequent stroke risk after TIA ranges from 3.5% to 10% at 2 days, rising to 17% by 90 days (5).

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TIA represents a significant health care burden in the emergency department (ED), with > 297,000 annual ED visits attributed to TIA in the United States, nearly 200,000 total inpatient admissions (via the ED and outpatient direct admission), and annual associated health care costs totaling \$2.6 billion (1,6,7). The number of patients with minor stroke has also grown considerably. While a consensus definition of “minor stroke” is lacking, for the purpose of this article, we adopted a commonly used definition of stroke syndromes with nondisabling deficits and National Institutes of Health Stroke Scale (NIHSS) score of  $\leq 5$  (8–11). In an analysis of the American Heart Association’s Get With the Guidelines–Stroke database, 7621 out of 33,995 patients (22.4%) arriving within 4.5 h of symptom onset had an NIHSS score of  $\leq 5$  (12).

In approaching TIA and minor stroke, it is appropriate to consider them together (collectively referred to as TIAMS). For example, a brief episode of a focal neurologic complaint that previously would have been classified as a TIA is now called a minor stroke if accompanied by abnormal findings on diffusion-weighted magnetic resonance imaging sequences (13). Recurrent stroke rates among patients with TIA are also very similar to those of patients with minor stroke (14). From the stroke neurologist’s perspective, the duration of symptoms is often less important than the cause of the event and what can be done to prevent a recurrence (15). Among minor stroke patients with nondisabling symptoms (e.g., isolated sensory loss, isolated facial droop, isolated dysarthria), it could be argued that the risks of thrombolytic therapy may outweigh potential benefits, and that such patients can potentially be treated conservatively, as are patients with TIA (10,16).

The ED is the primary clinical setting where TIAMS are frequently evaluated for the first time, and emergency clinicians play a critical role in the diagnosis and early management of TIAMS (12). While evidence-based guidelines for the emergency management of moderate to severe stroke are well-accepted within the medical community, there is less consensus regarding the optimal triage and management of TIAMS (13,14). Considering the potential risk of short-term (e.g., 30-day or 90-day) mortality, or recurrent stroke after TIAMS, a key concern for treating physicians in the ED is the execution of a safe and appropriate disposition plan (15,16). While most studies agree that urgent and timely evaluation for TIAMS is warranted, variations in clinical practice exist between inpatient and outpatient disposition of patients with TIAMS (17–20). Some patients are discharged after evaluation in the ED and are cared for in the outpatient setting, others remain in an “observation unit” without being admitted or discharged, while others experience prolonged and potentially costly inpatient admissions.

Recent work by Edlow, along with a 2016 American College of Emergency Physicians clinical policy on TIA, provides an excellent overview of the approach to TIA evaluation and care in the ED. However, questions remain regarding the ultimate disposition for these potentially high-risk patients (21,22). In addition, we expand on prior work by considering nondisabling minor strokes alongside TIA patients, and thus address the disposition of a larger population of ED patients. In this clinical review, we discuss current controversies regarding the management and disposition of patients with TIAMS presenting to the ED, namely, whether such patients can be safely discharged home for urgent follow-up from the ED vs. inpatient admission. We draw on data regarding the potential utility of common prediction tools, such as the ABCD and ABCD2 scores in helping to screen for such patients, and their association with near-term neurologic outcomes. We then summarize and describe previous studies on the safety and efficacy of different disposition approaches (e.g., hospital admission vs. outpatient management, including ED observation unit management) for TIAMS patients evaluated in the ED, with regard to neurologic and overall patient outcomes.

Ultimately, our hope is that by sharing our clinical review with the broader emergency medicine community, we may aid emergency clinicians and administrators in the safe and timely management of patients with TIAMS.

## DISCUSSION

### *Weighing the Evidence for Discharging or Admitting TIAMS*

*Can We Rely on Risk-Stratification Scores to Guide ED Disposition?* Several prediction scores have been developed using community- and hospital-based cohorts of TIA patients to determine which patients are at highest short-term risk for ischemic stroke and potentially which patients can be discharged safely (16,23–26). Among the most commonly used prediction tools is the ABCD2 score, which incorporates age, blood pressure, history of diabetes, and clinical features of the event (16,23,24,27). Such scores are simple to use; do not require specialized skill to obtain; and are easily scored, allowing for the potential use of a cut point (e.g., score of  $\geq 4$ ) to identify high-risk patients who may require rapid diagnostic testing (16,23,24,28).

Despite the advantages of its ease of use and simple interpretation, the utility of the ABCD2 score in helping guide admission vs. discharge decisions for TIAMS is limited. Recommendations from the American Heart Association suggest that hospitalization may be reasonable for TIA patients with an ABCD2 score  $\geq 3$  presenting within 72 h of symptoms, albeit with a low level of

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