
Best Clinical Practice



BEST CLINICAL PRACTICE: CONTROVERSIES IN TRANSIENT ISCHEMIC ATTACK EVALUATION AND DISPOSITION IN THE EMERGENCY DEPARTMENT

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□ Abstract—Background: Transient ischemic attack (TIA) affects over 200,000 patients annually in the United States, and it precedes approximately 14% to 23% of strokes. Patients are typically admitted for evaluation and management. **Objective:** This review investigates the controversies of emergency department (ED) evaluation of TIA, including imaging, clinical risk scores, rapid diagnostic protocols, and disposition. **Discussion:** TIA is a common condition, with over 200,000 patients affected annually, and is associated with risk of stroke. TIA is defined as a brief episode of neurologic dysfunction with no permanent infarction. A great deal of literature has evaluated the use of imaging, clinical risk scores, and diagnostic protocols in the evaluation of TIA. Head computed tomography noncontrast is not reliable to diagnose acute infarction. Magnetic resonance imaging with diffusion-weighted imaging displays greater diagnostic ability. Carotid imaging includes magnetic resonance angiography, computed tomography angiography, and Doppler with ultrasound. Risk scores that predict future stroke are not reliable when utilized alone. With imaging, including magnetic resonance imaging, patients with low-risk scores can be discharged. The use of ED diagnostic protocols and observation units can reduce length of stay while improving patient treatment and reducing stroke rate. An algorithm is provided for evaluation and disposition in the ED. **Conclusions:** TIA is a condition with high risk for stroke. Imaging is often not reliable, nor is the use of risk scores alone. The American College of Emergency Physicians provides a Level B Recommendation for the use of rapid diagnostic protocols to determine patient short-term risk for stroke while avoiding the reliance

on stratification instruments to discharge patients from the ED. Published by Elsevier Inc.

□ Keywords—transient ischemic attack; ischemic stroke; risk stratification; clinical score; neuroimaging; diagnostic protocol

INTRODUCTION

Transient ischemic attack (TIA) affects 200,000 to 500,000 patients in the United States annually, and this risk increases with age (1–3). This condition is classically considered to be a harbinger of stroke, as TIA may precede 14% to 23% of strokes (3–8). The risk of stroke after TIA may be as high as 10% at 7 days and 17% at 90 days (1–8). Due to this risk and the mortality and morbidity from stroke, TIA requires management and evaluation for high-risk conditions such as atrial fibrillation and carotid stenosis. Unfortunately, a significant proportion of patients are unaware of these symptoms and will not report them to a physician (1,2,9).

TIA was previously defined as a transient neurologic deficit due to ischemia, with symptom resolution in < 24 h. The American Heart Association (AHA) recently revised its definition to a brief episode of neurologic deficit resulting from cerebral ischemia, but not associated with permanent infarction (3–9). No time

restriction is present with this new definition. This modification was in part due to the finding that up to 30–50% of patients diagnosed with TIA demonstrate central infarction on neuroimaging (7–9). Symptoms associated with transient ischemia resolve within 1 h in 60% of patients and 2 h in 70% (7–9). Symptoms lasting over 1 h have a <15% chance of resolving (9). Visible infarction on neuroimaging is classified as stroke rather than TIA. The absence of neurologic symptoms with the presence of infarction on neuroimaging is termed “silent stroke” (1–8). This updated definition increases the rate of ischemic stroke by 50,000 annually, while decreasing the 90-day stroke rate in those diagnosed with TIA. At the same time, the rate of disabled patients from stroke would decrease by 3.4% (10).

Unfortunately, differentiating stroke, TIA, and stroke mimic (a condition that presents with stroke-like symptoms) can be difficult. Of patients presenting with stroke-like symptoms, up to 30% may actually be experiencing a stroke mimic such as hypoglycemia, seizure, neuropathy, sepsis, or migraine headache (11–13). Nonischemic transient neurologic attacks can be misdiagnosed as TIA, with diagnostic errors occurring in 20% to 62% of cases. Misdiagnosis can potentially increase risk of patient harm, as patients with true TIA that is considered mimic may not receive adequate treatment (13). Patients with mimic diagnosed with stroke may be given thrombolytics, with hemorrhage rate of approximately 1% to 2% (14,15).

A significant variation exists in the evaluation and management of patients with suspected TIA in the emergency department (ED), including imaging, laboratory investigation, consultation with Neurology, and disposition (16,17). Patients have historically been admitted for evaluation and management of suspected TIA. The push for rapid evaluation and treatment stems from a study by Johnston et al. demonstrating that 5% of patients with TIA go on to have a stroke within 2 days, with 10% suffering acute stroke within 3 months (1). This number has been questioned in the literature, with a 2016 study finding a stroke rate of 2.1% at 7 days and 6.2% at 1 year (18). Most argue that urgent evaluation, risk stratification, and preventative therapy are needed for patients; however, controversy exists regarding need for admission. The AHA and National Stroke Association (NSA) possess several criteria for which patients require admission, shown in Table 1 (3–6,8).

DISCUSSION

Assessment of patients with suspected TIA should be conducted in a rapid manner, as stroke and TIA must be differentiated in consideration of thrombolytic therapy. This evaluation of TIA can also determine which patients

Table 1. AHA and NSA Recommendations

Association	Admission Criteria
AHA	ABCD ² score of ≥ 3 , ABCD ² score of 0–2 and uncertain follow-up, or ABCD ² score of 0–2 and evidence that focal ischemia occurred.
NSA	Consider admission if first TIA within 24–48 h. For recent TIA within one week, hospitalization is needed for crescendo TIA (worsening TIAs), duration of symptoms longer than 1 h, internal carotid stenosis greater than 50% with symptoms, known cardiac source of embolus, or hypercoagulable state.

AHA = American Heart Association; NSA = National Stroke Association; TIA = transient ischemic attack.

require admission or discharge. Several factors associated with higher stroke risk include age over 60 years, infarct discovered on imaging, cardiogenic emboli, and modified Rankin score > 2 (1,2,17). Hypertension, diabetes, and coronary artery disease do not demonstrate statistically significant associations, though trends are present (16–18). The evaluation of suspected TIA centers on neuroimaging and the use of clinical risk scores, with the goal of risk stratification. However, the specific imaging required in the ED and patient disposition based on risk scores are controversial topics.

Imaging

The AHA/American Stroke Association (ASA) recommends neuroimaging within 24 h of suspected TIA. Magnetic resonance imaging (MRI) with diffusion-weighted imaging (DWI) is the preferred imaging modality, but computed tomography (CT) is most commonly available in the ED, as 56% to 92% of patients receive imaging with this modality in the ED (3–6,8,19).

Head CT. Rapid neuroimaging is utilized in patients with focal deficits and concern for ischemic stroke, as thrombolytics require the absence of hemorrhage. Head CT noncontrast is the primary imaging modality, which can rapidly identify other conditions such as intracranial hemorrhage or mass. This imaging modality displays sensitivities ranging from 12% for small emboli in peripheral vascular distributions to 52% for large proximal occlusions (3–6,8,17,19–22). Förster et al. in 2012 found that 95.7% of initial head CT examinations were negative for acute infarction (19). A study from Germany evaluating head CT noncontrast in 1533 patients with suspected TIA found a 3.1% rate of acute cerebrovascular accident, despite complete resolution of symptoms (20). Of the 1533 patients, 17 suffered ischemic stroke. However, no patients with new infarct on imaging experienced stroke while in the hospital (20). Another study in 2003 found the frequency of stroke did not differ at 90 days

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