



**The Management of ED TIA Patients:  
Can We Send Them Home From the ED?  
What Work-up Must Be Done First?**

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**Case Presentation**

A 58 year old female presents to the emergency department after developing dysarthria, diplopia, numbness, and pronounced weakness of the right face and hand that lasted roughly 12 minutes. The patient feels completely normal and only came in at his family's insistence.

Review of systems - mild headache with event. No palpitations, chest pain, or SOB.

Past medical history - Positive for hypertension and hyperlipidemia. No prior stroke or TIA.

Family history positive for premature coronary disease.

Meds - Beta-blocker for HTN. Not on aspirin.

Social - She does not smoke.

Physical Exam:

On examination the patient was normotensive, and comfortable.

- HEENT exam showed no facial or oral asymmetry or numbness. No scalp tenderness.
- CHEST exam showed no murmurs and a regular rhythm,
- ABDOMINAL and EXTREMITY exam was normal,
- NEUROLOGICAL exam showed normal mentation, CN II-XII normal as tested, motor / sensory exam normal, symmetrical normal reflexes, and normal cerebellar exam
- ED course:
  - ECG showed a normal sinus rhythm with mild LVH.
  - Non-contrast head CT scan was normal.
  - Blood-work (CBC with differential, electrolytes, BUN/Cr, and glucose) was normal. ESR was normal.
  - Monitor showed no dysrhythmias
  - Normal subsequent neurological symptoms.
  - The patient feels fine and is wondering if she can go home.

What do you think? What would you do?

## **Key Clinical Questions and Learning Points**

### **What is the 90-day risk of a subsequent stroke following an ED TIA evaluation?**

Transient ischemic attack (TIA) is defined as a neurological deficit lasting less than 24 hours, with most lasting less than one hour, brought on by focal cerebral or retinal ischemia.<sup>1</sup> TIAs are common, with an estimated 300,000 events occurring annually<sup>2</sup> and an estimated 5 million Americans having been given the diagnosis of TIA.<sup>3</sup> Furthermore, a TIA is essentially the “smoke before the fire” for these patients. Studies have shown that within 90 days of an emergency department diagnosis of TIA, 10.5% of patients will suffer a stroke, with most occurring within two days of the ED visit. Twenty one percent of these strokes are fatal and 64% are disabling. Additionally, 2.6% of TIA patients will die, 2.6% will suffer other adverse cardiovascular events, and 12.7% will have recurrent TIAs.<sup>4</sup> Roughly 15% of patients who have had a stroke report a history of TIA.<sup>5</sup> For many patients, stroke is considered to be a devastating event that is worse than death.<sup>6</sup> In 1999 stroke was the third leading cause of death in the United States (National center for health statistics, U.S. dept of health and human services). The national direct and indirect cost of stroke is estimated to be \$51 billion annually.<sup>7</sup>

### **What is the ischemic stroke risk within the first 48-72 hours of an ED TIA, such that hospital admission may be clinically indicated? Can risk following an ED TIA presentation be stratified, and based on what demographic and clinical evaluation factors?**

In 2000, Johnston reported the 90 day outcomes of 1,707 ED patients whose diagnosis was TIA.<sup>21</sup> 10.5% (180 patients) experienced a stroke, with half occurring in the first two days, and in total 25.1% experienced stroke of other adverse event in the first 90 days, with more than half occurring within the first four days. From their data five independent risk factors for stroke at 90 days were derived - age over 60 (OR1.8), diabetes (OR 2.0), TIA duration over 10 minutes (OR 2.3), weakness with TIA (OR 1.9), and speech impairment with TIA (OR 1.5).

Subsequently, in 2002 the same group derived seven risk factors from this data for cardiac morbidity at 90 days - atrial fibrillation (OR 7.2), history of coronary artery disease (OR 4.5), systolic blood pressure less than 140 (OR 4.5), LVH on ECG (OR 4.4), heart rate over 80 (OR 3.7), AV block on ECG (OR 3.3), and history of hypertension (OR 2.5).<sup>4</sup> Most patients suffering an adverse outcome did so within a short period following the index visit. It is not clear from this data what role diagnostic test results, such as an ADP, might play in screening patients for inpatient admission. Prospective validation of these findings is suggested.

### **What diagnostic testing must be performed in order to allow for outpatient evaluation and follow-up for ED TIA patients?**

All patients must have a history, physical, ECG, head CT, and appropriate blood-work (CBC, chem-7). Carotid imaging is also recommended, though the timing is what is at issue. Some suggest that it occur before discharge, others allow close follow-up. Though high grade stenosis is not common in TIA patients, when it is present, there is evidence that revascularization is best when done within two weeks to minimize morbidity. Other studies have demonstrated that it is logistically very difficult to achieve this on an outpatient basis. The need for urgent echo-cardiography to identify a cardio-embolic source is unclear and probably yet to be determined.

### **Which ED TIA patients might be the best candidates for outpatient evaluation and follow-up?**

There are several factors to consider. Ideally discharged patients should have a resolved deficit, a negative head CT, no history of atrial fibrillation or other cardioembolic sources (if they are not anti-coagulated), and ideally with a normal carotid doppler in the last six months. Additionally having a very low TIA risk score (either Johnston or ABCD criteria) is very helpful. Having said that, patients sent home from the ED for out patient management need to be on appropriate anti-platelet therapy, and have confirmed follow-up (especially if outpatient testing will be needed). Discharged patients also need to understand that another TIA or stroke may occur, especially in the next two days. If this occurs they need to return to the ED immediately to maintain the 3-hour window of opportunity should they be

having a lytic eligible stroke. As with everything, a well informed patient is better off.

### **Which ED TIA patients should in all instances be admitted?**

TIA patients with abnormal head CTs showing tumors, bleeds, or acute infarctions most likely will require inpatient services. Patients with persistent deficits by definition are not a TIA, but rather are a small stroke. Traditional practice is to admit them as well. If a patient is in atrial fibrillation with a TIA, then they need to be admitted for anticoagulation therapy. If a patient is known to have 70% carotid stenosis, and possibly also 50% stenosis, then admission for urgent (within two weeks) revascularization should be considered.

### **What were the methods of the Ross TIA ED diagnostic protocol? What are the main results of this clinical trial? What are the implications of these results?**

This was a prospective randomized study of an ED based accelerated diagnostic protocol (ADP) for TIA patients. Study TIA patients had a normal ED examination, head CT, ECG, lab work, and no known embolic source. Patients were randomized to an inpatient bed or to ADP care by an ED physician. Patients in both groups had orders for carotid dopplers, echocardiography, monitoring, serial examinations, and a neurology consultation. ADP patients with positive testing were admitted. The main outcomes were length of stay (LOS), 90-day total direct cost, recidivism, and clinical outcome.

149 patients were randomized to the ADP (75) or admission (74). More ADP patients received carotid imaging (97.3 vs 90.5%) and in less time (13.0 vs 25.2hr), and more received echo (97 vs 73%) in less time (19.1 vs 43hr). ADP patient median LOS was lower [25.6hr (21.9-28.7hr) vs 61.2hr (41.6-92.2hr)] and their 90-day costs were less (\$890 vs \$1,547). 15% of ADP patients were admitted with higher LOS and costs than discharged ADP patients (100.5 vs 24.2hr and \$2,736.8 vs \$843.88). 90-day related return visits were the same for both study groups (12%). More ADP patients were found to have stroke on their index visit (7 vs 5), but a comparable number developed a subsequent stroke (3 vs 2) or other major clinical event (4 each). This study suggests that a diagnostic protocol for TIA using

an ADP is more efficient, less costly, and demonstrated comparable clinical outcomes to traditional inpatient admission.

**Does the data suggest that an outpatient evaluation of TIA patients via an ED observation unit is a reasonable clinical approach?**

Yes. Applying these cost savings to a small percentage (18%) of TIA patients in the US would save at least \$29 million dollars annually. Currently there are 220 JCAHO accredited stroke centers in the US. A protocol for TIA patients such as this should probably be incorporated into the JCAHO accreditation process.

**What further studies could enhance our understanding of the ED management and disposition of ED TIA patients? Are there publications or clinical guidelines that provide a suggested approach to the ED evaluation and disposition of TIA patients?**

A recent review of TIA by two of the worlds leading experts on TIA is a “must read” for anybody interested in the state of the art for TIA patients. Additionally, recent guidelines for the prevention of subsequent stroke in patients with TIA or stroke are worth reading. Both papers focus more on preventative therapies, and less on specifically what should be done in the ED for these patients.

The management and disposition of emergency department patients with TIA is not entirely clear. It is mutually agreed upon in guidelines written by the American Heart Association (AHA) and the National Stroke Association (NSA) for the management of TIA, and standard emergency medicine textbooks, that patients with symptoms suggestive of a stroke or TIA require urgent evaluation in a setting such as the emergency department. Furthermore, this evaluation should include a history, physical, and ECG.<sup>8-13</sup> AHA guidelines and emergency medicine texts recommend that the initial evaluation include appropriate blood testing based on the history and CT imaging of the brain.<sup>11,12</sup> All agree that patients with noncardioembolic causes of TIA should receive antiplatelet therapy and that TIA patients with atrial fibrillation should receive anticoagulation. “Prompt” or “Urgent” imaging of the carotid arteries to detect stenosis greater than 70% is also agreed upon since urgent carotid endarterectomy is believed to be most beneficial in this group. However the optimal timing of endarterectomy in patients with high

grade carotid stenosis is unclear.<sup>12</sup> NSA guidelines and emergency medicine texts recommend hospitalization of patients with new onset TIA if imaging studies, such as carotid doppler, can not be performed urgently. However a separate review of TIA management hospitalization was identified as an area of uncertainty and suggested that management in a setting such as an emergency department observation unit may be a more cost effective alternative.<sup>12</sup> This is what prompted the TIA ADP study described above.

## **Patient Case Outcome**

- The patient was started on aspirin and admitted to the ED observation unit.
- While in the unit she had a 2-D echo with bubble contrast, which was normal. She had no arrhythmia detected on cardiac monitoring and no subsequent neurological deficits.
- However, carotid dopplers were abnormal. She showed 30-50% stenosis of the right internal carotid artery, and a severe flow limiting >70% stenosis of the left carotid artery at the origin of the internal carotid artery.
- She was admitted to the hospital for endarterectomy. Five days following ED arrival, and following inpatient pre-operative clearance, she underwent successful endarterectomy.
- On one month follow-up she was asymptomatic and her carotids were doing well.

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