



Evaluating ED Patients with Transient Ischemic Attack: Inpatient vs. Outpatient Strategies

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Case Presentation

A 59 year old male presents to the emergency department after developing dysarthria, diplopia, numbness, and pronounced weakness of the right face and hand that lasted roughly 8 minutes. His family confirmed findings. The patient feels completely normal and only came in at his families' insistence. Review of systems was significant for palpitations during the event, but no chest pain or shortness of breath. Past medical history is positive for hypertension and hyperlipidemia. There was no prior stroke or TIA. The patient smokes one pack per day and does not drink alcohol. Family history is negative for stroke, but positive for premature coronary disease. The patient has stopped his medications, and reports no allergies.

On examination the patient was mildly hypertensive, and comfortable. HEENT exam showed no facial or oral asymmetry or numbness, no carotid bruits, chest exam showed no murmurs and a regular rhythm, abdominal and extremity exam

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was normal, and neurological exam showed normal mentation, CN II-XII normal as tested, motor / sensory exam normal, symmetrical normal reflexes, and normal cerebellar exam.

ECG showed a normal sinus rhythm with mild LVH. The non-contrast head CT scan was normal. His blood work (CBC with differential, electrolytes, BUN/Cr, and glucose) was normal. While in the ED there were no dysrhythmias on the monitor, and no subsequent neurological symptoms. The patient feels fine and is wondering if he can go home. What do you think?

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Key Clinical Questions:

Is TIA just a little “mini-stroke” that lasts 24 hours and gets better?

Recent data on the duration of TIA symptoms indicates that most TIAs resolve within 30 to 60 minutes. Levy found that less than 15% of TIA patients with symptoms lasting over one hour had resolution of symptoms. In the NINDS studies placebo arm, if TIA did not resolve within 1 hour, or rapidly improve over 3 hours, then less than 2% had resolution of symptoms by 24 hours. With this in mind, Albers has proposed a re-definition of TIA - “A TIA is a brief episode of neurologic dysfunction caused by focal brain or retinal ischemia, with clinical symptoms typically lasting less than 1hr, and without evidence of acute infarction”. Clearly, a TIA is not a small or “mini” stroke.

What is the outcome of patients with TIA that present to the emergency department? Which TIA patients are likely to do worse?

TIAs are common, with an estimated 300,000 events occurring annually and an estimated 5 million Americans having been given the diagnosis of TIA. Furthermore, a TIA is essentially the “smoke before the fire” for these patients. Roughly 15% of patients who have had a stroke report a history of TIA. For many patients, stroke is considered to be a devastating event that is worse than death. 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.

In 2000 Johnston reported the 90 day outcomes of 1,707 ED patients whose diagnosis was TIA. 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. 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. 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).

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Subsequently in 2002 the same group derived seven risk factors from this data for separate cardiac morbidity at 90 days, they were - 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).⁴ 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 might play in screening patients for inpatient admission. Prospective validation of these findings is suggested.

After examining a patient with a TIA, can I just send them home from the emergency department for an office workup?

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, those 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. 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. All agree that patients with non-cardioembolic 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. 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.

It has been suggested that outpatient management of TIA is inadequate due to clinical barriers. In 2000 Goldstein reported that only 2% of TIA patients presenting to a primary care physicians office are admitted to the hospital on the day of the index visit, with an additional 3% admitted in the next 30 days. Only

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23% received head CT imaging, 40% received carotid imaging, 18% received an ECG, and 19% received an echocardiogram. Overall 31% had no evaluations within the first month of the index visit. Fewer than half of TIA patients with a history of atrial fibrillation were placed on anticoagulants, and only 59% of TIA patients had a change in antiplatelet therapy.

How many TIA patients need more than a head CT and an ECG in the emergency department?

There is evidence that TIA patients require more than a routine ED evaluation can provide. In 1995 Heneman and Lewis evaluated the outcomes of 161 ED patients admitted over one year with a diagnosis of acute stroke or TIA.¹⁹ Twenty one of these patients had an ED diagnosis of TIA with 3 developing a stroke and 3 having an “other significant inpatient outcome”. The remaining TIA admissions were classified as “not medically justified”. Overall they found that 39% of admissions for stroke or TIA were medically justified since adverse outcomes were identified following the initial ED evaluation. Patients with medically justified admissions spent 11.0 ± 10.6 days in the hospital compared to patients whose admission was not justified and spent 5.8 ± 5.2 in-hospital days. They concluded that admission was medically justified since a meaningful portion of patients were found to have a significant outcome that was missed on the initial ED evaluation.

Could a rapid “rule-out” program for TIA be part of a “brain attack” (stroke center) program, just as is done for low risk chest pain patients in a “chest pain center”? What are the necessary components of an ED TIA diagnostic protocol?

While there has been much interest in implementing “Brain attack” programs to rapidly initiate thrombolytic therapy in patients suffering acute ischemic strokes, little attention has been paid to programs to rapidly identify patients at high short term risk of stroke – such as TIA patients. Although it is important to treat patients with ischemic stroke rapidly, much benefit might be realized if patients are identified and treated before brain tissue necrosis occurs. Patients at risk include those with greater than 70% carotid artery stenosis, patients with paroxysmal atrial fibrillation not detected on initial ECG, and patients with echocardiographic findings associated with thromboembolism risk. Additionally, some TIA patients are actually experiencing a subtle stroke, not a TIA, and some develop a stroke shortly after their TIA.

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This “rapid rule out” approach has been developed for emergency department chest pain patients at low to intermediate risk of acute cardiac ischemia. Relative to traditional inpatient care, emergency department ADPs (accelerated diagnostic protocols) for chest pain have been shown to decrease length of stay and cost, improve patient satisfaction and quality of life, with comparable diagnostic outcomes. In a multicenter study of the impact of an ADP on the disposition of chest pain patients, relative to previous studies, it was suggested that availability of the ADP decreased the rate of “missed myocardial infarction” from 4.5% to 0.4%. If an emergency department ADP for TIA patients can be developed then it is possible that some of the same benefits demonstrated for chest pain patients, such as shorter length of stay, lower cost, comparable diagnostic outcomes, and perhaps even fewer inappropriate discharges, may be realized for emergency department patients experiencing TIA.

What is the difference in outcome of an ED TIA diagnostic protocol, compared to admission?

In 1999 Smith et al studied a TIA ADP used in an emergency department observation unit (EDOU) over a four month period. The protocol involved discretionary use of a neurology consultation, carotid Doppler, MR angiography, cerebral angiography, or echocardiography and compared the admission rate and cost of this approach. They used the same four month period in the year preceding the TIA ADP as a historical control for comparison. Over the two study periods 72 vs 73 ED TIA patients were included. During the study period, 27 of 72 TIA patients were enrolled in their ADP, with 17/27 (63%) being discharged from the ED. Overall the percent of all TIA patients discharged from the ED increased from 24.7% to 44.4% with the use of their TIA ADP. The percent of TIA patients evaluated, by inpatient admission or EDOU protocol, increased from 75.3% to 79.2%. Cost of discharged TIA ADP patients were similar to historical control TIA patients that were discharged in less than 3 days (\$1,676 ±\$880 vs. \$1868 ±\$749). This study is published as an abstract only and is limited in its historical control design and lack of clinical outcomes data.

In 2004 Ross reported preliminary results of a prospective randomized study of TIA patients that were managed in an ED observation unit, versus as an inpatient bed. All patients had orders for serial examination and neurology consultation, monitoring for atrial fibrillation, carotid Dopplers, and 2-D echo. Of the 99 patients, 53 were randomized to the ED work up (TIA accelerated diagnostic

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protocol or TIA-ADP) and 46 were randomized to inpatient care. Both groups were similar in terms of age, gender, and TIA risk factors for subsequent stroke and cardiac morbidity. 87% of patients managed using the TIA-ADP protocol were discharged from the ED. TIA-ADP patients showed a higher rate of test completion for carotid doppler (94% vs 85%) and 2-D echocardiogram (92% vs 72%). Compared to patients admitted for the inpatient evaluation (control group), the TIA-ADP patients hospital length of stay was decreased by 22.7 hours, and their cost was \$479 less for all TIA-ADP patients, and the cost was \$1,104 less for discharged TIA-ADP patients. Both groups showed comparable rate of stroke at 90 days. The most common reasons for a positive outcome were the subsequent development of stroke, and the discovery of carotid disease.

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Clinical Case Outcome

Emergency Department Course

The patient was started on aspirin and admitted to the ED observation unit. While in the unit he had a 2-D echo with bubble contrast, and carotid Dopplers - that were both normal. He had no dysrhythmias on his cardiac monitor. However twelve hours after his arrival in the emergency department, while in the EDOU, he developed a recurrence of symptoms that was persistent. He developed facial numbness, mild facial asymmetry with loss of his right naso-labial fold and dysarthria, and mild pronator drift. He was seen by a neurologist and admitted to the hospital for stroke on appropriate medication. While in the hospital he received an MRI that showed intra-cerebral atherosclerosis, which was treated medically.

Patient Outcome

He did well following his discharge.