

Evaluating ED Patients with Transient Ischemic Attack:

Inpatient vs. Outpatient Strategies

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TIA in the ED

- **Background**
 1. Definition of TIA
 2. The significance of TIA
- **Management of TIA in the ED**
 3. Recommendations for management of TIA
 4. Studies of the management of TIA
 5. The TIA Accelerated Diagnostic Protocol

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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 - palpitations during the event, no chest pain or SOB.
 - Past medical history - hypertension and hyperlipidemia. No prior stroke or TIA.
 - Family history positive for premature coronary disease.
 - Meds - Patient stopped his meds, reports no allergies.
 - Social - smokes one pack per day.

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Case Presentation (cont'd)

PE: 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 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.

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Case Presentation (cont'd)

- ED Course: ECG showed a normal sinus rhythm with mild LVH. The non-contrast head CT scan was normal. His bloodwork (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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1. Definition of TIA

- This is a TIA “by definition”
 - The original definition:
 - A sudden, focal neurological deficit ...
 - that lasts for less than 24 hours...
 - is presumed to be of vascular origin...
 - is confined to an area of the brain or eye perfused by a specific artery.

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Recent data on the duration of TIA symptoms

- Most TIAs resolve within 30 - 60 minutes:
 - Levy et al:
 - Less than 15% of TIA patients with symptoms lasting over one hour had resolution of symptoms.
 - NINDS placebo arm data:
 - If TIA did not resolve within 1 hour, or rapidly improve over 3 hours – less than 2% had resolution of symptoms by 24 hours.

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Albers Proposed 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”.

TABLE 1. FEATURES OF THE CURRENT AND PROPOSED DEFINITIONS OF TRANSIENT ISCHEMIC ATTACK.

Current, Time-Based Definition*	Proposed, Tissue-Based Definition†
Based on an arbitrary 24-hour time limit	Based on the presence or absence of a biologic end point
Suggests transient ischemic symptoms are benign	Indicates that transient ischemic symptoms can cause permanent brain injury
Promotes diagnosis on the basis of the temporal course rather than pathophysiology	Encourages use of neurodiagnostic tests to identify brain injury and its cause
Often delays interventions for acute cerebral ischemia	Facilitates rapid interventions for acute brain ischemia
Inaccurately predicts the presence or absence of ischemic brain injury	More accurately reflects the presence or absence of ischemic brain injury
Diverges from the distinction between angina and myocardial infarction	Consistent with the distinction between angina and myocardial infarction

*A transient ischemic attack is a sudden focal neurologic deficit lasting for less than 24 hours, of presumed vascular origin, and confined to an area of the brain or eye perfused by a specific artery.

†A transient ischemic attack is a brief episode of neurologic dysfunction caused by focal brain or retinal ischemia, with clinical symptoms typically lasting less than one hour, and without evidence of acute infarction.

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2. The significance of TIA:

- High volume:
 - 300,000 TIAs occur annually
 - 5 million Americans have been diagnosed with “TIA”.

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Significance of ED TIA Patients?

Johnston SC, Gress DR, Browner WS, Sidney S. Short-term prognosis after emergency department diagnosis of TIA. *JAMA*. 2000;284:2901-6.

- Study
 - Design: Cohort study; Kiaser HMO pts; 16 Ca. hospitals
 - Population = 1,707 ED TIA patients (3/97-2/98)
 - Outcomes at 90 d. = stroke, death, TIA, MACE, admits.
- Results:
 - 10.5% experienced a stroke
 - Half occurred in the first 2 days
 - 25.1% experienced a stroke or other MACE
 - More than half occurred in the first 4 days

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Significance of ED TIA patients?

Johnston et al. Short-term prognosis after emergency department diagnosis of TIA. *JAMA*. 2000;284:2901-6.

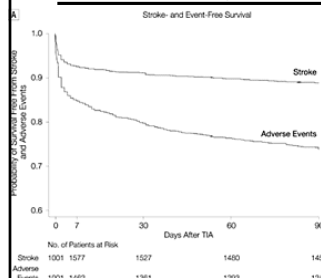


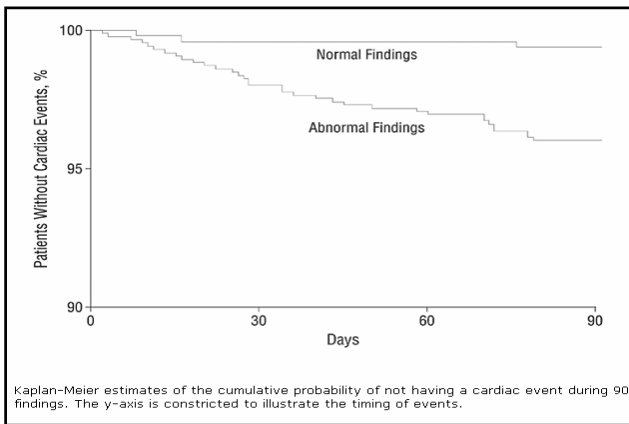
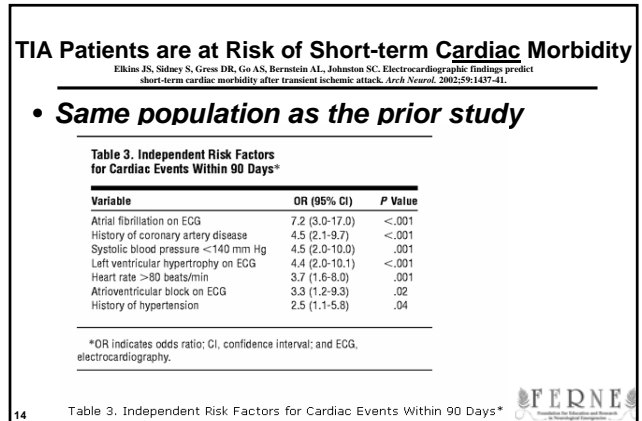
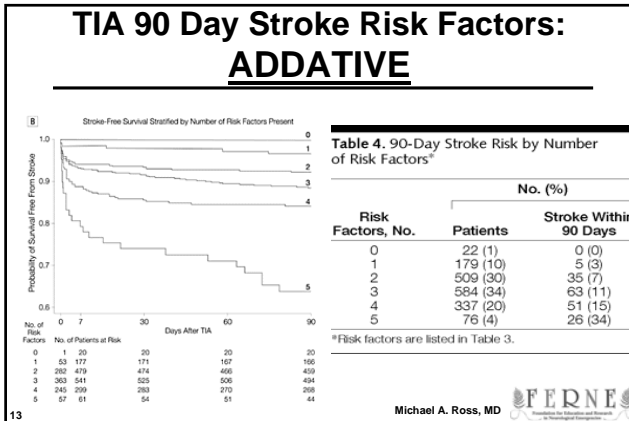
Table 3. Independent Risk Factors for Stroke Within 90 Days (N = 1707)*

	Odds Ratio (95% CI)	P Value
Age >60 y	1.8 (1.1-2.7)	.01
Diabetes mellitus	2.0 (1.4-2.9)	<.001
Duration of episode >10 min	2.3 (1.3-4.2)	.005
Weakness with episode	1.9 (1.4-2.6)	<.001
Speech impairment with episode	1.5 (1.1-2.1)	.01

*Based on logistic regression including all associated variables in univariate analysis ($P < .20$) with stepwise elimination of variables not contributing ($P > .10$). CI indicates confidence interval.

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A STROKE of Bad Luck

- Stroke is preceded by TIA in 15% of pts
- Stroke is considered “worse than death” by many patients
- National cost (direct & indirect) of stroke = \$51 billion annually!

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High risk: Stroke is the third leading cause of death in the US:

*Leading causes of death, 2000:

- **All causes** 100% (873 deaths / 100,000 pop.)
- #1 Heart disease 29.6% (258)
- #2 Cancer 23% (201)
- **#3 Stroke 7.0% (61)**
- #4 COPD 5.1% (44)
- #5 Accidents 4.1% (36)
- #6 Diabetes 2.9% (25)

*National Center for Health Statistics, U.S. Dept of Health and Human Services

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3. Guidelines for the Management of TIA in the ED

- Major TIA guidelines to consider:
 - Standard EM textbook
 - Tintinalli J., Kelen G, Stapczynski. Emergency Medicine, a comprehensive study guide. 5th ed. 2000.
 - ACEP clinical policy
 - Lewandowski C, Barsan W. Treatment of acute ischemic stroke. *Ann Emerg Med.* 2001;37:202-16.
 - ASA guidelines:
 - Culebras A, et al. Practice guidelines for the use of imaging in transient ischemic attacks and acute stroke. A report of the Stroke Council, American Heart Association. *Stroke.* 1997;28:1480-97.
 - AHA guidelines:
 - Wolf PA, et al. Preventing ischemic stroke in patients with prior stroke and transient ischemic attack : a statement for healthcare professionals from the Stroke Council of the American Heart Association. *Stroke.* 1999;30:1991-4.
 - NSA guidelines:
 - Brott TG, Clark WM, Fagan SC, et al. Stroke: the first hours: guidelines for acute treatment. *National Stroke Association.* 2000.

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Management of TIA, By the Rules:

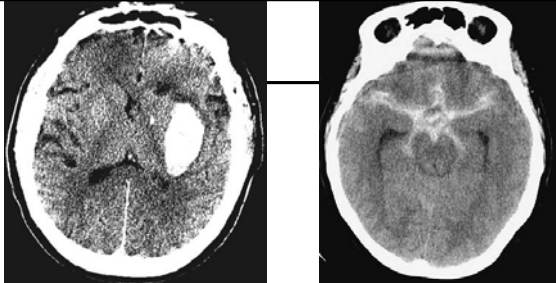
- Patients with symptoms of a TIA should:
 - **AHA, NSA, ACEP & Tintinalli all agreed:**
 - Receive urgent evaluation (ie ED visit)
 - Have a history, physical, and ECG
 - **AHA and Tintinalli agreed:**
 - Have appropriate blood testing based on history
 - Receive CT imaging of the brain
 - **AHA, NSA, ACEP & Tintinalli all agreed:**
 - Non-embolic TIA should receive antiplatelet Rx
 - Atrial fibrillation TIAs should be anticoagulated

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Initial ED Evaluation Should Include a History and Physical . . .

Conditions That May Cause Symptoms or Signs Suggestive of Transient Ischemic Attack.	
Migraine	Hypoglycemia
Inner-ear dizziness	Thrombocytopenia
Arterial dissection	Polycythemia
Transient global amnesia	Severe postural hypotension
Subdural hematoma	Hyperviscosity
Anticardiolipin-antibody syndrome	Cervical disk disease
Akinetic seizure	Carpal tunnel syndrome
Parietal-lobe epilepsy	Cerebral venous thrombosis
Subacute bacterial endocarditis	Temporal arteritis

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...Followed by appropriate testing, specifically an **ECG** to screen for atrial fibrillation and a **head CT** to screen for infarct, bleed, or other anatomic cause of symptoms

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Management of TIA, By the Rules:

- **AHA, NSA, ACEP & Tintinalli all agreed:**
 - Patients with symptoms of a TIA should:
 - Have “Prompt” or “Urgent” imaging of the carotids to detect patients with $\geq 70\%$ stenosis
 - Urgent endarterectomy is most beneficial in this group
- **NSA and Tintinalli agreed:**
 - Timing of the carotid dopplers:
 - Hospitalization if dopplers can not be done urgently.


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4. Studies of the Management of TIA

Office management of TIA???

– Goldstein LB, Bian J, Samsa GP, Bonito AJ, Lux LJ, Matchar DB. New transient ischemic attack and stroke: outpatient management by primary care physicians. *Arch Intern Med.* 2000;160:2941-6.


- **Results - focusing on the TIA group:**
 - **Diagnostic testing** within 30 days:
 - 23% had head CT done
 - 40% had carotid dopplers done
 - 18% had ECG done
 - 19% had echo done
 - 31% had no other evaluation than the office evaluation

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Office Management of TIA???

Goldstein et al. New transient ischemic attack and stroke: outpatient management by primary care physicians. *Arch Intern Med.* 2000;160:2941-6.

- **Therapies:**
 - Less than half of all patients with a history of atrial fibrillation received anticoagulation
 - 59% of TIA patients had a change in anti-platelet therapy
- **CONCLUSION:**
 - **Management of office patients with TIA needs improvement**
 - Barriers to optimal care need to be explored

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Relevant Studies: ED Management of TIA

Henneman PL, Lewis RJ. Is admission medically justified for all patients with acute stroke or transient ischemic attack? *Ann Emerg Med.* 1995;25:458-63.

- Design -
 - retrospective study of 161 ED pts admitted for CVA or TIA
- Results -
 - 6 of 21 TIA patients had major event or outcome in hospital
 - Overall 39% of TIA / CVA admits were “JUSTIFIED”:
 - JUSTIFIED LOS = 11.0 ±10.6 days
 - NOT JUSTIFIED LOS = 5.8 ±5.2 days
- Conclusion - *TIA patients require more care than a routine ED visit can safely offer*

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Preliminary EDOU TIA Protocols

Smith et al Effect of an emergency observation center (EOC) on cost of evaluation and hospital admissions for patients with (TIA). *AEM.* 1999;6:432.

- Design: Historical control comparison model
 - 72 EDOU period TIA patients
 - 73 non-EDOU period TIA patients (historical control)
- Results:
 - Percent with a *completed evaluation*
 - Increased from 75% to 79%
 - TIA *discharged from the ED* increased
 - Increased from 24.7% to 44.4%

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Management of TIA, “By the Rules”:

Johnston SC. Clinical practice. Transient ischemic attack. *N Engl J Med.* 2002;347:1687-92.

- Areas of uncertainty . . . Johnston et al:
 - Heparin after stroke in a.fib patient
 - Heparin after TIA in a.fib patient is clear
 - Optimal timing of endarterectomy after TIA
 - The benefit of neurology consultation
 - “The benefit of hospitalization is unknown.”
 - “Observation units within the ED . . . may provide a more cost-effective option.”

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Consider the CPOU Model

- Brain attack programs - NINDS data on rtPA within 3 hr (half within 90 min.)
 - ICB increased 0.6% to 6.4%
 - Mortality decreased 21% to 17% (N.S.)
 - % with minimal disability increased 32% to 44%
- TIA ADP - what impact might it have on 90 day outcomes:
 - Cost savings? Length of stay?
 - Missed stroke (10.5%) ?
 - death or MACE (5.2%) ?
 - Recurrent TIA (12.7%) ?

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5. The “TIA-ADP” study

Funded by EMF/FERNE grant

- Prospective randomized study.
 - Following initial ED testing, TIA patients were randomized to:
 - EDOU (TIA ADP protocol)
 - Inpatient hospital bed (traditional care)
- Primary outcomes
 - Index visit LOS
 - Index visit cost
 - Clinical outcomes

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Setting:


- High-volume university-affiliated suburban teaching hospital
 - Roughly 1,000 beds
- Emergency department = 74 bed
 - 2004 ED census = 113,105
 - 28% admit rate
- ED observation unit = 21 bed
 - 2004 EDOU census = 10,216
 - 19% admit rate


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TIA ADP Protocol:
Initial ED screening evaluation


- History and Physical
- IV, ECG, monitor
- HCT
- Labs
 - CBC with diff and platelets, glucose, lytes/BUN/Cr, ESR if indicated
- Contact neurologist
 - for neurology consult in EDOU.

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TIA-ADP Exclusion Criteria 

1. Persistent acute neurological deficits
2. Crescendo TIAs
3. Positive HCT scan for bleed, mass, acute infarct
4. Possible embolic source –
 - A. fib, P.A.Fib
 - patent foramen ovale
 - Cardiomyopathy
 - endocarditis
 - artificial heart valve
 - recent MI

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TIA-ADP Exclusion Criteria 


5. Known carotid stenosis (>50%) or mural thrombus
6. Non-focal symptoms – ie confusion, weakness, seizure, transient global amnesia
7. Hypertensive encephalopathy / emergency

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TIA-ADP Interventions in the EDOU:
Four Components

Serial testing


1. **Serial neuro exams** - staff, ECP, neurologist
Dx: Crescendo TIAs or occult stroke
2. **Cardiac monitoring**
Dx: Paroxysmal atrial fibrillation

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TIA ADP:
Target Pathology being Sought


Imaging

3. **Carotid dopplers** - (discretionary MRI / MRA)
Dx: Carotid stenosis >50-70%
4. **2-D echo**
Dx: Intra-cardiac clot or PFO (patient foramen ovale)


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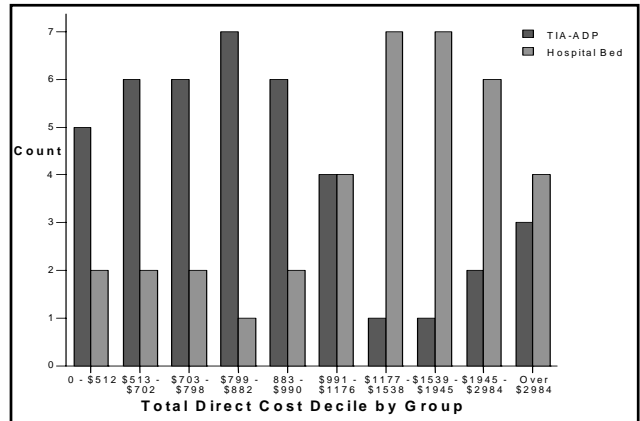
TIA-ADP Disposition Criteria

- **Admit / IP transfer**
 - Recurrent symptoms or neuro deficit
 - Surgical carotid stenosis - ie >50%
 - Embolic source requiring treatment
 - Unable to safely discharge patient
- **Home**
 - No recurrent deficits, negative workup
 - Appropriate antiplatelet therapy


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TIA-ADP PRELIMINARY RESULTS

37 Ann Emerg Med October 2004; 44:4-5121. Michael A. Ross, MD 




TIA-ADP CLINICAL RESULTS

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TIA ADP OUTCOMES

- 87% discharged from the ED
 - Hospital LOS decreased by 22.7 hours
- Lower cost:
 - All TIA-ADP patients (admitted + home) were \$479 less
 - Discharged TIA-ADP patients were \$1,104 less
- Higher rate of test completion
 - Doppler (94% vs 85%)
 - 2-D echo (92% vs 72%)
- Comparable rate of stroke at 90 days

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Summary

- TIA is not a “mini-stroke”, but it is a serious condition.
- Experts agree that TIA patients should be seen in ED for evaluation, including an ECG and a HCT.
- If hospital resources are available, a rapid ED evaluation of TIA is feasible and less costly than admission.

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CLINICAL CASE - OUTCOME

- 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 12 hours after his arrival in the ED, 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.

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CLINICAL CASE - OUTCOME

- 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.

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Questions??

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