

# The Management of TIA Patients: The Science and the Practice

Brian J. O'Neil MD, FACEP



---

Brian J. O'Neil MD FACEP  
Professor  
Department of Emergency Medicine  
Wayne State University  
Research Director,  
William Beaumont Hospital

Brian J. O'Neil MD, FACEP



## Case presentation

- 58 yo female presents to the ED with C/O developing dysarthria, numbness, and pronounced weakness of the right face and hand that lasted roughly 12 minutes.
- Review of systems - mild headache with event. No palpitations, chest pain, or SOB.
  - Past medical history - + for HTN and hyperlipidemia. - prior stroke or TIA.
  - FHx- positive for premature coronary disease.
  - Meds - Beta-blocker for HTN. Not on aspirin.
  - Social - She does not smoke/ no illicit drugs.

Brian J. O'Neil MD, FACEP



## Case presentation

- **Physical Exam:** patient was normotensive, and comfortable.
- **HEENT** no facial or oral asymmetry or numbness. No scalp tenderness. No Bruits
- **CHEST** no murmurs and a regular rhythm,
- **ABDOMINAL** and **EXTREMITY** exam was normal,
- **NEUROLOGICAL** normal mentation, CN II-XII normal, motor / sensory exam normal, symmetrical normal reflexes, and normal cerebellar exam.

Brian J. O'Neil MD, FACEP



## Case presentation

- ED course:
  - ECG: normal sinus rhythm with mild LVH.
  - Non-contrast head CT scan was normal.
  - 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?

Brian J. O'Neil MD, FACEP



## Background

- 300,000 TIAs occur annually
- Within 90 days:
  - **10.5%** will suffer a stroke
    - 64% will be disabling
    - Half occur within 1 - 2 days of ED visit
  - **2.6%** die
  - **2.6%** suffer adverse cardiovascular events
  - **12.7%** have additional TIAs

Brian J. O'Neil MD, FACEP



## Background

- Stroke is preceded by TIA in 15% of pts
- Stroke is the THIRD leading cause of death
  - National cost of stroke = \$51 billion annually!
  - Many consider stroke to be worse than death.

Brian J. O'Neil MD, FACEP



## Definition of TIA

### Current time based definition:

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

### Proposed tissue based definition:

- 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

This discussion is similar to what cardiology went through regarding unstable angina vs AMI

Tissue based not time based!

Brian J. O'Neil MD, FACEP



## Differential Diagnosis

### 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

Brian J. O'Neil MD, FACEP



## Physical Exam

- Exam – Realizing most have few neurologic findings
  - Carotid bruits
  - Atrial fibrillation
  - Neuro exam: 6 major areas
    - MS, CN II-IX, Motor, Sensory, Reflex, Coordination
  - NIH stroke score
    - Structured neurological exam
    - Validated tool for detection of significant deficits
    - Value as an educational tool / serial exams
    - Thrombolytic screening tool / outcome scale

Brian J. O'Neil MD, FACEP



## Utility of the H/P?

- TIA risk stratification
  - Johnston criteria
  - Rothwell criteria - "ABCD"
  - Combination/ cut offs of the above => stay tuned

Brian J. O'Neil MD, FACEP

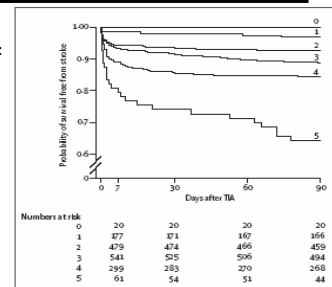


## TIA risk stratification - California Model

### Independent risk factors for stroke:

- TIA > 10 min. (OR = 2.3)
- Diabetes (OR = 2.0)
- Weakness with TIA (OR = 1.9)
- Age > 60yr (OR = 1.8)
- Speech impairment (OR = 1.5)

Risk factors were additive



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

Brian J. O'Neil MD, FACEP



### Our Patients' Johnston score?

Prospective trial of 149 pts with TIA symptoms

Group	Unadj. Odds Ratio	
	Beaumont (95% CI)	Johnston
Age > 60:	4.08 (0.89 - 18.72)	1.8
DM:	2.47 (0.82 - 7.41)	2
Weakness:	1.37 (0.47 - 3.99)	1.9
TIA>10min:	1.24 (0.41 - 3.79)	2.3
Speech:	1.02 (0.36 - 2.92)	1.5
Prev Stroke:	1.96 (0.50 - 7.74)	

Brian J. O'Neil MD, FACEP

### Our patients' Johnston score?

Prospective trial of 149 pts with TIA symptoms

Johnston Score	# of pts	CVA	TIA	Other MRE	MACE	total
0	5	0	0	1	0	1
1	26	0	0	2	2	4
2	44	4	0	1	1	6
3	46	8	5	1		14
4	18	3	1	1	1	6
5	8	0	1	1	0	2

Brian J. O'Neil MD, FACEP

### TIA risk stratification - British model?

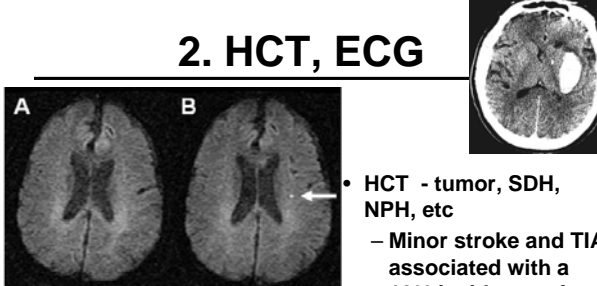
- **A = Age** >60 years = 1pt
- **B = BP:** SBP >140 or DBP >90 = 1pt
- **C = Clinical:**
  - Unilateral weakness = 2pt
  - Speech disturbance = 1pt
- **D = Duration**
  - >60 min = 2pt
  - 10 – 59 min = 1pt
  - <10 min = 0pt

Rothwell, et al. *Lancet* 2005; 366: 29–36

ABCD score	Patients (%)	Strokes (%)	% risk (95% CI)
≤1	2 (1%)	0	0
2	28 (15%)	0	0
3	32 (17%)	0	0
4	46 (24%)	1 (5%)	2.2 (0-6.4)
5	49 (26%)	8 (40%)	16.3 (6.0-26.7)
6	31 (16%)	11 (55%)	35.5 (18.6-52.3)
Total	188 (100%)	20 (100%)	10.5 (6.2-14.9)

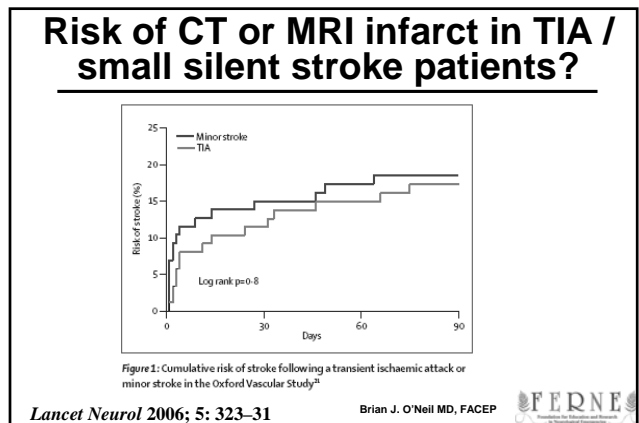
Table 3: 7-day risk of stroke stratified according to ABCD score at first assessment in the OXVASC validation cohort of patients with probable or definite TIA

## 2. HCT, ECG



- HCT - tumor, SDH, NPH, etc
- Minor stroke and TIA associated with a 10% incidence of stroke on MRI.

Figure 2. (A) Normal scan at baseline (no DWI lesion seen, no vessel occlusion, and no perfusion abnormality) in a 79-year-old man with a left hemispheric TIA lasting 90 minutes. (B) Arrow points to a small new DWI lesion in left middle cerebral artery territory seen at 30 days on follow-up MR. DWI = diffusion-weighted imaging.



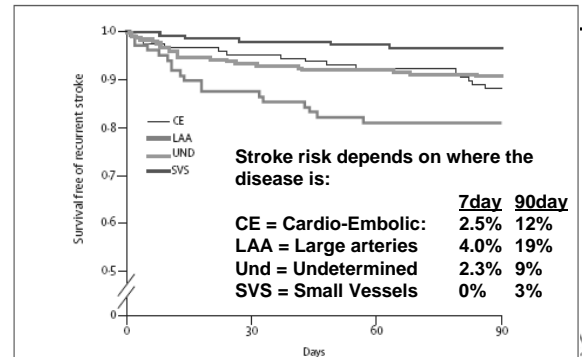
## 2. HCT, ECG

- ECG – **ATRIAL FIBRILLATION!!!**
  - Stroke risk – cardio-embolic risk
    - 4.6% at 1 month
    - 11.9% at 3 months
  - 61% reduction in annual risk of stroke (both ischemic or hemorrhagic) with coumadin

Brian J. O'Neil MD, FACEP



## 3. Carotid Dopplers



## Carotid Dopplers- WHEN???

- Carotid surgery if **>70%** stenosis is "time sensitive".
- 5 yr stroke risk reduction :
  - **0-2 weeks**
    - 75% stenosis = 30.2%
  - **2-4 weeks**
    - 75% stenosis = 17.6%
  - **4-12 weeks**
    - 75% stenosis = 11.4%
  - **+12 weeks**
    - 75% stenosis = 8.9%
- Similar for **50-70%** lesions

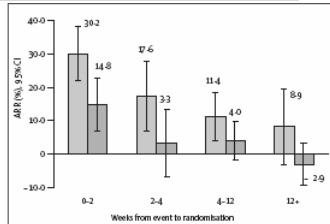
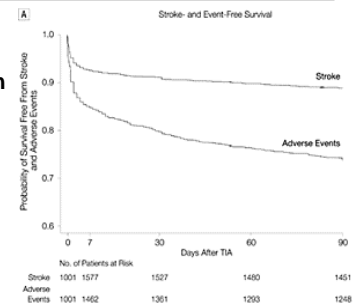


Figure 6: The absolute reduction with surgery in the 5 year risk of stroke and operative death in patients with 50-69% stenosis (red bar) and ≥70% stenosis without near-occlusion (blue bar) stratified by the time from last symptomatic event to randomization in a pooled analysis of data from randomized trials of endarterectomy for recently symptomatic carotid stenosis<sup>16</sup>. The numbers above the bars indicate the actual absolute risk reduction (ARR).

## 4. Further Clinical testing?

- Serial neurological exams?
  - 10.5% stroke within 3 months
    - Half within 2 days
    - Most within 1 day
- Monitoring for AF?
- 2-D echo?



## 5. Medical Management Antiplatelet Therapy

- Useful in non-cardioembolic causes
  - Aspirin 50-325 mg/day
  - Clopidogrel or ticlopidine
  - Aspirin plus dipyridamole
    - Latter two if ASA intolerant or if TIA while on ASA
- Routine anticoagulation not recommended

Brian J. O'Neil MD, FACEP



## 5. Medical management Risk Factor Modification

- HTN: BP below 140/90
- DM: fasting glucose < 126 mg/dl
- Hyperlipidemia: LDL < 100 mg/dl
- Stop smoking!
- Exercise 30-60 min, 3x/week
- Weight loss: < 120% of ideal weight
- Avoid excessive alcohol use

Brian J. O'Neil MD, FACEP



# FERNE/IEME Satellite: ED TIA Patient Diagnosis and Management

## Brian J. O'Neil MD, FACEP

### LIGHT-TO-MODERATE ALCOHOL CONSUMPTION AND THE RISK OF STROKE AMONG U.S. MALE PHYSICIANS

KLAUS BERGER, M.D., M.P.H., UMED A. AJANI, M.B., B.S., M.P.H., CARLOS S. KASE, M.D., J. MICHAEL GAZIANO, M.D., JULIE E. BURING, Sc.D., ROBERT J. GLAVIN, Ph.D., and CHARLES H. MENKENS, M.D., D.P.H.

#### ABSTRACT

**Background:** Several studies have shown U- or J-shaped relations between alcohol consumption and the risk of stroke. We evaluated the effect of light-to-moderate alcohol intake on the risk of stroke, with separate analyses of ischemic stroke and hemorrhagic stroke.

**Methods:** Our analyses were based on a prospective cohort study of 22,071 male physicians, 40 to 84 years old, who were participating in the Physicians' Health Study. At baseline, the participants reported that they had no history of stroke, transient ischemic attack, or myocardial infarction and were free of cancer. Alcohol intake, reported by 23,070 participants at baseline, ranged from none or almost none to two or more drinks per day.

**Results:** During an average of 12.2 years of follow-up, 675 strokes were reported. As compared with participants who had less than one drink per week, those who drank more had a reduced overall risk of stroke (relative risk, 0.79; 95 percent confidence interval, 0.66 to 0.94) and a reduced risk of ischemic stroke (relative risk, 0.77; 95 percent confidence interval, 0.62 to 0.94). There was no statistically significant association between alcohol consumption and hemorrhagic stroke. The overall relative risks of stroke for the men who had one drink per week, two to four drinks per week, five or six drinks per week, or one or more drinks per day were 0.79 (95 percent confidence interval, 0.69 to 1.04), 0.76 (95 percent confidence interval, 0.58 to 0.98), 0.52 (95 percent confidence interval, 0.42 to 0.65), and 0.80 (95 percent confidence interval, 0.64 to 0.99), respectively. In an analysis in which we controlled for major risk factors for stroke,

**Conclusions:** Light-to-moderate alcohol consumption reduces the overall risk of stroke and the risk of ischemic stroke in men. The benefit is apparent with as little as one drink per week. Greater consumption, up to one drink per day, does not increase the observed benefit. (*N Engl J Med* 1999;341:1567-74.)

©1999 Massachusetts Medical Society

**S**TROKE is a leading cause of morbidity and mortality in many countries. Among the risk factors for stroke, potentially hazardous but modifiable behavior such as alcohol consumption has drawn increasing attention in recent years, especially after a U-shaped relation was suggested between alcohol consumption and coronary heart disease.<sup>1</sup> Alcohol consumption is a modifiable behavior, and drinking moderate amounts of alcohol may have protective effects against subtypes of stroke.<sup>2-5</sup> Although most studies show a positive correlation between drinking and the risk of hemorrhagic stroke,<sup>2,3</sup> the relation with ischemic stroke is less clear.

Studies in North America and Europe have found a U- or J-shaped association, suggesting that moderate consumption of alcohol provides protection against ischemic stroke.<sup>6,7</sup> However, the definition of moderate consumption has differed substantially among studies. Some definitions were based on the frequency of alcohol consumption<sup>8</sup> and others on the amount (in grams of units per day).<sup>9</sup> In various studies, the categories associated with the lowest risk of ischemic stroke were 1 to 150 g per week,<sup>6</sup> 1 to 33 g per day,<sup>7</sup> 1 to 10 units per week,<sup>8</sup> two drinks per day,<sup>9</sup> and consumption of alcohol less than twice a day.<sup>10</sup> The reports of a protective effect of drinking with respect to cardiovascular and cerebrovascular dis-

From the Division of Preventive Medicine, Department of Medicine, Brigham and Women's Hospital (Dr. Berger, Dr. Kase, Dr. Gaziano), the Massachusetts General Hospital, Harvard Medical School, the Massachusetts Veterans Epidemiology Research and Informatics Center, Department of Veterans Affairs, Boston, Mass. (Dr. Berger), the Department of Neurology, Brigham and Women's Hospital, Boston, Mass. (Dr. Berger), the Department of Epidemiology, Harvard School of Public Health (Dr. Berger), the Department of Neurology, University of Toronto, Toronto, Ont., Canada (Dr. Berger), the Department of Neurology, University of Massachusetts, Worcester, Mass. (Dr. Berger), and the Department of Epidemiology and Public Health, University of Cambridge, Cambridge, U.K. (Dr. Gaziano).

Brian J. O'Neil MD, FACEP



## Management of TIA:

- Areas of **Certainty**:
  - Need for ED visit, ECG, labs, Head CT
- Areas of **less certainty**
  - The timing of the carotid dopplers
  - Need for echocardiogram
- Areas of **Uncertainty** -
  - “The benefit of hospitalization is unknown. . . **Observation units within the ED. . . may provide a more cost-effective option.**”
- Johnston SC. *N Engl J Med*. 2002;347:1687-92.

Brian J. O'Neil MD, FACEP



## An ED Diagnostic Protocol For Patients With TIA

To determine if emergency department TIA patients managed using an accelerated diagnostic protocol (ADP) in an observation unit (EDOU) will experience:

shorter length of stays

lower costs

comparable clinical outcomes

. . . relative to traditional inpatient admission.



Brian J. O'Neil MD, FACEP



## Patient population:

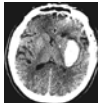
- Presented to the ED with symptoms of TIA
- ED evaluation:
  - History and physical
  - ECG, monitor, HCT
  - Appropriate labs
  - Diagnosis of TIA established
    - Decision to admit or observe
    - **SCREENING AND RANDOMIZATION**

Brian J. O'Neil MD, FACEP



## ADP Exclusion criteria

- Persistent acute neurological deficits
- Crescendo TIAs
- Positive HCT
- Known embolic source (including a. fib)
- Known carotid stenosis (>50%)
- Non-focal symptoms
- Hypertensive encephalopathy / emergency
- Prior stroke with large remaining deficit
- Severe dementia or nursing home patient
- Unlikely to survive beyond study follow up period
- Social issues making ED discharge / follow up unlikely
- History of IV drug use



Brian J. O'Neil MD, FACEP



## Methods: ADP Interventions


- Four components:
  - Serial neuro exams
    - Unit staff, physician, and a neurology consult
  - Cardiac monitoring
  - Carotid dopplers
  - 2-D echo
- **BOTH** study groups had orders for the same four components

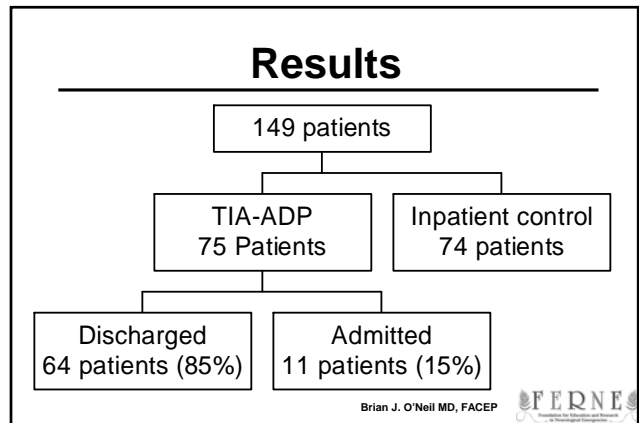
Brian J. O'Neil MD, FACEP



### Methods: ADP Disposition criteria

- **Home**
  - No recurrent deficits, negative workup
  - Appropriate antiplatelet therapy and follow-up
- **Inpatient admission from EDOU**
  - Recurrent symptoms or neuro deficit
  - Surgical carotid stenosis (ie >50%)
  - Embolic source requiring treatment
  - Unable to safely discharge patient


Brian J. O'Neil MD, FACEP 

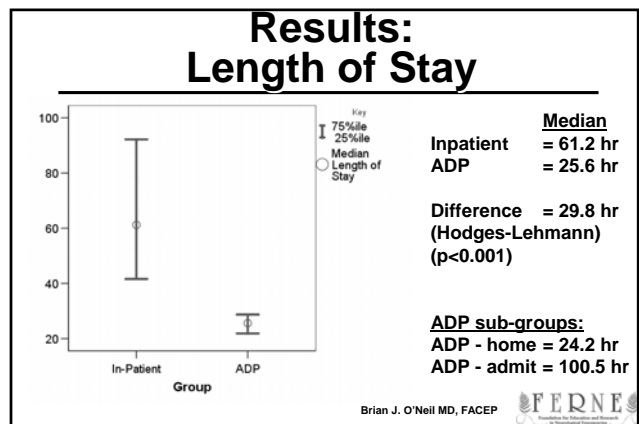


### Results: Patient Characteristics

	Inpatient Total n=74	TIA-ADP Total n=75
Mean Age (sd)	67.7yr (15.4)	68.4yr (15.3)
Male n (%)	34 (46%)	31 (41%)
TIA Stroke Risk Factors - mean (sd) *	2.7 (1.4)	2.4 (1.1)
Median (IQR) Initial ED LOS	6.2 hrs (5.0-6.2)	5.7 hrs (4.5-5.5)


\* Johnston - JAMA. 2000;284:2901-6.

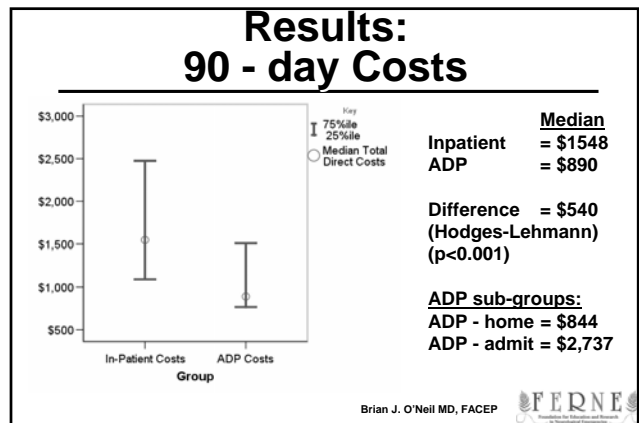
Brian J. O'Neil MD, FACEP 



### Results: 90-Day Clinical Outcomes

90 Day Outcomes	Inpatient Total n=74	TIA-ADP Total n=75
Related return visits	9 (12%)	9 (12%)
<b>Clinical Outcomes</b>		
Index visit CVA	5	7
Subsequent CVA (90 day)	2	3
Total 90 day CVA	7 (9%)	10 (13%)
Related Major event or MACE	4	4

Brian J. O'Neil MD, FACEP 



## Summary:

A diagnostic protocol for TIA in an EDOU is more efficient, less costly, and demonstrated comparable clinical outcomes to traditional inpatient admission.

Brian J. O'Neil MD, FACEP



## Implications

- National feasibility of ADP:
  - 18% of EDs have an EDOU
  - 220 JCAHO stroke centers
- National health care costs
  - Potential savings if 18% used ADP:
    - \$29.1 million dollars
  - Medicare observation APC
- Impact of shorter LOS
  - Patients – satisfaction, missed Dx
  - Hospitals – bed availability

Brian J. O'Neil MD, FACEP



## Our Case Patient's Johnston Score?

- Age > 60yr 0
  - Diabetes 0
  - TIA > 10 min. 1
  - Weakness with TIA 1
  - Speech impairment 1
- stroke risk score of 3:  
 ~5% at one week  
 ~8% at 3 months

Brian J. O'Neil MD, FACEP



## Our Case Patient's ABCD score?

- A = Age >60 years = 0
- B = BP: SBP >140 or DBP >90 = 0
- C = Clinical:
  - Unilateral weakness = 2pt
  - Speech disturbance = 1pt
- D = Duration
  - >60 min = 0
  - 10 – 59 min = 1pt
  - <10 min = 0
- TOTAL SCORE = 4 (2.2% risk of stroke at one week)

Brian J. O'Neil MD, FACEP



## CLINICAL CASE - OUTCOME

- patient started on aspirin and admitted to the ED observation unit.
- she had a normal 2-D echo with bubble contrast. She had no arrhythmia and no subsequent neurological deficits.
- carotid dopplers showed 30-50% stenosis of the right ICA and a severe flow limiting >70% stenosis of the origin of the left ICA
- She was admitted for endarterectomy. Five days following ED arrival, she underwent successful endarterectomy.
- On one month follow-up she was asymptomatic

Brian J. O'Neil MD, FACEP



## Who can you send home from the ED???

- C. Johnston:
  - “TIA risk score does not identify a “zero” risk group”
- Possibly:
  - Negative ED work-up (ECG, exam, CT), low TIA score, negative carotid dopplers within 6 months, safe home support for return in next 48 hours if needed?
- Discharge on Appropriate medications.
- Stress: quickly return if symptoms recur

Brian J. O'Neil MD, FACEP



## **QUESTIONS?**

---

- ***www.FERNE.org***
- **boneil@med.wayne.edu**
- **248-898-1301**

ferne\_ieme\_2006\_oneill\_tiarx\_111506\_finaled

Brian J. O'Neil MD, FACEP

