

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

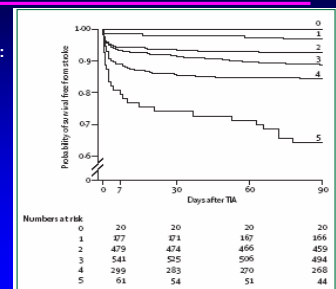


TIA risk stratification - California Model

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

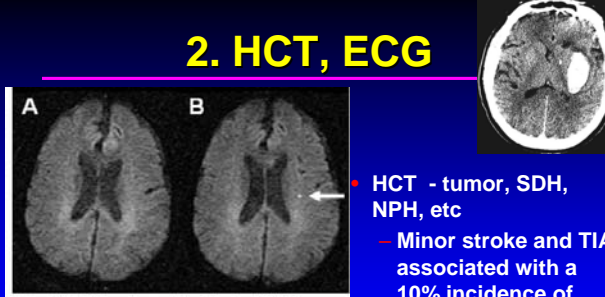
Rothwell, et al. *Lancet* 2005; 366: 29-36
 Brian J. O'Neil MD, FACEP

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

Brian J. O'Neil MD, FACEP

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.

Brian J. O'Neil MD, FACEP

Risk of CT or MRI infarct in TIA / small silent stroke patients?

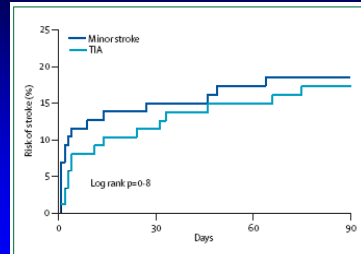


Figure 1: Cumulative risk of stroke following a transient ischaemic attack or minor stroke in the Oxford Vascular Study²⁴

Lancet Neurol 2006; 5: 323-31
 Brian J. O'Neil MD, FACEP

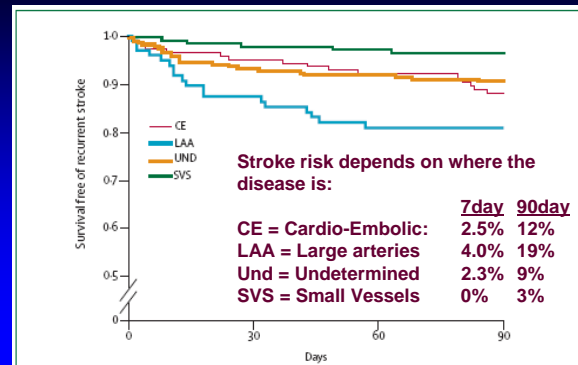
2. HCT, ECG

- 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

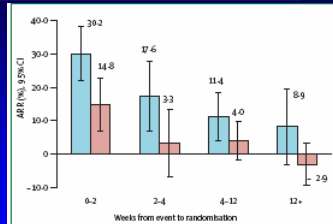
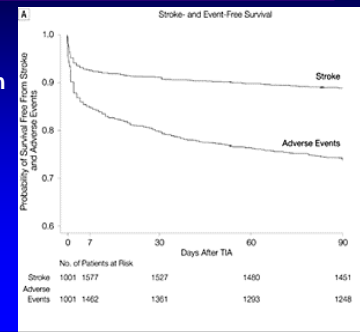


Figure 6: The absolute reduction with surgery in the 5 year risk of stroke and operative death in patients with 50-69% stenosis (red bar) and 70% stenosis without near-occlusion (blue bar) stratified by the time from last symptomatic event to randomization in a pooled analysis of data from randomized trials of endarterectomy for recently symptomatic carotid stenosis¹⁶. 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

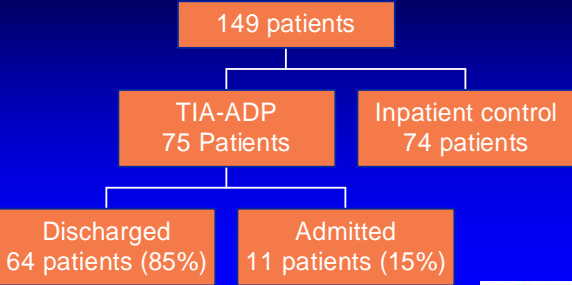


Methods: ADP Disposition criteria

- **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



```


    graph TD
      A[149 patients] --> B[TIA-ADP  
75 Patients]
      A --> C[Inpatient control  
74 patients]
      B --> D[Discharged  
64 patients (85%)]
      B --> E[Admitted  
11 patients (15%)]
    
```

Brian J. O'Neil MD, FACEP 

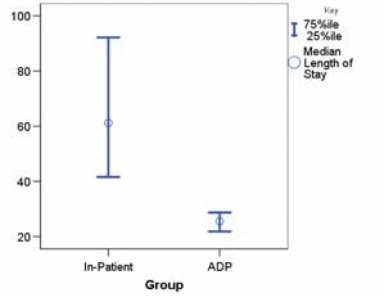
Results: Patient Characteristics

	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: Length of Stay




Median
 Inpatient = 61.2 hr
 ADP = 25.6 hr
 Difference = 29.8 hr
 (Hodges-Lehmann)
 (p<0.001)

ADP sub-groups:
 ADP - home = 24.2 hr
 ADP - admit = 100.5 hr

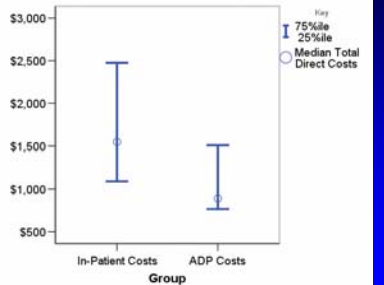
Brian J. O'Neil MD, FACEP 

Results: 90-Day Clinical Outcomes

90 Day Outcomes	Inpatient Total n=74	TIA-ADP Total n=75
Related return visits	9 (12%)	9 (12%)
Clinical Outcomes		
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 

Results: 90 - day Costs



Median
 Inpatient = \$1548
 ADP = \$890
 Difference = \$540
 (Hodges-Lehmann)
 (p<0.001)

ADP sub-groups:
 ADP - home = \$844
 ADP - admit = \$2,737

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_jeme_2006_oneill_tiarx_111506_finaled

Brian J. O'Neil MD, FACEP

