Dispo Dilemma: Risk Stratification of TIA in the ED

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Assistant Professor
Department of Emergency Medicine
Emory University School of Medicine
<table>
<thead>
<tr>
<th>Nature of Relationship</th>
<th>Name of Commercial Entity</th>
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<td>Advisory Board</td>
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<td>Consultant</td>
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<td>Other Relationships</td>
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Objectives

1. Understand which pre-existing condition place a TIA patient at higher risk for subsequent TIA/CVA

2. Explain the role of early imaging with MRI and Carotid Doppler in identifying TIA patients at high risk for subsequent CVA

3. Be able to calculate Risk scores for patient presenting to the ED with TIA symptoms

4. Apply risk stratification to identify which TIA patients need to be admitted and which can be safely discharged for out-patient follow-up
Case presentation

- A 58 year old female presents with pronounced weakness for 12 minutes. The patient feels completely normal and only came in at her family’s insistence. Past medical history – positive for hypertension and hyperlipidemia. No prior stroke or TIA.

- Physical exam: normotensive, no murmurs or bruits. **NEUROLOGICAL** exam is normal.

- ED course:
  - ECG showed a normal sinus rhythm with mild LVH.
  - Non-contrast head CT was normal.
  - Labs unremarkable
  - No dysrhythmias on monitor
  - Normal subsequent neuro exams

- The patient feels fine and is wondering if she can go home

- What do you think?
**TIA Definition – in evolution**

- **Traditional (1964)**
  - “Neurological deficit lasting less than 24 hours due to focal ischemia in the brain or retina”
  - NINDS tPA data - If TIA last >1hr, then >85% stroke

  - “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.”

  - “Transient episode of neurological dysfunction caused by focal brain, spinal cord, or retinal ischemia without acute infarction.”
  - TIME ELEMENT REMOVED
Epidemiology

- 200,000-500,000 cases per year
- Prevalence 2.3% = 5 million individuals
## Stroke Risk after TIA

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>N</th>
<th>Stroke Risk</th>
</tr>
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<tbody>
<tr>
<td>Johnston, et al (Kaiser ED)</td>
<td>2000</td>
<td>1707</td>
<td>10.5% 90d</td>
</tr>
<tr>
<td>Eliasew, et al (NASCET)</td>
<td>2004</td>
<td>603</td>
<td>20.1% 90d</td>
</tr>
<tr>
<td>Lovett, et al (Oxfordshire)</td>
<td>2004</td>
<td>209</td>
<td>12% 30d</td>
</tr>
<tr>
<td>Gladstone, et al (Toronto)</td>
<td>2004</td>
<td>371</td>
<td>5% 30d</td>
</tr>
<tr>
<td>Daffertshofer, et al (Germany)</td>
<td>2004</td>
<td>1150</td>
<td>13% 180d</td>
</tr>
<tr>
<td>Hill, et al (Alberta)</td>
<td>2004</td>
<td>2285</td>
<td>9.5% 90d</td>
</tr>
<tr>
<td>Lisabeth, et al (Texas)</td>
<td>2004</td>
<td>612</td>
<td>4.0% 90d</td>
</tr>
<tr>
<td>Kleindorfer, et al (Cinc)</td>
<td>2005</td>
<td>927</td>
<td>14.6% 90d</td>
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<tr>
<td>Whitehead, et al (Scotland)</td>
<td>2005</td>
<td>205</td>
<td>7% 30d</td>
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<tr>
<td>Correia, et al (Portugal)</td>
<td>2006</td>
<td>141</td>
<td>13% 7d</td>
</tr>
<tr>
<td>Tsivgoulis, et al (Greece)</td>
<td>2006</td>
<td>226</td>
<td>9.7% 30d</td>
</tr>
</tbody>
</table>

- 12% 90 day Stroke risk after TIA
- 5% at 2 days
Stroke Risk subsequent to a Stroke vs. TIA

- Stroke risk after a STROKE:
  - ~ 4% stroke risk at 90 days after stroke
    - IST: 3.3%/3m
    - CAST: 1.6%/3m
    - TOAST: 5.7%/3m
    - NASCET: 2.3%/3m

- Stroke risk after TIA:
  - ~ 11% at 90 days after a TIA

- 11% after a TIA vs. 4% after stroke
- Possible explanation - Tissue still at risk: unstable situation
  - More thrombo-embolic events
TIA PATHOPHYSIOLOGY

- Transient symptoms:
  - Recanalization
  - Brief transition from antegrade to retrograde flow

- Symptoms become manifest only when collaterals fail
Causes of TIA:

Intra-cranial vascular

Extra-cranial vascular

Cardio-embolic
Management of TIA: Initial evaluation - the essentials

- **History** - Duration - <10min, 10-60min, >60 min
  - Evidence to suggest non-vascular cause?
  - Vascular risk factors?
  - Symptoms to suggest potential causes?

- **Exam**: Neurologic deficits?
  - Carotid bruits (note limitations)?
  - Cardiac abnormalities? Arrhythmia, Murmur
  - Symptoms reproducible with maneuvers?

- **ECG, Monitor**

- **Labs** – CBC, glucose, chemistries, PT

- **HCT**
TIA: Differential Diagnosis

“Mimics”

- Epilepsy
- Complicated migraine
- Subdural hematoma
- Mass lesions, AVMs
- Arterial dissection
- Cervical disc disease
- Carpal tunnel syndrome
- Metabolic derangement (ex, hypoglycemia)
- Inner ear disease/BPV
- Transient global amnesia
- Cranial arteritis

Discordant diagnoses:

- Oxfordshire Community Stroke Project = 62% (GP vs Neurologist) (Dennis M, Stroke 1989)
- **SOS-TIA = 25% (Clinic vs Neurologist)**
- Discordance among neurologists (kappa 0.25-0.65) - Neurology 2003; 60:280
- Neurologists are not the ones making the diagnosis
2. ECG, Monitoring, and HCT

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

- Major dysrythmias, LV aneurism, etc
2. Brain imaging - HCT

- 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.
Imaging definition of stroke: When is a “TIA” a TIA?

- What about when a clinically silent acute infarct is present on imaging a TIA patient?

- New infarct on CT is a predictor of subsequent stroke:
  - More likely to have a stroke in 90 days (38% vs. 10%, p=0.008).
  - OR 4.1 after adjustment for clinical factors.

- New infarct on MRI is a predictor of subsequent stroke.
  - 5-fold increase in risk with new lesion on baseline MRI
  - Also, greater risk of in-hospital stroke in a second cohort.

VC Douglas et al, Stroke 2003; 34:2894
SB Coutts et al, Neurology 2005; 65:513
H Ay et al, Ann Neurol 2005; 57:679
TIA Stroke

Minor stroke

Cerebral infarction with transient signs

Reversible ischemia

Infarction

TIA

DWI+ TIA

Stroke
Decision Rules: The Holy Grail?
ABCD²

- Age > 60 (1)
- BP > 140/90 (initially) (1)
- Clinical
  - Focal Weakness (2)
  - Speech impairment W/O weakness (1)
- Duration
  - > 60 min (2)
  - 10-59 min (1)
- Diabetes (1)
ABCD2 Score

- 0-3 points, low risk group; 90 day stroke risk 3.1 %
- 4-5 points; moderate risk group; 90 day stroke risk 9.8%
- 6-7 points; high risk group; 90 day stroke risk 17.8 %
  - Josephson et al. Stroke 2008
What is our patient’s ABCD2 score?

- Age ≥60 (1) 0
- BP >140/90 (initial) (1) 0
- Clinical: 2
  - Focal weakness (2)
  - Speech impairment w/o weakness (1)
- Duration 1
  - ≥60 min (2)
  - 10-59 min (1)
- Diabetes (1) 0
- Total = 3
- Stroke at 2 days = 1%
- Stroke at 7 days = 2%
TIA: Stroke Risk Scores

- Short-term risk of stroke varies among the different studies:
  - At 2 days, 4-10%
  - At 30 days, 3-18%
  - At 90 days, 4-20%
Symptomatic ICA stenosis ≥50% = 9.1%
Symptomatic intracranial stenosis ≥50% = 5.0%
Atrial fibrillation = 5.9%
Other cardiac embolism = 2.1%

Table 2. Major Examination Findings According to the Conventional ABCD² Score Cutoff

<table>
<thead>
<tr>
<th></th>
<th>ABCD² Score</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;4 (n=679)</td>
<td>≥4 (n=497)</td>
<td>P</td>
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<tr>
<td>Total study sample</td>
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<td></td>
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<tr>
<td>Symptomatic internal carotid stenosis ≥50% or occlusion</td>
<td>9.1 (62)</td>
<td>13.7 (68)</td>
<td>0.014</td>
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<tr>
<td>Symptomatic intracranial stenosis ≥50% or occlusion</td>
<td>5.0 (34)</td>
<td>7.7 (38)</td>
<td>0.06</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>5.9 (40)</td>
<td>10.7 (53)</td>
<td>0.003</td>
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<tr>
<td>Other major cardiac sources of embolism*</td>
<td>2.1 (14)</td>
<td>3.2 (16)</td>
<td>0.21</td>
</tr>
<tr>
<td>At least one major examination finding</td>
<td>19.7 (134)</td>
<td>31.6 (157)</td>
<td>&lt;0.001</td>
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Patients seen at TIA clinics within 24 hours of symptom onset

<table>
<thead>
<tr>
<th></th>
<th>ABCD² Score</th>
<th></th>
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</tr>
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<tbody>
<tr>
<td></td>
<td>&lt;4 (n=679)</td>
<td>≥4 (n=497)</td>
<td>P</td>
</tr>
<tr>
<td>Symptomatic internal carotid stenosis ≥50% or occlusion</td>
<td>8.1 (28)</td>
<td>11.7 (38)</td>
<td>0.12</td>
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<tr>
<td>Symptomatic intracranial stenosis ≥50% or occlusion</td>
<td>5.8 (20)</td>
<td>6.2 (20)</td>
<td>0.83</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>7.3 (25)</td>
<td>12.4 (40)</td>
<td>0.025</td>
</tr>
<tr>
<td>Other major cardiac sources of embolism*</td>
<td>2.1 (7)</td>
<td>3.1 (10)</td>
<td>0.38</td>
</tr>
<tr>
<td>At least one major examination finding</td>
<td>10.0 (69)</td>
<td>29.6 (96)</td>
<td>0.004</td>
</tr>
</tbody>
</table>

Values expressed as percentage (no.) unless otherwise indicated.
*Mural thrombus, dilated cardiomyopathy, fibroelastoma, mitral stenosis, prosthetic heart valve, or recent myocardial infarction.
Design: Prospective observational cohort study of 637 TIA ADP patients (EDOU)
Limitations of Prediction Rules

- Discriminatory value sub-optimal
  - Patient with >70% carotid stenosis?
  - What about new a-fib?

- Generalizability is poor (reasons are not clear)
  - Clinical judgment **must** be considered!!!

- Perhaps these scores are really just selecting patients with “real” TIAs?
Other Decision Rules?

- ABCD$^3$
  - 9-point scale that adds a time element.
  - 2 points for “Dual” TIA within 7 days

- ABCD$^3$-I
  - Adds imaging
    - 2 points for 50% stenosis on carotid imaging
    - 2 points for abnormal Diffusion Weighted Imaging

- Predict early stroke at 7, 28 and 90 days

- Needs further validation

Merwick et al. *Lancet Neurology* 2010
Disposition Options:

1. Discharge for outpatient work up?
2. Continue her work up in the ED hallway?
3. Admit or observe?

- What the evidence and argument for each???
Option 1: Discharge for outpatient work up?

Office management of TIA???

- Design:
  - Retrospective study of 95 TIA and 81 stroke patients seen in office

- 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

- A “systems” issue not a “doctor” issue.
Timing of Carotid Dopplers?

Stroke risk depends on where the disease is:

- **CE** = Cardio-Embolic: 2.5% 12%
- **LAA** = Large arteries: 4.0% 19%
- **Und** = Undetermined: 2.3% 9%
- **SVS** = Small Vessels: 0% 3%
The Timing of Carotid dopplers?

- Carotid surgery if **>70%** stenosis lesions is “**time sensitive**”.

- Stroke risk reduction if done within:
  - 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
Noninvasive imaging of the cervicocephalic vessels should be performed routinely as part of the evaluation of patients with suspected TIAs (Class I, Level of Evidence A).

Initial assessment of the extracranial vasculature may involve any of the following: CUS/TCD, MRA, or CTA, depending on local availability and expertise, and characteristics of the patient (Class IIa, Level of Evidence B).
Echocardiography (at least TTE) is reasonable in the evaluation of patients with suspected TIAs, especially in patients in whom no cause has been identified by other elements of the workup (Class IIa, Level of Evidence B). TEE is useful in identifying PFO, aortic arch atherosclerosis, and valvular disease and is reasonable when identification of these conditions will alter management (Class IIa, Level of Evidence B).
Option 2:
Continue work up in the ED hallway?

ACEP TASK FORCE REPORT ON BOARDING

Emergency Department Crowding: High-Impact Solutions

- U.S. Trends:
  - Fewer hospitals
  - More ED visits
  - Higher age/acuity

- Result:
  - ED crowding

- You decide
It is reasonable to hospitalize patients with TIA if they present within 72 hours of the event and any of the following criteria are present:

a. \(ABCD^2\) score of \(\geq 3\) (Class IIa, Level of Evidence C).

b. \(ABCD^2\) score of 0 to 2 and uncertainty that diagnostic workup can be completed within 2 days as an outpatient (Class IIa, Level of Evidence C).

c. \(ABCD^2\) score of 0 to 2 and other evidence that indicates the patient’s event was caused by focal ischemia (Class IIa, Level of Evidence C).
When and Where?

- Inpatient admit . . . “An area of uncertainty”
- “The benefit of hospitalization is unknown. . . Observation units within the ED. . . may provide a more cost-effective option.”

- Observe using an ADP . . .
  - Outpatient TIA clinic
  - ED observation unit
### Eligibility Criteria:
1. Transient ischemic attack - resolved deficit, not crescendo
2. Negative Head CT
3. Workup can be completed within 48 hours

### Exclusion Criteria:
1. Head CT imaging positive for bleed, mass or acute infarction
2. Known extra-cranial embolic source - history of arterial fibrillation, cardiomyopathy, artificial heart valve, endocarditis, known mural thrombus, patient foramen ovale, or recent MI.
3. Known carotid stenosis (>60%)
4. Any persistent acute neurological deficit or crescendo TIAs
5. Non-focal symptoms - ie confusion, weakness, seizure, transient global amnesia
6. Hypertensive encephalopathy
7. Severe headache or evidence of cranial arteritis
8. Acute medical or social (poor home support) issues requiring inpatient admission
9. Prior large stroke - making serial neurological examinations problematic
10. Pregnancy

### General
- Admission
  - Place Patient in Observation in CDU
- Code Status
  - Full code

### Diet / Nutrition
- DIET GENERAL
  - DIET EFFECTIVE NOW starting Today at 0940 Until Specified

### Nursing Interventions
- CDU TIA PROTOCOL
  - STAT, UNTIL DISCONTINUED starting Today at 0940 Until Specified

### Patient Care
- Notify physician
  - Routine, PRI starting Today at 0939 Until Specified
  - Notify Physician for pulse greater than 120, respiratory rate greater than 24, temperature greater than 38.1, systolic BP less than 85, Pulse Ox less than 93%, change in mental status, chest pain or shortness of breath
- Vital signs
  - Routine, EVERY 4 HOURS First occurrence Today at 1200 Until Specified
- Pulse Oximetry
  - Routine, EVERY 4 HOURS First occurrence Today at 1200 Until Specified
  - With vital
- Neuro checks
  - Routine, EVERY 2 HOURS First occurrence Today at 1600 Until Specified
  - Starting today with First Occurrence Include Now For 12 Hours
  - Routine, EVERY 4 HOURS First occurrence Today at 1200 Until Specified

### Labs
- Laboratory
  - TSH, serum
    - STAT, ONE TIME First occurrence Today at 0940
  - Hemoglobin ATC
    - STAT, ONE TIME First occurrence Today at 0940
  - Chem 3, Lipid Panel
    - Routine, ONE TIME First occurrence Today at 0940

### Imaging
- MRI Angiogram Head w/wo Contrast
  - STAT
- MRI Brain w/wo Contrast
  - STAT
- MRI Angiogram Neck w/wo Contrast
  - STAT
TIA EDOU Data

- 4/12-4/13
- Grady
  - 176 pts (7% of census)
  - 79% discharge
  - CDU ALOS 16.9 hrs
  - 23.9 hour total LOS
- Emory Healthcare
  - 308 pts (6% of census)
  - 77% discharge
  - CDU ALOS 15.9 hours
  - 21.6 hour total LOS
Outcomes – better with outpatient TIA program:
- Shorter time to evaluation (1 vs. 3 days)
- Less time to first prescription (1 vs. 20 days)
- Fewer strokes at 90 days (2% vs. 10%)

Subset analysis of “phase 2”:
- Fewer subsequent (90day) admissions for stroke
  - 2% vs 8% (p=0.001)
- Fewer bed days per patient
  - 2 vs 6.9 (p<0.001)
- Lower cost per patient
  - £432 vs £1,056 (p=0.03)
  - Cost breakdown:
    - Increased vascular costs = + £166
    - Decreased stroke costs = - £790
A transient ischaemic attack clinic with round-the-clock access (SOS-TIA): feasibility and effects

French study of the impact of a 24hr TIA clinic (increased access to care) on 701 TIA / small stroke patients over 2 years:

- 17% showed brain injury on imaging
- Median TIA duration = 15 minutes
- Treatment outcomes:
  - Medical management = 100%
  - Urgent carotid revascularization = 5%
  - Anticoagulants for atrial fibrillation = 5%
- Clinical Outcomes
  - Same day discharge = 74%
  - 90-day stroke rate = 1.2% (vs. predicted by ABCD2 = 6.0%)

Philippa C Lavallée, Elena Mesegue, Halim Abboud, Lucie Cabrejo, Jean-Marc Olivet, Olivier Simon, Mikael Mazighi, Chantal Nifle, Philippe Niclot, Bertrand Lopergue, Isabelle E Klein, Eric Roquelaure, Philippe Gabriel Stea, Guy Leclère, Julien Lahreche, Pierre-Jean Trautou, Pierre Amarenco

Lancet Neurol 2007; 6: 953–60
Four components (following ED care)

1. **Serial neuro exams** – for stroke
   - Unit staff, physician, and a neurology consult
2. **Cardiac monitoring** – for paroxysmal atrial fibrillation
3. **Carotid dopplers** - for 50-70% stenosis
4. **2-D echo** –
Length of Stay

90 - day Costs

- Median length of stay: 61.2 hours
- Mean length of stay: 74 hours

- Median cost: $1,548
- Mean cost: $2,454

- Median cost: $890
- Mean cost: $1,493
Impact of an Emergency Department Observation Unit Transient Ischemic Attack Protocol on Length of Stay and Cost


Fadi Nahab, MD,* George Leach, MD,† Carlene Kingston, MD,* Osman Mir, MD,‡ Jerome Abramson, PhD,§ Sarah Hilton, MSHS,† Matthew Keadey, MD,† Bryce Gartland, MD,¶ and Michael Ross, MD†
4. Medical management

*Risk Factor Management*

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

National Stroke Association Guidelines for the Management of Transient Ischemic Attacks

*Editorial Team:* S. Claiborne Johnston, MD, PhD,1,2 Mai N. Nguyen-Huynh, MD,1 Miriam E. Schwarz, BS,1 Kate Fuller, MA,1 Christina E. Williams, BA, MS,1 S. Andrew Josephson, MD,1
EDOU performance at risk factor management

<table>
<thead>
<tr>
<th>Category</th>
<th>Carotid imaging</th>
<th>ECG</th>
<th>Diabetes screening</th>
<th>Screening and treatment if LDL above goal</th>
<th>Antithrombotic therapy</th>
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<td>Pre-ADP</td>
<td>96.5</td>
<td>80.7</td>
<td>94.7</td>
<td>98.3</td>
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<td>Non-ADP</td>
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<td>88.9</td>
<td>100.0</td>
<td>100.0</td>
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<td>81.1</td>
<td>100.0</td>
<td>89.2</td>
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Table 2. Rates of diagnostic study completion, risk factor evaluation and discharge on therapies for secondary stroke prevention

*Journal of Stroke and Cerebrovascular Diseases, Vol. ■, No. ■ (■-■), 2011: pp 1-6*
Polytherapy for Recurrent Stroke Prevention: Opportunity for Reduction of Subsequent Stroke Risk

- 12 meta-analyses
  - 106 studies / 210,926 pts.

Combination of
  - Diet
  - Exercise
  - ASA (ASA + dipyridamole)
  - Statin (high dose)
  - Antihypertensive drug (aggressive BP lowering)

Predicted 5-year major vascular event rate
  - RRR 80% (90%)
  - ARR 20% (22%)
  - NNT 5 (5)
  - Residual 5-year risk 5% (3%)

Benefits of combination therapy in patients with CVD and specific subtypes or co-morbidities

<table>
<thead>
<tr>
<th></th>
<th>Carotid stenosis</th>
<th>AF</th>
<th>Diabetes</th>
<th>Smoking</th>
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<tbody>
<tr>
<td>RRR (%)</td>
<td>90</td>
<td>86</td>
<td>84</td>
<td>87</td>
</tr>
<tr>
<td>ARR (%)</td>
<td>41</td>
<td>67</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>NNT (n)</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>4</td>
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</table>

ARR = absolute risk reduction; NNT = number needed to treat; RRR = relative risk reduction

Adapted with permission from Hackam DG, Spence JD. Stroke. 2007;38(6):1881
Antiplatelet therapy for TIA

**Aspirin** – 50-325mg
- Mainstay
- Long term protection:
  - 22% reduction in stroke, MI, vascular death
- Acutely protection *(CAST/IST)*:
  - 30% stroke reduction
    - 0.7% absolute decrease
  - 25% increase ICH
    - 0.2% absolute increase

**Clopidogrel alone:**
- Long term protection:
  - 8.7% reduction in stroke, MI, vascular death

**Aspirin + Clopidogrel:**
- Meta-analysis of FASTER, CHARISMA, CARESS, MATCH:
  - 34% reduction of stroke, TIA, ACS, death relative to aspirin alone
“POINT” NIH study: Is Aspirin + Clopidogrel Time sensitive?

Figure 2.1 Impact of clopidogrel-aspirin vs. either alone based on timing of enrollment after clinical event (Outcome: stroke, MI, or vascular death)

<table>
<thead>
<tr>
<th>Trial</th>
<th>Days</th>
<th>RRR</th>
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<tbody>
<tr>
<td>CHARISMA</td>
<td>18</td>
<td>24%</td>
</tr>
<tr>
<td>CHARISMA</td>
<td>180</td>
<td>16%</td>
</tr>
<tr>
<td>MATCH</td>
<td>5</td>
<td>17%</td>
</tr>
<tr>
<td>MATCH</td>
<td>21</td>
<td>8%</td>
</tr>
<tr>
<td>MATCH</td>
<td>60</td>
<td>0%</td>
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<tr>
<td>FASTER</td>
<td>0.5</td>
<td>28%</td>
</tr>
<tr>
<td>CURE</td>
<td>1</td>
<td>20%</td>
</tr>
<tr>
<td>CREDO</td>
<td>0.5</td>
<td>27%</td>
</tr>
</tbody>
</table>

Study Design

- Prospective, randomized, double-blind, multicenter trial, with 150 to 200 participating sites and 4,150 subjects

- Primary null hypothesis:
  - No difference in the event-free survival at 90 days in those treated with clopidogrel (600 mg loading dose then 75 mg/day) compared to placebo when therapy is initiated within 12 hours of onset
The patient was started on aspirin and admitted to the ED observation unit.

Normal 2-D echo, no arrhythmias, no subsequent deficits.

Carotid imaging was abnormal with > 70% stenosis of the left ICA.

She was admitted to the hospital and underwent successful endarterectomy 5 days later following pre-operative clearance.

One month later, she was asymptomatic and doing well.
CLOSURE I: PFO Closure for Cryptogenic Stroke or TIA

- First completed, prospective, randomized independently adjudicated PFO device closure study
- Primary Endpoint: 2 year incidence of stroke or TIA, all cause mortality for 30 days, neurological mortality to 2 years

<table>
<thead>
<tr>
<th></th>
<th>STARFlex</th>
<th>Medical</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>Composite</td>
<td>5.9%</td>
<td>7.7%</td>
<td>0.3</td>
</tr>
<tr>
<td>Stroke</td>
<td>3.1%</td>
<td>3.4%</td>
<td>0.77</td>
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<tr>
<td>Atrial Fib.</td>
<td>5.7%</td>
<td>0.7%</td>
<td>&lt;0.001</td>
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</table>

65-Year-Old Woman With 15-Year History of HTN

- Diagnosis: large artery **intracranial** occlusive disease

What about intracranial artery stenting?
NIH **Stopped** the trial in April 2011 *(451 patients – TIA and stroke)*:

- 30-day risk of stroke or death
  - Medical therapy **5.8%** (est 10.7%) – **below expected**
  - Stenting **14%** - **above expected**

- Aggressive medical therapy –
  - Aspirin + Clopidogrel x 3 mos, then aspirin alone
  - BP <140/90 mmHg [<130/80 in DM]
  - LDL-C <70 mg/dl
  - A1c < 7%, Smoking cessation, INTERVENT
Acute TIA

- Beware - TIA is a time sensitive emergency in patients that “look good”.

- Knowing current management issues, use local resources to maximize patient outcomes

- Emergency physicians need to be “experts” in managing neurovascular emergencies.
Resources

- Observation Protocols
  - Emory Observation Services Manual available on iTunes book store (it’s free)
  - ACEP website >> Clinical & Practice management>> Resources >> Observation Medicine
    - Graff’s Observation medicine text book
    - Sample protocols
    - Clinical policy statements

- Coding & Billing
Thank You!