Acute CVA and TIA

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Disclosure Statement

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Learning Objectives

1. Identify patients with underlying risk factors for stroke.
2. Employ cost-effective measures to decrease stroke in patients at risk.
3. State the 2009 AHA/ASA definition of TIA and describe the recommended evaluation.
4. Propose appropriate treatment options to improve outcomes in patients who suffer a stroke.
In 30 Minutes … The Plan

• CVA risk factors and $1^0$ prevention
• Acute CVA care
• $2^0$ prevention
• TIA – everything has changed
Stroke Pathogenesis

1. Acute stroke events are most often the result of which of the following pathological processes?

A. Acute thrombosis
B. Acute embolic event
C. Acute intracerebral hemorrhage
D. Acute subarachnoid hemorrhage
Stroke Pathogenesis

1. Acute stroke events are most often the result of which of the following pathological processes?

- A. Acute thrombosis [59%]
- B. Acute embolic event [41%]
- C. Acute intracerebral hemorrhage [1%]
- D. Acute subarachnoid hemorrhage [0%]
Stroke Type/Subtypes

Ischemic (80%-85%)
- Thrombotic (50%)
- Embolic (30%)

Hemorrhagic (15%-20%)
- Intracerebral (10%)
- Subarachnoid (6%)

What is a “cryptogenic stroke”? 

Large-vessel (20%-25%)
Small-vessel (20%-25%)
Stroke Type/Subtypes

- Ischemic (80%-85%)
  - Large-vessel (20%-25%)
  - Thrombotic (50%)
  - Small-vessel (20%-25%)
  - Embolic (30%)

But the underlying cause is undetermined

What is a “cryptogenic stroke”?
Stroke Risk Factors

• Traditional vs. novel

• Modifiable vs. non-modifiable
  – Age
  – Sex
  – Family Hx
  – Ethnicity
Traditional Risk Factors and CVA

Accounts for 2/3 of all strokes

- HTN
- Afib
- DM
- Physical inactivity
- Smoking
Stroke Type/Subtypes and Risk Factor: HTN

Ischemic (80%-85%)
  - Thrombotic (50%)
  - Embolic (30%)
  - Large-vessel (20%-25%)
  - Small-vessel (20%-25%)

Hemorrhagic (15%-20%)
  - Intracerebral (10%)
  - Subarachnoid (6%)

If you can control BP, can you reduce CVAs?
Stroke Type/Subtypes and Risk Factor: **HTN**

- **Ischemic (80%-85%)**
  - Thrombotic (50%)
  - Embolic (30%)

- **Hemorrhagic (15%-20%)**
  - Intracerebral (10%)
  - Subarachnoid (6%)

- **Large-vessel (20%-25%)**
- **Small-vessel (20%-25%)**

If you can control BP, can you reduce CVAs? **YES!**
* Supporting Evidence: Control HTN (the Placebo-Controlled Trials)

<table>
<thead>
<tr>
<th>Trial</th>
<th>Population</th>
<th>Treatment</th>
<th>NNT/yrs</th>
</tr>
</thead>
</table>
| MRC, 1985     | 17,354 pts  
Age: 36-64  
Diastolic: 90-109 | a) Bendrofluazide or  
b) Propranolol vs. placebo | 90/5.5yrs, 192/5.5yrs |
| SHEP, 1991    | 4,736 pts  
Age: 60+  
BP: 160-219/90+ | Chlorthalidone vs placebo | 43/4.5yrs    |
| STOP, 1991    | 1,627 pts  
Age: 70-84  
BP: 180-230/90+ | a) B-Blocker, or  
b) HCTZ + amiloride, or  
c) ACE-I vs. placebo | 34/4.0yrs    |
| MRC-2, 1992   | 4,396 pts  
Age: 65-74  
BP: 160-209/<115 | a) HCTZ + amiloride, or  
b) Atenolol vs placebo | 53/5.8yrs, 103/5.8yrs |
Stroke Type/Subtypes and Risk Factor: DM

Ischemic (80%-85%)
- Thrombotic (50%)
- Embolic (30%)

Hemorrhagic (15%-20%)
- Intracerebral (10%)
- Subarachnoid (6%)

Large-vessel (20%-25%)
Small-vessel (20%-25%)
Stroke Type/Subtypes and Risk Factor: Afib

- Ischemic (80%-85%)
  - Thrombotic (50%)
  - Embolic (30%)
  - Large-vessel (20%-25%)
  - Small-vessel (20%-25%)

- Hemorrhagic (15%-20%)
  - Intracerebral (10%)
  - Subarachnoid (6%)
  - If anticoagulated
Atrial Fibrillation and Stroke

- The older the patient with atrial fibrillation, the higher the risk of cardioembolic stroke.
- Strokes due to Afib have higher mortality and morbidity.
- Warfarin decreases absolute annual risk from 4.5% --> 1.4% (NNT=30).

![Bar chart showing CVA rate (% per yr) for different age groups: < 65 yrs, 65-75 yrs, > 75 yrs]
## CHADS<sub>2</sub> Risk Criteria

- CHF
- HTN
- Age > 75 yrs
- DM
- Prior Stroke or TIA

### Score

<table>
<thead>
<tr>
<th>Score</th>
<th>Risk Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Low-risk (ASA)</td>
</tr>
<tr>
<td>1</td>
<td>Moderate (ASA or warfarin)</td>
</tr>
<tr>
<td>2+</td>
<td>High-risk (warfarin)</td>
</tr>
</tbody>
</table>

### CHADS<sub>2</sub> Risk Criteria

<table>
<thead>
<tr>
<th>Pts. (N=1733)</th>
<th>CVA Rate (%/yr) (95%CI)</th>
<th>CHADS&lt;sub&gt;2&lt;/sub&gt; Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>1.9 (1.2 - 3.0)</td>
<td>0</td>
</tr>
<tr>
<td>463</td>
<td>2.8 (2.0 - 3.8)</td>
<td>1</td>
</tr>
<tr>
<td>523</td>
<td>4.0 (3.1 - 5.1)</td>
<td>2</td>
</tr>
<tr>
<td>337</td>
<td>5.9 (4.6 - 7.3)</td>
<td>3</td>
</tr>
<tr>
<td>220</td>
<td>8.5 (6.3 - 11.1)</td>
<td>4</td>
</tr>
<tr>
<td>65</td>
<td>12.5 (8.2 - 17.5)</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>18.2 (10.5 - 27.4)</td>
<td>6</td>
</tr>
</tbody>
</table>
NEW!!! AHA/ACC Guideline for the management of patients with Atrial Fibrillation

“In patients with nonvalvular AF, the CHA$_2$DS$_2$-VASc score is recommended for assessment of stroke risk. (Level of Evidence: B) ”
### CHADS<sub>2</sub> vs. CHA<sub>2</sub>DS<sub>2</sub>-VASc?

<table>
<thead>
<tr>
<th>CHADS&lt;sub&gt;2&lt;/sub&gt;</th>
<th>Score</th>
<th>CHA&lt;sub&gt;2&lt;/sub&gt;DS&lt;sub&gt;2&lt;/sub&gt;-VASc</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF</td>
<td>1</td>
<td>CHF</td>
</tr>
<tr>
<td>HTN</td>
<td>1</td>
<td>HTN</td>
</tr>
<tr>
<td>Age &gt;75 yrs</td>
<td>1</td>
<td>Age &gt;75 yrs</td>
</tr>
<tr>
<td>DM</td>
<td>1</td>
<td>DM</td>
</tr>
<tr>
<td>Prior Stroke or TIA</td>
<td>2</td>
<td>Prior Stroke or TIA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vascular disease</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age 65-74 yrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female sex</td>
</tr>
</tbody>
</table>

N=1733 VS. N=1,084 pts with Afib, not on warfarin x 1 year

**CHADS\textsubscript{2} vs. CHA\textsubscript{2}DS\textsubscript{2}-VASc?**

<table>
<thead>
<tr>
<th>Score</th>
<th>CHA\textsubscript{2}DS\textsubscript{2}-VASc</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CHF</td>
</tr>
<tr>
<td>1</td>
<td>HTN</td>
</tr>
<tr>
<td>2</td>
<td>Age &gt;75 yrs</td>
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</tr>
<tr>
<td>1</td>
<td>Female sex</td>
</tr>
</tbody>
</table>

**Risk Category**
- 0: Low-risk (ASA)
- 1: Moderate (ASA or warfarin)
- 2+: High-risk (warfarin)

**N= 73,538 pts** with afib, not on warfarin
10 year period in Denmark

Atrial Fibrillation: Warfarin
Potential Harms vs. Potential Benefits

• Decreases CVA by 64% (vs. ASA 22%)
  – **Absolute reduction approx. 3%/yr**

• Rate of ICH 0.1 - 0.6%
  – Increased with advanced age, HTN

• Major bleeding rates: 1.2%/yr
Which of the following new oral anticoagulants is approved for the management of non-valvular Afib?

A. Dabigatran (Pradaxa) - BID
B. Rivaroxaban (Xarelto) - qd
C. Apixaban (Eliquis) - BID
D. All of the above
Which of the following new oral anticoagulants is approved for the management of *non-valvular* Afib?

A. Dabigatran (Pradaxa) - BID  
B. Rivaroxaban (Xarelto) - qd  
C. Apixaban (Eliquis) - BID  
D. All of the above
If you were asked...

Which of the following new oral anticoagulants is approved for the management of DVT/PE?

A. Dabigatran (Pradaxa)
B. Rivaroxaban (Xarelto)
C. Apixaban (Eliquis)
D. All of the above
If you were asked…

Which of the following new oral anticoagulants is approved for the management of DVT/PE?

A. Dabigatran (Pradaxa)
B. Rivaroxaban (Xarelto)
C. Apixaban (Eliquis)
D. All of the above
Traditional Risk Factors and CVA

Accounts for 2/3 of all strokes
The Last “Traditional” Risk Factor: What About Family History?

• Documented parental stroke by 65 yrs of age is associated with a 3-fold increase in stroke in offspring.

Based on 8-year follow-up of 3,443 stroke-free Framingham offspring

Stroke Risk Factors

• Traditional vs. *novel*

• Modifiable vs. non-modifiable
  – Age
  – Sex
  – Family Hx
  – Ethnicity
Novel CVA Risk Factors: Antidepressants

- **Methods**: 136,293 post-menopausal women
  - From WHI, prospectively followed, avg 5.9 yrs
  - 5,496 were taking antidepressant at start

- **Results**: Hazard ratio (95%CI)
  - SSRI: 1.40 (1.09-1.80)
    - Hemorrhagic stroke: 2.12 (1.1 - 4.07)
    - Ischemic stroke: 1.21 (0.8 - 1.83)
    - All cause mortality: 1.32 (1.1 - 1.59)
  - TCA All cause mortality: 1.67 (1.33-2.09)

Risk Factors: Intracerebral Hemorrhage

- Hypertension
- Amyloid angiopathy
- AVMs
- Brain tumors
- Bleeding disorders
- Vasculitis
- CNS infection
- Septic embolism

High-risk groups
- Older age
- Ethnicity
(African American, Asian, Mexican American)

Drugs
- Anticoagulants
- Cocaine
- Amphetamines
- SSRIs
Subarachnoid Hemorrhage

- 80% due to saccular aneurysms
- Who is at risk?
  - Hypertension
  - Smoking
  - Vasculitis, SLE
  - Genetic
- Peak age 50

Sudden “thunderclap” headache, “worst HA of my life”
Neck pain/nuchal rigidity, vomiting, onset with exertion
In 30 Minutes … The Plan

• CVA risk factors and prevention

• Acute CVA care

• TIA – everything has changed
2. An 82 y/o male developed sudden dysarthria and RUE weakness. Onset at 8am. He arrives at the ED at 11 am. IV is inserted, labs sent.

Which of the following imaging studies should be ordered STAT?

A. Non-contrast head CT
B. Contrast head CT
C. CT-A (angiogram) of the head
D. Non-contrast MRI of head
2. An 82 y/o male developed sudden dysarthria and RUE weakness. Onset at 8am. He arrives at the ED at 11 am. IV is inserted, labs sent.

Which of the following imaging studies should be ordered STAT?

- A. Non-contrast head CT (88%)
- B. Contrast head CT (4%)
- C. CT-A (angiogram) of the head (3%)
- D. Non-contrast MRI of head (4%)
Stroke Type/Subtypes

Ischemic (80%-85%)
- Thrombotic (50%)
- Embolic (30%)

Hemorrhagic (15%-20%)
- Intracerebral (10%)
- Subarachnoid (6%)

Large-vessel (20%-25%)
Small-vessel (20%-25%)
Stroke Type/Subtypes

Ischemic (80%-85%) →

Hemorrhagic (15%-20%) →
3. An 82 y/o male developed sudden dysarthria and RUE weakness. Onset at 8am. He arrives at the ED at 11 am. BP= 200/100
At 12 noon, the labs and head CT are reported as “normal.” Your management will include....?

A. Initiate IV thrombolytic (tPA), Initiate IV nicardipine (Cardene) (for BP control), initiate Aspirin 325 mg po.
B. Initiate IV tPA, initiate IV nicardipine, do NOT initiate ASA 325 mg
C. Do NOT start IV tPA, initiate IV nicardipine, initiate ASA 325 mg
D. Do NOT start IV tPA, do NOT start IV nicardipine, initiate ASA 325 mg
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C. Do **NOT** start IV tPA, **initiate** IV nicardipine, **initiate** ASA 325 mg
D. Do **NOT** start IV tPA, do **NOT** start IV nicardipine, **initiate** ASA 325 mg

✓ D. Do **NOT** start IV tPA, do **NOT** start IV nicardipine, **initiate** ASA 325 mg
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D. Do NOT start IV tPA, do NOT start IV nicardipine, initiate ASA 325 mg
What Is the Data Supporting tPA for Stroke?

- 12 randomized trials of thrombolytics vs placebo for acute ischemic CVA
  - 2 were positive
  - 10 were negative or neutral

*The NNT.com*
The NINDS Trial

<table>
<thead>
<tr>
<th>Location</th>
<th># of Pts</th>
<th>Time of CVA</th>
<th>Drug and Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>624</td>
<td>3 hours</td>
<td>1) tPA 0.9 mg/kg vs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2) Placebo</td>
</tr>
</tbody>
</table>

RESULTS

A. Mortality: No difference!!!

B. Part 1: At 24-hour neurologic assessment (291 pts)
   No difference!!!

C. Part 2: At 3-month neurologic assessment (333 pts)
   (+) Significant difference***
The NINDS Trial

Positive Results

- 50% of pts with minimal/no disability at 3 months (with tPA)
- 38% of pts with minimal/no disability at 3 months (with placebo)

Number needed to treat (to experience benefit): 1 in 8

Absolute risk reduction (ARR) = 12% (NNT = 8)

Number needed to treat (NNT) = 1/ARR
Example: 1/.12 = 8.3
The NINDS Trial

Positive Results

• 50% of pts with minimal/no disability at 3 months (with tPA) vs.
• 38% of pts with minimal/no disability at 3 months (with placebo)

*Number needed to treat (to experience benefit): 1 in 8*

Negative Results

• 6.4% of pts develop intracranial hemorrhage (with tPA) vs
• 0.6% of pts develop intracranial hemorrhage (with placebo)

*Number needed to harm: 1 in 16*
I Heard That tPA Can Now Be Given Up to 4.5 Hrs After Onset of Stroke?

**ECASS 3, NEJM, 9/25/08:** tPA 3 - 4.5 hours

<table>
<thead>
<tr>
<th>Results</th>
<th>(+) tPA (n=418)</th>
<th>Placebo (n=403)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mRankin score (0-1)</td>
<td>52.4%</td>
<td>45.2%</td>
</tr>
</tbody>
</table>

**Absolute difference = 7%, NNT = 14**

| Symptomatic ICH | 2.4% | 0.2% |

**Absolute difference = 2.2%, NNH = 45**

But only in patients < age 80 yrs!!!
tPA (Thrombolytic for Stroke)

Recommended for ischemic stroke when:
1) CT reveals no evidence of hemorrhage
2) No hx of intracerebral hemorrhage
3) No seizure at onset of stroke
4) BP < 185/110

Age < 80 yrs
- Onset of symptoms < 4.5 hrs
- INR < 1.7

Age > 80 yrs
- Onset of symptoms < 3 hrs
- No anticoagulants
3. An 82 y/o male developed sudden dysarthria and RUE weakness. Onset at 8am. He arrives at the ED at 11 am. BP= 200/100. At 12 noon, the labs and head CT are reported as “normal.” Your management will include....?

A. **Initiate** IV thrombolytic (tPA), **Initiate** IV nicardipine (Cardene) (for BP control), **initiate** Aspirin 325 mg po.

B. **Initiate** IV tPA, **initiate** IV nicardipine, do **NOT** initiate ASA 325 mg

C. Do **NOT** start IV tPA, **initiate** IV nicardipine, **initiate** ASA 325 mg

D. Do **NOT** start IV tPA, do **NOT** start IV nicardipine, **initiate** ASA 325 mg
Blood Pressure Control: **CAUTION in Acute (ischemic) CVA!!!**

- Elevated BP is body’s desire to maintain cerebral perfusion

- AHA guidelines:  Treat BP systolic > 220  
  (2003, 2007)  Treat BP diastolic >120

- Recommended meds:
  1. Labetalol: 10 mg q 10-20 min
  2. Nicardipine: 5 mg/hr, titrate q 5 min  

  **Goal: 15% decrease in BP**

Blood Pressure Control:
A. *For Acute* (Hemorrhagic) CVA!!!

- If systolic BP 150-220 - lower BP sys to < 140

  *Class I, Level of Evidence A, AHA guideline, 5/2015*

Blood Pressure Control:
B. *For Subarachnoid Hemorrhage***!!

- Decrease systolic BP < 160

  *Class IIa, Level of Evidence C, AHA guideline, 2012*
Acute Ischemic Stroke

• What about prophylactic antiseizure meds?
  – Just say, “NO!”

• What about heparin?
  – Just say, “NO!”

• What about warfarin?
  – Just say, “NO!”

• What about clopidogrel (Plavix)?
  – Just say, “NO!” (**maybe in TIA/minor stroke**)

“The combination of ASA + clopidogrel *might be considered* for initiation within 24 hours of a minor ischemic stroke or TIA and for continuation for 90 days (Class IIb; Level of Evidence B).”

New recommendation (AHA/ASA, 2014)

**CHANCE** Study: Patients with minor ischemic stroke or TIA *in China*

Methods: Double-blind, randomized (within 24 hrs) to:

<table>
<thead>
<tr>
<th>Treatment</th>
<th>CVA at 90 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA (75-300 mg) + placebo</td>
<td>11.7%</td>
</tr>
<tr>
<td>ASA 75 mg + Clopidogrel 300 mg Day1, then 75 mg qd</td>
<td>8.6%</td>
</tr>
</tbody>
</table>
Acute Ischemic Stroke

• What about Aspirin?
  – **Just say, “YES!”**

• What about antipyretics (in fever)?
  – **Just say, “YES!”**

• What about treating hyperglycemia (> 180 mg/dL)?
  – **Just say, “YES!”**

• Assessment of swallowing before feeding?
  – **Just say, “YES!”**

Stroke Units

*Stroke. 2007;38(9):2536-2540*

- CVA accounts for 4% of all hospital admissions
- Cochrane Review: 23 trials reviewed ===> *decreases odds of death or dependency by 20% at 1 year!!!*

- Why? It’s not the high-tech stuff!!!!

1. Aspiration prevention, use of oxygen, and use of acetaminophen (for fever) were more commonly used in stroke units than general wards.
2. Less use of urinary catheters were noted in stroke units.
3. Stroke units experienced less stroke progression or recurrence, chest infections, other infections, falls, and pressure sores.
4. A review of death certificates suggests that stroke units do not prevent neurologic deaths, but deaths from stroke complications such as infections.
The post-CVA patient now returns to your care (office/rehab). Note the following recommendations for secondary prevention of ischemic stroke or TIA:

- **Hypertension**: start or resume BP meds “beyond the first several days” [Class I, Level of evidence A]
  - Goal: < 140/90 ([Class IIA]), ? < 130 systolic for lacunar CVA ([Class IIb])

- **Lipids**: (+) statins
  - for LDL-C > 100 mg/dL [Class I, Level of evidence B]
  - for LDL-C < 100 mg/dL [Class I, Level of evidence C]

- **Glucose/DM**: Screen for DM [Class IIa, Level of evidence C]

*AHA/ASA guideline 2014*
The post-CVA patient now returns to your care (office/rehab). Note the following recommendations for secondary prevention of ischemic stroke or TIA:

- **Obesity**: get the BMI  
  *Class I, Level of evidence C*

- **Physical Activity**: increase it.  
  *Class IIA, Level of evidence C*

- **Nutrition**: assess it.  
  *Class IIA, Level of evidence C*

- **Sleep study**: consider it.  
  *Class IIB, Level of evidence B*

- **Homocysteine, Antiphospholipid antibody**: – do not routinely test!

- **Hypercoagulation**:  
  *“unknown”*

- **Carotid artery evaluation**: See later in TIA section  
  *AHA/ASA guideline 2014*
4. TIA (Transient Ischemic Attack) is defined as:

A. Sudden focal neurologic deficit caused by focal brain ischemia of vascular origin that completely resolves in 24 hours.

B. A brief episode of neurologic dysfunction caused by focal brain or retinal ischemia, with clinical symptoms typically lasting < 1 hour, and without evidence of acute infarction.

C. A brief episode of neurologic dysfunction caused by focal brain or retinal ischemia, with clinical symptoms typically lasting < 1 hour, and with hyperacute changes on MRI.

D. A transient episode of neurologic dysfunction caused by focal brain, spinal cord, or retinal ischemia, without acute infarction.
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D. A transient episode of neurologic dysfunction caused by focal brain, spinal cord, or retinal ischemia, without acute infarction.
TIA: The Definition Has Changed!!!!

- **Classic definition**: sudden focal neurologic deficit caused by focal brain ischemia of vascular origin that completely resolves in 24 hours
- **2002 TIA Working Group**
  “A brief episode of neurologic dysfunction caused by focal brain or retinal ischemia, with clinical symptoms typically lasting less than 1 hour, and without evidence of acute infarction”
TIA: The Definition Has Changed!!!!

• Classic definition: sudden focal neurologic deficit caused by focal brain ischemia of vascular origin that completely resolves in 24 hours

• 2002 TIA Working Group
  “A brief episode of neurologic dysfunction caused by focal brain or retinal ischemia, with clinical symptoms typically lasting less than 1 hour, and without evidence of acute infarction”
TIA: New Definition
AHA/ASA Statement: June 2009

“A transient episode of neurologic dysfunction caused by focal brain, spinal cord, or retinal ischemia, without acute infarction”

Note 1: No time limitation
Note 2: A tissue-based definition
(no evidence of acute infarction)
Why No Time Limits?

<table>
<thead>
<tr>
<th>Duration of symptoms: hrs</th>
<th>(+) MRI - DWI (ie. +CVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 1</td>
<td>33.6%</td>
</tr>
<tr>
<td>1 - 2</td>
<td>29.5%</td>
</tr>
<tr>
<td>2 - 3</td>
<td>39.5%</td>
</tr>
<tr>
<td>3 - 6</td>
<td>30.0%</td>
</tr>
<tr>
<td>6 - 12</td>
<td>51.1%</td>
</tr>
<tr>
<td>12 - 18</td>
<td>50.0%</td>
</tr>
<tr>
<td>18 - 24</td>
<td>49.5%</td>
</tr>
</tbody>
</table>

Frequency of DWI abnormalities in patients with TIA of different durations:  
Pooled data from 10 MRI studies enrolling 818 patients.  
MRI - DWI image

- Bright white signal
- Associated with cytotoxic edema (ie. cell death)
- Occurs within minute of stroke

Source: VirtualMedStudent.com
Why Is This (the MRI) Important?
(in the patient that has returned to baseline)

Patients with minor CVA (+ DWI - MRI) have a worse prognosis than those with true TIA (- DWI - MRI)
Transient Neurologic Changes

and has returned to baseline

MRI

TIA (-)MRI

CVA (+)MRI
Acute Neurovascular Syndrome

MRI

TIA

(-)MRI

CVA

(+ )MRI
So My Patient Has a Neg (-) MRI
Was It a TIA?

**TIA: Anterior Circulation**
- Hemiparesis
- Unilateral sensory loss
- Visual field deficit
- Gaze preference
- Aphasia
- Left-sided spatial neglect

“negative” or “lost”

**Not Associated With TIA:**

**Non-focal Symptoms**
- Loss of consciousness**
- Dizziness
- Generalized weakness
- Mental confusion
- Vision: wavy lines, flashing lights (retina)
- Limb shaking or “tingling”
- Incontinence
TIA/Stroke Mimics
(The Differential Diagnosis of TIA/CVA)

- Structural brain lesion (tumor, hemorrhage, AVM, aneurysm)
- Infection (focal abscess, septic emboli)
- Seizure/Todd’s paralysis
- Complicated migraine
- Hypoglycemia
- Syncope from any cause (especially arrhythmia)
- Labyrinthine disorders
- Temporal arteritis
- Multiple sclerosis (flare)
TIA Management: Risk Assessment

Who is going on to acute CVA?
Who has such high-risk that they need hospitalization?

The AHA/ASA recommends the ABCD2 score to calculate a patient’s short-term risk of developing a CVA
ABCD² Score

- **Age:** greater than or equal to 60 (1 pt)
- **Blood pressure:** SBP ≥ 140 or DBP ≥ 90 (1 pt)
- **Clinical Features:**
  - Focal weakness (2 pt) or
  - Speech impairment without focal weakness (1 pt)
- **Duration of symptoms:**
  - > 60 minutes (2 pt) or
  - ≤ 59 minutes (1 pt)
- **Diabetes** (1 pt)

**Risk of CVA at 2 days**
- 0-3 points = 1% risk
- 4-5 points = 4.1% risk
- 6-7 points = 8.1% risk

What Do You Do With the ABCD² Score?

In 2009, the AHA/ASA Recommended:

“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:

• ABCD² score of > 3
• ABCD² score of 0-2 and uncertainty that diagnostic workup can be completed within 2 days as an outpatient
• ABCD² score of 0-2 and other evidence that indicates the patient’s event was caused by focal ischemia”

All Class IIa recommendations, Level of Evidence C
The TIA Diagnostic Evaluation:
Step 1: MRI – done... next ➔
Step 2: Duplex US of carotids

• “**Duplex US is recommended** to detect carotid stenosis in pts. who develop focal neurological symptoms corresponding to the territory supplied by the L or R internal carotid artery”

• “...MRA or CTA is indicated to detect carotid stenosis when US either cannot be obtained or yields equivocal or ...nondiagnostic results”

Class I recommendation, Level of Evidence C

AHA/ASA 2011 Guideline on Carotid and Vertebral Disease
Released 1/31/11
Carotid Artery Disease: When Do You Recommend Endarterectomy?

- **Indicated** in symptomatic patients with 70%-99% stenosis
- **Consider** in symptomatic patients with 50%-70% stenosis

  - 3 trials (NASCET, ECST, VA) benefits of CEA best in:
    - Men > women
    - Age > 75
    - Recent minor stroke (vs TIA)
    - Presence of hemispheric symptoms (not *amaurosis fugax*)
    - Early surgery (within 2 weeks of TIA)

- Note: These studies done prior to era of widespread aggressive medical therapy

  AHA, American Stroke Association, 2006
5. Screening for Carotid artery disease...
in 2007 and 2014, the USPSTF stated:

A. All adults ≥ 65 years of age should have ultrasound screening for carotid artery disease.
B. Adults > 65 years of age with diabetes should have ultrasound screening for carotid artery disease.
C. Adults > 65 years of age with any of the common risk factors for atherosclerosis (DM, HTN, smoking, family history, or hypercholesterolemia) should have ultrasound screening for carotid artery disease.
D. Adults should not be screened for carotid artery disease with ultrasound or other tests.
5. Screening for Carotid artery disease...

in 2007 and 2014, the USPSTF stated:

A. All adults ≥ 65 years of age should have ultrasound screening for carotid artery disease.

B. Adults > 65 years of age with diabetes should have ultrasound screening for carotid artery disease.

C. Adults > 65 years of age with any of the common risk factors for atherosclerosis (DM, HTN, smoking, family history, or hypercholesterolemia) should have ultrasound screening for carotid artery disease.

D. Adults should not be screened for carotid artery disease with ultrasound or other tests.
Carotid Artery Screening …
(Asymptomatic Population): D recommendation

• **The bottom line:**
  Prevalence of disease in age > 65 = 1%

• 4,348 persons would need screening to prevent 1 CVA in 5 years.

• 8,696 persons would need screening to prevent 1 *disabling* CVA in 5 years.
Answers

1. A
2. A
3. D
4. D
5. D
Thank you!
Physical Activity: Just Do It!

**Methods:** Women’s Health Study
- 39,315 women, reported physical activity at baseline, followed 11.9 yrs

**Results:** compared to sedentary (nonwalkers)
- Walk > 2 hrs/week ==> lowered CVA risk 30%
- … and speed (ie, vigorous) did not matter!!

Heparin (UFH) and Low-Molecular Weight Heparin (LMWH) for acute CVA?

Just say “NO.”

- AHA/ASA 2003, 2007 recommend “against”
  - IST (Lancet, 1997): 19,435 pts, UFH => no benefit
  - LMH - initial trials promising, subsequent disappoint
  - TOAST trial (JAMA, 1998) LMH ==> no benefit

- Cochrane Review: 24 trials (23,748 pts) ==>  
  - 9 fewer ischemic strokes (per 1,000) with heparin
  - 9 more intracerebral hemorrhages (per 1,000)
What About Aspirin and Ischemic Stroke?

Just Say “YES”

  - 12 trials (43,041 pts)
  - 13 pts; alive and independent (per 1,000) with ASA
  - 10 more pts: made complete recovery (per 1,000)
  - 2 more pts: intracerebral hemorrhage (per 1,000)
Endovascular Treatment: What are the outcomes?

A. Coil and Aspiration trials (vs. standard therapy = IV tPA)
   
   A. IMS III trial
   B. SYNTHESIS EXP
   C. MR RESCUE

   No Benefit
Endovascular Treatment: What are the outcomes?

B. Stent retrievers (vs. standard therapy= IV tPA)

<table>
<thead>
<tr>
<th>Study</th>
<th># of pts</th>
<th>Hrs to treat</th>
<th>mRS 0-2 @ 90 days</th>
<th>NNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR CLEAN</td>
<td>500</td>
<td>6hrs</td>
<td>19.1% vs. 32.6%</td>
<td>8</td>
</tr>
<tr>
<td>ESCAPE trial</td>
<td>316</td>
<td>12hrs</td>
<td>29.3% vs. 53.0%</td>
<td>4</td>
</tr>
<tr>
<td>EXTEND-IA trial</td>
<td>70</td>
<td>6hrs</td>
<td>40.0% vs. 71.4%</td>
<td>3</td>
</tr>
<tr>
<td>SWIFT PRIME</td>
<td>196</td>
<td>6hrs</td>
<td>35.5% vs. 60.2%</td>
<td>4</td>
</tr>
<tr>
<td>REVASCAT</td>
<td>206</td>
<td>8hrs</td>
<td>28.2% vs. 43.7%</td>
<td>7</td>
</tr>
</tbody>
</table>
1. Patients eligible for IV r-tPA should receive IV r-tPA even if endovascular treatments are being considered (Class I; Level of Evidence A).

2. Patients should receive endovascular therapy with a stent retriever if they meet all the following criteria (Class I; Level of Evidence A).
   (a) prestroke mRS score 0 to 1,
   (b) acute ischemic stroke receiving IV r-tPA within 4.5 hours of onset per guidelines
   (c) causative occlusion of the internal carotid artery or proximal MCA (M1),
   (d) age \( \geq \) 18 years,
   (e) NIHSS score of \( \geq \) 6,
   (f) ASPECTS of \( \geq \) 6, and
   (g) treatment can be initiated (groin puncture) within 6 hours of symptom onset
3. If endovascular therapy is contemplated, a noninvasive intracranial vascular study is strongly recommended during the initial imaging evaluation of the acute stroke patient but should not delay IV r-tPA if indicated. For patients who qualify for IVr-tPA according to guidelines from professional medical societies, initiating intravenous rtPA before noninvasive vascular imaging is recommended for patients who have not had noninvasive vascular imaging as part of their initial imaging assessment for stroke. Noninvasive intracranial vascular imaging should then be obtained as quickly as possible. (Class I; Level of Evidence A).

4. The benefits of additional imaging beyond CT and CTA or MR and MRA, such as CT perfusion or diffusion- and perfusion-weighted imaging, for selecting patients for endovascular therapy are unknown (Class IIb; Level of Evidence C).
Carotid Artery Screening … (Asymptomatic Population): D Recommendation

- **Put another way:** (the harms of screening)
  Prevalence of disease in age > 65 = 1%

- If you screen 100,000 adults…
  - 940 true positives
  - 7920 false positives*

  - Confirmatory angiography => 1.2% CVA rate
  - MRA = 90% specificity ==> 792 needless surgeries*