TIA triage in 2016

Not all that glitters is gold

Disclosures

- No industry related disclosures
- Expert witness work

Overview

- Definition
- Implications
- Guidelines, secondary prevention
- Implementation of guidelines

Definition

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- Key features[1]
  - Sudden, as opposed to rapid
  - Absence of nonspecifc symptoms

TIA

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  - 20 min to 3 hrs
  - There may or may not be evidence of infarction on MRI/DWI

Case 1

- 82yoM with Atrial Fibrillation (INR 1.6) and old right frontal lobe ischemic stroke.
- P/W sudden speech problems, 19:45, totally resolved by 21:00 in the ED
- NIHSS=0 in the ED
- HCT unremarkable (except old infarct)

HB12272002

TIA: short term risk of stroke

Study (year)	2 days	7 days	30 days
Johnston (2000)	5%		
Lovett (2003)		9%	12%
Gladstone (2004)			8%
Coull (2004)		8%	12%
Kleindorfer (2004)	4%	7%	11%
Correia (2006)		13%	
Average	**4.5%**	**8.5%**	**11%**

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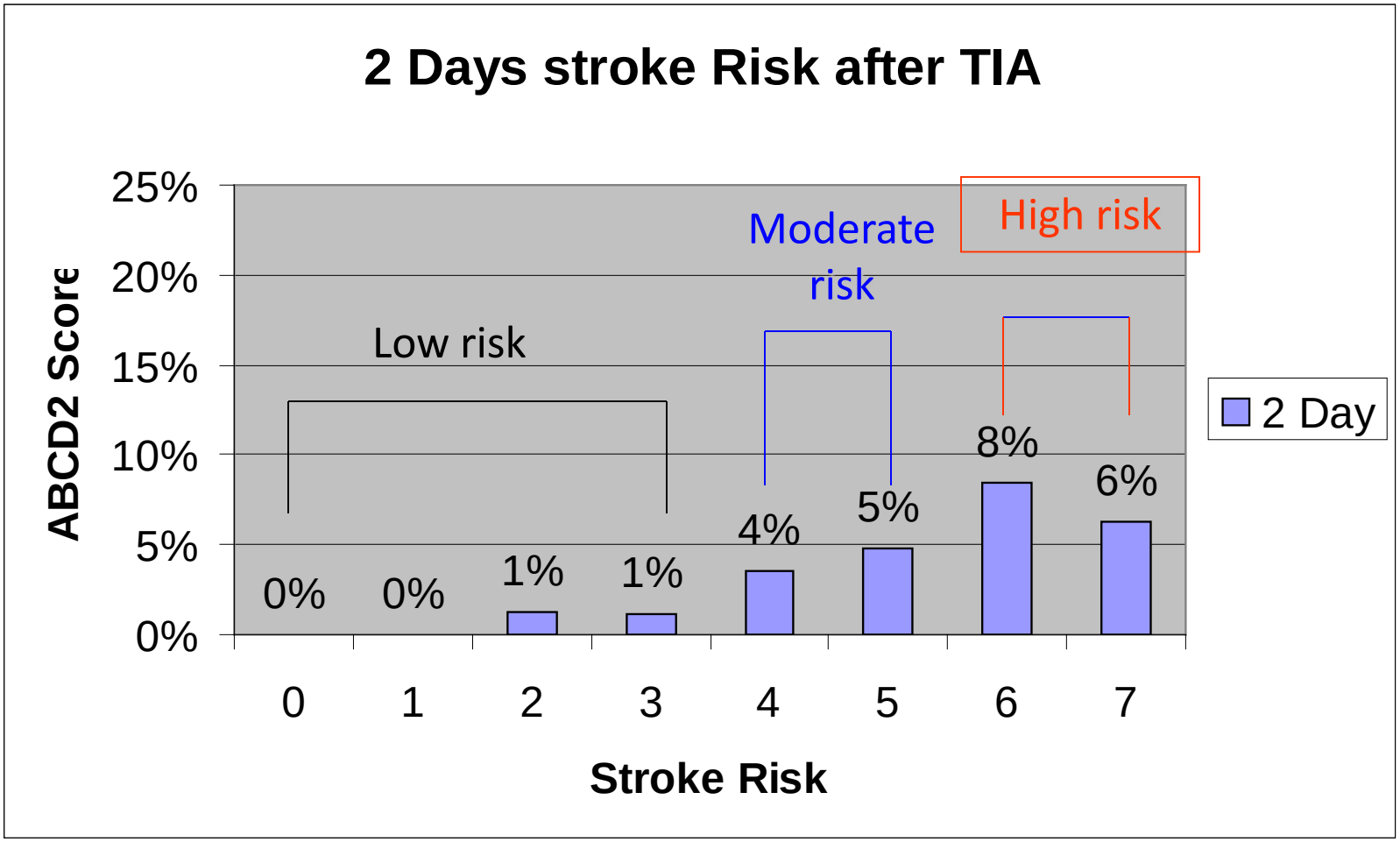
ABCD^2 score^2

Factor, points	OR (95% CI)
Age (≥60yrs = 1 point)	**1.4 (1.0-2.1)**
BP (≥140 mmHg systolic or ≥90 diastolic → 1 point)	**1.6 (1.1-2.2)**
Clinical Features: .Unilateral weakness → 2 points .Speech impairment without weakness→ 1 point	**2.9 (2.0-4.3)** *1.4 (0.8-2.3)*
Duration: ≥60 minutes → 2 points 10-59 minutes → 1 point	**2.3 (1.3-4.0)** **2.0 (1.0-3.7)**
Diabetes (Presence→ 1 point)	**1.6 (1.1-2.2)**

Risk stratification with ABCD^2 score



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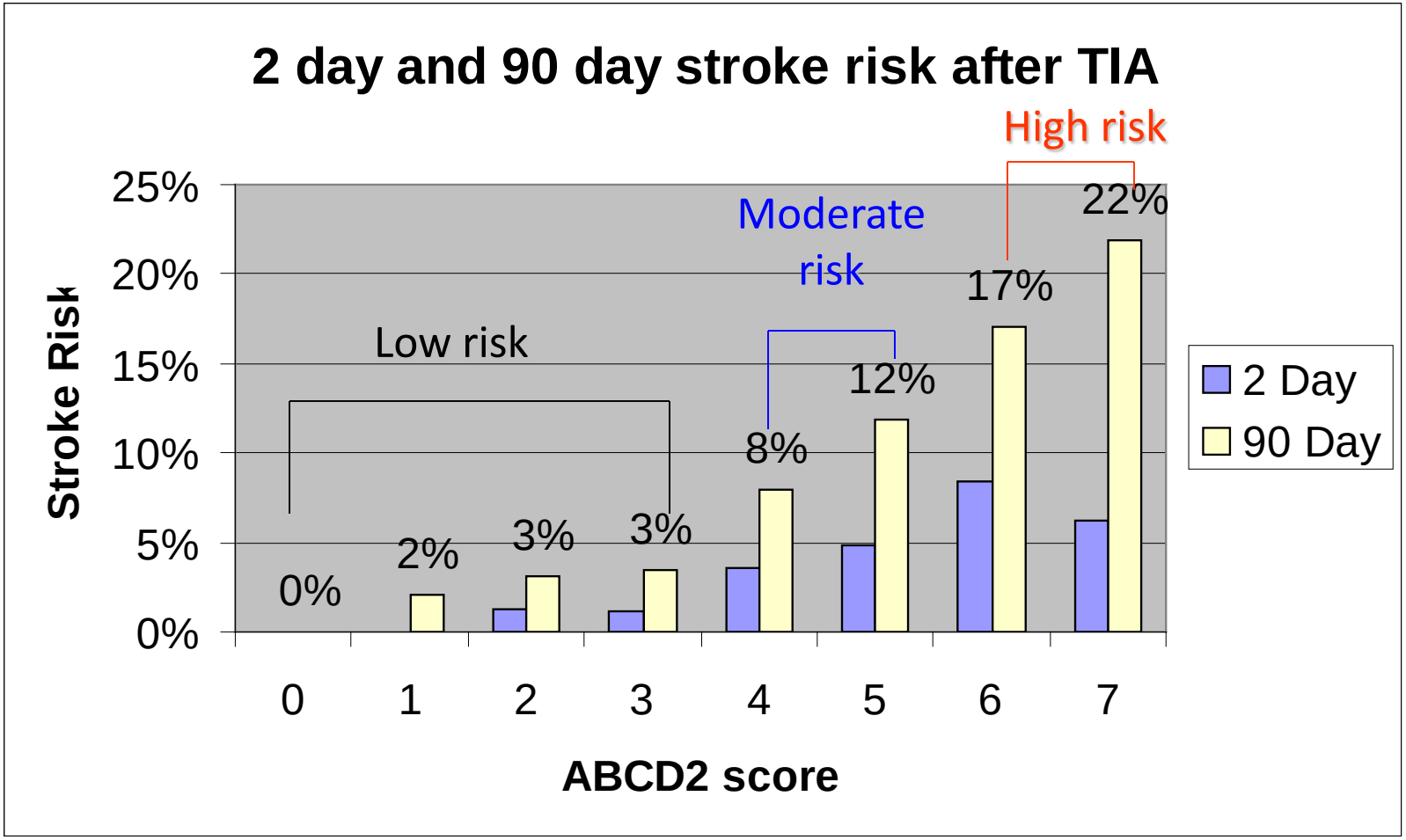

4799 patients

Case 1

- Who are the 0-8% of patients with TIA, who develop stroke in the fist 2 days?

Case 1

- The patient's $ABCD^2$ score =4

  2-day risk of stroke is 4%

  90-day risk of stroke is 8%

- The mechanism of the TIA is probably known a-fib, while sub-therapeutic on warfarin

Case 1

- We know the cause
- We have the treatment
- Our management options:

  A) Obtain immediate vascular imaging in ED

  B) Admit to hospital, observation, workup, anticoagulation

  C) Discharge home with “bridge” anticoagulation

  D) Discharge to home without bridge, but augment warfarin dose and recheck INR in 48hrs

Case 1

- *82yoM with Atrial Fibrillation (INR 1.6) and old right frontal lobe ischemic stroke.*
- *P/W sudden slurred speech, 19:45, totally resolved by 21:00 in the ED*
- *NIHSS=0 in the ED*
- *HCT unremarkable (except old infarct)*
- Cr = 1.5, CTA deferred, pt admitted for MRA

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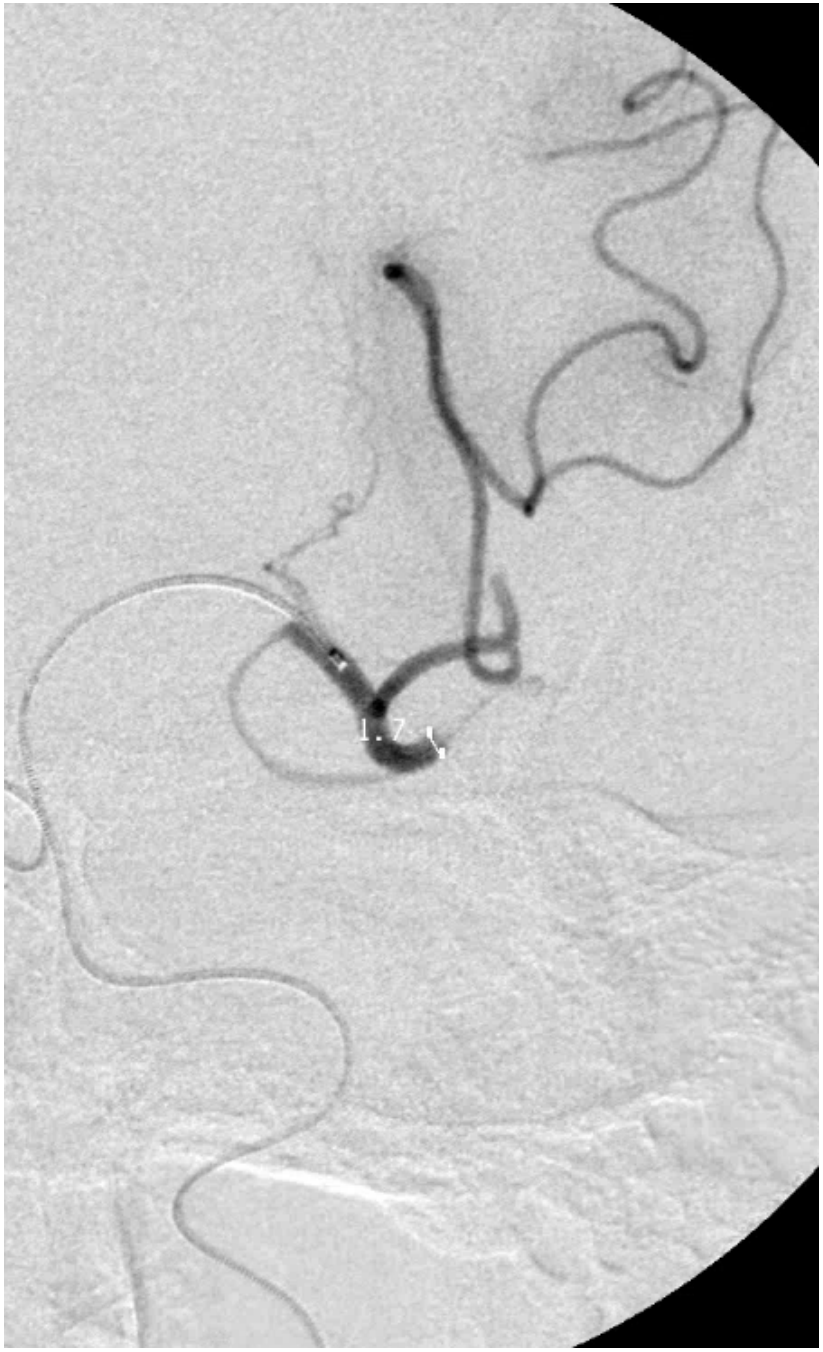
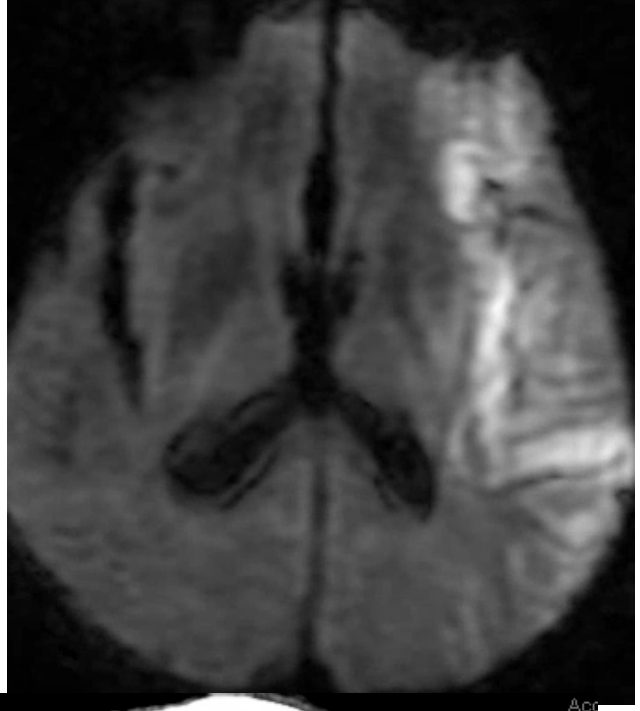
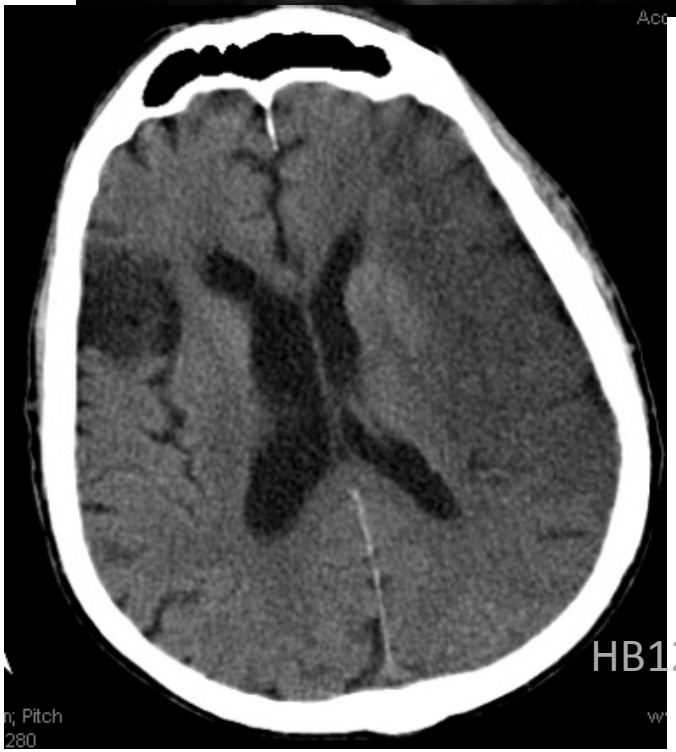
Case 1

- Admitted, MRA pending
- Discovered in room, aphasic, right hemiparetic
- NIHSS = 22







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Case 1

- Despite successful technical revascularization of a left M2 occlusion, the patient's deficits did not improve.
- Based on prior medical problems, was already dependent (mRS 2), the family withdrew care and the patient expired.

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- *Despite successful technical revascularization, of a left M2 occlusion, the patient's deficits did not improve.*
- *Based on prior medical problems, was already dependent (mRS 2), the family withdrew care and the patient expired.*
- The patient went from no deficit to death.

HB12272002

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Case 1

- *The left M2 occlusion caused the large stroke*
- *Was the left M2 occlusion present initially when his NIHSS resolved to 0?*
- *The ABCD score predicted low risk of stroke, so why did this happen?*
- *Is the ABCD score a tool we can use to triage the TIA patient?*
- What is the cause of stroke following TIA?

What causes TIA in general?

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- Cardioembolism
  - Atrial fibrillation
  - Cardiomyopathy
  - Paradoxical
  - Septic
- Athero-thrombo/embolism
  - Arch
  - Extrancranial ICA, VA
  - COW: MCA, iICA, BA
- Dissection
  - ICA, VA
- "Lacunar" lipohyalinosis
  - Small vessel
- Cerebral Venous Thrombosis

Hypothesis

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- *One feature that characterized Case 1 is the presence of "large vessel occlusion" (LVO)*
- Hypothesis: LVO is associated with increased risk of stroke following TIA, regardless of $ABCD^2$ score.

Coutts et al (2008)[3]

- Prospective cohort study
- 180 pts with TIA or minor stroke (NIHSS 0-3), followed for 90 days
- Intracranial Vessel Occlusion n=24 (13%)
- In the 24 with LVO, 46% had symptomatic clinical progression
  - Compared with 6% without LVO, RR 7.9 (3.7-17.1)
  - Presence of LVO **raised the risk of stroke 8-fold**

Coutts et al (2009)[4]

- Retrospective cohort, mild AIS or TIA, 2002-07
- Had CT + CTA i/e
- 297 pts identified, 90 day follow up
- Outcome “poor” mRS≥2 at 90d or d/c to other than home (rehab or nursing home)
- CTA: presence or absence of large vessel occlusion or severe (>50%) stenosis in either the circle of Willis (COW) or extracranial circulation

Coutts et al (2009)[4]

- In the poor outcome category, 27/57 (48%) had an LVO/SS
- COW + LVO/SS in 17/57(30%) of poor outcome vs 45/400(11%) of good outcome, p=0.0006
- Extracran + LVO/SS in 10/57 (18%) of poor outcome vs 35/400 (9%) of good outcome, p=0.054
- **The presence of LVO/SS is correlates with a poor outcome, especially if the lesion is in the Circle of Willis.**

Smith et al (2009)

- STOPStroke[5], prospective cohort
- Stroke/TIA and CT/A
- 33 months, 735 enrolled, n=97 TIA
- Of the TIA cases, 13 (13%) had LVO
- Overall, +LVO associated with 4.5-fold increased odds of death (95%CI 2.7-7.3, p<0.001) and absent LVO +3.2-fold increased odds of good outcome (95% CI 2.2-4.2, p<0.001)
- They did not have enough TIA cases to study TIA specifically

Predictors of risk of early stroke

- Higher $ABCD^2$ score
- Presence of LVO/SS

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- *Higher $ABCD^2$ score*
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- But, does high $ABCD^2$ = LVO ?

Predictors of risk of early stroke

- *Higher $ABCD^2$ score*
- *Presence of LVO/SS*
- But, does high $ABCD^2$ = LVO ?
  - There is little data
    - Arterial dissection
    - First presentation of atherosclerotic disease

Management Guidelines[7]

- Class 1 Evidence
  - Patients with TIA should preferably undergo neuroimaging evaluation within 24 hours of symptom onset.
  - Noninvasive imaging of the cervicocephalic vessels should be performed.
  - Patients with suspected TIA should be evaluated as soon as possible.

Management Guidelines[7]

- ECG should occur as soon as possible; prolonged cardiac monitoring is useful in patients with an unclear
- Echocardiography (at least TTE) is reasonable, especially in patients in whom no cause has been identified by other elements of the

Prevention Guidelines[8]

- Antiplatelet medication
- BP control
- HMG CoA reductase inhibitors
- Revascularization for symptomatic carotid stenosis
- Anticoagulation for afib

What's lacking

- Hospitalization
  - Admit, observation, or discharge
  - Selection
- Testing
  - Urgency of vascular imaging
  - Urgency of echo, rhythm analysis, blood work
- Ranta and Barber (2016)[9]

Model 1

- Admit all TIA cases to hospital or ED observation unit, with input from a stroke specialist.
- Pro: expert-driven, ability to observe and treat in case of worsening
- Con: clinical benefit unproven; no cost benefit

Model 2

- Sanders et al (2012)[10]
- ED assessment
  - Persistent signs, crescendo TIA, other medical issues: admission
  - Otherwise TIA clinic same or next day
- Vascular imaging: same or next day CDUS
  - Afib: anticoagulation, priority for TIA clinic
  - No afib, +CDUS ICAS>50%: CTA and priority to TIA clinic

Model 2

- 468 patients with 90 day follow up
- 150 control “admission method”
- Outcome = stroke at 90 days
- Stroke 1.50% (7/468) in Model 2, vs 4.67% (7/150) in “admission method”

Model 3

- SOS-TIA, Lavallee et al (2007)[11]
- Specialized 24/7 clinic
- Not clear who saw the pts, but 24/7 vascular neurologist available at least by phone
- CDUS, TCD and ECG
- If high suspicion, then urgent TTE
- Direct communication bw VN and PCP re secondary prevention strategy
- Discharge to home

Model 3

- 643 pts had “definite TIA”
- Overall 1.24% (0.72-2.12) risk of stroke at 90 days, compared with estimated 5.96% based on $ABCD^2$ scores for this cohort

Model 4

- Rothwell et al (2007)[12], EXPRESS study
- Compared routine TIA outpatient referral (med 3 days, CDUS, TTE, no immediate initiation of meds) to same-day open-access clinic (M-F) with immediate initiation of meds.
- Reduction of 90-day stroke from 10.3% to 2.1%, HR 0.2., 0.08-0.49, p = 0.0001)

The “Oxford” model,

Model 5

- Olivot (2011)[13] TWO ACES stud
- Prospective study, 224 pts that came to ED
- $ABCD^2$ = 0-3: sent from ED to TIA clinic (<48hr), MRA i/e or CTA i/e between ED and TIA clinic
- $ABCD^2$ = 4-5: CTA i/e
  - CTA i/e lesion >50% stenosis, admission
  - Otherwise, TIA clinic

Model 5

- Pts referred to TIA clinic had a stroke rate of 0.6% at 7 days (same at 90 d!), compared with expected 4.0, 7.1 % risk based on $ABCD^2$ score, $p<0.034$, $p<0.001$

Model 6

- Wasserman et al (2010)[14]
- ED visit, dx of TIA
  - Outpt CDUS, TTE, FLP
- $ABCD^2 \geq 6$: 7 day f/u in TIA clinic
- $ABCD^2 = 3\text{-}5$: 14 day f/u in TIA clinic
- $ABCD^2 < 4$: >14 day f/u

Model 6

- >1000 pts, outcome stroke at 90 days

ABCD2 score	Strokes	Predicted	P
<4 (n=321)	3, 0.9% (0-1.98)	3.1	0.0364
4-5 (n=469)	18, 3.8% (2.1-5.58)	9.8	<0.0001
≥ 6 (n=192)	10, 5.2% (2.07-8.35)	17.8	<0.0001
Combined	31, 3.2% (2.07-4.25)	9.1	<0.0001

Model 7

- Ranta et al (2015)15
- PCP with web-based decision tool triage to TIA clinic vs “usual care” by PCP
  - Web based tool
    - High risk ABCD2>3, 2 or more recent events, presence of afib → referral to TIA clinic 24 hrs
    - Low risk → TIA clinic within 7 days

Model 7

- 90-day stroke outcomes
- Intervention, 2/172 (1.2%)
- Control, 5/119 (4.2%)
- P = 0.098

Comparison

Model	Pro	Con
1	-Full and immediate vascular imaging -Ability to intervene if patient worsens	-Unproven clinical benefit, higher cost
2-7	-Avoids most hospitalization, cost savings	-There is clinical benefit when compared with the $ABCD^2$ risk, ie compared with doing nothing.

What is the goal?

- Cost savings?
- Reduction of stroke risk?

Hypothetical goals

- Reduction of cost, hospitalization
- Elimination (not reduction) of risk of stroke
  - This must include imaging of all cervicocranial vessels, knowing what we know about LVO and its strong correlation with poor outcome.

The UPMC-Mercy Model

- Brain and vascular imaging in ED
  - MRI brain, MRA head and neck
- If no infarct, and no LVO/SS, then observe 24h:
  - $ABCD^2$ >3, observe inpatient, complete workup
  - $ABCD^2$ <3, observe in “clinical decision unit” in the ED, then discharge home

Beyond Mercy

- If there is no afib and no LVO/SS, then
  - Antiplatelet
  - Address BP, glucose, LDL
  - Discharge home
  - Outpatient Holter
  - Follow up in Stroke clinic, next business day

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