

Transient Ischemic Attack To Admit or Not

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Transient Ischemic Attack (TIA)

- 23% strokes preceded by a TIA (*Neurology* 2005;64: 817)
- 300,000 TIAs in U.S. each year
- TIA is a common presentation to the Emergency Department, accounting for 1–3 of every 1,000 ED visits in the United States
- High short-term risk of stroke after TIA..

Management Strategies for TIA Evaluation

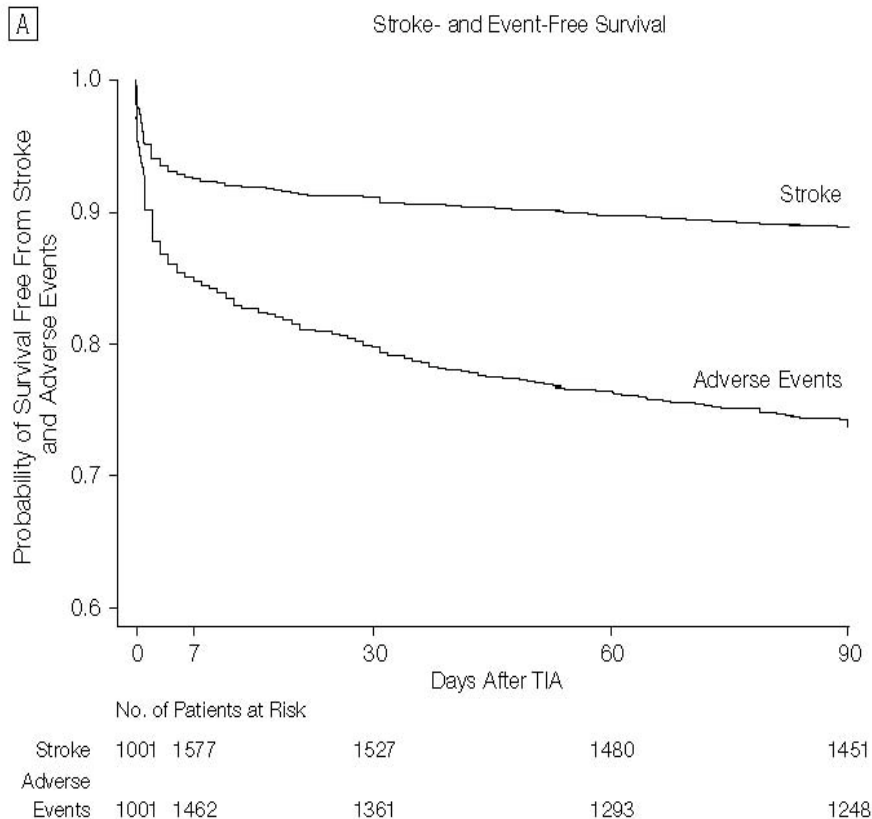
- Routine outpatient evaluation
- TIA Clinic
- Hospital admission
- Observation Unit

+/- stratification by risk score

Questions

- What is early risk of stroke?
- What intervention reduces the risk?
- What do guidelines suggest?
- What are some hospital approaches?
- Reimbursement considerations

Risk of Stroke after TIA



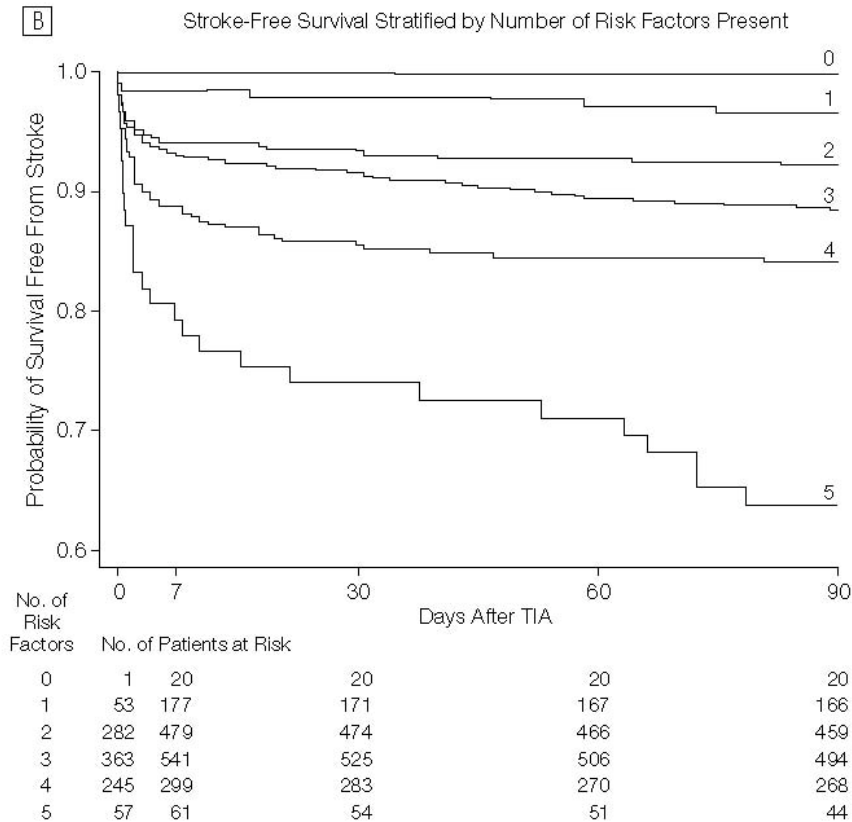
- 16 Kaiser Permanente hospitals in Northern CA
- 1707 patients (mean age, 72 yrs) identified by ED physicians as having TIA
- **10.5% (n=180) returned to the ED with a stroke in 90d**
- **half (n=91) within first 2 days.**

Independent Risk Factors for Stroke within 90 days

Risk Factor	Odds Ratio (95% CI)	P value
Age > 60 yr	1.8 (1.1 – 2.7)	0.01
Diabetes Mellitus	2.0 (1.4 – 2.9)	<0.001
Episode Duration > 10 min	2.3 (1.3 – 4.2)	0.005
Weakness with episode	1.9 (1.4 – 2.6)	<0.001
Speech impairment with episode	1.5 (1.1 – 2.1)	0.01

•N=1707

90-Day Stroke Risk by Number of Risk Factors

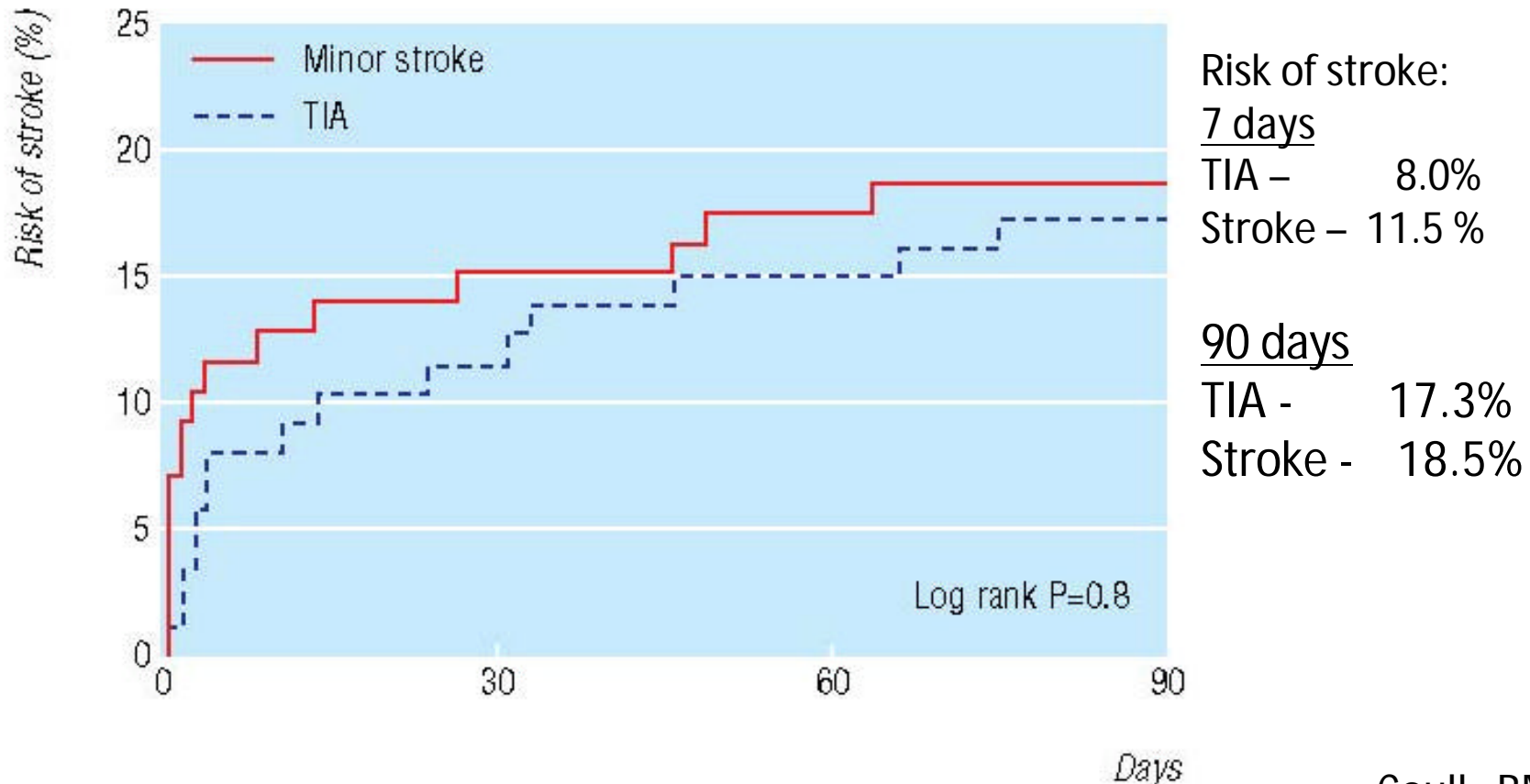


# Risk Factors	% Stroke at 90-days
0	0
1	3
2	7
3	11
4	15
5	34

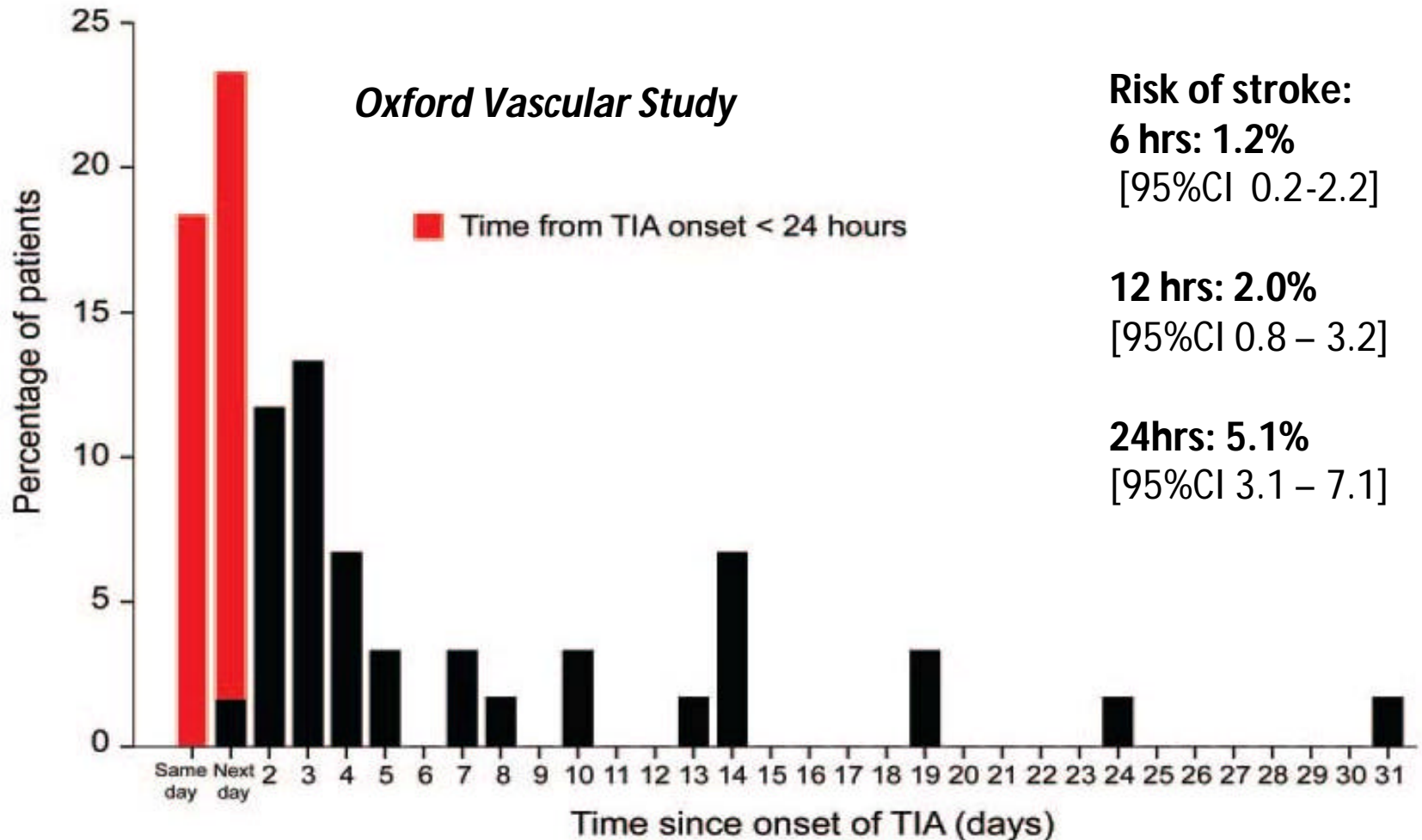
N=1707

Oxford Vascular Study

- Population of 90,542 people in 63 general practices in 9 family health centers in Oxfordshire, England.
- Study began April 2002 and ended March 31, 2003.
- All patients with TIA or minor stroke (NIHSS \leq 2) were followed x 3 months



Risk of recurrent stroke within 24 hours of onset of TIA



Of first 488 TIAs, 25 had recurrent strokes within 24hr

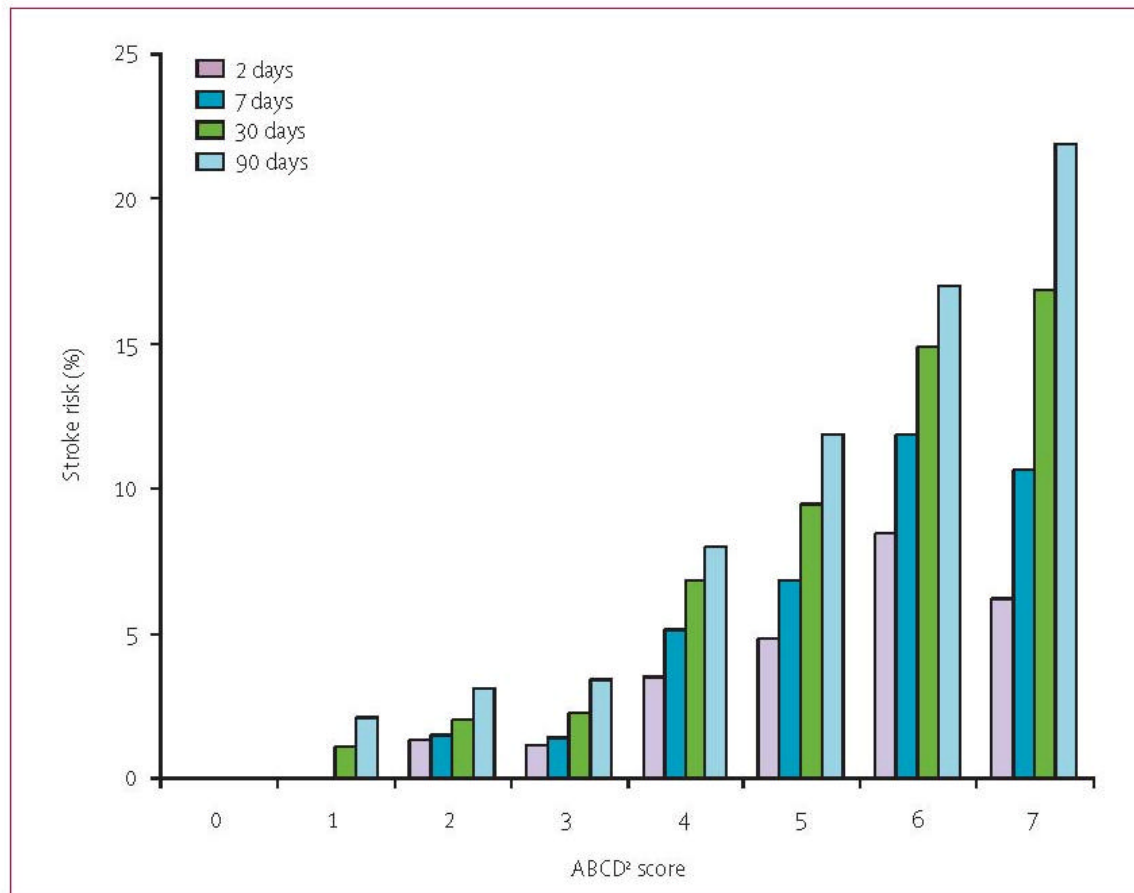
ABCD² Score for predicting very early risk of stroke after TIA

- California and ABCD scores each validated as prognostic indicator for stroke in pts with recent TIA
- ABCD² = unification of California and ABCD for predicting TWO-DAY risk of stroke
- Derived from 2 of the groups used to develop the original scores (n=1916)
- ABCD², validated in 4 new cohorts
- Performance fair-good: c statistics =0.62–0.83

ABCD² Score for predicting very early risk of stroke after TIA

Factors	Score
<u>A</u> ge \geq 60 yrs	1
<u>B</u> lood pressure \geq 140/90	1
<u>C</u> linical Features:	
Unilateral weakness	2
Speech impairment w/o weakness	1
<u>D</u> iabetes	1
<u>D</u> uration \geq 60 min	2

Short-term risk of stroke by ABCD² score in six groups combined



2-DAY RISK:

0-3: 1.0%

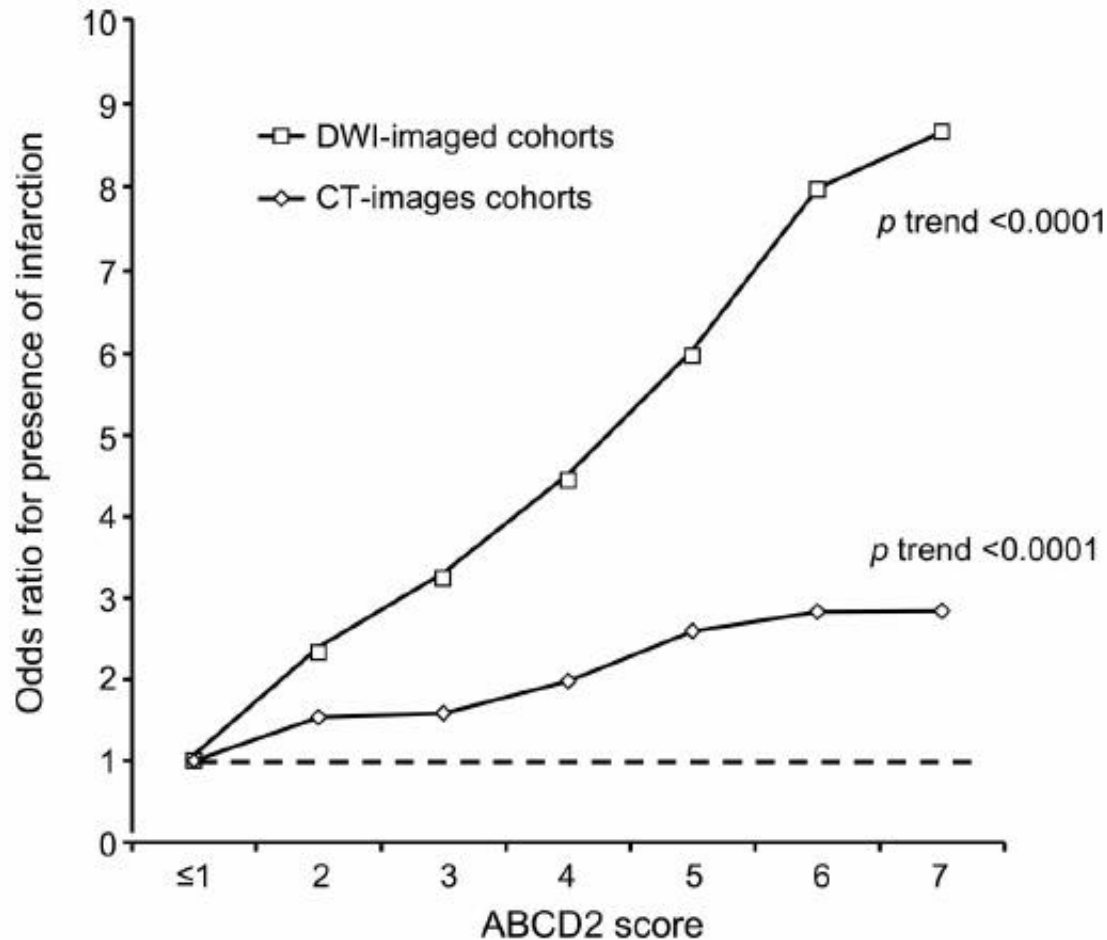
4-5: 4.1%

6-7: 8.1%

Pooled analysis of association between ABCD2 score and presence of infarction on diffusion-weighted imaging (DWI) or CT brain imaging

4574 pts
12 centers

ABCD2 is more
predictive in
DWI (+) pts



7 day stroke risk according to DW Imaging

ABCD²	DW(+) (n=884)	DW (-) (n=2,322)
0-3	1.8	0.1
4-5	7.5	0.7
6-7	12.5	0.4

ABCD³-I

- Incorporates imaging parameters with the existing ABCD² score and evidence of recent earlier TIA (dual TIA)

	ABCD ³ score	ABCD ³ -I score
Age ≥60 years	1	1
Blood pressure ≥140/90 mm Hg	1	1
Clinical features		
Speech impairment without weakness	1	1
Unilateral weakness	2	2
Duration		
10–59 min	1	1
≥60 min	2	2
Diabetes mellitus present	1	1
Dual TIA (TIA prompting medical attention plus at least one other TIA in the preceding 7 days)	2	2
Imaging: ipsilateral ≥50% stenosis of internal carotid artery	NA	2
Imaging: acute diffusion-weighted imaging hyperintensity	NA	2
Total range	0–9	0–13

Where the stated criteria are not met, a score of 0 is assigned. NA=not applicable. TIA=transient ischaemic attack.

ABCD³-I

- 2654 in the derivation sample
- 1232 in the validation sample

c-statistics (discriminatory ability)

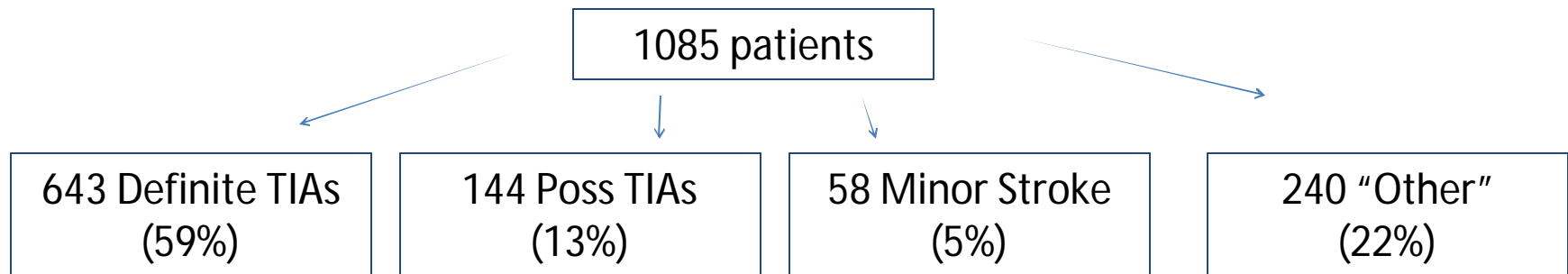
	Day 2	p value
Derivation sample		
ABCD ²	0.71 (0.62–0.77)	..
ABCD ³	0.78 (0.69–0.86)	0.083
ABCD ³ -I	0.90 (0.70–0.99)	0.035

Questions

- What is early risk of stroke?
- **What interventions reduce the risk?**
- What do guidelines suggest?
- What are some hospital approaches?
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SOS TIA

- January, 2003, and December, 2005
- Emergency Access 24 hr/7 days “TIA clinic”
- Bichat–Claude Bernard University Hospital, France
- Standardized Assessment
- Outcome: Stroke at 90 days

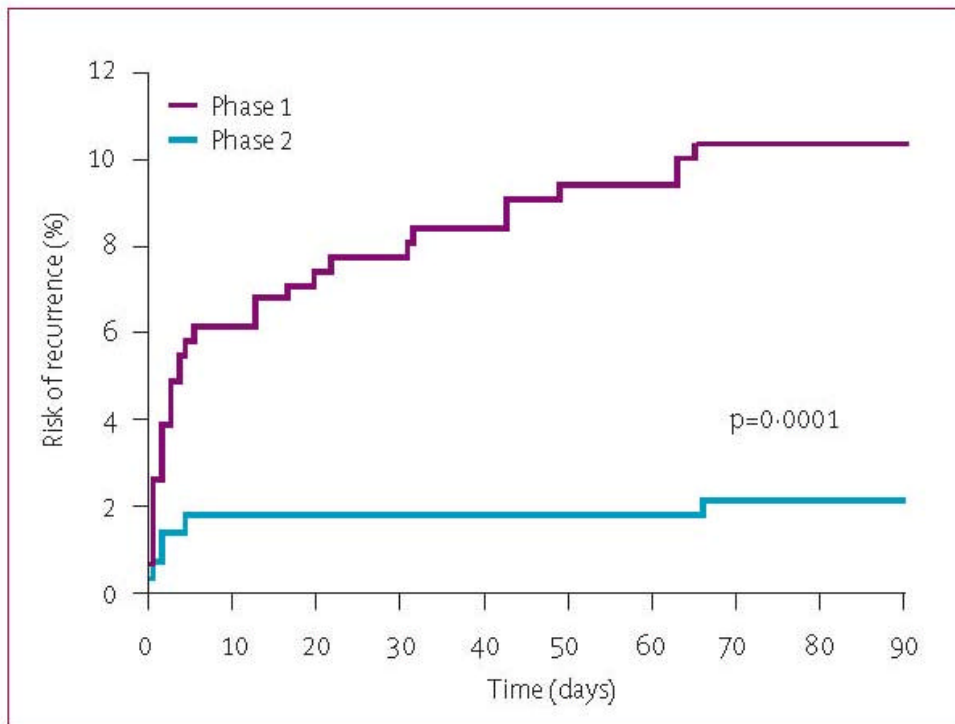


- Mean age 62yo
- 13 strokes at 90 days
- **Rate of stroke 1.2% [95% CI 0.7 – 2.1%] vs 6% predicted by ABCD² score**

Effect of urgent treatment of TIA and minor stroke on early recurrent stroke (EXPRESS)

- **Design**: Prospective before (phase 1: April 1, 2002, to Sept 30, 2004) versus after (phase 2: Oct 1, 2004, to March 31, 2007) study
- Nested within Oxford Vascular Study, rigorous population-based incidence study of all TIA and stroke
- **Objective**: Evaluated the effect on process of care and outcome of more urgent assessment and immediate treatment in clinic, in all patients with TIA or minor stroke not admitted direct to hospital
- **Primary outcome**: risk of stroke within 90 days

Effect of urgent treatment of TIA and minor stroke on early recurrent stroke (EXPRESS)



90-day risk of recurrent stroke in patients referred to the study clinic:

10.3% (32/310) in phase 1

2.1% (6/281) in phase 2

adjusted HR = 0.20, 95% CI 0.08–0.49; p=0.0001);

There was no significant change in risk in patients treated elsewhere

Effect of urgent treatment of TIA and minor stroke on early recurrent stroke (EXPRESS)

Measures of process of care in all TIA/stroke patients referred to study clinic (assessed at 1 month)

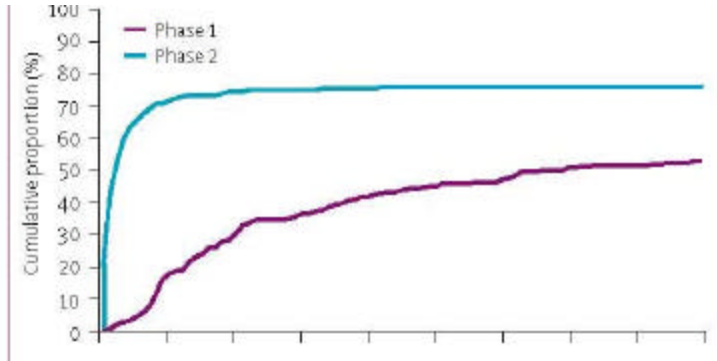
	Phase 1 (n=302)*	Phase 2 (n=278)*	p
On antiplatelet or anticoagulant	292 (97%)	269 (97%)	1.00
On aspirin and 30-day course of clopidogrel	26 (10%)	137 (49%)	<0.0001
On a statin	196 (65%)	233 (84%)	<0.0001
On one or more blood-pressure-lowering drugs	187 (62%)	231 (83%)	<0.0001
On two or more blood-pressure-lowering drugs	103 (34%)	168 (60%)	<0.0001
Systolic blood pressure (mm Hg)	142 (20)	136 (21)	0.0019
Diastolic blood pressure (mm Hg)	80 (10)	75 (10)	<0.0001
Time to carotid surgery	n=17	n=15	
<7 days	0 (0%)	6 (40%)	0.006
<30 days	2 (12%)	10 (67%)	0.001

Data are n (%), n/N (%), or mean (SD). *Analysis excludes patients who died before 30-day follow-up and seven patients with incomplete data (five in phase 1 and two in phase 2).

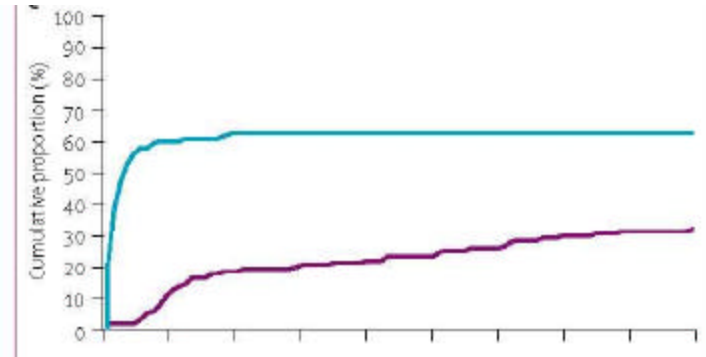
Effect of urgent treatment of TIA and minor stroke on early recurrent stroke (EXPRESS)

Cumulative proportions of patients prescribed new medication since first seeking medical attention

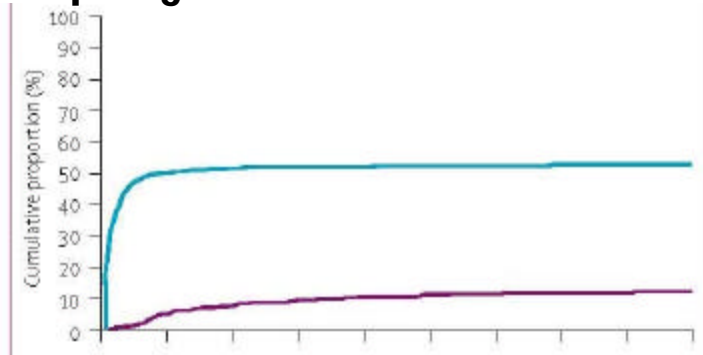
statin



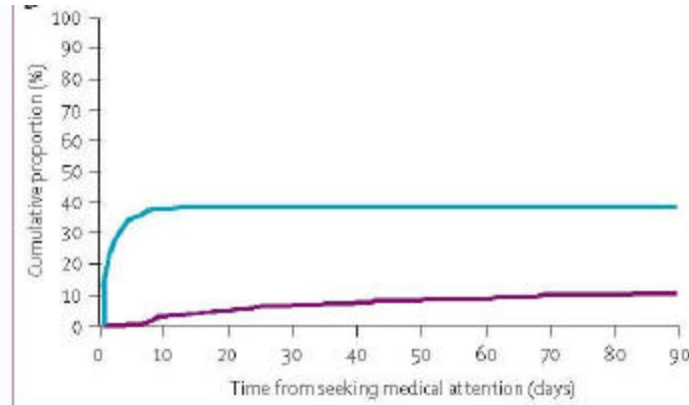
1st BP med



clopidogrel



2nd BP med



EXPRESS: effect on hospital costs

- Hospital admissions reduced:
 - 5/281 (1.8%) vs 25/310 (8.1%), $p = 0.001$
- Hospital Days reduced:
 - 672 vs 1957 days , $p = 0.017$
- ~ \$887 savings per TIA patient

Predicted Effect of Treatment Based on RCTs of Long-Term Treatment

Most Patients

Relative Risk Reduction

Aspirin

20%

Statin

20%

Blood Pressure Lowering

30%

Some Patients

Warfarin

50%

CEA w/i 2 weeks

75%

Total

>80%

Implications for Care

Interventions:

- Antithrombotics
- Statins
- BP meds
- Carotid revascularization

Implications for evaluation:

- Carotid imaging prior to discharge
- Labwork to include LFTs (baseline for statins)
- Follow-up (should include labwork if starting statin)

Implications for Care

Interventions:

- * • Antithrombotics (IST and CAST showed 1%ARR in stroke recurrence in first 2 weeks)
- Statins
- BP meds
- * • Carotid revascularization

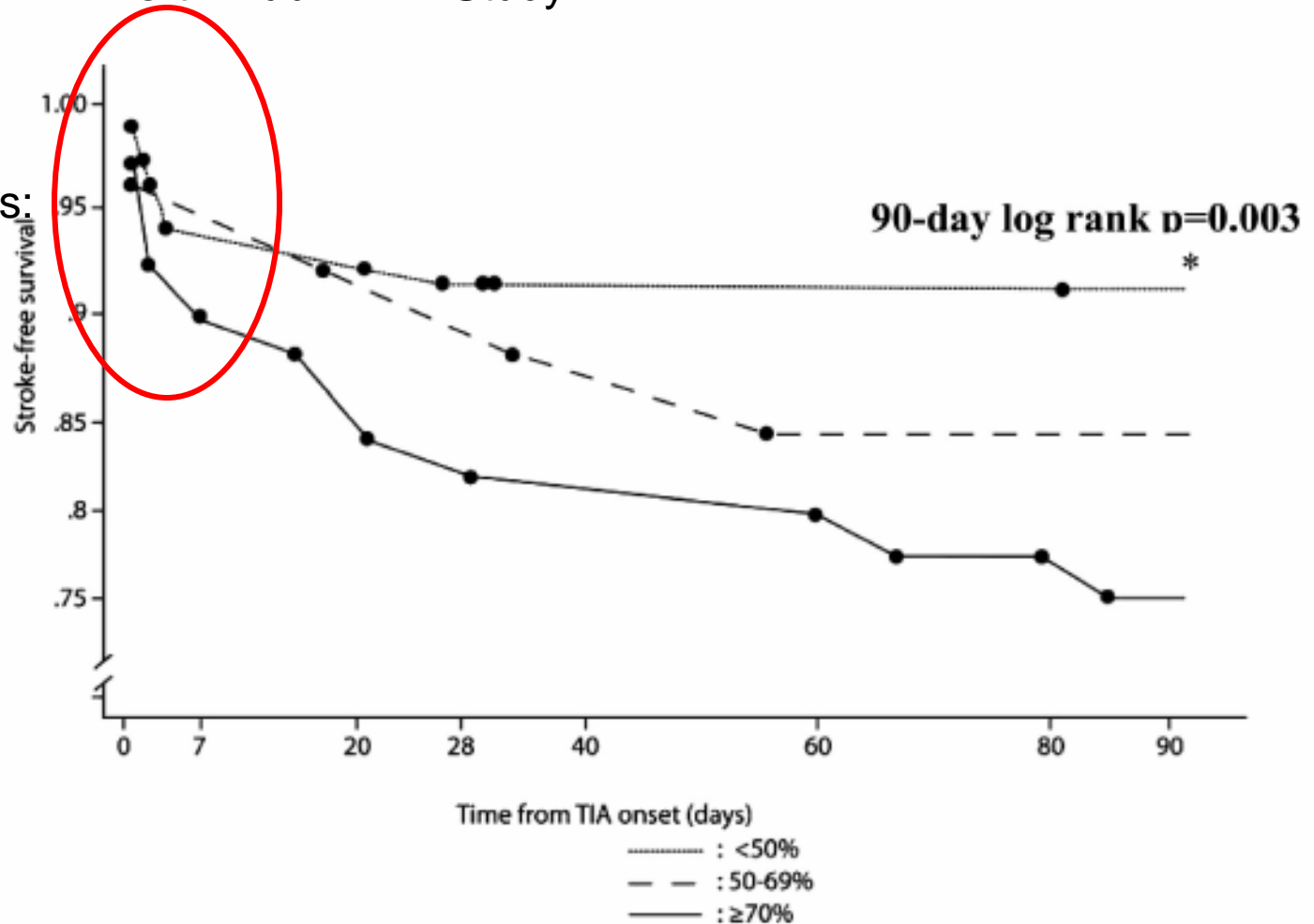
Implications for evaluation:

- Carotid imaging prior to discharge
- Labwork to include LFTs (baseline for statins)
- Follow-up (should include labwork if starting statin)

Kaplan-Meier curve of stroke risk with severity of carotid stenosis:

North Dublin TIA Study

>70% stenosis:
10% stroke
rate < 7 days



N=435

Management Options

- ~~Routine outpatient evaluation~~
- TIA Clinic
- Hospital admission
- Observation Unit

+/- stratification by risk score

Questions

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AHA Scientific Statement

Definition and Evaluation of Transient Ischemic Attack

1. **“Patients with TIA should preferably undergo neuroimaging evaluation within 24 hours of symptom onset. MRI, including DWI , is the preferred brain diagnostic imaging modality. If MRI is not available, head CT should be performed.”** *(Class I, Level of Evidence B)*
2. **Noninvasive imaging of the cervicocephalic vessels should be routinely as part of the evaluation of patients with suspected TIAs .**
(Class I, Level of Evidence A)
3. **Noninvasive testing of the intracranial vasculature reliably excludes the presence of intracranial stenosis *(Class I, Level of Evidence A)* and is reasonable to obtain when knowledge of intracranial disease will alter management. Reliable diagnosis of the presence and degree of stenosis requires the performance of angiography.**

AHA Scientific Statement

Definition and Evaluation of Transient Ischemic Attack

- 2. EKG should occur as soon as possible after TIA. (*Class I, LOE B*)**
- 3. Echocardiography (at least TTE) is reasonable in the evaluation of patients with suspected TIAs.. (*Class IIa, LOE B*)**
- 4. TEE is useful in identifying PFO, aortic arch atherosclerosis, and valvular disease and is reasonable when it would change management (*Class IIa, LOE B*)**

AHA Scientific Statement

Definition and Evaluation of Transient Ischemic Attack

- 5. It is reasonable to hospitalize pts with TIA if they present within 72 hours and any of the following are present: (*Class IIa, LOE C*)**
- ABCD² score ≥ 3**
 - ABCD² score 0-2 and there is uncertainty that diagnostic workup can be completed < 2 days or if there is other evidence that indicates that the patient's event was caused by focal ischemia**

National Stroke Association

Recommendations for Systems of Care for Transient Ischemic Attack

- Healthcare systems should establish a routine triage process for patients with possible TIA (Category 4).
 - Should include specific recommendations for patients who make initial contact through the telephone or through in-person evaluations in clinics and the ED.
- **Patients who may have experienced a TIA within the last 24 hours should be instructed to seek medical evaluation urgently, preferably at the closest emergency room or TIA clinic (Category 3).**
 - In some situations, calling 911 may be appropriate.

National Stroke Association

Recommendations for Systems of Care for Transient Ischemic Attack

- Those with **symptoms resolving 1 to 7 days earlier should be evaluated on the same day whenever possible**, and those with more delayed presentations should be evaluated promptly.
- **Hospital systems should develop a local TIA admission policy** established by representative physicians who care for patients with TIA (Category 4).
 - Such a policy should also define appropriate care for patients with TIA who do not require admission.
- **TIA patients who are not hospitalized should be directed to a setting where they may be evaluated <24 - 48 hours** by a physician with expertise in TIA or a TIA specialty clinic, for rapid patient assessment and treatment (Category 3).

National Stroke Association

Recommendations for Systems of Care for Transient Ischemic Attack

- Each center should develop a protocol to provide a relatively uniform, urgent evaluation for acute TIA patients regardless of the setting of care (Category 4).

The protocol should include the following:

- Urgent evaluation of acute TIA patients..**preferably <24 hours.**
- Description of standard, recommended laboratory testing.
- Protocols for head imaging, by MRI (optimal) or CT, **preferably <24 hours.**
- Protocols for carotid vascular imaging (MRA, CTA, or Doppler), **preferably <24 hours.**
- Protocols for obtaining an electrocardiogram (ECG), **preferably < 24 hours**
- Protocols for telemetry and/or echo in appropriate patients.

National Stroke Association

Recommendations for Systems of Care for Transient Ischemic Attack

For patients with TIA observed **in the hospital**, a standardized protocol should be developed (Category 4). Should include:

- **Monitoring for new neurological signs and sx's at least every 2 hours during the first 24 hours.**
- Cardiac monitoring while under observation.
- Protocol for thrombolysis if a new ischemic stroke occurs
- Protocol for urgent carotid intervention for appropriate candidates with symptomatic ICA stenosis >50%
- Protocol to initiate medical and behavioral interventions to reduce subsequent stroke risk,
- Education of the patient and family
- Protocol to inform PCP of test results and recommendations.

National Stroke Association

Recommendations for Systems of Care for Transient Ischemic Attack

For patients with TIA seen **as an outpatient**, a standardized protocol should be developed (Category 4). Should include:

- **Evaluation by clinical stroke expert < 48 hrs**
- Protocol for timely completion of recommended evaluation including lab, EKG, brain imaging, carotid vascular imaging and possibly ECHO and cardiac monitoring.
- Protocol for thrombolysis if a new ischemic stroke occurs
- Protocol for urgent carotid intervention for appropriate candidates with symptomatic ICA stenosis >50%
- Protocol to initiate medical and behavioral interventions to reduce subsequent stroke risk,
- Education of the patient and family
- Protocol to inform PCP of test results and recommendations.

Management Options

- ~~Routine outpatient evaluation~~
- TIA Clinic
- Hospital admission
- Observation Unit

+/- stratification by risk score

Factors in developing management strategy

- Clinical:
 - Speed of evaluation
 - Implementation of therapies (especially antithrombotics and carotid evaluation)
- Organization/infrastructure of system
- Reimbursement

Potential benefits of a short-stay hospital admission/observational status

- (1) Expedited diagnostic evaluation;
- (2) Monitoring of fluctuating patients with ready access to thrombolysis if they deteriorate;
- (3) Facilitation of early carotid revascularization;
- (4) Greater opportunity for risk factor modification
- (5) "TIA outpatient clinics" de-emphasizes the urgency required for their assessment.

Reimbursement considerations

- CMS has authorized RAC to audit cases of TIA.
- AAN monitoring, at least one large institution has had TIA admits denied.
- Some hospital administrators prefer observational status over admission
 - Potentially reduced risk of claim denial
 - Return to hospital after Observation stay does not constitute readmission

Potential benefits of a TIA clinic

- 1/3 referrals to a TIA clinic do not have cerebrovascular disease.. Not necessary to admit these patients
- More cost-effective for healthcare
- Helps avoid iatrogenic complications that can occur in hospitals (DVT, infections, etc)

Questions

- What is early risk of stroke?
- What intervention reduces the risk?
- What do guidelines suggest?
- **What are some hospital approaches?**
- Reimbursement considerations

University of Colorado Hospital

- Hospitalizes all TIA patients for observation and expedited evaluation

Emory University Hospital TIA Care Model

- TIA patients managed in the ED observation unit, Clinical Decision Unit (CDU)
- Use accelerated diagnostic protocol (ADP):
 1. Carotid imaging (MRA/MRI)
 2. Echocardiography
 3. Serial clinical evaluation—neuro-assessments q 2hrs, and a neurologist consult
 4. Cardiac monitoring for at least 12 hours.

Kaiser Permanente Northern California

- ED physician uses TIA order sets and discusses case with neurologists
- ABCD² > 3 admitted for 24hr observation and additional imaging and Neurology consulted
- ABCD² score \leq 3 and negative vascular imaging are discharged after initial evaluation with consultation in the outpatient Neurology clinic—usually within one to two days
- All entered into a registry, and case management nurses track and manage the population

Stanford Stroke Center TIA Clinic

Stanford emergency room for assessment of ABCD² score and to obtain initial vascular imaging.

- Outpatient TIA clinic:
 - ABCD² =3 points or 4 -5 points w/ unremarkable arterial imaging of the cervical and intracranial vessels (using CTA or MRA).
 - typically seen the next day in TIA clinic by both the TIA clinic coordinator (a nurse practitioner) and a Stanford Stroke Center neurologist. The clinic has access to urgent neuroimaging and cardiac diagnostic studies
- Hospital admission is recommended for patients with a score of 6 or 7 or for patients with >50% stenosis

Admit or Not Admit?

...It depends:

- System chosen should have the capability to rapidly:
 - Confirm diagnosis, start effective secondary prevention
- Options of TIA clinic, observation unit or admit all reasonable depending on hospital organization/features

Consider stratification by ABCD² , especially if no neurological evaluation available



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"Things are pretty backed up today, so we'd like you to take each other's blood pressure, weight and temperature."