Transient ischaemic attack
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Dr André Peeters
Service de Neurologie
Cliniques Universitaires Saint-Luc / U.C.L.
1200 BRUXELLES

Introduction

- Definition, aetiology & clinical manifestations
- Initial evaluation & management
- Secondary prevention
- Prognosis
- Conclusions
- Questions & answers

TIA Definition, aetiology & clinical manifestations

- Time-based definition (WHO)
  - a sudden, focal neurologic deficit < 24 hours, is presumed to be of vascular origin, and is confined to an area of the brain or eye (or spinal cord) perfused by a specific artery
  - Stroke : … > 24 hours, ….
- Tissue-based definition
  - a brief episode of neurologic dysfunction caused by focal brain or retinal (or spinal cord) ischemia, with clinical symptoms typically lasting < 1 hour, and without evidence of acute infarction

TABLE 1. FEATURES OF THE CURRENT AND PROPOSED DEFINITIONS OF TRANSIENT ISCHEMIC ATTACK.

CURRENT, TIME-BASED DEFINITION*	PROPOSED, TISSUE-BASED DEFINITION†
Based on an arbitrary 24-hour time limit	Based on the presence or absence of a biologic end point
Suggests transient ischemic symptoms are benign	Indicates that transient ischemic symptoms can cause permanent brain injury
Promotes diagnosis on the basis of the temporal course rather than pathophysiology	Encourages use of neurodiagnostic tests to identify brain injury and its cause
Fosters delays in interventions for acute cerebral ischemia	Facilitates rapid interventions for acute brain ischemia
Inaccurately predicts the presence or absence of ischemic brain injury	More accurately reflects the presence or absence of ischemic brain injury
Diverges from the distinction between angina and myocardial infarction	Consistent with the distinction between angina and myocardial infarction

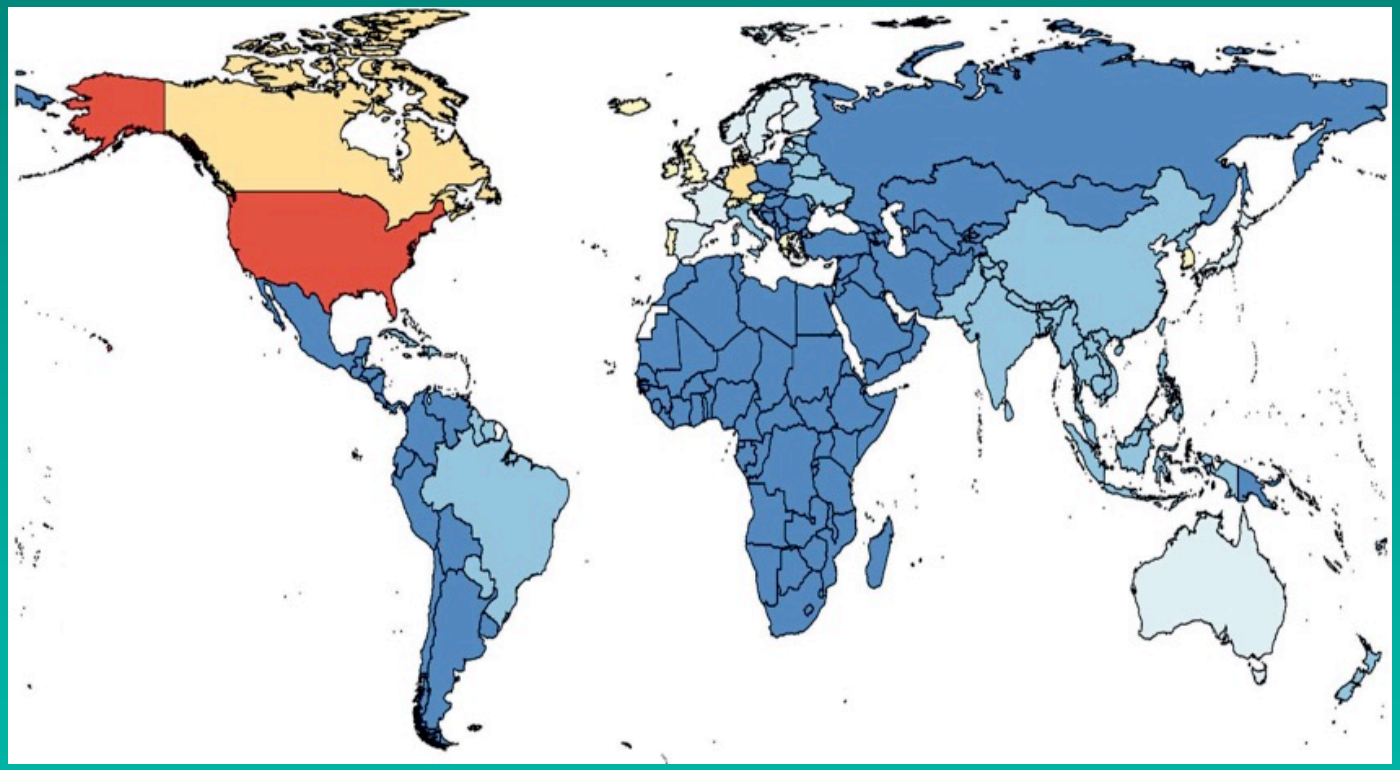
*A transient ischemic attack is a sudden focal neurologic deficit lasting for less than 24 hours, of presumed vascular origin, and confined to an area of the brain or eye perfused by a specific artery.

†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.

N Engl J Med 2002; 347:1713-1716

TIA Definition, aetiology & clinical manifestations

- Time-based definition (WHO)



Age-standardized annual prevalence (per 100,000) of ischemic stroke in 2013

Neuroepidemiology 2015;45:230–236

TIA Definition, aetiology & clinical manifestations

Typical TIA

Transient, non-progressive (sudden), focal neurologic symptoms including one or more of the following:

- Transient monocular blindness (amaurosis fugax)
- Aphasia or dysarthria
- Hemianopia
- Hemiparesis and/or hemisensory loss

UpTodate 2021

TIA Definition, aetiology & clinical manifestations

Atypical TIA

Gradual build-up of symptoms (> 5 min)

March of symptoms from one body part to another (≠ passing the midline)

Progression of symptoms from one type to another

Very brief spells (less than 30 seconds)

Isolated disturbance of vision in both eyes characterized by the occurrence of positive phenomena (e.g., flashing lights)

Isolated sensory symptoms remarkably focal distribution (finger, chin, tongue)

Isolated brainstem symptoms, such as dysarthria, diplopia, or hearing loss

Identical spells occurring over a period of more than one year

UpTodate 2021

TIA Definition, aetiology & clinical manifestations

Atypical TIA

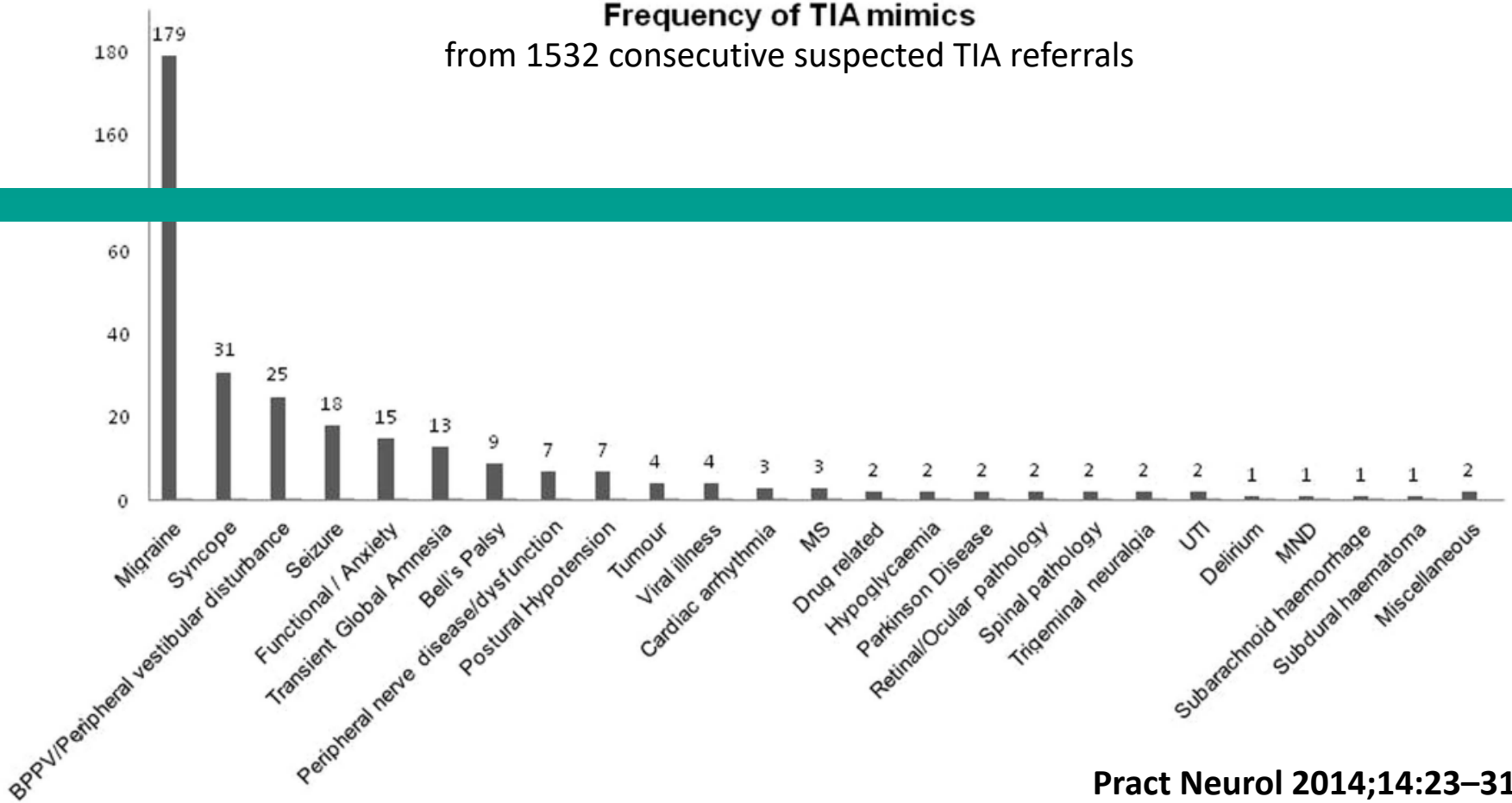
Other diagnoses : mimics

Some real TIAs : “non-consensus TIAs” and …?

Chameleons: TIAs can look like something else

TIA Definition, aetiology & clinical manifestations

Mimics



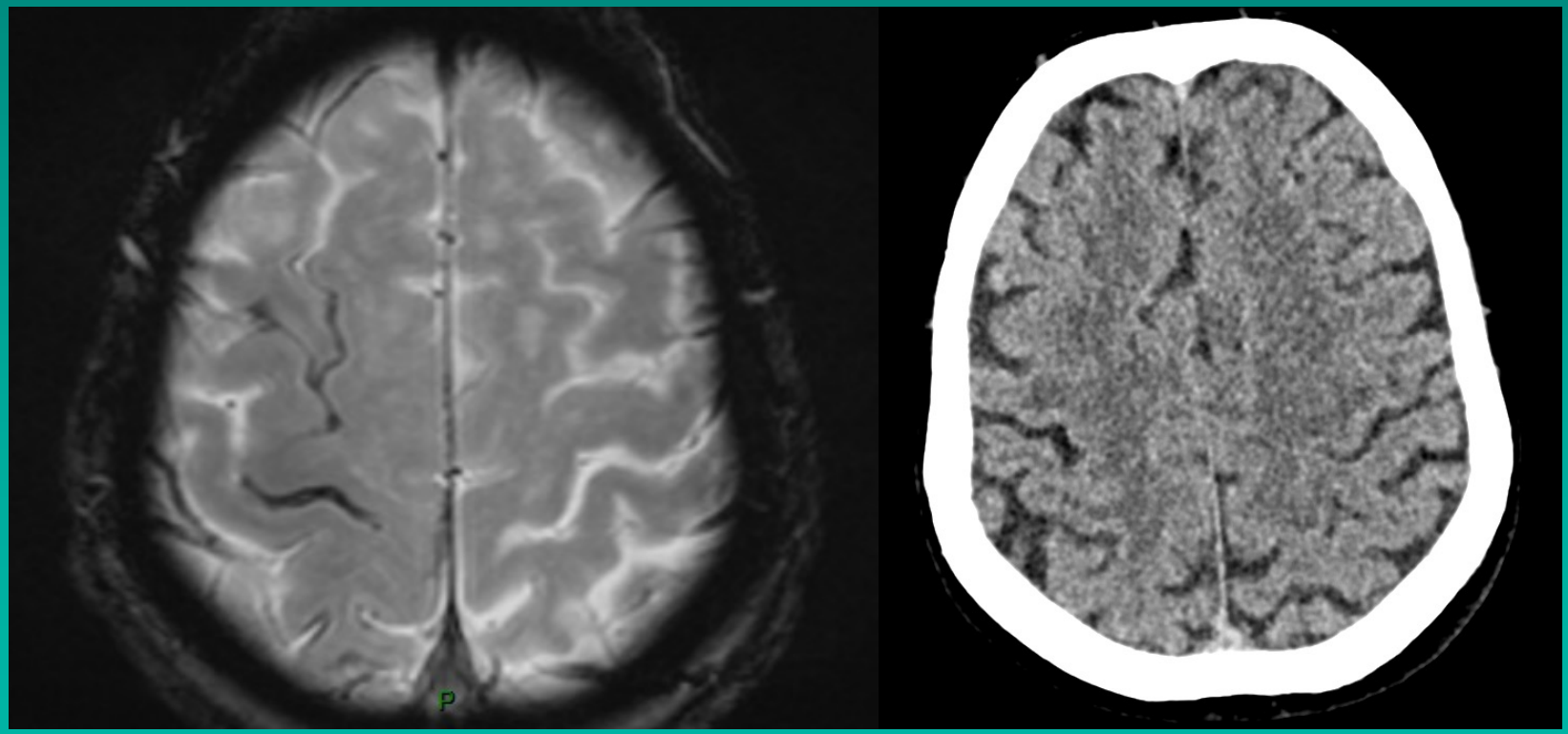
Pract Neurol 2014;14:23–31

	TIA	Migraine	Seizure	Syncope	Functional/ anxiety
Demographic	Older age Vascular risk factors More common in men	Younger age More common in women	Any age	Any age, often younger More common in women	Younger More common in women
Neurological symptoms	Negative symptoms, usually maximal at onset: for example, numbness, weakness, visual loss. Transient diplopia and monocular visual loss are often due to TIA Does not spread into other sensory modalities. Alteration or loss of consciousness almost never occur	Positive, spreading symptoms at onset. Visual the most common. May be followed by negative symptoms in the same domain Symptoms may evolve into another modality (eg, visual followed by somatosensory) True alteration or loss of consciousness almost never occur, though there may be 'confusion' or muddled thinking	Positive symptoms including painful sensory disturbance, limb jerking, head turning, dystonic posturing, lip smacking. Loss of awareness and amnesia for event unless simple partial seizures Postictal negative symptoms (eg, Todd's paresis) may persist for days	Faint or light headed (presyncopal). Vision may darken, or hearing becomes muffled. Loss of awareness	Isolated sensory symptoms common
Timing	Abrupt onset, gradual offset (minutes). Usually total duration minutes, nearly always <1 h Recur over days or weeks, usually not months or years.	Usually last 20–30 min, but may be much longer Can recur over years or decades.	Usually less than 2 min. Can recur over years	Seconds to less than a minute. Can recur over years	Tend to be recurrent and stereotyped
Associated symptoms	Headaches may occur, usually during the attacks	Headache usually afterwards with migrainous features (nausea, vomiting, photophobia, phonophobia, mechanosensitivity)	Tongue biting (especially lateral), incontinence, muscle pains, exhaustion or disorientation, headache follow	Sweating, pallor, nausea, rapid recovery to full alertness	May be preceded by emotional or psychosocial stressors Anxiety

Pract Neurol 2014;14:23–31

TIA Definition, aetiology & clinical manifestations

Mimics



Amyloid ‘spells’ and cerebral convexity subarachnoid haemorrhage

TIA Definition, aetiology & clinical manifestations

Mimics

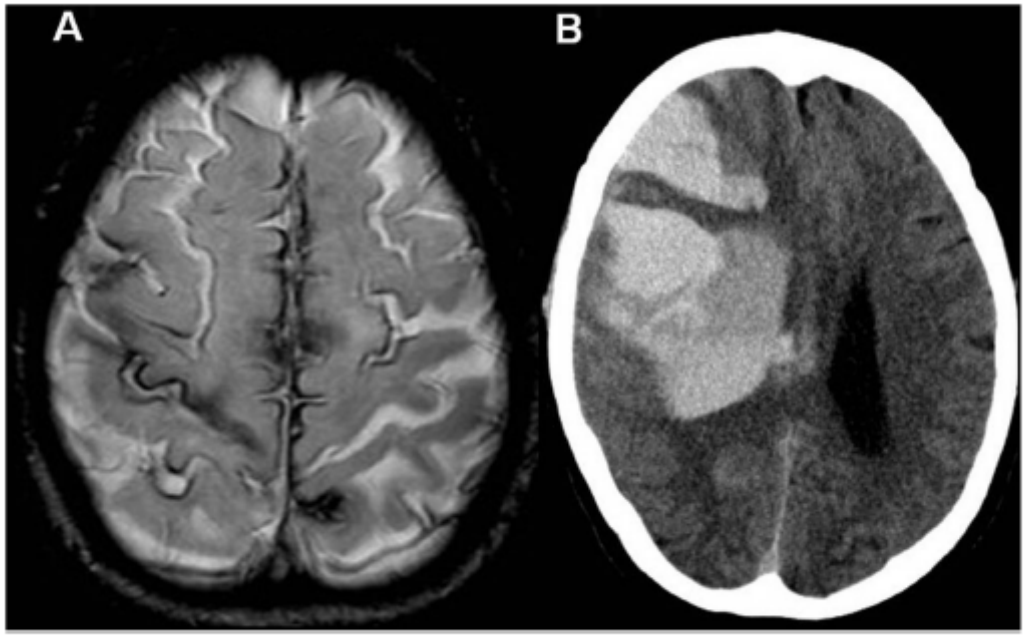


Figure 3 (A) MR scan of brain from an 82-year-old woman who presented with recurrent episodes of sudden onset needles affecting the face, gum and hand, with facial drooping, lasting about 20 min. The patient was treated with clopidogrel. (B) CT scan of head following admission 1 month later with sudden left haemiparesis. Note large right frontal intracerebral haematoma.

Pract Neurol 2014;14:23–31

Amyloid 'spells' and cerebral convexity subarachnoid haemorrhage

TIA Definition, aetiology & clinical manifestations

Non-consensus TIAs

Prospective classification of most common symptoms of classic TIA vs non-consensus TIA in OxVasc

Classic TIA

Motor weakness
Sudden onset of transient motor weakness in one or more body segment (face, arm, hand, leg)

Dysphasia
Sudden onset of transient expressive or receptive dysphasia, or both

Sensory loss
Sudden onset of transient sensory loss in two or more body segments (face, arm, hand, or leg)

Hemianopia or quadrantanopia
Sudden onset of transient visual loss in part of the visual field (homonymous hemianopia or quadrantanopia)

Monocular visual loss
Sudden onset of transient monocular visual loss

Vertigo plus
Sudden onset of transient vertigo plus other TIA symptoms

Diplopia plus
Sudden onset of transient diplopia plus other TIA symptoms

Dysarthria plus
Sudden onset of transient dysarthria plus other TIA symptoms

Ataxia plus
Sudden onset of transient ataxia plus other TIA symptoms

Non-consensus TIA

Vertigo only
Sudden onset of new non-recurrent isolated vertigo (with or without nausea or vomiting) not precipitated by head movement or trauma, and without associated ear pain, tinnitus, or hearing loss; cases with non-specific dizziness or light headedness are excluded

Ataxia only
Sudden onset of transient unsteadiness of gait without any other cause

Diplopia only
Sudden onset of transient isolated binocular double vision without an obvious ocular (eg, retinal detachment) or neuromuscular cause

Dysarthia only
Sudden onset of transient isolated slurred speech

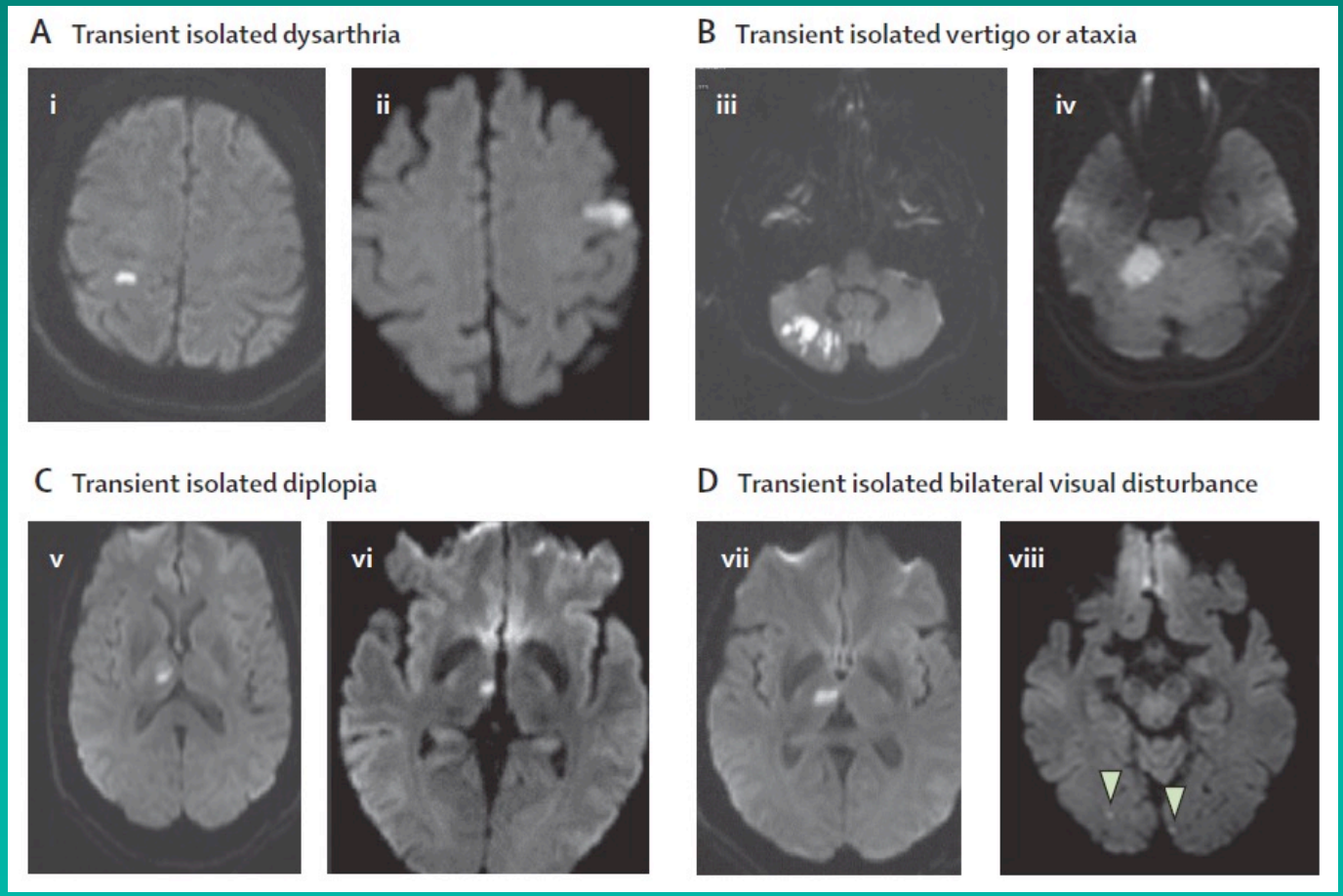
Bilateral decreased vision only
Sudden onset of transient isolated bilateral visual impairment (excluding hemianopia or quadrantanopia) without associated positive symptoms

Single segment sensory loss only
Sudden onset of transient isolated unilateral numbness in only one body segment (face, arm or hand, or leg) without march

Lancet 2021; 397: 902–12

TIA Definition, aetiology & clinical manifestations

Non-consensus TIAs

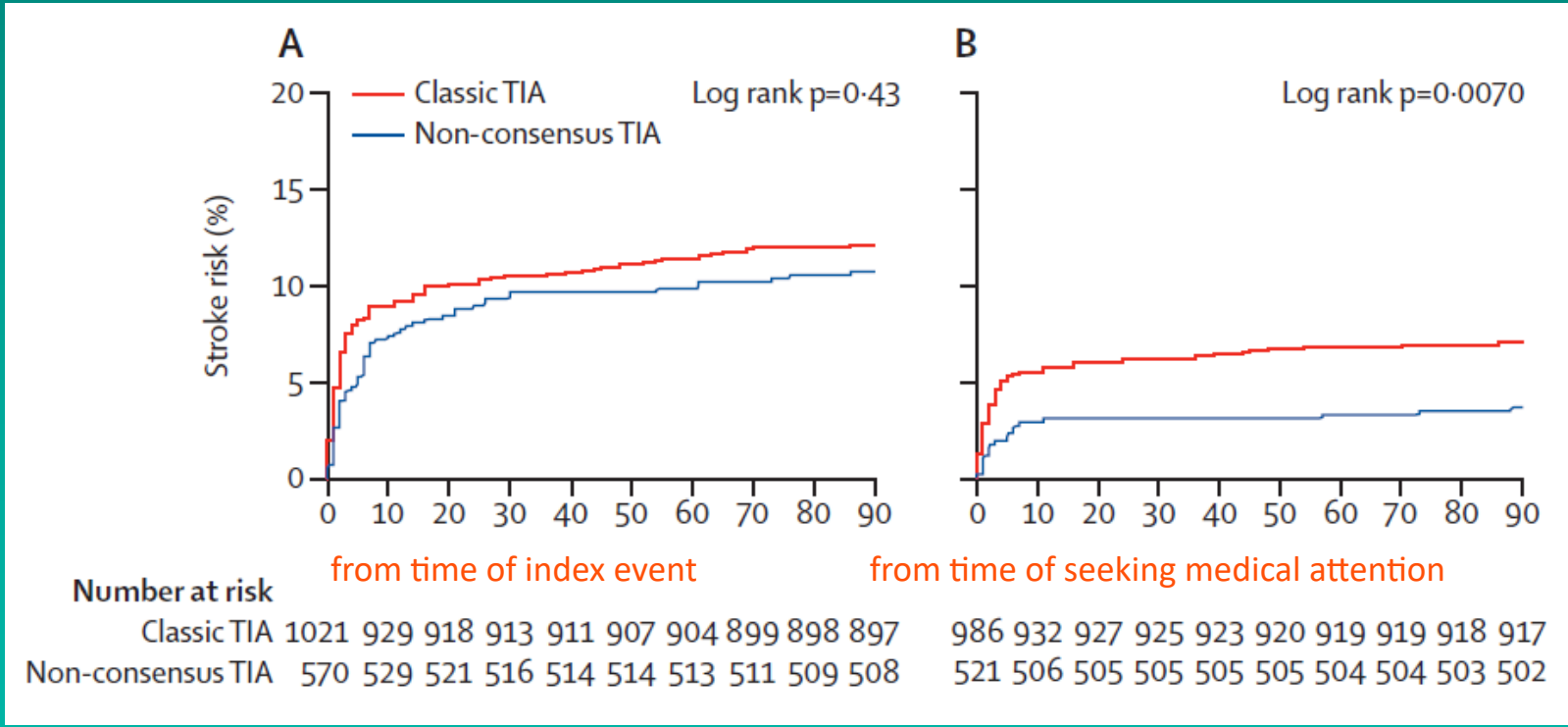


Lancet 2021; 397: 902–12

TIA Definition, aetiology & clinical manifestations

Non-consensus TIAs

90-day stroke risk in patients with classic TIA and non-consensus TIA

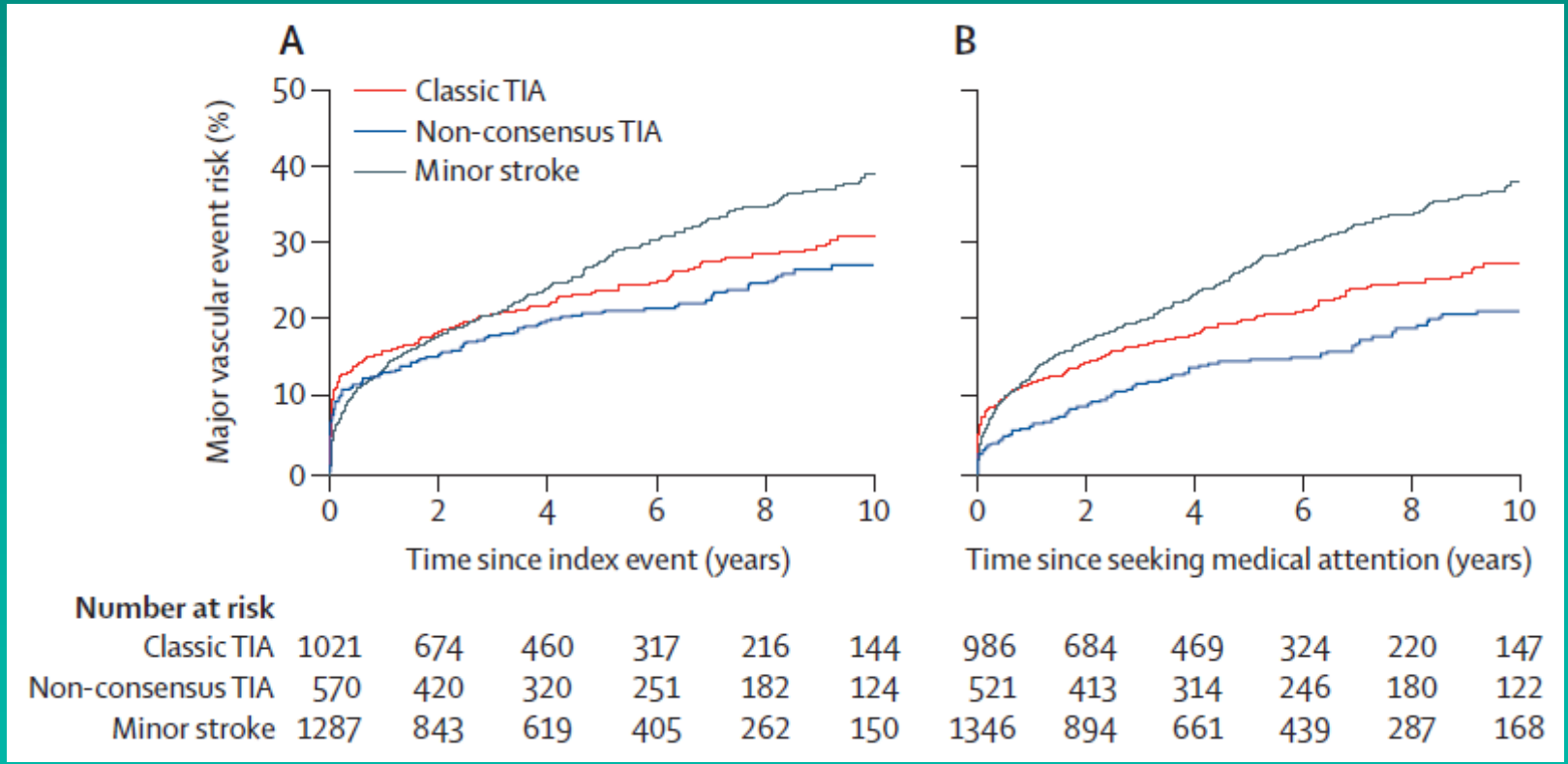


Lancet 2021; 397: 902–12

TIA Definition, aetiology & clinical manifestations

Non-consensus TIAs

10-year risk of all major vascular events in patients with non-consensus TIA, classic TIA, and minor ischaemic stroke



Number at risk												
Classic TIA	1021	674	460	317	216	144	986	684	469	324	220	147
Non-consensus TIA	570	420	320	251	182	124	521	413	314	246	180	122
Minor stroke	1287	843	619	405	262	150	1346	894	661	439	287	168

Lancet 2021; 397: 902–12

TIA Definition, aetiology & clinical manifestations

- "Stroke with negative DWI-MRI"

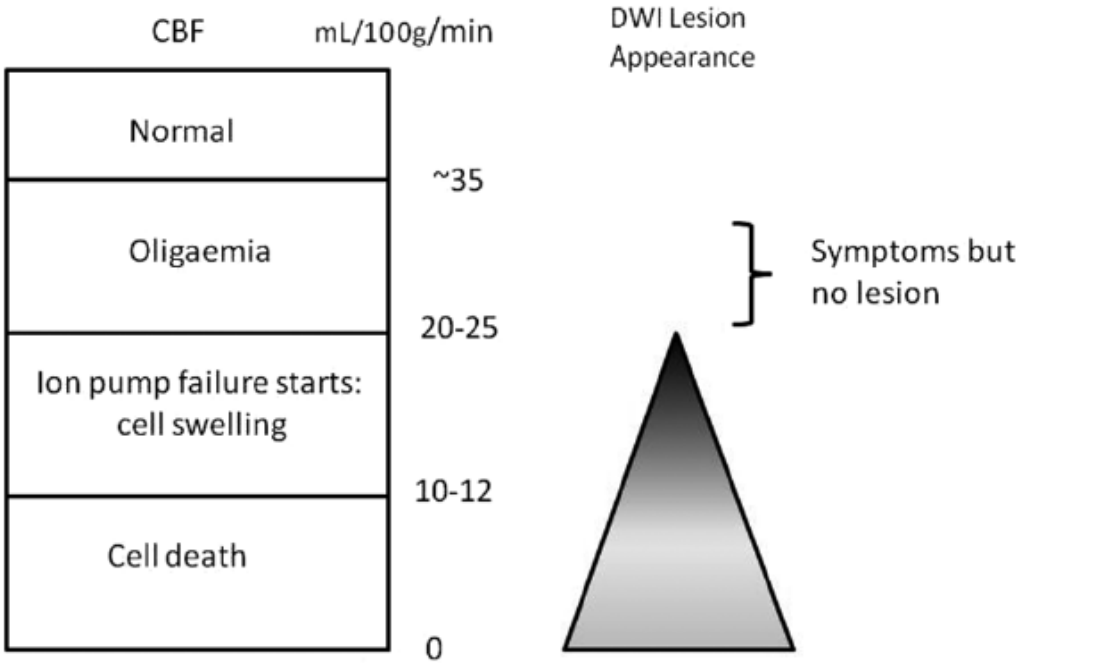


Figure 3. Relationship between symptoms, cerebral blood flow (CBF) and diffusion-weighted imaging (DWI) lesion.

Stroke. 2015;46:3142-3148

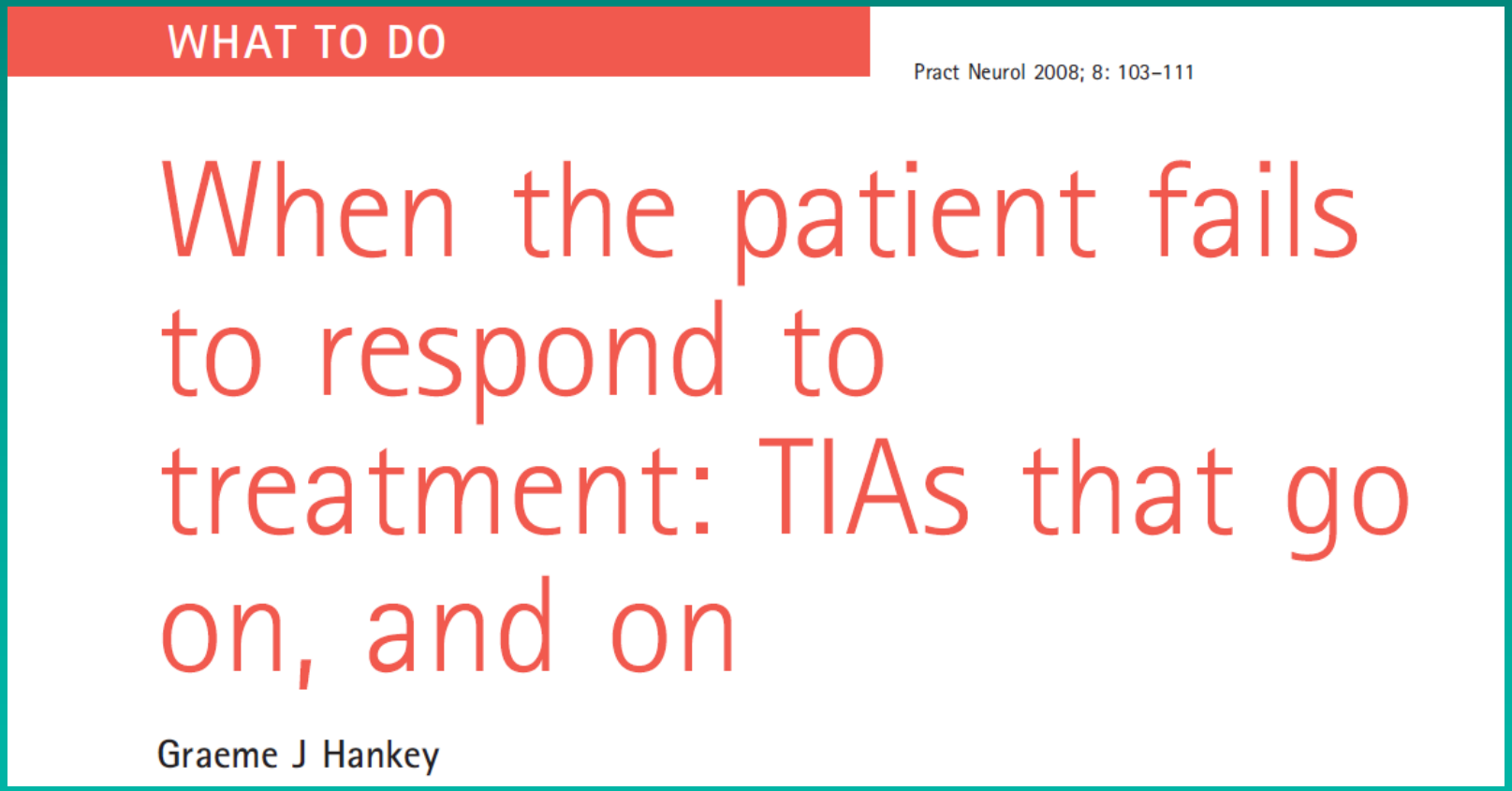
TIA Definition, aetiology & clinical manifestations

- TIA = symptom / syndrome, the real question is …

TIAs: We need to return to the question, 'What is wrong with Mr. Jones?'
Louis R. Caplan
Neurology 1988;38;791
DOI 10.1212/WNL.38.5.791

- TIA/minor stroke : aim on secondary prevention
- Major stroke: aim on acute R/ to limit morbidity/mortality

TIA Definition, aetiology & clinical manifestations



WHAT TO DO

Pract Neurol 2008; 8: 103–111

When the patient fails to respond to treatment: TIAs that go on, and on

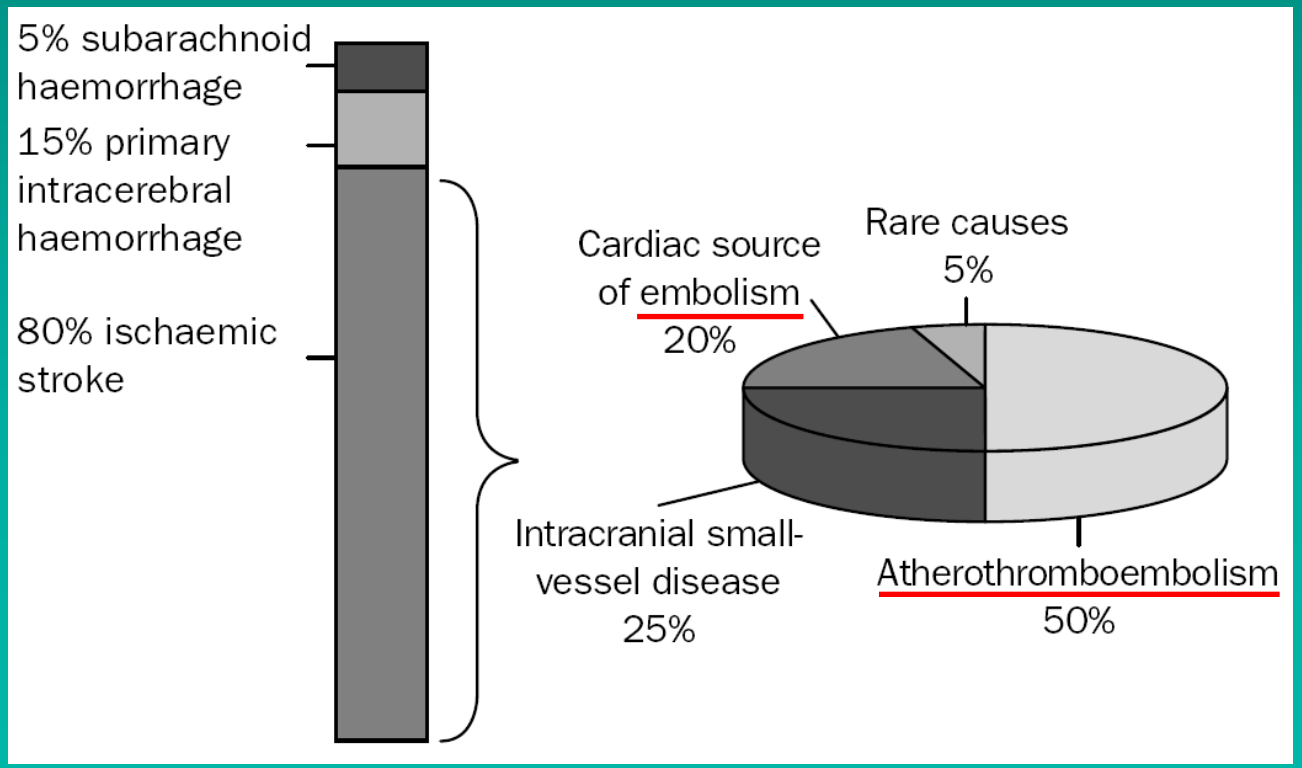
Graeme J Hankey

TIA Definition, aetiology & clinical manifestations

- **When the patient fails to respond to treatment: TIAs that go on, and on**
  - then the diagnosis must be reviewed
  - and if they are TIAs, what are they caused by (atherothromboembolism, embolism from the heart, etc)?
    - Ex: patient in AF, 3 identical TIAs: internal carotid artery stenosis!
  - …

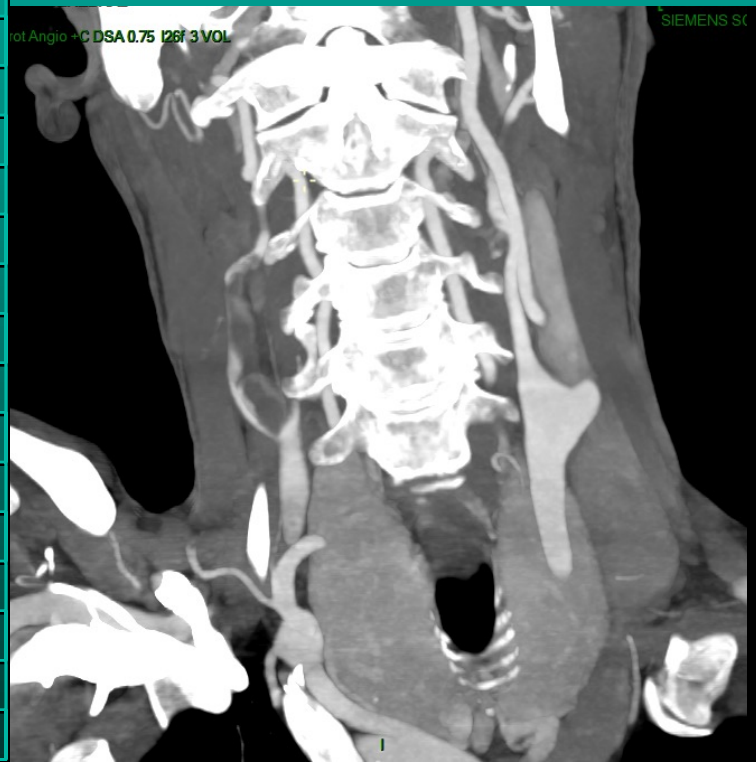
TIA Definition, aetiology & clinical manifestations

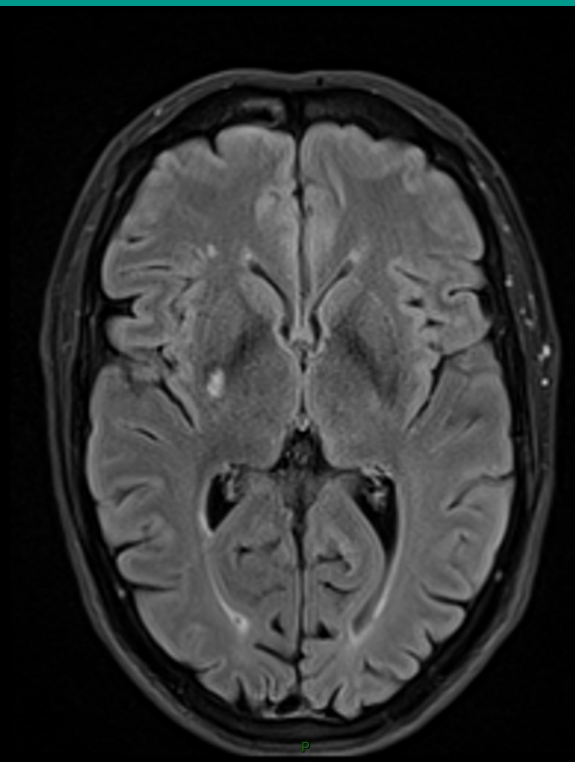
- Pathophysiologic subtypes
  - Embolic TIA (artery-to-artery, cardioaortic or unknown source)

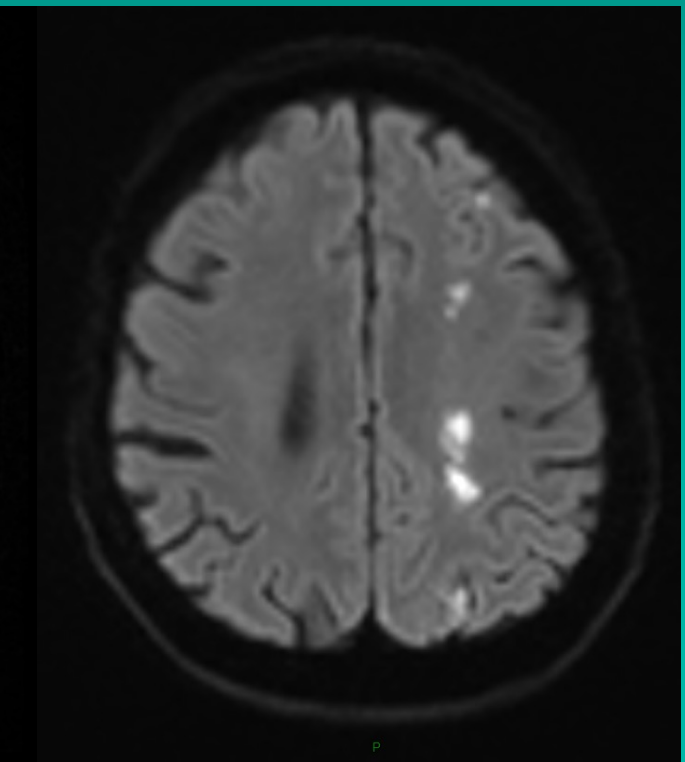


Lancet 2003; 362: 1211–24

- Pathophysiologic subtypes
  - Embolic TIA (artery-to-artery, cardioaortic or unknown source)
  - Lacunar or small penetrating vessel TIA
    - (capsular warning)
  - Large artery, low-flow TIA
    - (limb shaking TIA’s)







Initial evaluation & management

- Express (EXisting PREventive Strategies for Stroke)
  - OCSP (Oxford Community Stroke Project)
  - Phase 1 :
    - GP referred by fax to TIA clinic
    - study team contacted the patient, appointment ASAP
    - report, with treatment recommendations, faxed to the GP
    - no R/ given in hospital, no prescription, “contact your GP ASAP”
  - Phase 2 : no appointments necessary, treatment initiated immediately

Lancet 2007; 370: 1432–42

Initial evaluation & management

- Express (EXisting PREventive Strategies for Stroke)

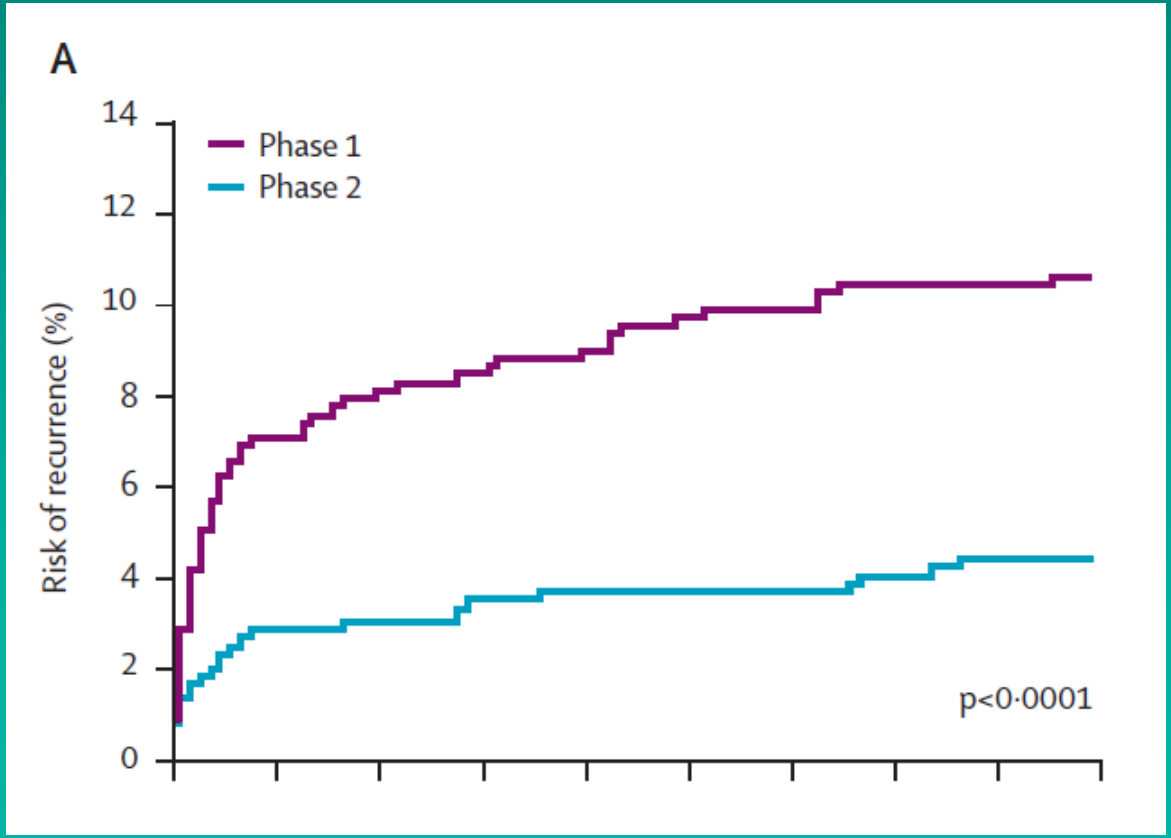
  - First line evaluation
    - Brain imaging (usually CT), ECG the same day
    - Carotid US and TTE (TEE) following week

  - Treatment
    - ASA if not already on antiplatelets (75 mg daily), or CLO if ASA contraindicated;
    - or those seen < 7 days (thought to be at particularly high early risk), clopidogrel (75 mg daily, stop after 30 days) in addition to aspirin
    - simvastatin (40 mg daily);
    - BP lowering unless SBP < 130 mm Hg on repeated measurement (either ↑ existing medic, or + perindopril 4 mg (+/-) indapamide 1,25 mg);
    - anticoagulation as required

Lancet 2007; 370: 1432–42

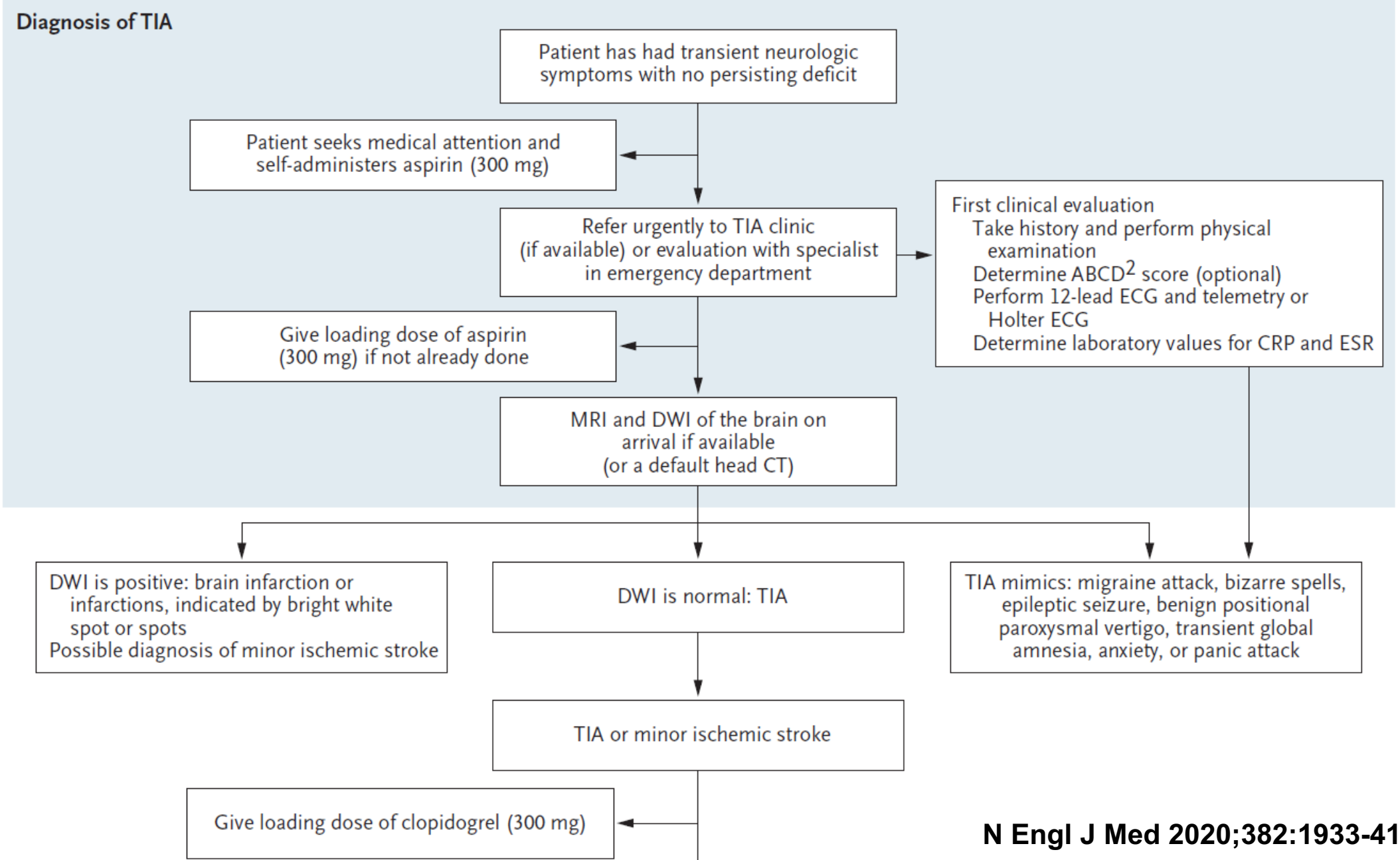
Initial evaluation & management

- Express (EXisting PREventive Strategies for Stroke)



Lancet 2007; 370: 1432–42

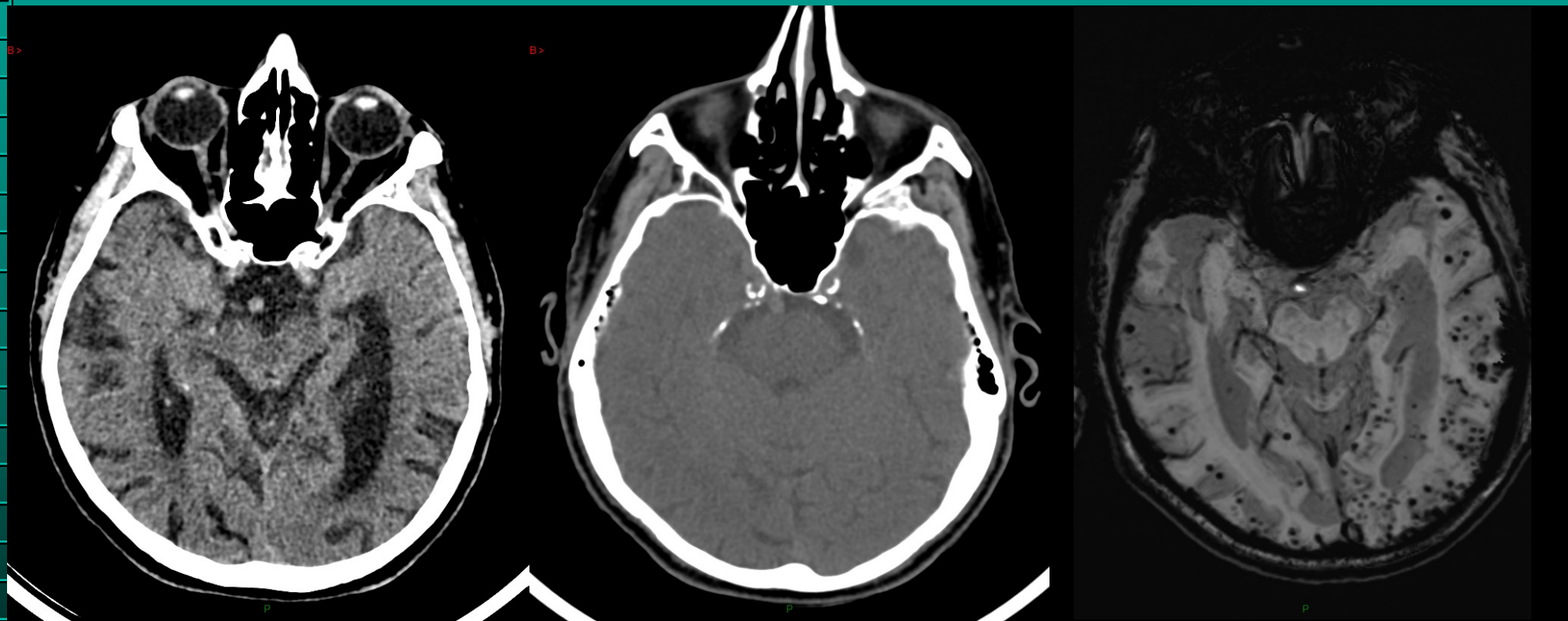
Initial evaluation & management



N Engl J Med 2020;382:1933-41

Initial evaluation & management

- 75 ♂: isolated dysarthria (non-consensus TIA)
  - ECG : AF
  - Brain CT : ≠ processus aigu endocrânien (ischémique ou hémorragique)
    Calcification des siphons carotidiens



Early secondary prevention

- Early dual antiplatelet therapy
- Early anticoagulation
- Early CEA
- Early life style modification

Early Dual Antiplatelet Therapy

- ASA + clopidogrel
  - CHANCE
  - FASTER
  - POINT
- ASA + ticagrelor
  - THALES

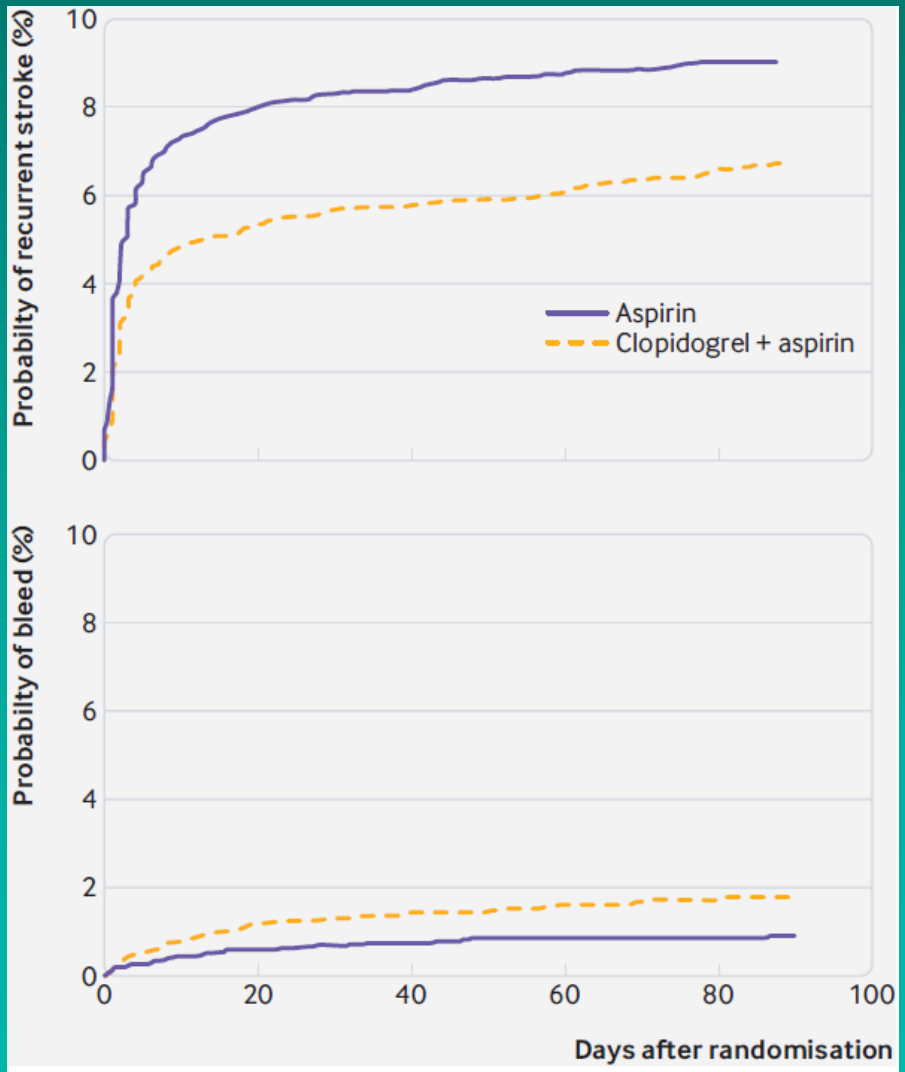


Fig 3 | Pooled Kaplan-Meier time-to-event curves for stroke and bleeding

BMJ 2018;364:k5108

Early anticoagulation

doi:10.1093/europace/euv309

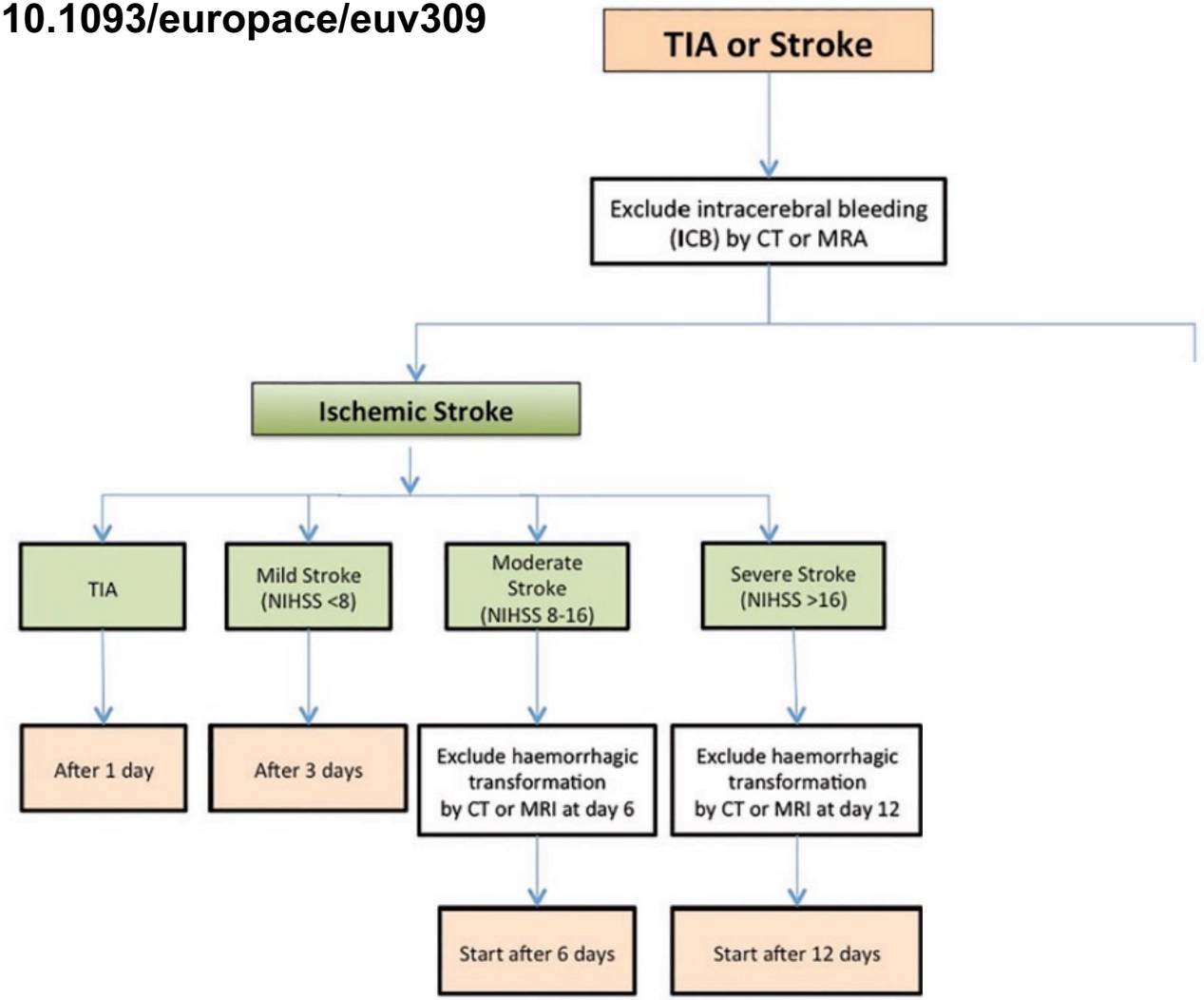
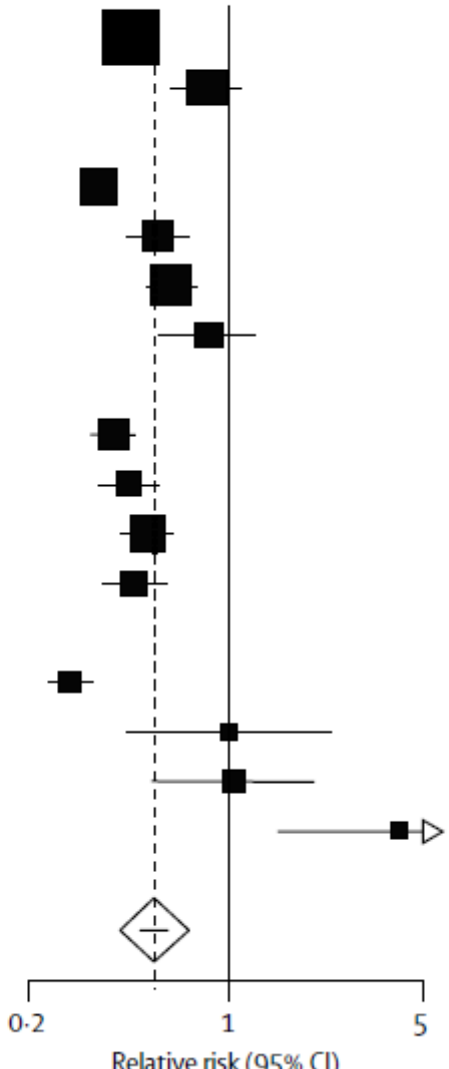


Figure 9 Flowchart for the initiation or re-initiation of anticoagulation after TIA/stroke or intracerebral haemorrhage.

Early carotid endarterectomy

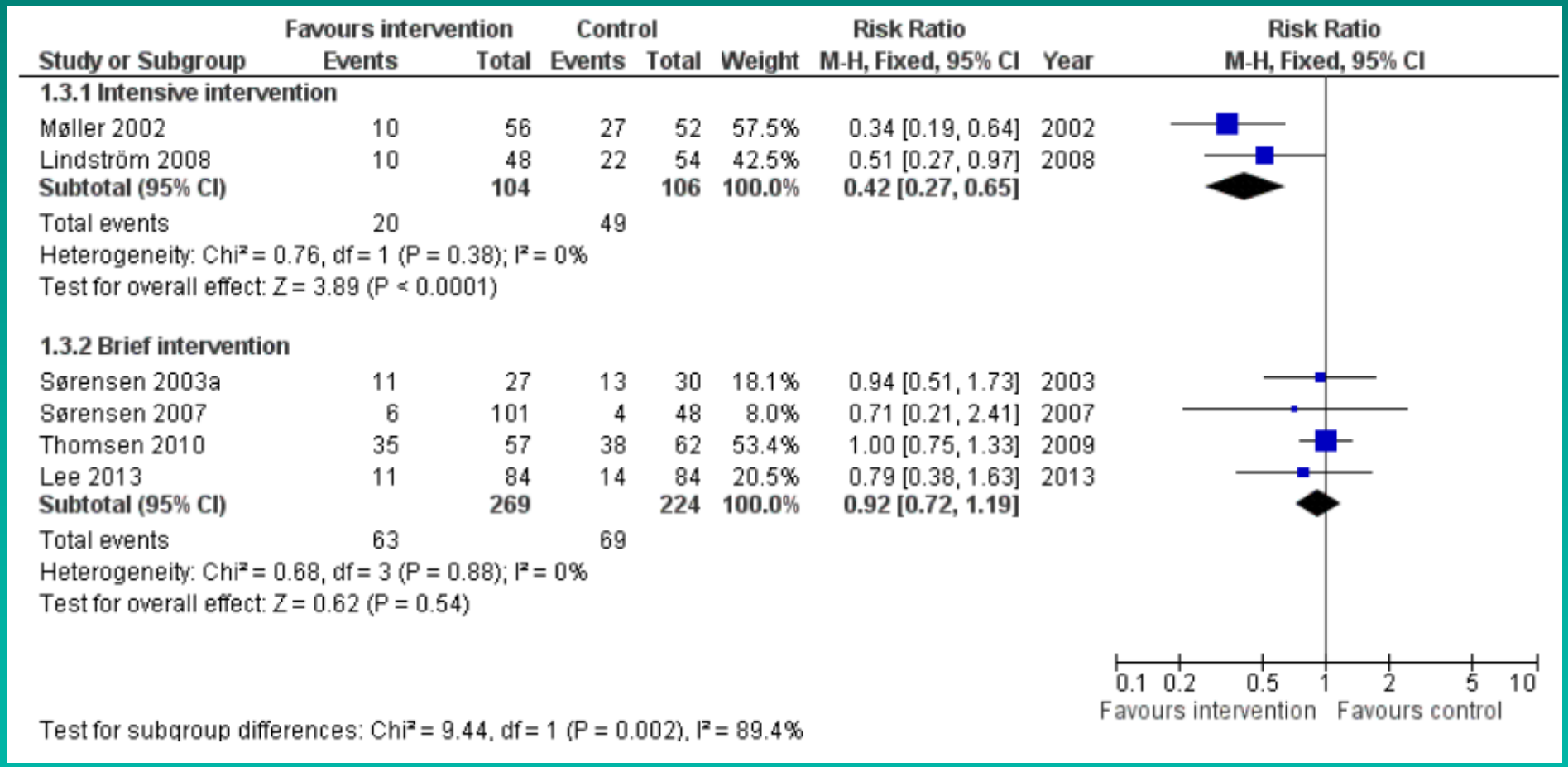
Subgroup	Events/patients: Surgical	Events/patients: Medical	RR	95% CI	% ARR	95% CI
Sex						
Male	92/890	172/784	0·46	0·41–0·51	13·1	9·2 to 16·9
Female	59/436	55/346	0·84	0·63–1·12	2·7	−2·6 to 8·0
Time since last event						
<2 weeks	30/284	80/269	0·35	0·31–0·40	21·0	14·0 to 28·0
2–4 weeks	29/233	41/193	0·57	0·45–0·73	9·7	2·1 to 17·2
4–12 weeks	56/512	76/450	0·63	0·52–0·78	6·8	2·0 to 11·5
>12 weeks	36/297	30/218	0·85	0·58–1·26	2·3	−4·4 to 9·0
Time since last event: males						
<2 weeks	20/178	52/185	0·39	0·33–0·47	18·6	10·0 to 27·2
2–4 weeks	16/139	33/136	0·45	0·35–0·58	14·4	4·9 to 23·9
4–12 weeks	37/365	60/317	0·52	0·43–0·64	9·9	4·1 to 15·7
>12 weeks	19/208	27/146	0·47	0·36–0·61	11·3	2·7 to 19·9
Time since last event: females						
<2 weeks	10/106	28/84	0·28	0·23–0·33	25·8	13·6 to 38·1
2–4 weeks	13/94	8/57	1·00	0·44–2·26	0·0	−11·7 to 11·7
4–12 weeks	19/147	16/133	1·04	0·54–1·99	−0·5	−8·8 to 7·7
>12 weeks	17/89	3/72	4·30	1·48–12·46	−16·0	−26·5 to −5·5
Total	151/1326	227/1130	0·55	0·50–0·62	9·8	6·6 to 12·9



Lancet 2005; 365: 256–65

Early life style modification

- Interventions for preoperative smoking cessation



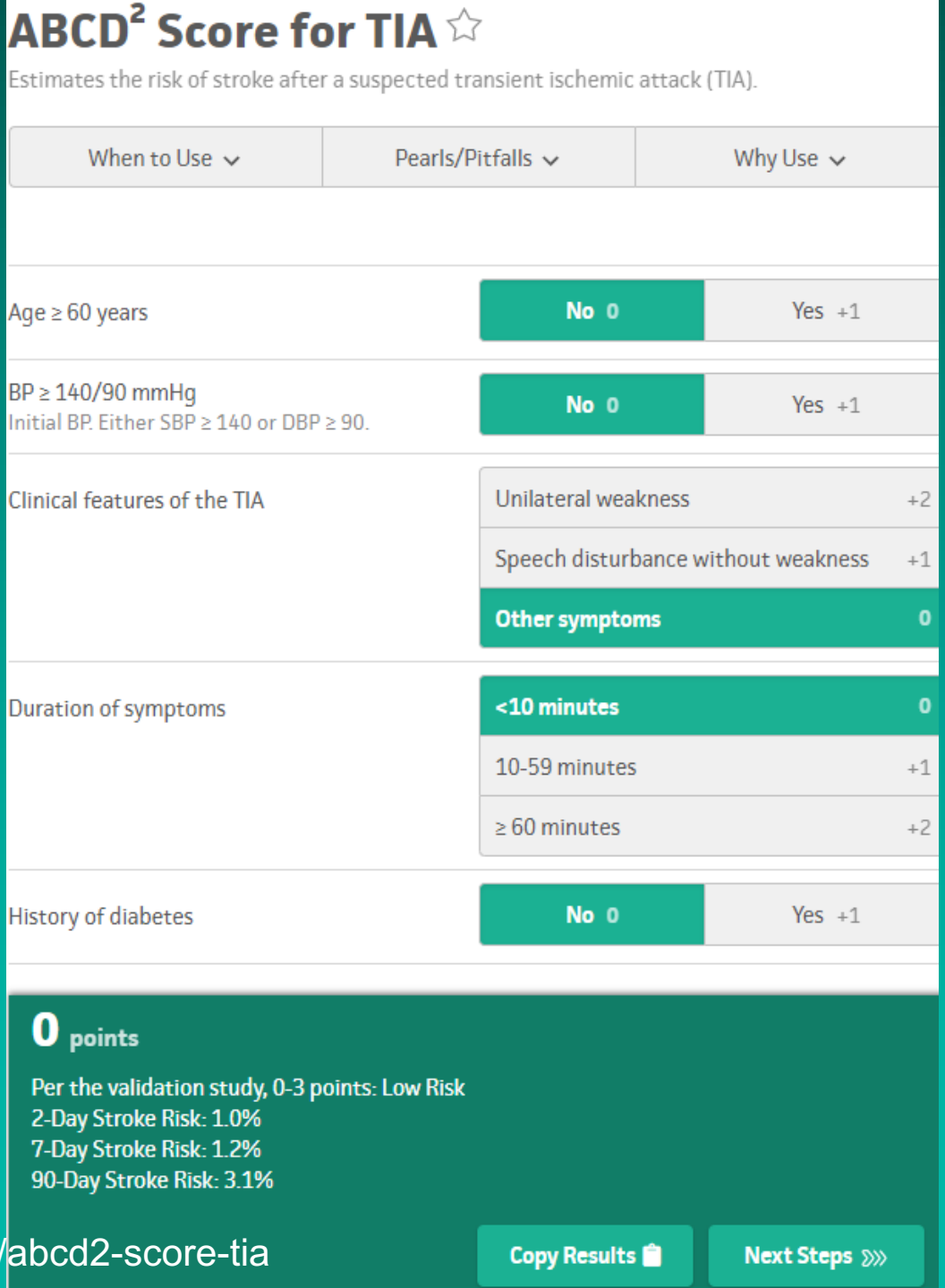
Study or Subgroup	Favours intervention Events	Total	Control Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI	Year
1.3.1 Intensive intervention							
Møller 2002	10	56	27	52	57.5%	0.34 [0.19, 0.64]	2002
Lindström 2008	10	48	22	54	42.5%	0.51 [0.27, 0.97]	2008
Subtotal (95% CI)		**104**		**106**	**100.0%**	**0.42 [0.27, 0.65]**	
Total events	20		49				
Heterogeneity: Chi² = 0.76, df = 1 (P = 0.38); I² = 0%							
Test for overall effect: Z = 3.89 (P < 0.0001)							
1.3.2 Brief intervention							
Sørensen 2003a	11	27	13	30	18.1%	0.94 [0.51, 1.73]	2003
Sørensen 2007	6	101	4	48	8.0%	0.71 [0.21, 2.41]	2007
Thomsen 2010	35	57	38	62	53.4%	1.00 [0.75, 1.33]	2009
Lee 2013	11	84	14	84	20.5%	0.79 [0.38, 1.63]	2013
Subtotal (95% CI)		**269**		**224**	**100.0%**	**0.92 [0.72, 1.19]**	
Total events	63		69				
Heterogeneity: Chi² = 0.68, df = 3 (P = 0.88); I² = 0%							
Test for overall effect: Z = 0.62 (P = 0.54)							
Test for subgroup differences: Chi² = 9.44, df = 1 (P = 0.002), I² = 89.4%							

Cochrane Database of Systematic Reviews 2014, Issue 3. Art. No.: CD002294

Prognosis & risk stratification

- 7 d – 90 d (ABCD² / Canadian TIA score)
- 1-year
- 5-year
- 10-year (and beyond)?

- ABCD²



https://www.mdcalc.com/abcd2-score-tia

Prognosis & risk stratification

- ABCD²

was developed to help nonspecialists identify patients at a higher risk for stroke (EMR)

7-day recurrent stroke rates in the ≥ 4 group (10.2%), in the < 4 group (3.2%)

the largest drivers of recurrent stroke after TIA are

- (1) whether the event was due to a true TIA opposed to a mimic

  (a triage score to identify true TIAs vs mimics would have the most clinical utility)

- (2) the mechanism of ischemia (early vascular imaging - AF detection)

TIAs: We need to return to the question, 'What is wrong with Mr. Jones?'

Louis R. Caplan

Neurology 1988;38;791

DOI 10.1212/WNL.38.5.791

Prognosis & risk stratification

ORIGINAL ARTICLE

One-Year Risk of Stroke after Transient Ischemic Attack or Minor Stroke

Pierre Amarenco, M.D., Philippa C. Lavallée, M.D., Julien Labreuche, B.S.T., Gregory W. Albers, M.D., Natan M. Bornstein, M.D., Patrícia Canhão, M.D., Louis R. Caplan, M.D., Geoffrey A. Donnan, M.D., José M. Ferro, M.D., Michael G. Hennerici, M.D., Carlos Molina, M.D., Peter M. Rothwell, M.D., Leila Sissani, B.S.T., David Školoudík, M.D., Ph.D., Philippe Gabriel Steg, M.D., Pierre-Jean Touboul, M.D., Shinichiro Uchiyama, M.D., Éric Vicaut, M.D., and Lawrence K.S. Wong, M.D., for the TIAregistry.org Investigators*

N Engl J Med 2016;374:1533-42

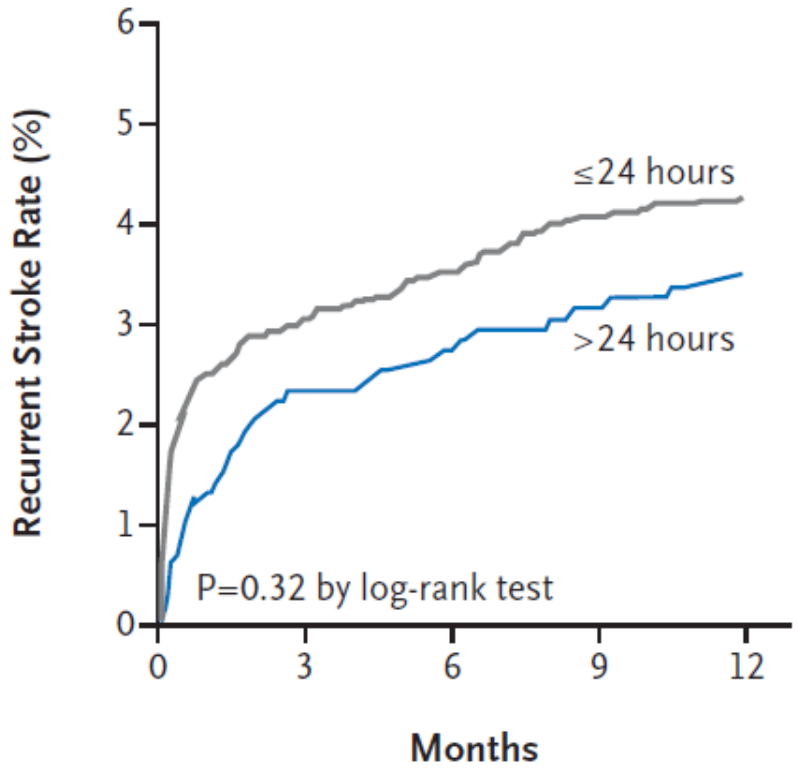
Table 4. One-Year Event Rates.*

Outcome	Patients (N=4583)
	no. (%)
Primary outcome	
Major cardiovascular events	274 (6.2)
Death from cardiovascular causes	25 (0.6)
Nonfatal stroke	210 (4.7)
Nonfatal acute coronary syndrome	39 (0.9)
Secondary outcomes	
Death from any cause	80 (1.8)
Stroke or TIA	533 (12.0)
Stroke	224 (5.1)
TIA	326 (7.4)
Intracerebral hemorrhage	16 (0.4)
Acute coronary syndrome	46 (1.1)
Myocardial infarction	16 (0.4)
Bleeding	87 (2.0)
Moderately severe bleeding†	16 (0.4)
Major bleeding‡	18 (0.4)

N Engl J Med 2016;374:1533-42

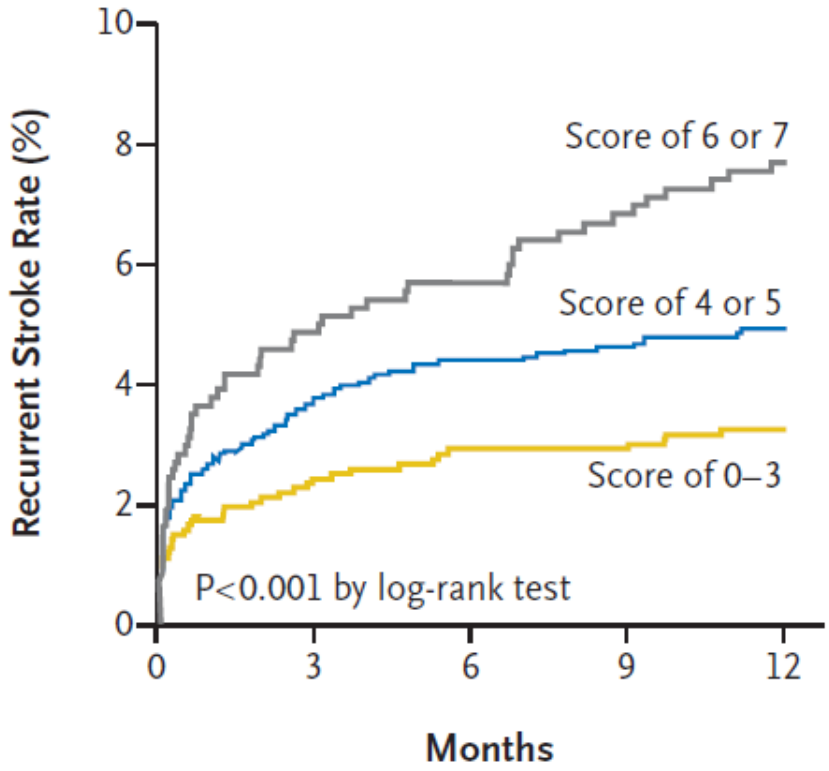
Prognosis & risk stratification

A Rate of Recurrent Stroke According to Time from Symptom Onset to Evaluation by Stroke Specialist



No. at Risk					
≤24 hours	3593	3289	3101	3067	2965
>24 hours	990	926	888	881	850

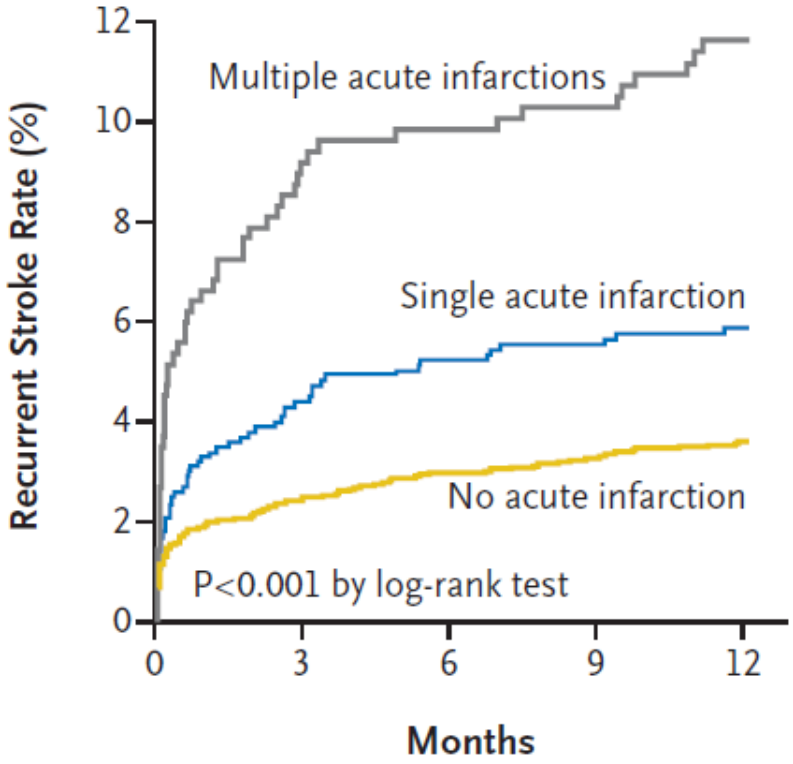
B Rate of Recurrent Stroke According to ABCD² Stroke Risk Score



No. at Risk					
Score of 0–3	1294	1221	1175	1166	1063
Score of 4 or 5	1851	1701	1633	1625	1484
Score of 6 or 7	745	684	657	642	596

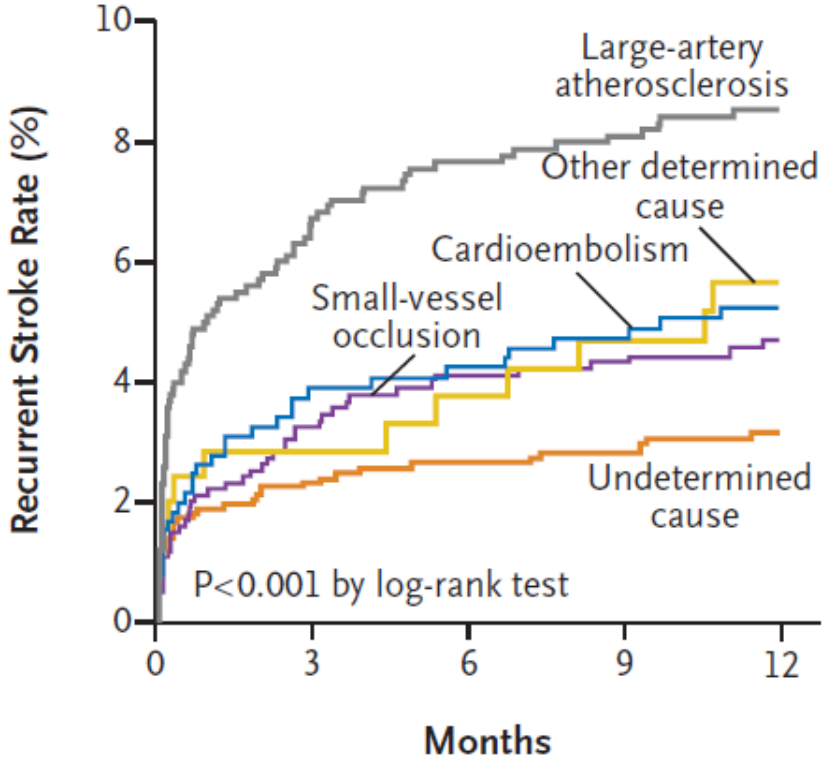
N Engl J Med 2016;374:1533-42

C Rate of Recurrent Stroke According to Finding on Brain Imaging



No. at Risk					
No acute infarction	2946	2699	2570	2542	2289
Single acute infarction	995	926	894	885	821
Multiple acute infarctions	481	414	397	394	357

D Rate of Recurrent Stroke According to Cause of TIA or Minor Stroke (TOAST Classification)



No. at Risk					
Large-artery atherosclerosis	987	892	863	853	799
Small-vessel occlusion	983	905	862	857	790
Cardioembolism	641	584	570	561	494
Other determined cause	244	214	205	198	184
Undetermined cause	1354	1263	1206	1199	1085

N Engl J Med 2016;374:1533-42

Prognosis & risk stratification

ORIGINAL ARTICLE

Five-Year Risk of Stroke after TIA or Minor Ischemic Stroke

P. Amarenco, P.C. Lavallée, L. Monteiro Tavares, J. Labreuche, G.W. Albers, H. Abboud, S. Anticoli, H. Audebert, N.M. Bornstein, L.R. Caplan, M. Correia, G.A. Donnan, J.M. Ferro, F. Gongora-Rivera, W. Heide, M.G. Hennerici, P.J. Kelly, M. Král, H.-F. Lin, C. Molina, J.M. Park, F. Purroy, P.M. Rothwell, T. Segura, D. Školoudík, P.G. Steg, P.-J. Touboul, S. Uchiyama, É. Vicaut, Y. Wang, and L.K.S. Wong, for the TIAregistry.org Investigators*

N Engl J Med 2018;378:2182-90

Table 3. Event Rates at 5 Years.

Outcome	Patients (N = 3847)	
	no.	*% (95% CI)**
Primary outcome†		
Major cardiovascular events	469	12.9 (11.8–14.1)
Death from cardiovascular cause	96	2.7 (2.2–3.3)
Fatal stroke	44	1.1 (0.8–1.6)
Fatal myocardial infarction	3	0.1 (0.0–0.2)
Nonfatal stroke	297	8.1 (7.3–9.0)
Nonfatal acute coronary syndrome	76	2.1 (1.7–2.6)
Secondary outcomes‡		
Death from any cause	373	10.6 (9.6–11.7)
Death from cardiovascular cause	96	2.7 (2.2–3.3)
Fatal stroke	44	1.1 (0.8–1.6)
Fatal myocardial infarction	3	0.1 (0.0–0.2)
Stroke or TIA	621	16.8 (15.6–18.1)
Stroke	345	9.5 (8.5–10.5)
TIA	307	8.3 (7.4–9.2)
Intracranial hemorrhage	39	1.1 (0.7–1.5)
Acute coronary syndrome	84	2.4 (1.8–2.9)
Myocardial infarction	39	1.1 (0.8–1.6)
Bleeding	230	6.5 (5.6–7.3)
Moderately severe§	52	1.5 (1.1–1.9)
Major¶	53	1.5 (1.1–2.0)

N Engl J Med 2018;378:2182-90

Conclusions

- TIA are symptoms, they have many causes
  "What is wrong with Mr. Jones, …"
- Transient ≠ benign
- TIA and stroke = a continuum of pathology < cerebral ischaemia
- Early initiation of existing R/ after TIA or minor stroke is associated with an 80% reduction in the risk of early recurrent stroke

Questions?


SI ON NE VOUS A PAS RÉPONDU, C'EST QUE ...
NOUS SOMMES DÉBORDÉS
VOTRE QUESTION ÉTAIT NULLE
VOUS NE NOUS AVEZ RIEN ENVOYÉ
ON N'A PAS QUE ÇA À FOUTRE