The diagnosis of stroke and TIA

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NHS Lothian

- Stroke is clinical diagnosis that needs to be made rapidly to access acute treatments
- More severe symptoms are usually the easiest to recognize
- There is often clinical confusion for severe stroke affecting the posterior circulation

What are focal symptoms?

Yes

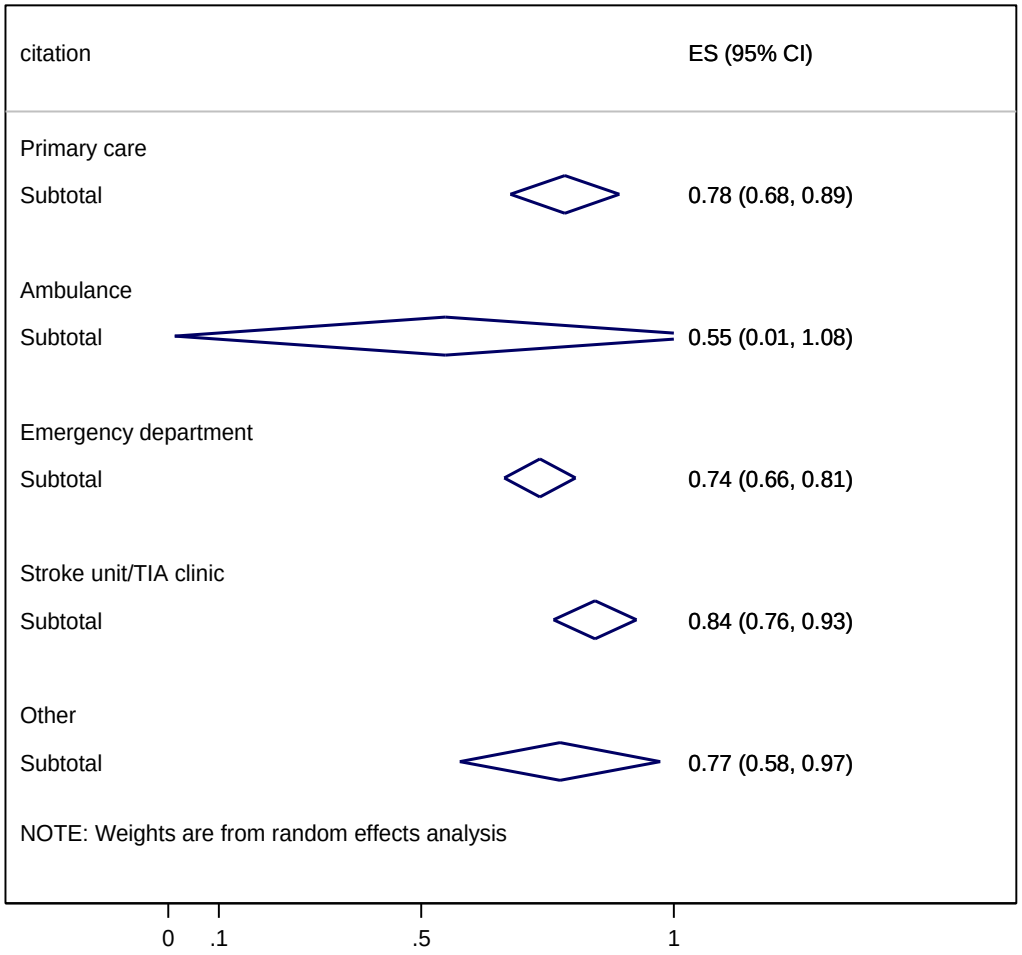
- weakness, clumsiness, or sensory alteration in ≥limb on the same side,
- speech or language disturbance,
- loss of vision in one eye or part of the eye, or homonymous hemianopsia;
- sensory alteration, ataxia, imbalance, or unsteadiness not associated with vertigo;
- two or more of the following: diplopia, dysphagia, dysarthria, or vertigo.

No

- disturbances of vision with flashes, objects, distorted-view tunnel vision, or image moving;
- tiredness /heavy sensation in >1 limbs,
- sensory symptoms or a gradual spread of sensory symptoms;
- isolated disorder of swallowing or articulation, double vision, dizziness, or uncoordinated movements;
- unconsciousness, limb jerking, tingling of the limbs or lips, disorientation, and amnesia.

→ Although some stroke patients do not have focal symptoms, focal symptoms are a useful rule of thumb to identify 'suspected stroke'

Proportion with stroke in different settings



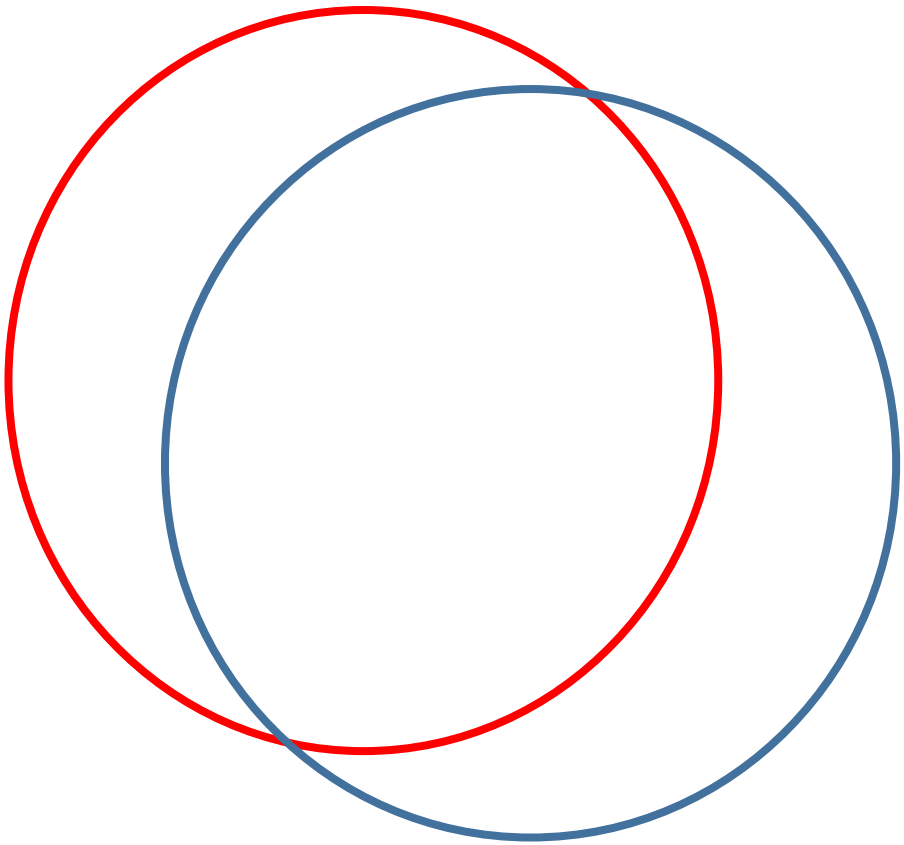
Differential diagnosis (% of mimic)

Seizure	20%
Syncope	12%
Sepsis	10%
Migraine	9%
Brain tumour	8%
Functional disorders	7%
Metabolic/unspecified	11%

→ ~quarter of patients in ED with suspected stroke have another Dx

Gibson & Whiteley J R Coll Physicians Edinb 2013; 43:114–8

Is clinical assessment too unreliable?



MR brain for all
too few machines

stroke neurologist for all
too few trained

brain troponin
not invented yet

No: clinical assessment is necessary!

Severe persisting symptoms

Complete agreement paramedic & neurologist

Face: 78%

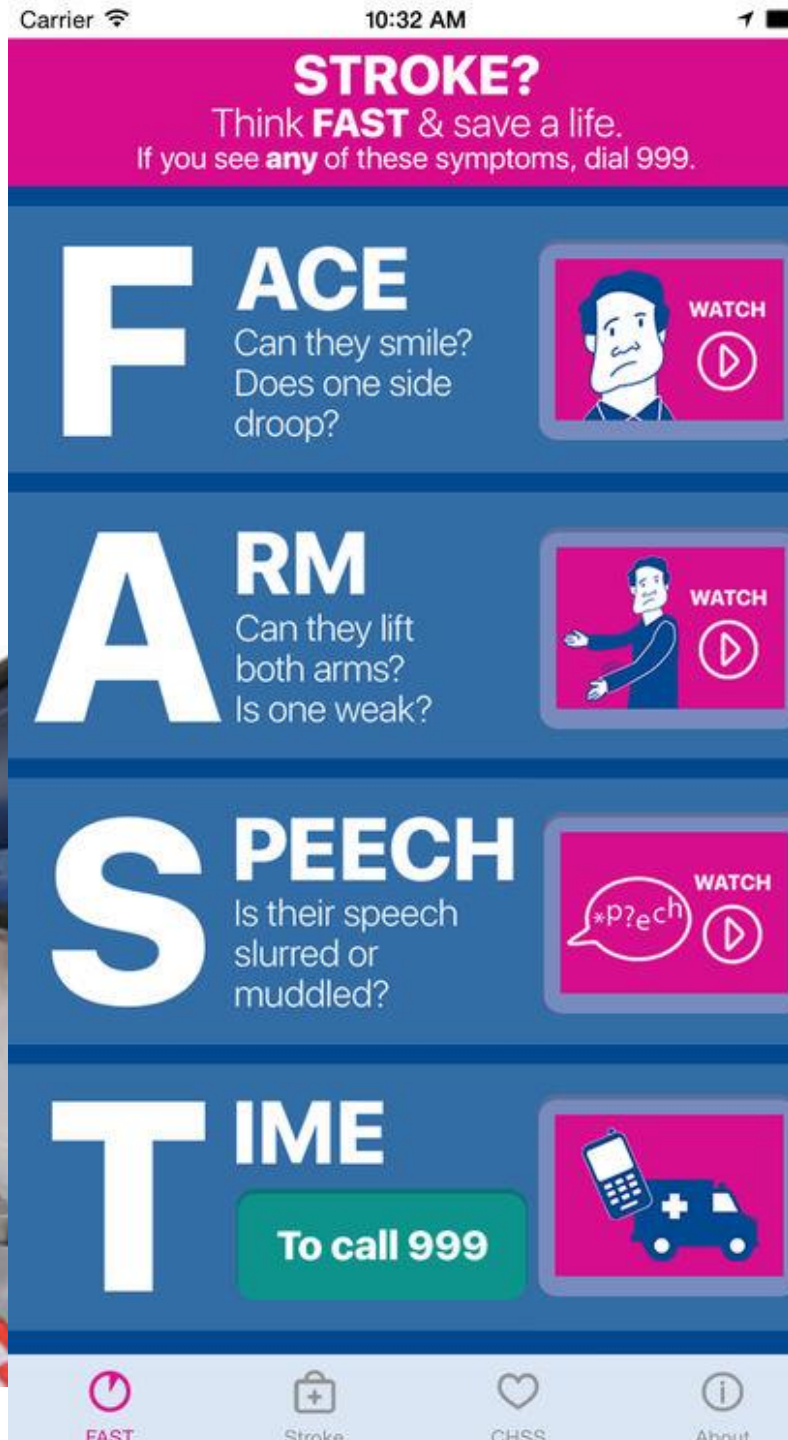
Arm : 98%

Speech 89% (n=189)

Prehospital CT

Berlin, Fredrikstad, Melbourne, Houston etc.

↓ stroke to thrombolysis time ~15’ Berlin



Triage – >1 ROSIER SCALE: PPV 90%. NPV 88%

GGS E=☐ M=☐ V=☐ **BP** ☐☐ ***BM** ☐

**** If BM < 3.5 mmol/l treat urgently and reassess once blood glucose normal***

Has there been loss of consciousness or syncope?

Y (-1) ☐ N (0) ☐

Has there been seizure activity?

Y (-1) ☐ N (0) ☐

Is there a NEW ACUTE onset (or on awakening from sleep)?

I.	Asymmetric facial weakness	Y (+1) ☐	N (0) ☐
II.	Asymmetric arm weakness	Y (+1) ☐	N (0) ☐
III.	Asymmetric leg weakness	Y (+1) ☐	N (0) ☐
IV.	Speech disturbance	Y (+1) ☐	N (0) ☐
V.	Visual field defect	Y (+1) ☐	N (0) ☐

*Total Score _____ (-2 to +5)

Provisional diagnosis: ☐ Stroke ☐ Non-stroke (specify) _____

* Stroke is likely if total scores are > 0. Scores of </= 0 have a low possibility of stroke but not completely excluded.

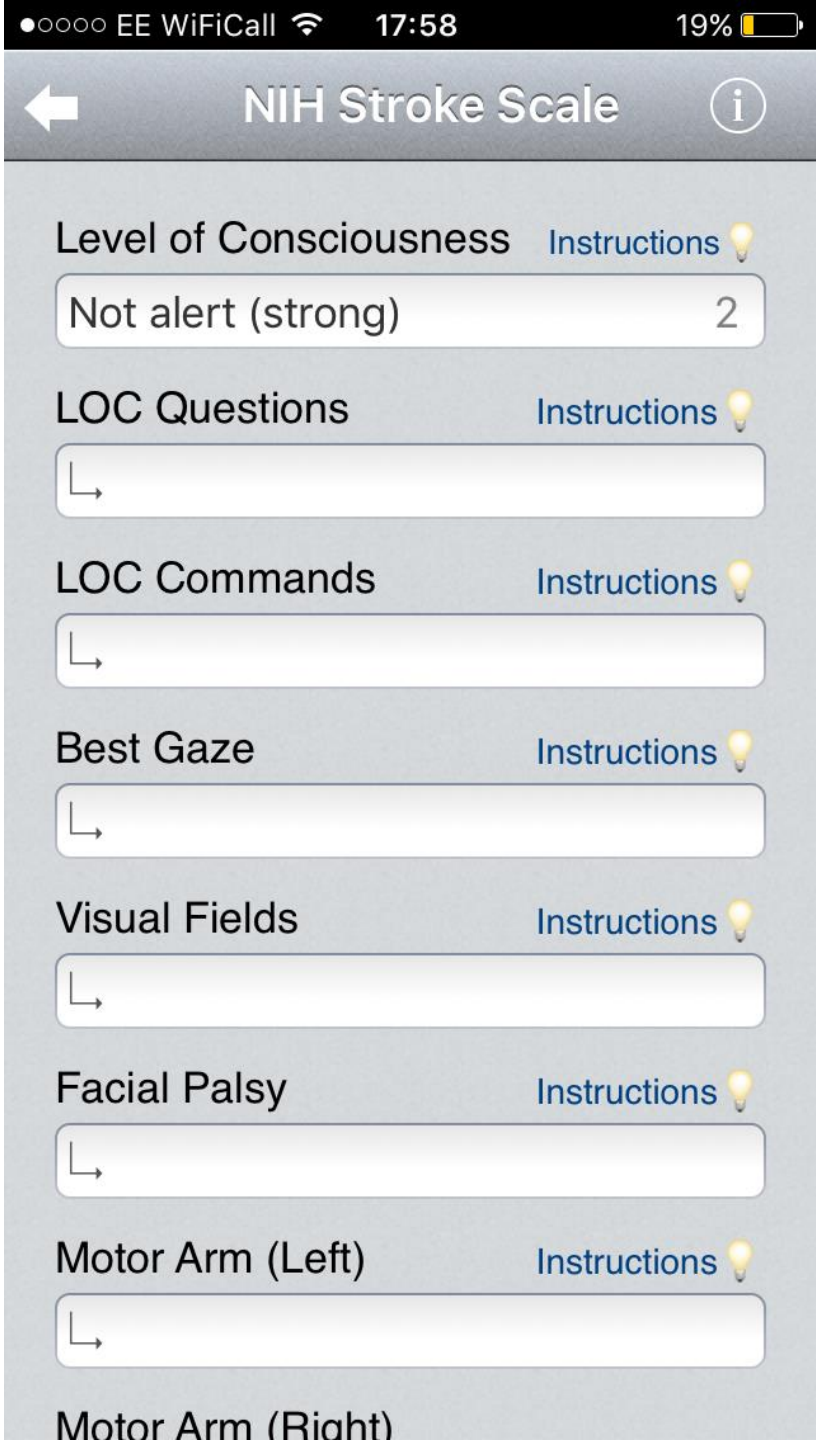
Structured examination - NIHSS

Strengths

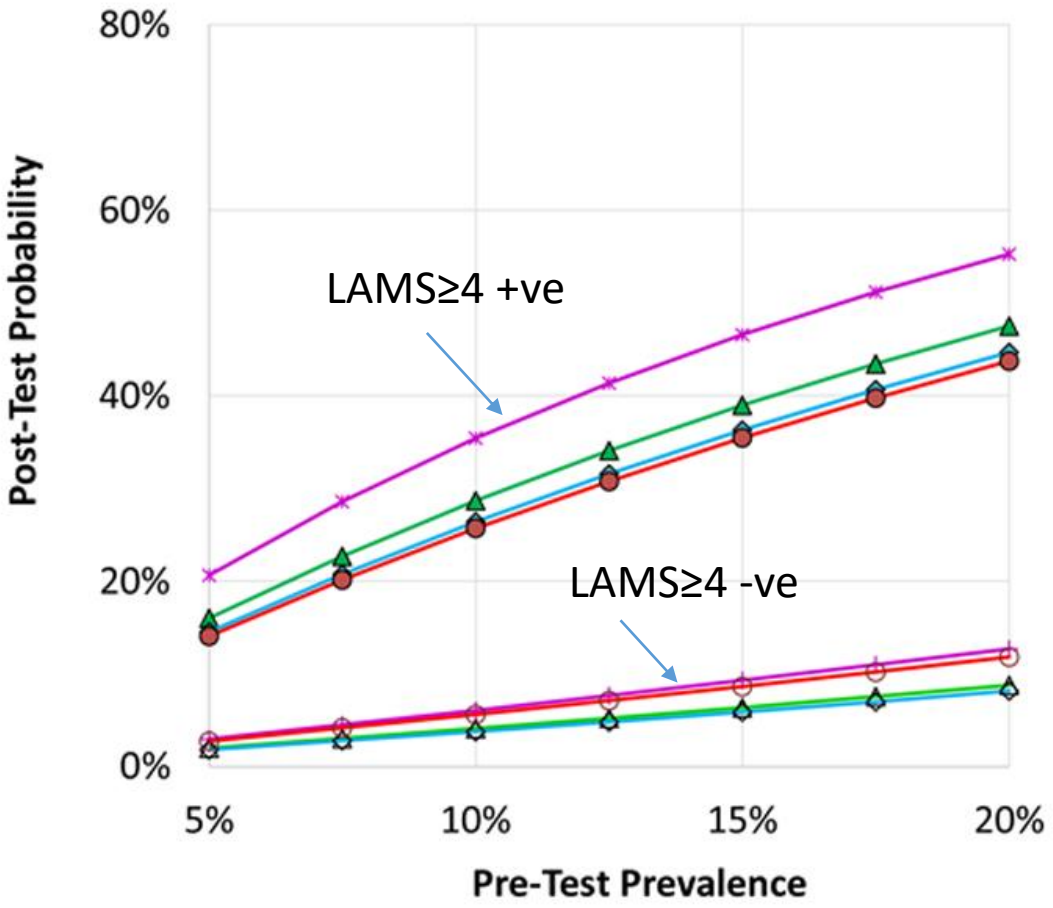
- Measure of severity
- Used in most trials
- Good for anterior circulation

Weakness

- Under-recognition of post circulation stroke
- Threshold underestimates severity of some disabling strokes



Identifying large vessel occlusion (LVO)



No threshold on any instruments-> LVO with high sensitivity AND specificity

Systems that use prediction instruments will miss some patients with LVO and milder stroke.

→ ***scales are useful triage tool to identify stroke but probably not LVO***

Stroke. 2018 Mar;49(3):e111-e122

Clinical features of other differential diagnoses

Known sudden onset

Functional or malingering

Todd's paresis

Migraine

Brain tumours

Onset thought to be sudden

Motor neurone disease

Brain tumour (but brain attacks)

Subdural haematoma

Functional symptoms

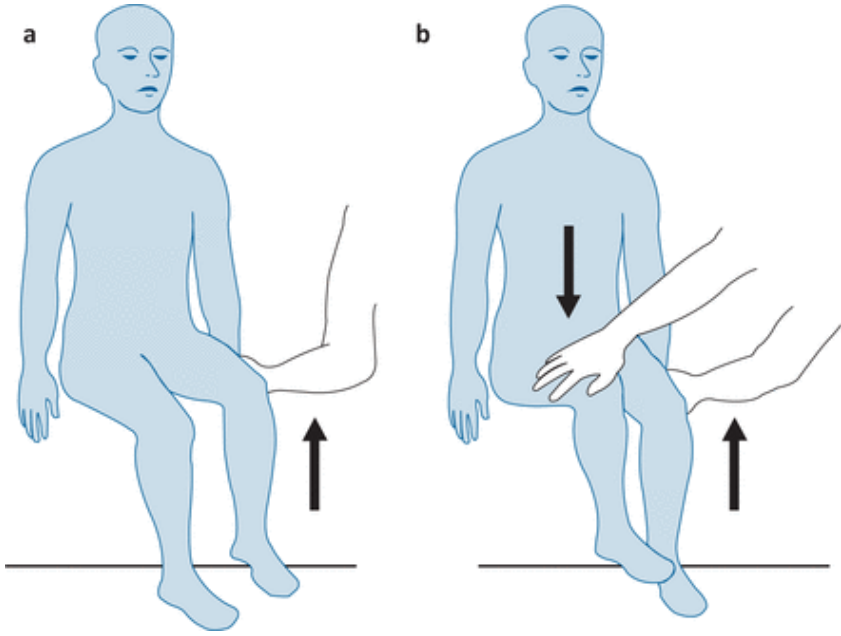
Can present with acute hemiparesis

Panic/dissociation at onset

Often with other functional symptoms or syndromes

Feigning & malingering less common – ‘frequent attenders’, out of area etc..

Don’t make a diagnosis just because someone has psychological or psychiatric problems



Hoover’s sign

Hip extension weakness → disappears with contralateral hip flexion

43 year-old woman

- No significant medical history
- Sitting on Sofa – daughter notices that her face looks strange
- She feels a bit zoned out
- Patient notices weakness and numbness of right arm
- Progressively worsening over 1 hour
- Admitted to hospital with suspected stroke affecting face arm and leg

43 year-old woman

Right leg weakness with positive Hoover’s sign

- Normal MRI brain inc DWI
- Diagnosis – functional disorder
- Responded to positive explanation of diagnosis
- Physiotherapy
- Change of work/life balance
- Almost complete recovery

52 year old woman

HPC

Not working because of irritable bowel syndrome
One week of headaches; behind eyes and occipital
Suddenly became sweaty on morning of admission, unable to speak, then recovered. Then right hand went floppy, numb and improved a little

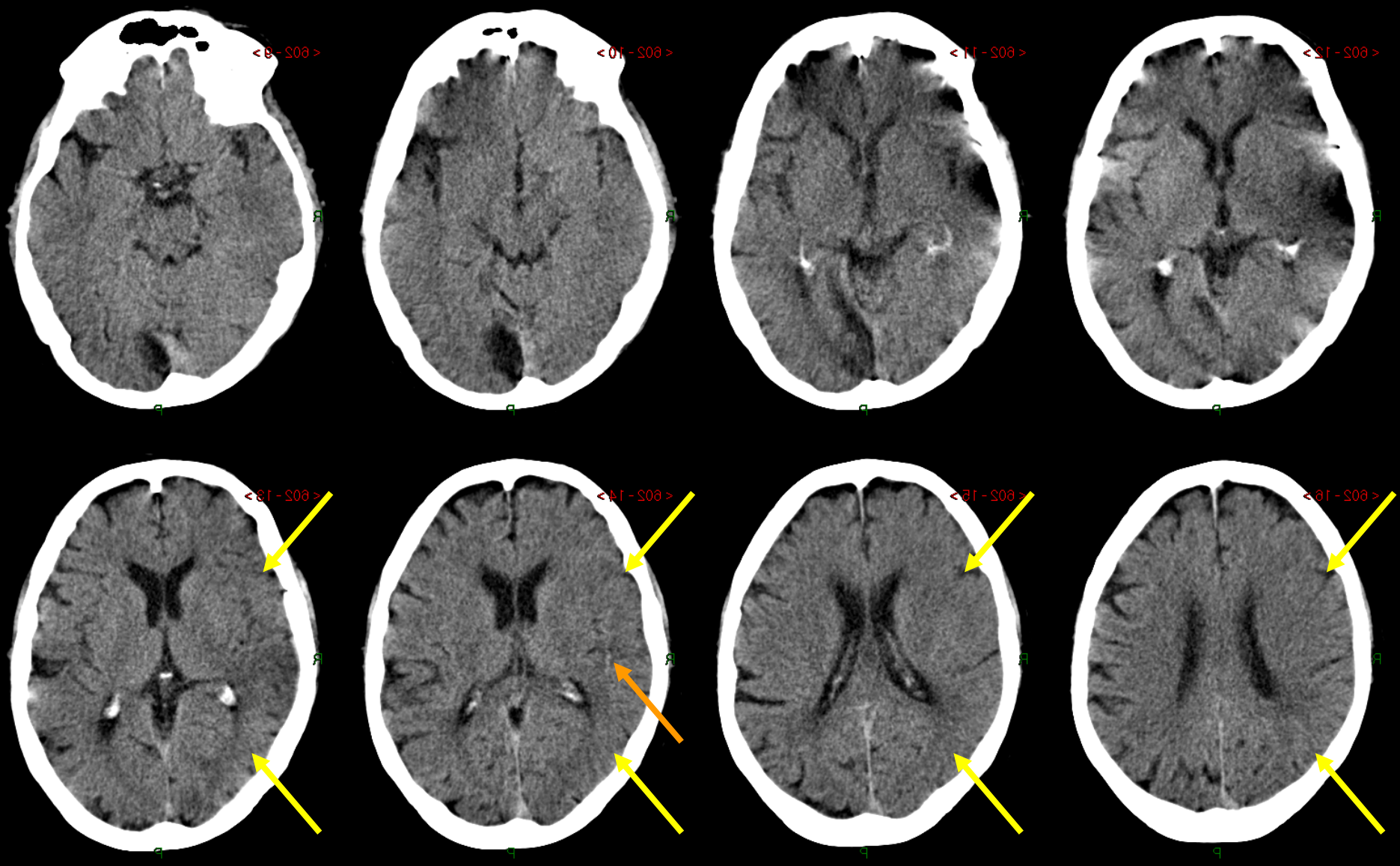
PMH

IBS
Chronic fatigue syndrome
Hysterectomy

O/E

Moderate right arm and leg weakness. Dysarthria.

Case WW20AJF3
Findings: Dense MCA branch; swollen left hemisphere
Diagnosis: Hyperacute left hemisphere PACI



59 year old man

Found collapsed by wife in the bathroom 30 minutes after last seen well

Prior left hemisphere haemorrhagic stroke, with residual mild right hemiparesis

Arrived in ED with severe right hemiparesis and dysphasia

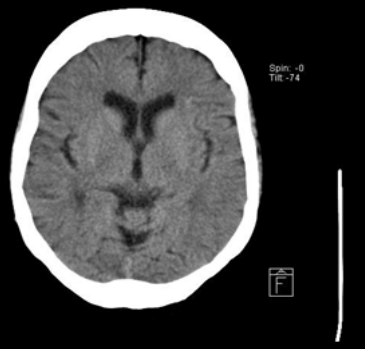
Intermittent twitching right arm and 1 generalised seizure

Diagnosis: Todd's paresis

85 year old woman with identical early morning episodes of right hemiparesis, normal BM at admission

Recently begun treatment with gliclazide

Diagnosis: *Sulphonyurea induced hypoglycaemia*



Migraine and migraine plus

Rare– probably over diagnosed - cause of acute hemiparesis

Familial hemiplegic migraine
Headache, fever, meningismus, hemiparesis quick onset & prolonged
Dominantly inherited: CACNA1A - Ca^{++} channel

Headache and Neurological deficits with Lymphcytosis
headache, deficits involving different neurovascular territories, and CSF lymphocytic pleocytosis.

Cerebral vasoconstriction syndromes
Thunderclap headache, transient focal neurological deficits (usually visual), sometimes persistent leading to stroke.

40 year old woman

HPC

Awoke with shuddering sensation over the right side of her face, and couldn't control right thumb.
In the morning, couldn't walk, kept falling to right
2 months previously had a 15' episode of right thumb twitching

PMH

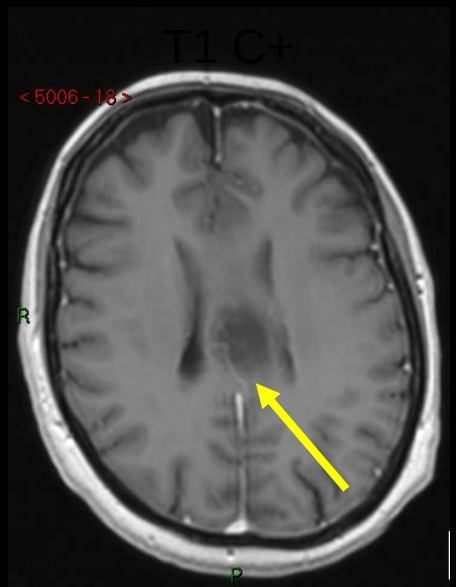
Psychotic illness
Smoker
Independent

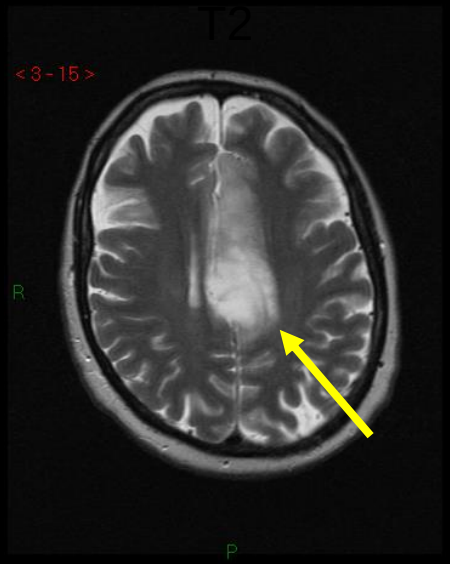
O/E

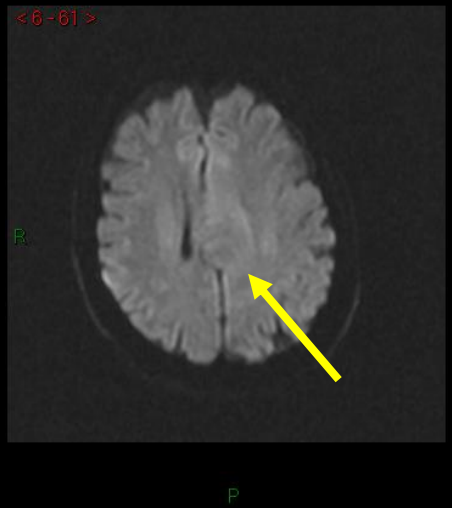
Difficult to walk tandem gait

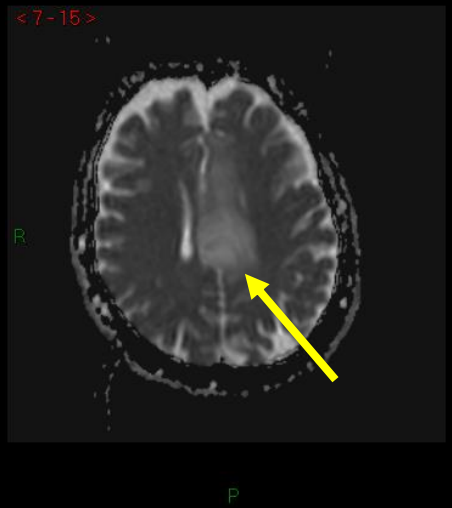
(15)

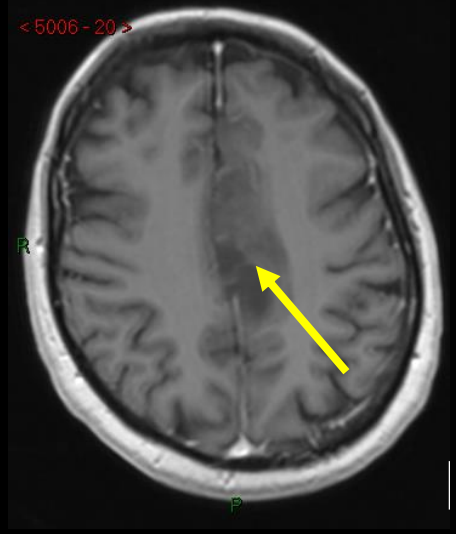
Diffuse astrocytoma.

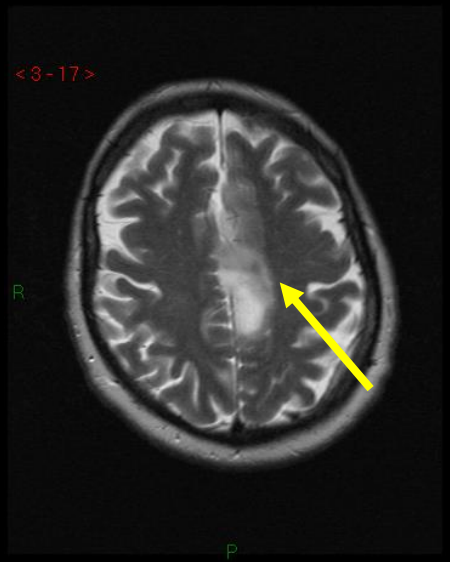


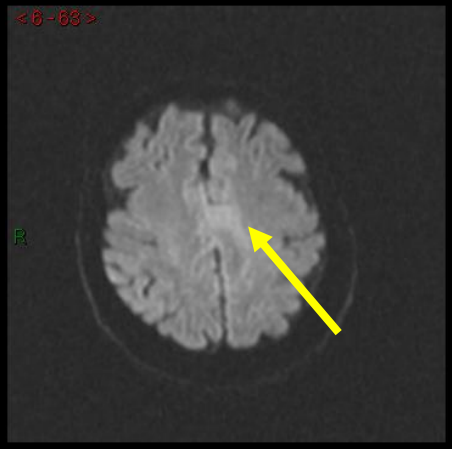


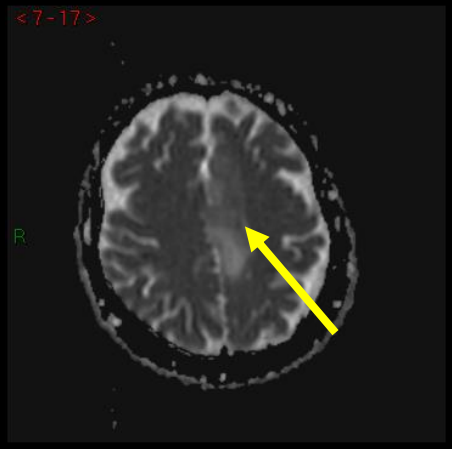












92 year old man

HPC

Woke up to change his catheter bag, but was unable to do so because of severe right hand weakness
Speaking jibberish to his wife, and right facial droop
Symptoms improving by admission

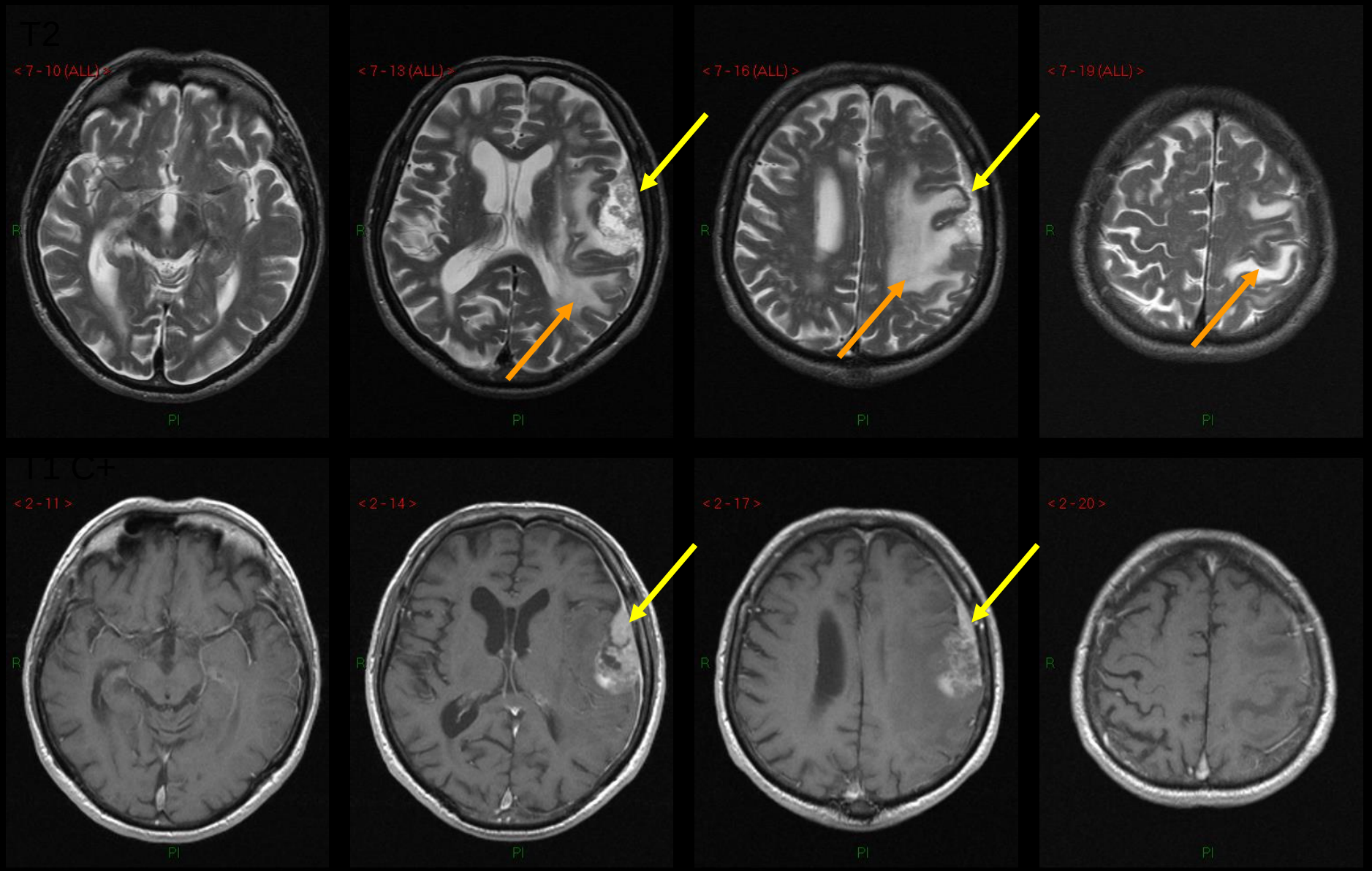
PMH

Aortic valve stenosis
Gastritis

O/E

Mild dysarthria
Slow fingers of right hand

Meningioma – ‘meningioma attack’



52 year old woman

Awoke with dysarthria and mild right arm weakness

MRI normal 2 months after the event

No upper or lower motor neurone signs

Over the next 6 months her symptoms progressed

Wasting of right arm and more severe dysarthria

→ amyotrophic lateral sclerosis

Stroke mimics: summary

- *Functional* → *positive signs*
- *Todds paresis* → *seizure at onset*
- *Hypoglycaemia* →↓*glucose + improvement with glucose*
- *Migraine* → *rarely cause significant weakness*

Doesn’t look like a stroke but is?

Bilateral thalamic strokes	*Persistent global amnesia*
Limb-shaking TIA	*Focal epilepsy*
Brainstem stroke	*Labyrinthopathy*
Critical carotid stenosis	*Glioma*
Cortical stroke	*Peripheral nerve lesion*
Bilateral occipital strokes	*Confusion/delirium*
Parietal stroke	*Inattention/cognitive deficit*

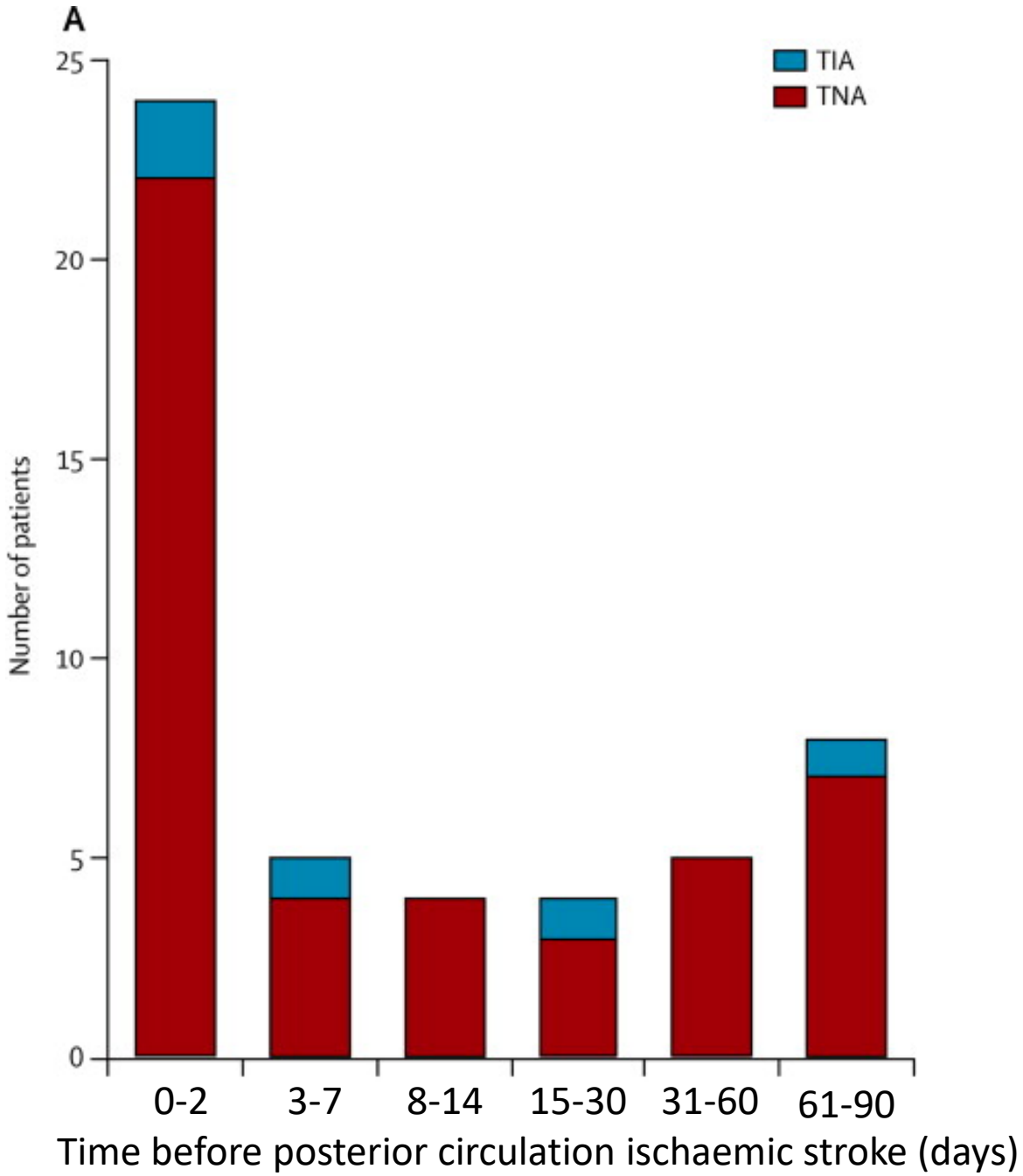
Posterior circulation stroke: difficult symptoms!

Common non-specific prodromes

- Vertigo
- Headache
- Often FAST negative in early stages

Other prodromal symptoms and signs

- Decrease in consciousness
- Double vision, visual-field deficits
- Dysequilibrium, dysarthria, dysphagia
- Tinnitus, hearing loss
- Drop attacks, jerking or shaking episodes
- Pathological laughter (“fou rire prodromique”)
- Peduncular hallucinosis



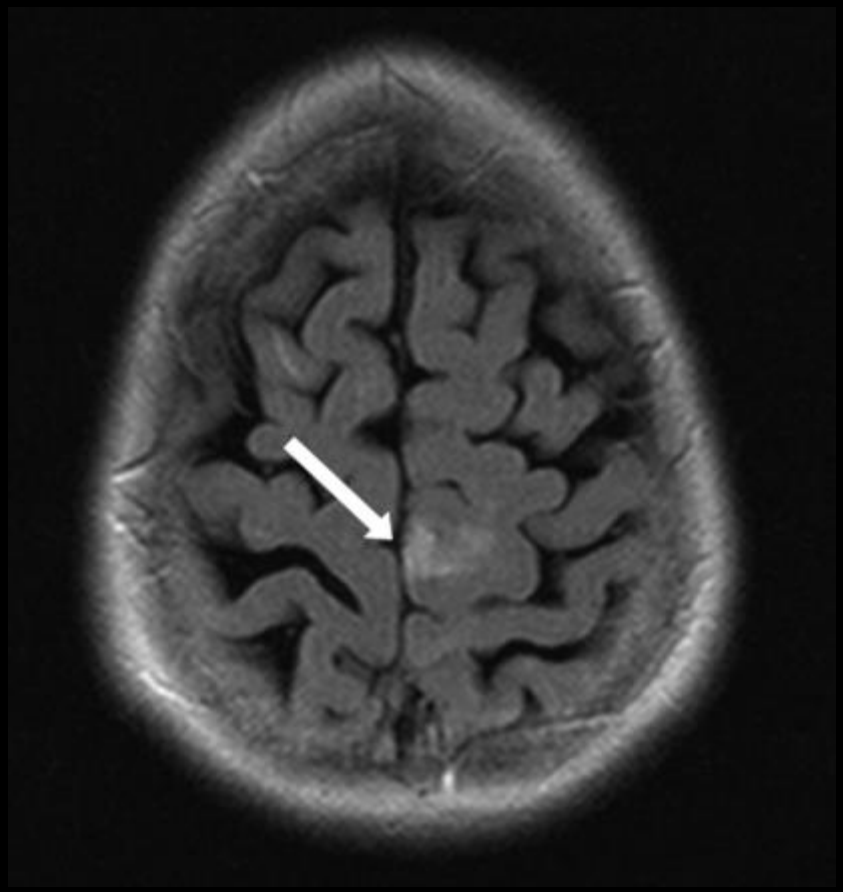
http://dx.doi.org/10.1016/S1474-4422(12)70299-5

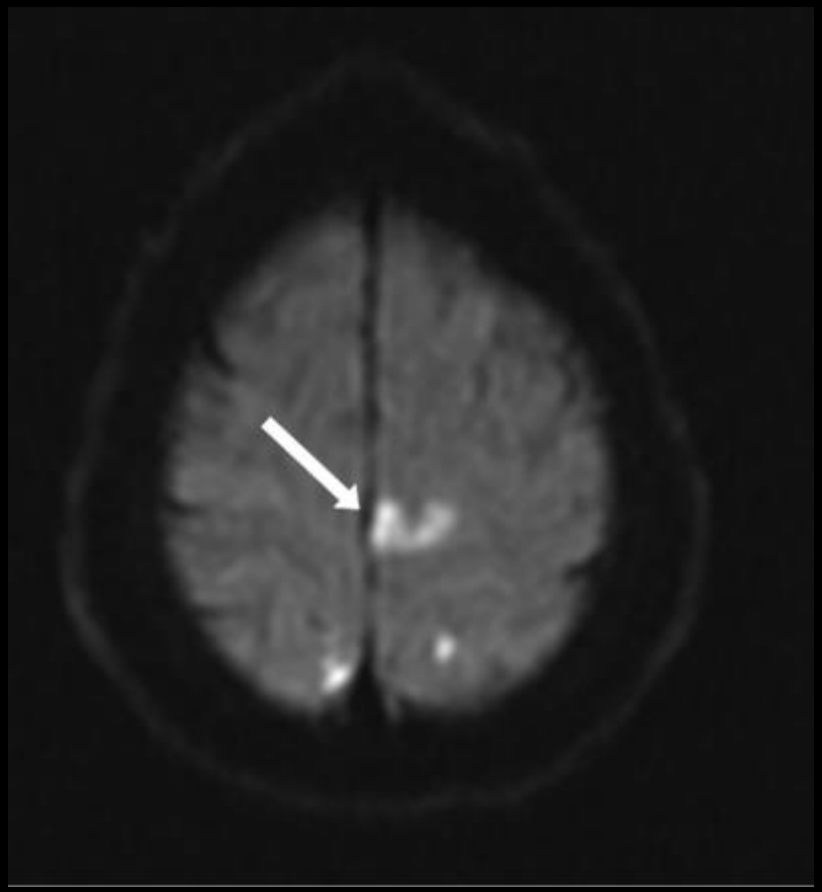
70-year-old woman

Episode of right leg weakness of sudden onset, fully resolving within an hour.

Right leg weakness recurred the next day, prompting admission to hospital. She had a history of rheumatoid arthritis.

On examination, there was weakness of the right leg. The initial diagnosis was of a peroneal nerve palsy





45 year old woman

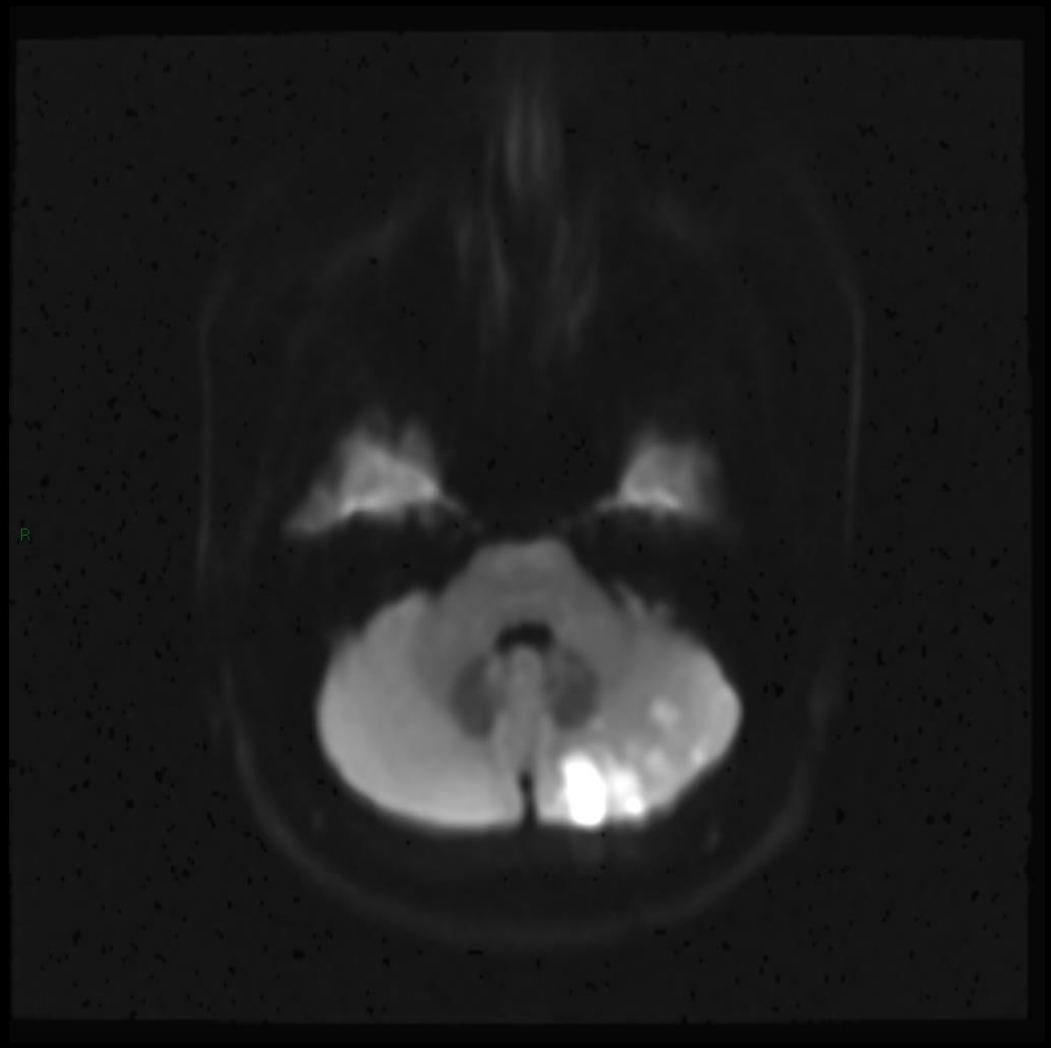
Having an argument. Felt faint, and right arm had a numb feeling. Couldn't speak; eyes went blurry as if going to pass out.

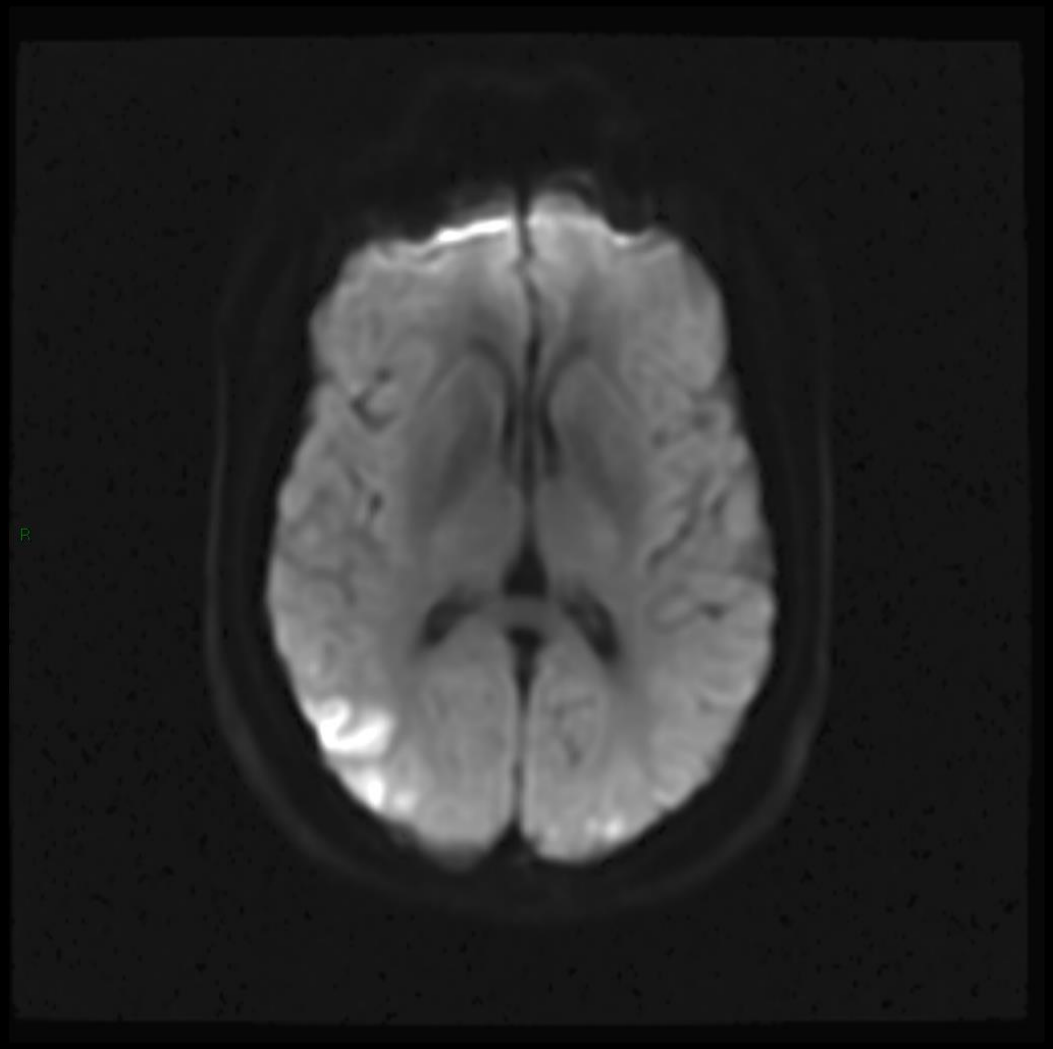
Then a burning pain in her right finger, and seemed really painful.

Remember back being rubbed, felt tingly. Headache in the ambulance, lasted 2 hours, felt very sick. Now feels drained, light-headed.

WITNESS: Speech, all-mixed up. Seemed to be falling to ground. Seemed to be stamping with her right leg.

History: chronic daily headache since 18 yrs old; intermittent abdominal pain.


R
P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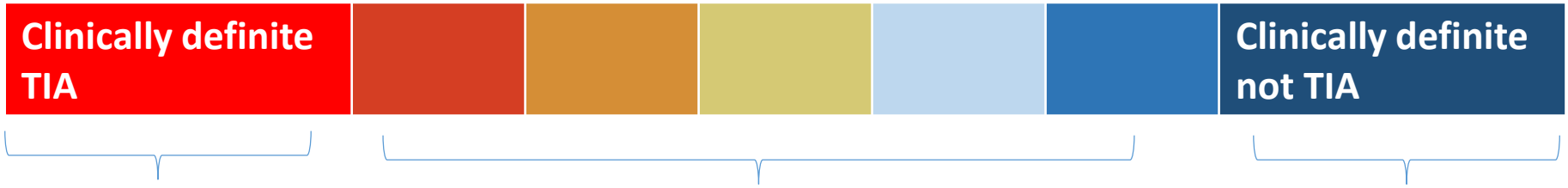
PAT T: 37.0C
TEE T <37.0C

Diagnosis

Multiple territory cardio-embolic ischaemic strokes secondary to atrial myxoma

Transient symptoms



Majority of patients

Definite focal symptoms

Transient hemiparesis

Face and arm weakness

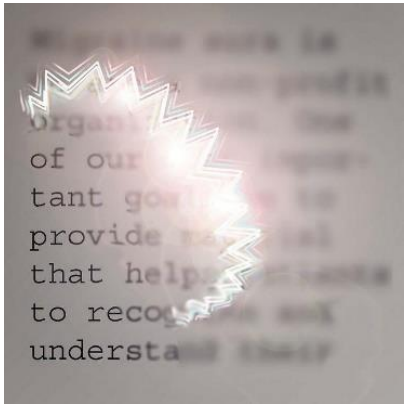
Clear dysphasia

Spreading positive symptoms

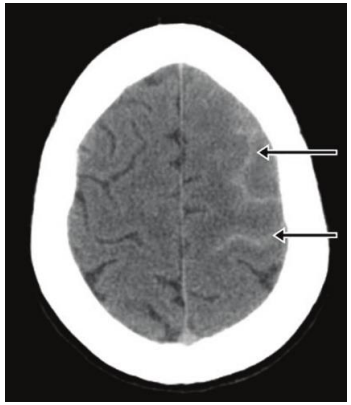
Recurrent symptoms over years

Transient memory disturbance

Transient smartphone blindness

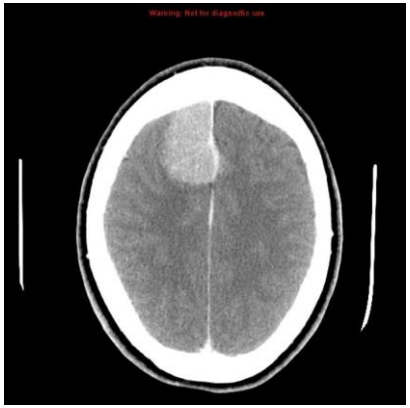


Migraine aura



Amyloid spells

Transient facial nerve palsy with change in air pressure descending in a plane



Meningioma attacks

→ There is often considerable clinical uncertainty in the diagnosis of TIA or minor stroke

Care pathway for TIA

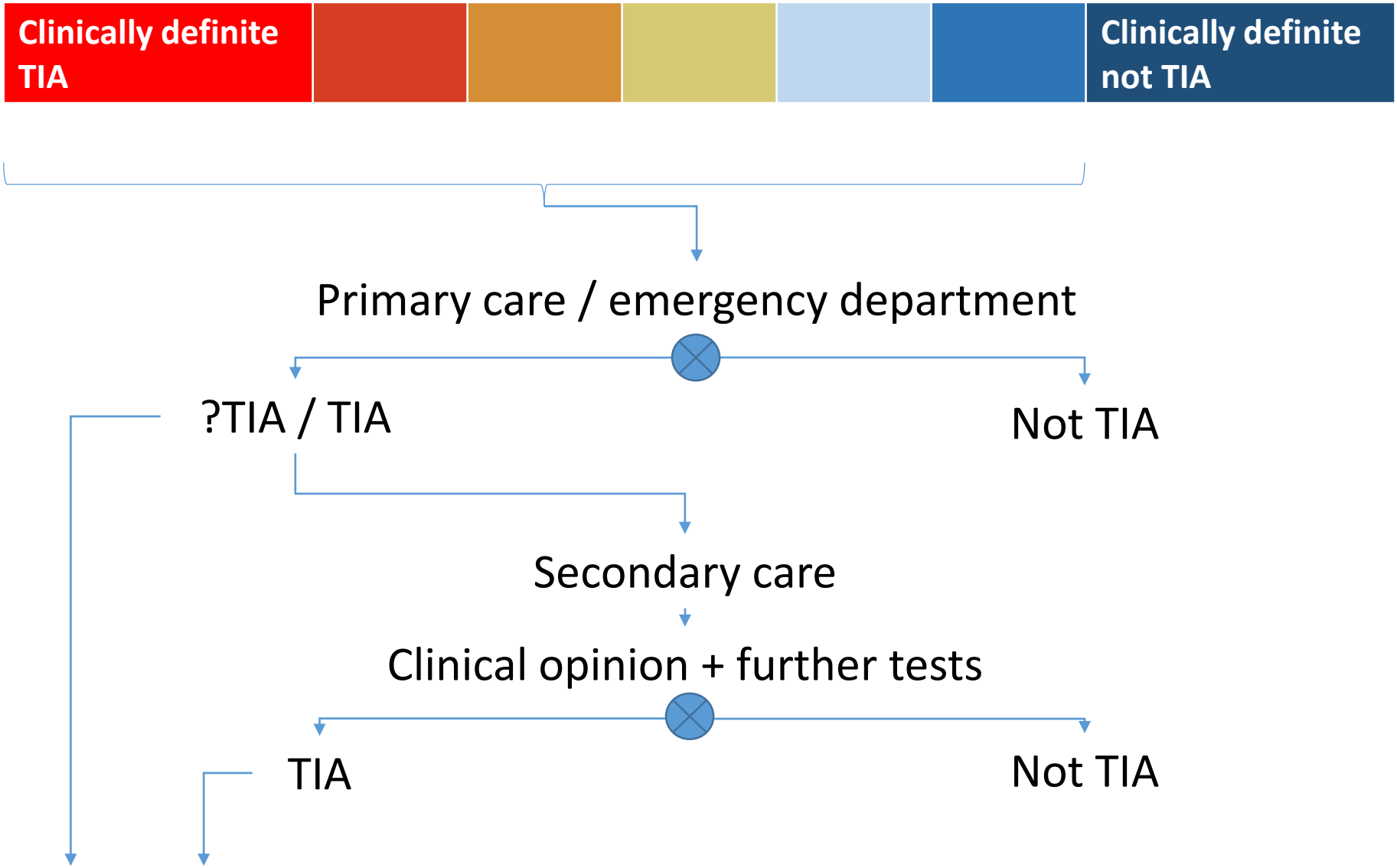
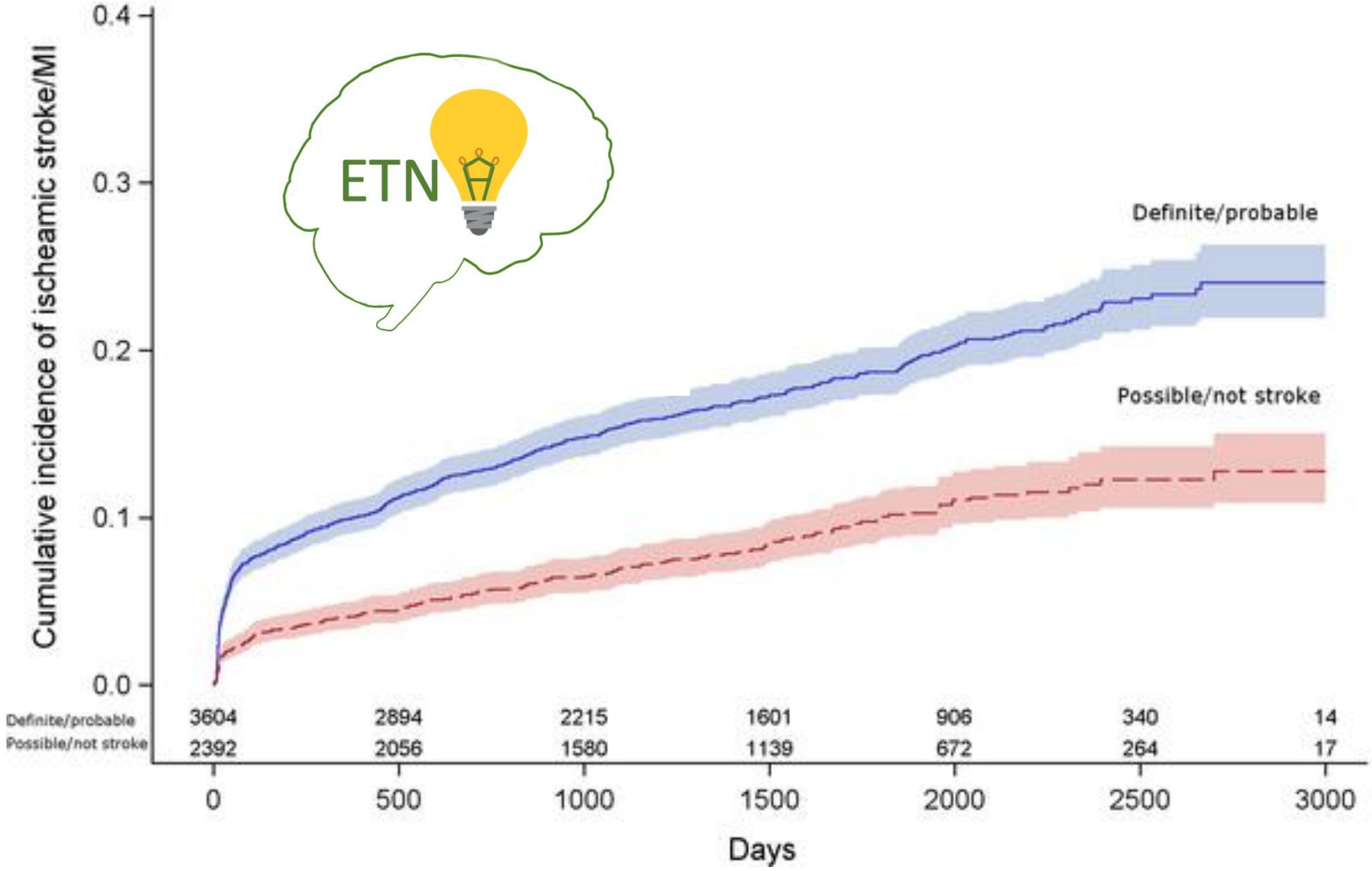


Fig 1. Cumulative incidence curves of ischaemic stroke or myocardial infarction in follow up in patients with a diagnosis of definite or probable TIA/stroke versus possible or not TIA/stroke, with 95% CI.



Graham C, Bailey D, Hart S, Hutchison A, Sandercock P, et al. (2019) Clinical diagnosis of TIA or minor stroke and prognosis in patients with neurological symptoms: A rapid access clinic cohort. PLOS ONE 14(3): e0210452. https://doi.org/10.1371/journal.pone.0210452
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0210452

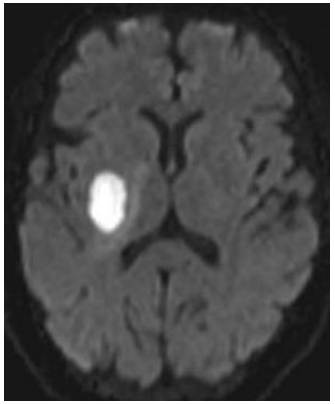
Is looking for more DWI magnetic resonance imaging the answer?

Who?

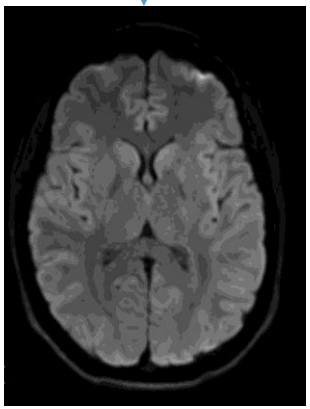
Clinically uncertain?

Almost all patients?

Clinically definite?



DWI +ve
15 to 30%
~ doubling of risk of stroke relative to DWI negative
5 yr risk 10-15%



DWI -ve
70 to 85%
5 yr risk of stroke 10-15%

MRI scanning all definite TIA -> double MRI use in Cincinatti in 2010

Hurford Neurology 2019

The diagnosis of stroke is important for stroke thrombectomy services

→ Positive diagnosis allows faster care of patients

→ Negative diagnosis reduced unnecessary transfer and distress for patient and family

the threshold for referral has fallen…. EDs are less confident about diagnosing …[other causes of chest pain]… without referring the patient for angiography…number of PCI is ~constant over past 10 yrs but referrals have risen to approaching 2 not PCI :1. PCI

Jim McLenachan, Cardiologist

→ *Although some stroke patients do not have focal symptoms, focal symptoms are a useful rule of thumb to identify 'suspected stroke'*

→ *~quarter of patients in ED with suspected stroke have another Dx*

→ *scales are useful triage tool to identify stroke but probably not LVO*

→ *Functional*	→ *positive signs*
→ *Todds paresis*	→ *seizure at onset*
→ *Hypoglycaemia*	→↓*glucose + improvement with glucose*
→ *Migraine*	→ *rare cause of significant weakness*
→ *Normal MRI DWI*	→ *does not rule out stroke or TIA*

→ *There is often considerable clinical uncertainty in the diagnosis of TIA or minor stroke*

Edinburgh Stroke Winter School

February 2020

Learn to develop and answer questions in clinical stroke research

To apply Send CV and 100 word motivation to judi.clarke@ed.ac.uk

Edinburgh Neuroscience

Stroke association

ESO EUROPEAN STROKE ORGANISATION

65 year old surveyor

At interview in a hot a room, busy day.

Trying to find words, and couldn't get words out of his mouth for 3-4 minutes.

Tried to write down what he was saying. Managed to start to speak, and was fine.

Had decided to stop statins with sore arms. Had sore eyes, at bottom of head. No stutter previously

No past medical history, examination normal


R

Diagnosis

Single episode of speech arrest due to glioblastoma multiforme of left posterior temporal lobe

50 year old man

- Woke with symptoms in left hand that resolved completely. At emergency department he was symptom-free.

- He woke with numbness in the left hand which lasted approximately 15 minutes, initially over the whole hand, improving with tingling in his fingertips.

- Neurological examination normal. BP 160/81 mmHg.

- Sent home with diagnosis of radial nerve palsy

- Re-presented 6 weeks later awoke with a severe left arm and left leg weakness → severe left hemisphere ischaemic stroke.
- Not eligible for intravenous thrombolysis
- Intra-arterial thrombectomy, successfully opened the internal carotid artery and middle cerebral artery.
- Died next day with malignant cerebral oedema