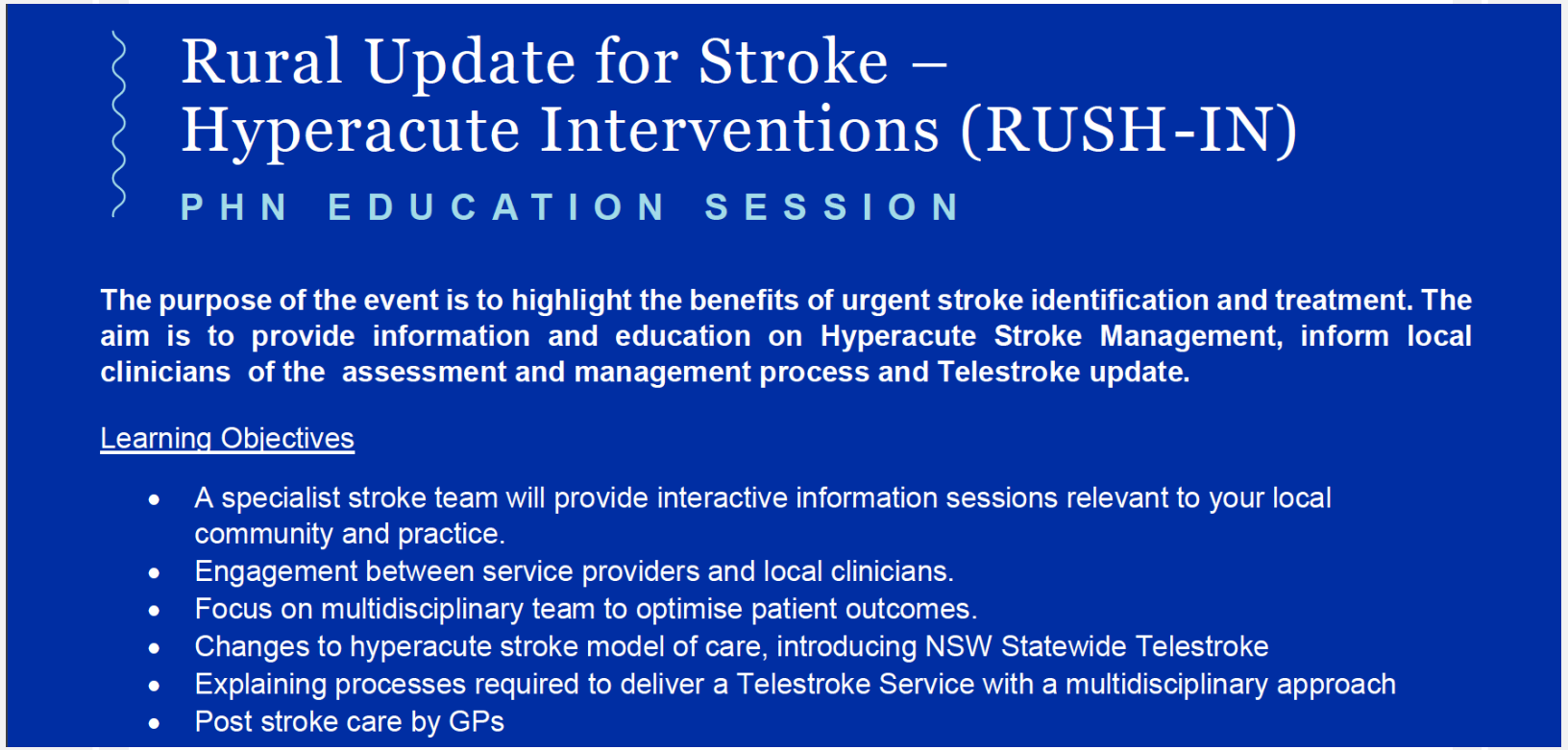
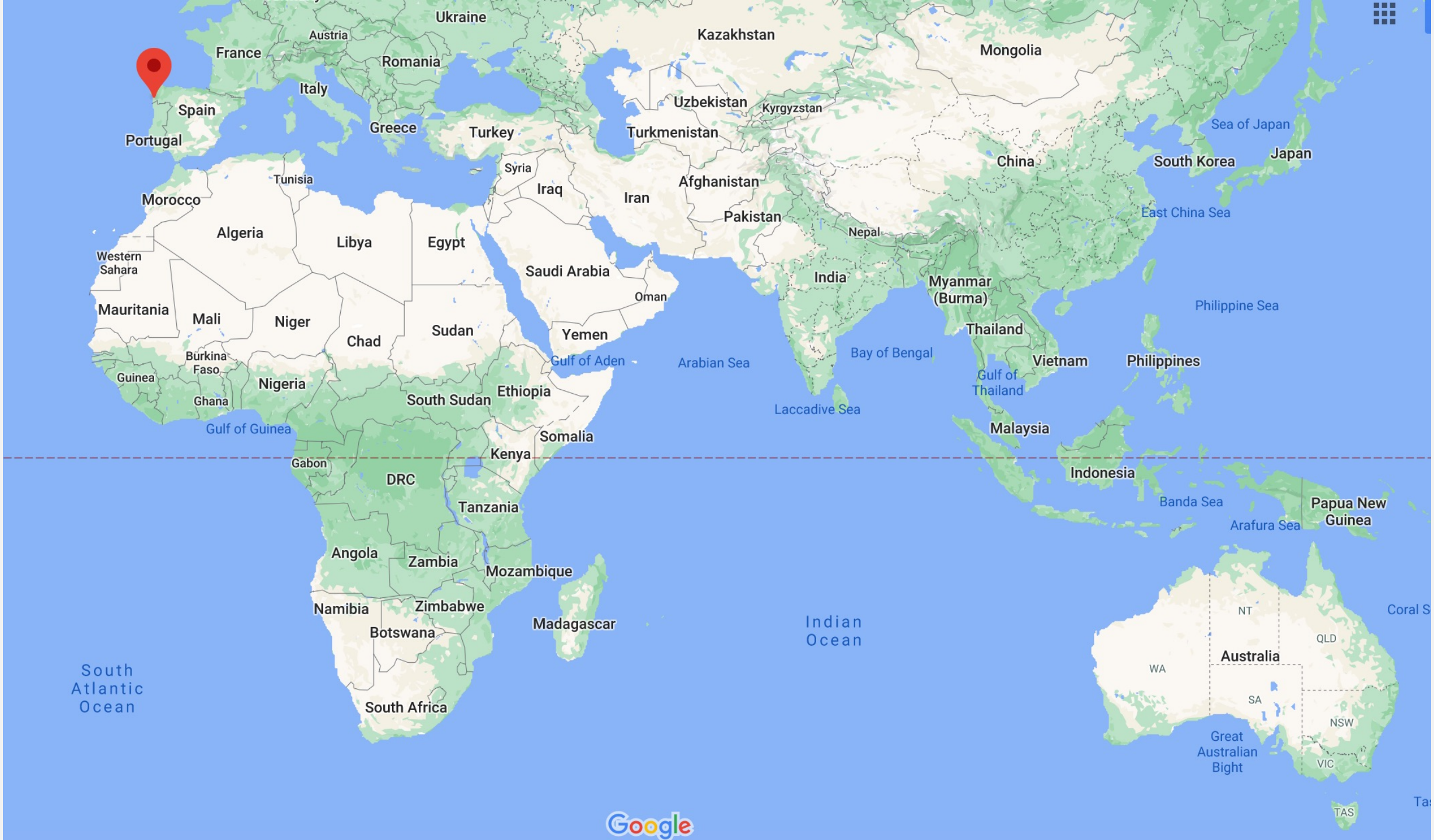
# ACUTE STROKE AND TIA MANAGEMENT

Carlos García-Esperón

John Hunter Hospital


- Hyperacute stroke
- NSW telestroke / pre hospital phase
- TIA / Minor stroke management
- Clinical case




Ukraine
Kazakhstan
Mongolia
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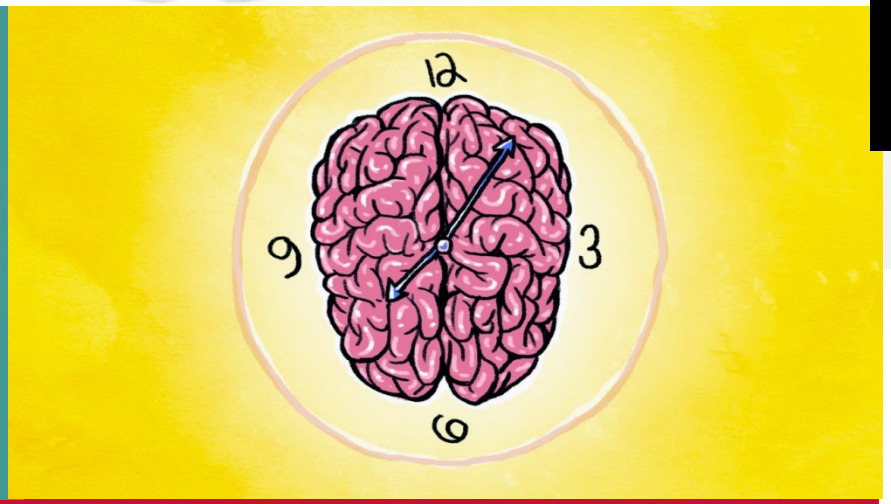
Sea of Japan
China
South Korea
Japan
Syria
Iraq
Iran
Afghanistan
Pakistan
Tunisia
Morocco
Algeria
Libya
Egypt
Nepal
East China Sea
Western Sahara
Saudi Arabia
India
Myanmar (Burma)
Oman
Mauritania
Mali
Niger
Chad
Sudan
Yemen
Thailand
Philippine Sea
Gulf of Aden
Arabian Sea
Bay of Bengal
Vietnam
Philippines
Burkina Faso
Guinea
Nigeria
Ethiopia
Gulf of Thailand
Ghana
South Sudan
Laccadive Sea
Malaysia
Gulf of Guinea
Somalia
Kenya
Gabon
DRC
Indonesia
Tanzania
Banda Sea
Papua New Guinea
Arafura Sea
Angola
Zambia
Mozambique
Namibia
Zimbabwe
Madagascar
Botswana
Indian Ocean
Coral S
NT
QLD
Australia
WA
SA
NSW
Great Australian Bight
VIC
South Africa
South Atlantic Ocean
TAS
Google


WHEN YOU PRETEND
YOU PERFECTLY UNDERSTAND
NATIVE SPANISH SPEAKERS


WITH A STROKE,
TIME LOST IS BRAIN LOST.
Learn more at StrokeAssociation.org or 1-888-4-STROKE.
Ad Council
American Stroke Association.


12
3
6
9


TIME LOST
IS BRAIN LOST


TIME
IS
BRAIN
Randomise and
treat urgently

# EARLY NOTIFICATION OF STROKE TEAM!

**Estimated Pace of Neural Circuitry Loss in Typical Large Vessel, Supratentorial Acute Ischemic Stroke**

| | Neurons Lost | Synapses Lost | Myelinated Fibers Lost | Accelerated Aging |
|---|---|---|---|---|
| Per Stroke | 1.2 billion | 8.3 trillion | 7140 km/4470 miles | 36 y |
| Per Hour | 120 million | 830 billion | 714 km/447 miles | 3.6 y |
| Per Minute | 1.9 million | 14 billion | 12 km/7.5 miles | 3.1 wk |
| Per Second | 32 000 | 230 million | 200 meters/218 yards | 8.7 h |

Saver, Stroke 2006

Total number of neurons: 85 billion

# MR X.

77 years old male.

Alcohol consumption: 4-5 beers per day.

Atrial fibrillation; on Dabigatran 5 years ago. Stopped. Reason?

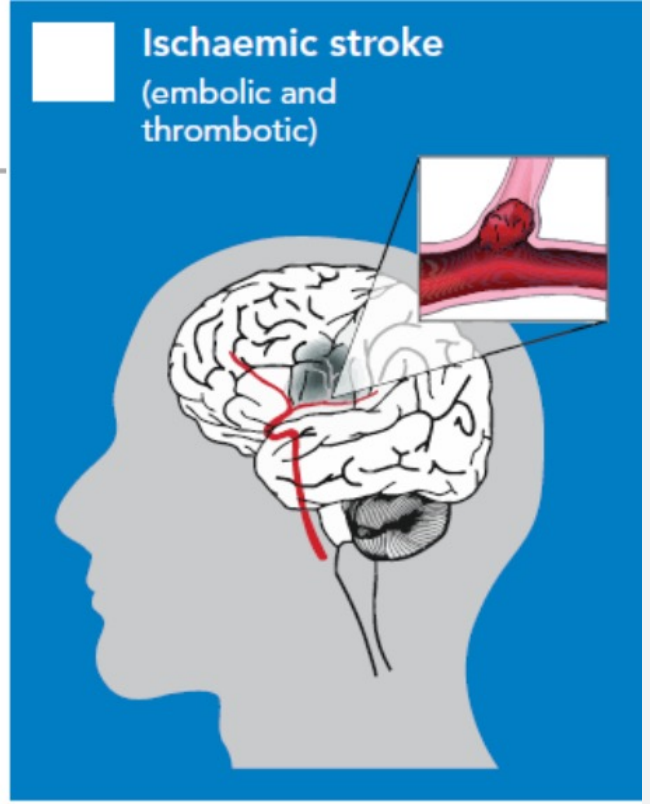
Yesterday, at 17.00, at the pub.

Headache, word finding difficulties, right side weakness.

Called ambulance 000

Arrived hospital at 18:15

# 1 IN 6 AUSTRALIANS WILL SUFFER A STROKE




Stroke is one of the leading causes of disability in Australia

50,000 new strokes each year in Australia

An ischemic stroke occurs when a brain artery is occluded

If the artery remains blocked for more than a few minutes, the neurons die

The goal for both of these treatment strategies is early reperfusion (dissolving or removing the clot).

# MR X ED ARRIVAL18:35 / SO 17:00)

Left gaze preference, right homonimous hemianopia, right central facial palsy, Right hemiparesis (A1/5 – L3/5), right hypoesthesia, mixed aphasia.

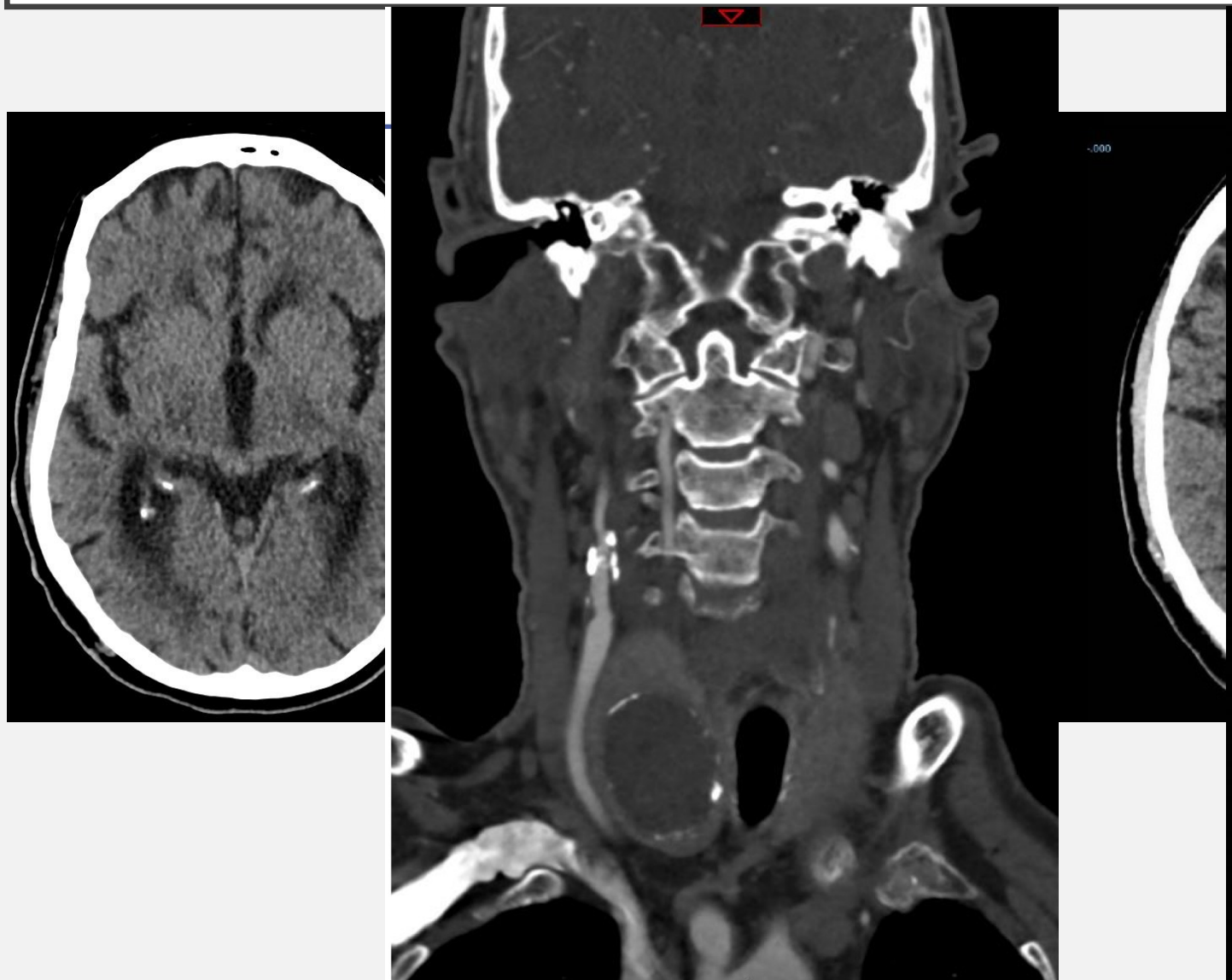
NIHSS 20

ECG, Blood tests are normal

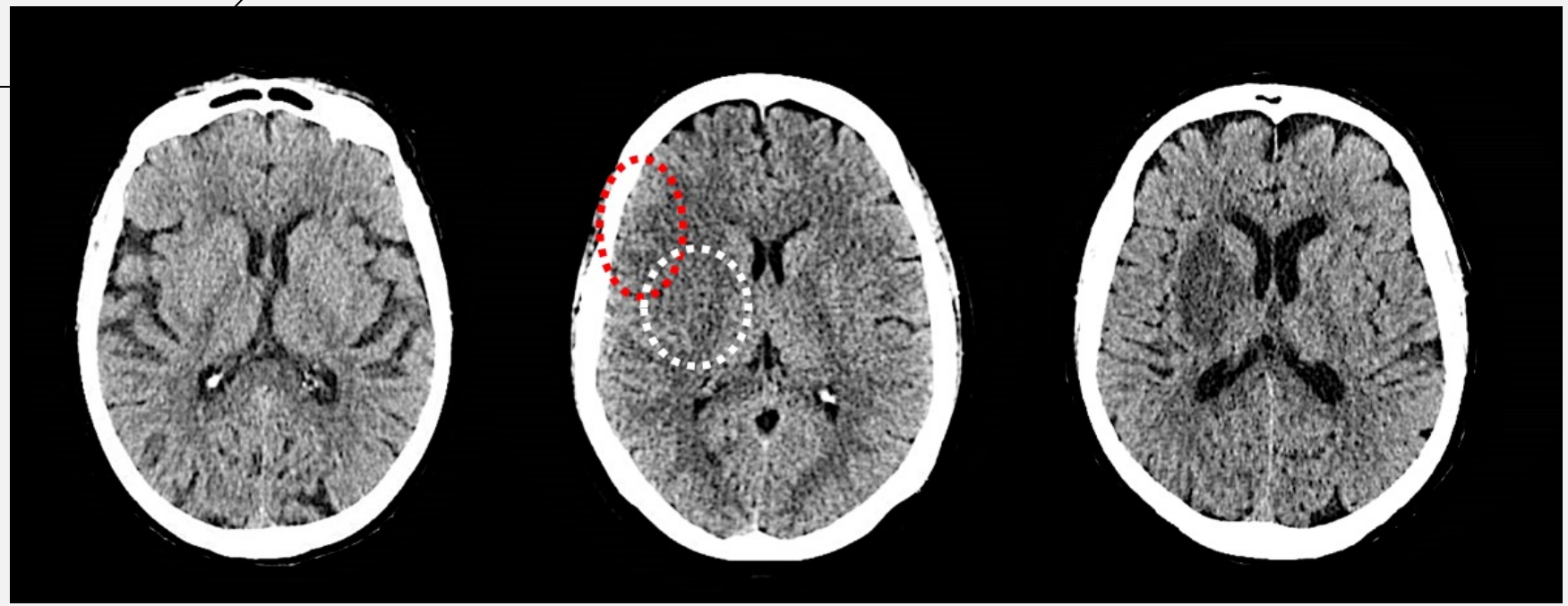
**What kind of brain imaging should be ordered?**

a- Brain CT
b- Brain CTA
c- Brain CTP
d- Brain MRI
e- Cerebral angiogram
f- A+B+C

# BRAIN NCCT + CTA



NOT EVERYTHING IS BLACK AND WHITE

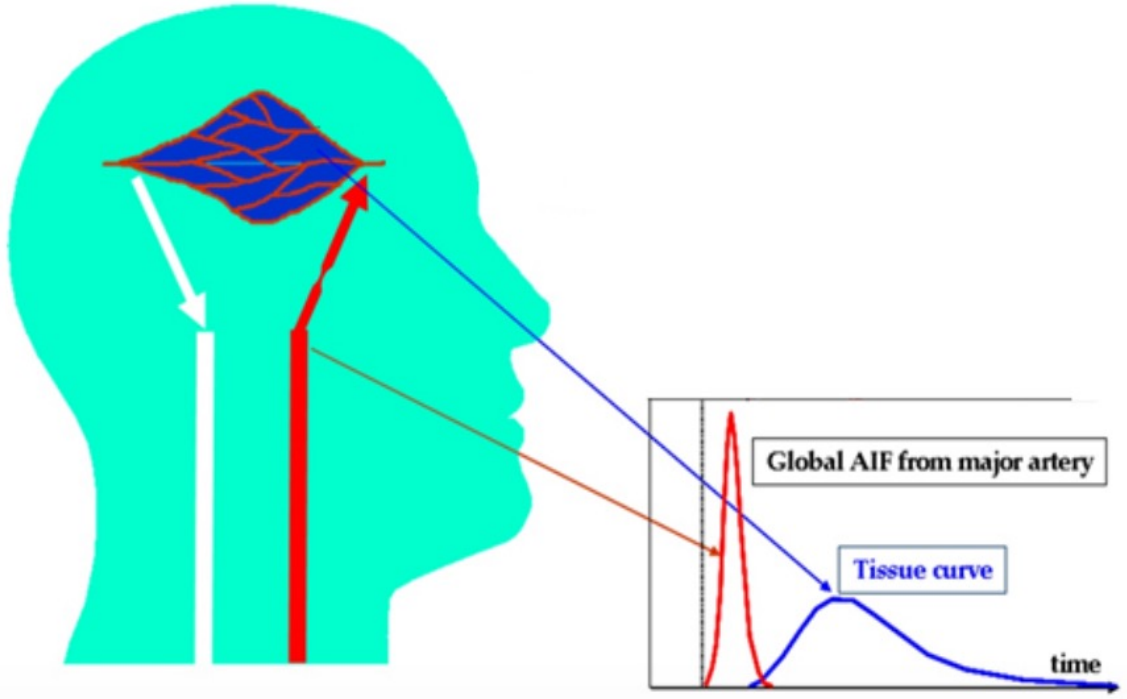


# MULTIMODAL IMAGE, BRAIN CT+CTA+CTP

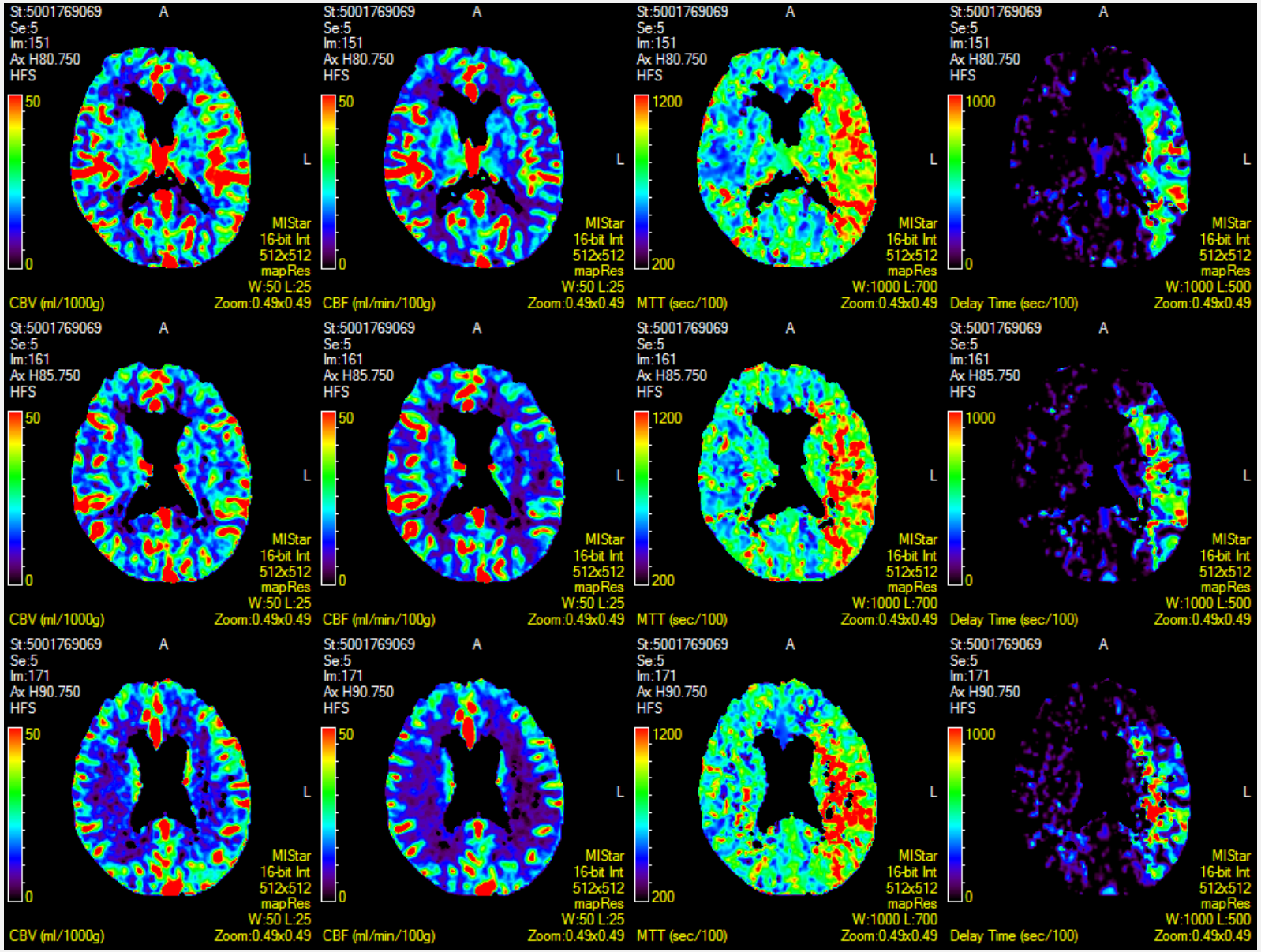
Using the contrast injection movie, we calculate
Cerebral blood flow, volume, and transit (MTT and Tmax/Delay Time)

**Core**
long DT+ low CBF
(no blood enters the region of the infarct)

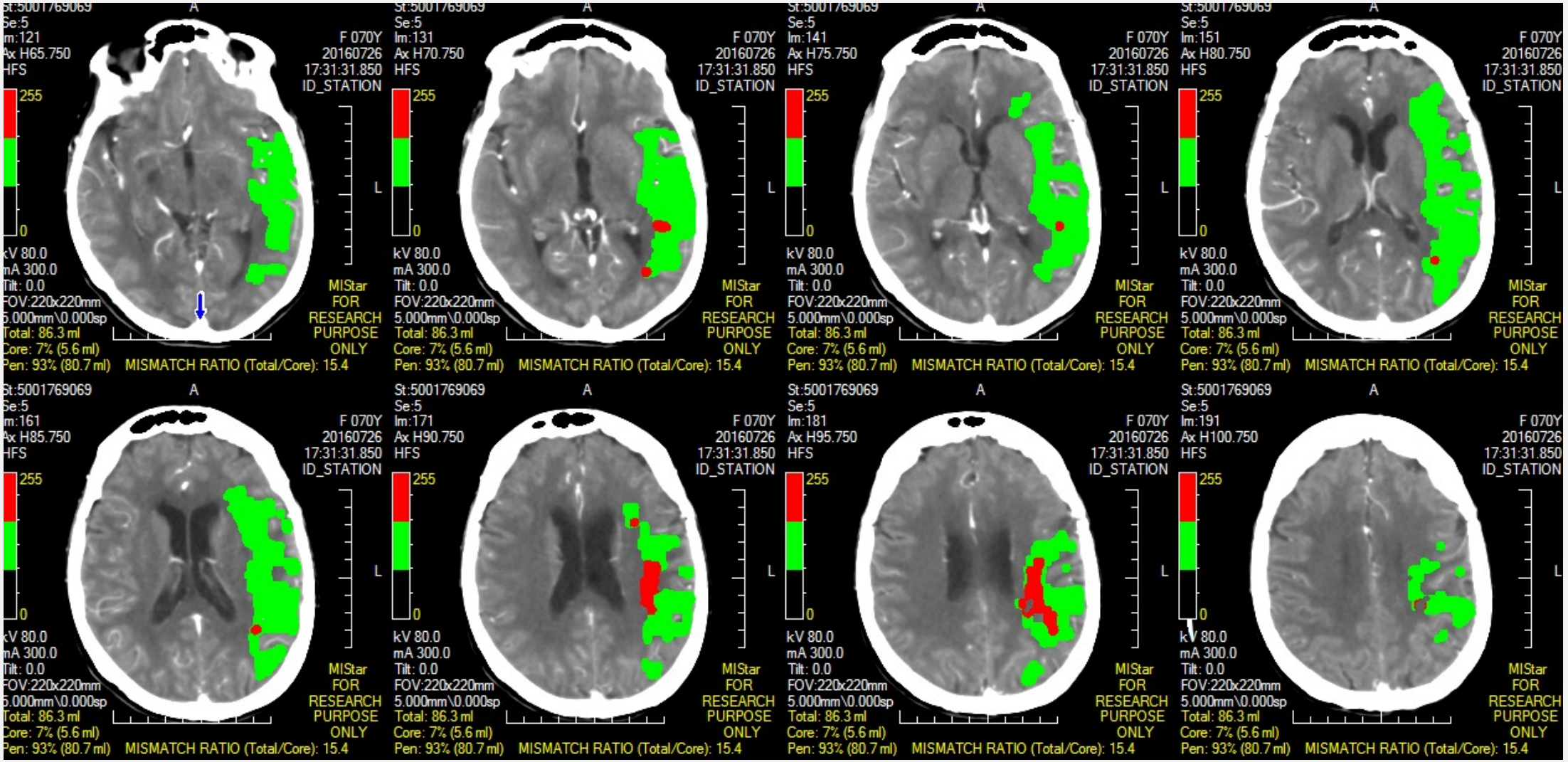
**Penumbra**
long DT + normal or high CBF
(maximal vasodilation)



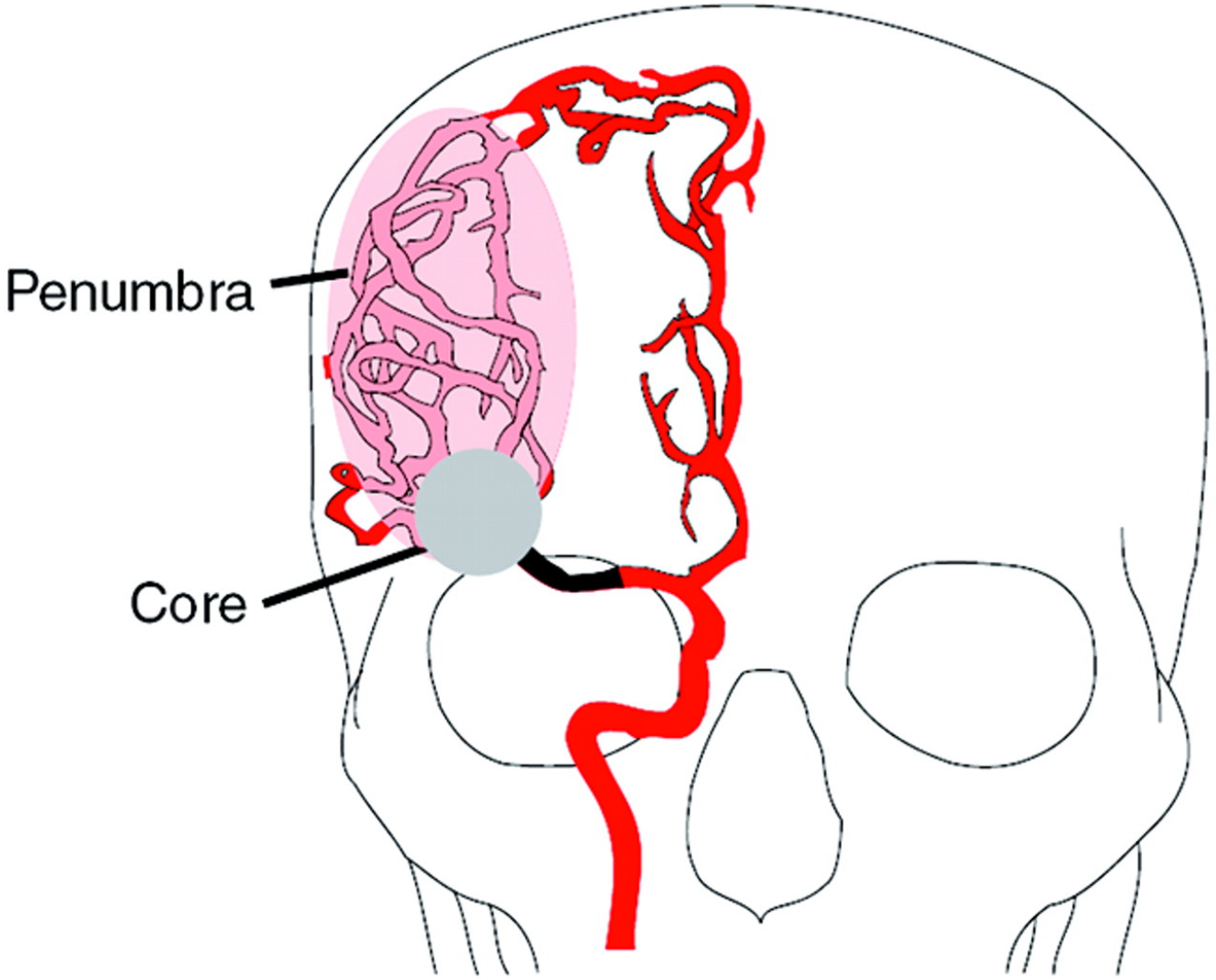
| CEREBRAL BLOOD VOLUME | CEREBRAL BLOOD FLOW | MEAN TRANSIENT TIME | DELAY TIME |
|---|---|---|---|



# CT PERFUSION – CORE / PENUMBRA MAPS



# HUMAN PENUMBRA




1980's

PET studies suggested penumbra exists in humans and even for long period

# WORLD HAS CHANGED

# WHY DO CTP BEFORE TREATMENT?

- Target mismatch (core <70 mL, penumbra >15 mL)
  - 23 times greater chance of excellent outcome compared to untreated
  - 77% reduction in mortality

- Large core volume (>70mL)
  - 48% increase of mortality and x9 symptomatic intracerebral haemorrhage

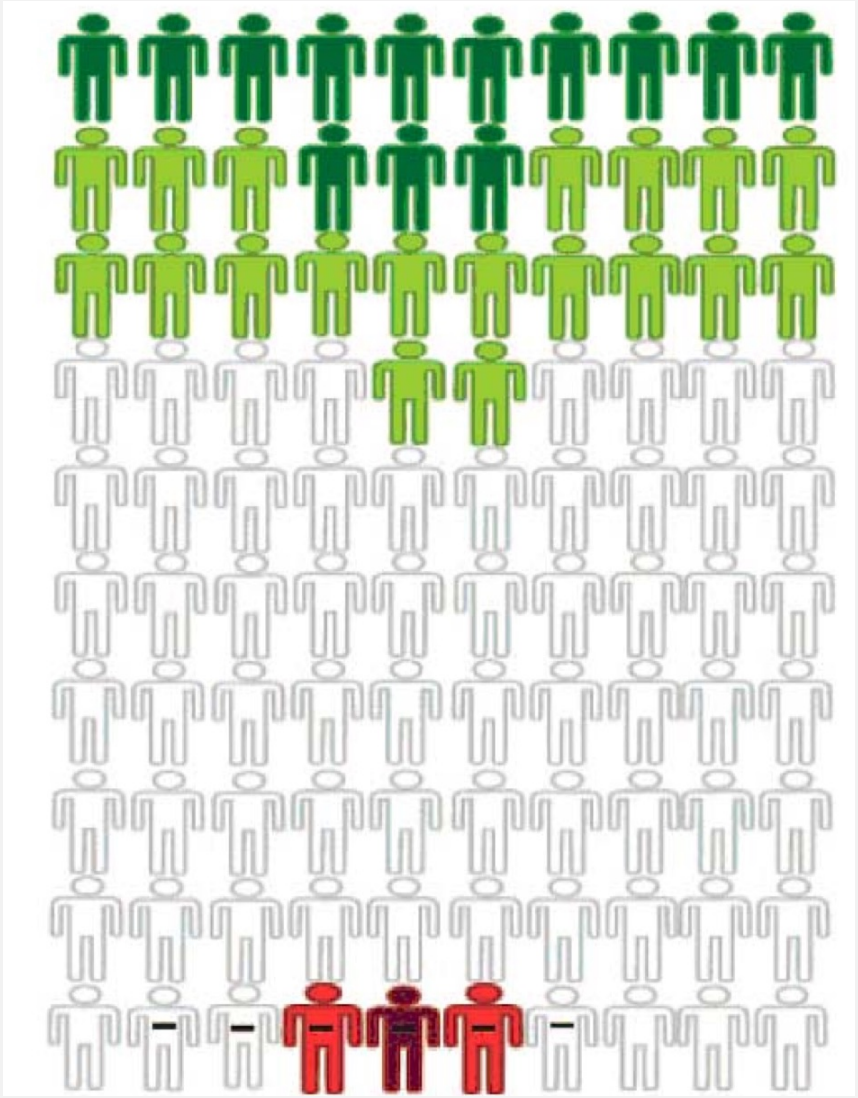
- Small perfusion lesion (<15 mL)
  - One-third of all lysis eligible strokes
  - No significant benefit from thrombolysis *(Bivard, 2018 Annals of Neurology)*

- No target mismatch
  - **16 times greater chance of poor clinical outcome** and death if treated

# AND NOW, WHAT TO DO?

- A - Start Aspirin 100mg + Clopidogrel 75mg STAT
- B - Start Heparin iv.
- C - Start Alteplase (rTPA)
- D - Tenecteplase 0.25mg/kg
- E- Endovascular clot retrieval
- F - Alteplase + Endovascular clot retrieval

# THROMBOLYSIS

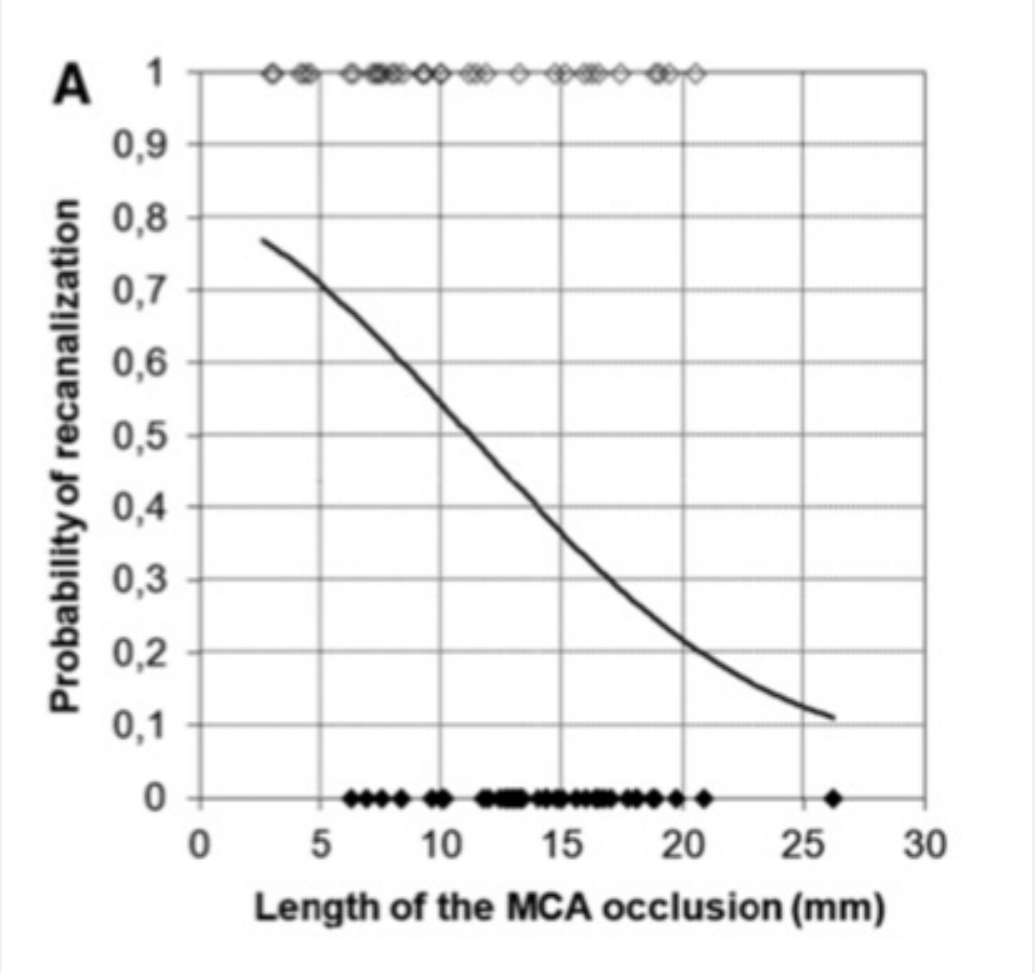



Delivered at rural hospitals of the Telestroke network
The majority of patients do not benefit
Thrombolysis is not ideal to dissolve big clots

# LIMITATIONS

## Not for everyone

- Patients on Warfarin (if INR >1.7)
- Patients on NOAC (and compliant)
- Recent surgery (2 weeks)
- Pregnancy




Rohan et al, Stroke 2015

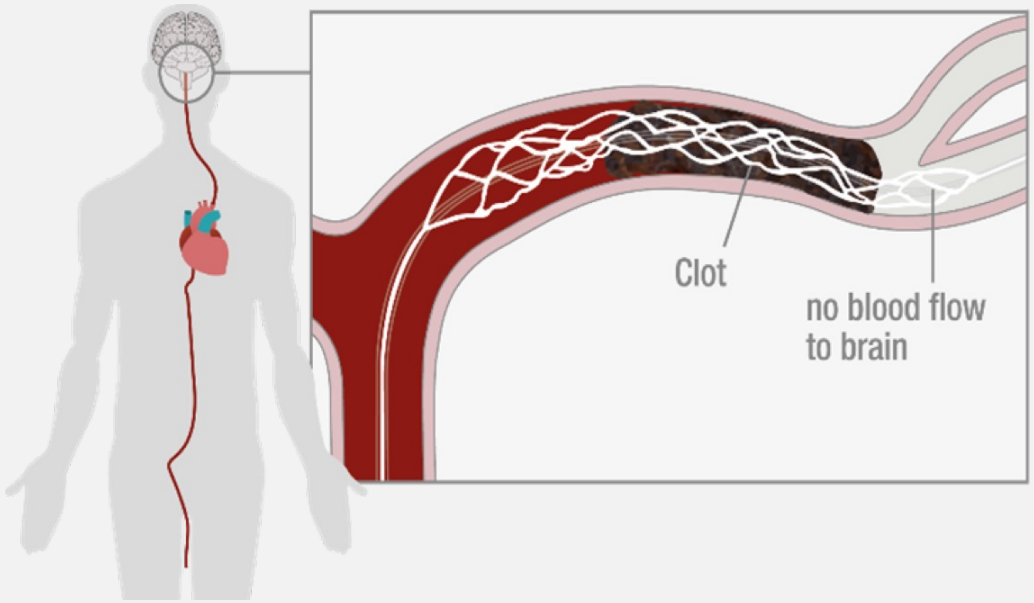
# MR X AFTER TPA (18:50 - SO:17:00)

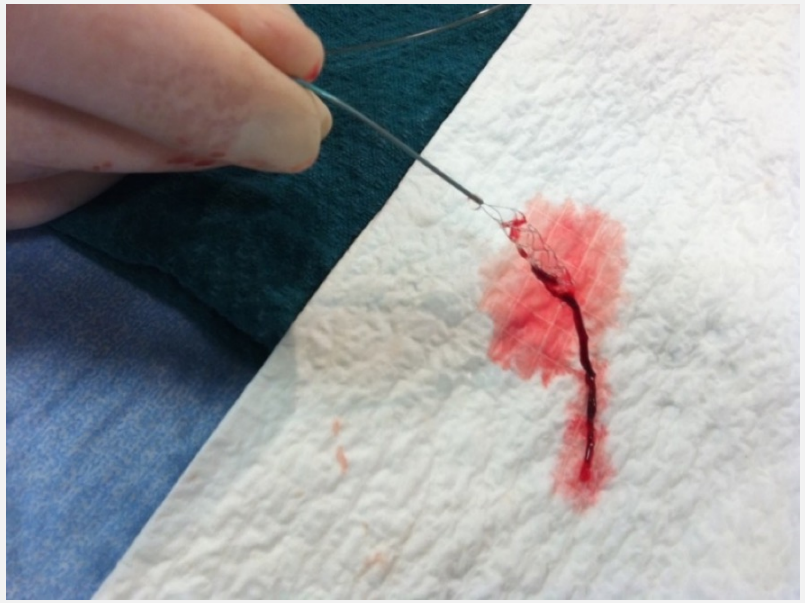
- No clinical improvement.
- Still right side weakness, mixed aphasia, and h.hemianopia.

# THROMBECTOMY / ENDOVASCULAR CLOT RETRIEVAL

**For patients with ischemic stroke caused by a large artery occlusion and brain tissue to save**

24 hour window



# OUTCOME OF THROMBECTOMY TRIALS (2015)

**3 month outcome after disabling stroke**

| | Thrombectomy | Medical treatment |
|---|---|---|
| Independent | **46%** | **26.5%** |
| Moderate dependent | 32.5% | 41.1% |
| Bed bound/Dead | 21.5% | 34.4% |

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**Number need to treat = 3**

# CTP, IMAGING MODALITY FOR THROMBECTOMY

ORIGINAL ARTICLE

## Thrombectomy 6 to 24 Hours after Stroke with a Mismatch between Deficit and Infarct

Raul G. Nogueira, M.D., Ashutosh P. Jadhav, M.D., Ph.D., Diogo C. Haussen, M.D., Alain Bonafe, M.D., Ronald F. Budzik, M.D., Parita Bhuva, M.D., Dileep R. Yavagal, M.D., Marc Ribo, M.D., Christophe Cognard, M.D., Ricardo A. Hanel, M.D., Cathy A. Sila, M.D., Ameer E. Hassan, D.O., et al., for the DAWN Trial Investigators*

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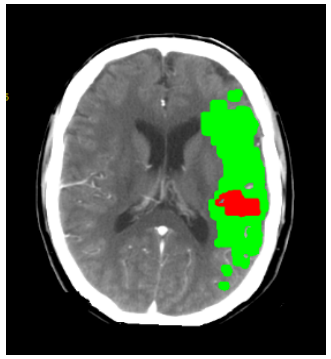
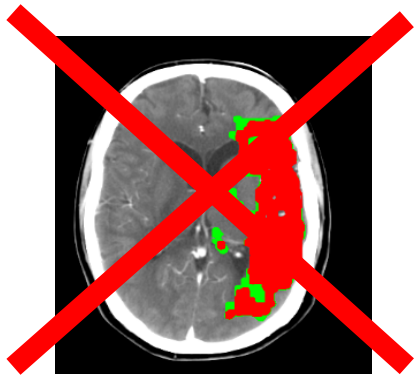
Gregory W. Albers, M.D., Michael P. Marks, M.D., Stephanie Kemp, B.S., Soren Christensen, Ph.D., Jenny P. Tsai, M.D., Santiago Ortega-Gutierrez, M.D., Ryan A. McTaggart, M.D., Michel T. Torbey, M.D., May Kim-Tenser, M.D., Thabele Leslie-Mazwi, M.D., Amrou Sarraj, M.D., Scott E. Kasner, M.D., et al., for the DEFUSE 3 Investigators*





# CTP, IMAGING MODALITY FOR ECR

ORIGINAL ARTICLE

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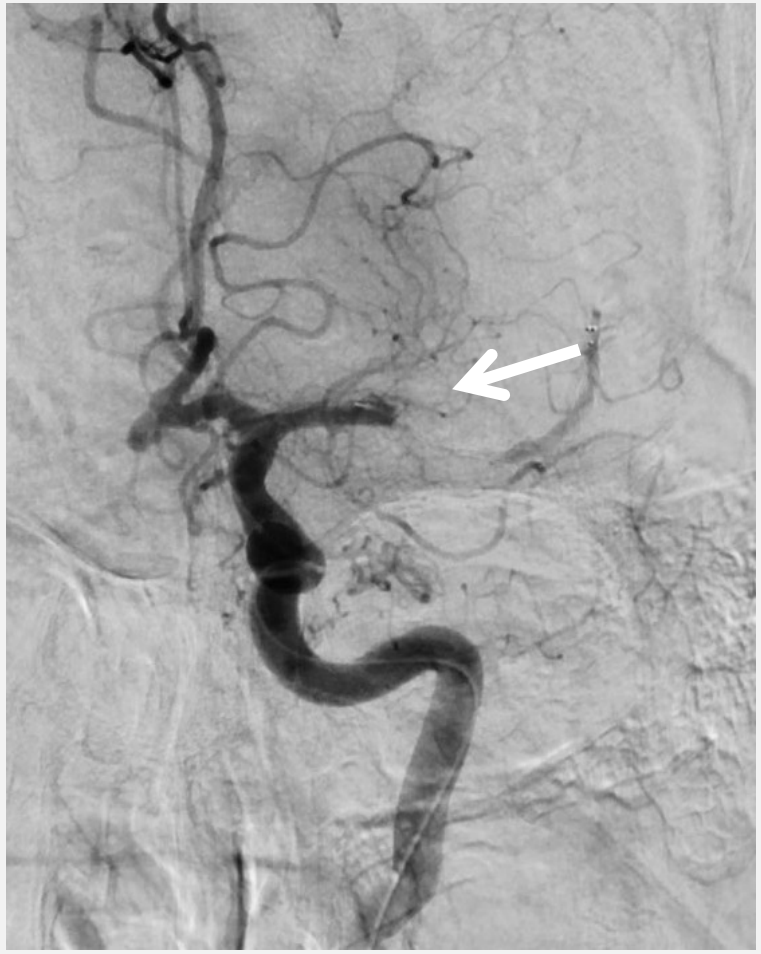
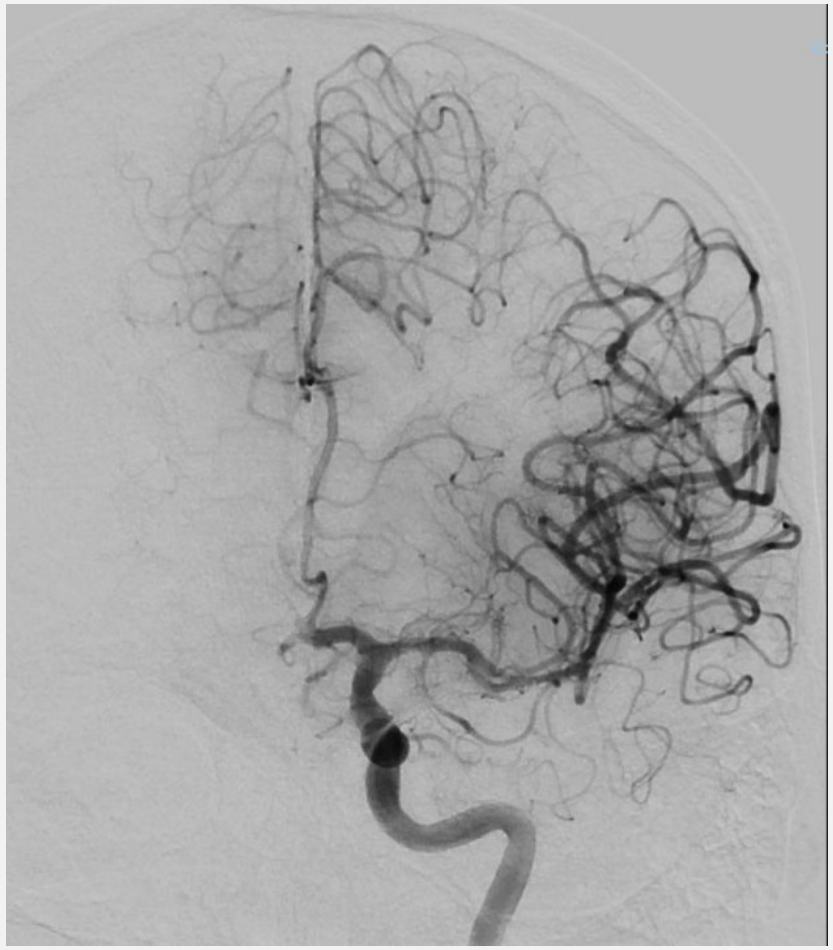
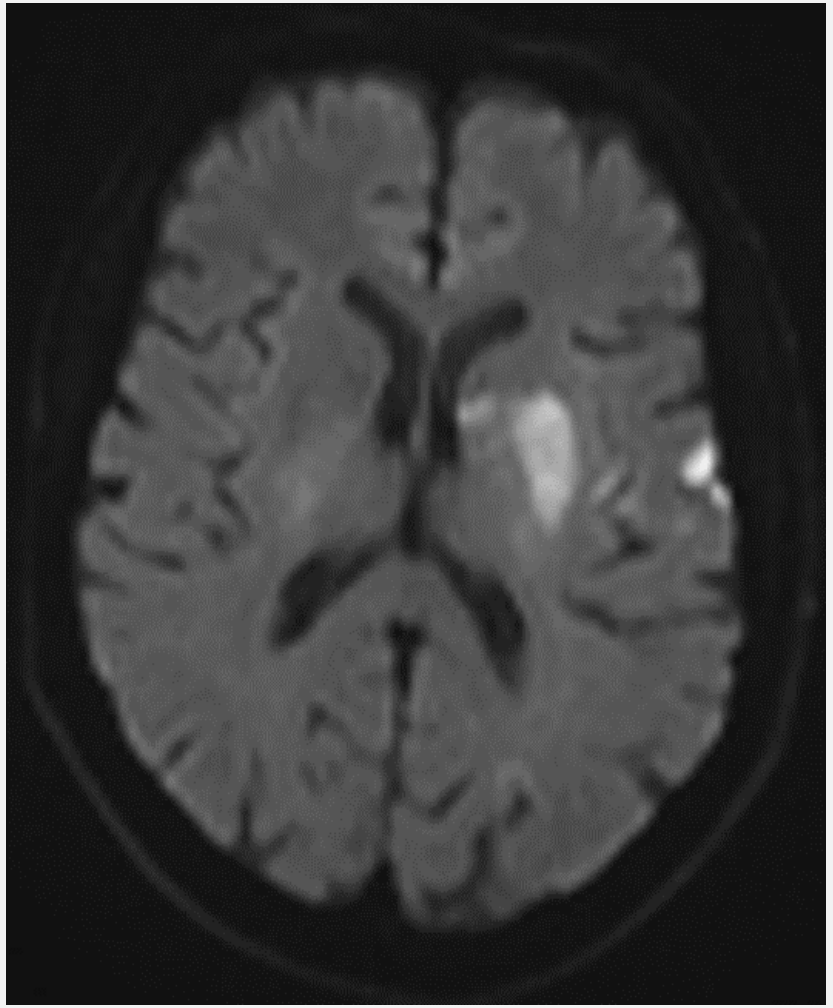
NNT = 3-4

# MR X : SUCCESFUL THROMBECTOMY





# F UP IMAGE



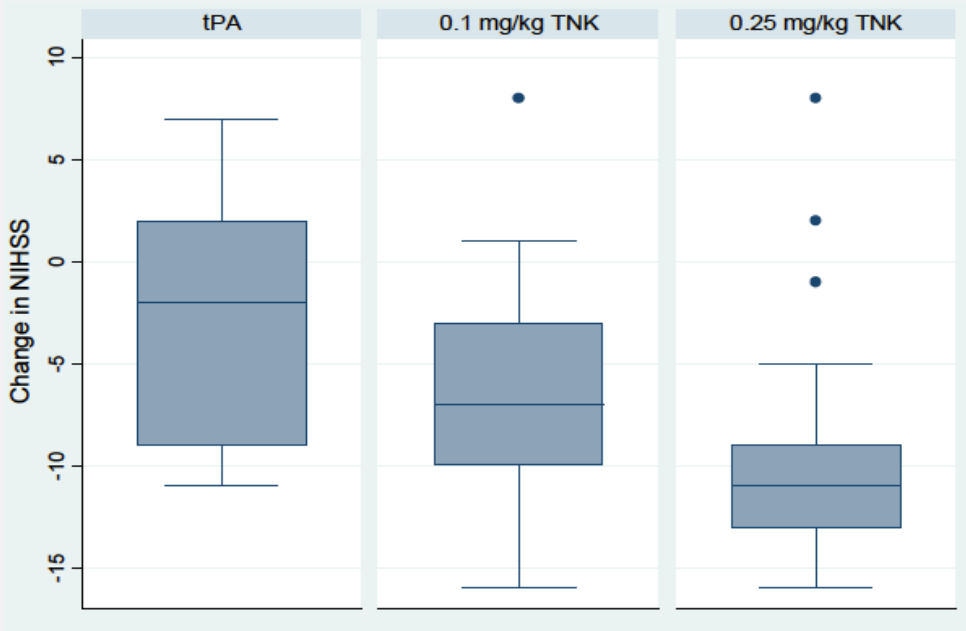
# TENECTEPLASE? NOT YET

More fibrin-specific than alteplase (tPA)
More resistant to plasminogen activator inhibitor-1 than tPA
½ life longer than other lytics

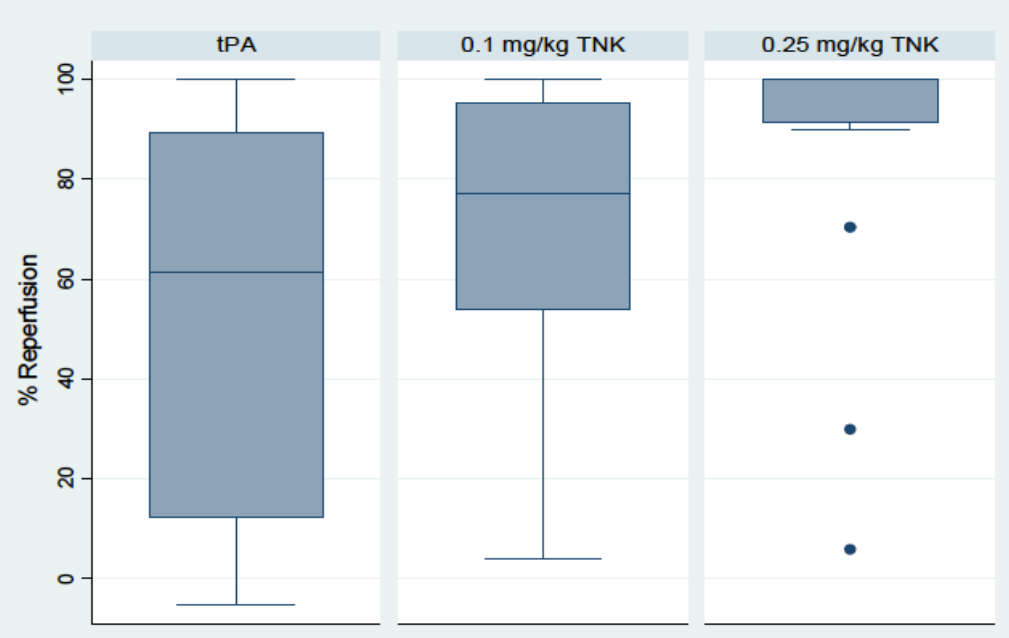
Single dose as bolus

## Phase IIB TNK vs tPA (NEJM 2012)

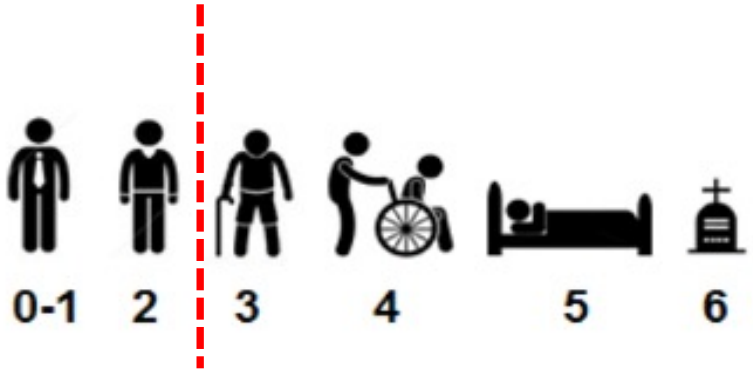
**NIHSS 24 h**




**% Reperfusion**



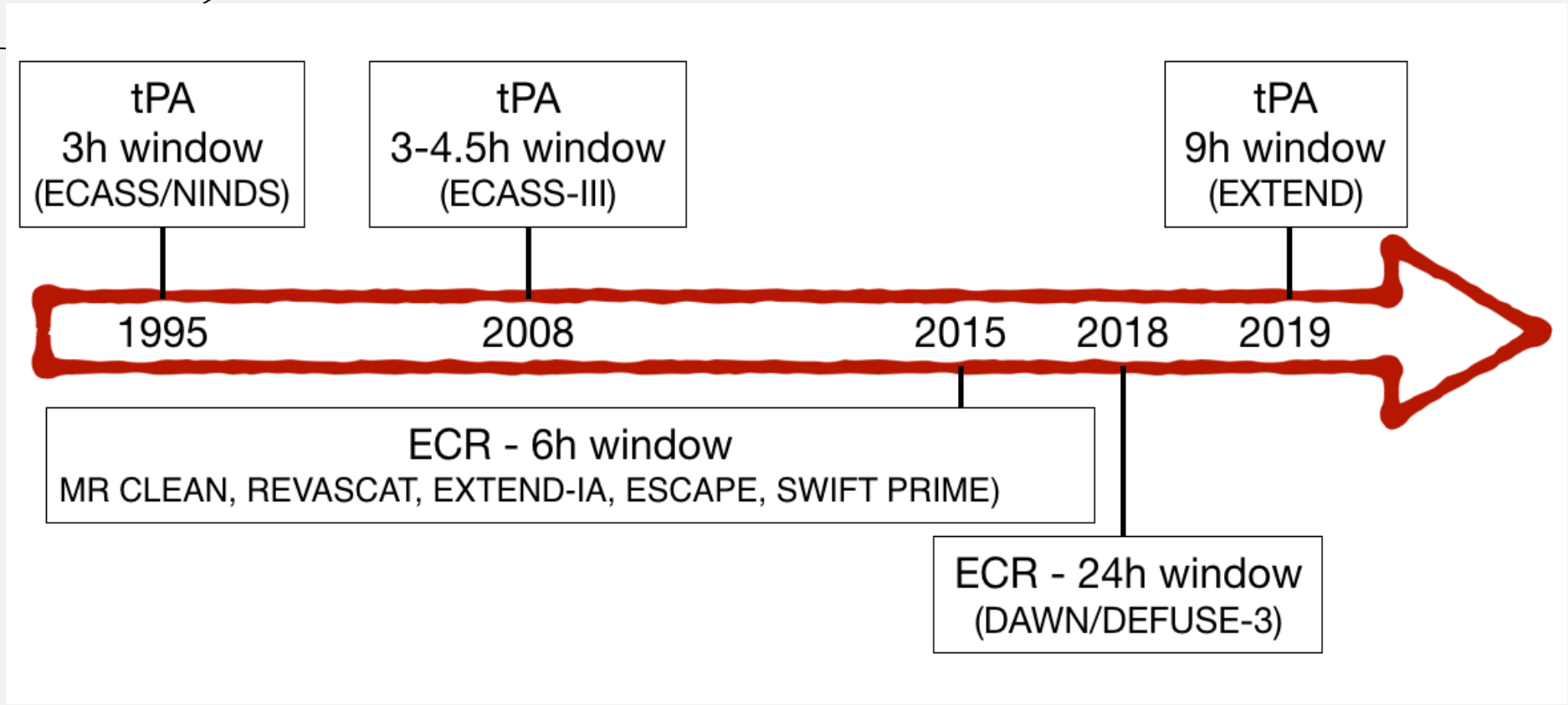
| Results | N=221 Combined therapy "Bridging" | N=217 Primary Thrombectomy EVT alone |
|---|---|---|
| 90-day mRS 0-2 | 51.6% (114/221) | 56.7% (123/217) |
| 90-day mRS shift | - | - |
| 90-day mRS 0-1 | 37.6% (83/221) | 39.2% (85/217) |
| 90-day mRS 0-3 | 67.0% (148/221) | 70.0% (152/217) |

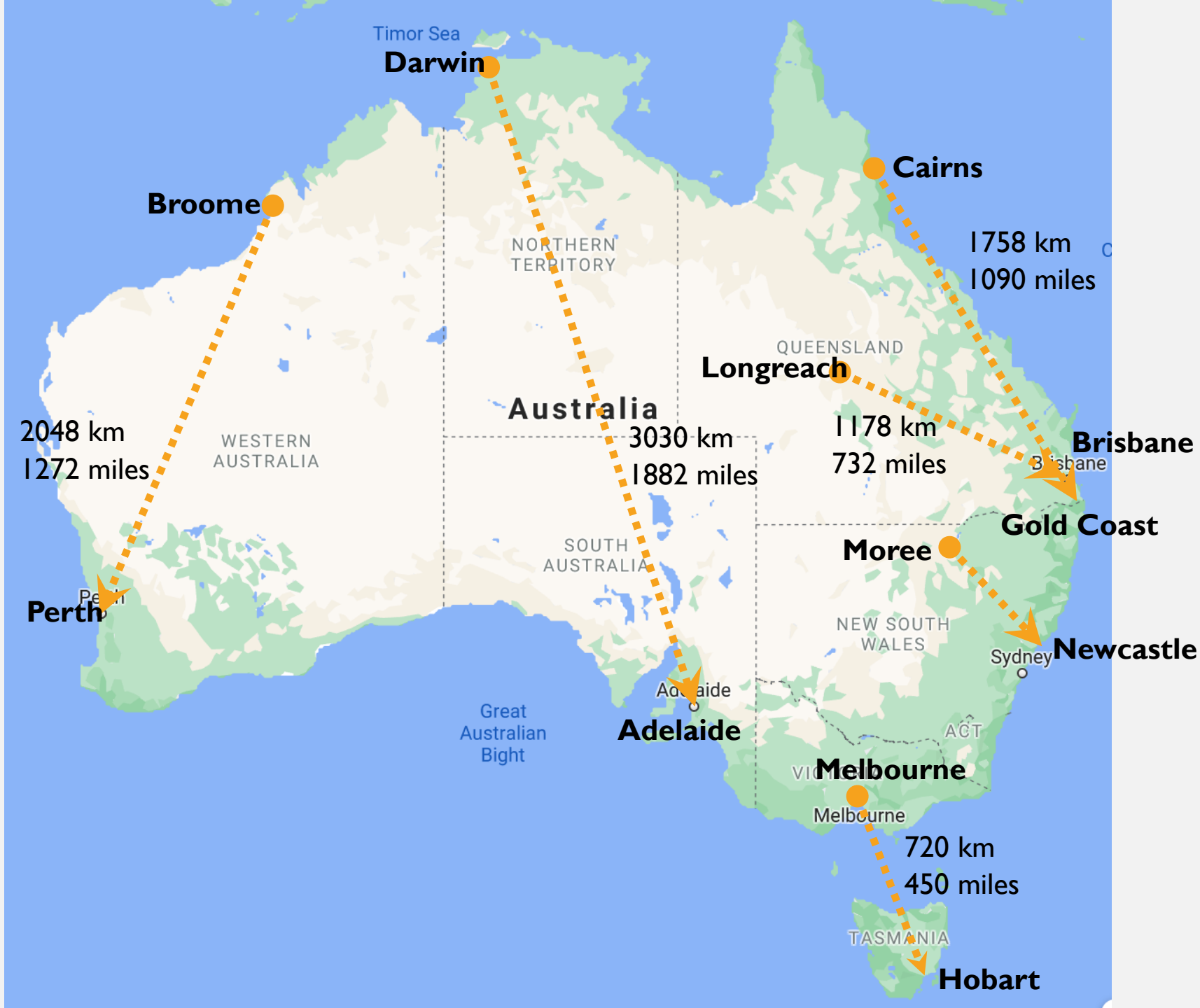



Modified Rankin Scale (mRS)

# NO EVIDENCE TO SKIP TPA BEFORE THROMBECTOMY

# TIMELINE OF REPERFUSION THERAPIES

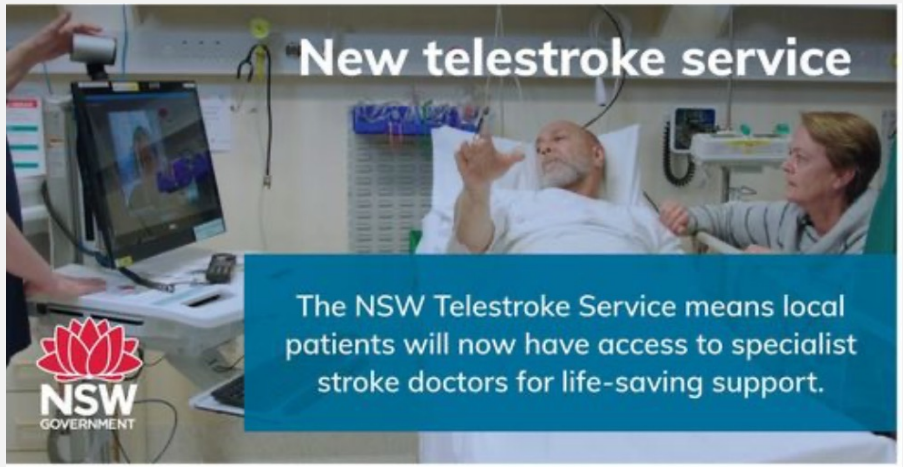


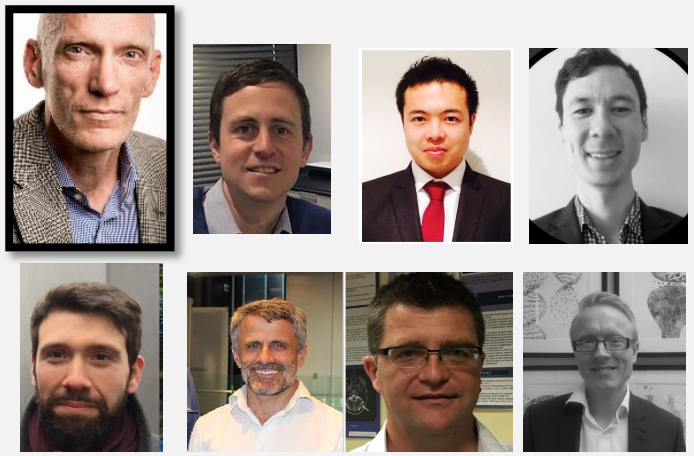

Timor Sea
Darwin
Broome
Cairns
NORTHERN TERRITORY
1758 km
1090 miles
QUEENSLAND
Longreach
Australia
2048 km
1272 miles
WESTERN AUSTRALIA
3030 km
1882 miles
1178 km
732 miles
Brisbane
Gold Coast
SOUTH AUSTRALIA
Moree
Perth
NEW SOUTH WALES
Sydney
Newcastle
Great Australian Bight
Adelaide
ACT
Melbourne
Melbourne
720 km
450 miles
TASMANIA
Hobart

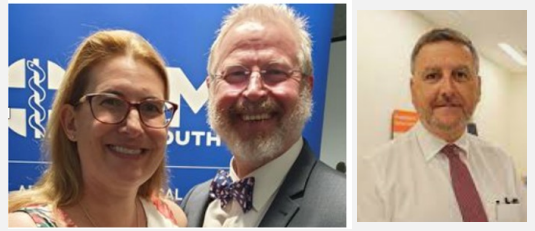
# NSW TELESTROKE

- Increase in the volume of patients requiring acute stroke triage
- Increased volume of patients receiving reperfusion therapies
- HNE / MNC: Pilot project of telestroke (since April 2013)
- NSW telestroke: March 2020 (Coffs/Port)


*Courtesy of NSW Telestroke network (Prof Butcher et al)*







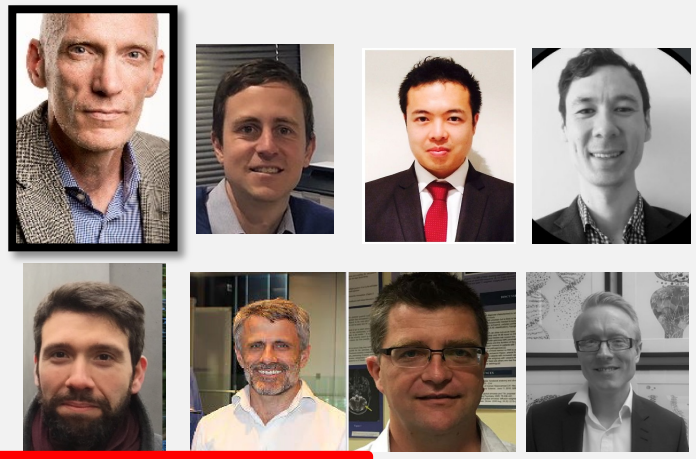
Paul Reeves

Alvin Chew

Candice Delcourt

Mark Parsons

*Courtesy of NSW Telestroke network (Prof Butcher et al)*

Paul Reeves

Alvin Chew

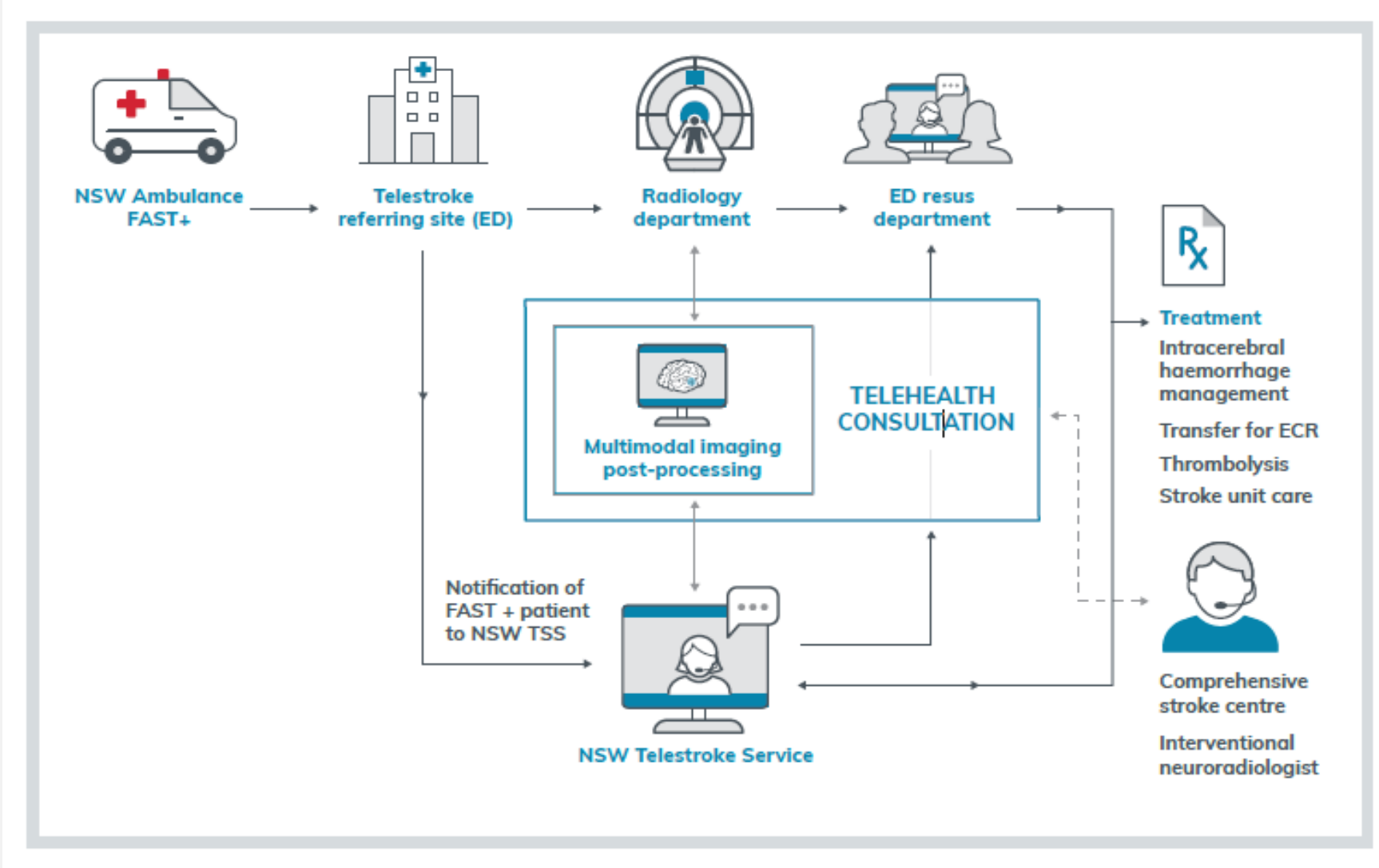
Candice Delcourt

Mark Parsons

Tamworth

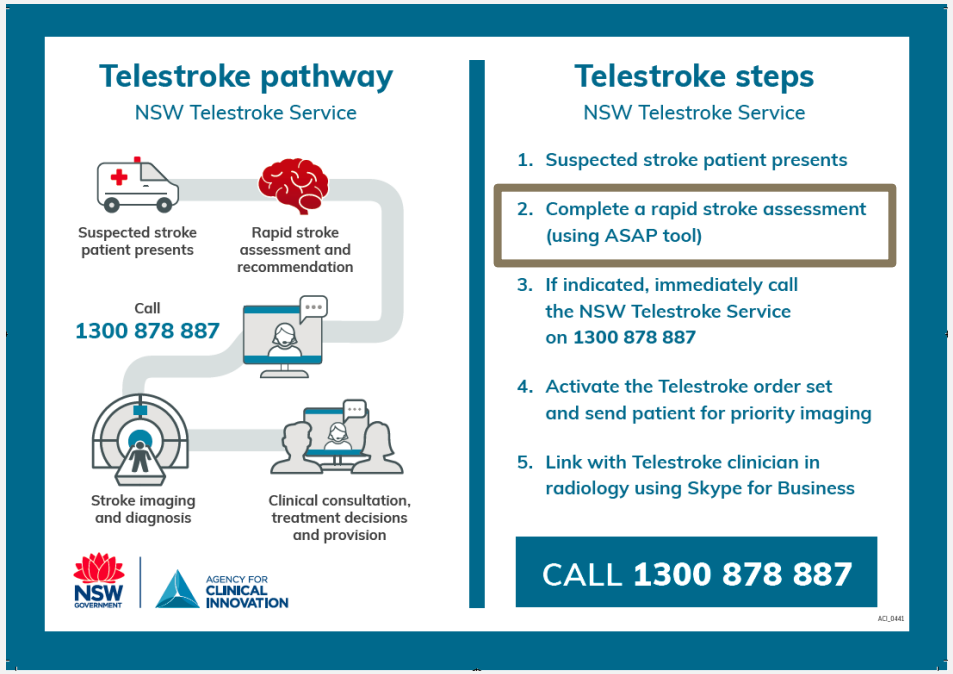
Wagga Wagga

*Courtesy of NSW Telestroke network (Prof Butcher et al)*




*Courtesy of NSW Telestroke network (Prof Butcher et al)*

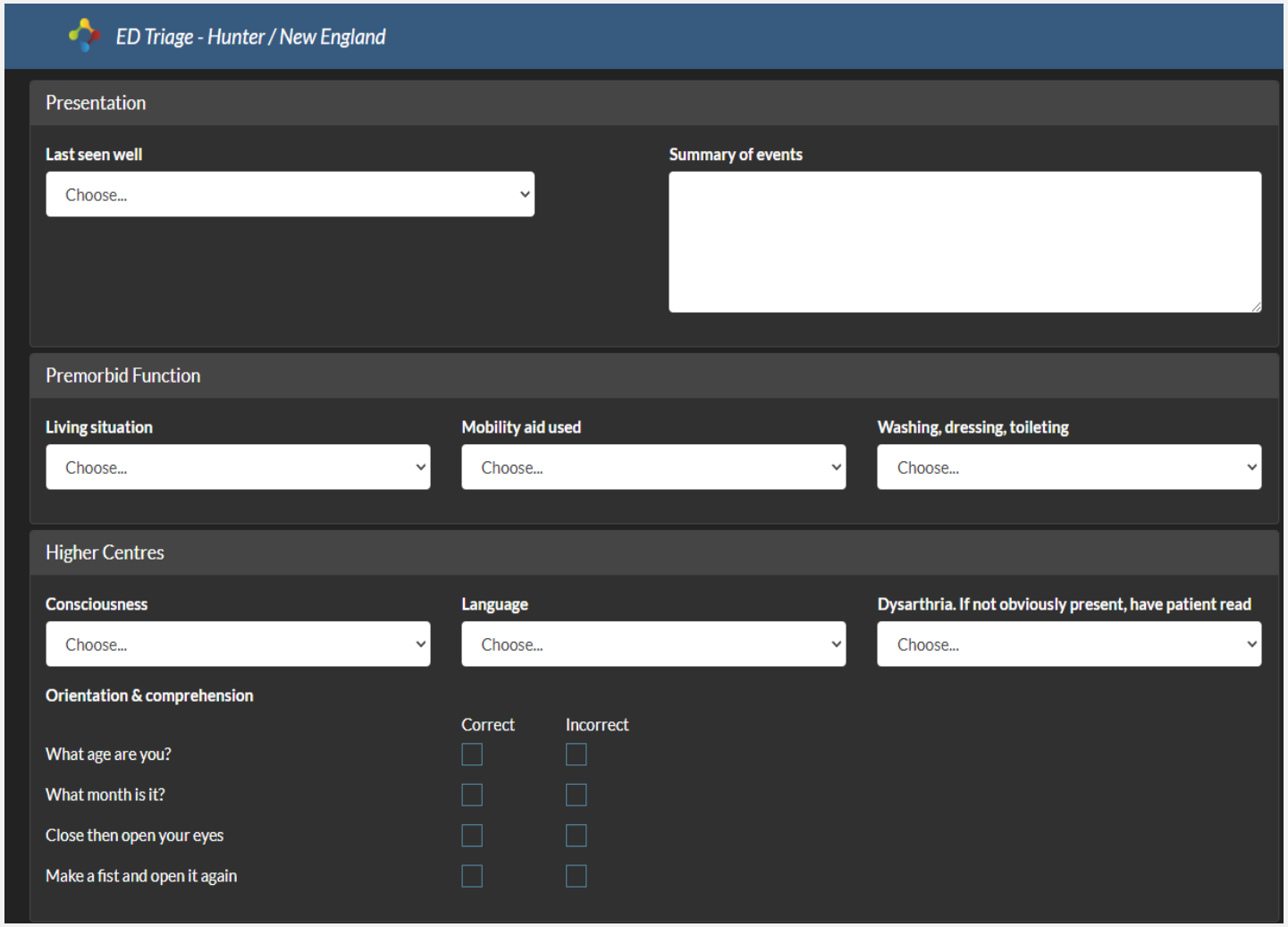
# IMPLEMENTATION: EDUCATION AND TRAINING FOR STAFF




*Prof Rohan Walker et al (UoN / HMRI)*

*Courtesy of NSW Telestroke network (Prof Butcher et al)*

# STROKE TRIAGE - ROUNDS



# ED ACUTE ASSESSMENT: WHEN TO CALL?

- Time from onset
- Severity of symptoms: NIHSS
- Pre-morbid status – mRS / DBS

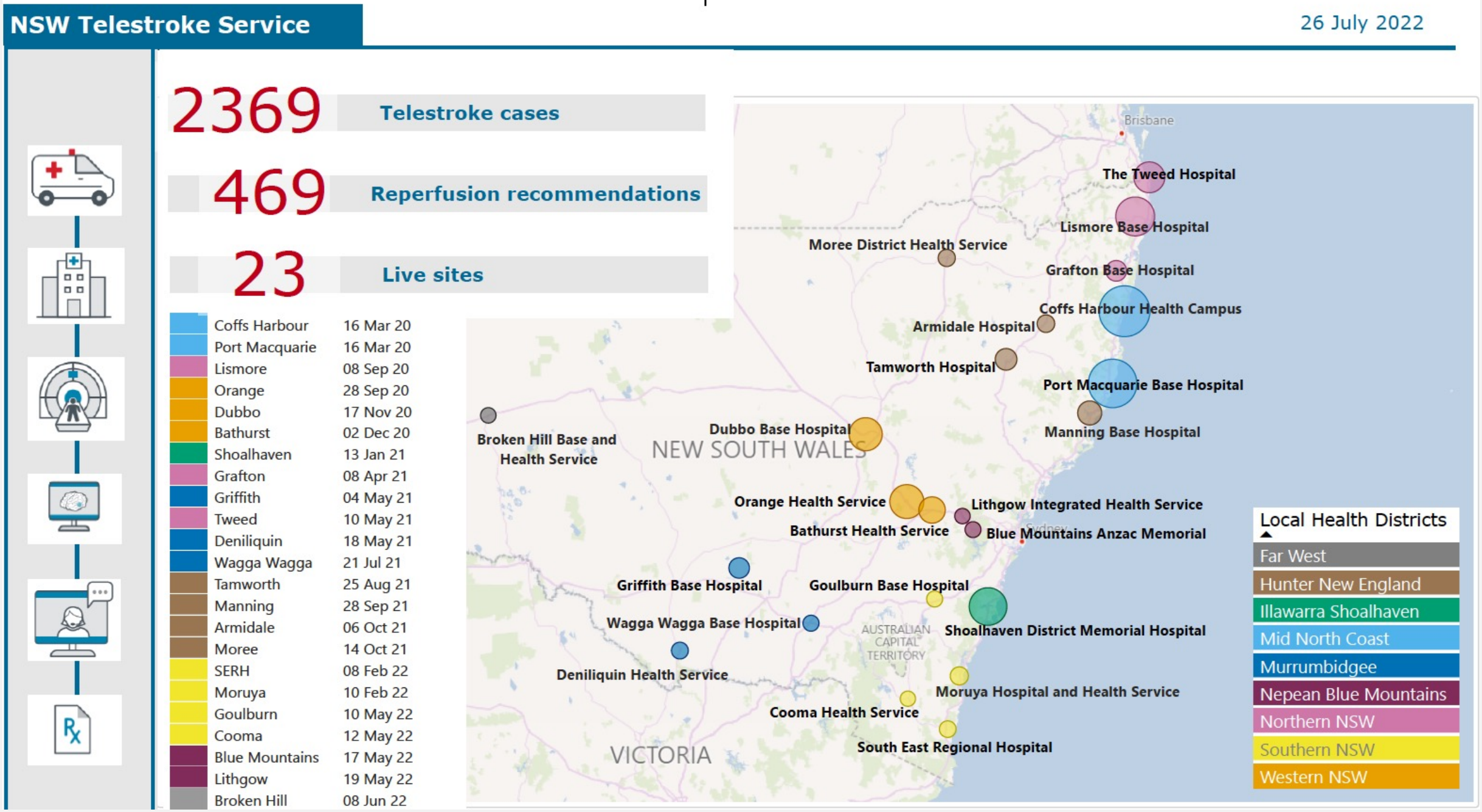
# D-B-S

Driving /

Domestics

Banking

Shopping




*Courtesy of NSW Telestroke network (Prof Butcher et al)*

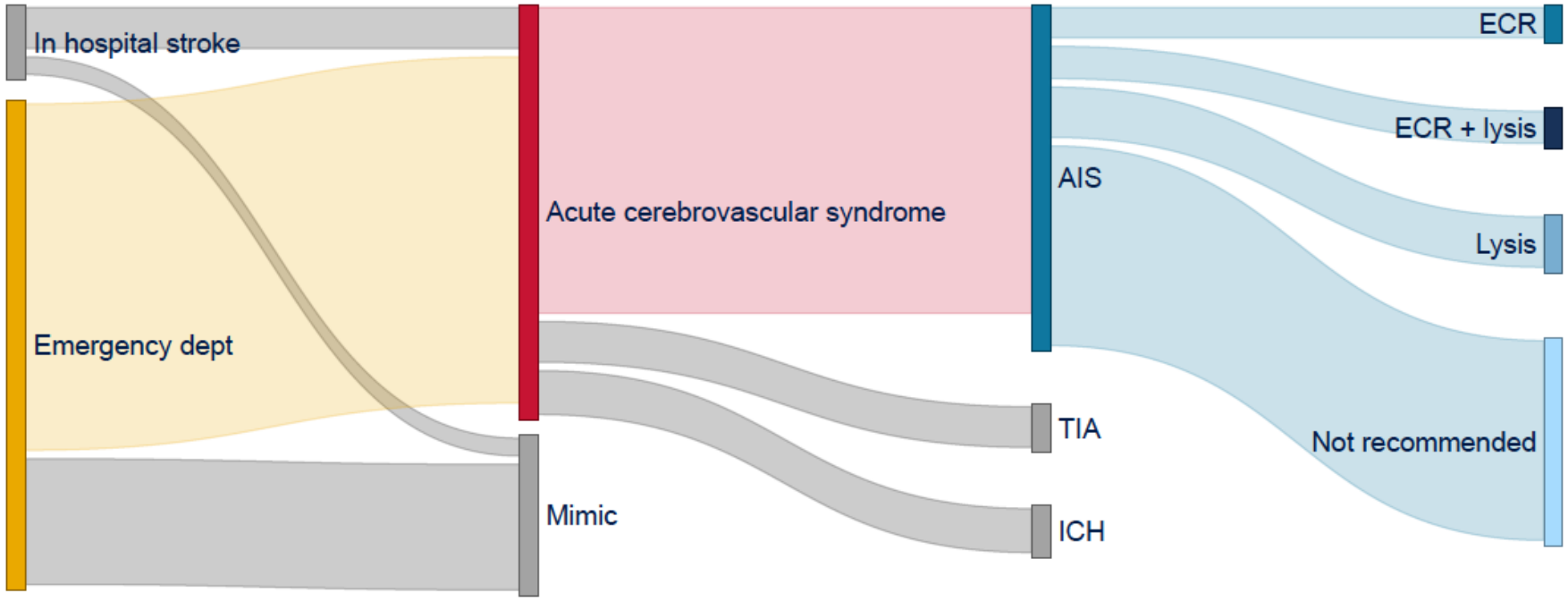
## Telestroke pathways

66%

58%

**Cases are acute ischaemic strokes**

Telestroke cases from presentation type to reperfusion recommendation




*Courtesy of NSW Telestroke network (Prof Butcher et al)*

| Hospital | Cases | ED | Ward | Mimics | TIA | Strokes | Reperfusion recommended | ICH | AIS | Lysis | ECR | ECR + lysis |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coffs Harbour | 386 | 350 | 36 | 95 | 24 | 267 | 72 | 35 | 232 | 34 | 17 | 21 |
| Port Macquarie | 358 | 314 | 43 | 99 | 27 | 232 | 63 | 31 | 201 | 31 | 15 | 17 |
| Lismore | 252 | 227 | 25 | 58 | 26 | 168 | 47 | 20 | 148 | 21 | 15 | 11 |
| Shoalhaven | 241 | 217 | 24 | 70 | 26 | 145 | 49 | 10 | 135 | 19 | 13 | 17 |
| Orange | 200 | 177 | 22 | 64 | 11 | 125 | 39 | 18 | 107 | 18 | 12 | 9 |
| Dubbo | 192 | 162 | 30 | 54 | 13 | 125 | 39 | 13 | 112 | 20 | 9 | 10 |
| Tweed | 165 | 149 | 15 | 43 | 8 | 114 | 31 | 19 | 95 | 15 | 8 | 8 |
| Bathurst | 119 | 109 | 10 | 41 | 10 | 68 | 26 | 10 | 58 | 15 | 6 | 5 |
| Manning | 92 | 86 | 6 | 18 | 7 | 67 | 30 | 8 | 59 | 10 | 11 | 9 |
| Tamworth | 69 | 60 | 9 | 18 | 6 | 45 | 13 | 6 | 39 | 2 | 5 | 6 |
| Grafton | 59 | 54 | 5 | 15 | 3 | 41 | 15 | 5 | 36 | 7 | 2 | 6 |
| Griffith | 57 | 53 | 4 | 12 | 5 | 40 | 9 | 5 | 35 | 5 | 1 | 3 |
| Moruya | 32 | 27 | 5 | 8 | 3 | 21 | 3 | 3 | 18 |  | 1 | 2 |
| Armidale | 25 | 22 | 3 | 6 | 1 | 18 | 5 | 1 | 17 | 2 | 2 | 1 |
| Moree | 22 | 22 | 0 | 7 | 1 | 14 | 5 | 2 | 12 |  | 4 | 1 |
| Deniliquin | 18 | 18 | 0 | 5 | 1 | 12 | 2 | 3 | 9 | 1 |  | 1 |
| SERH | 16 | 15 | 1 | 3 | 1 | 12 | 7 | 0 | 12 | 4 | 1 | 2 |
| Goulburn | 8 | 7 | 1 | 1 | 1 | 6 | 1 | 0 | 6 |  |  | 1 |
| Wagga Wagga | 8 | 7 | 1 | 5 | 0 | 3 | 1 | 1 | 2 |  | 1 |  |
| Blue Mountains | 7 | 7 | 0 |  | 2 | 5 |  | 0 | 5 |  |  |  |
| Broken Hill | 3 | 1 | 1 |  | 0 | 3 | 1 | 0 | 3 | 1 |  |  |
| Lithgow | 3 | 3 | 0 | 1 | 0 | 2 | 2 | 0 | 2 | 2 |  |  |
| Cooma | 1 | 1 | 0 | 1 |  | 0 |  | 0 | 0 |  |  |  |
| **Total** | **2333** | **2088** | **241** | **624** | **176** | **1533** | **460** | **190** | **1343** | **207** | **123** | **130** |

*Courtesy of NSW Telestroke network (Prof Butcher et al)*

# Door times

66.0

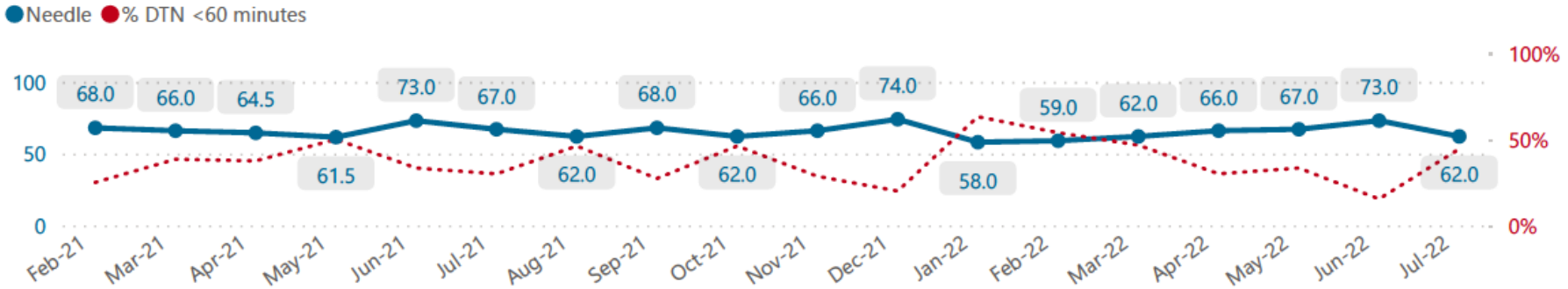
36%

**Door to needle <60 minutes all time**

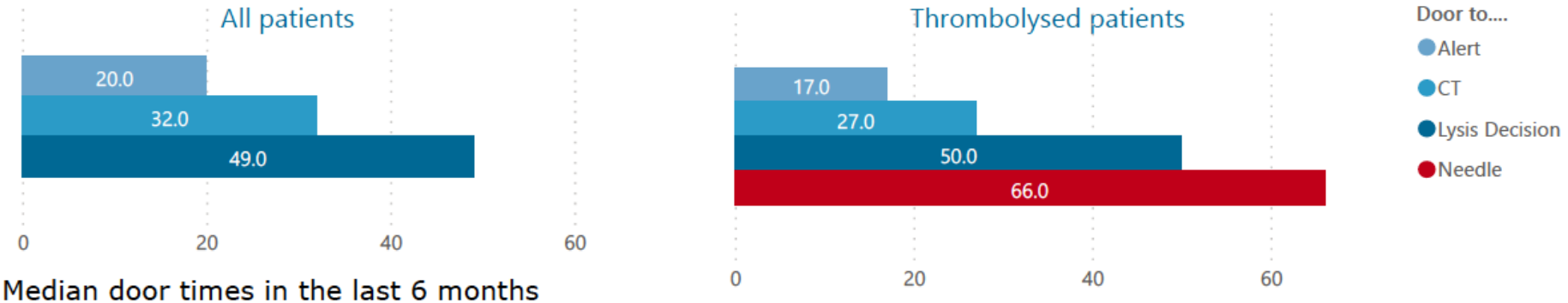
35%

**Door to needle <60 minutes in last 8 weeks**

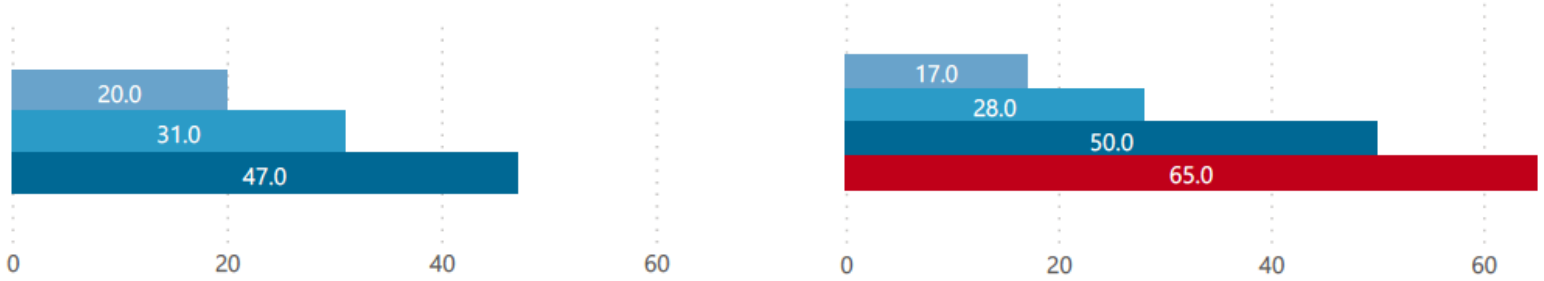
## Median door to needle time in minutes




## Median door times for all months




## Median door times in the last 6 months



## Workload

**6.9**

**Average calls per day in last 8 weeks**

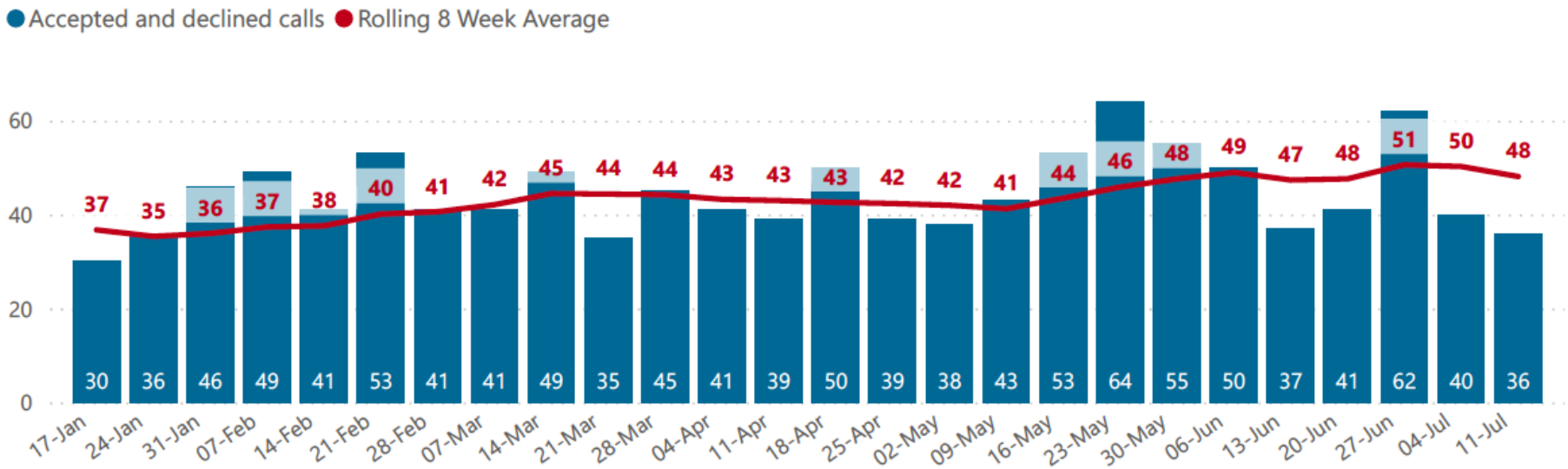
**3.8**

**Average accepted cases per day in last 8 weeks**

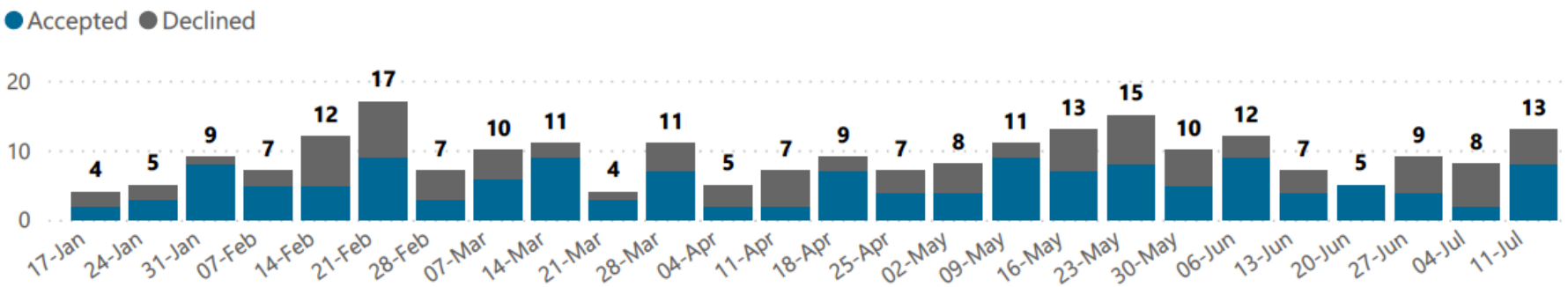
**32%**

**of all calls declined**

### Weekly call volume in last 6 months




### Overlapping calls per week



# Workload

**56**

**Median consultation duration in minutes**
(last 6 months)

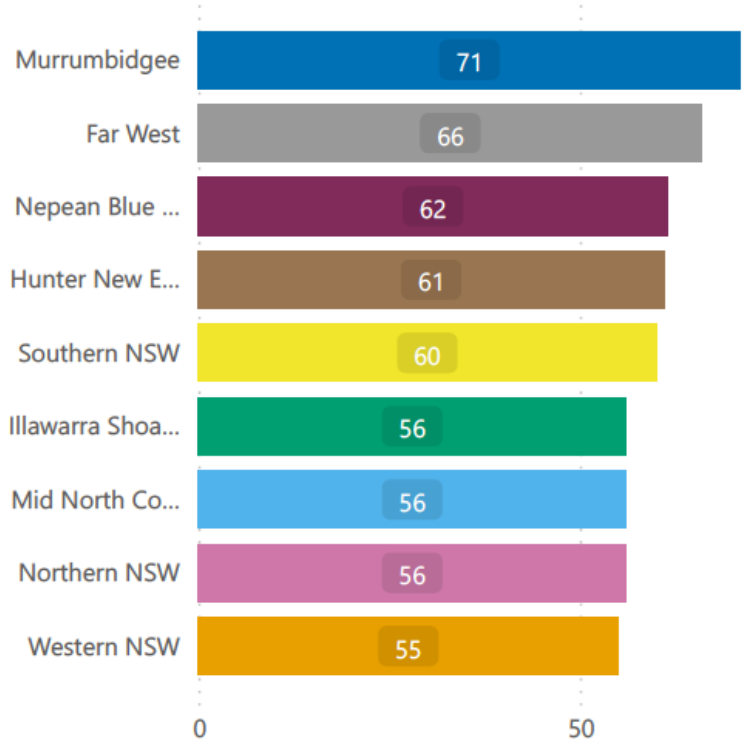
**64%**

**Calls received in core hours 8am - 6pm**
(last 6 months)

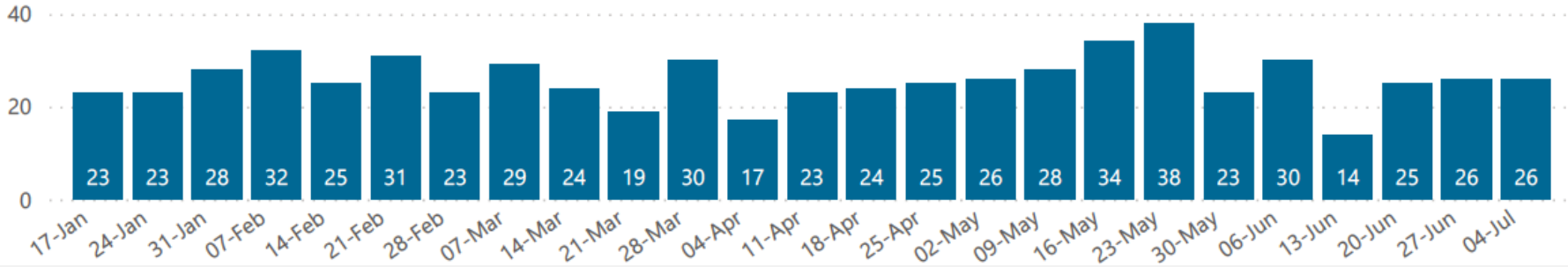
## Telestroke call pattern in last 6 months

| Call Time | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Total |
|---|---|---|---|---|---|---|---|---|
| 00:00 | 6 | 4 | 7 | 4 | 3 | 5 | 8 | 37 |
| 02:00 | 1 | 1 | 5 | 5 | 6 | 6 | 3 | 27 |
| 04:00 | 1 | 2 | 3 | 5 | 3 | 5 | 2 | 21 |
| 06:00 | 2 | 4 | 12 | 3 | 7 | 6 | 4 | 38 |
| 08:00 | 12 | 14 | 21 | 13 | 23 | 7 | 20 | 110 |
| 10:00 | 27 | 21 | 22 | 26 | 31 | 23 | 24 | 174 |
| 12:00 | 16 | 22 | 30 | 22 | 32 | 21 | 27 | 170 |
| 14:00 | 28 | 24 | 28 | 34 | 24 | 19 | 24 | 181 |
| 16:00 | 19 | 12 | 24 | 17 | 20 | 17 | 20 | 129 |
| 18:00 | 16 | 22 | 17 | 10 | 14 | 16 | 10 | 105 |
| 20:00 | 10 | 10 | 9 | 16 | 15 | 13 | 14 | 87 |
| 22:00 | 13 | 13 | 5 | 11 | 12 | 11 | 10 | 75 |
| **Total** | **151** | **149** | **183** | **166** | **190** | **149** | **166** | **1154** |

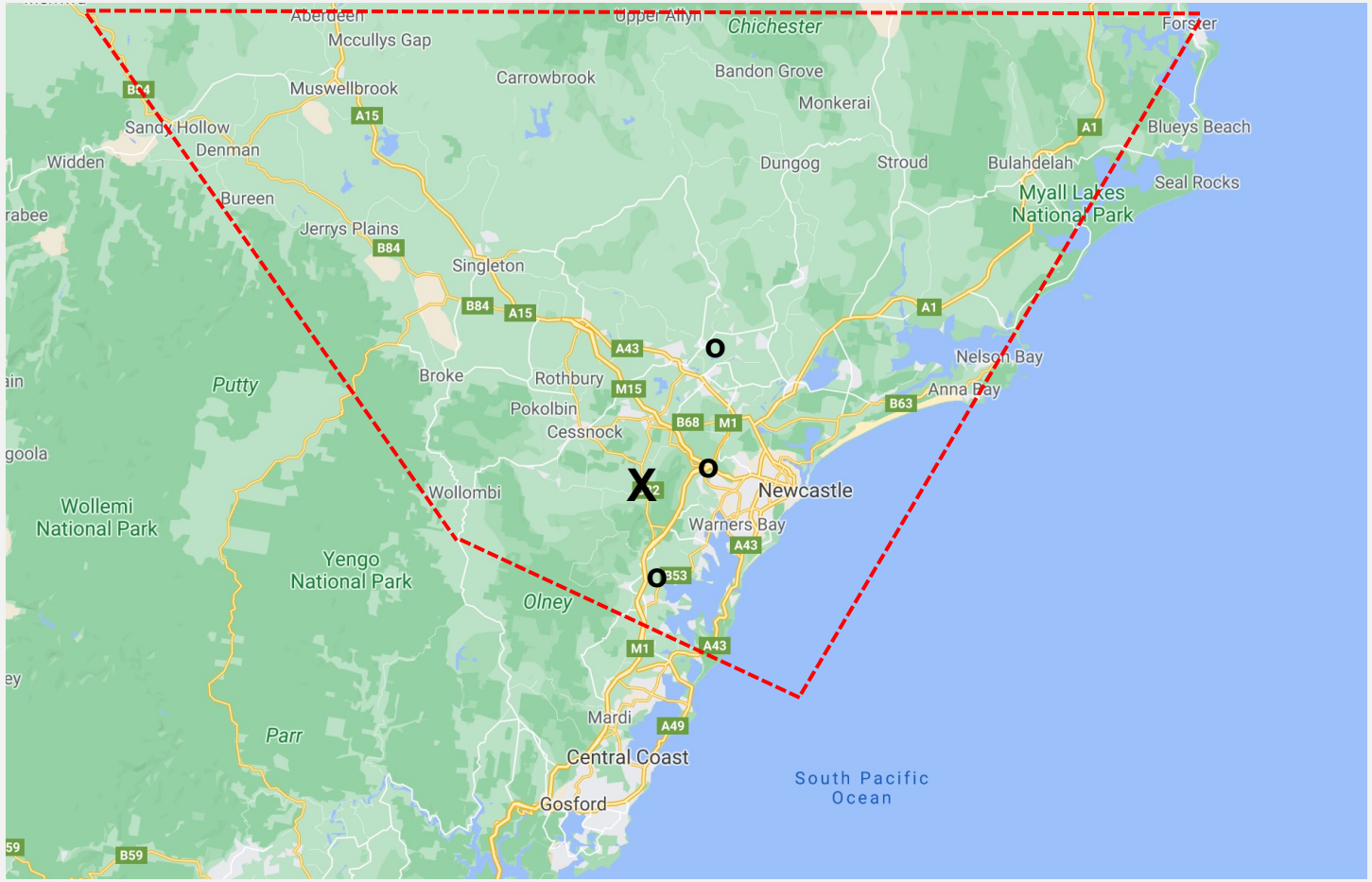
## Median consultation duration




## Total consultation hours per week in last 6 months



# NSW AMBULANCE - DIRECT NEUROLOGIST CALL

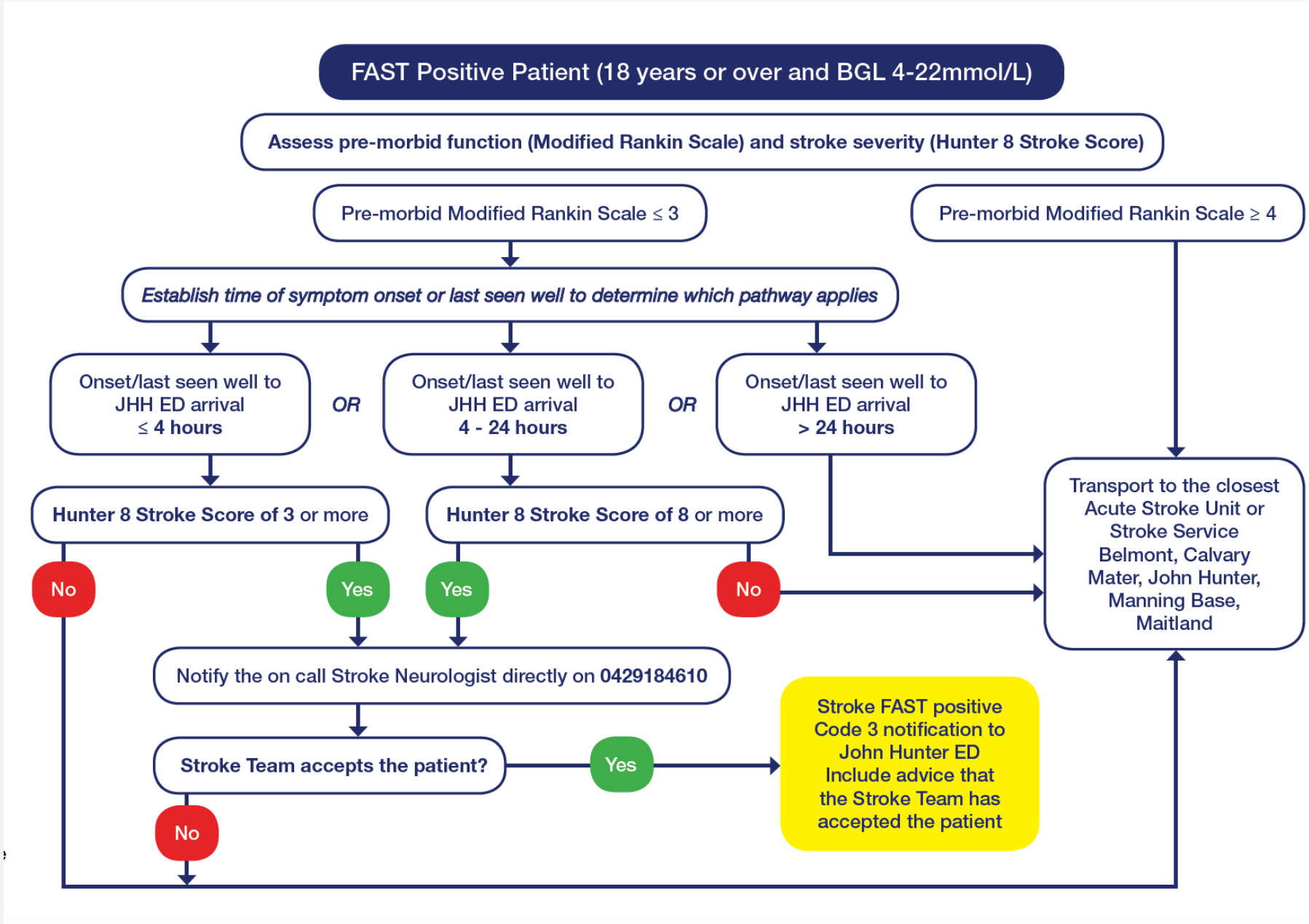


# HUNTER-8

**Hunter-8 ≥ 8**

½ patients have a large vessel occlusion (ECR candidates) or ICH

| Hunter 8 Item | Scoring Definition | Score on Scene | Score on Arrival |
|---|---|---|---|
| 1. LOC Observations | **0** Alert (A)<br>**1** Rousable to minor stimulation (V)<br>**2** Rousable only to painful stimulation (P)<br>**3** Reflex response or unrousable (U) | | |
| 2. LOC Questions<br>Ask patient's age and current month (must be exact) | **0** Both correct<br>**1** One correct or dysarthria, foreign language<br>**2** Neither correct | | |
| 3. Commands – opens/close eyes, grip and release non paretic hand then other hand (1 step commands or mimic ok) | **0** Both correct (OK if impaired by weakness)<br>**1** One correct<br>**2** Neither correct | | |
| 4. Best Gaze – test horizontal eye movements-tracking object/face | **0** Normal<br>**1** Partial gaze, abnormal gaze in 1 or both eyes<br>**2** Forced eye deviation or total paresis which cannot be overcome | | |
| 5. Facial Palsy – show teeth, close eyes tight, raise eyebrows. If stuporous, check symmetry of grimace to pain | **0** Normal<br>**1** Minor paralysis, flat nasolabial fold, asymmetrical smile<br>**2** Partial paralysis (lower face)<br>**3** Complete paralysis (upper & lower face) | | |
| 6. Motor Arm – arms outstretched 90° sitting or 45° (supine) for 10 seconds. Encourage best effort.<br>Score for Left and then right arm. | **0** No drift for 10 seconds<br>**1** Drift but does not hit bed<br>**2** Some effort against gravity but can't sustain<br>**3** No effort against gravity<br>**4** No movement at all<br>**X** Unable to assess due to amputation, fusion<br>Explain _____ | Left<br>Right | Left<br>Right |
| 7. Dysarthria – read or repeat list of words (see word list below) | **0** Normal<br>**1** Mild-mod slurred speech but intelligible<br>**2** Unintelligible or mute<br>**X** Intubated or mechanical barrier | | |
| 8. Extinction/Neglect – simultaneously touch patient on both hands or legs with their eyes closed.<br>Show fingers in both visual fields | **0** Normal none detected<br>**1** Neglect or extinction to double simultaneous stimulation in any modality (sensory, visual) OR visual/sensory loss on one side.<br>**2** Profound neglect in both visual and sensory modalities | | |
| **Total Score** | | /24 | /24 |


FAST Positive Patient (18 years or over and BGL 4-22mmol/L)
Assess pre-morbid function (Modified Rankin Scale) and stroke severity (Hunter 8 Stroke Score)
Pre-morbid Modified Rankin Scale ≤ 3
Pre-morbid Modified Rankin Scale ≥ 4
Establish time of symptom onset or last seen well to determine which pathway applies
Onset/last seen well to JHH ED arrival ≤ 4 hours
OR
Onset/last seen well to JHH ED arrival 4 - 24 hours
OR
Onset/last seen well to JHH ED arrival > 24 hours
Hunter 8 Stroke Score of 3 or more
Hunter 8 Stroke Score of 8 or more
No
Yes
Yes
No
Transport to the closest Acute Stroke Unit or Stroke Service Belmont, Calvary Mater, John Hunter, Manning Base, Maitland
Notify the on call Stroke Neurologist directly on 0429184610
Stroke Team accepts the patient?
Yes
Stroke FAST positive Code 3 notification to John Hunter ED Include advice that the Stroke Team has accepted the patient
No

# TIA / MINOR STROKE MANAGEMENT
# POST STROKE CARE

# MOST OF TIA = MINOR STROKES

*"Transient episode of neurologic dysfunction caused by focal brain, spinal cord, or retinal ischemia"*

AHA definition now includes **Absence of Infarct on Imaging**.
Clinical definition = **No** residual symptoms at 24 hours.

TIA / minor stroke = spectrum of same disease

## What brain imaging to do?

Detecting acute ischemia in NCCT after symptoms that resolve within 24 hours is low (4%)

MRI (DWI) is highly sensitive (88% sensitivity) and specific (95% specificity) for acute infarction

# URGENT TREATMENT!

- **Untreated:** high short term risk for subsequent events (7-17% 90-day risk recurrent stroke)[1].

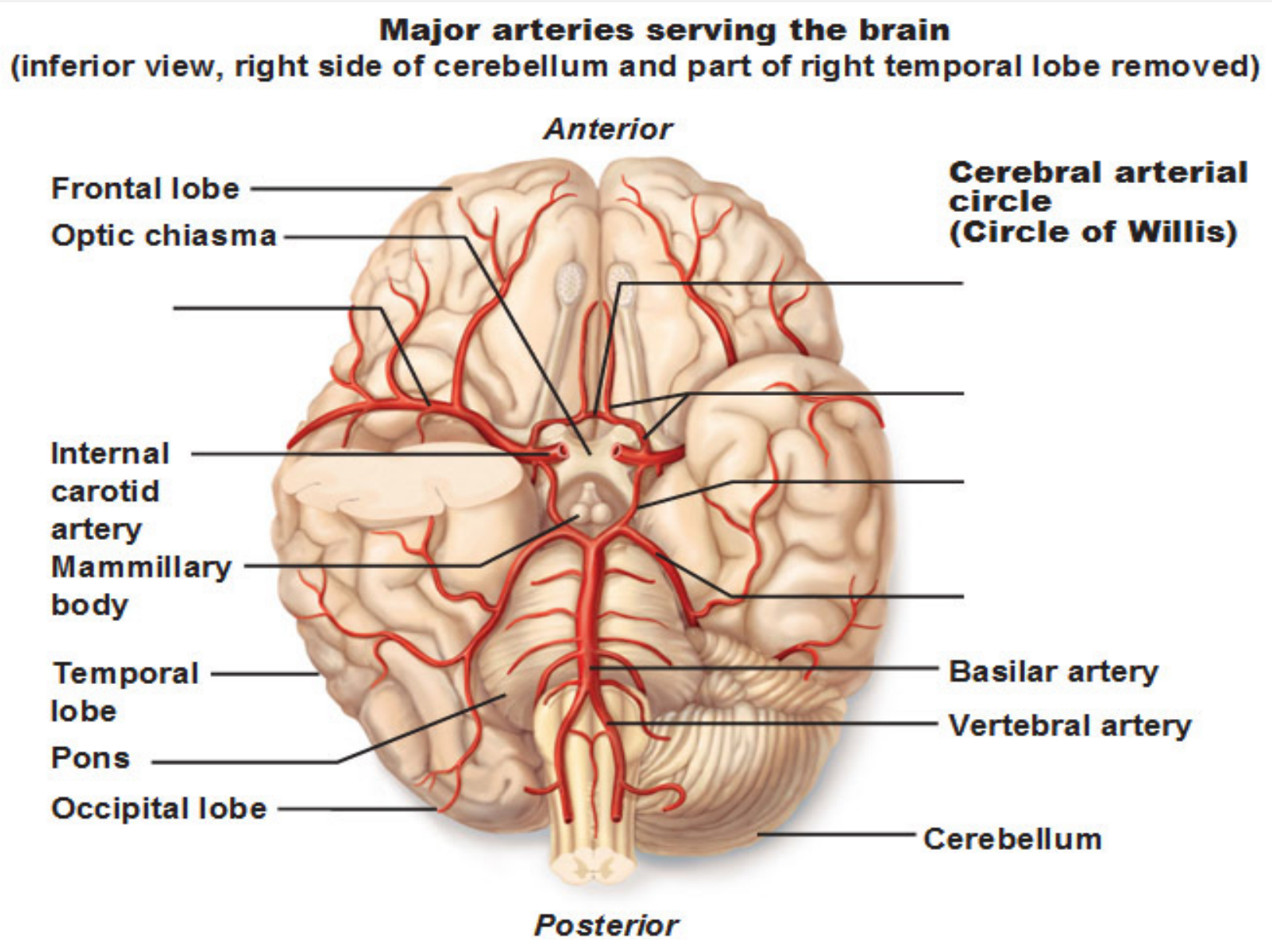
- **Treatment** – antithrombotic ± BP lowering, statin and assessment for AF and symptomatic carotid stenosis ➔ may prevent ≥ 80%.

- Early antithrombotics = majority of benefit

- **Correct Identification** is key: History (sudden onset) + Examination + Investigations

1. Rothwell et al. *Lancet* 2007

# SYMPTOMS




- **Unilateral weakness** (Face-Arm-Leg)
- **Aphasia**
- **Hemianopia**
- **Unilateral numbness** (Face/Arm/Leg)

---

- **Isolated dysarthria**
- **Numbness 1 limb**
- **Isolated dizziness**

# TIA RISK STRATIFICATION

**All symptoms are not equal:**

- Dysarthria, ataxia, confusion, vertigo → poor predictive value.
- Aphasia, hemiparesis → much stronger predictive value.

**ABCD2 scoring system – helps stratify risk – particularly in non-specialist hands.**

**Addition of Imaging (MRI) → better prediction.**

- Remains controversial – does not tell you about carotids

# EXCLUDING A STROKE

1. **It is only a TIA if the patient is completely neurologically normal:**
   - No visual field defect.
   - No sensory inattention.
   - No dysarthria.
   - No dysphasia (follows 3-step command, names low frequency words).

# TIA/STROKE MIMICS

- Looks like TIA / stroke, but it is something else
- 5% - 17% of total ED presentations

| Common mimics | |
|---|---|
| **Seizures** | |
| **Syncope** | |
| **Functional disorders** | 60% |
| **Migraine with aura** | |
| **Sepsis** | |
| Brain tumor | |
| Metabolic | |
| BPPV | |
| Drugs | |
| Bell's palsy | |
| Transient global amnesia | |

# MORE LIKELY MIMIC

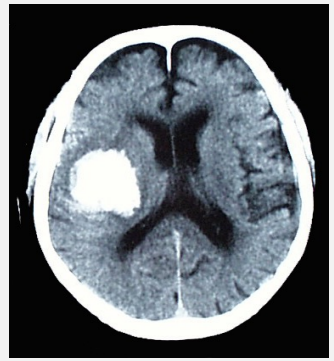
## Positive symptoms

- Indicate an excess of neuronal electrical activity

- Visual: flashing lights, zig zag shapes, lines, shapes, objects
- Motor: jerking limb movements
- Onset: Progressive

Stroke / TIA - Negative symptoms – Loss of functionality

# CLASSIFICATION AND MECHANISMS



**ISCHEMIC**
(80%)

**HEMORRHAGIC**
(20%)

**TIA/STROKE**

Subarachnoid hemorrhage

Intracerebral hemorrhage

Atherosclerotic (20%)

Cardioembolic (20%)

Lacunar (25%)

Infrequent (5%)

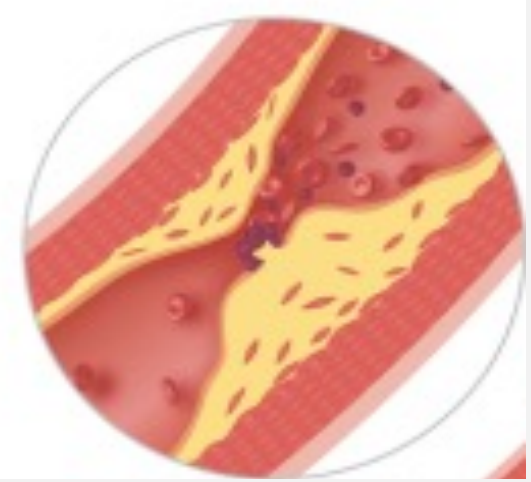
Cryptogenic (30%)

# MECHANISMS AND TESTS

# ATHEROSCLEROTIC

Atherosclerosis > 50% stenosis of relevant extra or intracranial artery

Most common location: Carotids



Carotid bifurcation on DSA

Can cause ischemic infarction due to:

- Local thrombosis / Embolism /Distal hypoperfusion

**All patients with carotid territory stroke or TIA should have extracranial vessels assessed**

Carotid US
CT Angiography / MR Angiography

# CAROTID STENOSIS

**Who to Treat?** **Controversy lessening**

- Symptomatic vessels (recent TIA in the relevant territory) 70-99% stenosis ➔ revascularise.
- Asymptomatic vessels – not as strong benefit, but evidence growing (specially in >80%).

*Not advocating screening, or carotid dopplers for everyone!*
*Vessels on the asymptomatic side detected during stroke work up may be worth treating*

**How?**

- Carotid endarterectomy. Consider stenting in young (<70 y).

**When?**

- Within 2 weeks from event greater benefit

# TIA ANTIPLATELET THERAPY

**CHANCE Trial[1] (China)** 21 days A+C:

- 5000 pts, <24h of high risk TIA or minor stroke randomised to A+C (300mg loading, then 75mg, + ASA x 21days then Clopidogrel alone to 90 d.) or Aspirin alone

- ➔ 32% relative risk reduction (3.5% ARR) of recurrent stroke at 90 days with A+C, no difference bleeding.

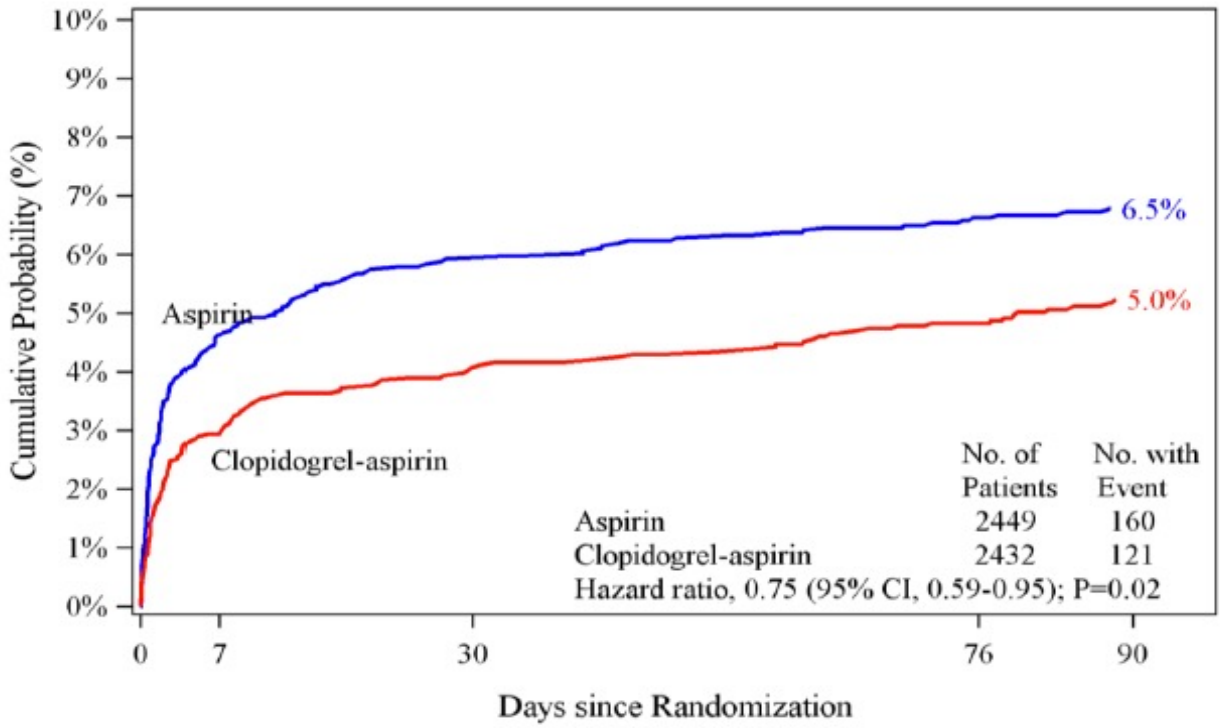
**POINT Trial (US, Europe, Newcastle, other Aust)** 90 days A+C:

- 1.5% absolute risk (30%RRR) reduction major ischemic events (most in 1st 3/52)
- 0.5% absolute risk increase of major haemorrhage (most in subsequent 9/52).

1. Wang et al. NEJM 2013
n.b. Ed. Commentary by G Hankey (Perth)
2. Johnston et al. NEJM 2018

POINT TRIAL

# Results: Major Ischemic Events

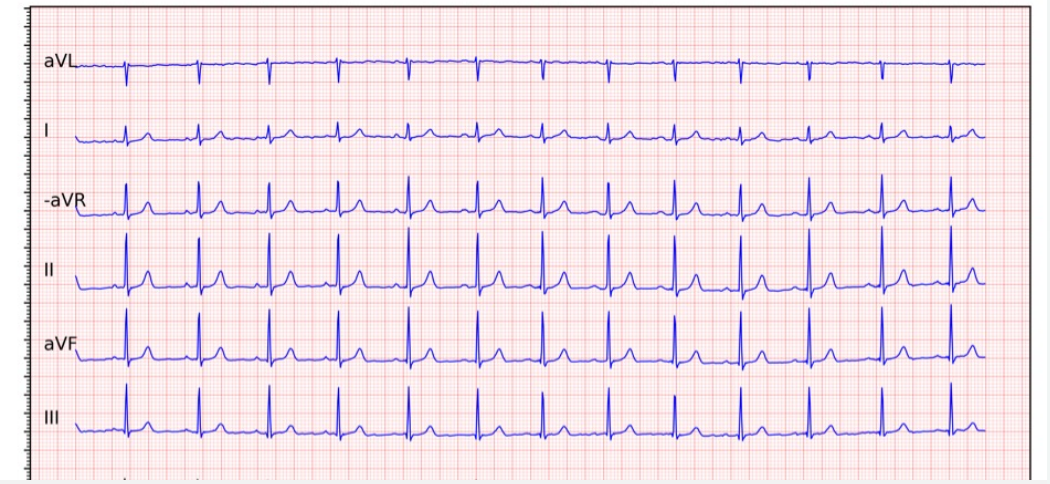



| No. at Risk | | | | | |
|---|---|---|---|---|---|
| Aspirin | 2449 | 2269 | 2153 | 2105 | 1365 |
| Clopidogrel-aspirin | 2432 | 2279 | 2179 | 2113 | 1445 |

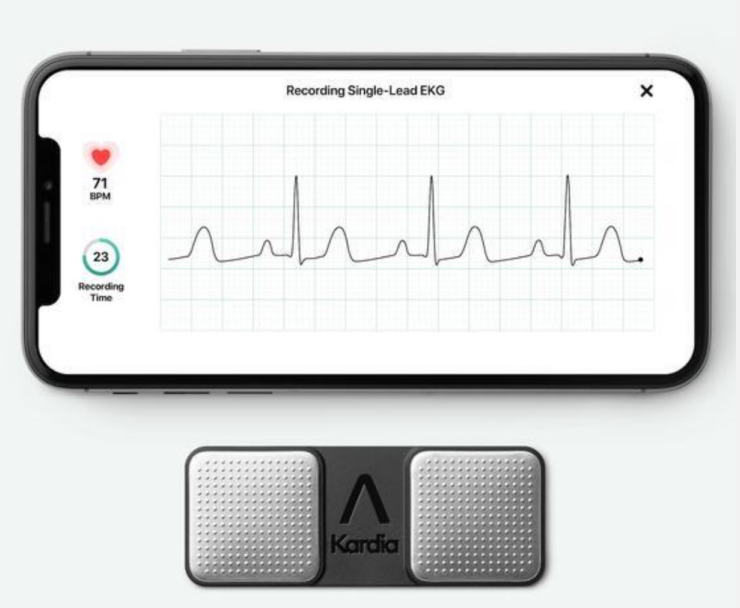
# CARDIOEMBOLIC SOURCE

## ECG – SHORT PERIOD

For high-risk stroke/TIA workup, not routine population screening




ECG / 24 h ECG telemetry




Kardia iECG (200 AUD)


Apple Watch (600 AUD)

# ECG – LONG PERIOD

30-day HeartBug


Loop recorder implant

# LACUNAR STROKE

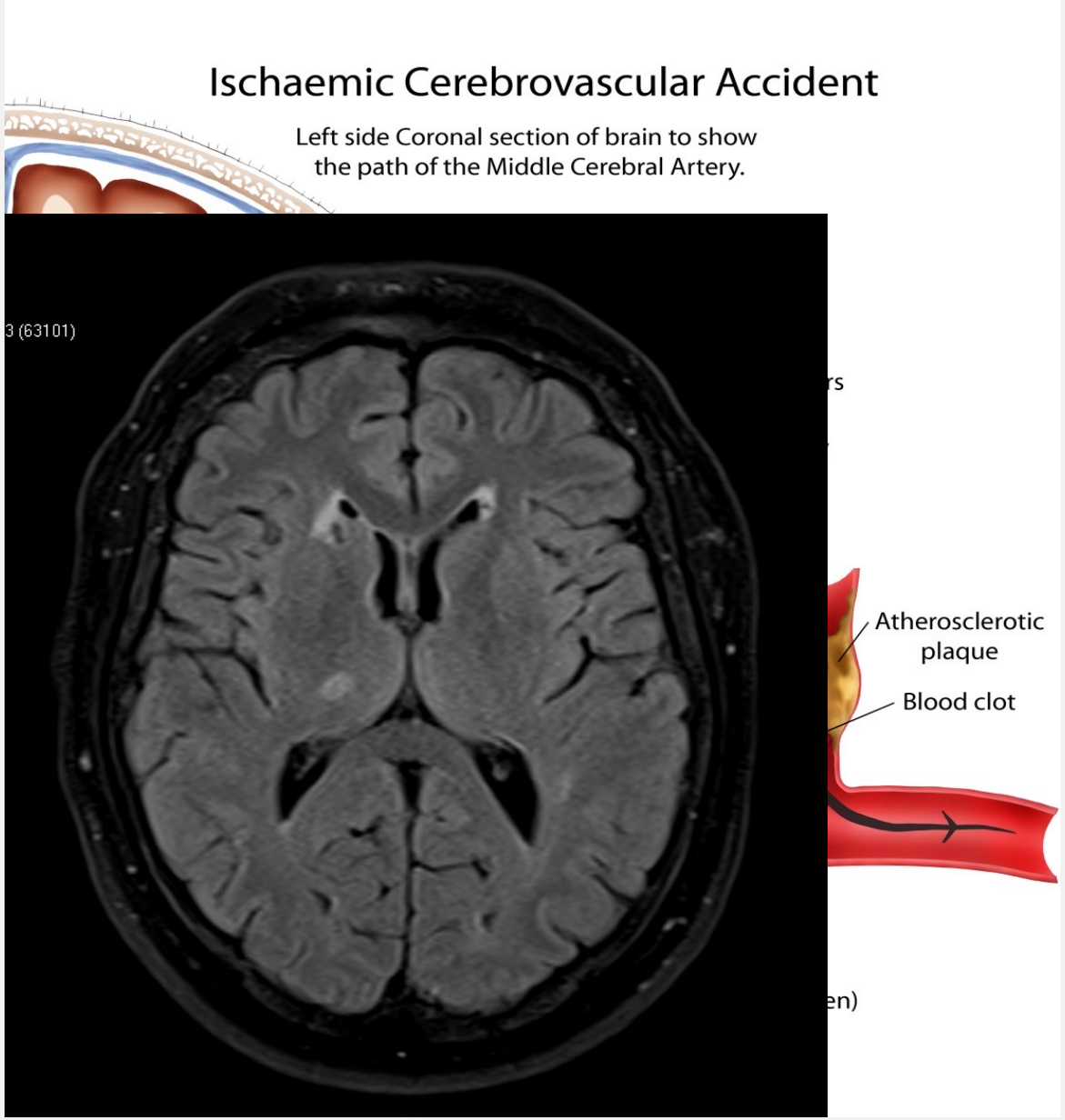
Vascular risk factors leads to hyperplasia of the wall vessel: **Lypohyalonisis**

Brainstem and basal ganglia

**Always subcortical and inferior to 15 mm.**

**Secondary to vasc risk factors**

- Smoking
- Sugar
- Hypertension
- Hypercholesterolemia




**Antiplatelet therapy + Statins + Risk factor control!**

# PFO CLOSURE / SCREENING

PFO does not cause strokes

Incidental finding: 20-25% population

**But** emboli from venous circulation can by-pass lungs and cause stroke if PFO +

PFO screen indicated in young patients (<60 y old) with possible embolic (cortical) stroke/TIA and no other clear cause of the stroke/TIA.

If patient performing a Valsalva maneuver at onset might suggest PFO mechanism

**Complementary test**

Bubble study request in TTE

TOE

Right-left shunt by transcranial doppler

# YOUNG STROKE PATIENT

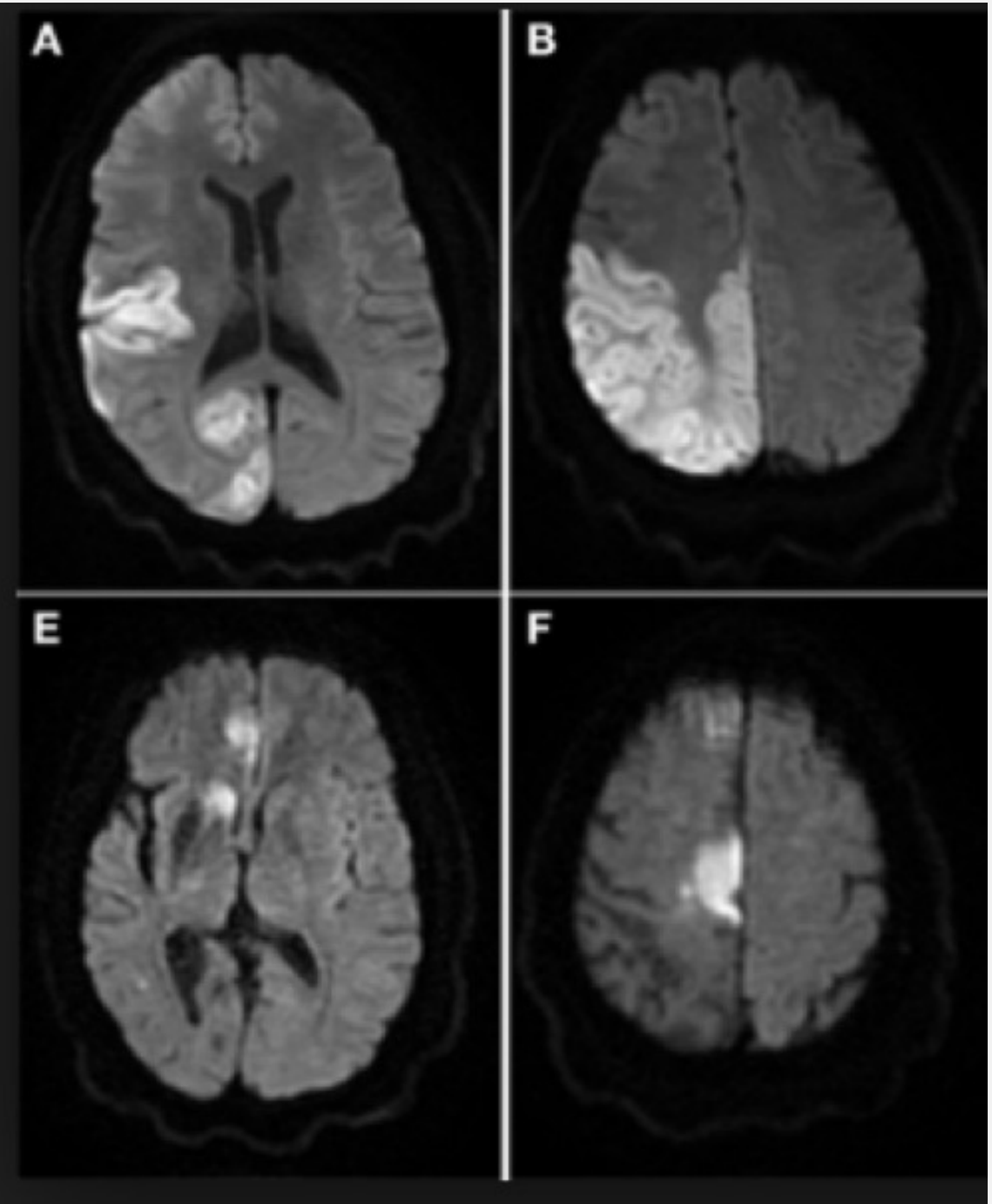
Carotid / vertebral dissection

# AF AND ANTICOAGULATION

- Paroxysmal, persistent and permanent AF have increased stroke risk.
  - (approx 3x RR on average – NVAF;  17x RR for AF + Valvular HD).

- Indications for DOAC – $CHA_2DS_2$ VASc> 1 or 2.
  - $CHA_2DS_2$ VASc 0 ➔ no Rx (ASA is not recommended NHF and other guidelines).

- Warfarin just indicated for mechanical valves, or severe mitral stenosis with AF.




# CRYPTOGENIC STROKE

3 large multicenter randomized clinical trials comparing antiplatelet versus DOAC in cortical strokes *(NAVIGATE-ESUS, RESPECT-ESUS and ATTICUS)*

Negative for secondary prevention of ischemic events
Increased haemorrhagic risk in DOAC group

Conclusion: AF needs to be captured!

# SUMMARY: TIA PATHWAY

- Exclude ICH (NCCT).

- Determine mechanism:
  - Carotid Stenosis (duplex / CTA / MRA)
  - AF? ECG +/- Holter → **Anticoagulate**
  - <60 y.o. cryptogenic => PFO? (TTE agitated saline bubble study).

- If not in AF:
  - Clopidogrel 300 mg stat, + 75 mg daily.

    +

  - Aspirin 300 mg stat + 100-150 mg daily.

  } **X 3 weeks, then single Antiplatelet and Statins**

***Referral to stroke clinic (JHH)***

# SECONDARY PREVENTION

- Dual antiplatelet-3 weeks then monotherapy, high dose Statin
- AF – Anticoagulation
- Avoid Aspirin + NOAC
- Warfarin is the past
- Don't forget the life style risk factors - smoking, alcohol

- **Driving**
- TIA - no driving 2 weeks (4 weeks for commercial licence)
- Minor stroke – not for 4 weeks (3 months for commercial)

# REFERRAL PATHWAY

- Stroke / TIA clinic (Rapid access)
- 6 sessions per week at JHH
- Referral fax: 4921 34 88 - Addressed to Prof Neil Spratt, Dr Alvin Chew or myself

- Telestroke clinic MBH (please, flag that patient is from Manning area)
  - Weekly
  - Referral to local stroke coordinator MBH (Emma McCartney, stroke coordinator) / JHH

  - Maitland stroke clinic (please, flag that patient is from Maitland area)
  - Fortnightly (since Feb 2022)
  - Referral to be sent to the JHH

**If Questions?**

In-hours stroke fellow at JHH
(8-5pm Monday – Friday)

# UNEXPLAINED LOC

44 years old female

PMH / Anxiety on SSRI

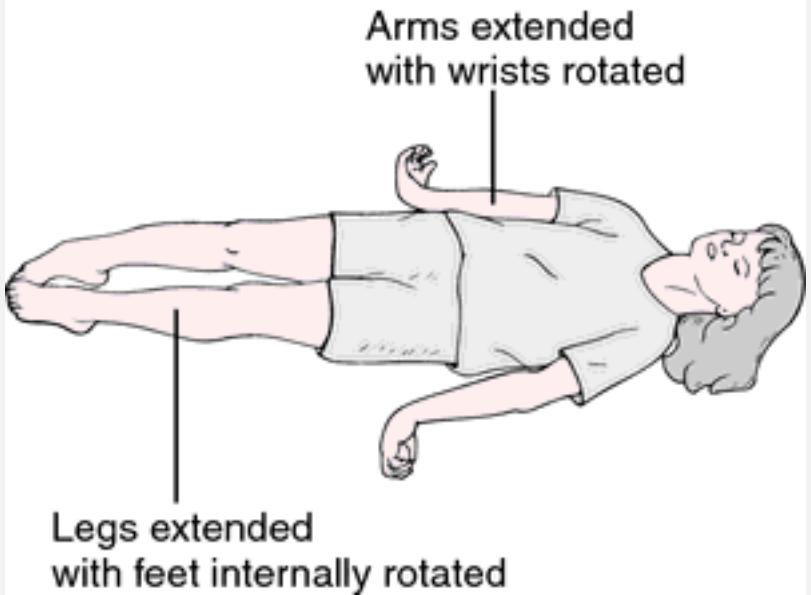
Unwell + vomiting + collapse – hit head on bathroom floor

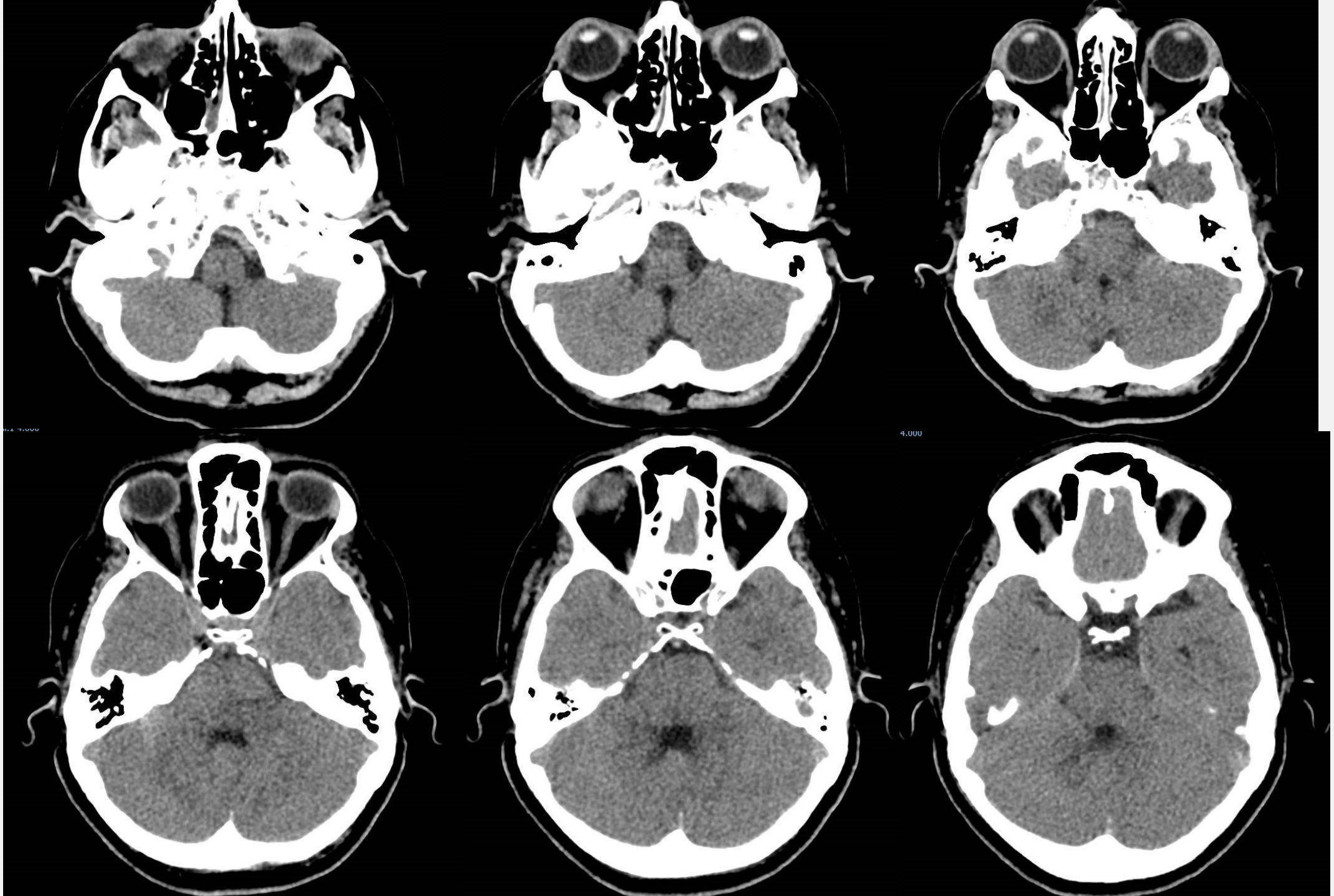
Arrival JHH (60-90 minutes since onset)

Extensor (decerebrate) posture, GCS 5 – Intubation

<u>Bloods</u>: Normal

37.2 C





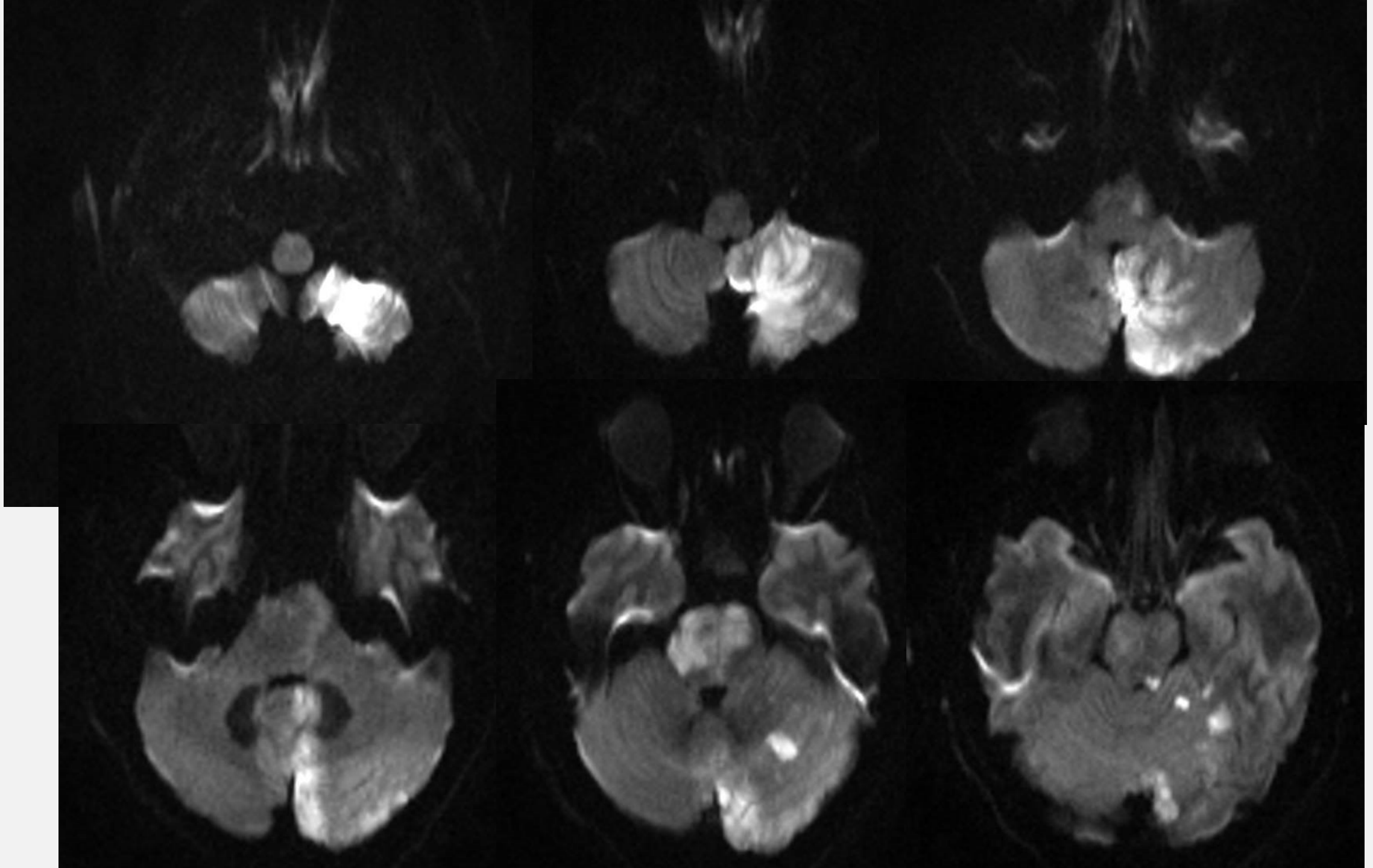
## Differential diagnosis

Meningoencephalitis / seizure / drugs?

## Admission in ICU

LP: Normal

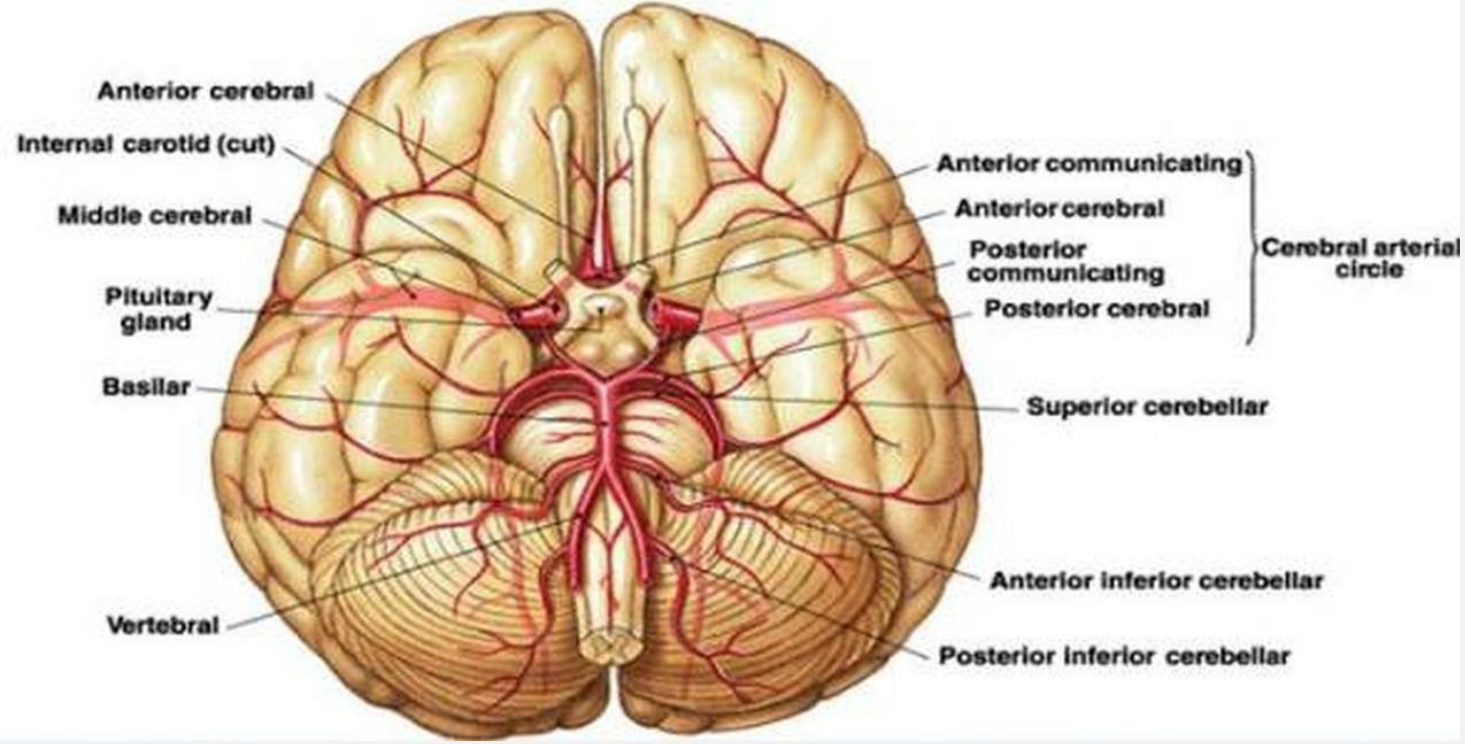
Successful extubation day after, but need to re-intubation later that day




Patient extubated 4 days since onset.

Locked-in syndrome.

Communicate with family blinking.




**Prevalence**
3-5% of ischemic strokes

**Outcome with no treatment**
70-90% mortality

**SYMPTOMS**
Motor deficits (hemi or tetraparesis) - 40-65% cases

Dysarthria (+++) - 30-60%

Vertigo, nausea, and vomiting - 55-70%

Visual disturbances (diplopia, hemianopia..) - 20-30%

Altered consciousness - 20-30%

# THANKS!

**Q?** carlos.garciaesperon@health.nsw.gov.au