TO SHIP OR NOT TO SHIP

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Stroke Director
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Objectives

- Review tPA
- ED evaluation
- Transfer decision
- Summary
- Questions

Disclosures

- None

History behind tPA

- NINDS trial: Landmark study in 1995 marked the beginning of a revolution in stroke treatment
- Funded by NIH
- Conducted at 8 medical centers around the US
- Small number of patients enrolled
- This trial led to FDA approval of Alteplase in 1996
- Met with great skepticism
- 100 mg vial costs about $8,000

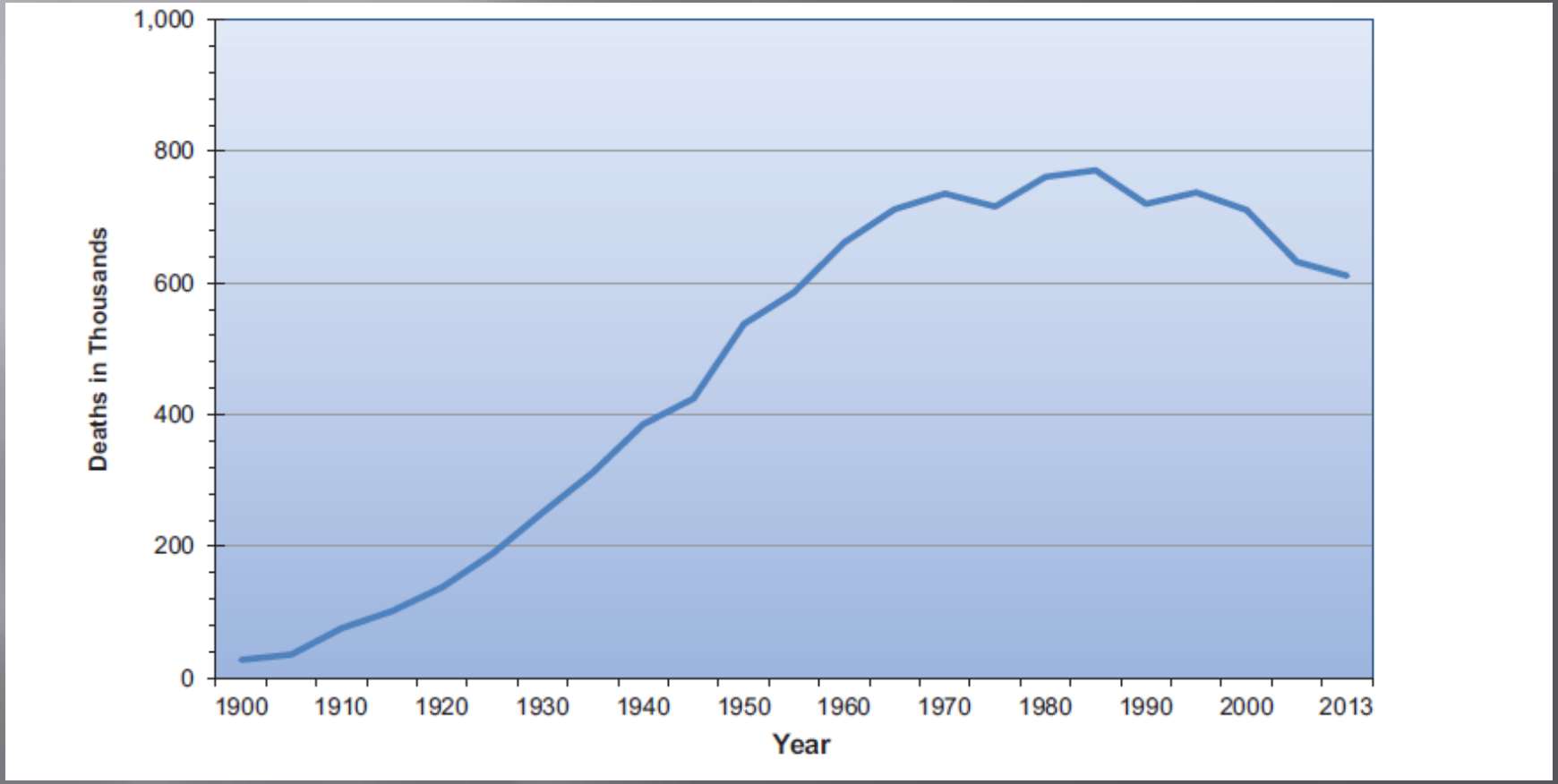
Paradigm shift

- A position statement from the American Academy of Emergency Medicine in 2002:
- *"objective evidence regarding the safety, efficacy, and applicability of tPA for acute ischemic stroke is insufficient to warrant its classification as standard of care"*
- Now widely accepted and standard of care world wide

Alteplase

- FDA prescribing information for CVA was revised in February 2015
- No new data was reviewed
- Many of the contraindications were changed to warnings or precautions

Stroke Death Rates



Alteplase

- Labeled indications:
  - Ischemic stroke < 3 hours
  - STEMI
  - Massive pulmonary embolism

Alteplase

- Off label indications:
  - Ischemic stroke in the 3-4.5 hour window
  - Sub-massive PE
  - Frostbite
  - Arterial/venous occlusion
  - Prosthetic valve thrombosis
  - Para pneumonic effusions

Alteplase

- General contraindications per FDA
  - Active internal bleeding
  - Recent intracranial/spinal surgery or head trauma
  - Severe uncontrolled HTN >185/110
  - Bleeding diathesis
    - Thrombocytopenia

Stroke Severity

- Prior version of FDA label did not recommend tPA for minor deficits
- Also listed severe deficits (NIH>22) as increased risk
- New label in 2015 removed both of these warnings

tPA: Rapidly improving sx

- IV tPA is reasonable for patients with moderate to severe ischemic stroke and early improvement but remain impaired and potentially disabled in the judgment of the examiner
- Because benefit is time dependent, delaying treatment in order to monitor for further improvement is not recommended

Reasons for tPA delay

- Most common is delay in presentation
  - <1/3 of eligible strokes arrive within 3 hours
  - Lack of recognition by patient or family
  - Slow adoption of treatment algorithms
  - Complexity of large system changes needed at the hospital or EMS level

"TIME IS BRAIN"

- The most important factor in successful thrombolytic therapy for acute ischemic stroke is early treatment.
- 32,000 brain cells lost per second during stroke
- This is why it's paramount for the patient to be taken to the nearest tPA ready hospital

ED Targets

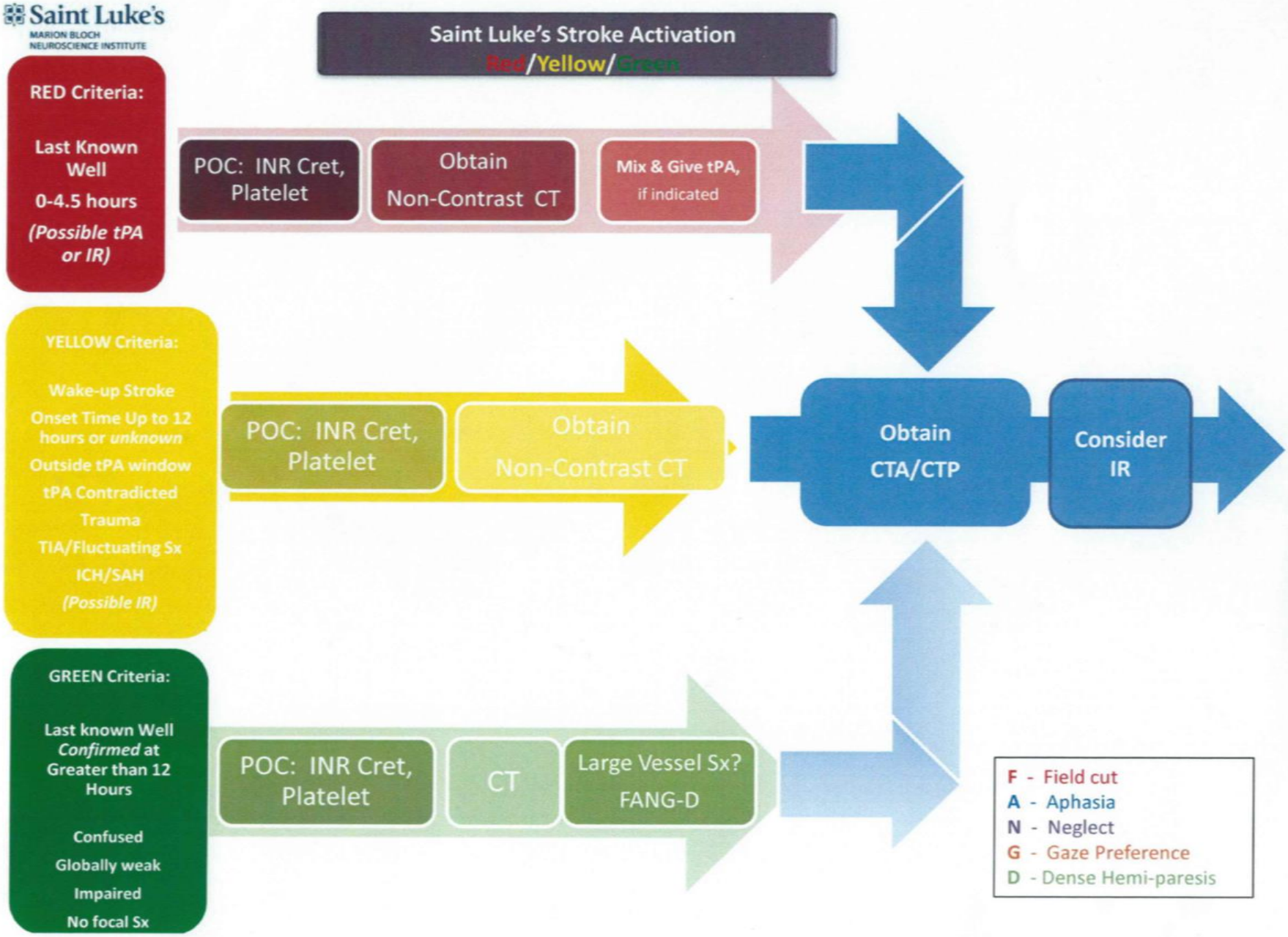
- Door to physician < 10 minutes
- Door to stroke team < 15 minutes
- Door to CT < 25 minutes
- Door to CT result < 45 minutes
- DTN < 60 minutes
- Door to stroke unit admission < 3 hours
- Door to transfer < 90 minutes

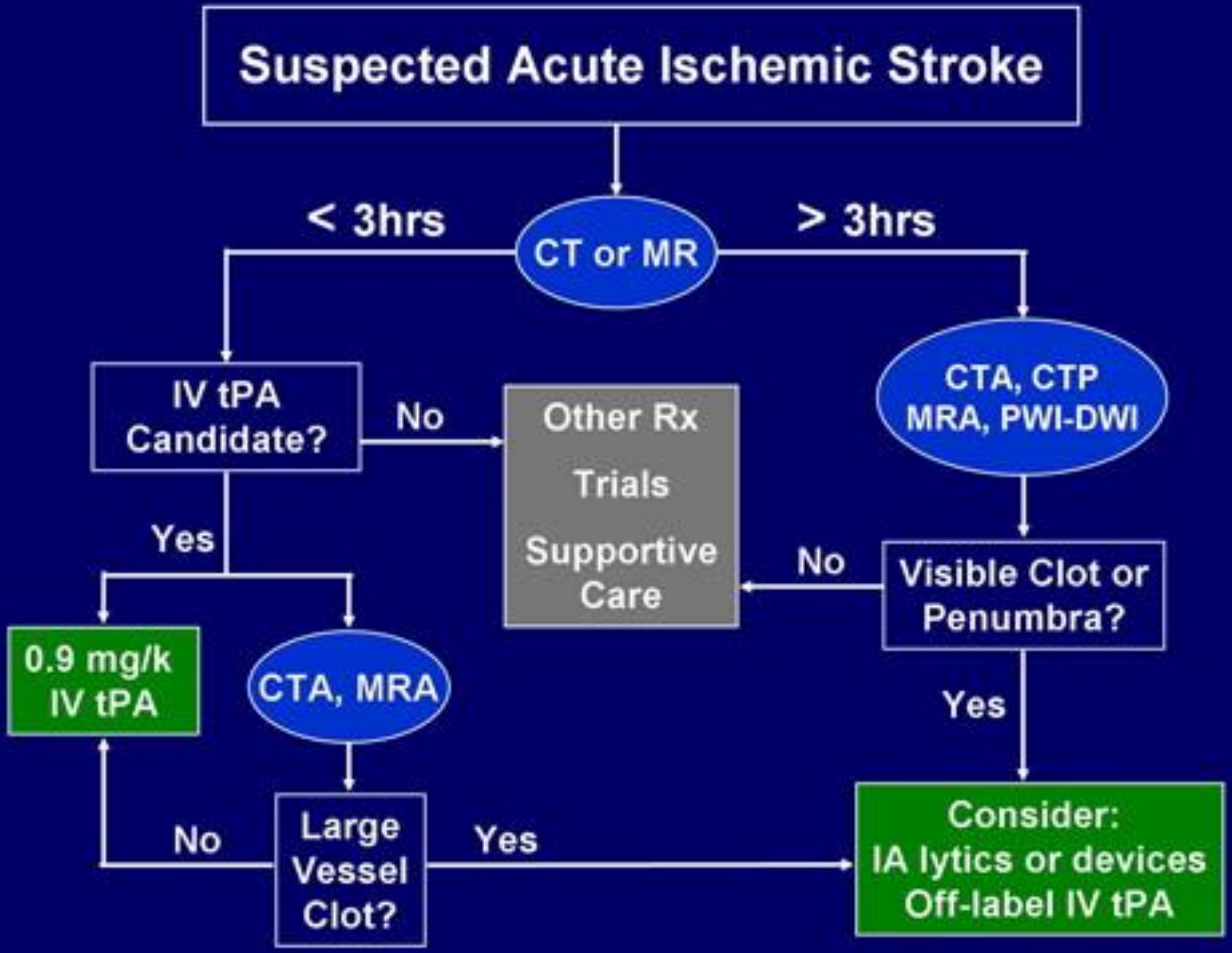
ED Targets

- DTN ≤ 45 minutes?
  - Requires a robust stroke process with strict adherence to pre-set protocols
- DTN ≤ 30 minutes?
  - Requires experienced staff

Code Stroke Protocols

- A process that allows the rapid evaluation and treatment of acute stroke patients
- Team approach involving multiple staff and departments


Saint Luke's
MARION BLOCH NEUROSCIENCE INSTITUTE
Saint Luke's Stroke Activation
Red/Yellow/Green
RED Criteria:
Last Known Well
0-4.5 hours
(Possible tPA or IR)
POC: INR Cret, Platelet
Obtain Non-Contrast CT
Mix & Give tPA, if indicated
YELLOW Criteria:
Wake-up Stroke
Onset Time Up to 12 hours or unknown
Outside tPA window
tPA Contradicted
Trauma
TIA/Fluctuating Sx
ICH/SAH
(Possible IR)
POC: INR Cret, Platelet
Obtain Non-Contrast CT
Obtain CTA/CTP
Consider IR
GREEN Criteria:
Last known Well Confirmed at Greater than 12 Hours
Confused
Globally weak
Impaired
No focal Sx
POC: INR Cret, Platelet
CT
Large Vessel Sx? FANG-D
F - Field cut
A - Aphasia
N - Neglect
G - Gaze Preference
D - Dense Hemi-paresis


Suspected Acute Ischemic Stroke
< 3hrs
CT or MR
> 3hrs
IV tPA Candidate?
No
Other Rx
Trials
Supportive Care
CTA, CTP MRA, PWI-DWI
Yes
No
Visible Clot or Penumbra?
0.9 mg/k IV tPA
CTA, MRA
Yes
No
Large Vessel Clot?
Yes
Consider:
IA lytics or devices
Off-label IV tPA

Code Stroke Team

Emergency Room
- ED RN
- Critical Resource Nurse
- Patient Care Technician
- Lab
- ED Physician→ Neurologist
- CT technician
- Radiologist
- Pastor
- House supervisor
- Program manager

Code Stroke

- Blood is labeled with a special color tag to help ensure lab recognizes the priority
- Multi-departmental alert to allow the CT techs to prepare the scanner
- Radiologist aware of incoming study
- Mobilizes additional staff (critical resource nurse) to assist with care

Code Stroke

- Triage
  - Chief Complaint
  - Symptom onset (Last known well)
  - Vital signs
  - Glucose POC, iSTAT INR, Cr
- Patient is taken directly to CT scanner
- After CT scan the pt is taken to their ED room to complete workup

Prehospital Activation

- Code Stroke can be activated by EMS
- Patient goes directly to CT
- Prehospital blood can be sent to lab

Imaging Modalities

- Non-contrast CT
- CT angio
- CT perfusion
- MRI
  - Rapid MRI protocol

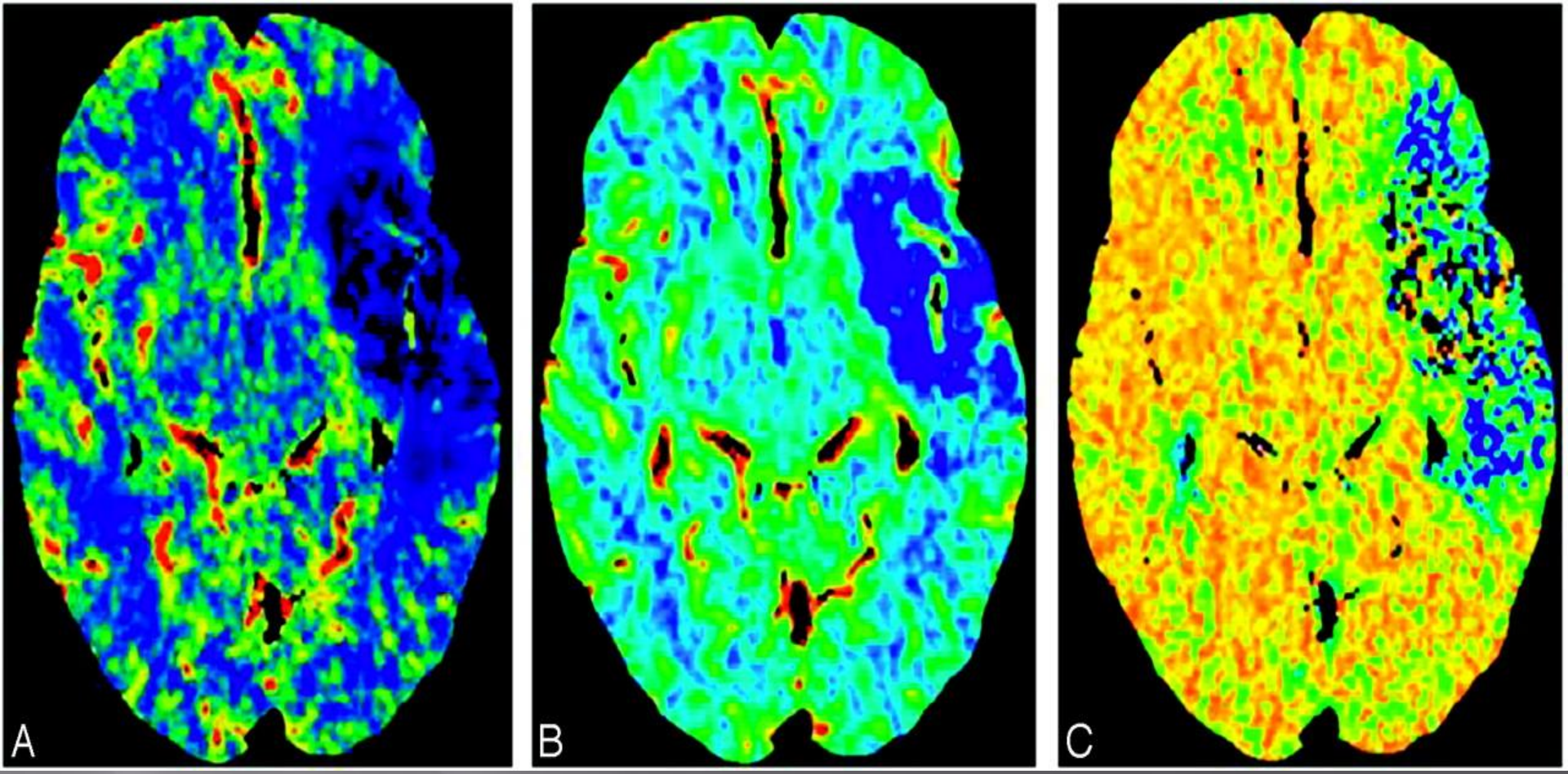
Non-contrast CT

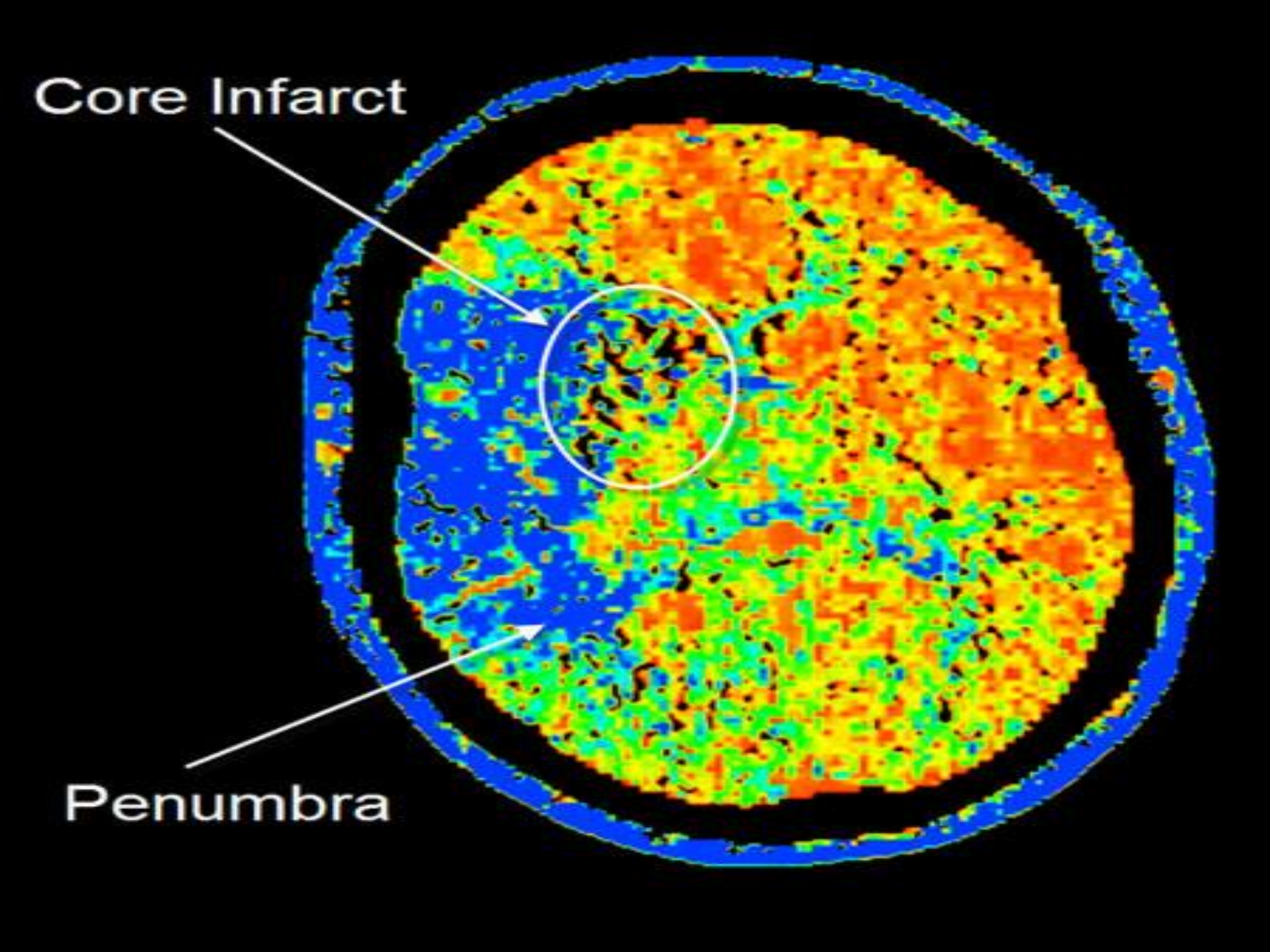
- Rapid
- The goals of CT in the acute setting are:
  - exclude intracranial hemorrhage, which would preclude thrombolysis
  - look for any features of ischemia/ infarction
  - exclude other intracranial pathologies that may mimic a stroke, such as tumor

CT perfusion

- Computed tomography (**CT) perfusion imaging shows which areas of the brain are supplied or perfused adequately with blood and provides detailed information on delivery of blood or blood flow to the brain.**
- For patients presenting beyond the tPA-approved time window (3 or 4.5 hours), perfusion is also added to assess penumbra and collateral circulation

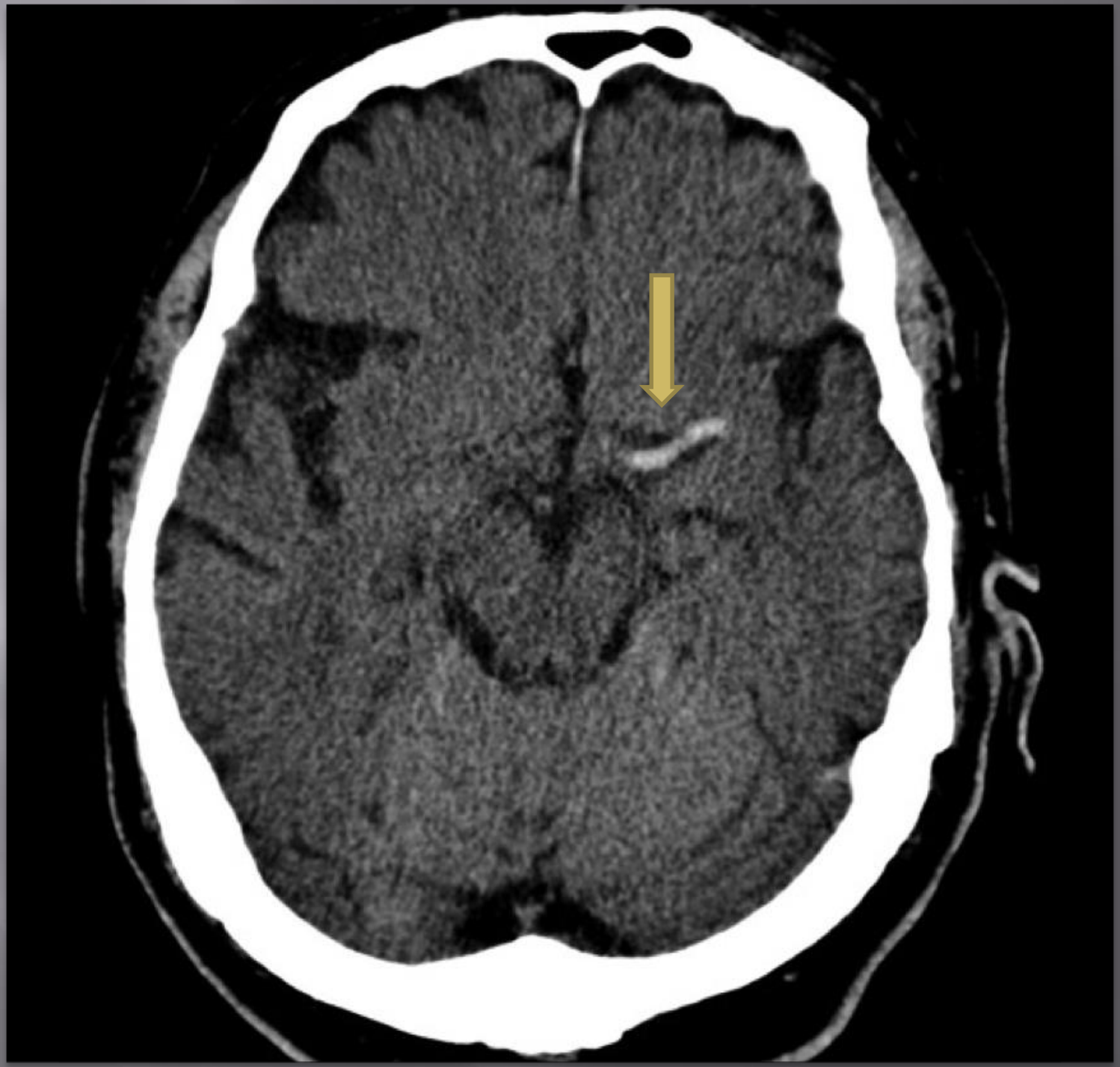

Dead
Tissue
Penumbra

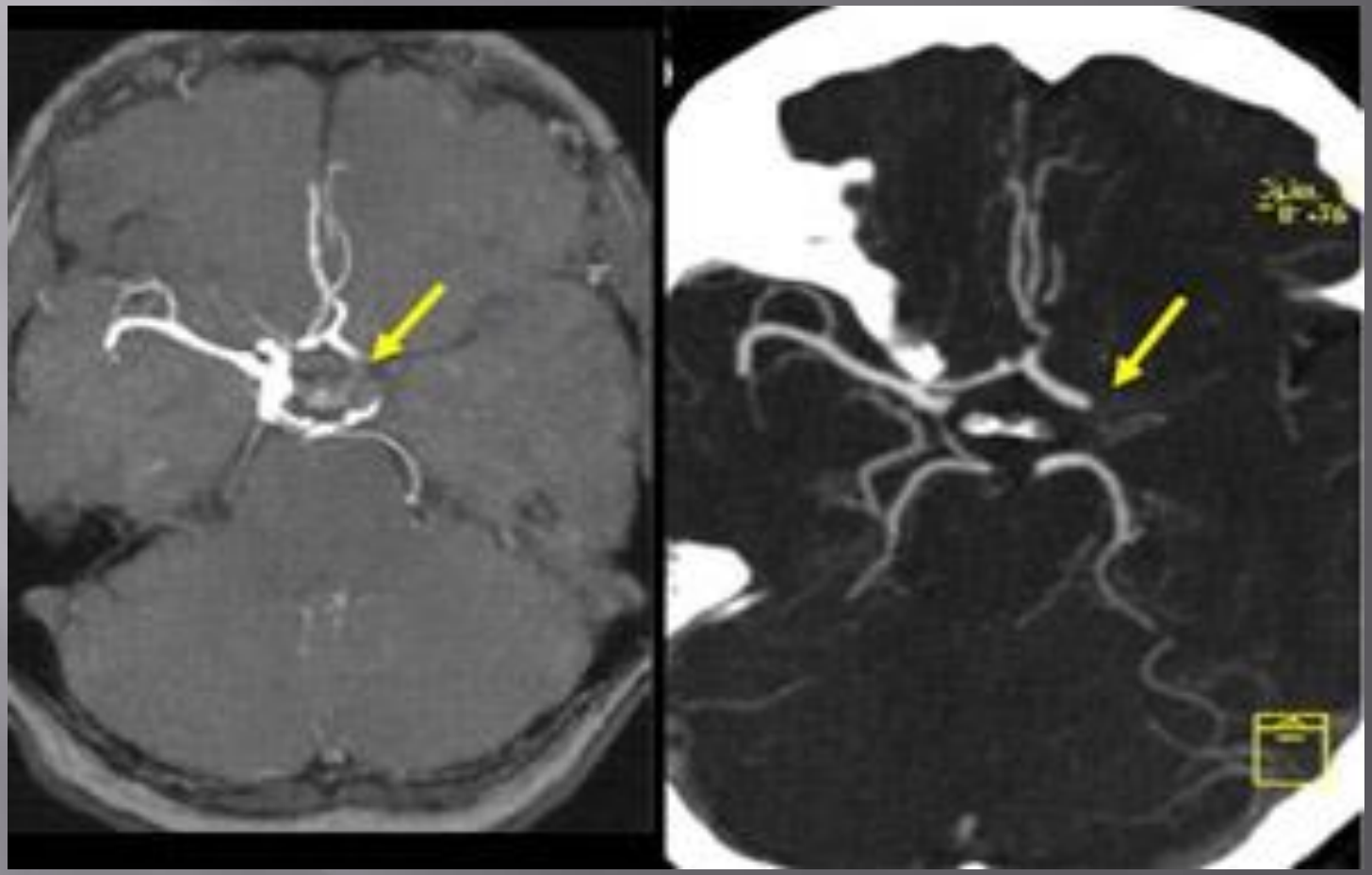

A
B
C


Core Infarct
Penumbra

CT Angio Head

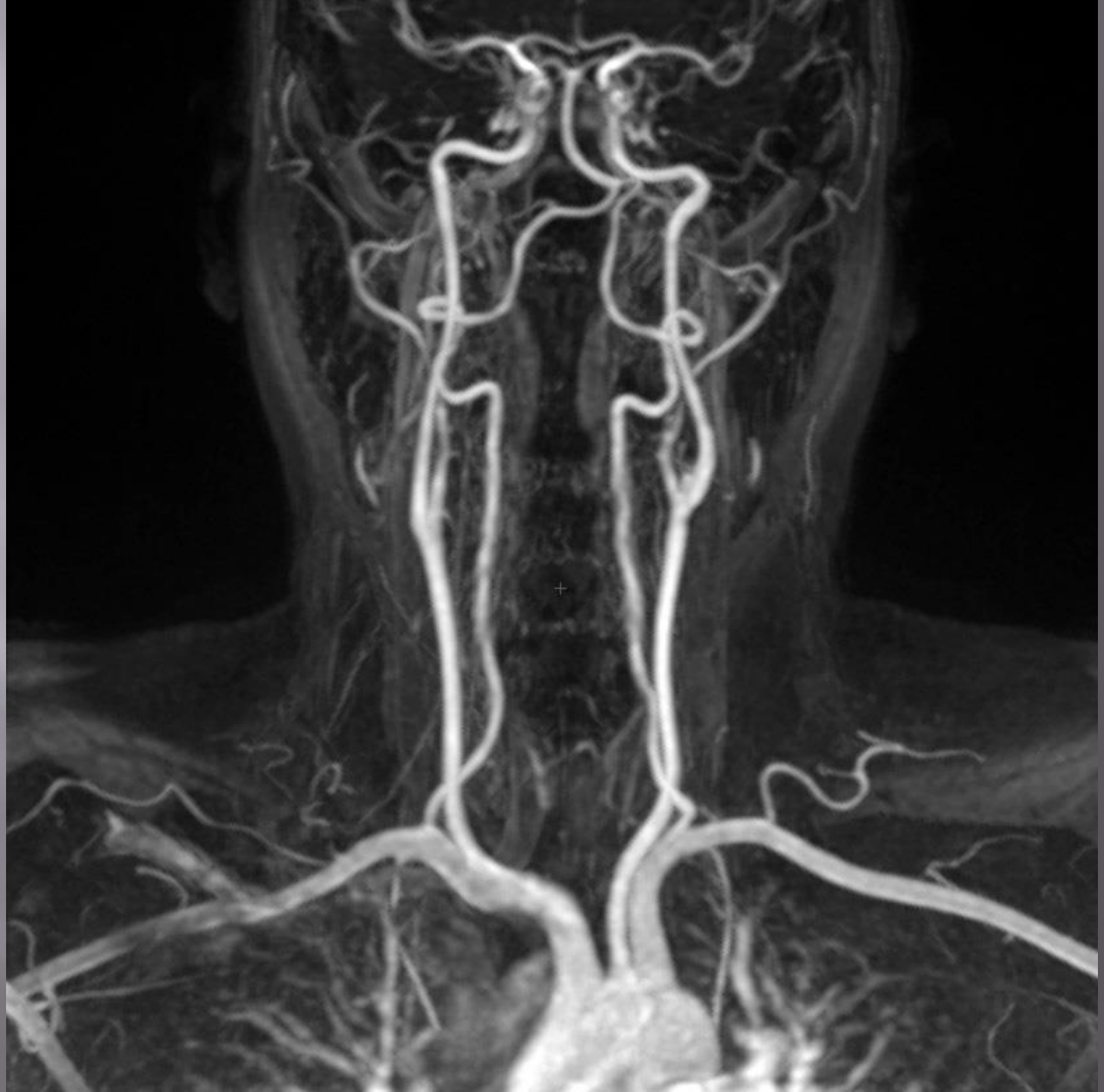
- Indications:
  - Stroke
  - Dense MCA sign
  - Aneurysm
  - Dissection
  - Stenosis
  - Ateriovenous malformation (AVM)

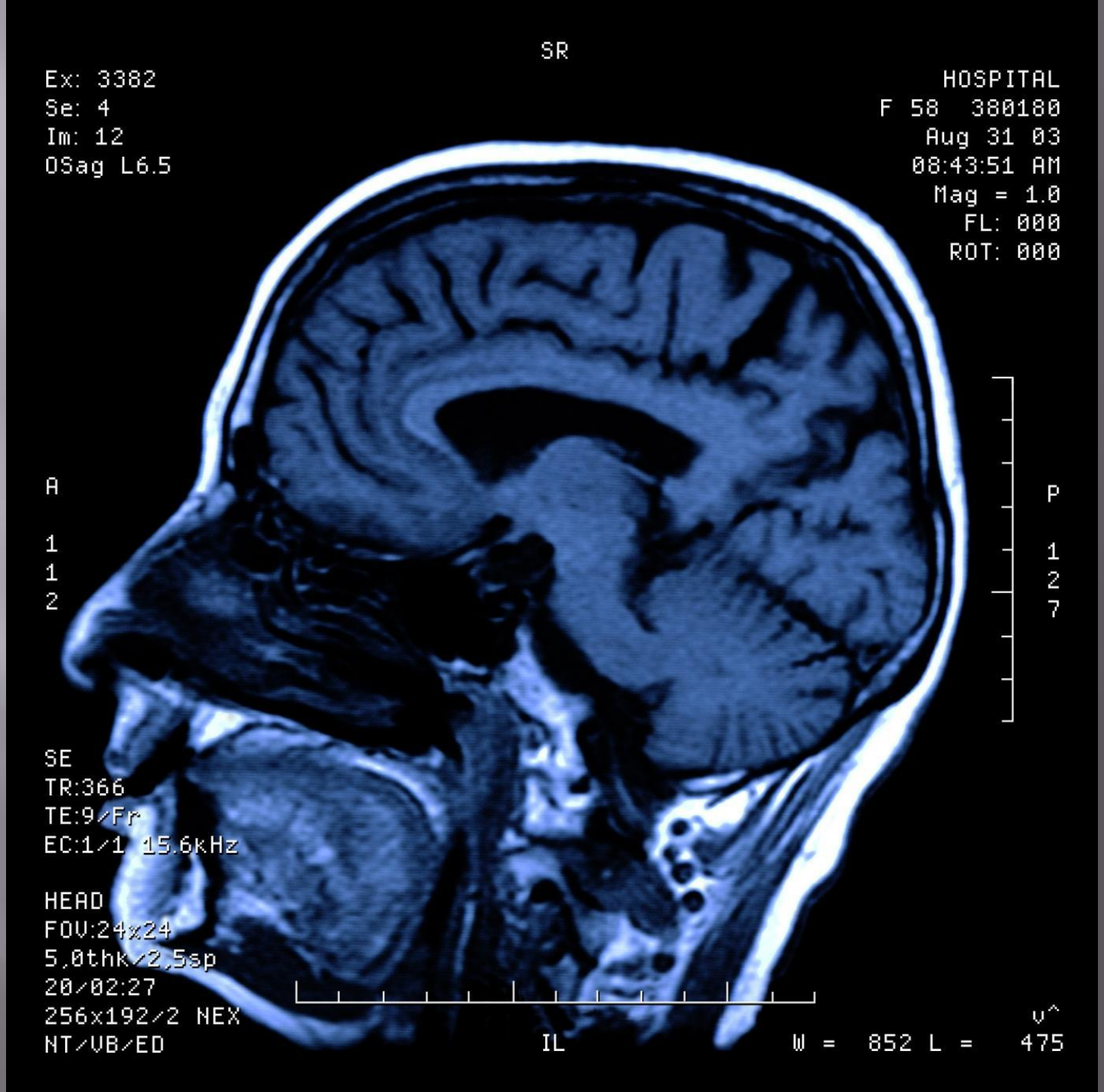




CT Angio Neck

- Indications
  - Stroke
  - Carotid stenosis
  - Dissection
  - Tumor

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HEAD
FOV:24x24
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256x192/2 NEX
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IL
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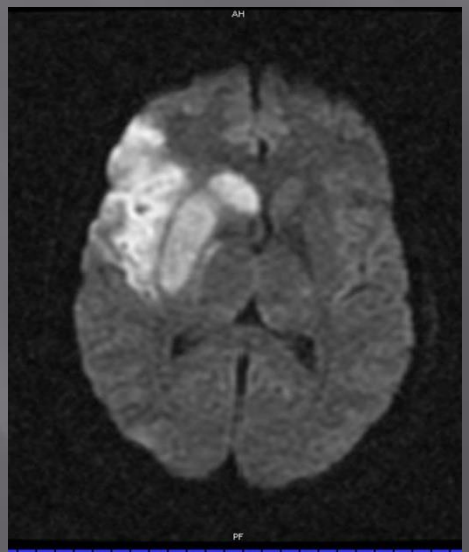
MRI

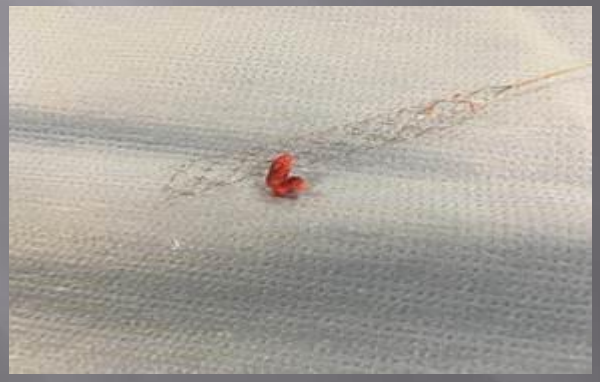
- Increased sensitivity and specificity
- Increased imaging and interpretation times
- DWI
  - Diffusion weight imaging can detect extracellular water movement into the intracellular environment during ischemia, accompanied by swelling of cells and narrowing of the extracellular spaces.

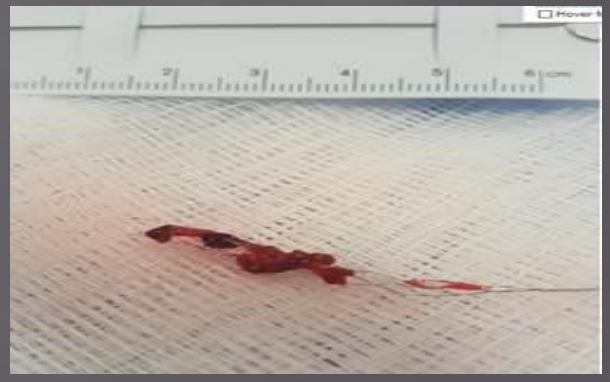


TRANSFER?

Large Vessel Occlusion

- These strokes are more severe and disabling
- Key to treatment is endovascular therapy
  - Intra-arterial tPA
  - Clot retrieval devices
- IV tPA is indicated prior to transfer
- Transfer to a Comprehensive Stroke Center





Large Vessel Symptoms

- F - Field cut
- A - Aphasia
- N - Neglect
- G - Gaze Preference
- D - Dense Hemi-paresis

Wake up Stroke

- Time of onset unknown
- 20% of CVA's
- Majority of these patients are excluded from IV reperfusion therapy and IA thrombectomy
- No treatment options?

Wake up Stroke

- Paradigm Shift:
  - Originally treated with routine medical management
  - Penumbral imaging
- Likely to benefit:
  - Small core
  - Large penumbra
- Unlikely to benefit
  - Large core
  - Small penumbra

When to consider transfer

- Any hemorrhage
- Wake up stroke
- Failure of tPA
- Dense MCA sign
- Large vessel occlusion

Stroke Mimics

- Psychogenic
- Seizures
- Hypoglycemia
- Complex migraine
- Hypertensive encephalopathy
- Wernike's encephalopathy
- CNS infections
- CNS tumor
- Drug toxicity

Stroke Mimics

- Account for up to 25% of stroke activations
- Common characteristics
  - Younger age
  - Lower NIH
  - Prior psychiatric history
  - Lack of risk factors

Conclusion

- Remember "time lost is brain lost"
- tPA window is only 3-4.5 hours
- Interventional therapy window varies on severity and expertise level of staff

Conclusion

- Advances in the last 20 years along with the designation and regionalization of stroke centers, along with protocols and national initiatives, have all resulted in improved recognition and treatment of stroke patients

Conclusion

- Key for rapid DTN time
  - Have protocol in place
  - Educate staff
  - Educate and share data with EMS
  - Pre-hospital activation goes directly to CT
  - Walk in strokes go from triage to CT
  - POC labs
  - ED physician decides if tPA is given
  - ***PASSION***

Conclusion

- Future research will focus on better imaging and interventional techniques

Questions?