



ELVO update

Michael Wilder, MD

Director, Neurointerventional Program

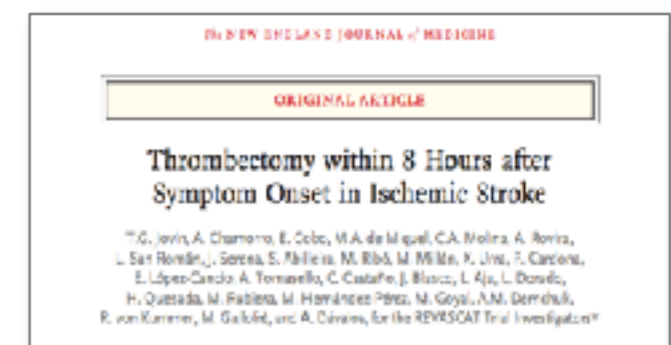
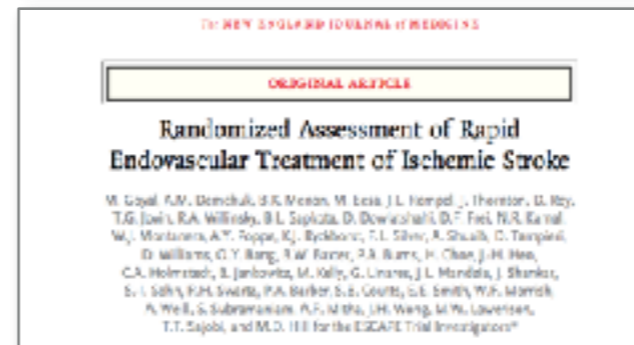
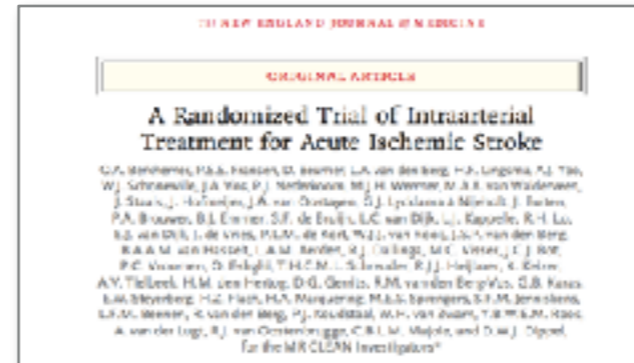
PeaceHealth Sacred Heart

Springfield, Oregon

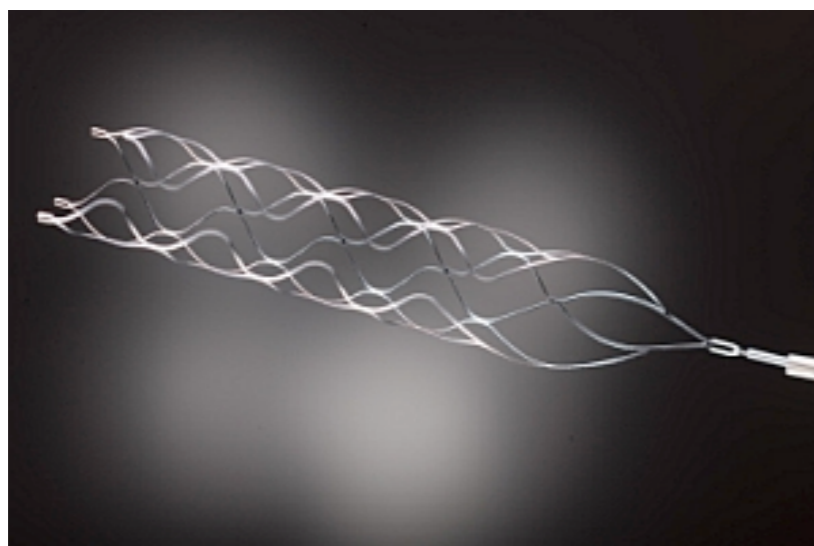
Riverbend

- 24/7 thrombectomy
- ELVO alert
- Access PH
- PACU
- Anesthesia

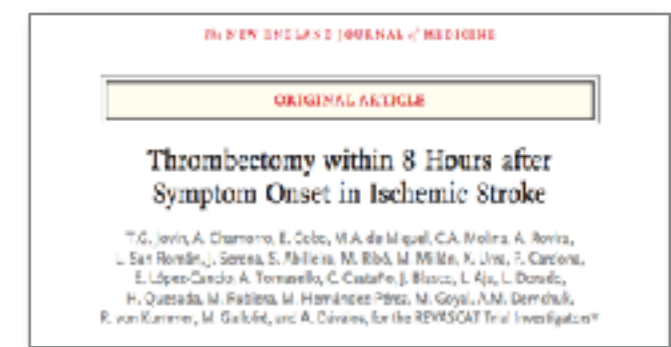
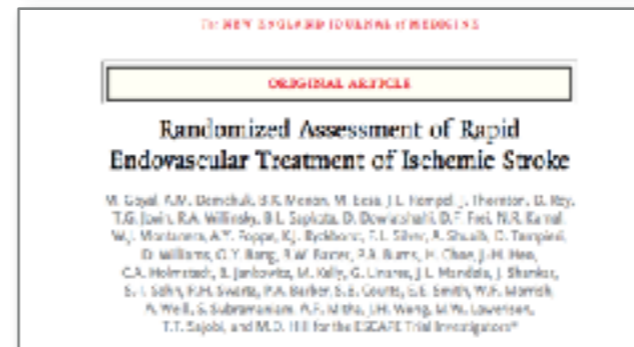
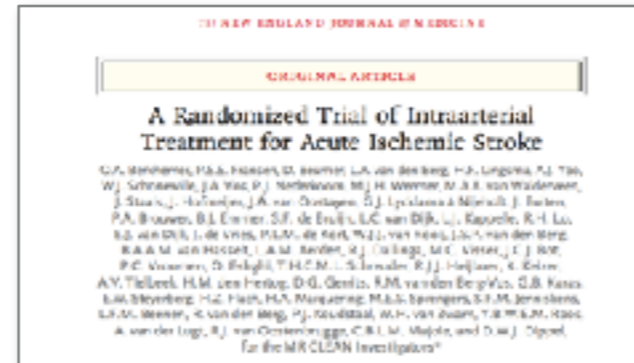
- 5 landmark RTCs 2015



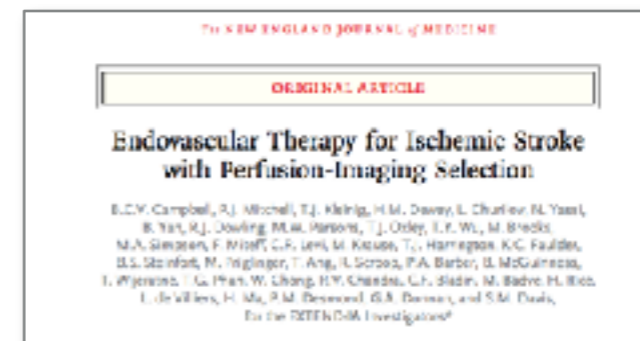
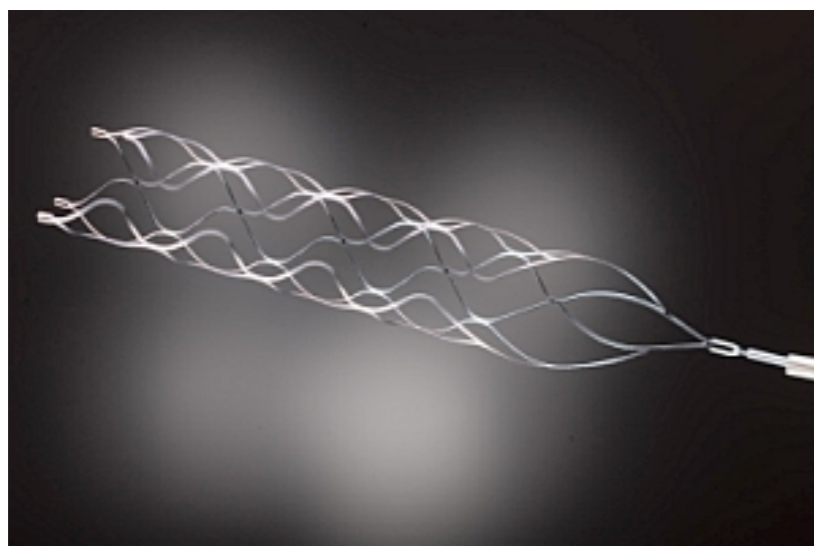
Goyal et al. Lancet. 2016



- 5 landmark RTCs 2015



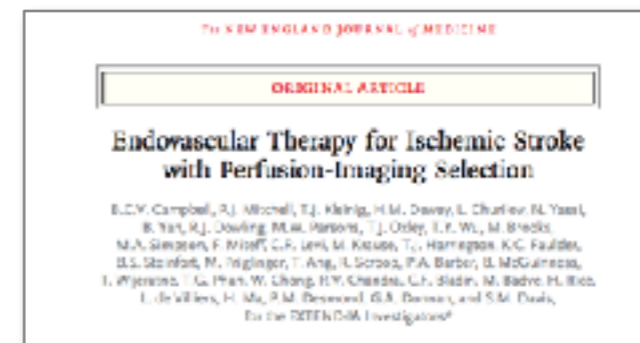
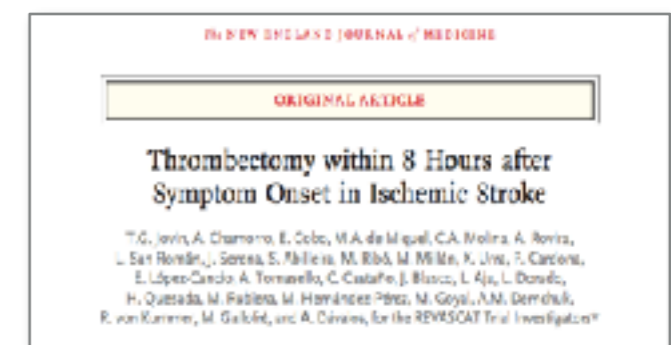
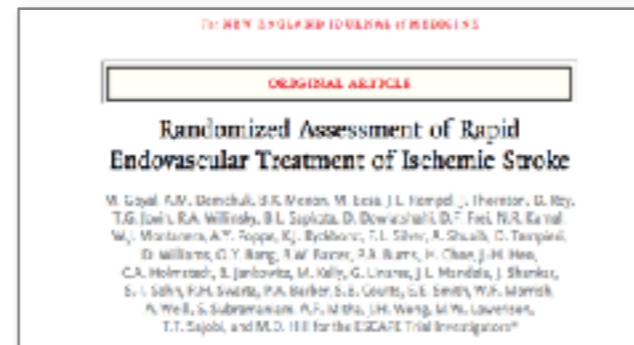
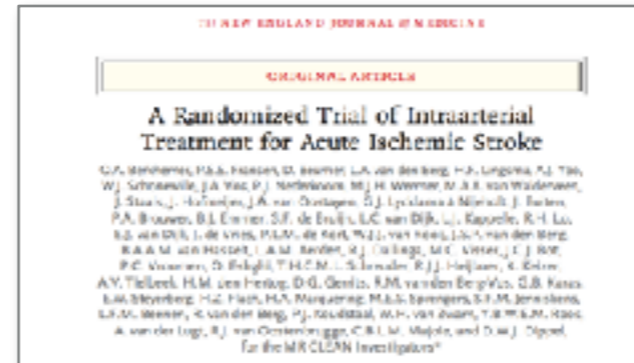
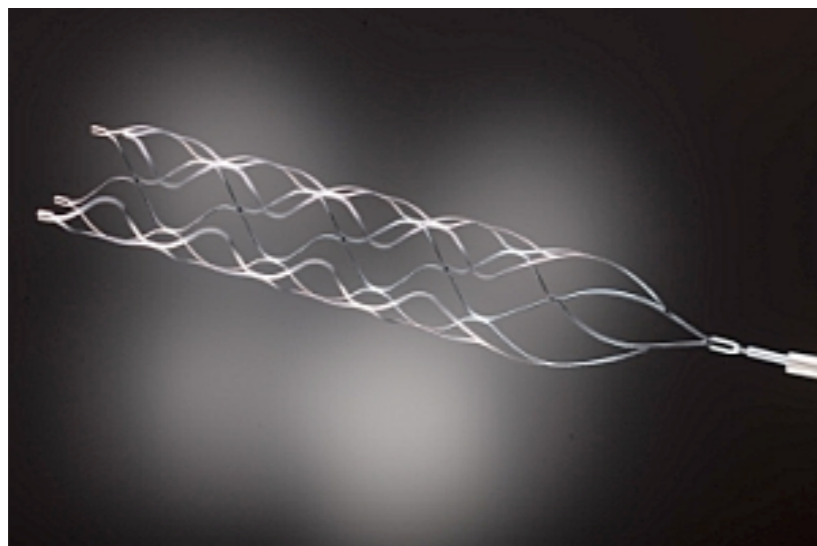
Goyal et al. Lancet. 2016



- 5 landmark RTCs 2015

- Meta-analysis:

Goyal et al. Lancet. 2016

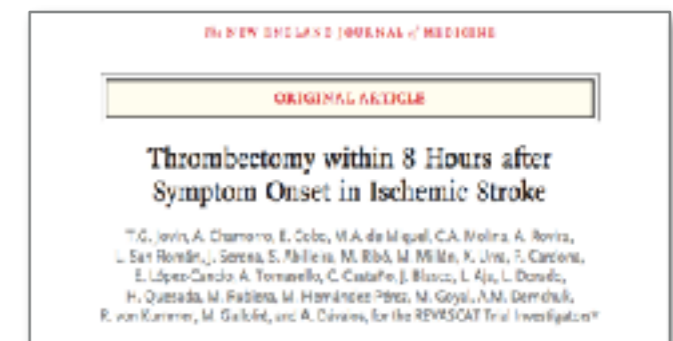
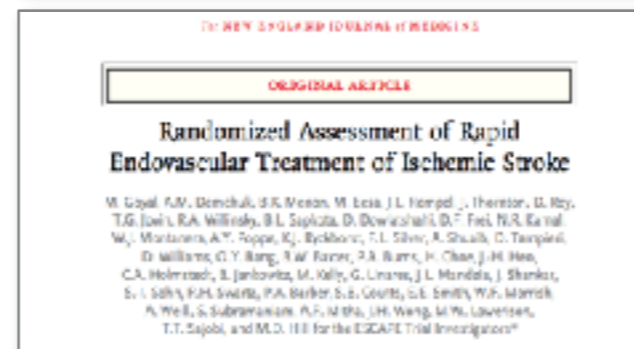
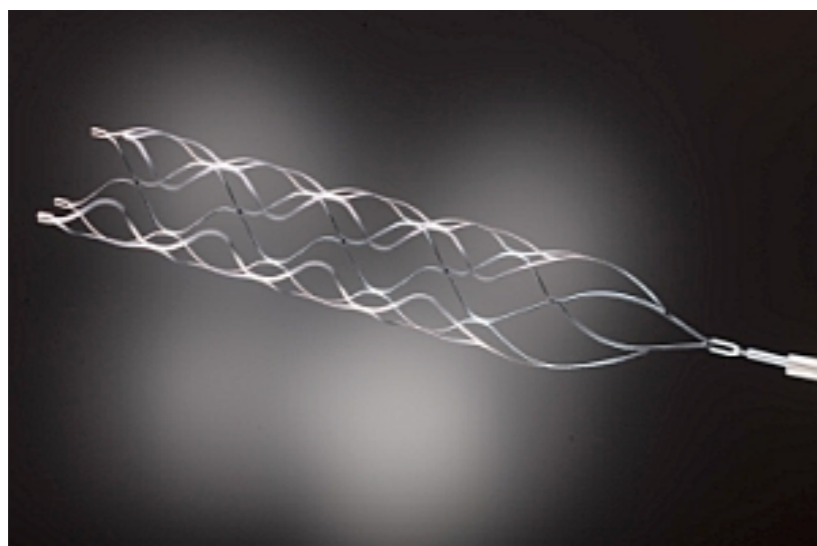


- 5 landmark RTCs 2015

- Meta-analysis:

- n = 1287
- NNT 2.6

Goyal et al. Lancet. 2016



AHA/ASA Guideline

2015 American Heart Association/American Stroke Association Focused Update of the 2013 Guidelines for the Early Management of Patients With Acute Ischemic Stroke Regarding Endovascular Treatment

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

- **ELVO**

- ELVO
 - Emergent Large Vessel Occlusion

- ELVO
 - Emergent Large Vessel Occlusion
 - <6 hours from onset

- **ELVO**
 - **Emergent Large Vessel Occlusion**
 - <6 hours from onset
 - Without large completed infarct

- **ELVO**
 - **Emergent Large Vessel Occlusion**
 - <6 hours from onset
 - Without large completed infarct
 - ASPECTS ≥ 6

- **ELVO**

- **Emergent Large Vessel Occlusion**

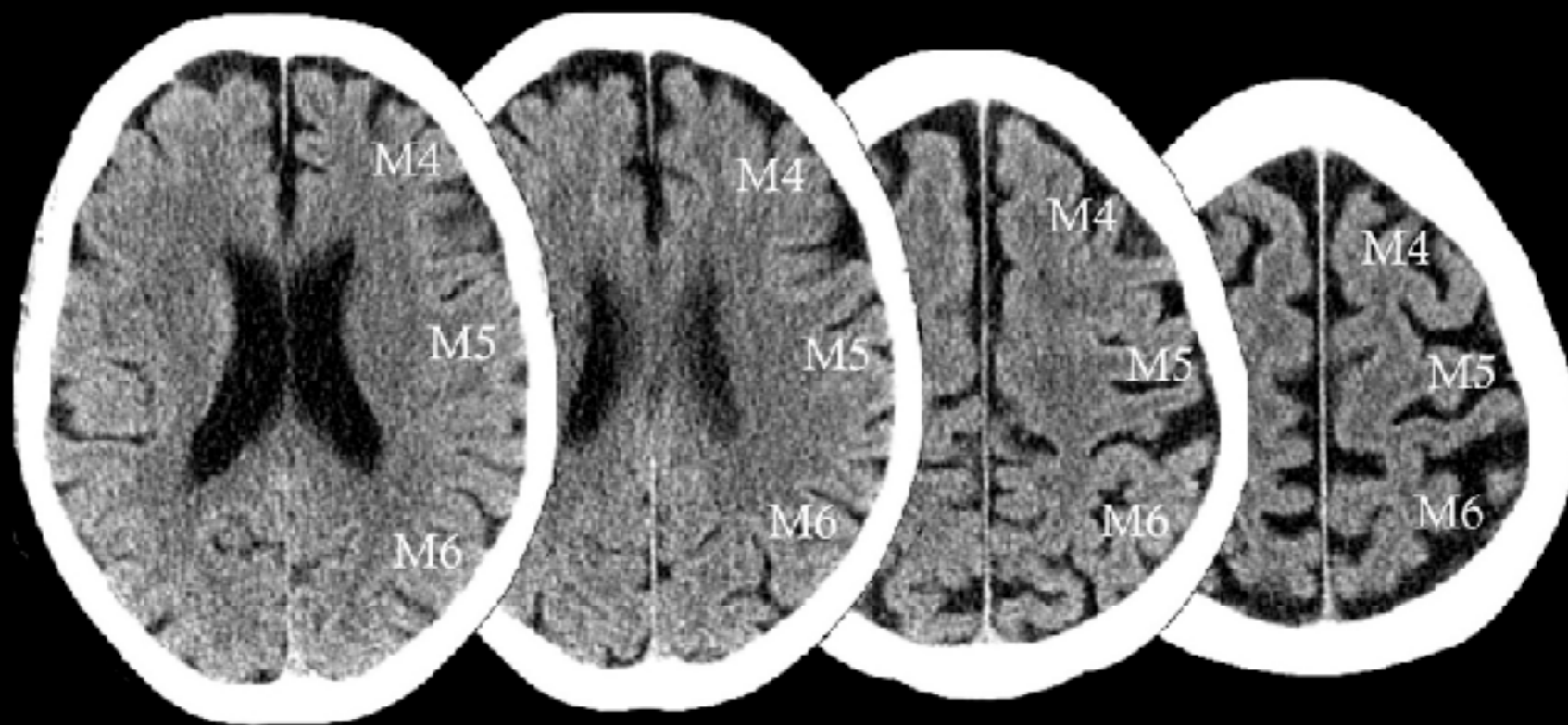
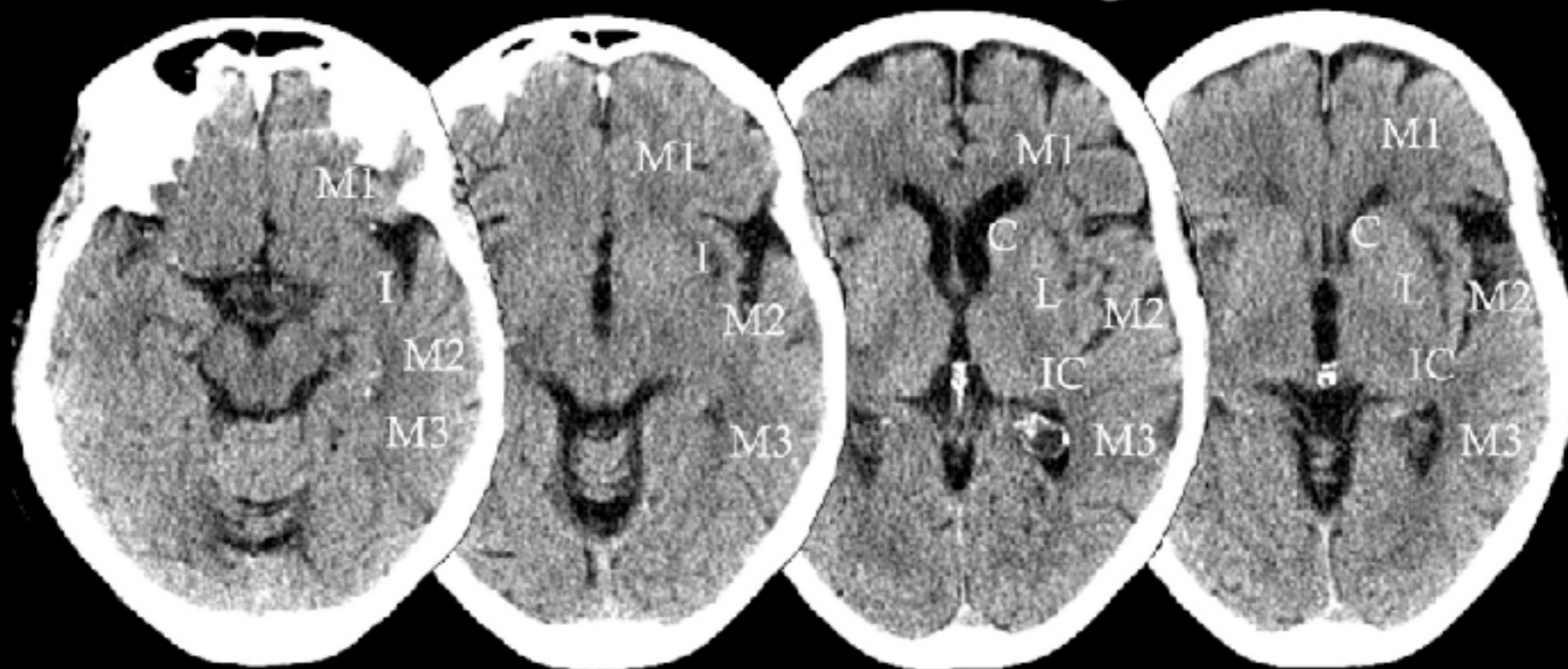
- <6 hours from onset
 - Without large completed infarct
 - ASPECTS ≥ 6
 - NIHSS ≥ 6

- **ELVO**

- **Emergent Large Vessel Occlusion**

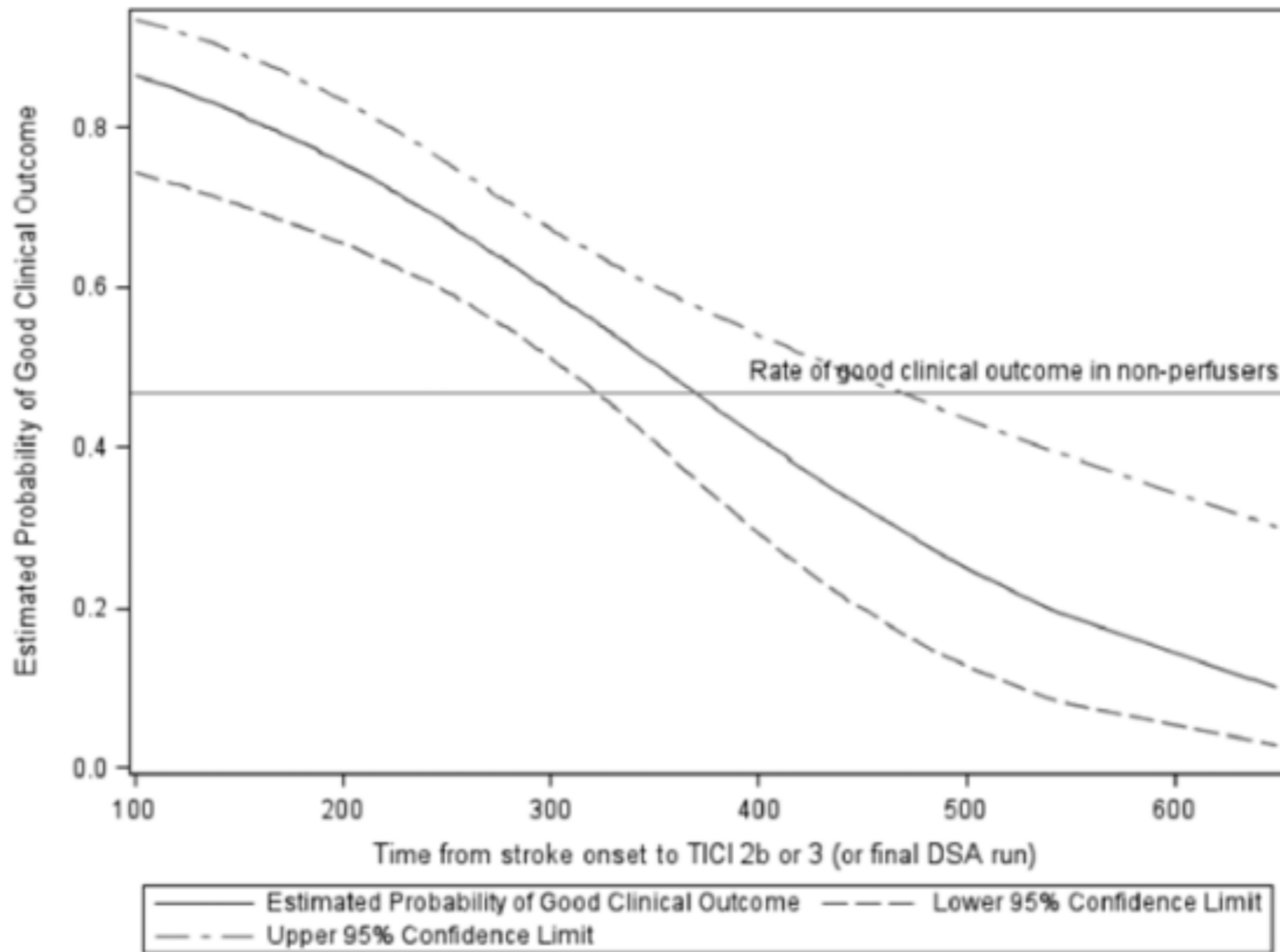
- <6 hours from onset
 - Without large completed infarct
 - ASPECTS ≥ 6
 - NIHSS ≥ 6
 - Large vessel occlusion

Ganglionic Level



Supraganglionic Level

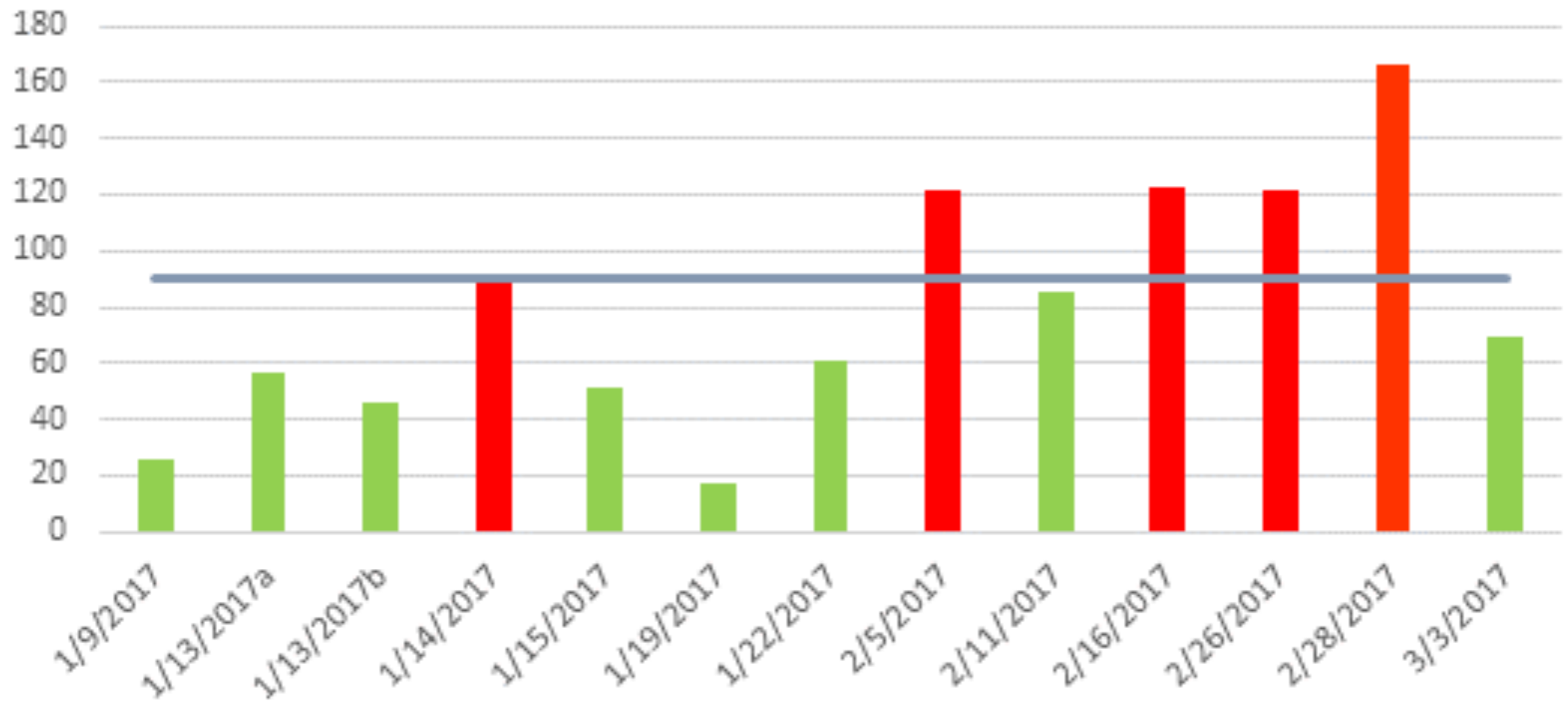
- All patients still get IV tPA if eligible



Every hour of delay leads to 38% decrease in likelihood of good outcome

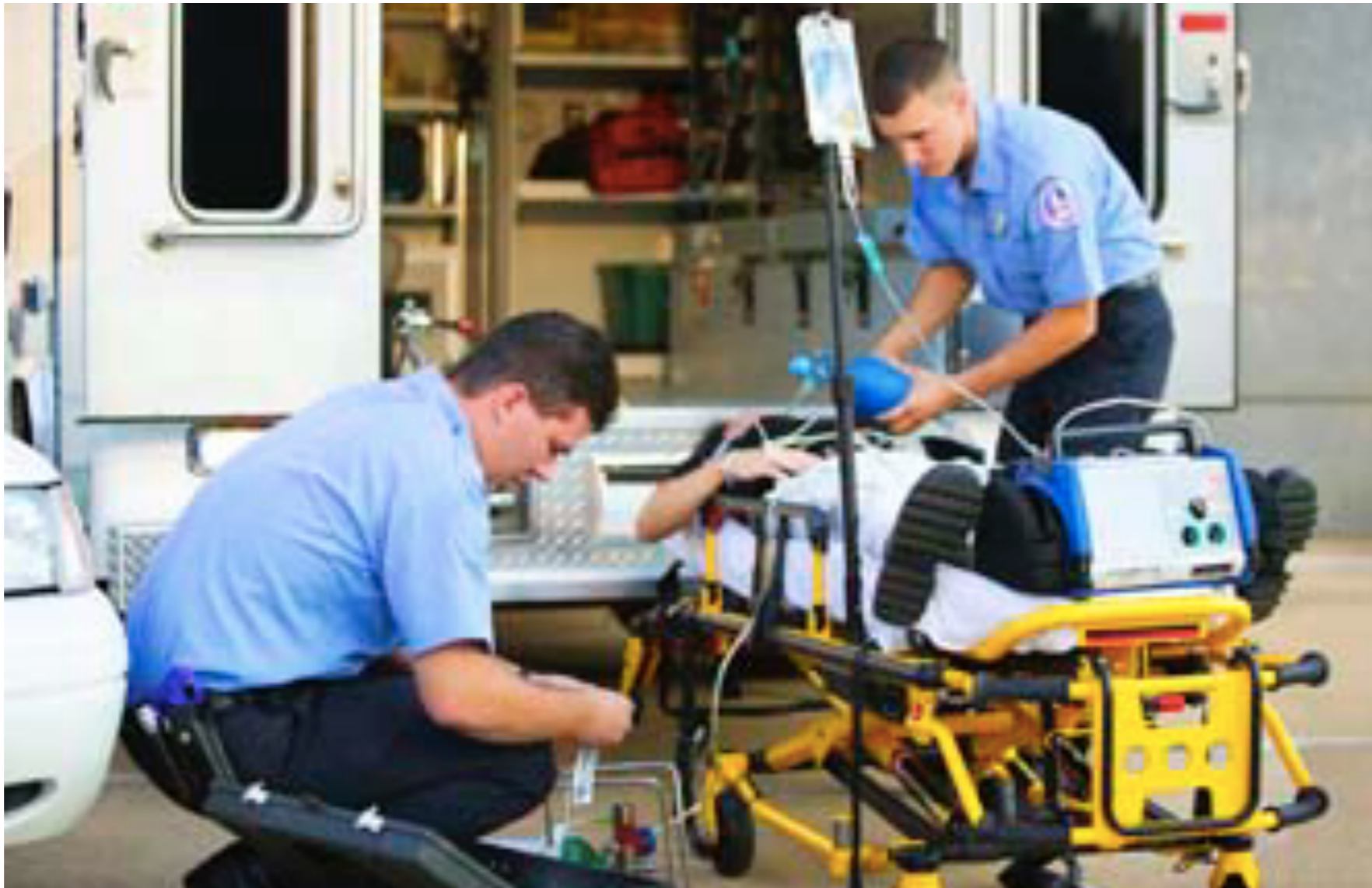
- Door to groin goal ≤ 90 minutes

2017 Endovascular Intervention
ED Arrival to Groin Puncture
Goal ≤ 90 minutes



- Earlier involvement of interventionalist
 - Prior to CT scans being done
 - CTA head & neck on all stroke alerts

Field identification of ELVO



Two questions in the field

Two questions

Two questions

1. Is the patient having a stroke?

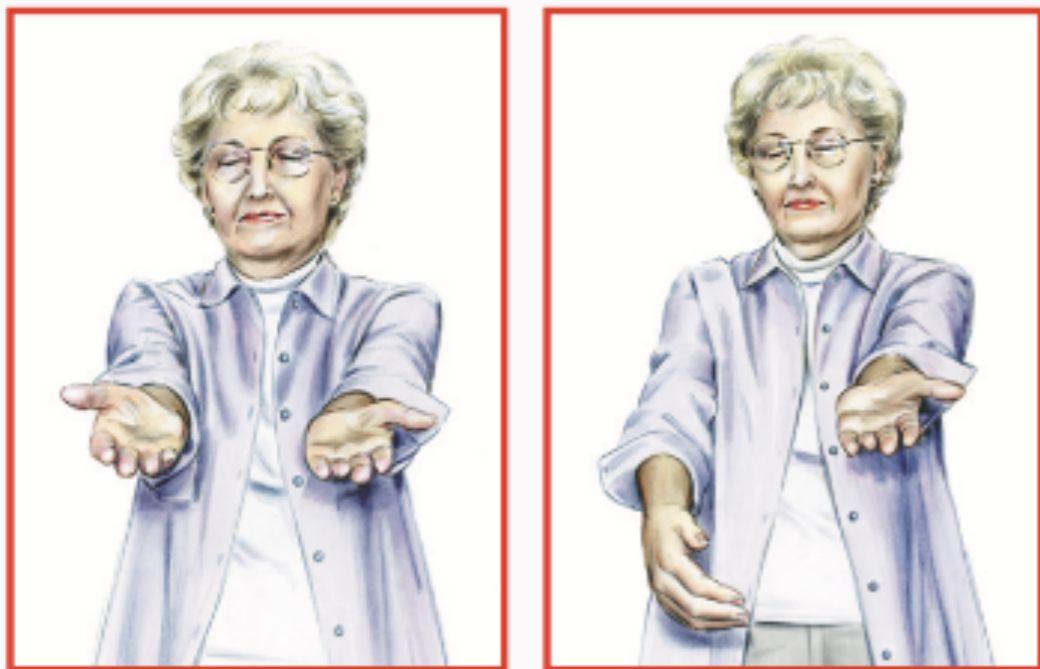
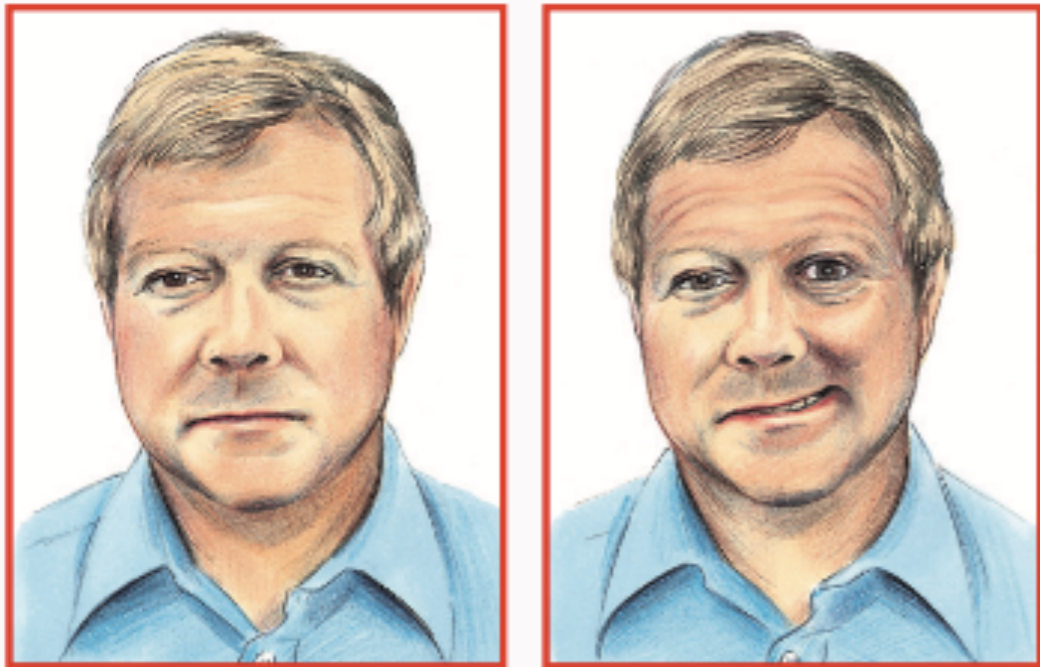
Two questions

1. Is the patient having a stroke?
2. Does the patient need endovascular therapy? (ELVO)

Stroke?

Cincinnati

Los Angeles



SCREENING CRITERIA:

4. Age > 45
5. History of seizures or epilepsy absent
6. Symptom duration **less than 24 hours**
7. At baseline, patient is **not** wheelchair bound or bedridden

8. Blood glucose between 60 and 400:

9. Exam: LOOK FOR OBVIOUS ASYMMETRY

	Normal	Right	Left
Facial Smile/Grimace:	<input type="checkbox"/>	<input type="checkbox"/> Droop	<input type="checkbox"/> Droop
Grip:	<input type="checkbox"/>	<input type="checkbox"/> Weak Grip <input type="checkbox"/> No Grip	<input type="checkbox"/> Weak Grip <input type="checkbox"/> No Grip
Arm Strength:	<input type="checkbox"/>	<input type="checkbox"/> Drifts Down <input type="checkbox"/> Falls Rapidly	<input type="checkbox"/> Drifts Down <input type="checkbox"/> Falls Rapidly

Based on exam, patient has **only unilateral** (and not bilateral) weakness:

10. Items 4,5,6,7,8,9 all YES's (or unknown) → LAPSS screening criteria met:

11. If LAPSS criteria for stroke met, call receiving hospital with a "code stroke", if not then return to the appropriate treatment protocol. (Note: the patient may still be experiencing a stroke even if LAPSS criteria are not met.)

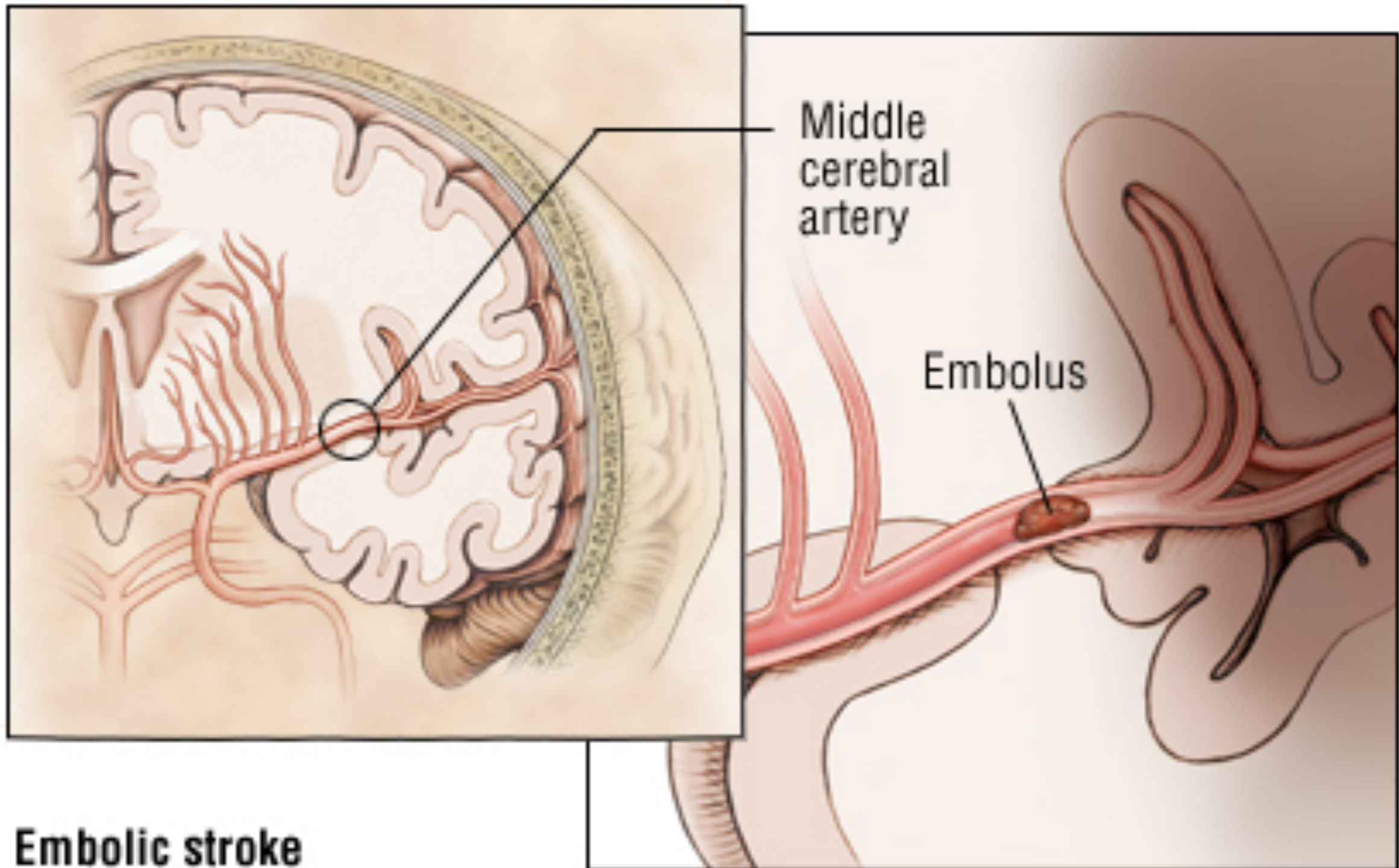


“You can’t teach an old dog new tricks”

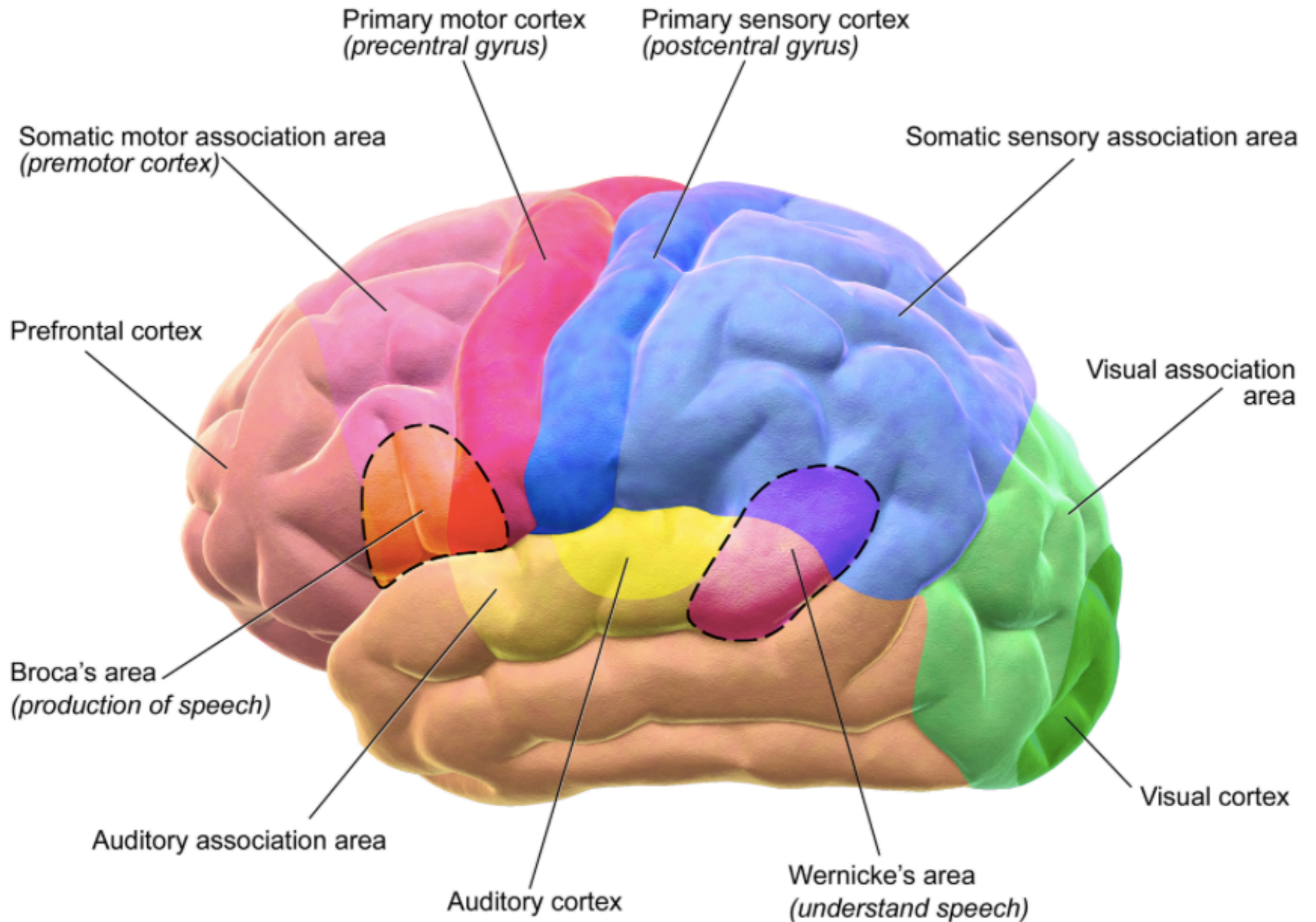
Kidwell et al. *Stroke* 2000

ELVO?

Cortical Signs



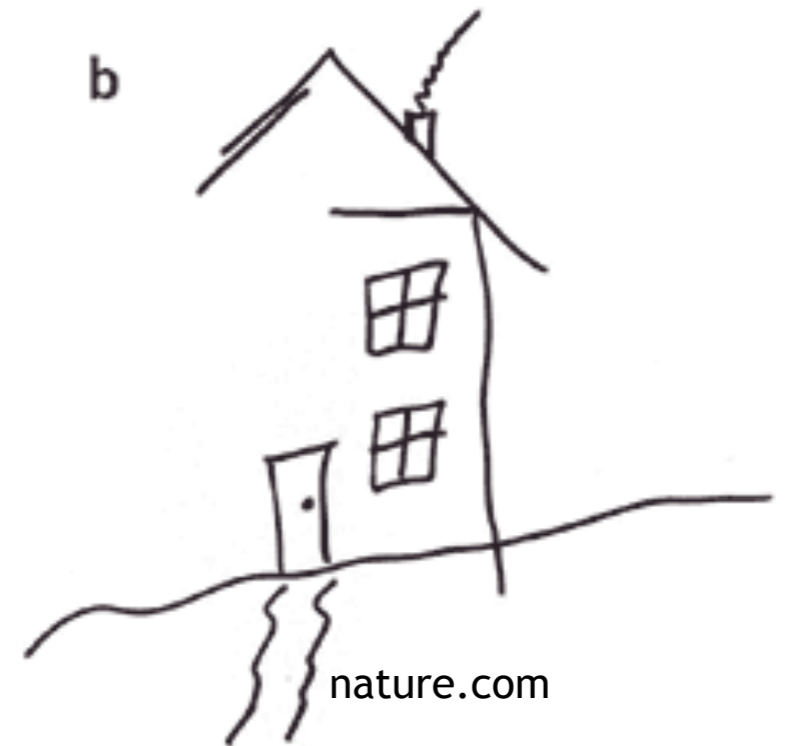
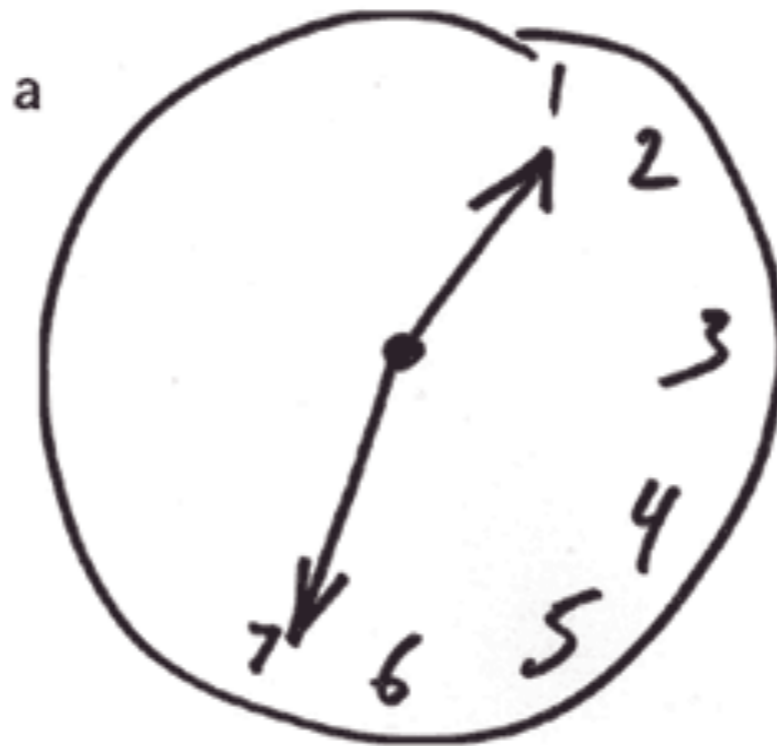
Embolic stroke



- Aphasia

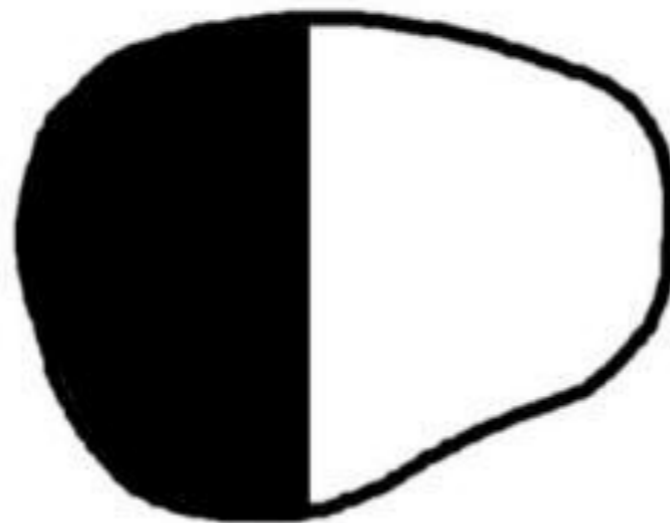


- Neglect

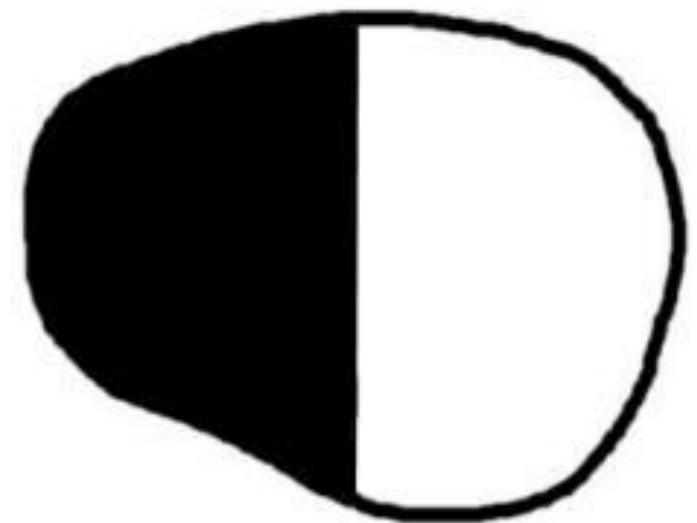


- Visual field cut

Left

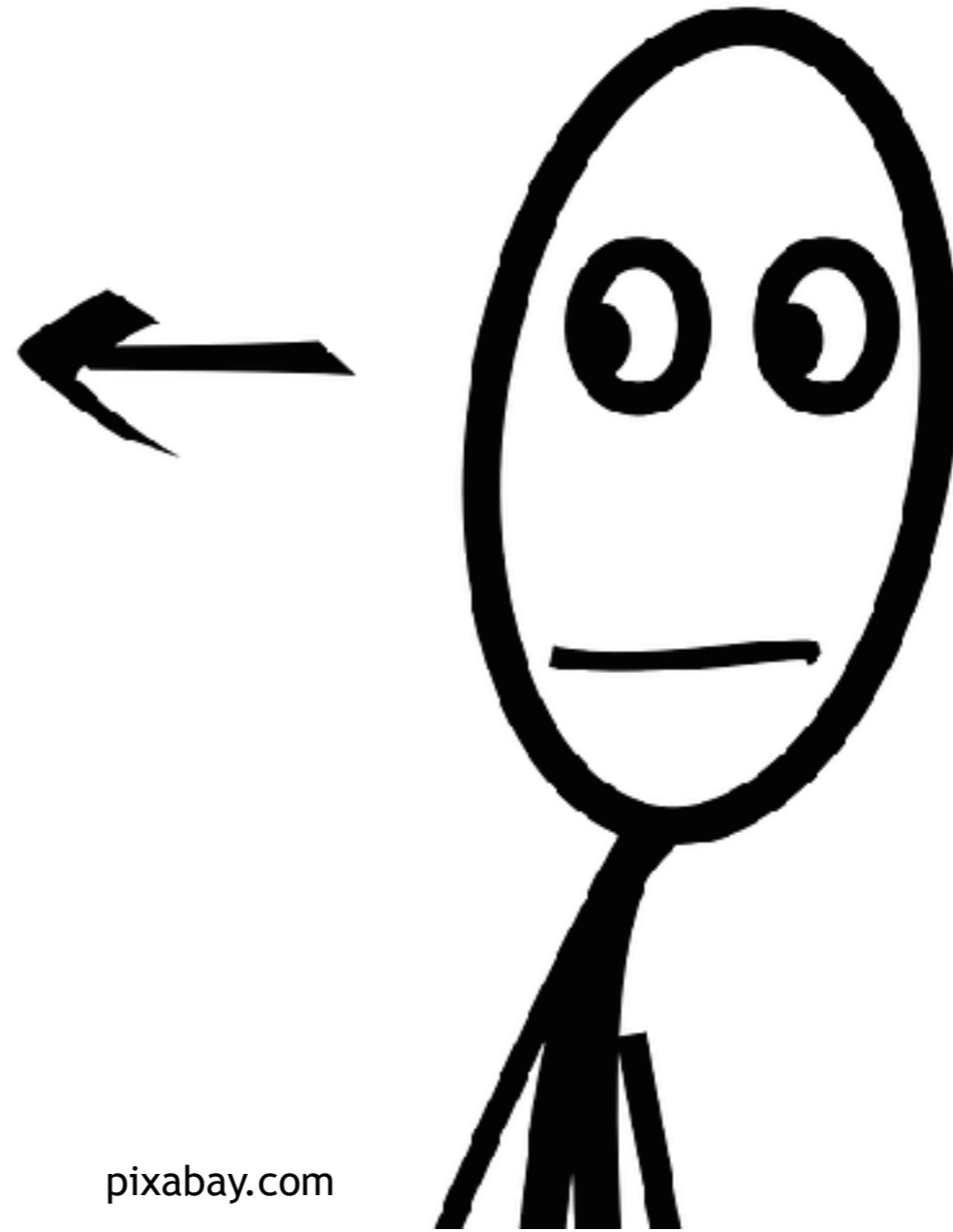


Right



casemed.case.
edu

- Gaze palsy



pixabay.com

RACE

Item	Instruction		RACE score	NIHSS score equivalence
Facial palsy	Ask the patient to show teeth	Absent (symmetrical movement)	0	0
		Mild (slightly asymmetrical)	1	1
		Moderate to severe (completely asymmetrical)	2	2-3
Arm motor function	Extending the arm of the patient 90 degrees (if sitting) or 45 degrees (if supine)	Normal to mild (limb upheld more than 10 seconds)	0	0-1
		Moderate (limb upheld less than 10 seconds)	1	2
		Severe (patient do not rise the arm against gravity)	2	3-4
Leg motor function	Extending the leg of the patient 30 degrees (in supine)	Normal to mild (limb upheld more than 5 seconds)	0	0-1
		Moderate (limb upheld less than 5 seconds)	1	2
		Severe (patient do not rise the leg against gravity)	2	3-4
Head and gaze deviation	Observe eyes and cephalic deviation to one side	Absent (eye movements to both sides were possible and no cephalic deviation was observed)	0	0
		Present (eyes and cephalic deviation to one side was observed)	1	1-2
Aphasia (if right hemiparesis)	Ask the patient two verbal orders - "close your eyes" - "make a fist"	Normal (performs both tasks correctly)	0	0
		Moderate (performs one task correctly)	1	1
		Severe (performs neither tasks)	2	2
Agnosia (if left hemiparesis)	Asking: - "Who is this arm" while showing him/her the paretic arm (asomatognosia) - "Can you move well this arm?" (anosognosia)	Normal (no asomatognosia nor anosognosia)	0	0
		Moderate (asomatognosia or anosognosia)	1	1
		Severe (both of them)	2	2
RACE Score total			0-9	

Table 6 Vision, Aphasia, Neglect (VAN) screening tool⁶⁸

Item	Responses
Motor arm	
Raise both arms	Mild—minor drift Moderate—severe drift Severe—flaccid or no antigravity No weakness—VAN negative
Vision	
Assessment of visual fields, vision, diplopia	Field cut Double vision New blindness None
Aphasia	
Repeat and name two objects	Expressive Receptive
Open and close eyes and fist	Mixed None
Neglect	
Gaze preference, tactile or spatial neglect	Forced gaze or inability to track to one side Unable to feel both sides at the same time or unable to identify own arm Ignores one side None

VAN+, motor involvement plus any VAN.

VAN+, 100% sensitivity, 90% specificity, 0.0 negative likelihood ratio for large vessel occlusion.

LAMS

The Los Angeles Motor Scale (LAMS)

Facial droop

Absent

0

Present

1

Arm drift

Absent

0

Drifts down

1

Falls rapidly

2

Grip strength

Normal

0

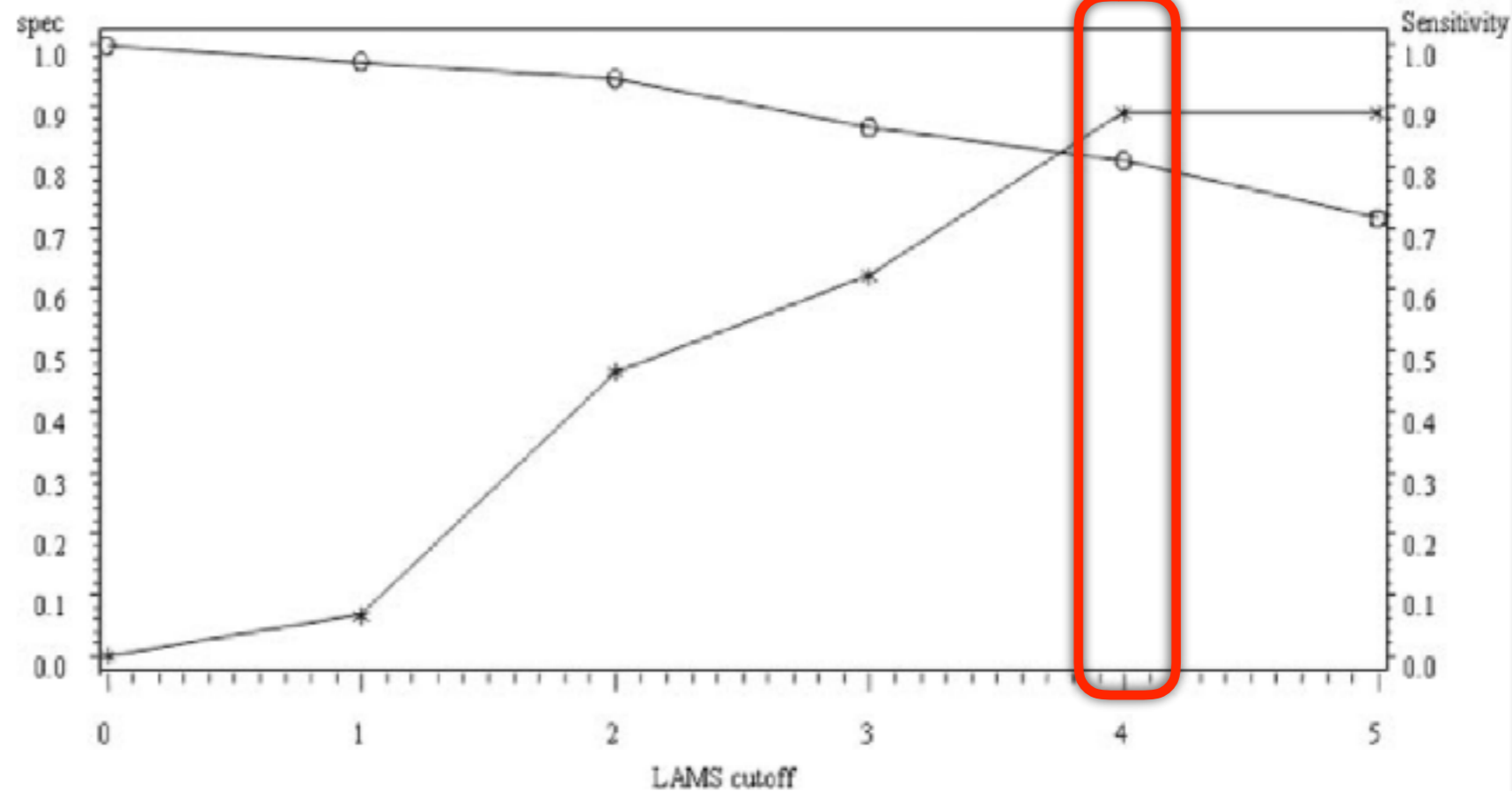
Weak grip

1

No grip

2

Specificity and Sensitivity for LAMS_Cutoff



C-STAT

Item	Findings	Score
Gaze	Absent	0
	Present	2
Arm Weakness	Absent	0
	Present	1
Alteration of consciousness	Absent	0
	Present	1
C-STAT Positive		2 or greater

Gaze

- Conjugate gaze deviation (≥ 1 NIHSS)
- 2 points - highest weight in scale

Yes



No



Gaze

Gaze

Item	Findings	Score
Gaze	Absent	0
	Present	2
Arm Weakness	Absent	0
	Present	1
Level of consciousness	Absent	0
	Present	1
C-STAT Positive		2 or greater

Gaze

Item	Findings	Score
Gaze	Absent	0
	Present	2
Arm Weakness	Absent	0
	Present	1
Level of consciousness	Absent	0
	Present	1
C-STAT Positive		2 or greater

Arm Weakness

- Arm (right or left or both) falls to bed before 10 seconds (≥ 2 NIHSS)

Arm Weakness

Arm Weakness

Item	Findings	Score
Gaze	Absent	0
	Present	2
Arm Weakness	Absent	0
	Present	1
Level of consciousness	Absent	0
	Present	1
C-STAT Positive		2 or greater

Arm Weakness

Item	Findings	Score
Gaze	Absent	0
	Present	2
Arm Weakness	Absent	0
	Present	1
Level of consciousness	Absent	0
	Present	1
C-STAT Positive		2 or greater

Level of consciousness

- Incorrectly answers at least 1 of 2 of LOC questions on NIHSS (age, month) **and**
- Does not follow at least one of two commands (close eyes, make a fist)
- ≥ 1 on NIHSS items 1b and 1c

Level of consciousness

Level of consciousness

Item	Findings	Score
Gaze	Absent	0
	Present	2
Arm Weakness	Absent	0
	Present	1
Alteration of consciousness	Absent	0
	Present	1
C-STAT Positive		2 or greater

Level of consciousness

Item	Findings	Score
Gaze	Absent	0
	Present	2
Arm Weakness	Absent	0
	Present	1
Alteration of consciousness	Absent	0
	Present	1
C-STAT Positive		2 or greater

C-STAT Performance on Detection of LVO

	Sensitivity	Specificity	Positive Likelihood Ratio	Negative Likelihood Ratio
Severe Stroke NIHSS > 15	89%	73%	3.3	0.15
Moderate Stroke NIHSS > 10	75%	85%	5.00	0.29

- EMS training next week
 - Radio in as “C-STAT positive” if score ≥ 2
 - Page out stroke alert as “C-STAT positive”
 - Will enable early involvement of interventionalist for diagnosis and treatment of ELVO

Conclusion

- Early recognition is key
- Will allow improved door to groin times

Suggestions

- CTA head and neck on all stroke alerts
- Alert interventionist prior to imaging if cortical findings and weakness
- C-STAT
- Stroke activation order set placed prior to pt arrival

Thank you