

Intelligence artificielle dans la prise en charge de l'AVC

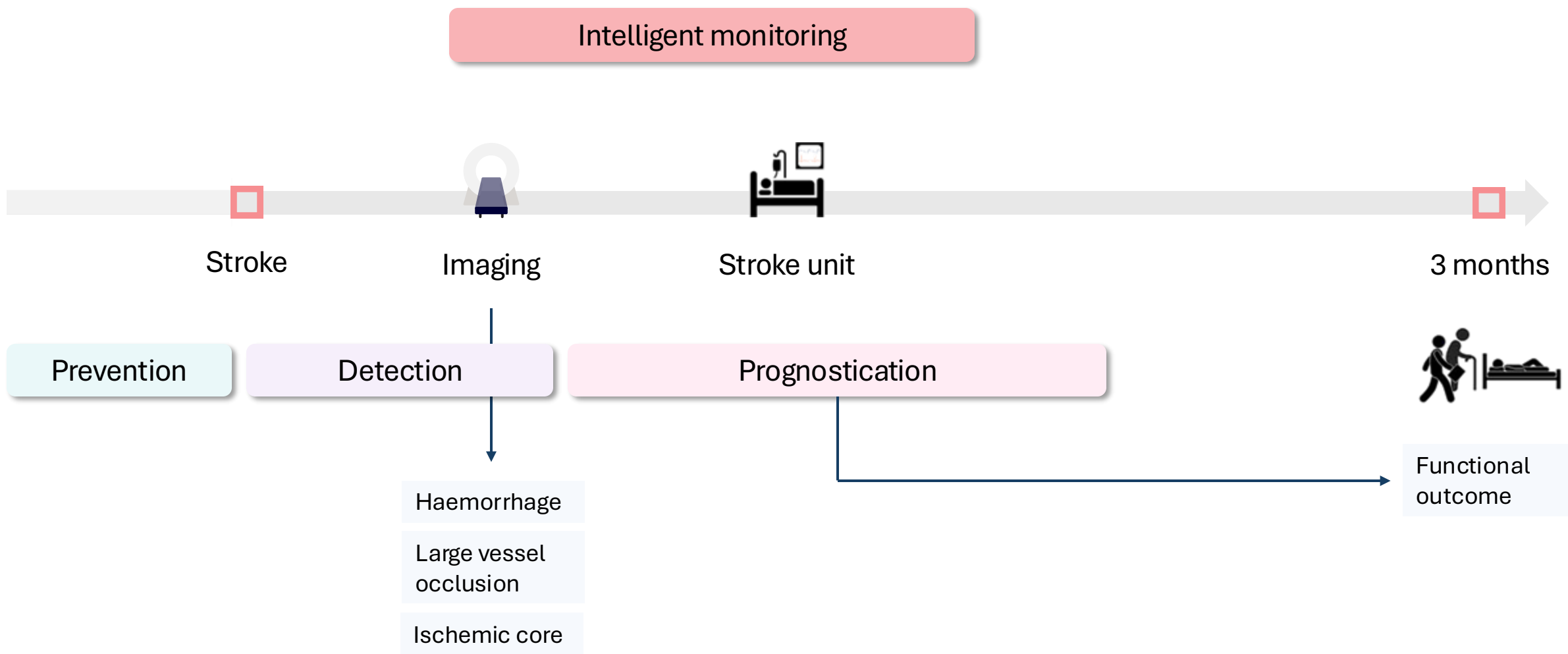
Ready for prime time?



Preamble

- AI $\neq$ intelligent
- Continuous learning is not allowed
- Development phases
 1. Training
 2. Internal validation
 3. External validation
 4. Prospective validation -> impact?

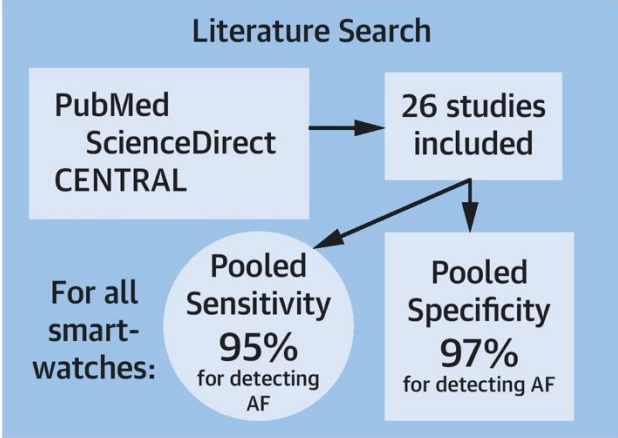




Prevention



AFib detection



17'349 patients



Apple Watch



Samsung



Fitbit



Withings ScanWatch



Amazfit

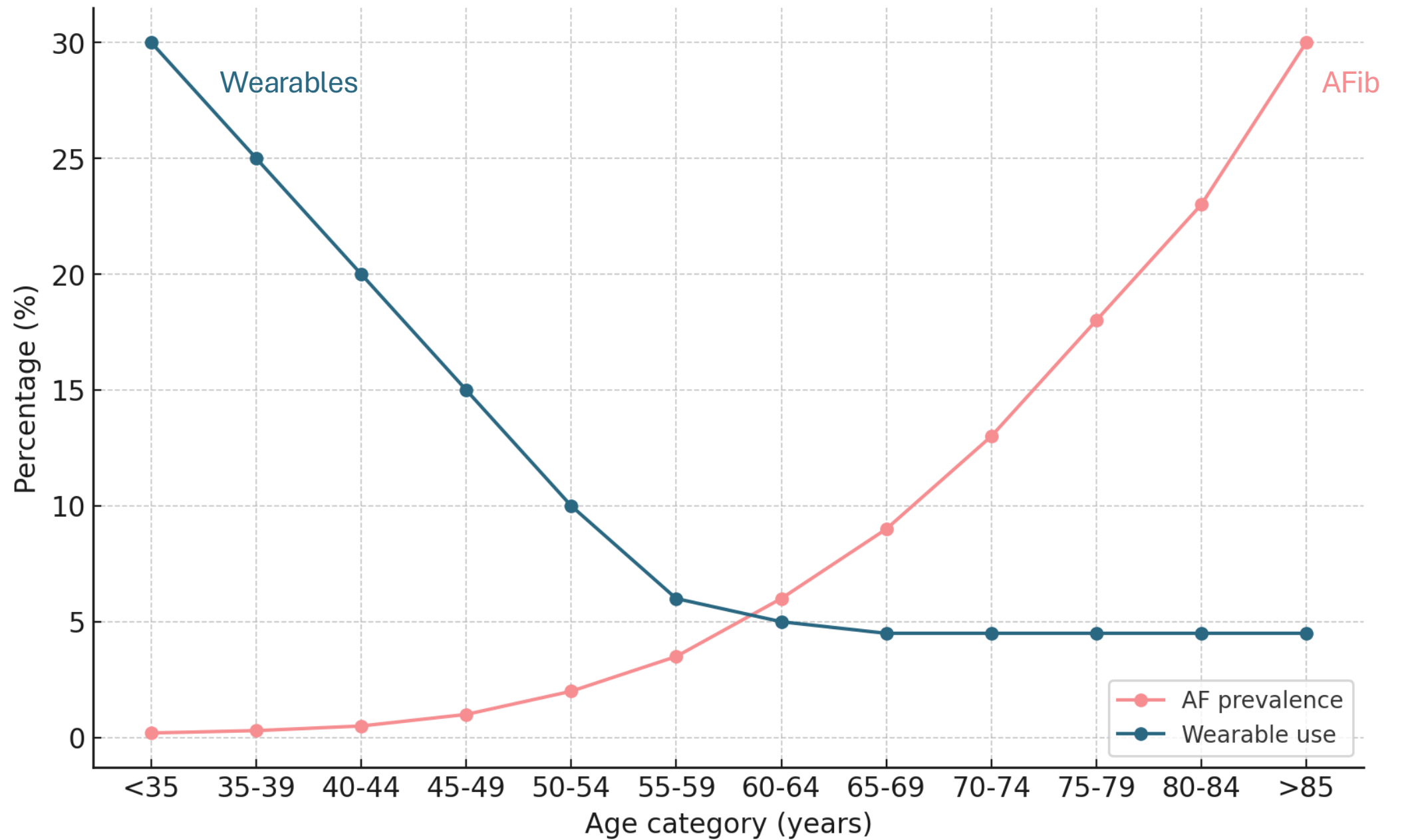


Seiko Epson PWM



Garmin Forerunner

Sensitivity:	94%	97%	66%	89%	99%	98%	97%
Specificity:	97%	96%	79%	95%	99%	91%	98%



AFib detection

Inclusion	ECG	Stroke		Events/total Cases	Controls		Estimate [95% CI]
		Study					
CHADSVASC ≥ 2	intermittent	HALCOX 2017		6/502	10/501		0.62 [0.23, 1.70]
>75y	intermittent	GUDMUNDSDOTTIR 2024		630/14356	687/14356		0.93 [0.84, 1.03]
>75y	intermittent	SVENNBERG 2021		921/14387	985/14381		0.95 [0.87, 1.04]
>70y	continuous	SINGER 2024		37/5952	34/5953		1.10 [0.69, 1.76]
							0.94 [0.88, 1.01]



2.2x Afib detections
(95% CI 1.41–3.50)

AFib detection

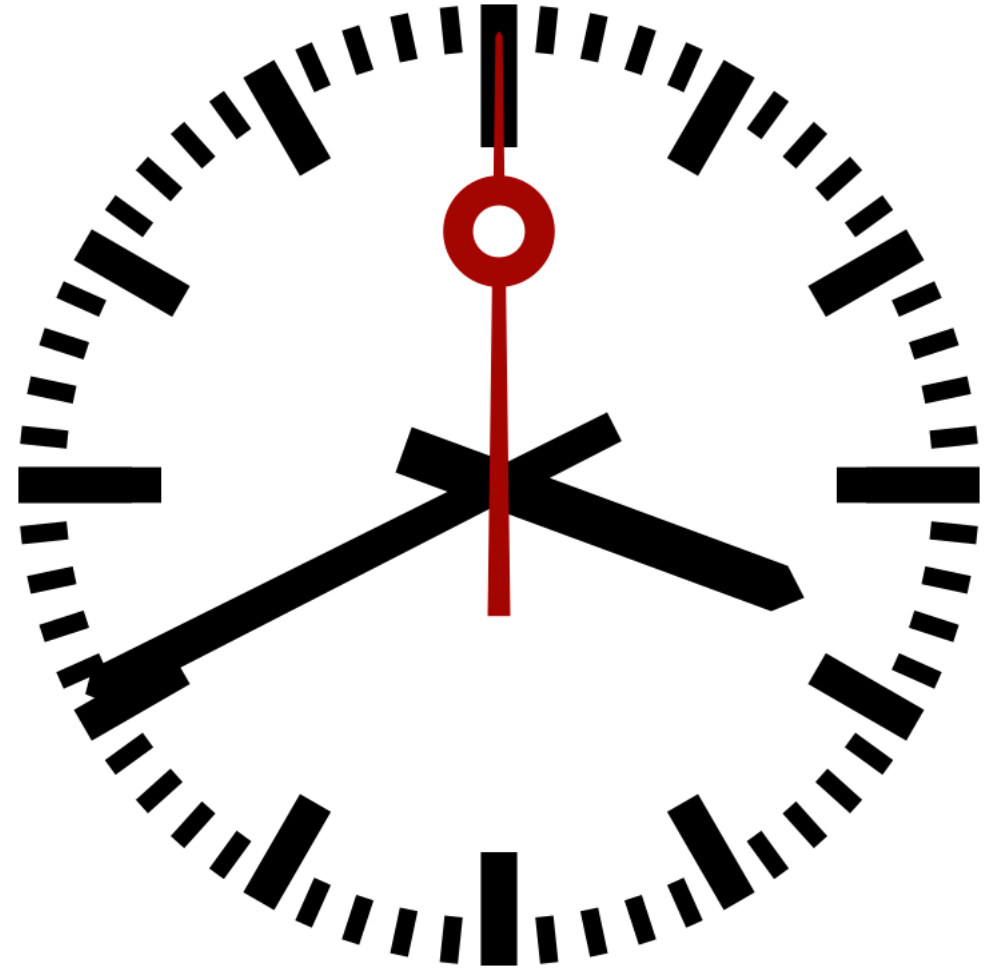
after stroke

Sn 34-60%

Sp 95-100%

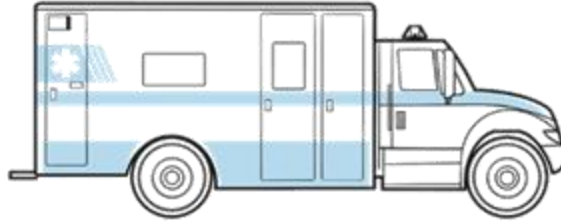


Acute phase





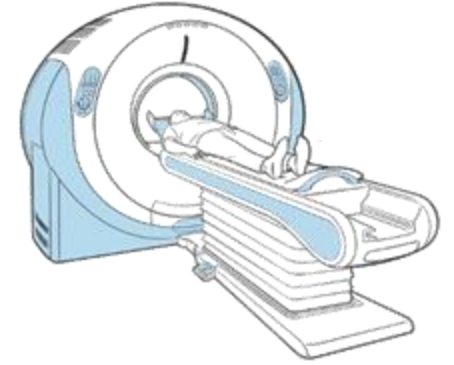
30 MINUTES



+20 MINUTES



+10 MINUTES



+10 MINUTES

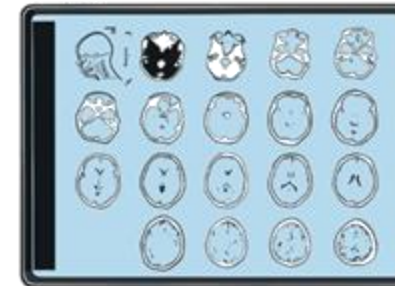
TOTAL TIME: 95 MINUTES

TOTAL NEURONS LOST: 180.5 MILLION



WITHOUT AI INTERVENTION

+25 MINUTES



WITH AI INTERVENTION

+3 MINUTES

TOTAL TIME: 73 MINUTES

TOTAL NEURONS LOST: 138.7 MILLION

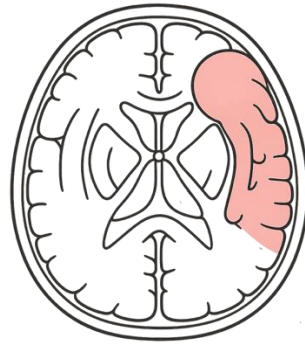
Imaging



Haemorrhage

Sn 68–99%

Sp 83–98%



Scoring
ASPECTS

ICC 0.72

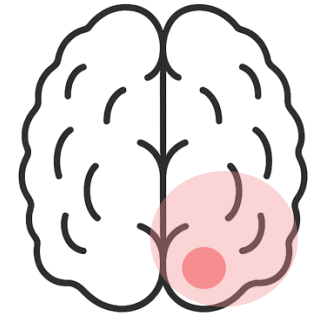
vs. expert ICC 0.62



LVO
Large Vessel Occlusion

Sn 85–98%

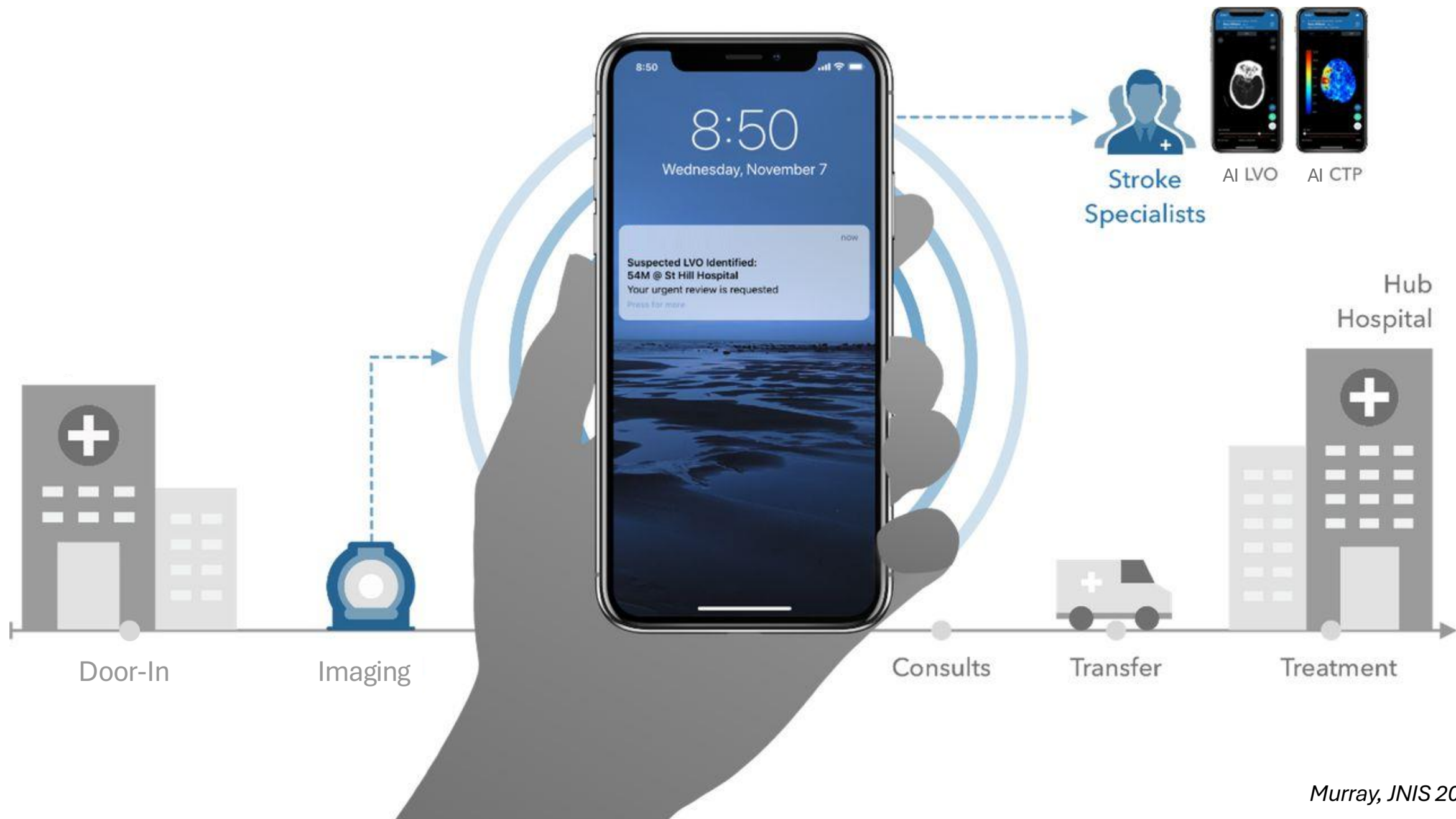
Sp 74–98%



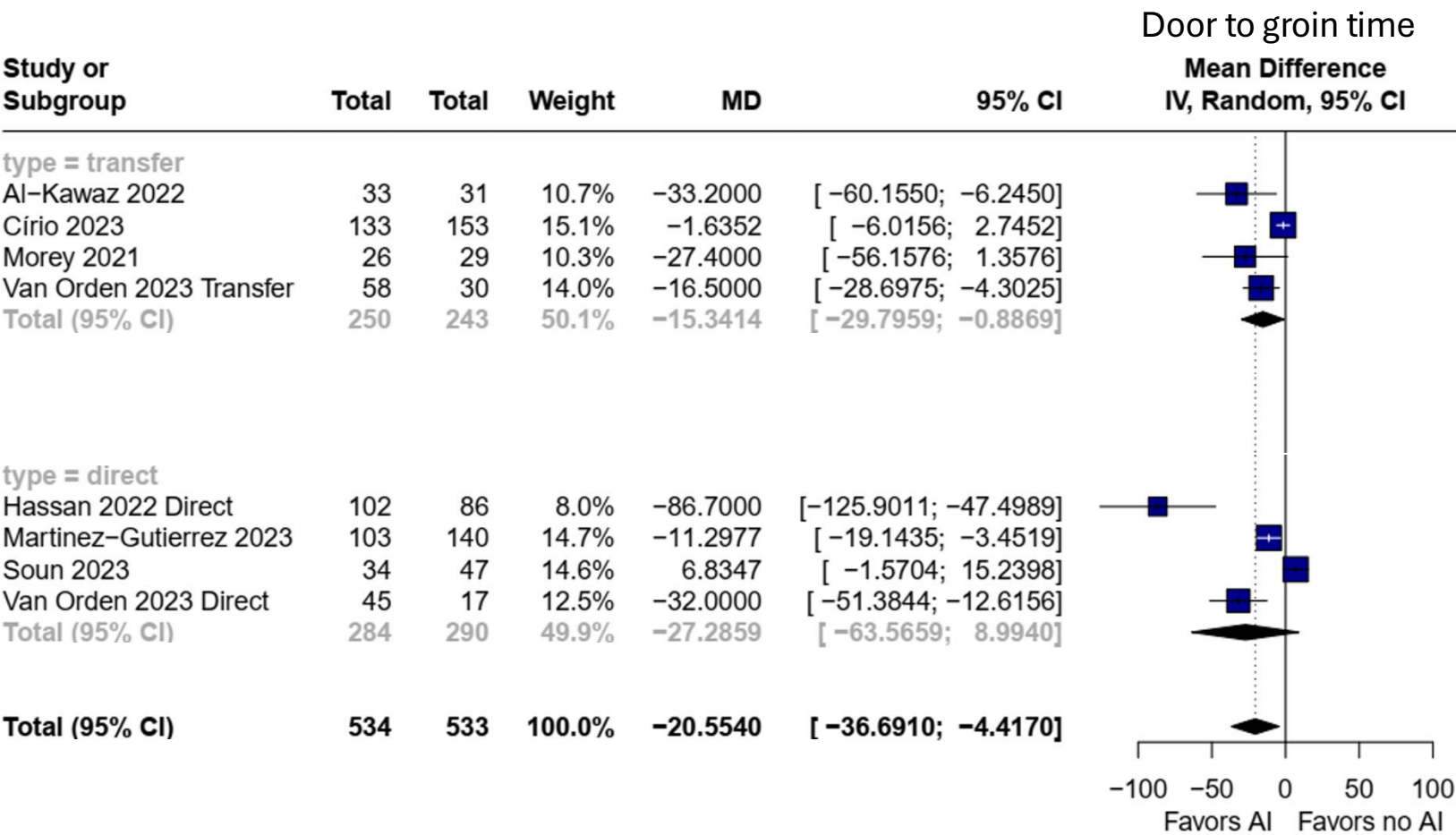
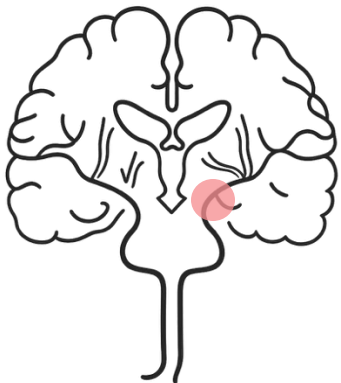
Ischemic core

Δ 1.29 mL

95% CI [−6.49, 3.92]



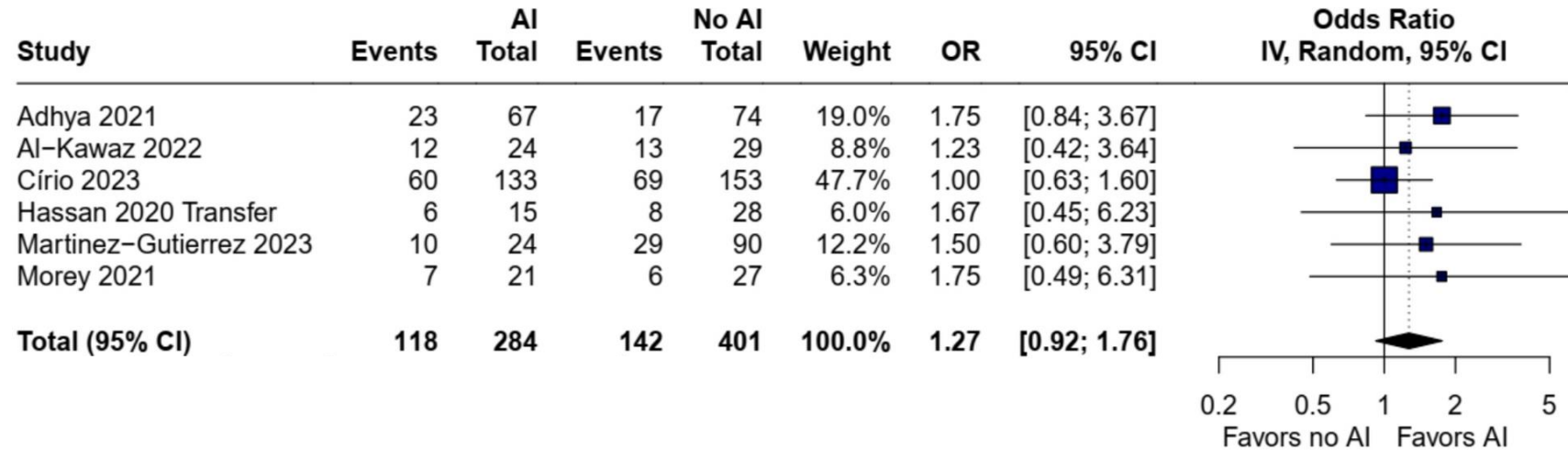
LVO Detection



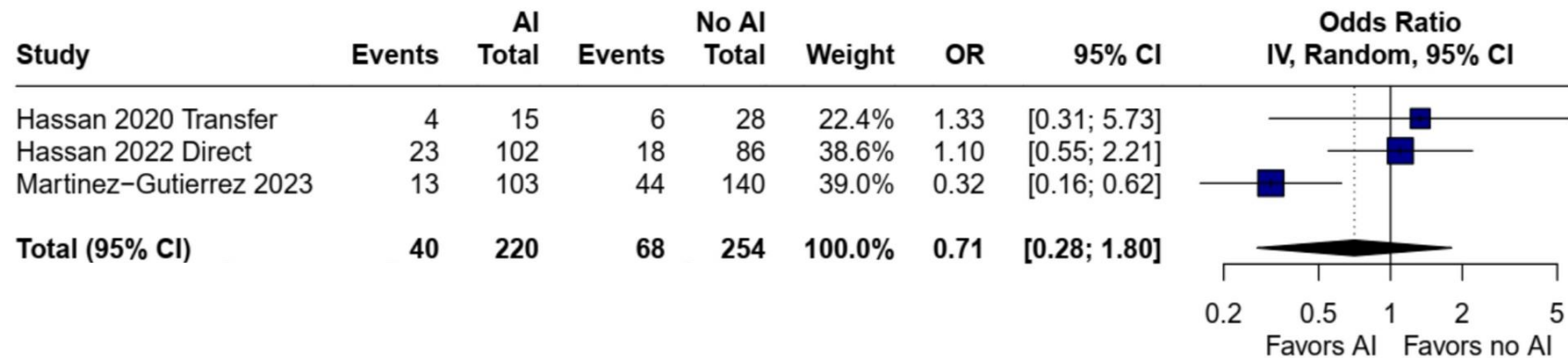
Hassan 2022	143 min	94 min
Martinez-Gutierrez 2023	100 min	88 min
Soun 2023	97 min	101 min
Van Orden 2023	97 min	85 min

LVO Detection

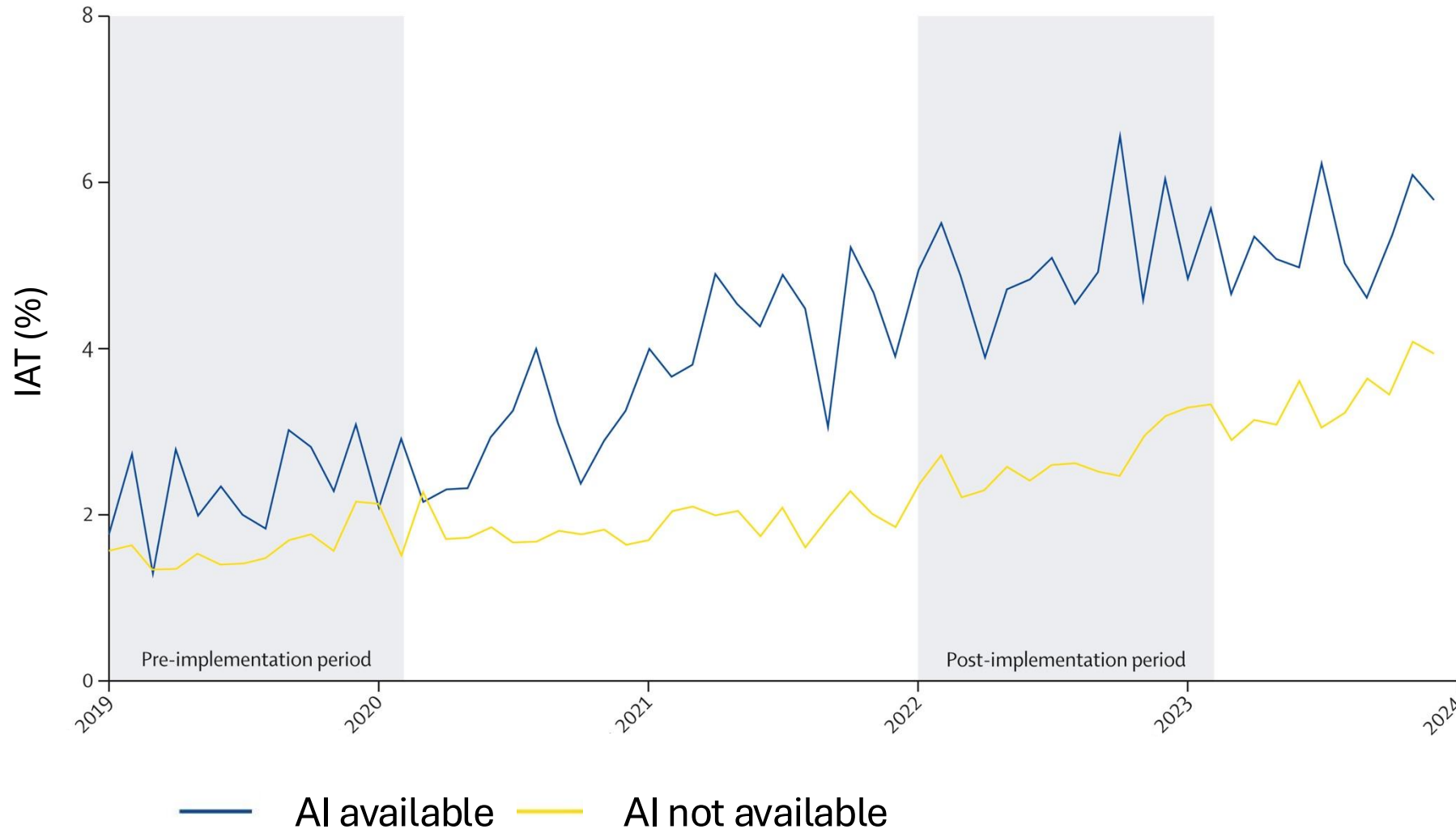
Functional
Independence
(mRS 0-2)



Mortality



Post-implementation evaluation



26 hospitals
71'017 patients

3'578.90 CHF/QALY

Westwood, NHS 2024

Nagaratnam, Lancet Dig Health 2025

“automated LVO alert arrives [...] far earlier than human interpretation, in many cases even before the CTA images were available for review on the clinical PACS.”

What do physicians think of it

How important is the immediate access to imaging?
(using the software as quick access PACS)

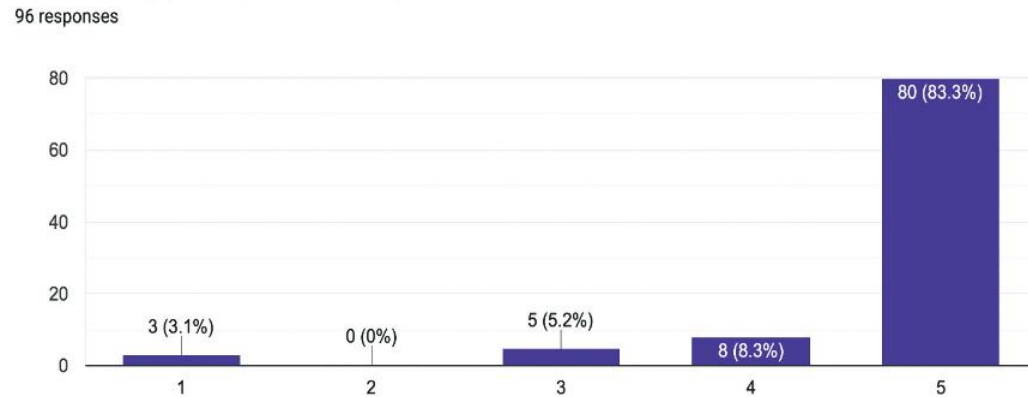


Figure 1. Perceived importance of immediate imaging access (using the AI software as quick access PACS).

How do you rate the importance of AI LVO detection tools in rapidly triaging LVO stroke patients?

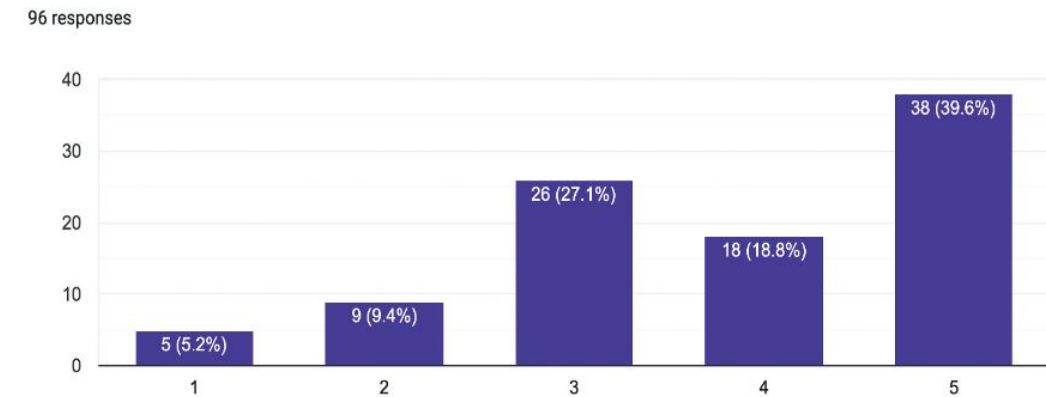
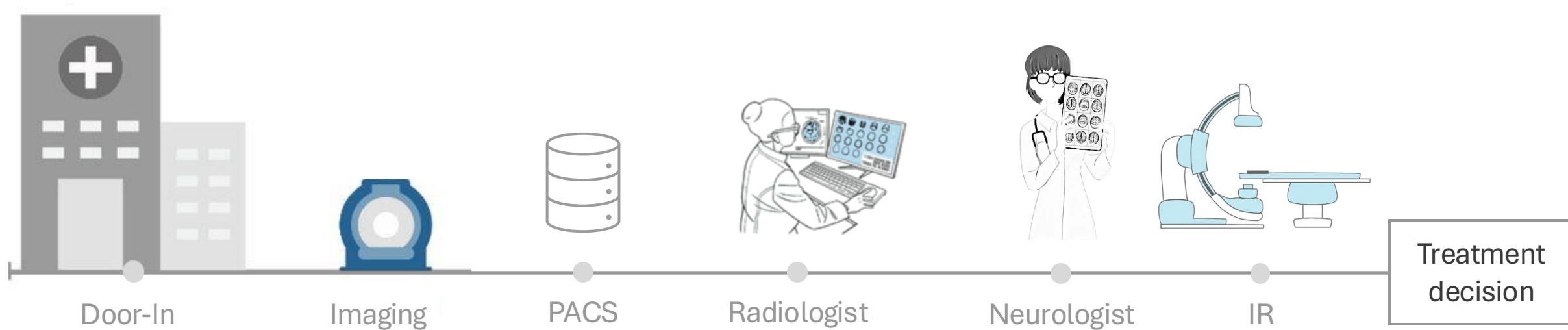
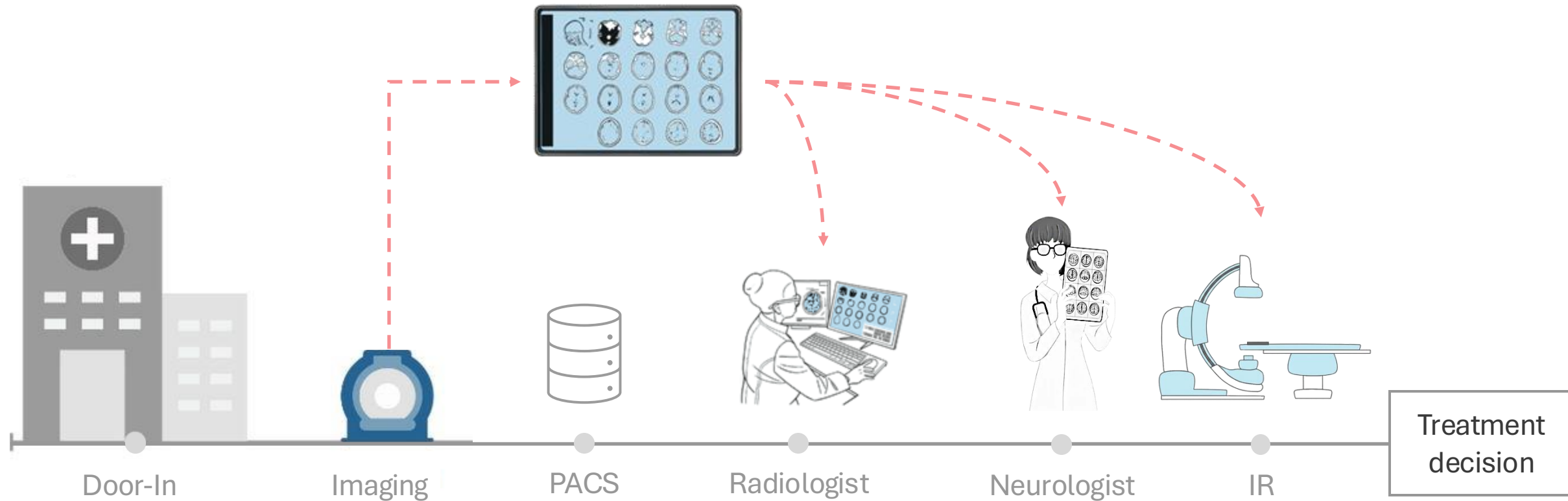


Figure 2. Perceived importance of AI LVO detection tools for rapid stroke triage.

Process optimisation



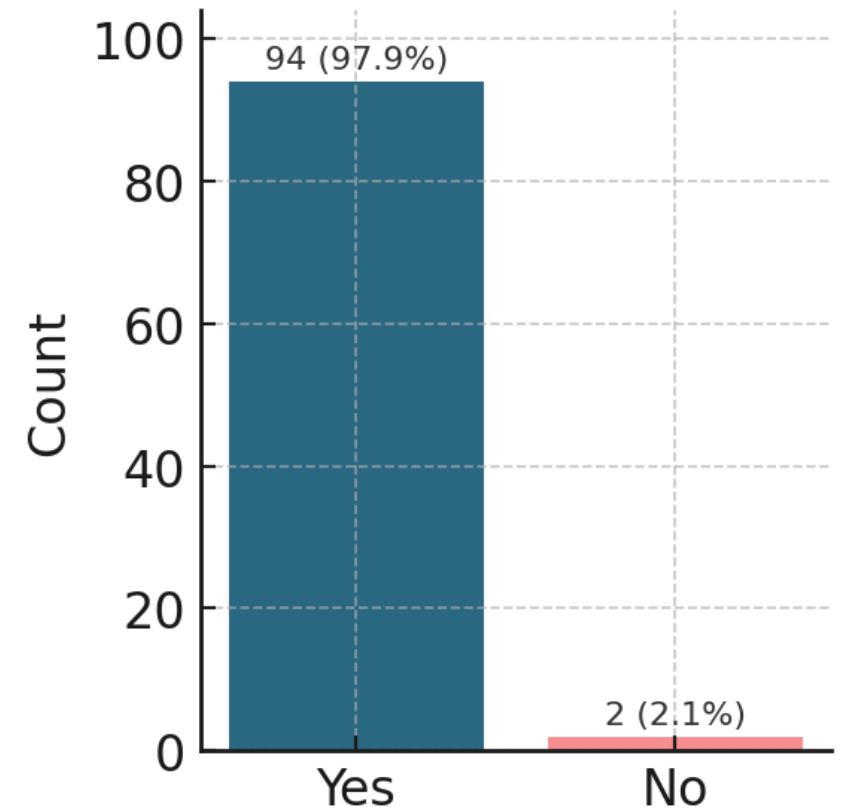
Process optimisation



Process optimisation

Type of AI LVO detection tool. Number of responses: 95

Viz AI	45 (47.4 %)
Rapid AI	43 (45.3%)
Other	7 (7.3%)



AI LVO detection tool formally integrated into a written acute ischemic stroke triage process. Number of responses: 96

Yes	36/96 (37.5%)
No	60/96 (62.5%)

Pitfalls

False positive

Chronic occlusion or moyamoya pattern

Moderate-severe stenosis or multifocal narrowing

Residual contrast or venous contamination

Dolichoectasia

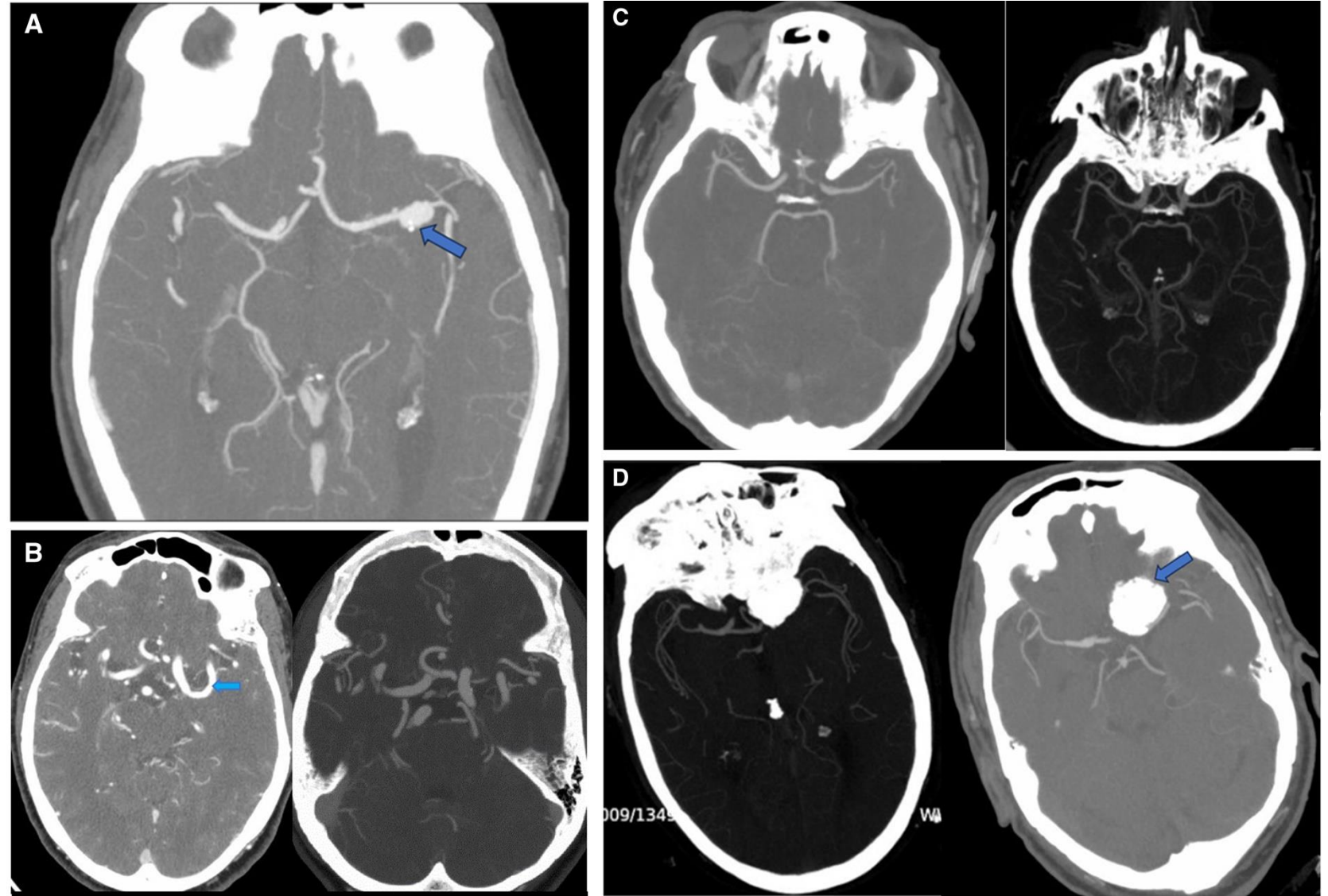
Saccular aneurysm at MCA bifurcation

Physiological variation between left and right

Mass effect from space-occupying lesion

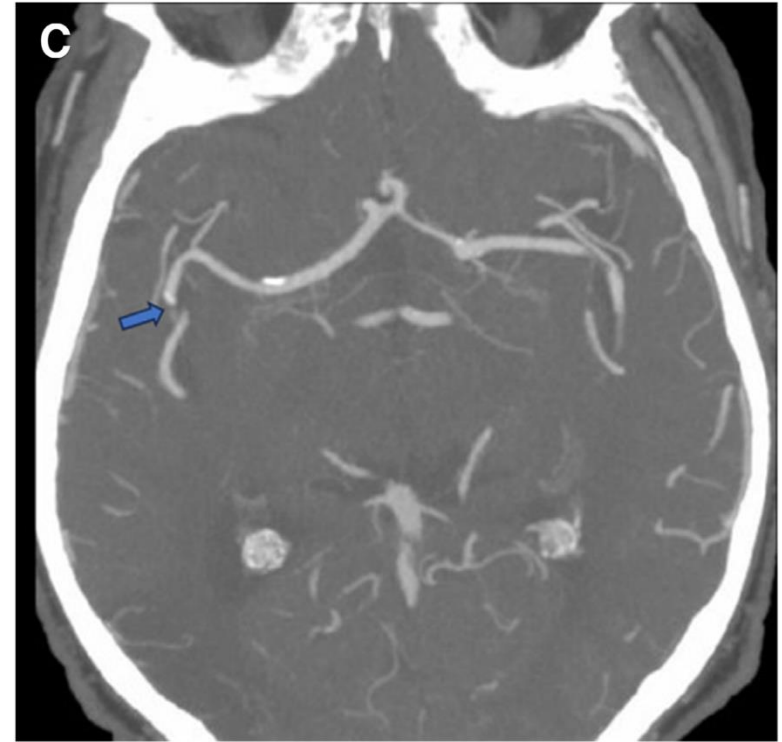
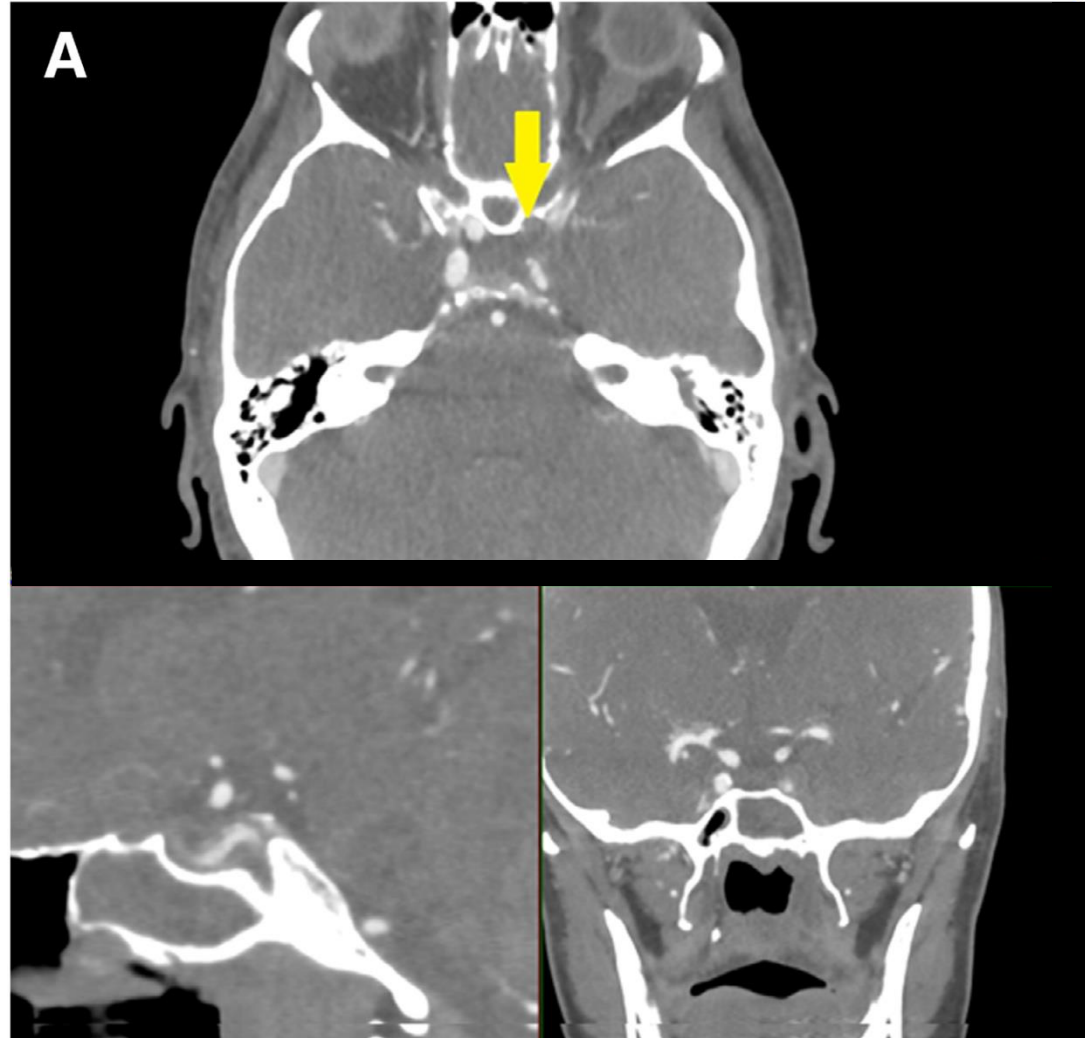
Factors altering patient hemodynamics

Cervical ICA occlusion

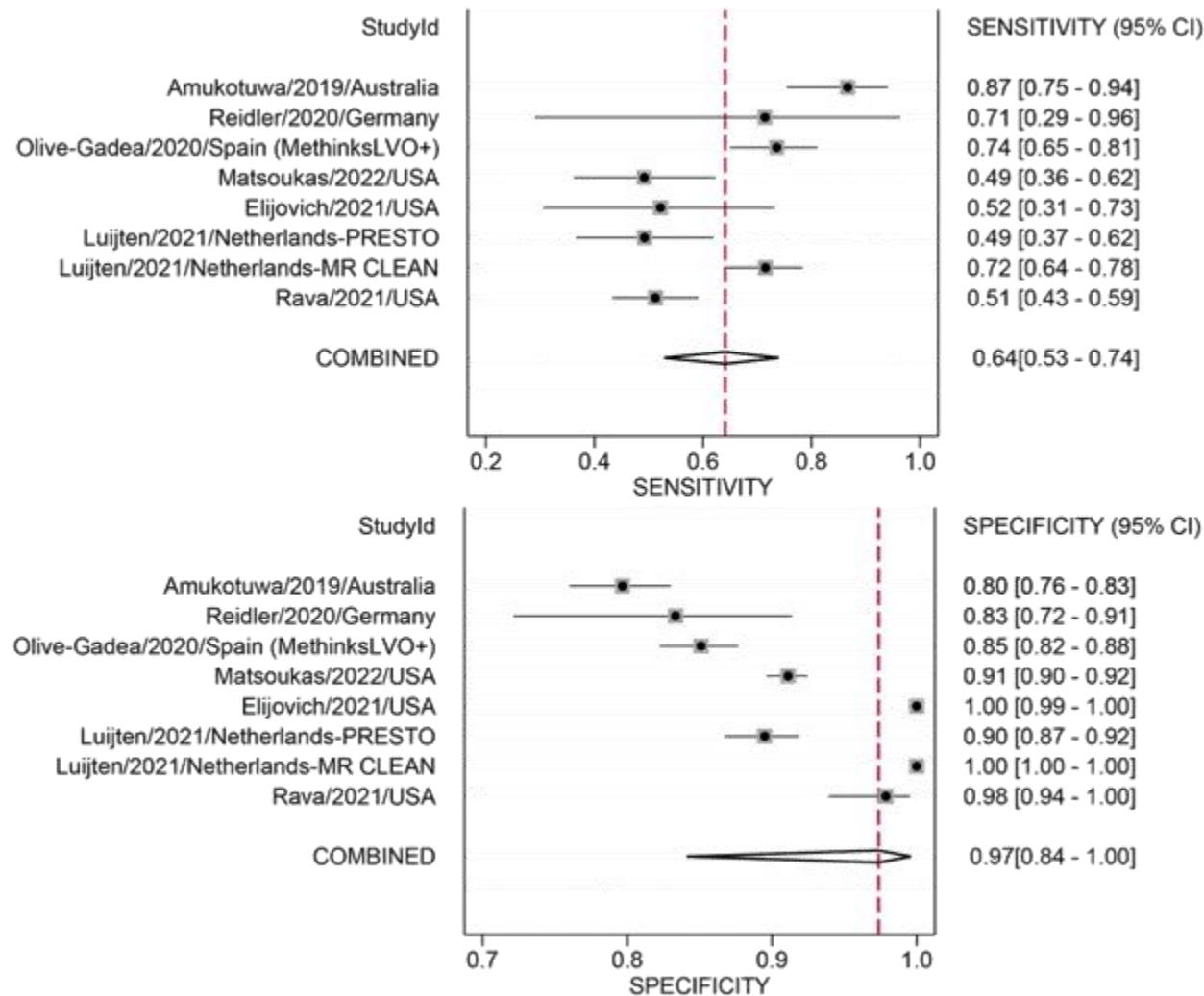


Pitfalls

False negative
Short-segment occlusion
Small or distal vessel occlusion
Branch point occlusion (ie, MCA bifurcation)
Calcified thrombus/embolus
Proximity to the bony structure

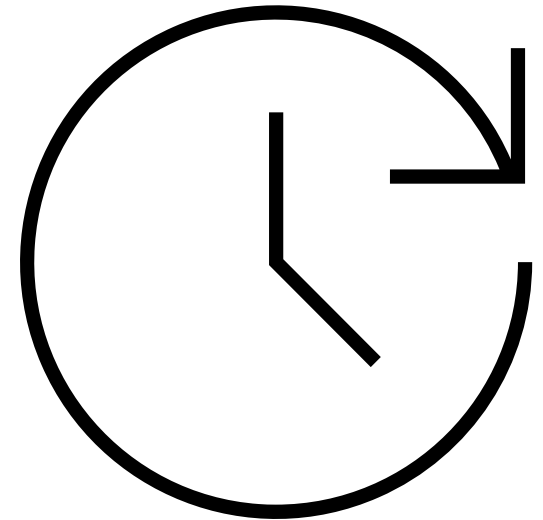


M2 occlusion



Sn 64%
Sp 97%

Prognostication



Prognostication



You

Provide a unique estimate of the mRS value at 3-months following mechanical thrombectomy of an anterior circulation ischemic stroke of the patient with the following characteristics: Age: 35 years ; Sex: Male ; Previous mRS: 0 Comorbidities: Atrial fibrillation: No ; Heart failure: No ; Arterial hypertension: No ; Diabetes mellitus: No ; Dyslipidemia: No ; Coronary artery disease: No ; Current smoking: Yes ; Active cancer: No ; Current medications: Oral anticoagulation: No ; Antiplatelets : No ; Statins: No ; Last-Time-Seen-Well-to-door delay (minutes): 180 ; NIHSS at admission: 9 ; Admission systolic blood pressure (mmHg): 124 ; Admission glucose (mg/dL): 107 ; ASPECTS score: 10 ; Intervention type: Thrombolysis and thrombectomy ; Last-Time-Seen-Well-to-needle time if IV thrombolysis (minutes): 740 ; Occlusion site: M1 ; Tandem occlusion: No ; Last-Time-Seen-Well-to-puncture time (minutes): 429 ; General anesthesia during mechanical thrombectomy: No ; Final mTICI score: 2c ; Total number of device passes: 2 ; Last-Time-Seen-Well-to-reperfusion time (minutes): 545.

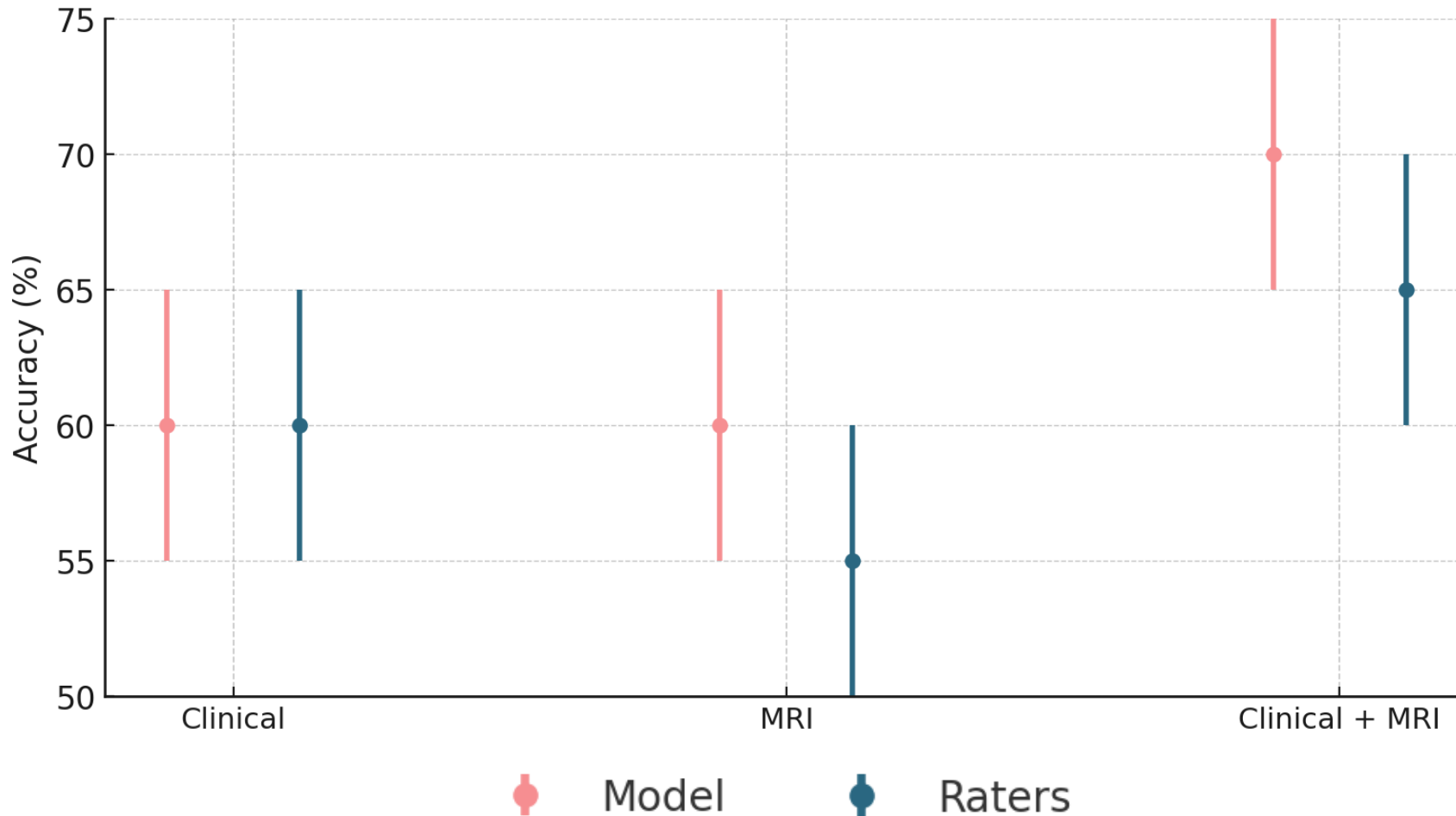


ChatGPT

Considering the provided information and the generally positive indicators for a favorable outcome, a unique estimate for the mRS at 3 months following mechanical thrombectomy could be 1.

Accuracy 49%

Prediction of functional outcome (mRS)



Meta-analysis:

Sn 74%

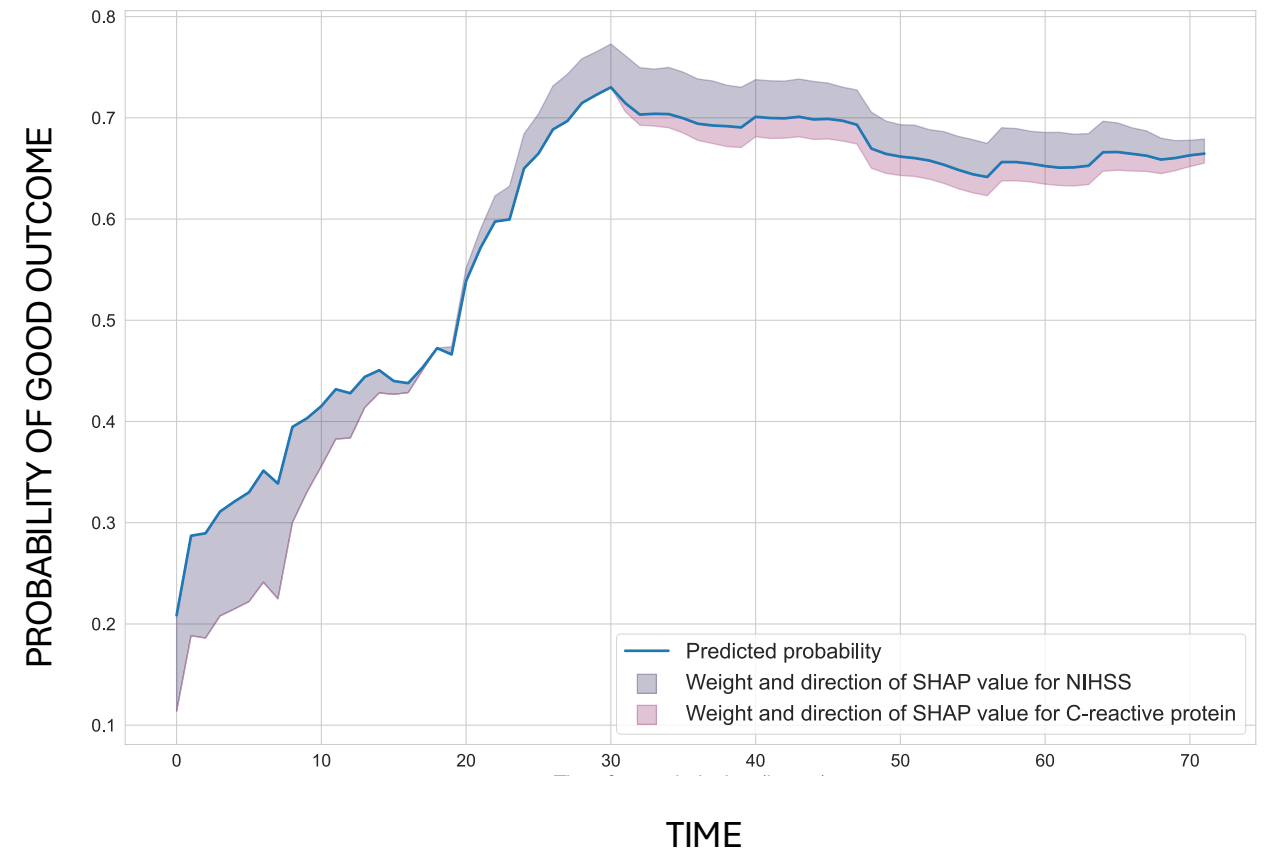
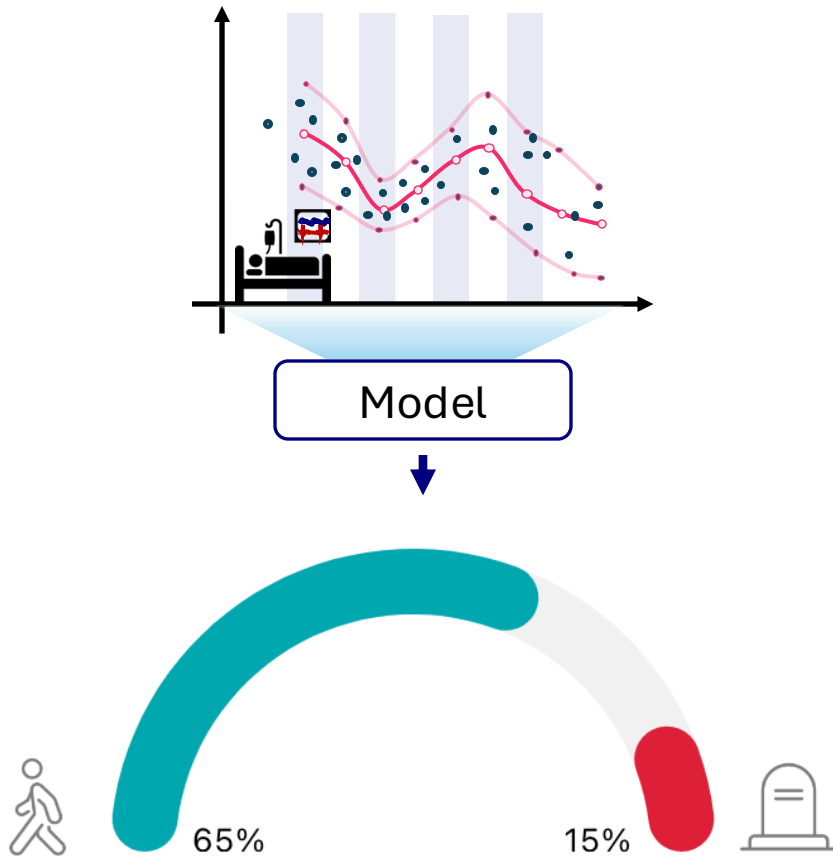
Sp 72%

Almost no
external validation

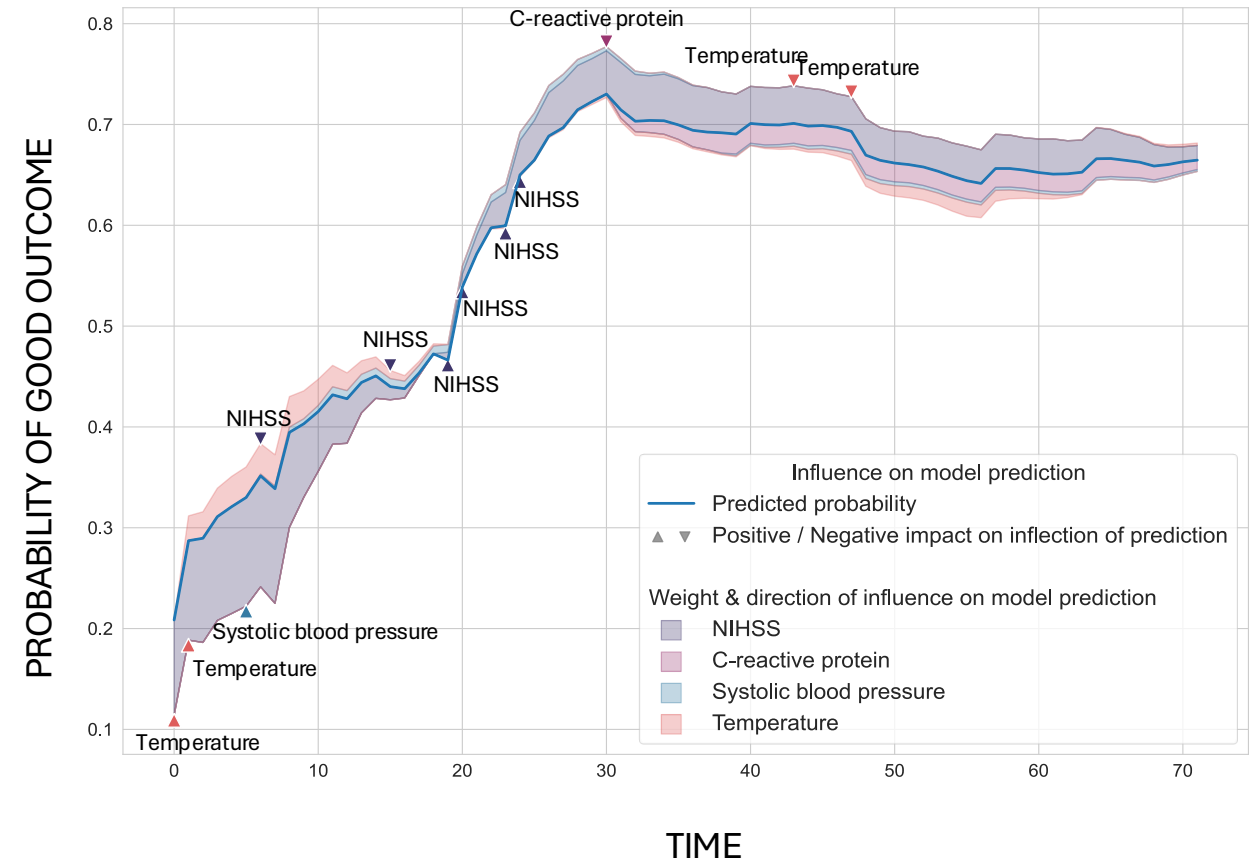
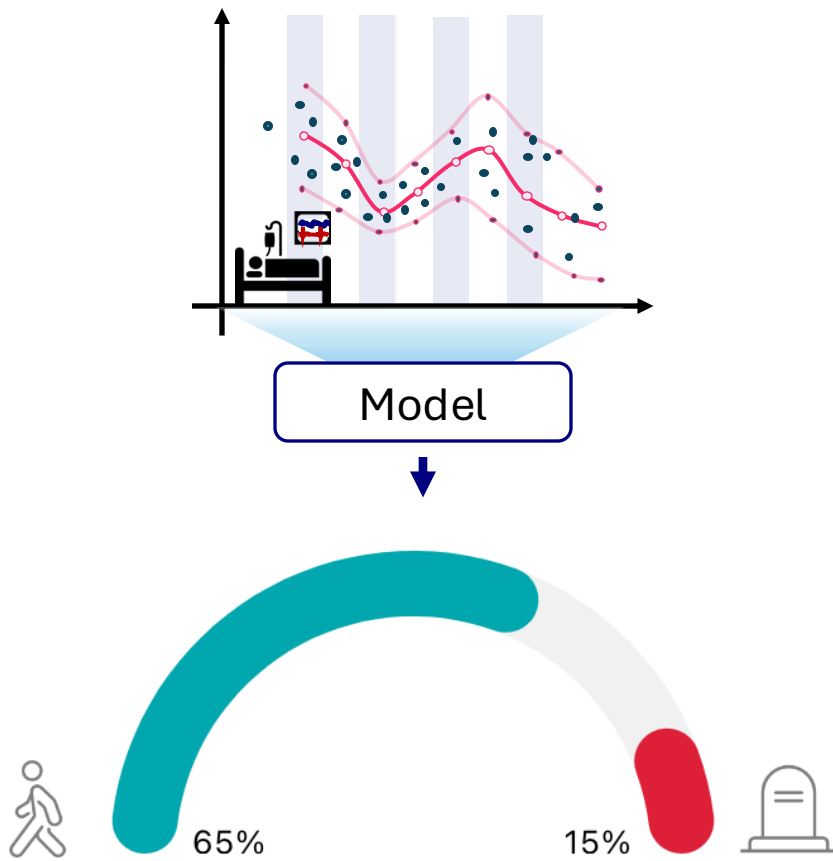
Intelligent stroke unit



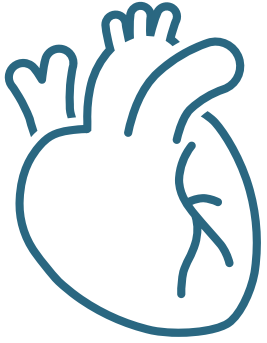
Intelligent stroke unit



Intelligent stroke unit



Intelligent stroke unit



Afib

Sn 39%

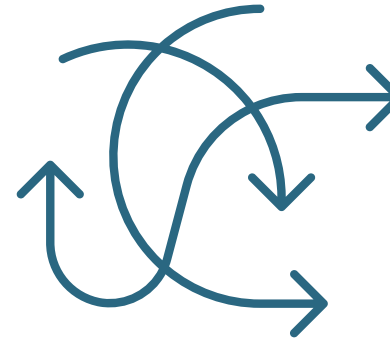
Sp 90%



Intracranial
hypertension

Sn 74%

Sp 73%



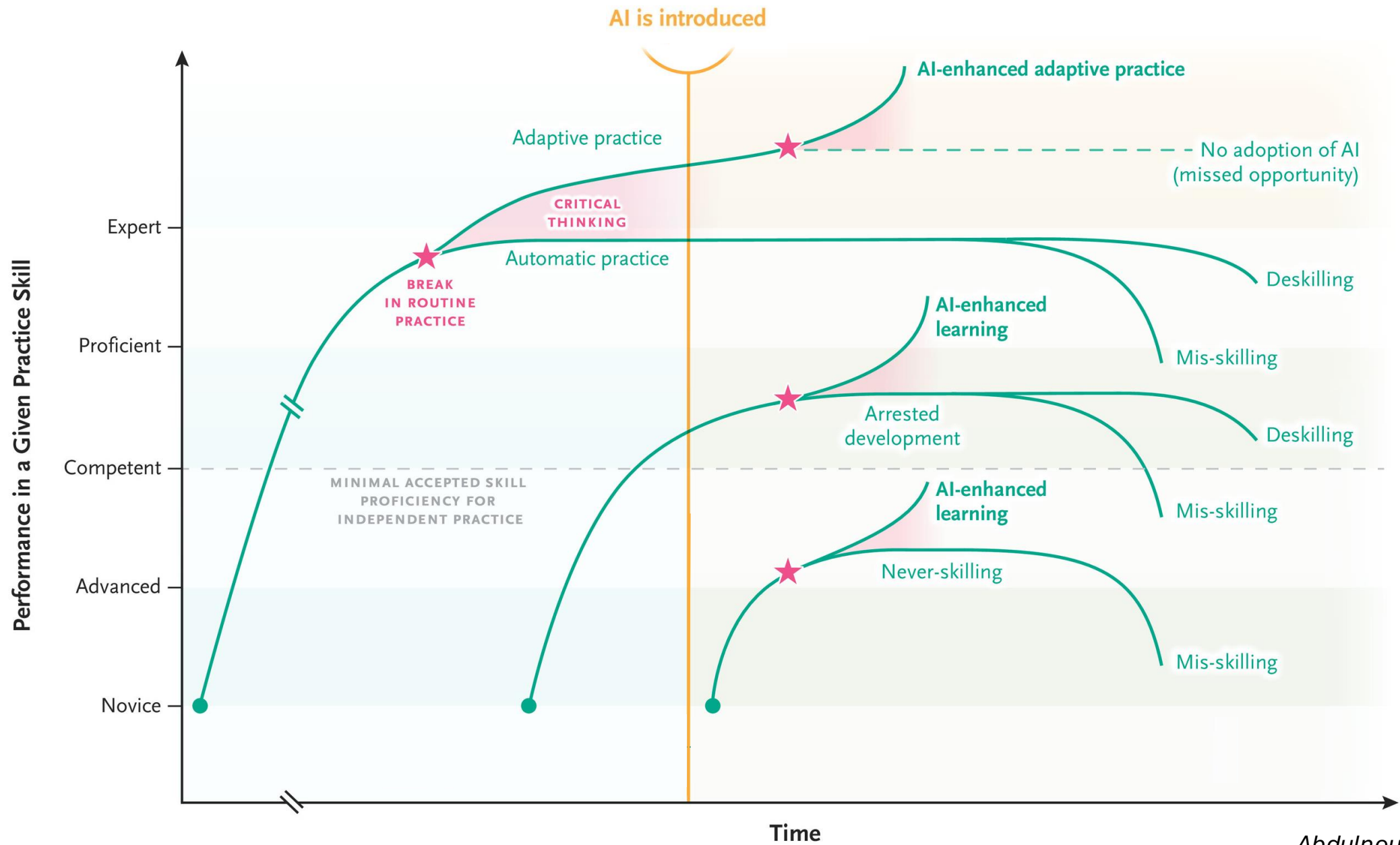
Delirium

AUC 70%



Falls

Intelligent video
surveillance



Intelligence artificielle dans la prise en charge de l'AVC



