Supplementary Materials

Details of the included variables and the calculation method for individual scores can be

found in Supplementary Tables 1-3.

The HEP score¹ was not calculated because data on dementia and current smoking status were missing in our cohort. The Swirl Sign Score System² was not calculated as detailed morphological features on the swirl sign were not collected in our cohort.

The original Spot Sign Score³ was developed in a cohort of patients investigated with mixed single-phase and dynamic CTA protocols. For pragmatic purposes, we calculated separately a "applied to single-phase CTA-Spot Sign Score" and "applied to multi-phase CTA-Spot Sign

Score" in our cohort.

NCCT scores	Score assessment
BAT Score (maximum score=5 points)	• Blend sign = 1 point
Morotti et al 2018 ⁴	• Any hypodensity = 2 points
	• Onset-to-imaging time <2.5 hours = 2 points
BRAIN Score (maximum score =24 points)	• Baseline ICH volume <10mL (0 point), 20-20mL (5
Wang et al 2014 ⁵	points), >20mL (7 points)
	Recurrent ICH= 4 points
	• Anticoagulation Use*= 6 points
	• IVH= 2 points
	• Onset-to-imaging time= for each hour 5 to 0 point
Basal Ganglia Score** (maximum score= 7	• Onset-to-imaging time <6 hours = 1 point
points)	• Baseline ICH volume $\geq 30 \text{mL} = 1 \text{ point}$
Huang et al. 2018 ⁶	• Island sign = 1 point
	• Blend sign = 1 point
	• Swirl sign = 1 point
	• Anticoagulation Use or INR>1.5 = 1 point
	• IVH = 1 point
NAG Score (maximum score= 3 points)	• NIHSS $\geq 10 = 1$ point
Sakuta et al. 2018 ⁷	• Anticoagulation Use = 1 point
	• Serum Glucose $\geq 133 \text{ mg/dL} = 1 \text{ point}$
HEAVN Score (maximum score= 8 points)	• Heterogeneous density = 2 points
Miyahara et al. 2018 ⁸	• Peri-hematoma edema = 1 point

Supplementary Table 1. Assessment of NCCT Hematoma Expansion Prediction Scores

	• Anticoagulation use = 1 point
	• Initial ICH volume > 30 mL = 1 point
	• Blend or Fluid-level sign = 2 points
HEP Score (maximum score=18 points)	• Onset-to-imaging time= for each hour 5 to 0 point
Yao et al. 2015 ¹	• Dementia = 4 points
	• Current Smoking = 3 points
	• Antiplatelet use = 3 points
	• GCS = 9-11 (1 point); 6-8 (2 points); 3-5 (3 points)
	• SAH on CT = 2 points
NCCT Expansion Score (maximum score=2)	• Hypodensity sign = 1 point
Rodriguez-Luna et al. 2023 ⁹	• Ultra-early Growth $>5mL/h = 1$ point
"Li et al. NCCT Score" (maximum score=14)	• GCS=≥9 (1 point); 6-8 (3 points); 3-5 (5 points)
Li et al. 2023 ¹⁰	• Initial ICH= ≤ 18 mL (1 point); 18-45 mL (3 points);
	>45 mL (5 point)
	• NCCT signs= only island sign (2 points), only blend
	sign (2 points), at least two NCCT signs (island sign,
	blend sign, black hole sign, fluid levels) (4 points)***
"Kong et al. NCCT Score" (maximum	• GCS $\leq 8=2$ points
score=11)	• $uHG \ge 2.7 mL/h = 2.5 \text{ points}$
Kong et al. 2021^{11}	• At least one NCCT sign (island sign, black hole,
	blend sign, fluid level)= 2 points
	• Use of anticoagulants= 4.5 points
Swirl Sign Score System	Number of swirl sign
Chen et al. 2024^2	Maximum diameter
	Swirl shape
	Boundary
	Minimum CT
	• Minimum distance from the swirl to the edge

NCCT= Non-Contrast CT. ICH= Intracerebral Hematoma. IVH= Intraventricular Hematoma. INR=

International Normalized Ratio. GCS=Glasgow Coma Scale. SAH=Subarachnoid Hemorrhage. uHG=ultra-early Hematoma Growth.

* The original score was "Warfarin"

** original score developed only for deep ICH

*** At least one of the NCCT signs must be the island or blend sign

Supplementary Table 2. Assessment of sCTA Hematoma Expansion Prediction Scores

sCTA scores	Score assessment
"applied to sCTA- Spot Sign Score" (maximum	• Spot signs number= $1-2$ (1 point); ≥ 3 (2 points)
score=4)	• Spot sign maximum axial diameter $\geq 5 \text{ mm} = 1$
Delgado Almandoz et al. 2009 ¹²	• Spot sign maximum CT density $\geq 180 \text{ HU} = 1$
9-Point Score (maximum score=9)	• Anticoagulation use* = 2
Brouwers et al. 2014 ¹³	• Onset-to-imaging time < 6 hours = 2
	• Initial ICH volume= 30-60 mL (1 point); >60 mL
	(2 points)
	• Spot Sign present = 3
PREDICT A Score (maximum score=21)	• Onset-to-imaging time= for each hour 5 to 0
Huynh et al 2015 ¹⁴	• Anticoagulation use*= 6
	• Spot Sign number= 1 (4 points); ≥ 2 (8 points)
	• GCS $\leq 13 = 4$ points
PREDICT B Score (maximum score=28)	• Onset-to-imaging time= for each hour 5 to 0
Huynh et al. 2015^{14}	• Anticoagulation use*= 6
	• Spot Sign number= 1 (4 points); ≥ 2 (8 points)
	• NIHSS = 5-14 (4 points); ≥15 (7 points)
Acute ICH Growth Score (maximum score=7)	• $uHG > 5mL/h = 1$
Al-Ajlan et al 2017 ³	• Irregular Shape = 1
	• Heterogeneous density = 1
	• Fluid-level sign = 1
	• Spot sign = 1
	• Anticoagulation Use = 2
sCTA Expansion Score (maximum score=3)	• $uHR > 5mL/h = 1$
Rodriguez-Luna et al. 2023 ⁹	• Spot Sign = 2

sCTA=single-phase CT Angiography. ICH=Intracerebral Hematoma. GCS=Glasgow Coma Scale.

NIHSS=National Institutes of Health Stroke Scale. uHG=ultra-easly Hematoma Growth.

* The original score was "Warfarin"

Supplementary Table 3. Assessment of mCTA Hematoma Expansion Prediction Scores

mCTA scores	Score assessment
"applied to mCTA Spot Sign Score" (maximum	• Spot signs number $1.2(1 \text{ point}) > 2(2 \text{ points})$
score= 4) Delgado Almandoz et al. 2009 ¹²	 Spot signs number = 1-2 (1 point); ≥5 (2 points) Spot sign maximum axial diameter ≥5 mm = 1 point
	 Spot sign maximum C1 density ≥ 180 HU = 1 point
mCTA Expansion Score (maximum score=2)	• Spot sign in 1^{st} phase = 1 point
Rodriguez-Luna et al. 2023 ⁹	• Spot sign in any phase = 1 point

mCTA=multi-phase CT Angiography.

Calibration plots for scores to predict HE

We divided predicted probabilities into deciles to evaluate calibration and computed the mean observed proportion of HE within each decile. We generated a calibration plot for each score. The blue lines represent the observed proportion of HE calculated as the mean event rate within each decile, while the red line represents ideal calibration (perfect agreement between predicted and observed probabilities). Points above the red line indicate overestimation (predicted probability higher than observed), whereas points below indicate underestimation.



Supplementary Figure 1. BAT score



Supplementary Figure 2. BRAIN score

Supplementary Figure 3. Basal Ganglia Score



Supplementary Figure 4. NAG Score



Supplementary Figure 5. HEAVN Score



Supplementary Figure 6. NCCT Expansion Score



Supplementary Figure 7. "Li et al. NCCT Score"



Supplementary Figure 8. "Kong et al. NCCT Score"



Supplementary Figure 9. "applied to sCTA- Spot Sign Score"





Supplementary Figure 10. 9-Point Score

Supplementary Figure 12. PREDICT B Score

Supplementary Figure 13. Acute ICH Growth Score

Supplementary Figure 14. sCTA Expansion Score

Supplementary Figure 15. "applied to mCTA- Spot Sign Score

Supplementary Figure 16. "mCTA Expansion Score"

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