

Rutgers Annual Stroke Conference
September 18, 2026

THE TIMING QUESTIONS

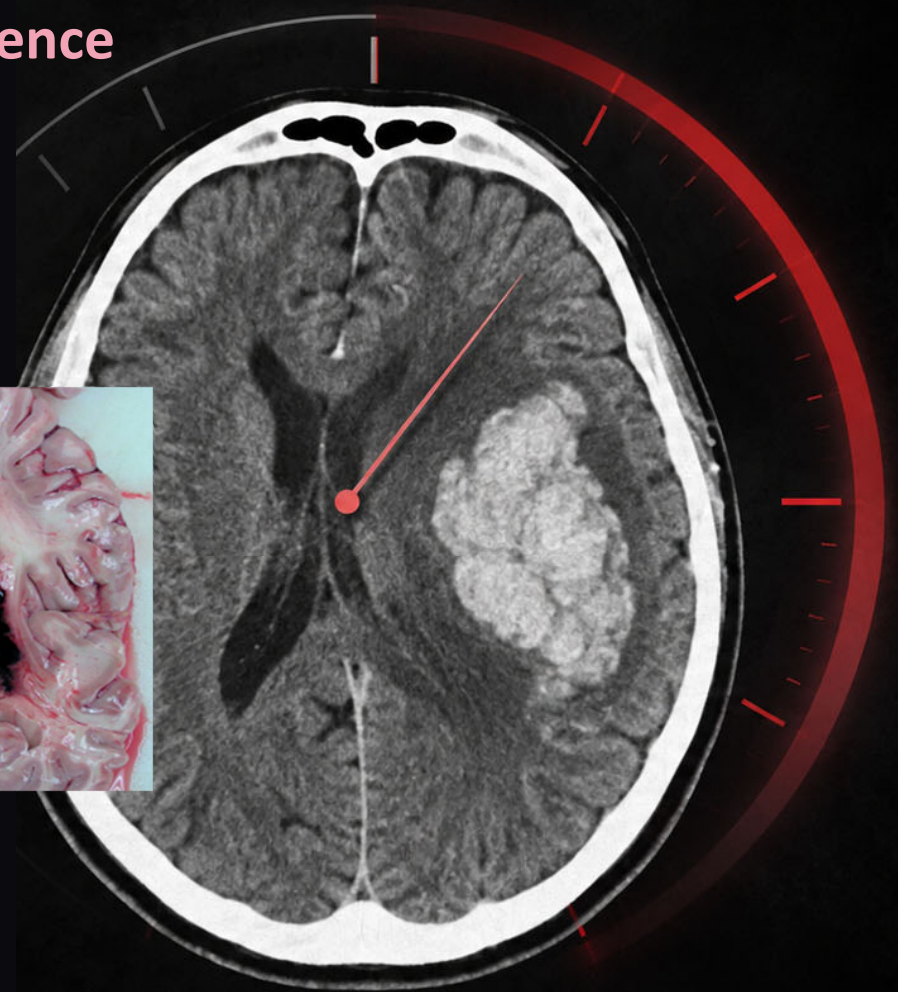
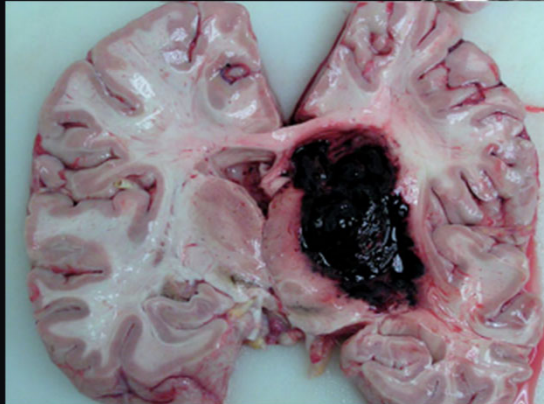
Minimally Invasive ICH Evacuation Revisited

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Disclosures and learning goals

DISCLOSURE

Site principal investigator

NIH MINUTE trial
NCT07260916

BY THE END OF THIS TALK

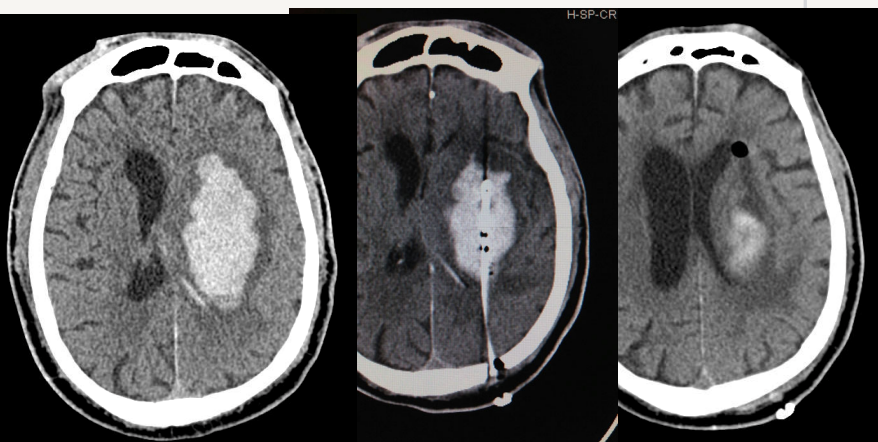
Compare evacuation times and outcomes in ENRICH, MIND, and MISTIE III.

Separate the evidence for lobar ICH from the unresolved deep ICH question.

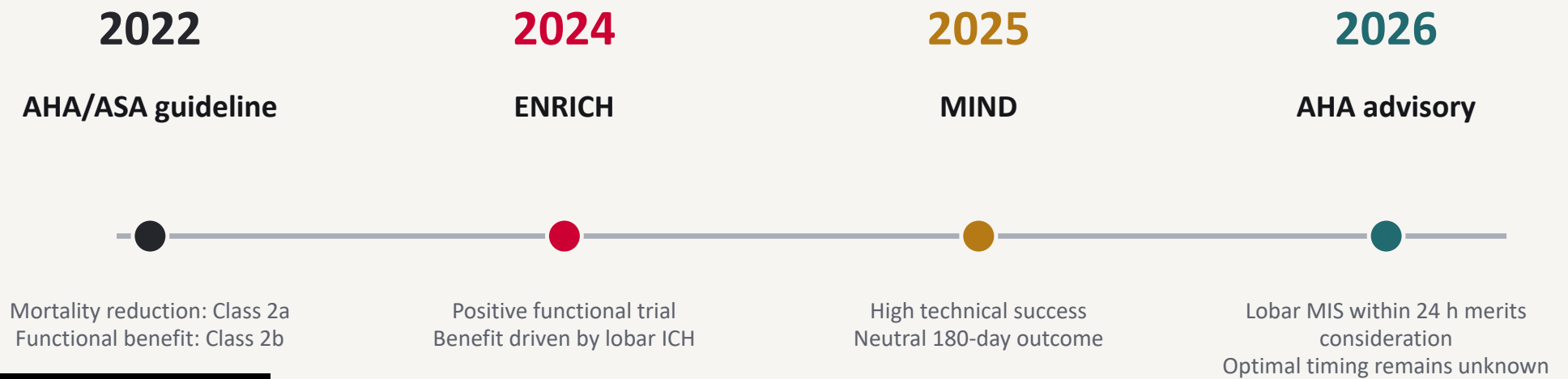
Apply a stabilization-to-evacuation workflow that avoids preventable delay.

Focus

The timing decision, not a device comparison



What changed since the 2022 guideline



Timing is now a candidate treatment variable, not just an eligibility cutoff.

Four clocks start at ictus

01

Hematoma

Expansion risk is front-loaded. Mass effect and inflammatory injury continue after bleeding stops.

02

Hemostasis

Reversal, blood pressure control, and vascular imaging determine physiologic readiness.

03

Procedure

Trajectory, visualization, evacuation speed, and bleeding control shape the operative risk.

04

Evidence

Trial windows, achieved treatment times, location, and technique define what we can infer.

A single onset-to-OR number cannot capture all four.

RCT timing landscape

Hours from onset or last known well

ENRICH

Direct tubular evacuation

17 h

permitted to 24 h

MIND

Direct endoscopic
evacuation

28 h

permitted to 72 h

MISTIE III

Catheter aspiration plus
alteplase

47 h

permitted to 72 h

0 8 16 24 48 72

Window
achieved median

ENRICH: early direct evacuation changed the field

TRIAL DESIGN

300 patients, age 18-80

Lobar or anterior basal ganglia ICH, 30-80 mL

GCS 5-14, NIHSS >5, baseline mRS 0-1

Tubular transsulcal parafascicular evacuation within 24 hours

17 h

Median onset-to-evacuation

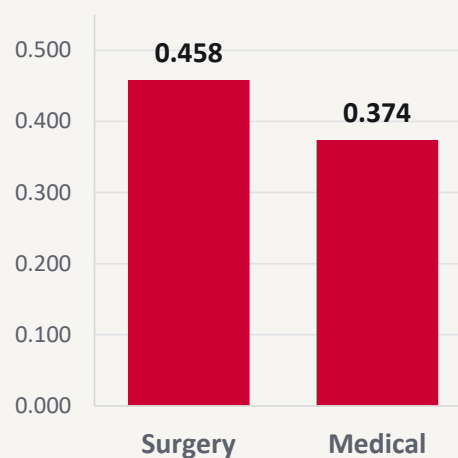
IQR 11-21 h

7 mL

Median residual volume

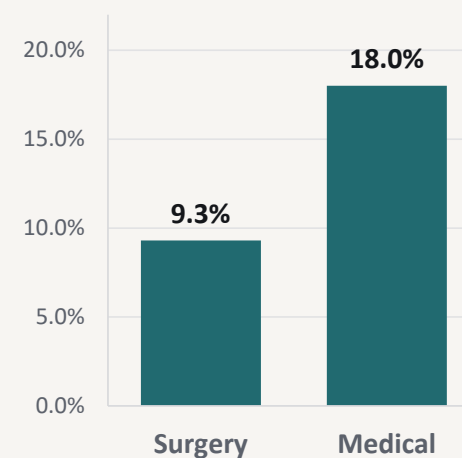
IQR 2-17 mL

180-DAY UTILITY-WEIGHTED MRS



Difference 0.084
95% Bayesian CrI 0.005-0.163
Posterior probability 0.981

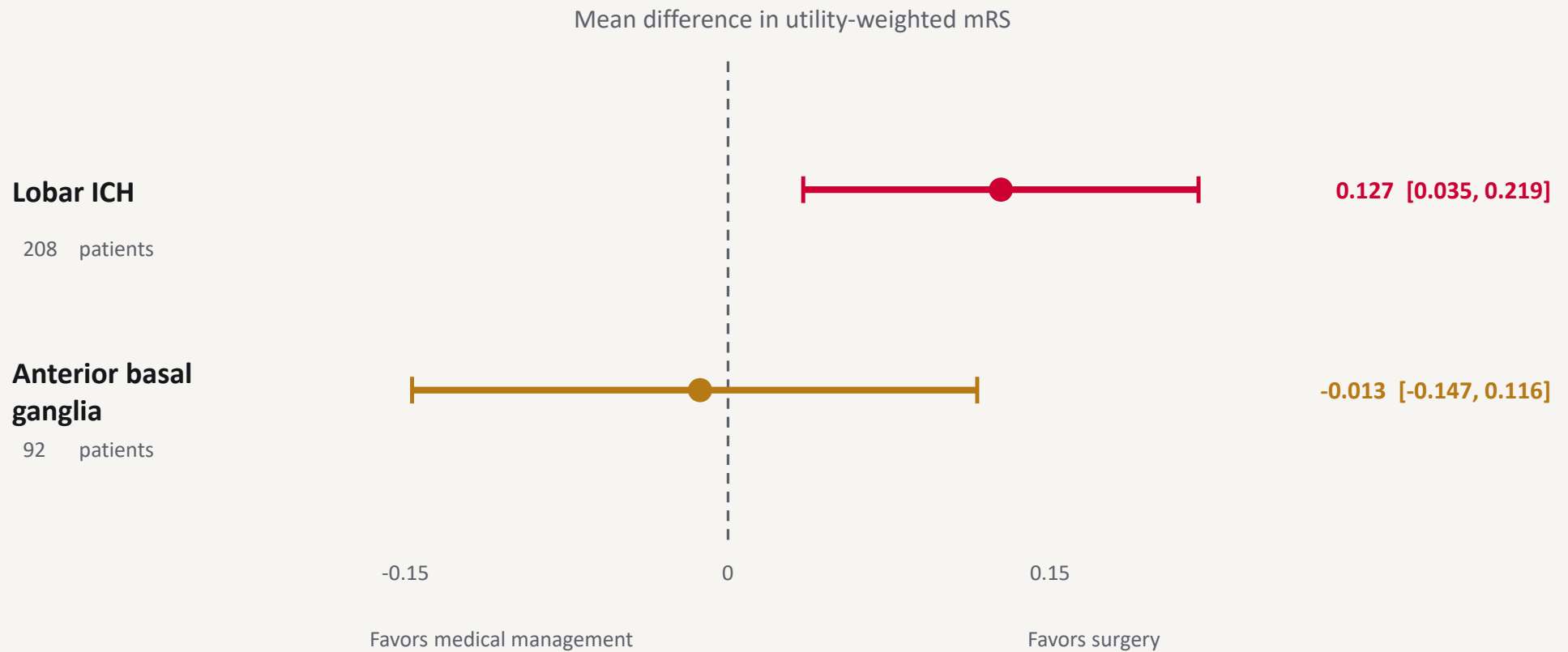
30-DAY MORTALITY



Postoperative rebleeding with neurologic decline: 3.3%

Functional benefit was driven by lobar ICH.

Location modified the ENRICH treatment effect



MIND: technical success with a neutral 180-day result

POPULATION AND TIMING

236

Patients enrolled before early stop

154 surgery, 82 medical

28 h

Median onset-to-evacuation

IQR 21-46 h

69.5%

Deep hemorrhage

72 lobar, 164 deep

79.2%

Reached residual ≤ 15 mL

Median residual 6 mL

CLINICAL OUTCOMES

1.03

Unadjusted common OR for 180-day mRS
96% CI 0.62-1.72, P=.45

mRS 0-2

16.7%

surgery

16.7%

medical

30-day mortality

7.2%

9.8%

Later timing and a deep-heavy cohort limit comparisons with ENRICH.

MISTIE III: stability-first, gradual decompression

Diagnostic CT

Acute ICH ≥ 30 mL

Stability CT

≥ 6 h later, growth < 5 mL

Catheter

Stereotactic aspiration

Alteplase

1 mg every 8 h as needed

47 h

Median onset-to-treatment

IQR 33-60 h

13 mL

Median residual volume

60% reached ≤ 15 mL

Functional outcome

45% vs 41%

mRS 0-3 at 365 days, $P=.33$

Mortality

19% vs 26% $P=.04$

Three RCTs tested three different timing strategies

	ENRICH	MIND	MISTIE III
Technique	Tubular direct	Endoscopic direct	Catheter + alteplase
Dominant location	Lobar (69%)	Deep (70%)	Deep (62%)
Volume	30-80 mL	20-80 mL	≥ 30 mL
Permitted window	<24 h	<72 h	<72 h
Achieved median	17 h	28 h	47 h
Median residual	7 mL	6 mL	13 mL
Primary functional result	Positive overall, lobar-driven	Neutral	Neutral

Cross-trial differences in outcome cannot isolate timing from location, technique, or population.

Pooled evidence supports MIS, but certainty narrows

2025 COCHRANE REVIEW

24 RCTs

4,597 participants across surgical comparisons

Good functional outcome

RR 1.36

95% CI 1.18-1.58

All-cause mortality

RR 0.71

95% CI 0.60-0.84

Low-risk-of-bias restriction

RR 1.12

95% CI 0.96-1.32

Functional benefit loses significance when restricted to low-risk-of-bias trials.

The pooled signal does not settle who benefits, when to operate, or which technique to use.

| The observational timing signal

0.95

adjusted odds ratio per additional
hour

95% CI 0.92-0.98
P=.004

90-patient endoscopic cohort

All patients underwent MIS within 72 hours.

Earlier evacuation remained associated with good long-term outcome after adjustment.

Younger age, lobar location, and absence of IVH also predicted favorable outcome.

Association is not causation. Selection and workflow confounding remain.

Ultra-early evacuation changes the hemostasis problem

<5 h

**Ultra-early endoscopic
evacuation**

142 consecutive patients

+2.4

points on intraoperative bleeding
score

14% vs 3%

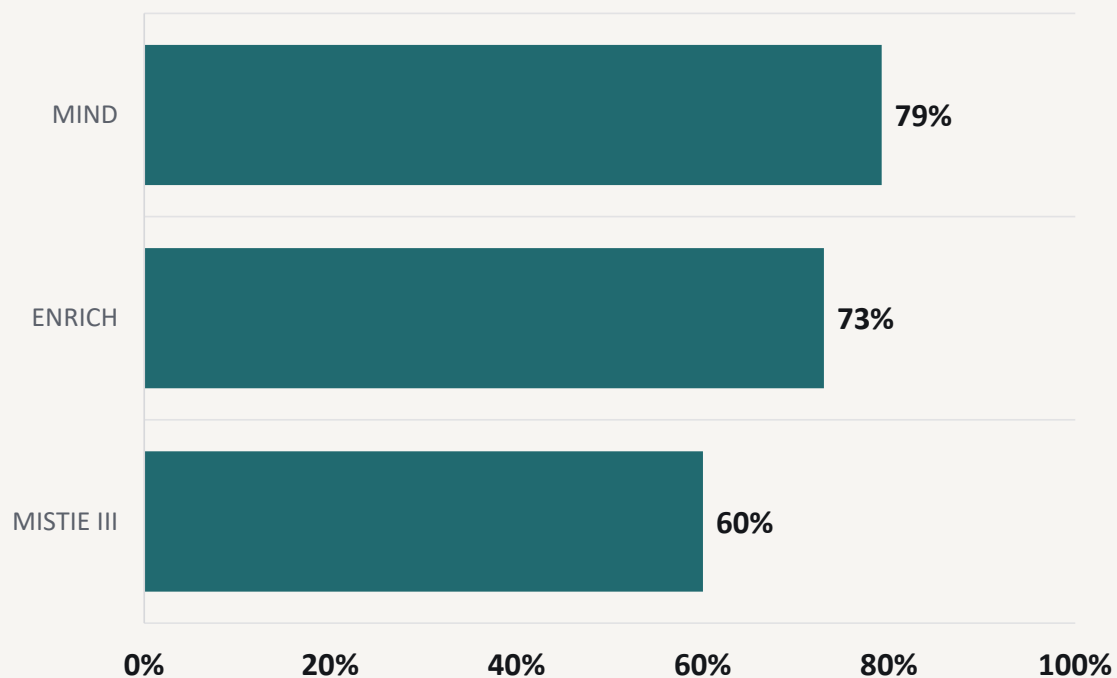
postoperative rebleeding, P=.23

0% vs 6%

30-day mortality, P=.99

Direct visualization and active hemostasis may allow safe study of the earliest window.

Residual clot below 15 mL is a target, not a verdict



MISTIE III

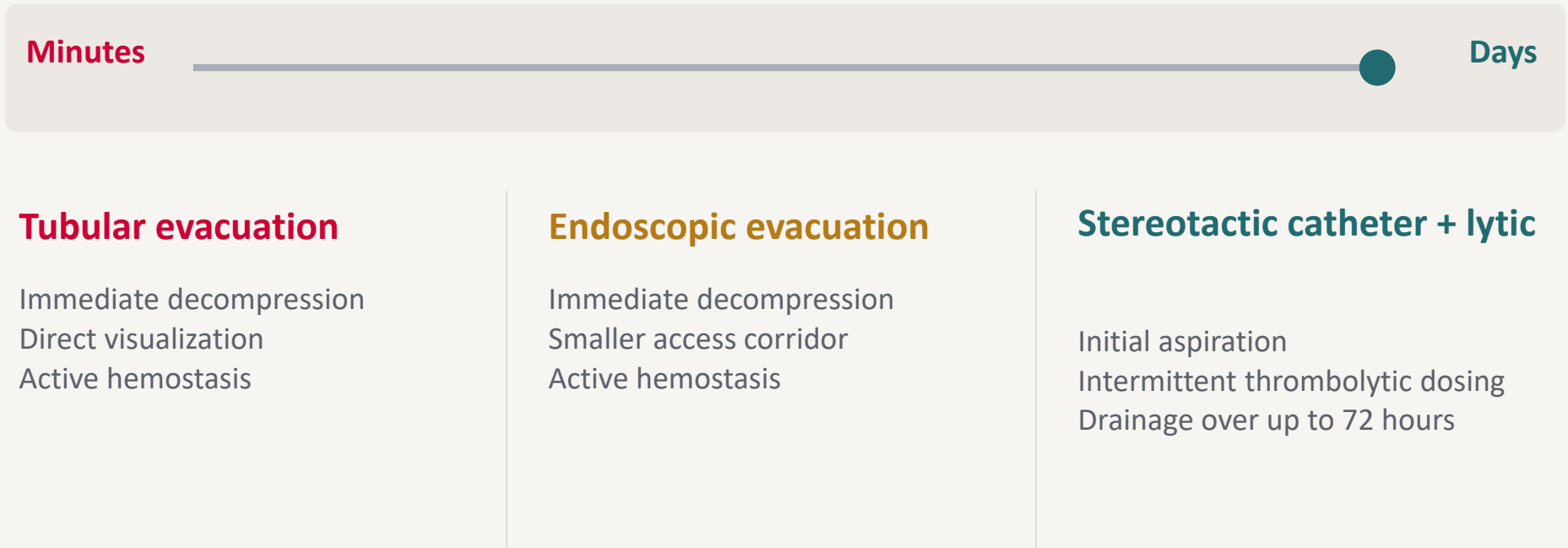
Post hoc analyses linked lower residual volume with better outcomes.

MIND

The highest rate of reaching the target did not produce a significant 180-day benefit.

Technical success appears necessary, but it is not sufficient.

Technique changes the meaning of time to evacuation



A shared onset-to-procedure number does not represent a shared biological intervention.

| The first hour remains medical

60

minutes

INTERACT3 care bundle

Common OR 0.86 for worse functional outcome
Serious adverse events 16.0% vs 20.1%

01 Reverse anticoagulation

Aim for rapid correction. The advisory cites 60 minutes as a potentially beneficial target.

02 Control blood pressure

Target SBP 130-140 mm Hg in the advisory, with attention to renal and perfusion risk.

03 Obtain vascular imaging

CTA helps exclude a secondary cause and informs the operative plan.

04 Prevent secondary injury

Maintain normothermia and guideline-based glucose targets while the team mobilizes.

Readiness before direct evacuation

MISTIE LOGIC

Radiographic stability served as a protocol gate before catheter-directed thrombolysis.

Stability CT at least 6 hours after the diagnostic scan
Growth <5 mL
Corrected coagulation parameters

DIRECT-EVACUATION LOGIC

Current trials define readiness through rapid stabilization and intraoperative bleeding control.

CTA excludes a secondary lesion
Reversal is complete and BP is controlled
A trained team can achieve direct visualization and hemostasis
Repeat CT remains appropriate after deterioration or a meaningful interval

Define readiness by physiology, imaging, and operative capability rather than a fixed waiting period.

Practical timing windows in 2026



Candidate profile with the strongest current support

LOBAR ICH

30-80 mL

Surgery within 24 hours

Do not automatically exclude

Reversed anticoagulation or correctable coagulopathy
Correctable antiplatelet use
Suspected cerebral amyloid angiopathy

Neurologic severity	GCS 5-14 and NIHSS >5
Premorbid status	mRS 0-1 in the advisory's best-supported profile
Age	Trial evidence largely limited to age ≤ 80
Imaging	No underlying vascular lesion, tumor, trauma, or dominant IVH
Physiology	No herniation and coagulopathy can be corrected
Technical goal	A safe trajectory with residual clot ≤ 15 mL

Deep ICH remains the unanswered question

ENRICH

17 h

median treatment time

Anterior basal ganglia
cohort crossed futility
threshold

MIND

28 h

median treatment time

Deep-heavy cohort with
neutral 180-day result

MISTIE III

47 h

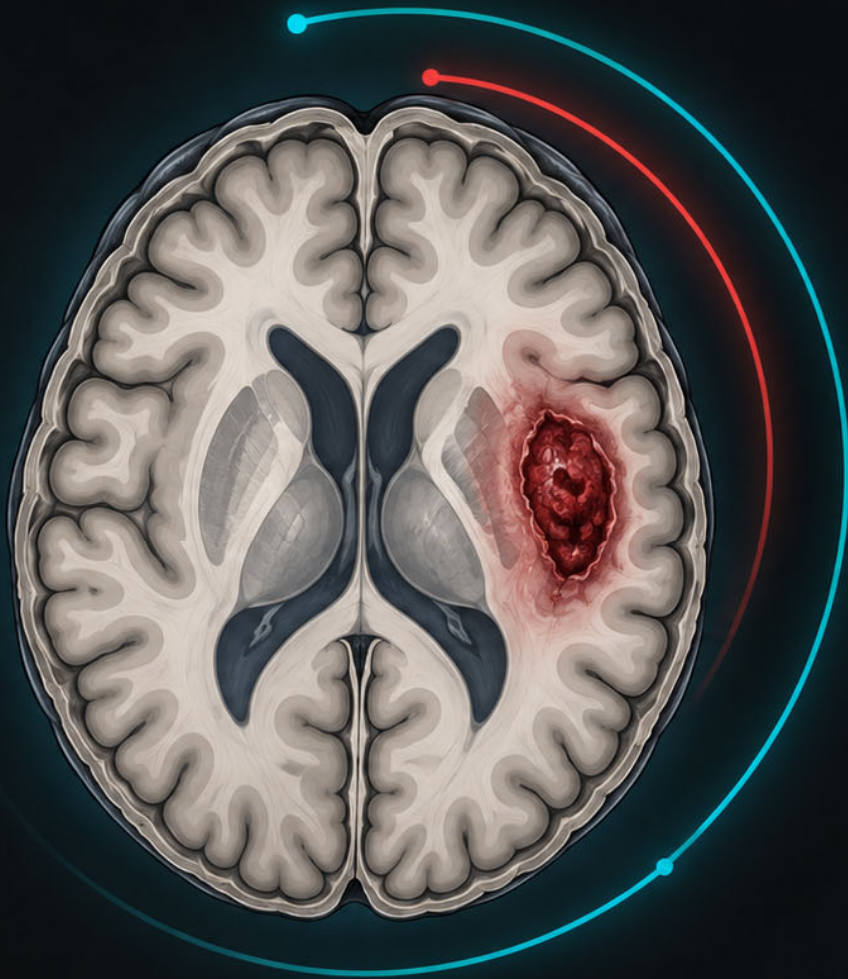
median treatment time

Deep-majority cohort with
mortality, not functional,
signal

2026

Trial enrollment
best addresses the
evidence gap for
eligible deep ICH.

MINUTE and REACH directly test early evacuation in basal ganglia hemorrhage.



NIH STROKENET • NCT07260916

MINUTE

Testing earlier evacuation
for basal ganglia ICH

300 participants • adaptive enrichment design

1:1 SCUBA + standard care vs standard care

Two randomization cohorts: <8 h | 8–16 h

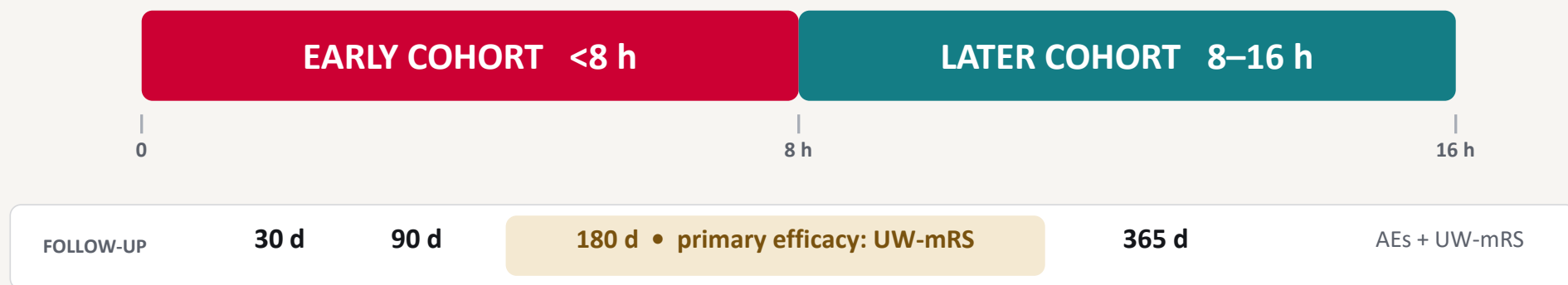
RECRUITING

Randomize by 16 h from last known
well

MINUTE: randomization and timing cohorts



RANDOMIZATION TIME FROM ONSET / LAST KNOWN WELL



MINUTE: who fits the trial?

+ Core inclusion

Age 18–80; pre-ICH mRS 0–2

Spontaneous, supratentorial, nonthalamic basal ganglia ICH ≥ 20 mL

NIHSS ≥ 6 ; GCS ≥ 7

CTA/MRA excludes an underlying vascular lesion

Randomize ≤ 16 h from LKW; surgery feasible ≤ 120 min after randomization

× High-yield exclusions

Thalamic, infratentorial, or secondary ICH; midbrain extension

INR >1.4 , aPTT >40 , or DOAC/LMWH exposure at onset

Platelets $<100,000$ or platelet dysfunction

IVH occupying $>50\%$ of either lateral ventricle

DNR/DNI, pregnancy, or active systemic infection



Operational screen: CTA/MRA • consent/LAR • active life-saving treatment goals

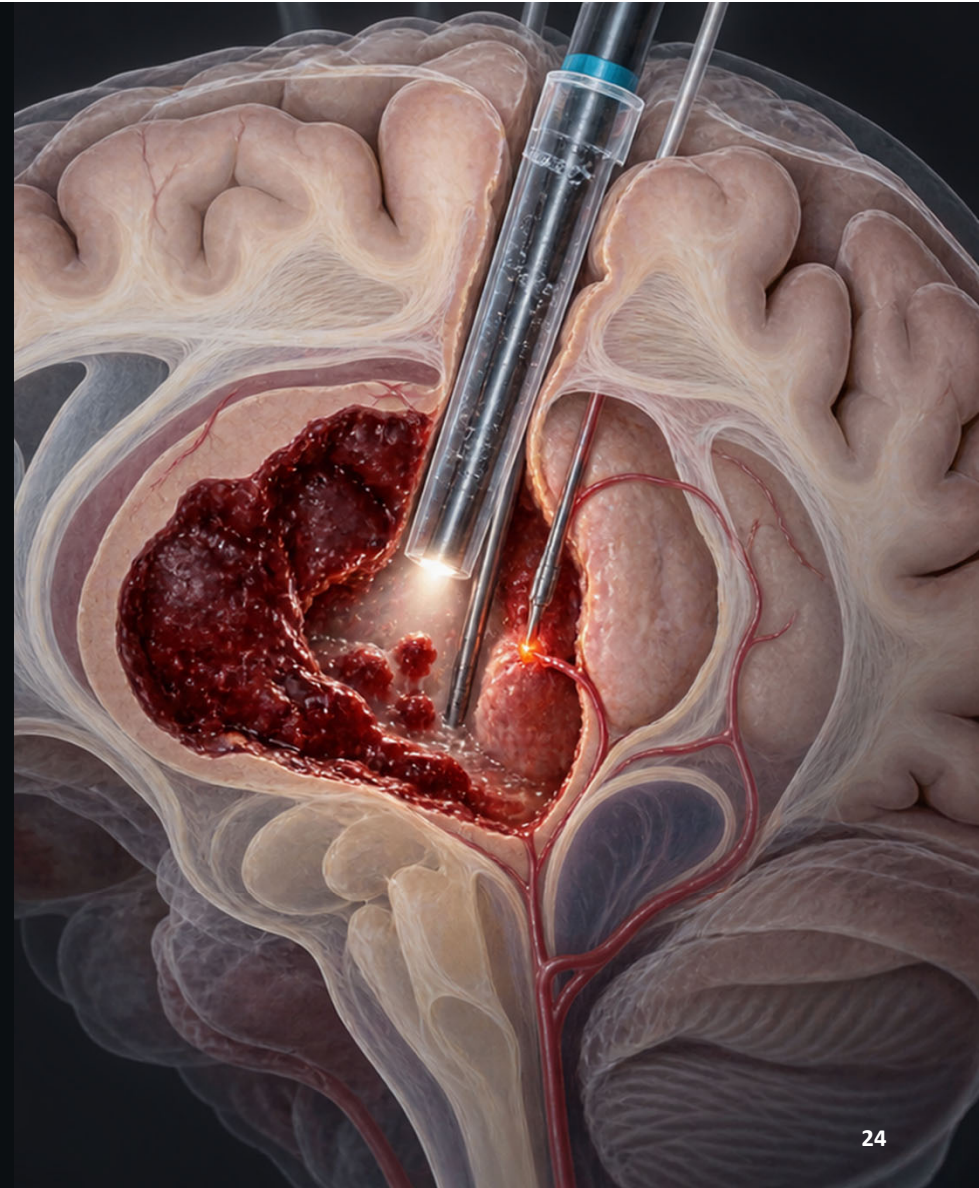
MINUTE • PROCEDURAL LOGIC

SCUBA evacuation

A technique built around visualization and hemostasis

- 01 **Plan** Long-axis trajectory into the hematoma
- 02 **Enter** Access through a transparent sheath
- 03 **Evacuate** Endoscopic suction + irrigation under direct vision
- 04 **Control** Identify and treat active bleeding before closure

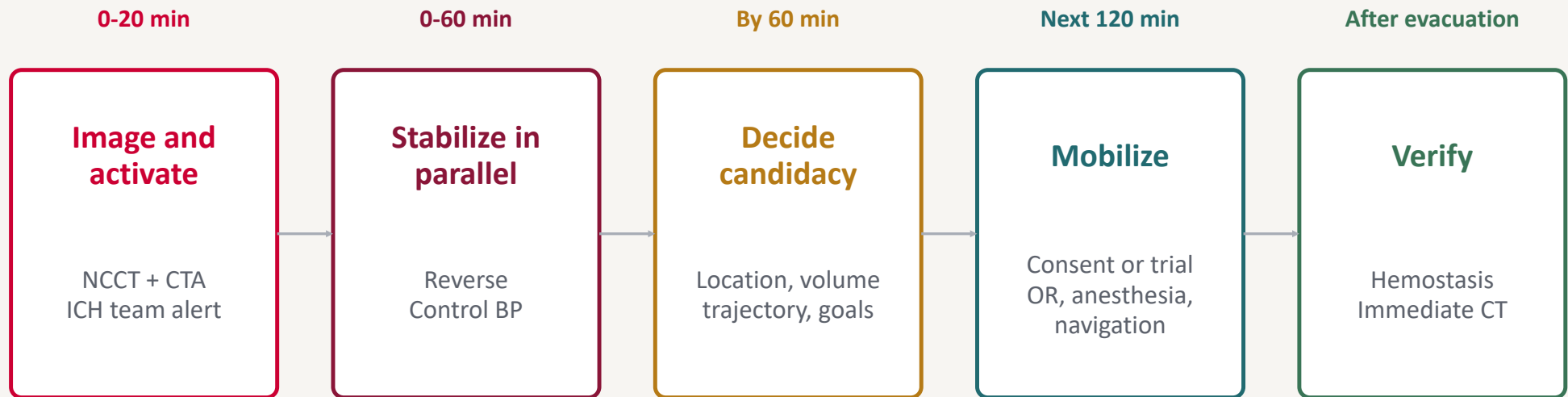
Earlier surgery raises the premium on visualization and hemostatic control.



Trials that will define the clock

Trial	Population	Timing target	Technique	Planned n
DIST	Supratentorial ≥ 10 mL	Start < 8 h	Endoscopic	600
EVACUATE	Supratentorial ≥ 20 mL	Start < 8 h	Aurora Surgiscope	240
EMINENT	Lobar, BG, or thalamic 20-100 mL	Start 6-24 h	Endoscopic	200
MINUTE	Nonthalamic BG ≥ 20 mL	Randomize ≤ 16 h; surgery target < 120 min	SCUBA endoscopic	300
REACH	Anterior BG 20-80 mL	Goal OR < 8 h; required < 24 h	Tubular MIPS	600

A proposed door-to-evacuation pathway



Operational principle

Run stabilization, surgical review, and trial screening concurrently.

Case 1: lobar ICH at 6 hours

COMPOSITE CASE

Age

68

Premorbid mRS

0

Location

Left frontal lobar

Volume

52 mL

GCS / NIHSS

11 / 16

CTA

No vascular lesion

BP

138 mm Hg

Anticoagulation

None

What would you do?

Proceed with early MIS now

Wait for another stability CT

Continue medical management alone

Transfer to a higher-volume ICH center

Current evidence supports discussing early MIS within 24 hours when safe evacuation to ≤ 15 mL is feasible.

Case 2: basal ganglia ICH at 5 hours

COMPOSITE CASE

Age	Premorbid mRS
63	0
Location	Volume
Right putaminal	42 mL
GCS / NIHSS	Thalamus
9 / 18	No extension
CTA	INR
No vascular lesion	1.0

Evidence-aligned next step

**Screen immediately for an
early deep-ICH trial**

MINUTE

Outside a trial, individualize rescue surgery.
Current randomized evidence has not
established functional benefit for routine deep
ICH evacuation.

Take-home points

- 01** Selected lobar ICH now has randomized evidence for MIS within 24 hours.

- 02** The actual treatment time matters more than the outer edge of a trial window.

- 03** Ultra-early surgery encounters more active bleeding, which makes visualization and hemostasis central.

- 04** Residual clot ≤ 15 mL is a procedural target, not a guarantee of functional benefit.

- 05** Deep ICH and the earliest time windows should remain high-priority trial questions.

Questions

**The timing question
remains open.
The treatment window is
becoming testable.**

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