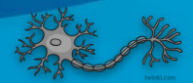
The Neuroscience Institute
The Jewish Hospital
MERCYHEALTH

Acute Ischemic Stroke: Key Guideline & Practice Updates

John Kachoris, MD
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Medpace, Inc.

Disclosures

- None



AHA/ASA GUIDELINE

2026 Guideline for the Early Management of Patients With Acute Ischemic Stroke: A Guideline From the American Heart Association/American Stroke Association

Endorsed by the American Association of Neurological Surgeons/Congress of Neurological Surgeons, Neurocritical Care Society, the Society for Academic Emergency Medicine, the Society of NeuroInterventional Surgery, and the Society of Vascular and Interventional Neurology.

The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists.

Guideline Writing Group

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January 2026

IV Thrombolysis

- Thrombolytic Agent of Choice
  - Tenecteplase (TNK)
    - 0.25 mg/kg (max 25 mg) bolus
  - Alteplase (tPA)
    - 0.9 mg/kg (max 90 mg)
    - 10% given as bolus
    - Remainder infused over 60 minutes
  - High-Dose Tenecteplase (TNK)
    - 0.4 mg/kg IVP
    - May increase risk of sICH without improving functional outcomes
- Mild Non-Disabling Stroke
  - Within 4.5 h from LKW ⇒ Should *not* receive thrombolytic
    - No superiority in improved functional outcomes *compared to DAPT*







IV Thrombolysis

Inclusion Criteria

- Diagnosis of ischemic stroke causing measurable neurologic deficit
- Onset of symptoms or Last Known Well (LKW) < 4.5 h before treatment begins*

Consider if Benefits are Greater Than Risks of Bleeding

- Extracranial cervical dissections
- Extra-axial intracranial neoplasms
- Angiographic procedural stroke
- Unruptured intracranial aneurysm
- History of GI/GU bleeding
- History of MI
- Recreational drug use
- Uncertainty of stroke diagnosis/stroke mimics
- Moya-Moya

Relative Contraindications

- Pre-existing disability
- DOAC exposure
- Ischemic stroke within 3 months
- Prior ICH
- Recent major non-CNS trauma (14d - 3mo)
- Recent major non-CNS surgery (≤ 10d)
- Recent GI/GU bleeding (≤ 21d)

Relative Contraindications (Cont.)

- Intracranial arterial dissection
- Intracranial vascular malformations
- Recent STEMI within 3 mo
- Acute pericarditis
- Left atrial or ventricular thrombus
- Systemic active malignancy
- Pregnancy & post-partum period
- Dural puncture within 7d
- Arterial puncture of noncompressible site within 7d
- Moderate to severe TBI (≥ 14d - 3mo)
- Intracranial/spinal surgery (≥ 14d - 3mo)

Absolute Contraindications

- CT Head with extensive hypodensity
- CT head with acute ICH
- SBP > 185 or DBP > 110
- Moderate to severe TBI < 14d
- Intracranial/spinal surgery < 14d
- Acute spinal cord injury within 3mo
- Intra-axial neoplasm
- Infective endocarditis
- Severe coagulopathy or thrombocytopenia
- Aortic arch dissection
- Amyloid immunotherapy or ARIA

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Endovascular Thrombectomy

- Anterior Circulation LVO (ICA or M1): **0-6 Hours** & NIHSS Score ≥ 6

  - ASPECTS 0-2
    - ▻ Select patients < 80 yo
    - ▻ mRS 0-1
    - ▻ Ø sig mass effect

    2a Reasonable

  - ASPECTS 3-10
    - ▻ mRS 0-1

    1 Beneficial

  - mRS 2 (Mild Disability)
    - ▻ ASPECTS ≥ 6

    2a Reasonable

  - mRS 3-4 (Moderate Disability)
    - ▻ ASPECTS ≥ 6

    2b May Be Reasonable

  - Dominant M2 Division
    - ▻ *Reasonable, benefits uncertain*
    - ▻ mRS 0-1
    - ▻ ASPECTS ≥ 6

    2a Reasonable

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  - ASPECTS ≥ 6

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  - *Reasonable, benefits uncertain*
  - mRS 0-1
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2b May Be Reasonable

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  - *Reasonable, benefits uncertain*
  - mRS 0-1
  - ASPECTS ≥ 6

May be reasonable

2a Reasonable

Endovascular Thrombectomy

- Anterior Circulation LVO (ICA or M1): **6-24 Hours** & NIHSS Score ≥ 6
  - ASPECTS 3-5
    - ▻ Select pts < 80 yo
    - ▻ mRS 0-1
    - ▻ ∅ sig mass effect
    - ▻ Favorable CTP

    1 Beneficial
  - ASPECTS 6-10
    - ▻ mRS 0-1
    - ▻ Favorable CTP

    1 Beneficial
- Other Circulation LVO

  3 No Benefit
  - Non-dominant proximal M2
  - Distal MCA
  - ACA
  - PCA

Endovascular Thrombectomy

- Anterior Circulation LVO (ICA or M1): **6-24 Hours** & NIHSS Score ≥ 6
  - ASPECTS 3-5
    - ▻ Select pts < 80 yo
    - ▻ mRS 0-1
    - ▻ ∅ sig mass effect
    - ▻ Favorable CTP

    1 Beneficial
  - ASPECTS 6-10
    - ▻ mRS 0-1
    - ▻ Favorable CTP

    1 Beneficial

- 6-16h *Beneficial*
- 16-24h *Reasonable*

- Other Circulation LVO
  - Non-dominant proximal M2
  - Distal MCA
  - ACA
  - PCA

3 No Benefit

Endovascular Thrombectomy

- Anterior Circulation LVO (ICA or M1): **6-24 Hours** & NIHSS Score ≥ 6
  - ASPECTS 3-5
    - ▻ Select pts < 80 yo
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    1 Beneficial

    • 6-16h *Beneficial*
    • 16-24h *Reasonable*
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    - ▻ mRS 0-1
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    1 Beneficial

- Other Circulation LVO

  3 No Benefit

  May Be Reasonable
  - Non-dominant proximal M2
  - Distal MCA
  - ACA
  - PCA

Endovascular Thrombectomy

- Basilar Artery Occlusion
  - NIHSS Score ≥ 10
    - 0-24 hours
    - mRS 0-1
    - PC-ASPECTS ≥ 6

1
Beneficial

  - NIHSS Score 6-9
    - 0-24 hours
    - mRS 0-1
    - PC-ASPECTS ≥ 6

2b
May Be Reasonable

Endovascular Thrombectomy

- Basilar Artery Occlusion
  - NIHSS Score ≥ 10
    - 0-24 hours
    - mRS 0-1
    - PC-ASPECTS ≥ 6

1
Beneficial

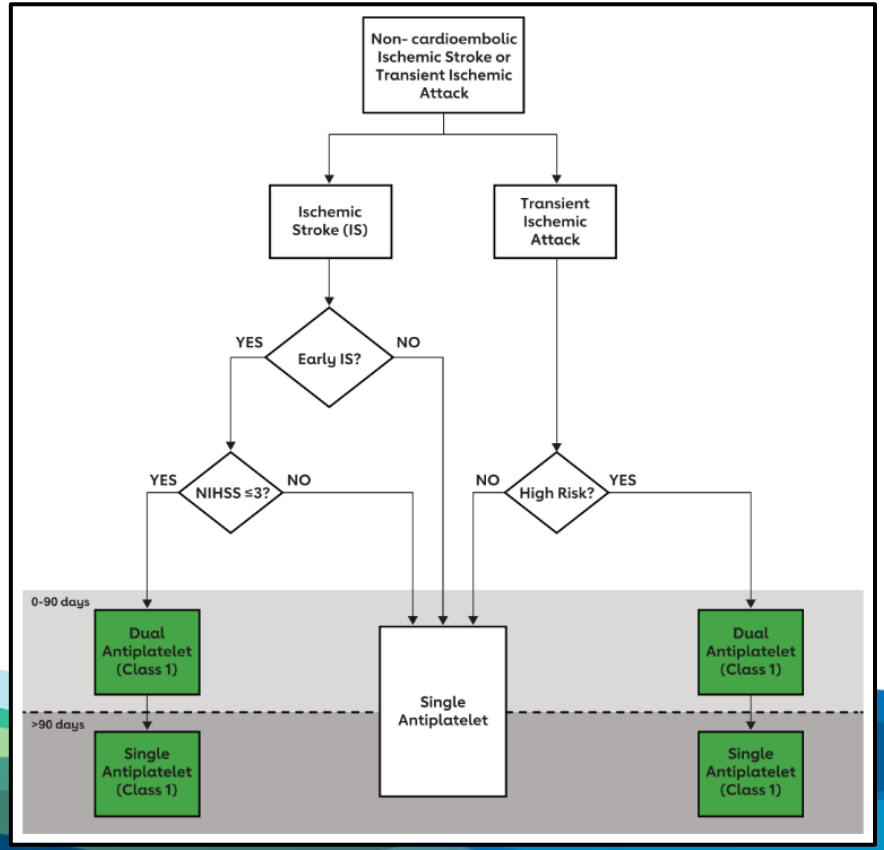
  - NIHSS Score 6-9
    - 0-24 hours
    - mRS 0-1
    - PC-ASPECTS ≥ 6

2b
May Be Reasonable

0-6 hrs: May Be Reasonable

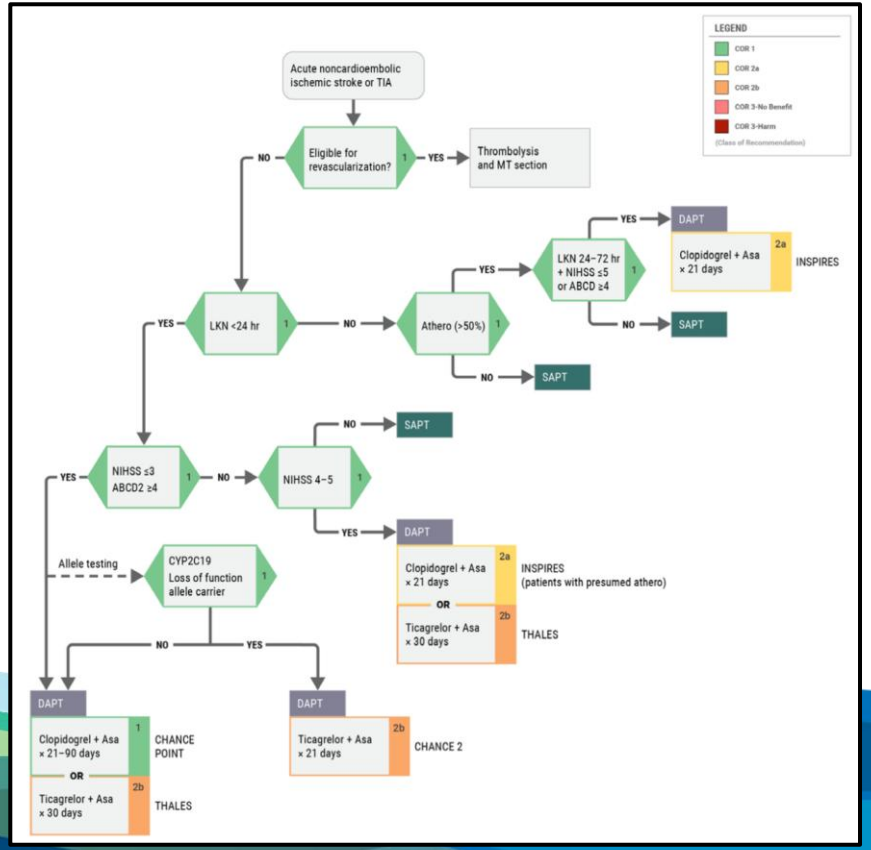
Dual Antiplatelet Therapy (DAPT)

- 2021 Guidelines



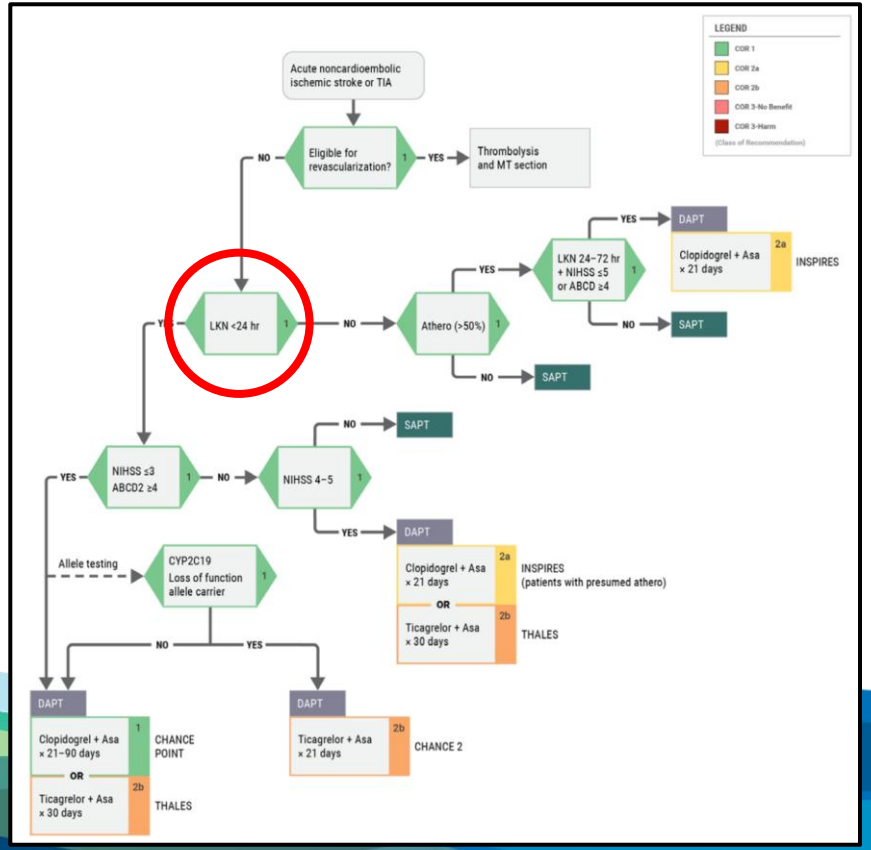
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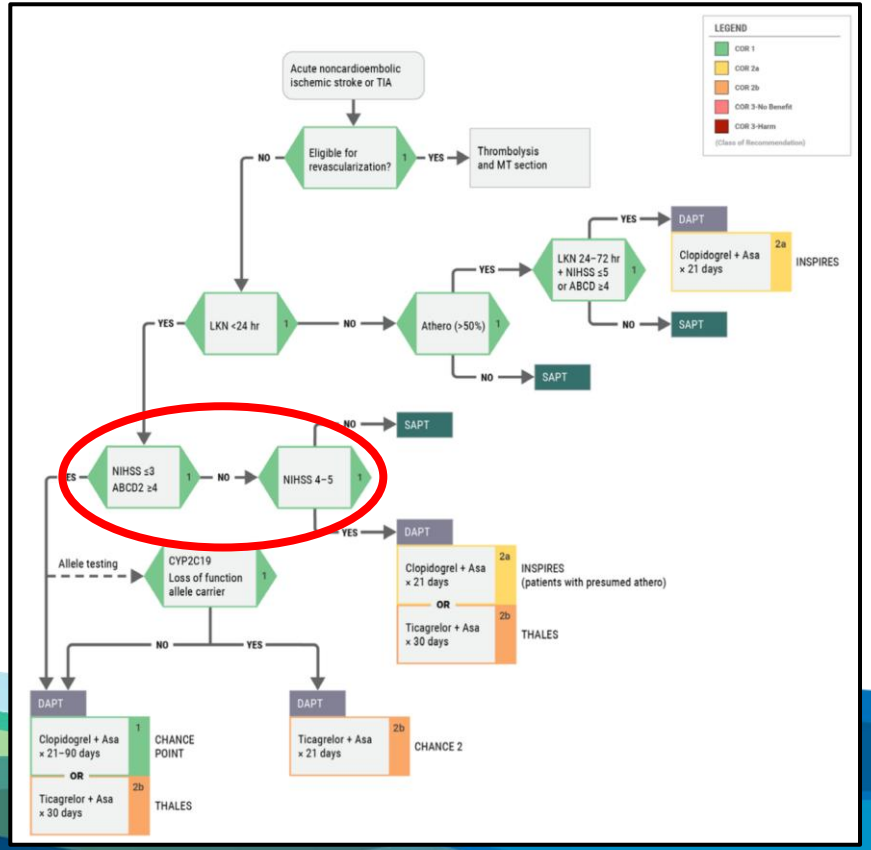
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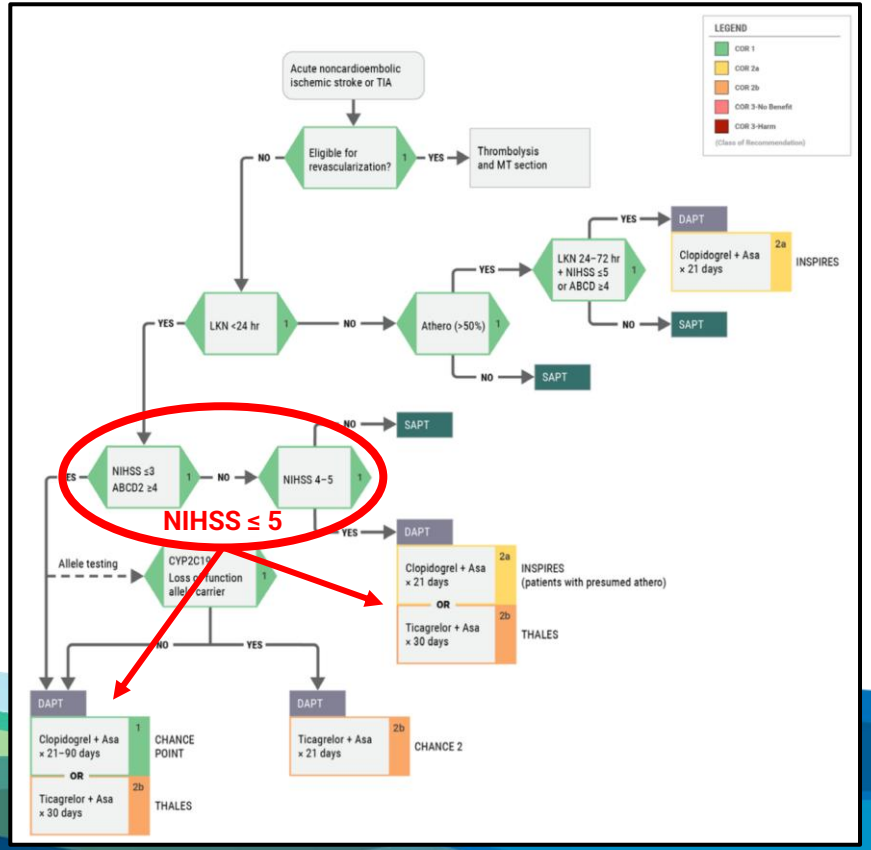
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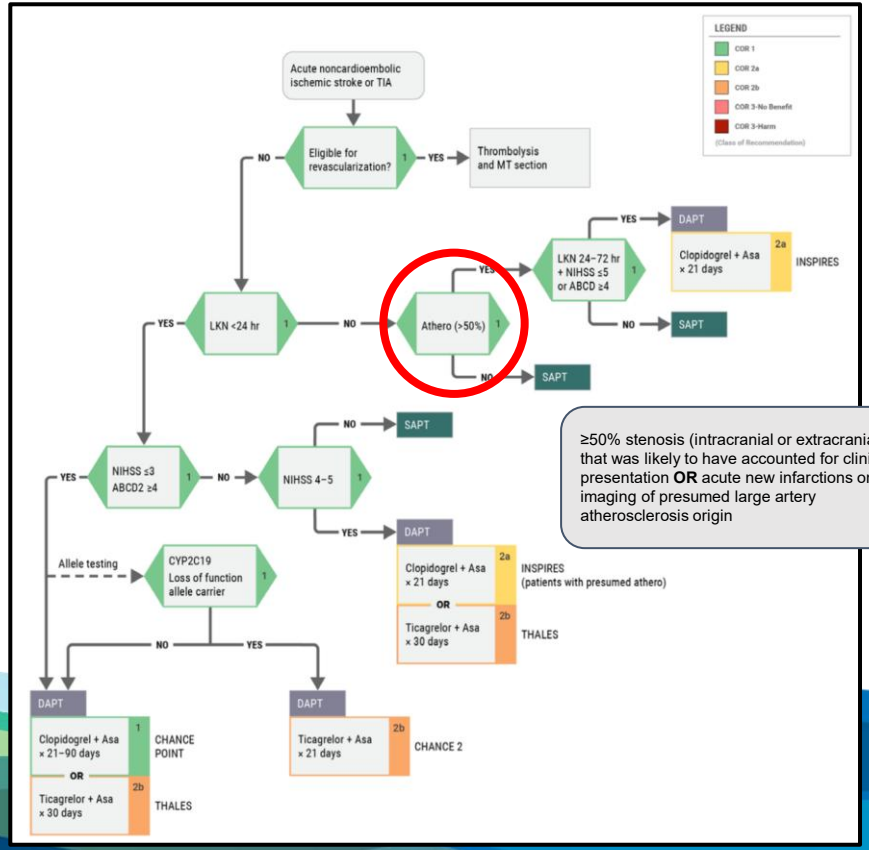
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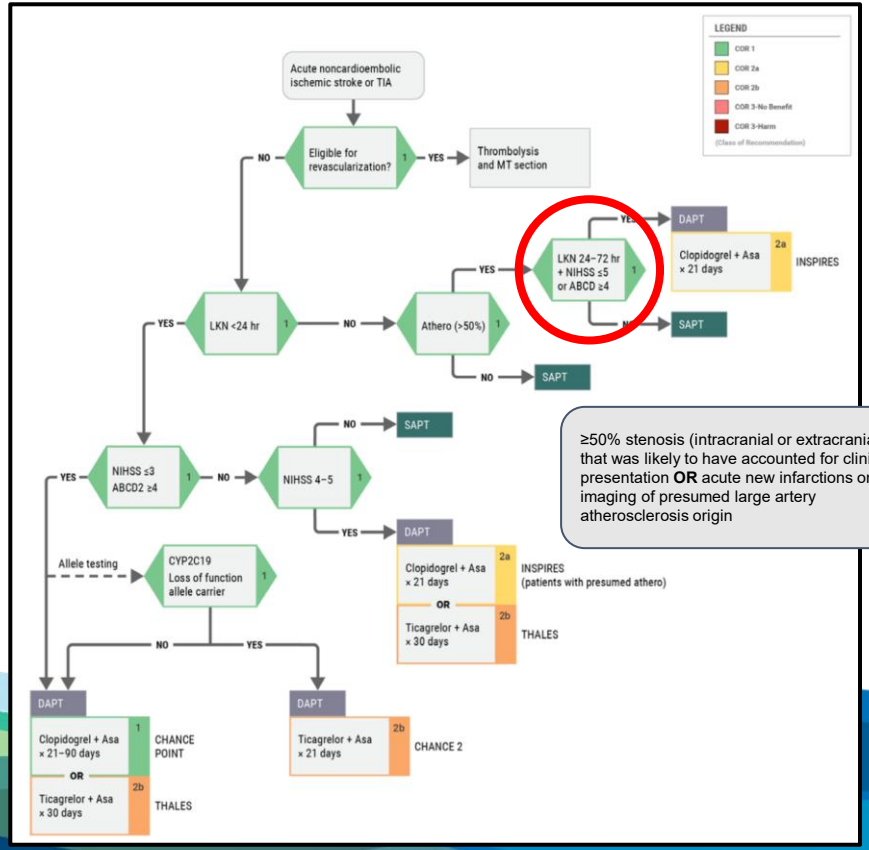
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Dual Antiplatelet Therapy (DAPT)

- 2026 Guidelines



Blood Pressure Management

- After IV Thrombolytic

  3
  No Benefit

  - Mild to moderate severity acute ischemic stroke
  - SBP target < 140 mmHg not associated with improved functional outcome compared to < 180 mmHg

- After Anterior Circulation EVT

  3
  Harm

  - TICI 2b, 2c, or 3
  - Without other indication for alternate BP target
  - SBP target < 140 mmHg for first 72 hours is harmful
    - Lower functional independence
    - Higher mortality
    - Early neurologic deterioration
    - Increased major disability at 3 months
  - Not enough data for specific posterior circulation stroke recommendations

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Anticoagulation

- Atrial Fibrillation
  - Carefully selected patients (eg, milder severity)
  - Early oral anticoagulation is low risk
    - Reasonable compared to delayed anticoagulation
    - Efficacy for prevention of early recurrent stroke is not established
  - What is early?
    - OPTIMAS trial: ≤ 4 days (compared to 7-14 days)
    - TIMING trial: ≤ 4 days (compared to 5-10 days)
    - ELAN trial: ≤ 48 h for mild/moderate strokes & 6-7 days for major strokes

2a
Reasonable

Surgical Management

- Supratentorial Infarction
  - Decompressive Craniectomy with Dural Expansion
    - ≤ 60 years old — **1** Beneficial
      - Unilateral MCA infarctions
      - Neurologic deterioration (decreased level of consciousness) within 48 hours due to brain swelling despite medical therapy
      - Beneficial to reduce mortality and improve functional outcome
    - > 60 years old — **2b** May Be Reasonable
      - May be considered to reduce mortality
    - Post IV tPA Thrombolysis — **2b** May Be Reasonable
      - If development of malignant cerebral edema, despite medical therapy
      - Performed within 48 hours
      - No additional safety concerns

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      - If development of malignant cerebral edema, despite medical therapy
      - Performed within 48 hours
      - No additional safety concerns

Surgical Management

- Cerebellar Infarction
  - Obstructive Hydrocephalus
    - Ventriculostomy
      - Indication: Development of obstructive hydrocephalus
      - Outcome: Improves neurological function & decreases mortality
      - Concomitant or subsequent decompression may or may not be necessary

1 Beneficial

    - Decompressive Suboccipital Craniectomy with Dural Expansion
      - Indication: Neurologic deterioration *or* infarct volume ≥ 35 ml
      - Outcome: Improves outcomes & decreases mortality
        - Volume ≥ 35 ml ⇒ significant improvement in favorable outcomes at 1-year follow-up

1 Beneficial

Pediatric Acute Ischemic Stroke

- Prehospital
  - Pediatric screening tools
    - Good interrater reliability
    - Sensitivity, specificity, predictive value undetermined
    - Usefulness unknown

2b May Be Reasonable

- Imaging
  - MRI/MRA: Prefered initial imaging
  - CT/CTA: Acceptable if MRI not available within 25 minutes

2a Reasonable

- Thrombolytics
  - Confirmed AIS with disabling deficits in ages 28 days - 18 years within 4.5 h of symptom onset
    - Alteplase (tPA) is safe, but efficacy is uncertain

2b May Be Reasonable

Pediatric Acute Ischemic Stroke

- Endovascular Thrombectomy
  - ≥ 6 Years Old
    - Can be effective to improve functional outcomes:
      - LVO within 6 hours by experienced neurointerventionalists
      - LVO 6-24 hours with potentially salvageable brain tissue

2a
Reasonable

  - 28 days - 6 Years Old
    - May be reasonable to improve functional outcomes:
      - AIS ± 1st time seizure due to LVO
      - Within 24 hours
      - With potentially salvageable brain tissue
      - Done by neurointerventionalists with pediatric experience

2b
May Be Reasonable

Pediatric Acute Ischemic Stroke

- Considerations for Non-Pediatric Hospitals
  - Protocols for handling pediatric stroke arriving to ED
  - Viz.ai only FDA approved for ≥ 18 yo
    - Clinical validation studies submitted to FDA for Viz LVO excluded patients < 18 yo
    - But this is for the algorithm, not the images themselves
  - Jewish Hospital able to admit ≥ 16 yo
    - What if Code Stroke called?
    - EMTALA / pt abandonment vs being held to a pediatric standard of care

Prehospital

- EMS Destination Management
  - In areas with well-coordinated Stroke Systems of Care (SSOC)
    - ▻ Hospitals proficient in thrombolysis delivery & good interhospital transfer
  - Transport ≥ 45-60 min to TCC ⇒ ∅ improved 3mo outcome

3
No Benefit

- Mobile Stroke Unit (MSU)
  - Superior to conventional EMS for faster treatment times & improved outcome
  - Does not address the issue of wealthy urban centers vs rural/poor systems

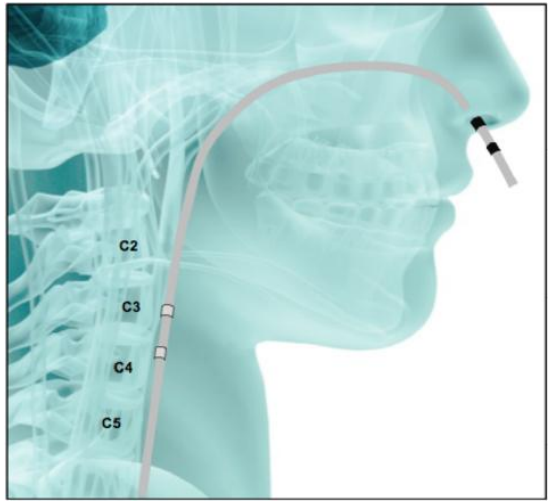
1
Beneficial

- Direct Triage to Angiography Suite (DTAS)
  - Suspected LVO on prehospital stroke severity scale (eg, C-STAT, RACE)
  - Flat-panel head CT ⇒ catheter-based angiography
  - May be considered to reduce time to intervention & improve functional outcomes

2b
May Be Reasonable

Dysphagia

- Pharyngeal Electrical Stimulation (PES)
  - Electrodes sit against pharyngeal mucosa
  - Impulses travel to
    - ▻ Nucleus Tractus Solitarius
      - ◦ Central pattern generator for swallowing
    - ▻ Swallowing motor cortex
  - Induces physical reorganization
    - ▻ Expands cortex functional map of throat muscles
    - ▻ Prompts unaffected brain to “take over”
  - Typical treatment regimen
    - ▻ 5 Hz x10 min/day x3 (up to 6) consecutive days
  - 2026 Guideline: Stroke with dysphagia
    - ▻ PES can be beneficial to reduce dysphagia severity and decrease the risk of aspiration



2a
Reasonable

Image Source: https://www.dovepress.com/pharyngeal-electrical-stimulation-device-for-the-treatment-of-neurogen-peer-reviewed-fulltext-article-MDER

THE EXTENDED WINDOW PARADIGM: TIME vs. TISSUE

THE OLD RULES vs. THE NEW APPROACH

Old Rule: **STRICT TIME LIMIT**

<4.5h (Sx recognition)

New Approach: **TISSUE VIABILITY**

4.5-9h (Sx recognition/sleep midpoint)

'Tissue Clock'

TALE OF TWO PROTOCOLS: CHOOSE YOUR TOOL

WAKE-UP PROTOCOL (MRI)

2a Reasonable



Identifies Timing of Stroke

DWI/FLAIR MISMATCH

DWI positive (Restricted Diffusion) →



FLAIR negative (No Signal) →



Estimates Time-of-Onset < 4.5h

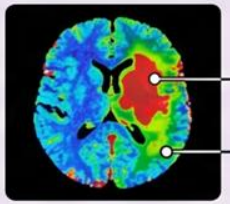
Best for: Small (Lacunar) Strokes

Uses: Visual Assessment

VS

EXTEND PROTOCOL (CTP/MRI Perfusion)

2a Reasonable



Finds Salvageable Brain Tissue

ISCHEMIC CORE / PENUMBRA MISMATCH

Ischemic Core (Dead Tissue)

Penumbra (Salvageable Tissue)

Best for: Large Vessel Strokes

Captures specific EXTEND:
Core Volume < 70 mL
Mismatch Volume > 10 mL
Mismatch Ratio > 1.2

Uses: Automated Software (RAPID, etc.)

THE 6-HOUR SCENARIO: RESOLVING THE DILEMMA

Patient arriving at : **6 Hours**

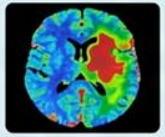
6 Hours

Standard MRI (WAKE-UP)



WAKE-UP invalid (>4.5h from onset)

CTP / MRI Perfusion (EXTEND)



Finds Mismatch

Action Required

THE 6-HOUR TRADE-OFF: ACCEPTING RISK FOR REWARD

RISK

Symptomatic Hemorrhage (sICH): **6.2%** vs **0.9%** in placebo

REWARD

Excellent Outcome (mRS 0-1 at 90 days): **35.4%** vs **29.5%** in placebo

Net benefit heavily favors treatment

Image Source: Google Gemini

Extended Window Thrombolysis



Image Source: Google Gemini

Extended Window Thrombolysis

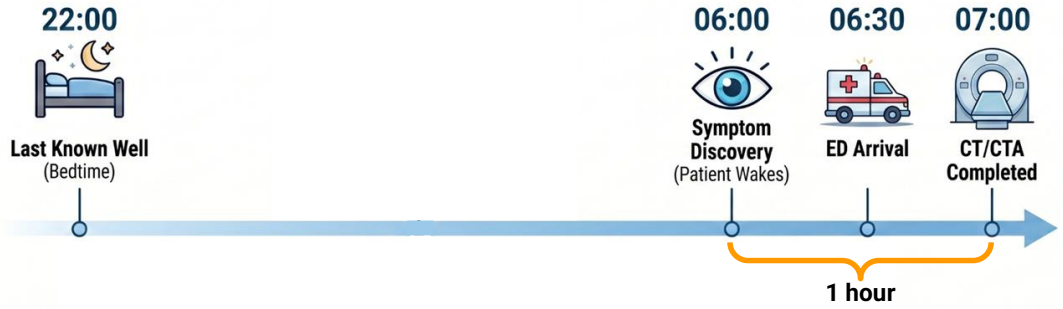


Image Source: Google Gemini

Extended Window Thrombolysis

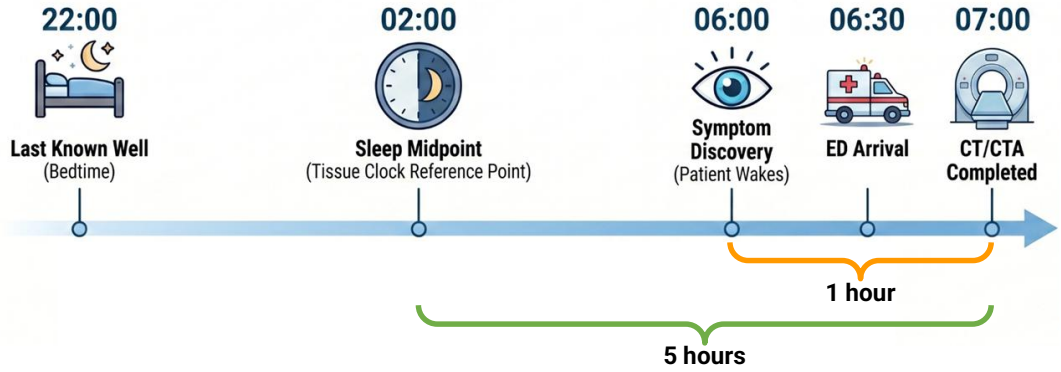


Image Source: Google Gemini

Extended Window Thrombolysis

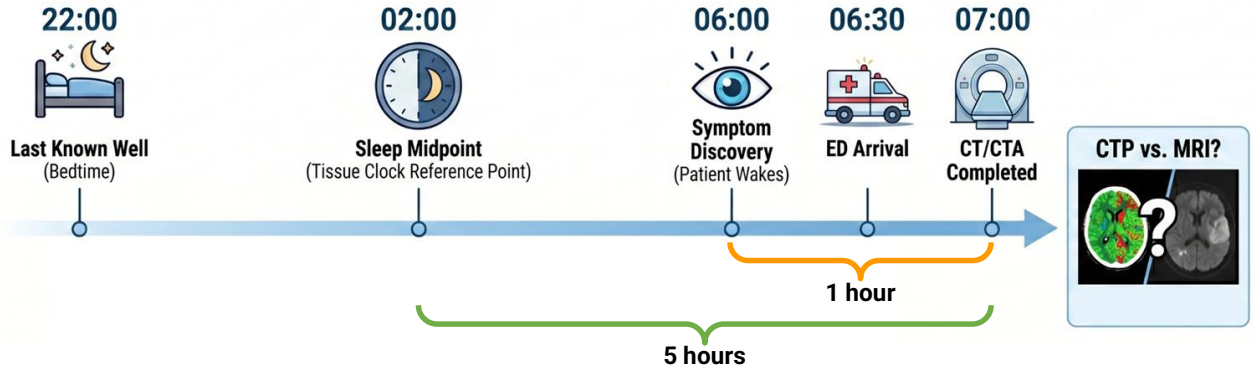


Image Source: Google Gemini

Extended Window Thrombolysis

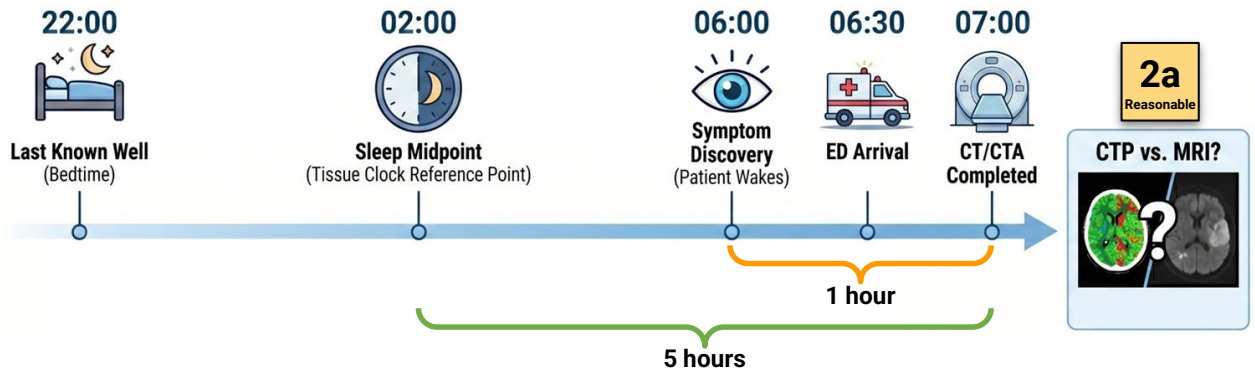


Image Source: Google Gemini

Extended Window Thrombolysis

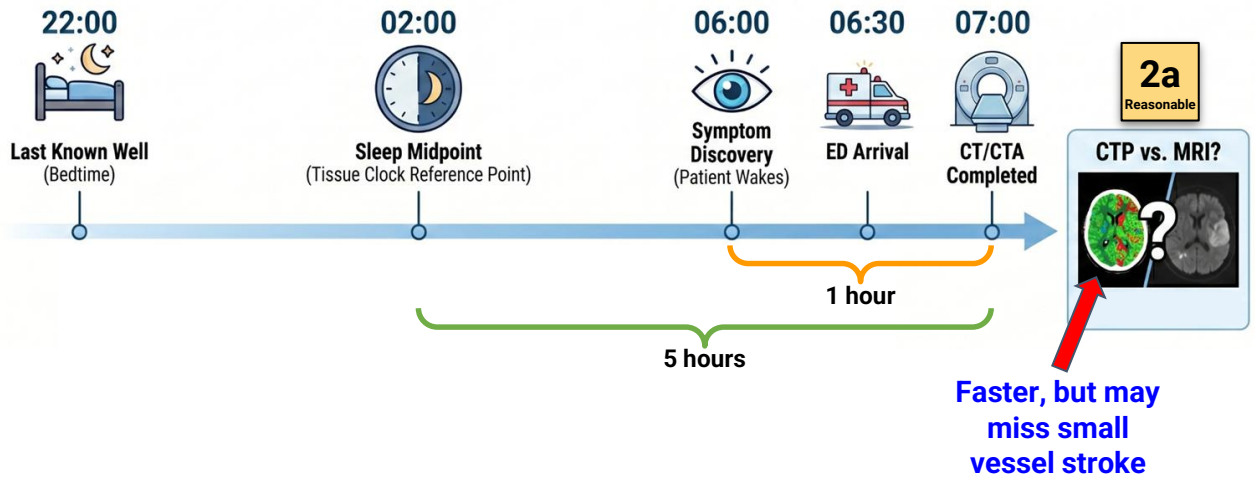


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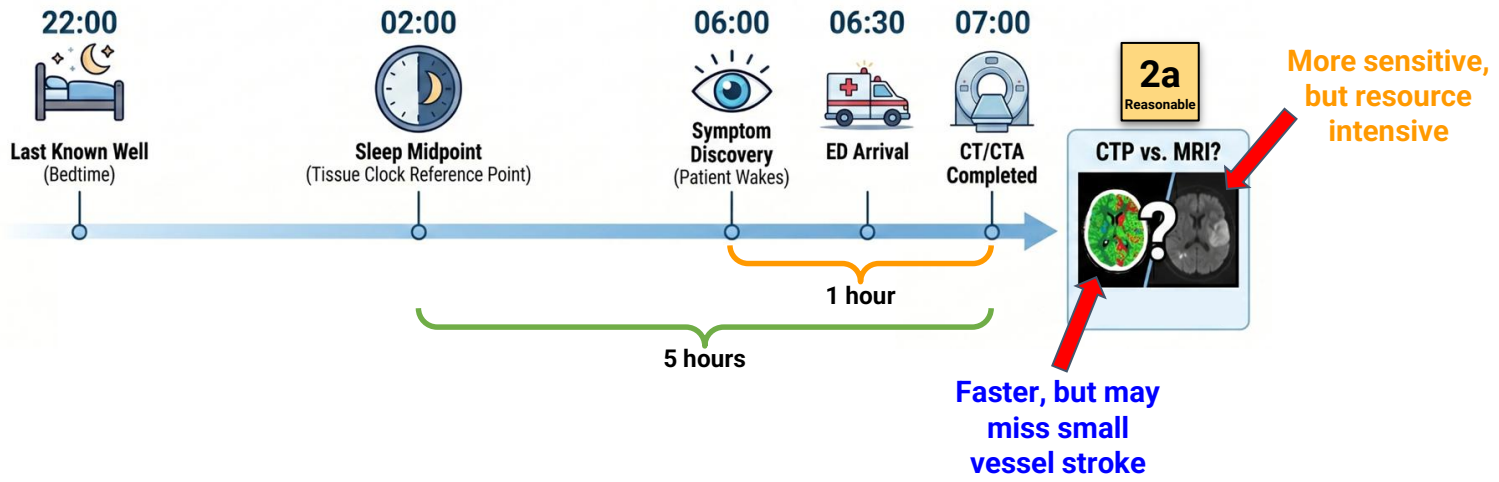


Image Source: Google Gemini

Extended Window Thrombolysis

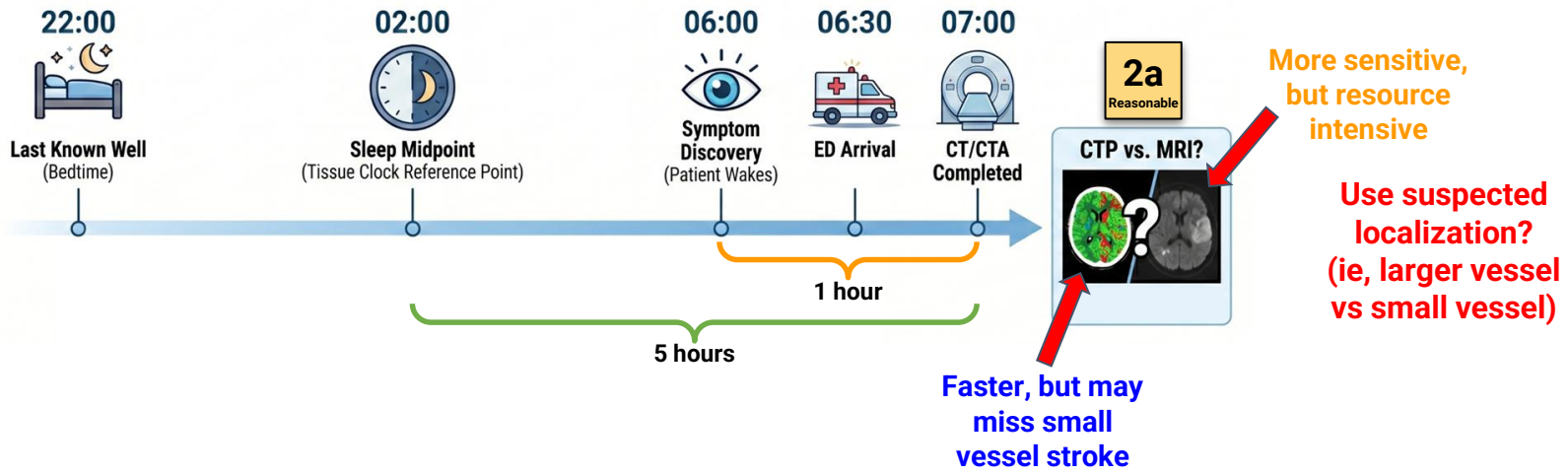


Image Source: Google Gemini

Extended Window Thrombolysis

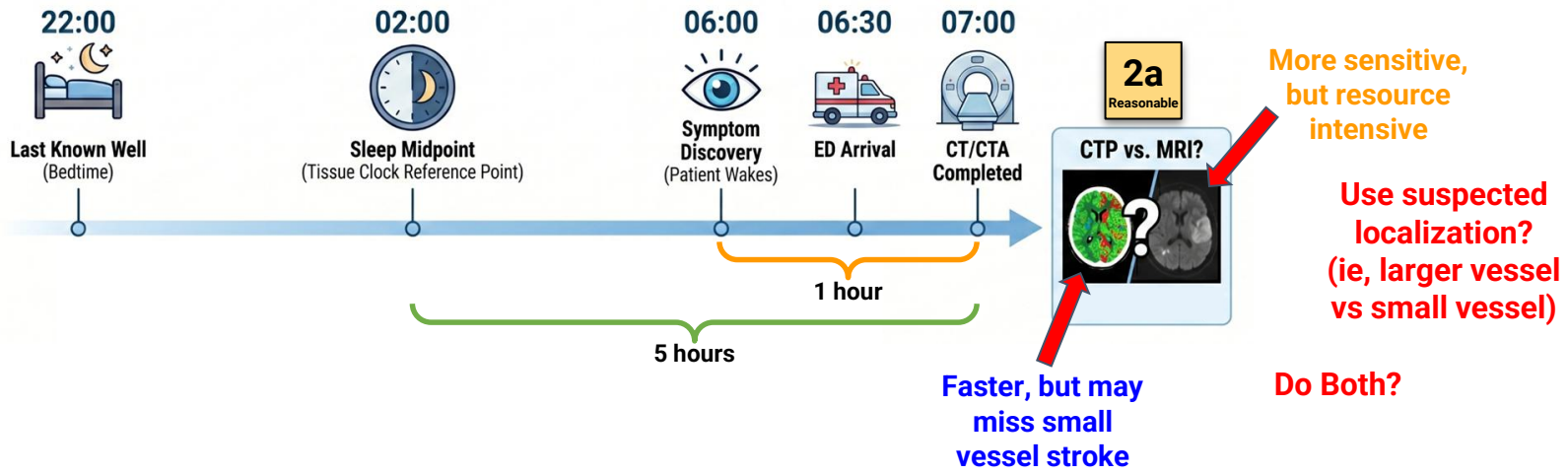


Image Source: Google Gemini

Extended Window Thrombolysis

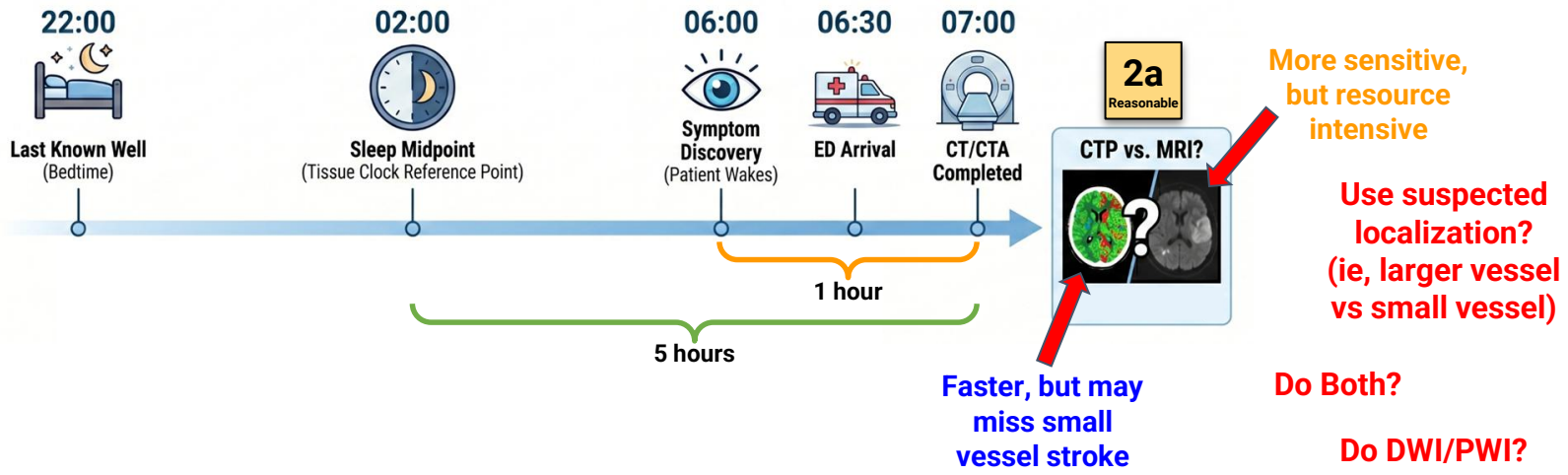
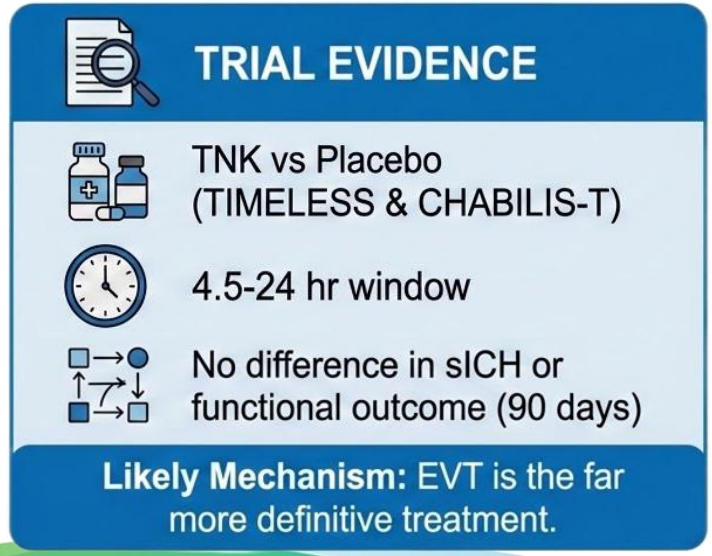


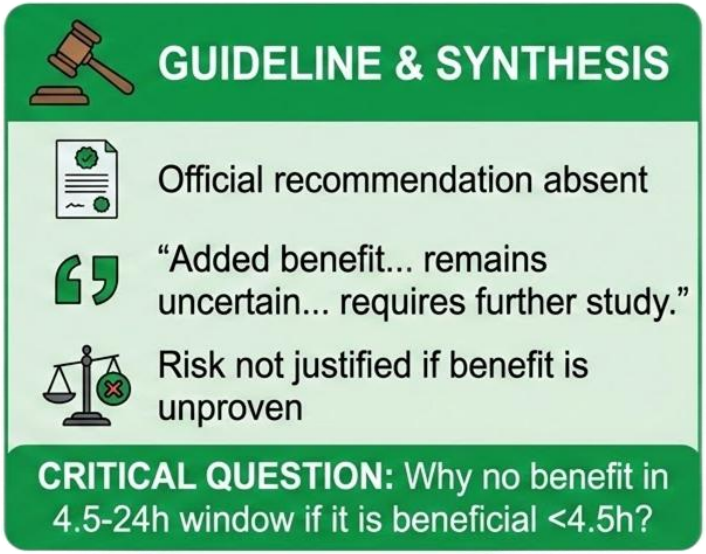
Image Source: Google Gemini

Extended Window Thrombolysis

- Considerations

EVT *and* Extended Window Thrombolysis = NO

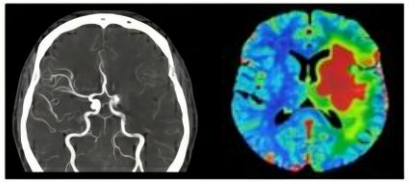




Extended Window Thrombolysis

- Considerations (cont.)

EVT Unavailable



AIS LVO + SALVAGEABLE PENUMBRA

NO ACCESS to EVT / TRANSFER DELAY

IV THROMBOLYSIS (IVT) MAY BE BENEFICIAL

Within 4.5-24h

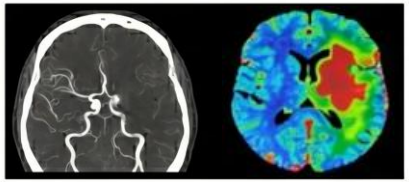
2b May Be Reasonable

Image Source: Google Gemini

Extended Window Thrombolysis

- Considerations (cont.)

EVT Unavailable



AIS LVO + SALVAGEABLE PENUMBRA

NO ACCESS to EVT / TRANSFER DELAY

IV THROMBOLYSIS (IVT) MAY BE BENEFICIAL

Within 4.5-24h

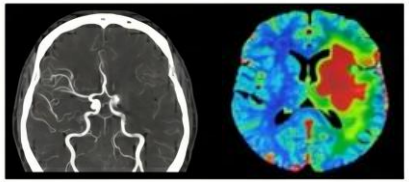
2b May Be Reasonable

Image Source: Google Gemini

Extended Window Thrombolysis

- Considerations (cont.)

EVT Unavailable



AIS LVO + SALVAGEABLE PENUMBRA

NO ACCESS to EVT / TRANSFER DELAY

IV THROMBOLYSIS (IVT) MAY BE BENEFICIAL

Within 4.5-24h

2b
May Be Reasonable

TRACE-III Trial
(NEJM 2024)

Image Source: Google Gemini

References

- Prabhakaran S, Gonzalez NR, Zachrison KS, Adeoye O, Alexandrov AW, Ansari SA, Chapman S, Czap AL, Dumitrascu OM, Ishida K, Jadhav AP, Johnson B, Johnston KC, Khatri P, Kimberly WT, Lee VH, Leslie-Mazwi TM, Mac Grory B, Madsen TE, Menon B, Mistry EA, Park S, Parker S, Perez de la Ossa N, Reeves M, Saiz T; Scott PA, Schwartzberg D, Sheth SA, Sporns PB, Times S, Tjoumakaris S, Wolfe SQ, Yaghi S. 2026 Guideline for the early management of patients with acute ischemic stroke: a guideline from the American Heart Association/American Stroke Association. *Stroke*. 2026;57:e1–e119. doi: 10.1161/STR.0000000000000513

- Powers WJ, Rabinstein AA, Ackerson T, Adeoye OM, Bambakidis NC, Becker K, Biller J, Brown M, Demaerschalk BM, Hoh B, Jauch EC, Kidwell CS, Leslie-Mazwi TM, Ovbiagele B, Scott PA, Sheth KN, Southerland AM, Summers DV, Tirschwell DL; on behalf of the American Heart Association Stroke Council. Guidelines for the early management of patients with acute ischemic stroke: 2019 update to the 2018 guidelines for the early management of acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2019;50:e344–e418 doi: 10.1161/STR.0000000000000211.

- Kleindorfer DO, Towfighi A, Chaturvedi S, Cockroft KM, Gutierrez J, Lombardi-Hill D, Kamel H, Kernan WN, Kittner SJ, Leira EC, Lennon O, Meschia J, Nguyen T, Pollak PM, Santangeli P, Sharrief A, Smith SC, Turan T, Williams L. 2021 Guideline for the prevention of stroke in patients with stroke and transient ischemic attack: a guideline from the American Heart Association/American Stroke Association. *Stroke*. 2021;52:e364–e467. doi: 10.1161/STR.0000000000000375

- Ma G, Mo R, Zuo Y, et al. Tenecteplase for Acute Non–Large Vessel Occlusion 4.5 to 24 Hours After Ischemic Stroke: The OPTION Randomized Clinical Trial. *JAMA*. 2026;335(13):1137–1147. doi:10.1001/jama.2026.0210

- Xiong Y, Campbell BCV, Schwamm LH, et al. Tenecteplase for Ischemic Stroke at 4.5 to 24 Hours without Thrombectomy. *N Engl J Med*. 2024;391(3):203–212. doi:10.1056/NEJMoa2402980


The End