

Emergency Department Stroke (Mimic) Patient Care: *How to Successfully Treat AIS Patients and Optimize Patient Outcomes?*

2026 Update

August 11, 2026

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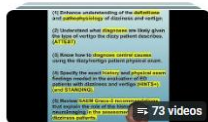
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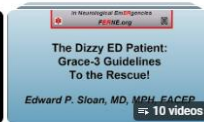
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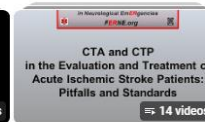
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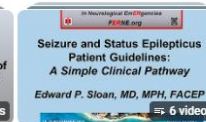
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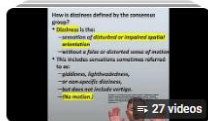
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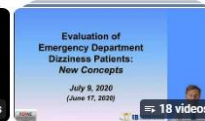
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Stroke Mimic Patients: *Learning Objectives*

Learning Objectives

- Recognize common stroke mimics and their distinguishing clinical features.
- Identify stroke chameleons, especially mild and posterior circulation AIS.
- Consider the clinical examination and imaging with respect to possible delayed reperfusion.
- Understand the safety of IV thrombolysis when mimics are inadvertently treated.

What are the most common CNS Ischemia Chameleons?

Capsular Warning Syndrome

- May be a single penetrating artery
- Internal capsule symptoms
- Multiple recurrent attacks in first 24-48 hours
- Fluctuating, recurrent symptoms that suggest seizure or conversion disorder
- High stroke risk for these patients

Nadarajan V et al. Pract Neurol. 2014;14(1):23-31. PMID: 24453269.

CNS Ischemia Chameleon Diagnoses

- 53-year-old male
- Right hemiparesis, facial weakness x 1 h.
- 4 recurrent, stereotypical bouts over past 7 h
- Dx TIA, dual antiplatelet, high dose statin Rx
- Within 24 h, stroke, hemiparesis, facial weakness
- MRI showed L infarction, CT angiogram OK normal.
- Capsular Warning Syndrome

Shariff E, Shahid R. Turk J Emerg Med. 2025;25:246-249. PMID: 40746575.

What are the most common CNS Stroke Chameleons?

CNS Stroke Chameleon Diagnoses

- AMS (1 in 3 patients have a stroke etiology)
- Syncope (1 in 6 patients have a stroke)
- Hypertensive Emergency (1 in 7 are stroke)
- Systemic Infection (1 in 10 are stroke)
- Acute Coronary syndrome (1 in 10 are stroke)
- ***Don't hesitate to neuroimage with these Dx***

Dupre CM et al. J Stroke Cerebrovasc Dis. 2014;23(2):374-378. PMID: 23954604.

CNS Stroke Chameleon Presentations

- Altered mental status / decreased consciousness
- Dizziness, vertigo, or imbalance
- Syncope or transient loss of consciousness
- Atypical or mild neurological symptoms
- Concurrent medical illness that distracts from stroke
- Posterior circulation/cerebellar presentations
- Maintain a low threshold for stroke evaluation and appropriate neuroimaging

Brunser AM et al. Cerebrovasc Dis. 2025;54:315-322. PMID: 39025044.

CNS Stroke Chameleon Study

- **Prospective, single-center observational study** at a comprehensive stroke center in **Santiago, Chile**
- **2014–2023: 1,197** consecutive ED patients with confirmed AIS
- Stroke chameleon (SC) = AIS **initially missed or diagnosed as another condition** in the ED
- **63/1,197 (5.2%)** were stroke chameleon patients, approximately 1 in 20 AIS patients

Brunser AM et al. Cerebrovasc Dis. 2025;54:315-322. PMID: 39025044.

CNS Stroke Chameleon Findings

- Stroke Chameleon (SC) patients were **younger**: 59 vs 70 years
- SC patients had **milder strokes**: median NIHSS 1 vs 3
- **82.5% of SC patients had NIHSS ≤ 5**
- SC patients had **less facial weakness, limb weakness, sensory loss, dysarthria, gaze abnormalities, and visual-field abnormalities**
- **Large-vessel occlusion was less common**: 21.3% vs 37.2%
- **IV thrombolysis was less frequent**: 15.8% vs 32.3%
- **Key Finding:**
Stroke chameleons were generally younger patients with milder, less typical neurological deficits, less thrombolysis.

Brunser AM et al. Cerebrovasc Dis. 2025;54:315-322. PMID: 39025044.

Stroke Chameleon Pt Findings

- **Posterior circulation** associated with stroke chameleon presentation OR 3.02 (95% CI 1.45–6.3)
- **Altered LOC** an important chameleon feature: OR 3.0 -5.7
- **Atrial fibrillation**: OR 2.22 for stroke chameleon in the ED
- **Lower NIHSS and absence of classic focal findings** seen
- **Cardioembolic strokes** may produce small cortical lesions, minimal symptoms, seizures, or initially negative DWI
- **Neurological symptoms in a patient with atrial fibrillation should remain concerning for stroke even with negative DWI**
- **In appropriate acute vestibular syndrome patients, HINTS+ performed by trained clinicians can improve recognition of central ischemia.**

Brunser AM et al. Cerebrovasc Dis. 2025;54:315-322. PMID: 39025044.

Stroke Mimic Patients: *Relevant Clinical Questions & Answers*

How do we distinguish CNS Ischemia patients from those with stroke mimics?

TIA Patient Presentations

- TIA patients are generally older
- TIA patients have a loss of function
- Symptom onset is usually abrupt
- TIA sx are transient (with no acute CNS infarction seen on DWI)

Nadarajan V et al. Pract Neurol. 2014;14(1):23-31. PMID: 24453269.

TIA Mimic Patient Symptoms

- **Up to 25% of TIA presentation may be mimics**
- Migraine patients have headache, vomiting
- Seizures are repetitive stereotypical events
- Syncope can be established by history
- Hypoglycemia can be detected clinically
- Speech abnormalities can be challenging

Nadarajan V et al. Pract Neurol. 2014;14(1):23-31. PMID: 24453269.

TIA/Stroke Patients Study

METHODS

- Cross-sectional observational study **2 Danish stroke centers**
- **592 adults** admitted with suspected stroke/TIA
- **479 confirmed stroke/TIA; 113 stroke mimics**
- Patients interviewed about **presenting symptoms and help-seeking behavior**
- Stroke/TIA confirmed by **neurologist assessment and CT/MRI**
- **Multivariable logistic regression** identified factors associated with stroke mimic patients

Sørensen VFI et al. BMJ Open. 2025;15:e088014. PMID: 39909509.

TIA/Stroke Patients Study

Data

- **19.1%** of suspected stroke patients were **stroke mimics**
- Common mimics: **peripheral vertigo** 24.7%; **migraine** 11.5%
- Mimics were **younger**: 67 vs 74 years
- Mimics more often **female**: 55.8% vs 40.1%
- **Less limb weakness**: 23.9% mimics vs 48.0% stroke/TIA
- **Fewer ≥ 2 BE-FAST sx**: 36.3% mimics vs 58.9% stroke/TIA
- **Sudden onset did not significantly distinguish** mimics from stroke/TIA
- **Rare** 2/113 (1.8%) **mimic patients received IV thrombolysis**

Sørensen VFI et al. BMJ Open. 2025;15:e088014. PMID: 39909509.

TIA/Stroke Patients Study

Independent Predictors

- **Vertigo** → mimic: OR 1.86
- **Female sex** → mimic: OR 1.79
- **Increasing age** → less likely mimic: OR 0.96/year
- **Limb weakness** → less likely mimic: OR 0.52
- **Difficulty controlling extremity** → less likely mimic: OR 0.51
- **Key Concept: Mimic patients common, such that clinical stroke factors all must be evaluated**

Sørensen VFI et al. BMJ Open. 2025;15:e088014. PMID: 39909509.

**Do stroke mimic patients less
often receive IV
thrombolysis, with what
effects?**

Is IV TT safe when administered to stroke mimic patients?

IV tPA Exclusion Criteria in Mimic Pts

- 842 Chilean patients, ED pts with aphasia as most common presenting symptom
- 113 stroke mimic patients (13%), younger and diabetic more often
- Most commonly toxic-metabolic and seizures
- 152 contraindications in mimic pts, 96 (63%) due to outside of therapeutic window and 37 (24%) symptoms too mild based on NIHSS
- Beneficial self-selection away from TT occurs.

Brunser AM et al. J Stroke Cerebrovasc Dis. 2013;22(7):1140-1145.

IV tPA Safety in Stroke Mimic Patients

- 5581 EU Patients, multi-national obs study
- 100 stroke mimic patients (1.8%)
- Mimic pts younger, female, fewer risk factors, but smoking and prior CNS ischemia noted
- Symptomatic ICH rate (ECASS II definition): ~1%
- Vs Ischemic stroke sICH rate (7.9%)

- ICH is not a common TT complication.
- (Healthy CNS vessels)

Zinkstok SM et al. Stroke. 2013;44(4):1080-1084. PMID: 23444310.

Thrombolysis in Mimic Pts

- 4,594 ED Patients
- Stroke mimics were seen in > 80% in thrombolysed patients with an NIHSS = 0
- Dizziness common
- Posterior circulation ischemia evaluation important
- Targeted neuro-ophthalmologic examination, including HINTS in appropriate AVS patients when performed by trained clinicians, improves diagnostic assessment.

Tysland T et al. Front Neurol. 2026;17:1735022. PMID: 41783847.

IV tPA Safety in Stroke Mimic Patients

- **Single-center retrospective cohort study**
- Patients Rx with **IV thrombolysis** for suspected AIS, 2022–2024
- Included patients: **no early ischemic changes on NCCT and no arterial occlusion on CTA**
- All received **alteplase 0.9 mg/kg within 4.5 hours**
- **330 patients**: 293 AIS and 37 stroke mimics
- Compared demographics, symptoms, vascular risk factors, NIHSS, outcomes, and IVT complications
- **LASSO + Firth logistic regression** identified independent predictors of stroke mimic

Klimbytė B, Matijošaitis V, Vaitkus A. Front Neurol. 2025;16:1629435.

IV tPA Safety in Stroke Mimic Patients

- **11.2%** (37/330) were **stroke mimic patients**
- Mimics were **younger**: 57.4 vs 70.2 years
- **More sensory symptoms**: 81% mimics vs 60% AIS
- **More headache**: 11% vs 3.1%
- Mimics had **less AFib** (0% vs 20%), **diabetes** (5.4% vs 20%), and **hypertension** (68% vs 84%)
- Mimics had **more migraine** (22% vs 1.7%), **epilepsy** (8.1% vs 0.7%), and **vestibular disease** (8.1% vs 1.4%)
- Most **common mimics**: **migraine** 24.3%, **functional disorders** 24.3%, **peripheral vestibular dysfunction** 16.2%

Klimbytė B, Matijošaitis V, Vaitkus A. Front Neurol. 2025;16:1629435.

IV tPA Safety in Stroke Mimic Patients

- Independent mimic predictors: migraine OR 8.47; epilepsy OR 31.11; sensory symptoms OR 3.39; younger age OR 0.93/year
- Initial NIHSS similar, but mimic patients showed much faster neurologic improvement
- More mimic patients had discharge mRS = 0; 92% vs 19% of AIS
- No intracranial hemorrhage or seizures occurred in thrombolysed stroke mimics

Klimbytė B, Matijošaitis V, Vaitkus A. Front Neurol. 2025;16:1629435.

IV Lysis Safety in Mimic Patients

Methods

- **Cleveland Clinic Florida, 2018-2023**
- Presentation within 4.5 hours of ictus
- NIHSS ≤ 5 , but symptoms were considered disabling.
- Alteplase and then tenecteplase after Jan 2022.
- **61 patients**

Data

- **18 (29%) stroke mimic patients**
- Migraine 50%, Toxic-metabolic 27%, Seizure 17%, Somatoform 5%
- **No symptomatic ICH (vs 2%)**
- **No asymptomatic ICH (vs 4.8%)**
- **No extracranial bleeding (vs 2%)**
- No adverse events related to thrombolysis

Afzal S et al. J Stroke Cerebrovasc Dis. 2025;34(6):108298. PMID: 40188899.

**What about if you work in a
remote hospital, drip & ship?
Is the mimic problem greater?**

IV TT, Mimic Pts & Drip/Ship

- 120 tPA patients, one receiving stroke center
- 20 stroke mimic patients (17%); conversion, migraine, seizure, and hypoglycemia, Hx psych
- No ICH, all discharged home
- 18/83 (22%) mimic rate in drip/ship patients
- 2/37 (5.4%) mimic rate in hub hospital patients
- Higher mimic rate is to be expected, acceptable and uncomplicated in drip/ship patients

Mehta S et al. J Stroke Cerebrovasc Dis. 2014;23(5):844-849. PMID: 23954608.

Telemed/IV Lysis and Mimic Pts

- 171 IV lysis patients evaluated by telemedicine
- **43 stroke mimics (25%)**
- **Toxic-metabolic** encephalopathy most common mimic
- **86% of mimic patients discharged home**
- Clinical predictors could not reliably exclude mimics before thrombolysis
- **Stroke mimics remain an expected consequence of rapid remote thrombolysis**
- **Do not withhold indicated thrombolysis solely because a stroke mimic is possible**

Loggini A et al. Neurohospitalist. 2025;15:337-342. PMID: 40083864.

**What are the important
clinical questions related to
stroke mimics, TT, and patient
outcomes?**

Important Clinical Questions

- Can we clearly and easily distinguish TIA and AIS patients from stroke mimic patients?
- What is an acceptable miss rate for mimics?
- Should we continue to give IV TT quickly based on our initial clinical impression and non-contrast CT results?
- What about stroke chameleon patients who have vertigo that is central in etiology?

Boulter DJ, Schaefer PW. Semin Roentgenol. 2014;49(1):22-38. PMID: 24286516.

Important Clinical Questions

- Can we reliably distinguish TIA and AIS patients from stroke mimic patients?
- What is an acceptable stroke mimic patient rate in thrombolysis patients?
- Should IV thrombolysis proceed rapidly when AIS remains clinically likely despite diagnostic uncertainty?
- How can we identify stroke chameleon patients presenting with central vertigo?

Tysland TB et al. Front Neurol. 2026;17:1735022. PMID: 41783847.

Can we quantify the TT risk in stroke mimic patients?

IV Thrombolysis Risk Data

- Recent mimic rate 11%
- 29% mimic patients in a minor stroke cohort
- 92% with mRS = 0 at hospital discharge
- No ICH observed in 37 mimic patients
- No adverse events related to thrombolysis

Klimbyte B et al. Front Neurol. 2025;16:1629435. PMID: 41426999.

IV Thrombolysis Risk Data

- **Zinkstok 2013:** sICH $\approx 1\%$ in 100 mimics
- **Mehta 2014:** 0 ICH in 20 mimics
- **Afzal 2025:** 0 sICH, 0 asymptomatic ICH in 18 mimics
- **Klimbytè 2025:** 0 ICH in 37 mimics
- **Loggini 2025:** 0 sICH in 43 mimics
- **Tysland 2026:** no symptomatic ICH among mimics
- **Serious hemorrhage after inadvertent thrombolysis of a stroke mimic is uncommon.**

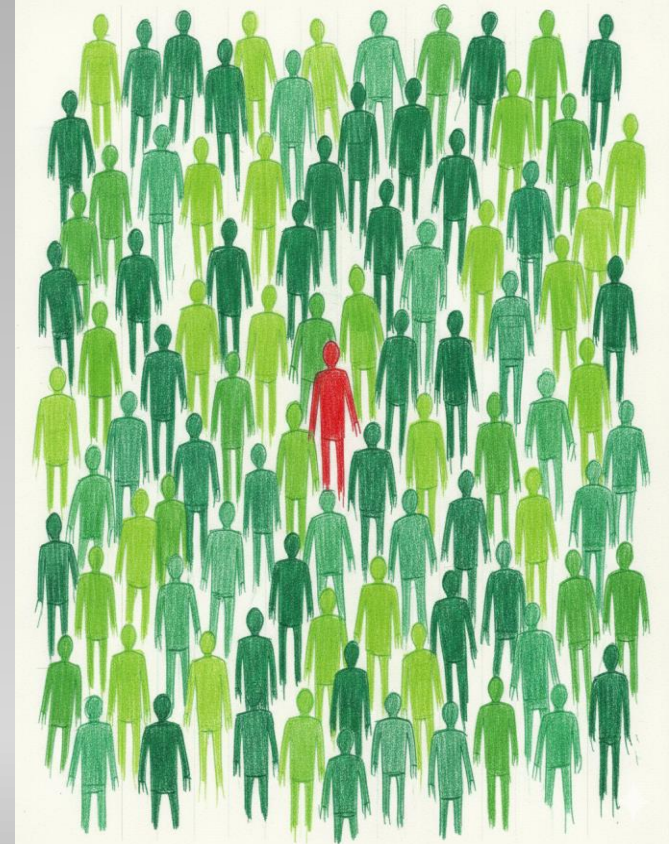
A Quantification of IV tPA Risk

- Assume 20% mimic rate in IV lysis patients
- Look at the next 1000 AIS IV TT patients
- Assume a 2% ICH rate (2x AMI Rx ICH rate)
- 800 true AIS patients, 16 will have ICH
- 200 mimic patients, 4 will have ICH
- 4 Mimic patients with ICH (fewer with sICH)
- If 250 emergency physicians provide lysis 1 time, there may be one ICH in a stroke mimic patient without significant 90-day disability as a result of the IV thrombolytic therapy.

Klimbyte B et al. Front Neurol. 2025;16:1629435. PMID: 41426999.

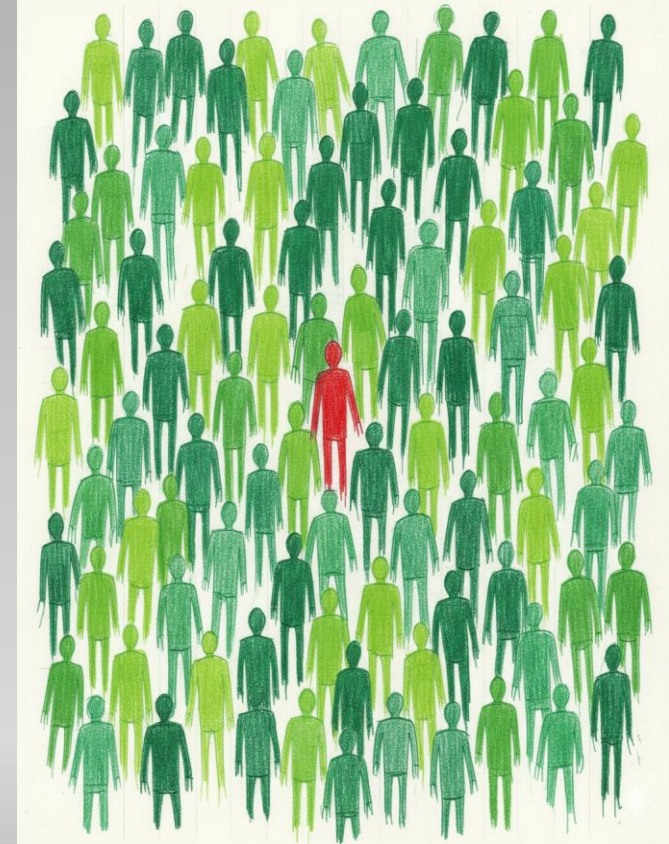
A Quantification of IV TT Risk

- 250 patients receive TT for AIS
- 200 IV TT AIS (real stroke) patients
 - 1 of 8 with best outcome
 - +25 mRS live independent pts
- 50 stroke mimic patients, IV TT
 - 1 patient with ICH
 - No long-term disability
- Numbers favor IV TT for all suspected AIS patients, even with 20% mimics.



IV Thrombolysis Risk Summary

- When disabling AIS remains clinically likely and the patient is otherwise eligible, concern for a possible mimic should not by itself delay indicated IV thrombolysis.



What are CNS Ischemia, Mimic/Chameleon Patient Key Clinical Concepts?

CNS Ischemia Patients

Stroke Syndrome

- “Stroke is a syndrome, not a diagnosis.”

Stroke Syndrome

- **“Stroke is a syndrome, not a diagnosis.”**
- Stroke alerts include true CNS ischemia, stroke mimic, and stroke chameleon patients.
- Clinicians must rapidly separate ischemic stroke, hemorrhage, mimic, and chameleon patients while preserving treatment speed.

Stroke Syndrome

- **“Stroke is a syndrome, not a diagnosis.”**
- Similar neurological syndromes may result from CNS ischemia, hemorrhage, or stroke mimic conditions; conversely, true CNS ischemia may present atypically as a stroke chameleon.

Stroke Syndrome

- **Sørensen:** Clinical presentations substantially overlap between true stroke/TIA and mimics; **no single symptom reliably separates them.**
- **Klimbytté:** Even after **NCCT showed no early ischemia and CTA showed no occlusion**, patients could not reliably be separated into AIS versus mimics; **293/330 were ultimately AIS.**
- **Afzal:** Among patients with minor but disabling stroke syndromes, **29% were mimics and 71% true ischemic strokes.**
- **Brunser:** The converse problem also occurs: **5.2% of confirmed AIS patients were initially missed as stroke chameleons**, particularly those with mild or atypical presentations.
- **Tysland:** Acute dizziness illustrates the syndrome problem particularly well; similar presentations can represent peripheral vestibular disease or posterior circulation ischemia.

CNS Ischemia Demographics

- “CNS ischemia patients generally are older and have more vascular risk factors than stroke mimic patients.”

CNS Ischemia Demographics

- **“CNS ischemia patients generally are older and have more vascular risk factors than stroke mimic patients.”**
- Mimics often occur in younger patients, women, and those with seizure/migraine history.
- Stroke risk rises with age and vascular disease.
- Demographics modify the probability of CNS ischemia but cannot establish or exclude the Dx.
- Younger age does not exclude AIS and may contribute to missed stroke recognition.

CNS Ischemia Demographics

- **Sørensen 2025:** Stroke/TIA patients were older than mimics, **median 74 vs 67 years.**
- **Klimbytté 2025:** AIS patients were substantially older, **70.2 vs 57.4 years**, and had more **hypertension, diabetes, and atrial fibrillation.**
- **Loggini 2025:** Cerebrovascular disease patients were older than mimics, **median 70 vs 61 years.**
- **Brunser 2025:** Importantly, true AIS patients who became **stroke chameleons were younger** than readily recognized AIS patients, **59 vs 70 years.** Thus, younger age should never reassure the clinician that AIS is absent.

CNS Ischemia Timing/Symptoms

- **“Do not use abrupt onset or transient symptom resolution as strong discriminators. Negative focal loss of neurological function remains more useful, but no symptom pattern alone reliably confirms or excludes CNS ischemia.”**

CNS Ischemia Timing/Symptoms

- “Do not use abrupt onset or transient symptom resolution as strong discriminators. Negative focal loss of neurological function remains more useful, but no symptom pattern alone reliably confirms or excludes CNS ischemia.”
- Stroke is often sudden-negative loss; mimics often include positive or fluctuating symptoms.
- True ischemic stroke typically produces abrupt loss of function (weakness, aphasia, visual loss).
- Mimics often have waxing/waning deficits, agitation, paresthesias, headache, confusion, or inconsistent neurologic findings.

CNS Ischemia Timing/Symptoms

- **Sørensen 2025 — Abrupt onset is not a reliable discriminator.** Sudden onset occurred in **59.3% of stroke/TIA patients vs 51.3% of mimics ($p=0.12$)**. Abrupt onset remains compatible with ischemia but does not reliably distinguish stroke/TIA from mimics.
- **Sørensen 2025 — Negative focal motor symptoms favor CNS ischemia.** Limb weakness (**48.0% vs 23.9%**) and difficulty controlling an extremity (**35.7% vs 16.8%**) were considerably more common in stroke/TIA than mimics.
- **Brunser 2025 — Absence of classic focal findings increases the risk of missed AIS.** Stroke chameleons had fewer typical findings such as facial weakness, limb weakness, sensory deficits, dysarthria, gaze abnormalities, and visual-field abnormalities.
- **Shariff 2025 — Transient symptom resolution does not exclude evolving ischemia.** Recurrent, stereotyped transient motor/sensory episodes in **capsular warning syndrome** may completely resolve and subsequently progress to completed stroke.

Stroke Mimic Patients

Seizure/Todd's Paralysis Patients

- “Seizure and postictal Todd's paralysis remain important stroke mimics.
- A history of epilepsy substantially increases the likelihood of a mimic, but seizure-associated focal deficits must still be evaluated for possible CNS ischemia.”

Seizure/Todd's Paralysis Patients

- **Klimbytè 2025 — Epilepsy strongly favored a stroke mimic.** Epilepsy was an independent predictor of stroke mimic presentation (**OR 31.11**), and **Todd's paralysis accounted for 8.1%** of mimics.
- **Afzal 2025 — Seizure remained a common cause of stroke mimic. 17% of stroke mimics** among thrombolysed patients with minor but disabling deficits were ultimately attributed to seizure.
- **Loggini 2025 — Seizure remained important in the telestroke population. 19% of stroke mimics** receiving thrombolysis after telemedicine evaluation were ultimately diagnosed with seizure.
- **Klimbytè 2025 — Seizure-associated mimics can still receive thrombolysis safely.** Despite inclusion of Todd's paralysis/seizure mimics, no intracranial hemorrhage occurred among the **37 thrombolysed mimic patients**.

Diagnose Glucose Problems Early

- “Identify glucose abnormalities early in every suspected AIS patient because metabolic abnormalities can produce stroke-like neurological deficits and may require immediate treatment.”

Diagnose Glucose Problems Early

- **Loggini 2025** — Toxic-metabolic disorders remain major stroke mimics. Toxic-metabolic encephalopathy was the **most common mimic category (40%)** among thrombolysed telestroke patients. This supports early identification of readily reversible metabolic causes during stroke evaluation.
- **Afzal 2025** — Toxic-metabolic encephalopathy remains an **important mimic**. It accounted for **27% of stroke mimics** in patients receiving thrombolysis for minor but disabling suspected AIS.
- **Klimbytė 2025** — Metabolic and systemic conditions remain part of the contemporary mimic differential. However, this study does not provide new evidence specifically changing your approach to hypoglycemia or hyperglycemia.

Migraine Aura Symptoms

- “Migraine with neurological aura remains an important stroke mimic, particularly in younger patients.
- However, migraine history or aura-like symptoms cannot independently exclude CNS ischemia.”

Migraine Aura Symptoms

- **Klimbyte 2025 — Migraine strongly favored a stroke mimic.** A history of migraine was an independent predictor of stroke mimic presentation (**OR 8.47**). Migraine accounted for **24.3% of all mimics** in this thrombolysed cohort.
- **Afzal 2025 — Migraine was the most common stroke mimic.** Among thrombolysed patients with minor but disabling symptoms who were ultimately diagnosed as mimics, **50% had migraine**.
- **Sørensen 2025 — Migraine remained a common contemporary mimic diagnosis.** Migraine accounted for **11.5% of stroke mimics** among patients evaluated for suspected stroke/TIA.
- **Loggini 2025 — Migraine also occurred among thrombolysed telestroke mimics.** Complex migraine accounted for **5% of stroke mimics**, confirming that migraine can produce sufficiently convincing neurological deficits to trigger thrombolytic treatment.

Functional Neurologic Disorder

- **“Functional neurological disorder (FND) remains an important stroke mimic and may produce convincing focal neurological deficits.**
- **Positive functional examination findings may increase suspicion for FND, but the possibility of CNS ischemia must still be appropriately evaluated.”**

Functional Neurologic Disorder

- **Loggini 2025** — **Functional neurological disorder was a major stroke mimic.** Conversion/functional disorder accounted for **35% of stroke mimics** among thrombolysed telestroke patients, making it the **second most common mimic category** in that cohort.
- **Klimbytė 2025** — **Functional disorders remained among the most common mimics.** Functional neurological disorder accounted for **24.3% of stroke mimics**, tied with migraine as the most common mimic diagnosis in this cohort.
- **Afzal 2025** — **Functional presentations can be sufficiently convincing to receive thrombolysis.** Somatoform disorder was identified among patients initially treated with IV thrombolysis for suspected AIS.
- **Loggini 2025** — **Telestroke may make recognition more difficult.** Findings such as **give-way weakness** and **Hoover's sign** may be harder to assess remotely without an experienced bedside facilitator, increasing diagnostic uncertainty.

Toxic-Metabolic, Infection Causes

- “Toxic-metabolic disorders remain important and potentially reversible stroke mimics and should be identified early during AIS evaluation.
- CNS infection should remain in the differential when supported by the clinical presentation.”

Toxic-Metabolic, Infection Causes

- **Loggini 2025** — Toxic-metabolic encephalopathy was the most common stroke mimic. It accounted for **40% of the 43 stroke mimics** among thrombolysed telestroke patients. This strongly reinforces toxic-metabolic disorders as a major contemporary mimic category.
- **Afzal 2025** — Toxic-metabolic encephalopathy was again a major mimic. It accounted for **27% of stroke mimics** among patients thrombolysed for minor but disabling suspected AIS.
- **Klimbytė 2025** — Systemic/metabolic disorders remained part of the stroke-mimic differential. The study reinforces the broad range of nonvascular disorders capable of producing acute focal neurological presentations, although it provides less specific toxic-metabolic data than Loggini or Afzal.

CNS Mass Lesions Timeline

- “CNS mass lesions remain important stroke mimics.
- The clinical timeline may help suggest a structural process, but an apparently acute presentation does not exclude a mass lesion or establish AIS.”

CNS Mass Lesions Timeline

- **Klimbytė 2025 — CNS tumors remain an important stroke mimic.** CNS tumor accounted for **8.1% of stroke mimics** in this thrombolysed cohort, confirming that structural CNS lesions can present with acute stroke-like neurological deficits.
- **Klimbytė 2025 — Mass lesions can be convincing enough to enter the AIS treatment pathway.** These patients were evaluated and treated as suspected AIS before the final mimic diagnosis was established, reinforcing the potential overlap between structural lesions and acute ischemic presentations.

Stroke Chameleon Patients

Posterior Circulation Ischemia

- “Posterior circulation ischemia remains a particularly dangerous stroke chameleon: dizziness or vertigo, NIHSS 0, mild or atypical deficits, and initially negative imaging do not reliably exclude CNS ischemia.
- Focused neurological and vestibular examination, including appropriately performed HINTS in selected acute vestibular syndrome patients, is critical.”

Posterior Circulation Ischemia

- **Brunser 2025 — Posterior circulation ischemia strongly predicts stroke-chameleon presentation.** Posterior circulation involvement was independently associated with an initially missed AIS diagnosis, with approximately **3-fold greater odds of being a stroke chameleon (OR 3.02; 95% CI 1.45–6.3)**.
- **Tysland 2026 — Acute dizziness remains a major posterior stroke diagnostic challenge.** Patients with posterior circulation ischemia may present with **isolated dizziness and few conventional stroke findings**. The study reinforces that **NIHSS 0 does not exclude posterior circulation ischemia**.
- **Tysland 2026 — Better bedside vestibular assessment is needed.** Incomplete neuro-ophthalmologic examination was common among thrombolysed dizzy patients. The authors support standardized evaluation and **HINTS when performed by appropriately trained clinicians** to improve diagnostic accuracy.

Posterior Circulation Ischemia

- **Sørensen 2025 — Vertigo favors a mimic but cannot exclude CNS ischemia.** Vertigo occurred more commonly in mimics (**42.5%**) but was also present in **25.7% of stroke/TIA patients**. Vertigo therefore increases the probability of a peripheral mimic but cannot safely rule out posterior circulation ischemia.
- **Klimbyte 2025 — Posterior-type presentations are a major source of mimic uncertainty.** Nearly half (**48.6%**) of the stroke mimics clinically simulated posterior circulation stroke, demonstrating the substantial overlap between peripheral vestibular disease and posterior CNS ischemia during acute evaluation.
- **Afzal 2025 — Negative DWI does not completely exclude posterior ischemia.** Some patients ultimately classified as true stroke were **DWI-negative**, and **25% of these DWI-negative strokes had symptoms localizing to the posterior circulation**.

Posterior Circulation Ischemia

Think posterior circulation ischemia with the following:

- Severe gait or truncal ataxia
- Central-pattern nystagmus
- Diplopia or abnormal ocular alignment
- Dysarthria or dysphagia
- New hearing abnormality
- Other focal neurological findings
- High vascular-risk/cardioembolic context
- Persistent clinical concern despite negative initial imaging

IV Thrombolytic Therapy in Suspected AIS Patients

TT in Mimic Patients is Safe

- “IV thrombolysis in stroke mimic patients has a very low risk of serious complications, particularly symptomatic intracranial hemorrhage, and generally favorable clinical outcomes.”

TT in Mimic Patients is Safe

- **Afzal 2025** — **Strongly supports safety.** Among **18** thrombolysed stroke mimics, there were **no symptomatic ICHs, asymptomatic ICHs, extracranial bleeding events, or other thrombolysis-associated adverse events.** **89%** had mRS <1 at discharge.
- **Klimbyte 2025** — **Strongly supports safety in a larger mimic cohort.** Among **37** thrombolysed stroke mimics, there were **no intracranial hemorrhages.** **92%** had mRS 0 at discharge.
- **Loggini 2025** — **Supports safety in telestroke patients.** Among **43** thrombolysed stroke mimics, there were **no symptomatic intracranial hemorrhages,** and **86%** were discharged home.
- **Tysland 2026** — **Supports very low serious hemorrhagic risk, but reinforces that risk is not zero.** There were **no symptomatic intracranial hemorrhages among mimics,** although asymptomatic hemorrhages occurred.

Chameleon Patients Have CNS Stroke

- “Stroke chameleon patients have true CNS ischemia but may present with mild, atypical, transient, or posterior circulation symptoms that obscure the stroke diagnosis.”

Chameleon Patients Have CNS Stroke

- **“Stroke chameleon patients have true CNS ischemia but may present with mild, atypical, transient, or posterior circulation symptoms that obscure the stroke diagnosis.”**
- Chameleons include posterior strokes, isolated aphasia, delirium, and ‘sepsis-like’ stroke.
- True ischemic stroke may present atypically: dizziness without weakness, confusion, falls, isolated visual symptoms, or transient deficits.
- Clinicians must avoid “anchoring” and keep stroke in the differential until excluded.

Chameleon Patients Have CNS Stroke

- **Brunser 2025** — Direct contemporary confirmation of the stroke-chameleon concept. Among 1,197 patients with confirmed AIS, 63 (5.2%)—approximately 1 in 20—were initially missed or diagnosed as another condition in the ED.
- **Brunser 2025** — Chameleons frequently have mild or atypical strokes. Median NIHSS was only 1, and 82.5% had NIHSS ≤ 5 . Classic findings such as facial weakness, limb weakness, sensory deficits, dysarthria, gaze abnormalities, and visual-field abnormalities were less frequent.
- **Brunser 2025** — Posterior circulation ischemia particularly increases chameleon risk. Posterior circulation involvement was associated with approximately threefold greater odds of a chameleon presentation (OR 3.02).
- **Afzal 2025** — Negative DWI does not necessarily eliminate CNS ischemia. Some patients ultimately classified as true stroke were **DWI-negative**, including patients with posterior circulation symptoms.
- **Shariff 2025** — Transient resolution does not eliminate CNS ischemia risk. Capsular warning syndrome can produce recurrent, completely resolving neurological deficits before progression to completed ischemic stroke.

What are the most common CNS Ischemia Mimics?

CNS Ischemia Mimic Diagnoses

- Systemic illness and syncope
- Todd's Hemiparesis and seizures
- Hypo-and hyperglycemia
- Migraine aura and hemiplegia
- Functional Neurological Disorder
- CNS infections
- Toxic and metabolic
- Mass lesions
- Peripheral Vestibular Disorders / Benign Paroxysmal Positional Vertigo (BPPV)
- Bell's Palsy and peripheral nerve dysfunction

What are other causes of CNS ischemia presentations in mimic patients?

Pattern-Based Approach to Mimics

- Cerebral venous thrombosis / venous infarction
- CNS infection / encephalitis
- Seizure / Todd's paralysis
- Hypoglycemia and other toxic-metabolic disorders
- Transient global amnesia
- CNS tumors / mass lesions
- Migraine with neurological aura
- Functional neurological disorder
- Peripheral vestibular disorders

Rare, High-Stakes Mimic Patients

Methotrexate-Induced Leucoencephalopathy

- 17 yo with Acute Lymphocytic Leukemia
- Intra-thecal MTX
- Limb paresthesias and clumsiness
- Recurrent, reversible
- MRI changes were noted that looked like AIS
- Consider with chemotherapeutic agents
- Supportive care
- High index of suspicion

Gosavi T Ann Ind Acad Neuro 2013

Methotrexate-Induced Leucoencephalopathy

- 16 yo with Acute Lymphocytic Leukemia
- High dose methotrexate
- Sudden dysphasia and cognitive slowing → global aphasia and altered consciousness.
- MRI showed bilateral diffusion restriction, initially suggesting acute ischemia.
- IV alteplase given, MTX withheld
- Supportive care resulted in complete neurological recovery within 3 days.

Duong TV, et al. Am J Case Rep. 2026. PMID: 41936065

Spontaneous Spinal Epidural Hematoma

- Patient has persistent neck and back pain
- Fluctuating neurological status
- Hemorrhage seen at C6-7 and T12 (narrow)
- Hemi-paresis in older patients
- Consider this diagnosis prior to clot lysis
- High index of suspicion

Akimoto T J *CNS Disease* 2014

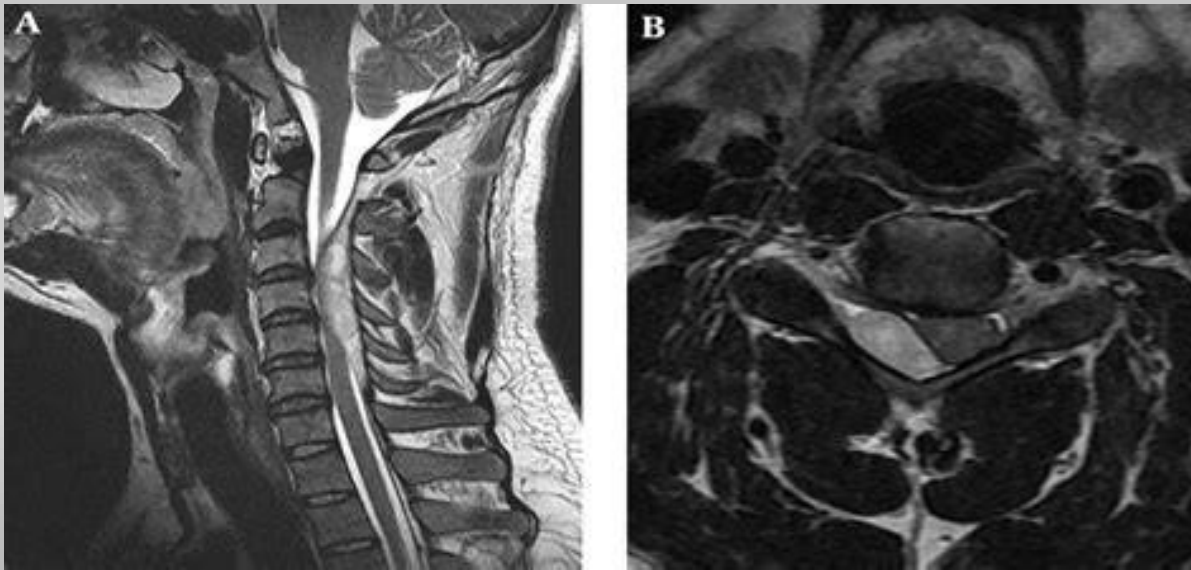
Spontaneous Spinal Epidural Hematoma

- **Sudden cervical/neck pain**
- **Followed by acute hemiparesis and sensory deficits**
- **Initially suspected to be acute ischemic stroke**
- **Initial brain CT was unremarkable**
- **Cervicothoracic MRI demonstrated spinal epidural hematoma from C3–T2 with spinal cord compression**
- **Surgical decompression performed**
- **Complete neurological recovery within one month**

Castelo-Pablos MF, et al. Cureus. 2025;17(5):e83994. PMID: 40519452.

Spontaneous Spinal Epidural Hematoma

- Acute hemiparesis + severe neck/back pain + absent cranial findings → consider cervical spinal pathology before thrombolysis.



**So what can be
concluded and recommended
regarding ED ALS patient care?**

ED Stroke Pts: *Mimics & Chameleons*

- Stroke mimics and chameleons are common during suspected AIS evaluation.
- Mimics resemble AIS; chameleons have true CNS ischemia.
- No single finding/test reliably distinguishes mimics and AIS.
- Beware of mild, atypical, transient, posterior circulation presentations.
- Use focused examination, laboratory testing, and appropriate neuroimaging.
- Continue to provide timely thrombolysis when AIS remains clinically likely.

ED Stroke Patient Care: *DDx*

- Use demographics and vascular risk factors to modify, not determine, AIS probability.
- Consider common stroke mimic diagnoses based on the patient's Hx, exam, and presentation.
- Always consider stroke chameleons with mild, atypical, or posterior symptoms.
- Consider AIS even in patients with low NIHSS or initially negative imaging.
- Document the clinical evidence supporting AIS, TIA, or an alternate diagnosis.

ED Stroke Patient Care: *Thrombolysis*

- Provide timely IV thrombolysis to eligible AIS patients when clinically indicated.
- Stroke mimics inadvertently treated with IV thrombolysis have a very low risk of serious complications.
- Diagnostic uncertainty alone should not unnecessarily delay thrombolysis when AIS remains clinically likely.
- Provide indicated IV thrombolysis promptly even when arranging transfer for possible thrombectomy.

ED Stroke Patient Care: *TT Safety*

- IV thrombolysis has a favorable safety profile in appropriately selected AIS patients.
- Stroke mimics inadvertently treated with IV thrombolysis have a very low risk of symptomatic ICH.
- Most thrombolysed stroke mimic patients have favorable clinical outcomes.
- Diagnostic uncertainty should be balanced against the neurological consequences of delaying true AIS Rx.
- Use established eligibility and exclusion criteria to guide timely IV thrombolysis.

ED Stroke Patient Care: *Posterior Ischemia*

- Posterior circulation ischemia is an important stroke chameleon presentation.
- Dizziness, vertigo, and imbalance may be the predominant symptoms.
- Absence of weakness, aphasia, or a high NIHSS does not exclude AIS.
- Early NCCT, and occasionally MRI DWI, both may be negative despite CNS ischemia.
- Maintain suspicion when the presentation is atypical or examination suggests central ischemia.

ED Stroke Pt Care: *Acute Vestibular Syndrome*

- Distinguish central from peripheral acute vestibular syndrome.
- Assess gait, ataxia, nystagmus, hearing, and neurological findings.
- Use HINTS+ in appropriate AVS patients by trained clinicians.
- Obtain advanced imaging when central ischemia remains suspected.
- Discharge when evaluation supports a peripheral vestibular diagnosis and CNS ischemia has been adequately considered.

ED AIS Patients: Top 10 Actions

ED Stroke Pt Care: *Top 10 Clinical Actions*

1. Treat every acute focal neurologic syndrome as possible AIS.
2. Identify disabling deficits independent of the NIHSS score.
3. Check glucose and identify reversible metabolic abnormalities immediately.
4. Use demographics and vascular risk factors to refine AIS probability.
5. Actively evaluate for common stroke mimics.

ED Stroke Pt Care: *Top 10 Clinical Actions*

6. Actively search for mild, atypical, and posterior stroke chameleons.
7. Evaluate for posterior circulation ischemia even if the NIHSS = 0.
8. Assess acute vestibular syndrome systematically, using HINTS+ when appropriate and trained.
9. Provide indicated IV thrombolysis promptly when AIS remains clinically likely.
10. Reassess the diagnosis whenever the symptoms, exam, and imaging are discordant.

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Questions?

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