

Updates in Stroke Care for Family Physicians

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Disclosures

None

No Consulting fees, no off-label uses of medications, no relationships with ineligible companies



Example Patient

A 48 y.o. man of Hmong descent had abrupt onset of left-hemibody numbness 6 weeks ago. He presented to the ED the day following symptom onset and on MRI brain was found to have an area of acute infarction in the right frontal white matter and thalamus. He was admitted to the community hospital and was discharged on 81 mg aspirin, 75 mg plavix, lisinopril 10 mg, Atorvastatin 80 mg. Stroke workup was notable for bilateral ACA (anterior cerebral artery) stenosis.

Three weeks after discharge he noticed right leg weakness and clumsiness and presented to the ED within 2 hours after symptom onset. He was found to have a new area of infarction in the bilateral ACA territories despite compliance with new medications.



What is the reason for the new stroke?

- A. Lack of medication compliance
- B. Non-response to clopidogrel (Plavix)
- C. High incidence of intracranial atherosclerosis in the asian population
- D. Incomplete stroke workup in the first hospitalization
- E. Intracranial arteries should have been stented within 2 weeks of stroke onset
- F. More than one of the above?



Stroke Epidemiology

- Common and disabling
- 5th leading cause of death
- Lifetime risk 25%
- Incidence is reducing with improving PREVENTION- Risk factor control



Stroke Classification

- Ischemic 88%
- Hemorrhagic 12%



Hemorrhagic Stroke

- Much less common, but higher mortality rates
- Causes/Risk Factors
 - Hypertension
 - Cerebral amyloid angiopathy
 - Vascular malformation (not common)
 - Intracranial Malignancy
 - Hemorrhagic transformation of ischemic stroke



Hemorrhagic Stroke

May cause:

- **Headache** (rare in ischemic stroke)
- **Decreased Level of consciousness** (rare in ischemic stroke)



Hemorrhagic Stroke

Diagnosis and Management

- Non-contrast CT
- If atypical features - vascular imaging or brain MRI
- Treatment
 - Supportive
 - Strict blood pressure control
 - Reversal of anticoagulation if applicable



Ischemic Stroke Etiologies

- Embolic
 - Cardioembolic, ESUS (embolic stroke of unknown source)
- Large vessel
 - Carotid stenosis
- Small vessel (aka lacunar)
- Other known mechanism (i.e. vertebral dissection associated with trauma)



Acute Stroke Workup

- CT Angiography Head and Neck
- Glucose
- INR
- CBC with platelet count
- Intracranial arteries- assess for intracranial atherosclerosis
- Extracranial arteries- assess for carotid stenosis, intervention indicated for ICA stenosis 70%-99%

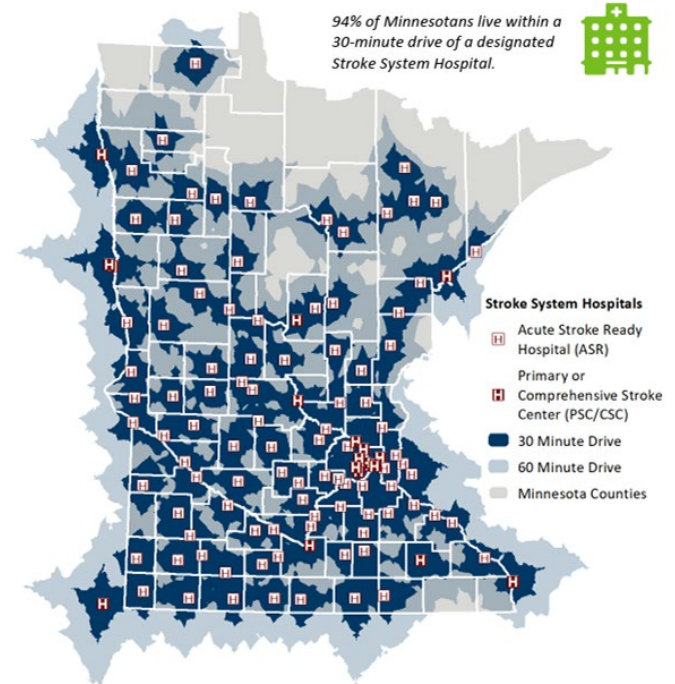


Comprehensive Stroke Centers (11)

1. Abbott Northwestern Hospital – Minneapolis
2. Essentia Health – Fargo
3. Hennepin Health Care – HCMC – Minneapolis
4. M Health – University of Minnesota Medical Center – Minneapolis
5. Mayo Clinic Hospital – Rochester, Saint Mary's Campus – Rochester
6. North Memorial Health Hospital – Robbinsdale
7. Park Nicollet Methodist Hospital – St. Louis Park
8. Regions Hospital – St. Paul
9. Sanford Medical Center Fargo – Fargo
10. Centra Care St. Cloud Hospital – St. Cloud
11. United Hospital – St. Paul

Minnesota Stroke System Coverage

DRIVE TIME TO DESIGNATED STROKE SYSTEMS HOSPITALS,
JUNE 2023



For more information on the Minnesota Stroke System, visit Minnesota Stroke System (<https://www.health.state.mn.us/diseases/cardiovascular/stroke/system.html>). Map prepared by the MDH Cardiovascular Health Unit, June 2023.

[Minnesota Stroke System Designated Hospitals - MN Dept. of Health \(state.mn.us\)](https://www.health.state.mn.us/diseases/cardiovascular/stroke/system.html)



Acute Treatment Options

- Thrombolytics

- U of M/ Fairview was an early adopter of using tenecteplase (TNK) in place of tissue plasminogen activator (TPA). Benefits of TNK:
 - Given as a bolus IV dose, does not require one hour to infuse.
 - Longer half life
 - More specific for fibrinogen
 - Reduced risk of intracranial hemorrhage
 - Possible up to 4.5 hours since last known normal (LKN)

- Thrombectomy

- Indicated for large vessel occlusion identified on angiography (CTA or MRA)
- Possible up to 24 hours since last known normal
- “Perfusion mismatch” of core relative to penumbra

1. Thomas GR, Thibodeaux H, Errett CJ, Badillo JM, Keyt BA, Refino CJ, Zivin JA. A long-half-life and fibrin-specific form of tissue plasminogen activator in rabbit models of embolic stroke and peripheral bleeding. **Stroke**. 1994; 25:2072–2079
- Van de Werf F, Cannon C, Luyten A, Houbracken K, McCabe C, Berioni S, Blumki E, Sarelín H, Wang-Clow F, Fox N, Braunwald E. Safety assessment of single-bolus administration of TNK tissue-plasminogen activator in acute myocardial infarction: the ASSENT-1 trial. **Am Heart J**. 2000; 137:786–791
- Keyt BA, Paoni NF, Refino CJ, Berleau L, Nguyen H, Chow A, Lai J, Peña L, Pater C, Ogez J. A faster acting and more potent form of tissue plasminogen activator. **Proc Natl Acad Sci U S A**. 1994; 91:3670–3674



Thrombolytic (relative) Contraindications

- Active bleeding, major surgery within 14 days
- INR > 1.7 or active use of anticoagulation
- Platelets < 100k
- Stroke within 3 months
- Last known normal > 4.5 hours*, or established stroke on brain imaging
- HTN > 185/110 despite treatment
- Glucose < 50

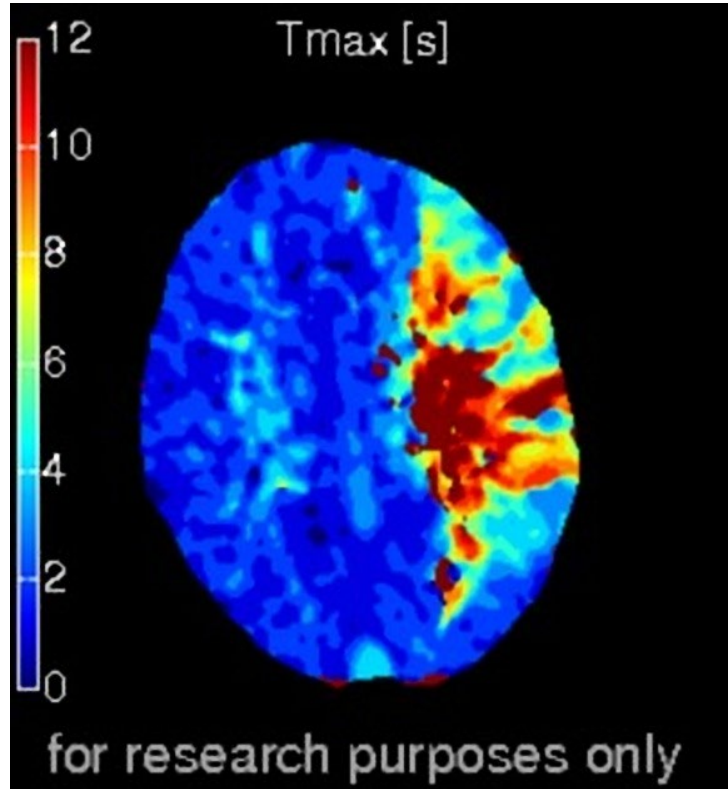


Wake Up Stroke

- Common phenomenon of awaking with stroke symptoms. LKN is often bedtime the previous night, placing them outside the typical 4.5 hour window of thrombolytics.
- CT perfusion or MRI showing a core/ penumbra mismatch can be used to offer acute treatments



Favorable Core-Penumbra Ratio



Completed stroke on head CT



Wake Up Stroke Treatment Options

- With a favorable core-penumbra ratio, thrombolytics can be considered
- Thrombectomy is offered up to 24 hours after last known normal
 - Core penumbra ratio demonstrating salvageable tissue
 - Favorable premorbid Modified Rankin Score



Secondary Stroke Prevention Workup

- Lipid panel- LDL goal 40-70
- A1c- Goal <7.0
- Telemetry- assess for Atrial fibrillation. CHADs2Vasc score for risk stratification, consideration of anticoagulation
 - Patients with an embolic stroke and no identifiable Afib in the hospital qualify for a 2-4 week ambulatory cardiac monitoring
- Smoking cessation
- Stroke education including diet- Mediterranean diet is recommended



Dual Antiplatelet Therapy (DAPT)

Why the variability?

- Usually aspirin 81 mg daily with plavix 75 mg daily
- 21 days following ischemic stroke in patients without intracranial atherosclerosis
- 90 days following ischemic stroke in patients with intracranial atherosclerosis
 - 90 days in the presence of an aortic atheroma
- All stroke patients are recommended to take a daily aspirin (at least 81 mg) daily thereafter



Back to our case. Why the recurrent stroke?

Was the workup complete?

- CTA head and neck- assessed intracranial and extracranial blood vessels. Identified intracranial atherosclerosis
- Lipid panel revealed LDL of 131, above the goal of 40-70
- A1c of 7.9%, improved from the first stroke admission, though still above the goal of 7.0%
- Hypertension on admission is common in the case of acute stroke. Long term goal <130/80
- Neither the first nor second stroke was embolic in etiology, so an outpatient cardiac monitor is not indicated
- How to manage recurrent stroke while on dual antiplatelet therapy?



Stroke Workup

- P2Y12 function test: 230 (180-376 reference range for patients NOT receiving a P2Y12 inhibitor)
- Result is consistent with either non-compliance or non-response to clopidogrel
- HEAD MRA:
 1. Moderate to severe focal narrowing involving the P1 segment of the right posterior cerebral artery.
 2. Severe narrowing involving the A2 segment of the right anterior cerebral artery.



Treatment of Recurrent Stroke on a Case-by-Case Basis

This patient had intracranial atherosclerosis

- More common in Asian populations including our Hmong population in Minnesota
 - 51-54% in East Asian stroke patients vs, 12% in caucasian
- Treatment is optimal medical management
- Due to the platelet inhibition study I switched him from Plavix to Brilinta (90 days) and continued daily aspirin
- Discussed the importance of daily exercise and the Mediterranean diet
- Discussed the importance of of blood pressure management, medication compliance, follow up with his PCP, follow up with a stroke neurologist
- Discussed that medications would have to be refilled

- Huang YN, Gao S, Li SW, Huang Y, Li JF, Wong KS, Kay R. Vascular lesions in Chinese patients with transient ischemic attacks. *Neurology*. 1997;48:524–525
- De Silva DA, Woon F-P, Lee M-P, Chen CPLH, Chang H-M, Wong M-C. South Asian patients with ischemic stroke: intracranial large arteries are the predominant site of disease. *Stroke*. 2007;38:2592–2594



Stroke Characteristics in the Hmong Population

- Hmong patients with stroke were younger (60 vs. 71 years of age)
- Presented to the ED 4 hours later
- Were less likely to receive thrombolytics (6% vs 14%)
- Worse lipid profile
- Higher A1c
- Stroke mechanism was more likely to be small vessel disease
- Less frequent discharge to a rehabilitation facility

Haitham Hussein, MD

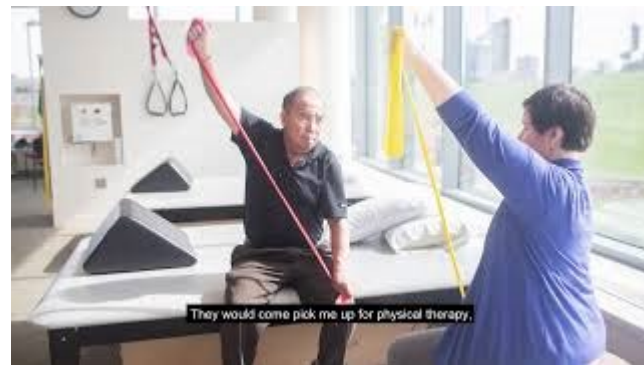
Stroke Characteristics in a Cohort of Hmong American Patients, Hussein, et. al. Journal of the American Heart Association, Volume 12, Issue 15, 1 August 2023



Social Determinants of Health

- Medical literacy
 - Lack of knowledge regarding stroke warning signs
 - Incomplete communication or lack of knowledge regarding prescription medications
 - Inaccessible information - language
- Reduced access to preventative care
 - Underdiagnosed HTN, hyperlipidemia, diabetes

[Stroke recovery in real life: One survivor shares her story \(youtube.com\)](#)



How Do I Discuss Secondary Prevention in Stroke Patients?

- When is the best time to walk for 30 minutes? When you wake in the morning, or after dinner?
- What does a healthy diet mean?
 - “If it comes in a box or a bag it is not as healthy as fresh fruits and vegetables”
 - “Use meat as a condiment, not as the main course”
 - “Buy a box of already washed mixed greens and add it to every meal”
- “*Doc, I love teriyaki chicken and rice. It’s what I eat every day*”
- “You will have to get refills for these medications and may have to take them forever”



Presenting Symptoms of Stroke

- Neurologic deficits within a vascular territory
- The well known:
 - Acute onset
 - Weakness or numbness of one side of the face/body or the other
 - Difficulty speaking or understanding
 - Hemi-neglect
 - Visual field cut
 - Usually not associated with pain
- Less well known:
 - What about acute onset unilateral neck pain in a patient aged 20-40?
 - Recent neck injury or cervical chiropractic adjustment?



Vertebral Dissection

- More common in younger patients
- Associated with neck pain
- Treatment includes either aspirin or anticoagulation



Summary

- Secondary stroke prevention cannot be overemphasized
- Many of the increased risk of stroke and recurrent stroke can be traced to socially determined factors
- Blood pressure control are critically important to reduce risk of ischemic and hemorrhagic stroke



Thank you!

Questions?



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