

Hyperacute and Acute Stroke

Reconnecting over Stroke: A Primary Care Update

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November 22, 2023

Disclosures

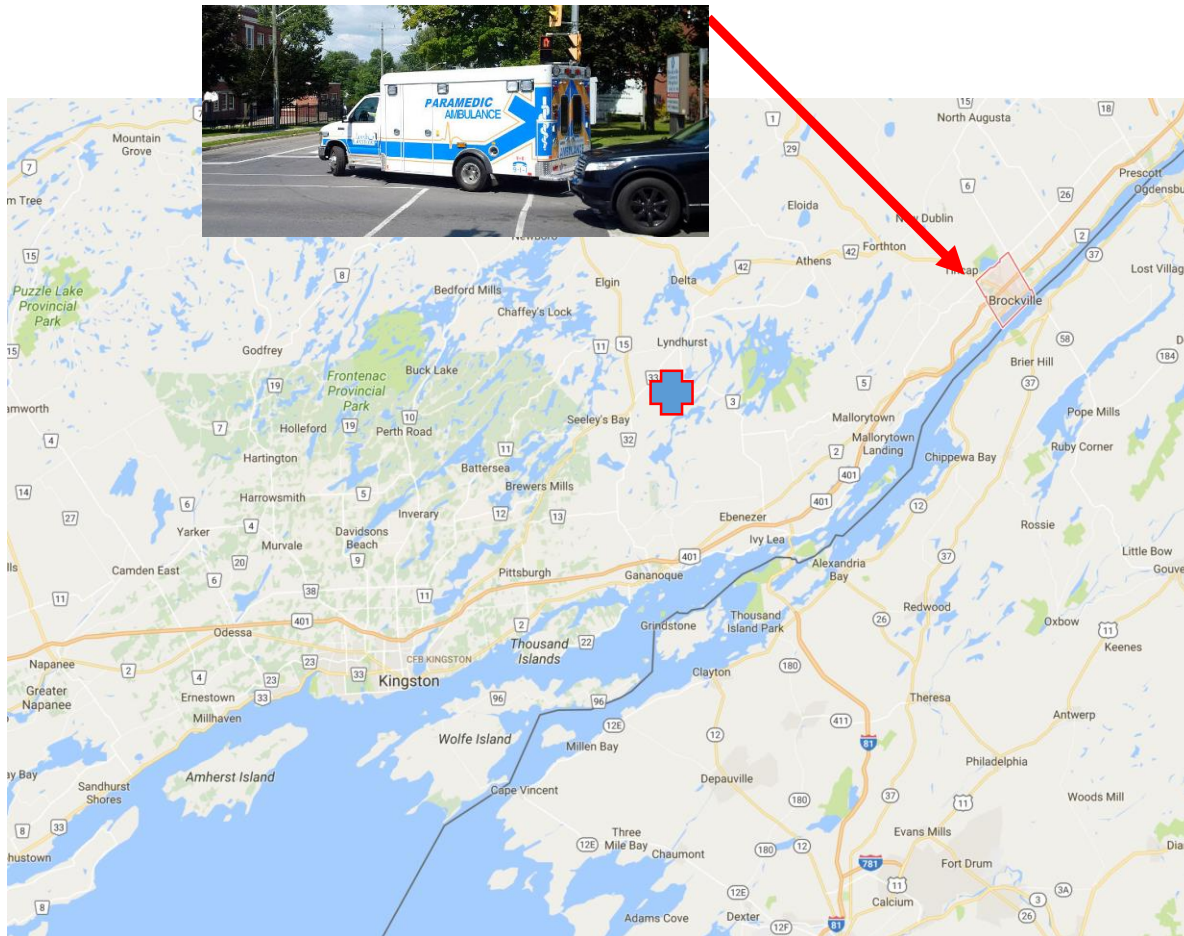
- I have no commercial conflicts or disclosures
- I have not received payment of any kind for this presentation

Objectives

- Review management and evidence for hyperacute stroke care
- Gain an understanding of the challenges of hyperacute stroke care in our region

One Brockville patient's story...

- ~ 9 am: 75 y.o. develops immediate right arm and leg weakness, and can't speak
- ~9:30 am: EMS is on the scene within minutes of family calling 911



EMS stroke assessment for possible Large Vessel Occlusion (LVO): Los Angeles Motor Scale (LAMS)



FACIAL DROOP

ABSENT: 0
PRESENT: 1



ARM DRIFT

ABSENT: 0
DRIFTS DOWN: 1
FALLS RAPIDLY: 2



GRIP STRENGTH

NORMAL: 0
WEAK GRIP: 1
NO GRIP: 2

LAMS Score ≥ 4 indicates a more severe stroke and can be communicated as LVO screen positive

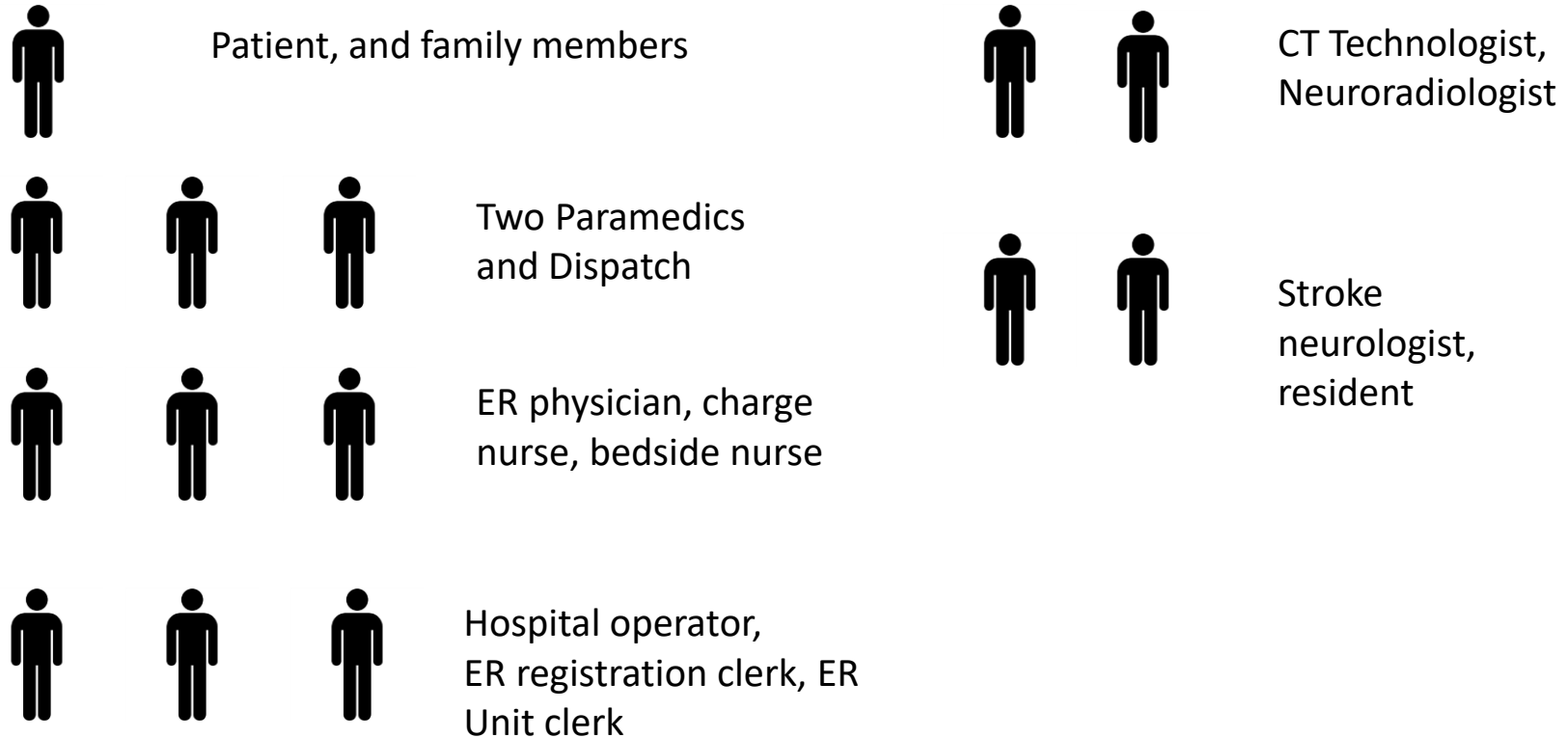
Adapted from *The Paramedic Prompt Card for Acute Stroke Bypass Protocol - Paramedic Training Module* originally developed by CorHealth Ontario <https://www.youtube.com/watch?v=EanfEzCHYc8&feature=youtu.be>

Stroke. 2021;52:70–79. DOI: 10.1161/STROKEAHA.120.031467

- 10:45 am (1h 45 min after onset of symptoms): EMS arrives at Kingston General Hospital ED
- Stroke neurologist and team already notified and waiting for the patient



How many people are notified during the first 10 minutes of hyperacute stroke care?



Hyperacute stroke care kind of looks like this...





Every minute of stroke results in the loss of...

- **2 million neurons**
- **12 km myelinated fibre**
- **14 billion synapses**
- **4 to 7 days of lifespan**

- For every hour of ischemia, the brain loses as many neurons as it does over 3.6 years of normal life

Time is Brain

Reduced in-hospital mortality (OR, 0.96; 95% CI, 0.95-0.98; P < .001)

Reduced symptomatic intracranial hemorrhage (OR, 0.96; 95% CI, 0.95-0.98; P < .001)

Increased achievement of independent ambulation at discharge (OR, 1.04; 95% CI, 1.03-1.05; P < .001)

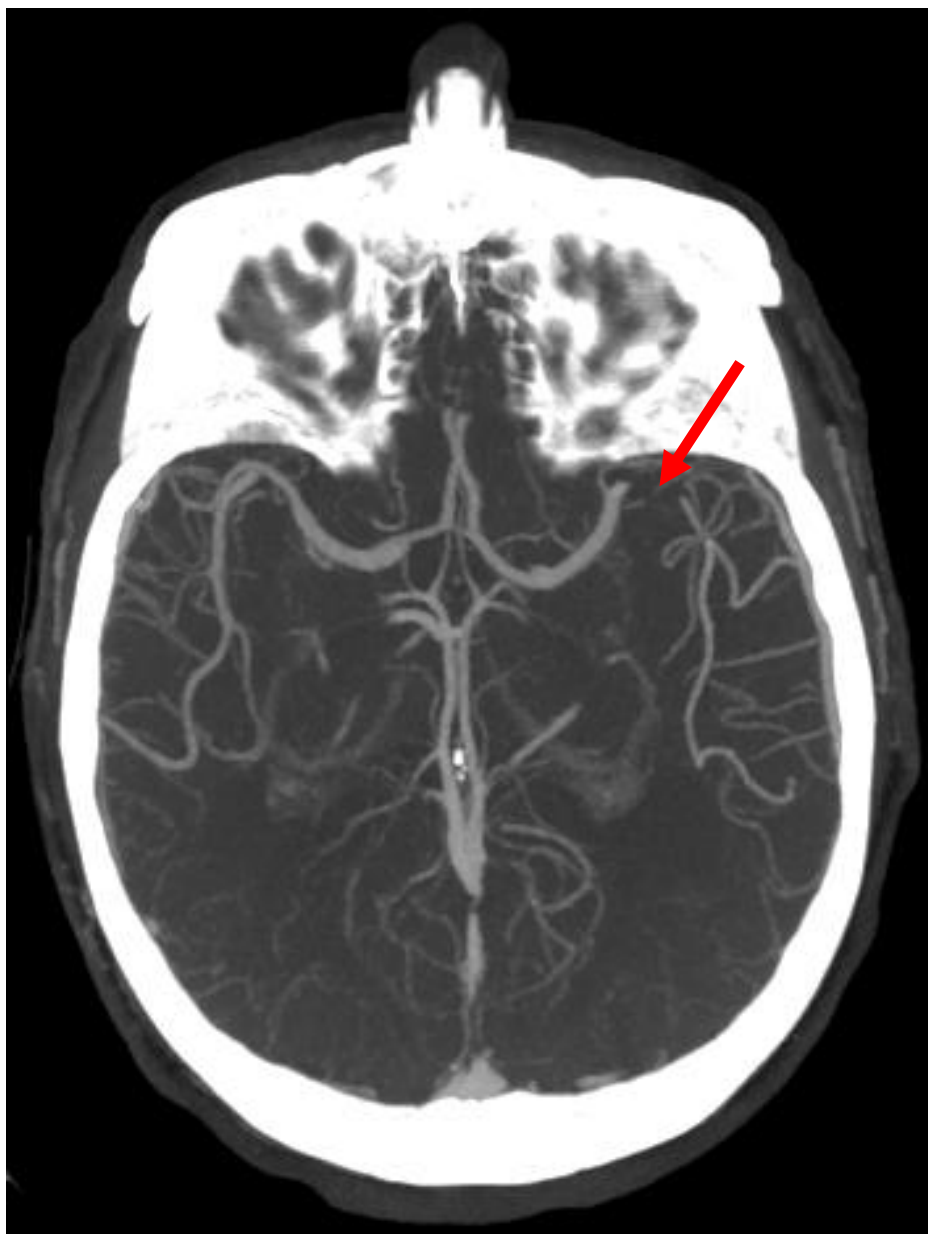
Increased discharge to home (OR, 1.03; 95% CI, 1.02-1.04; P < .001).

- 11:00 am (2h after onset of symptoms)
- Patient immediately brought to CT
- Non contrast head CT, multiphase CTA, and CT perfusion scan was performed.



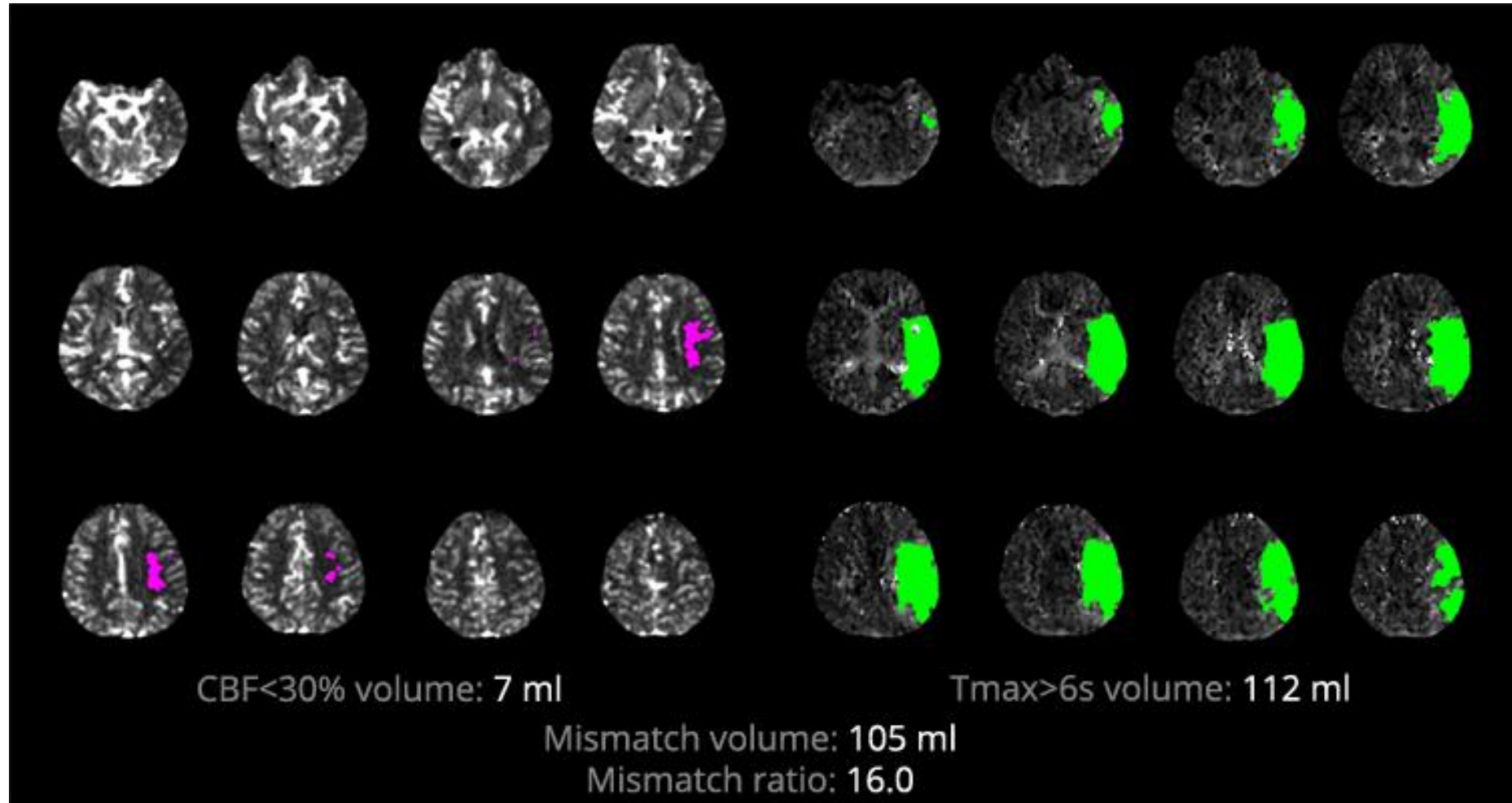


CT head showed subtle signs of acute ischemic stroke in the left hemisphere



**CT angiogram
showed the
absence of blood
flow in one
segment of the
left middle
cerebral artery**

CT perfusion scan showed the area of brain already infarcted (pink) and the area of brain that is at risk but can be salvaged (green)



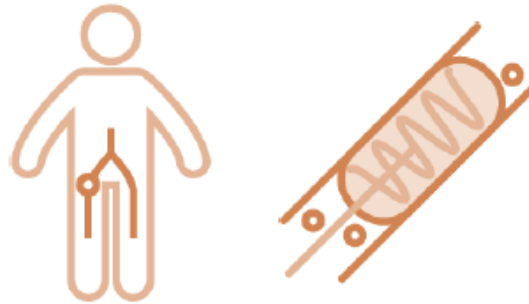
Treatments for Acute Ischemic Stroke

Thrombolysis with either tPA or TNK



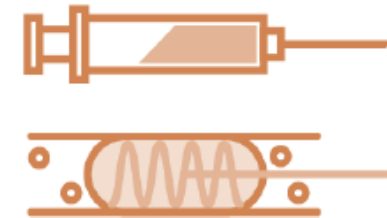
- Thrombolytic agent administered intravenously that dissolves the clot (clot buster)
- tPA must be delivered within 4.5 hours of stroke symptom onset
- **TNK is now replacing tPA because it's as effective and easier to administer**

Endovascular thrombectomy (EVT)



- Mechanical removal of a clot using a catheter and stent
- EVT is ideally performed within 6 hours of stroke symptom onset. However, this time window may be extended to 24 hours for a select group of patients

EVT and thrombolysis



- A patient can receive both tPA and EVT
- Can also receive both TNK and EVT

Intravenous tenecteplase compared with alteplase for acute ischaemic stroke in Canada (AcT): a pragmatic, multicentre, open-label, registry-linked, randomised, controlled, non-inferiority trial



Bijoy K Menon, Brian H Buck, Nishita Singh, Yan Deschaintre, Mohammed A Almekhlafi, Shelagh B Coutts, Sibi Thirunavukkarasu, Houman Khosravani, Ramana Appireddy, Francois Moreau, Gord Gubitz, Aleksander Tkach, Luciana Catanese, Dar Dowlatshahi, George Medvedev, Jennifer Mandzia, Aleksandra Pikula, Jai Shankar, Heather Williams, Thalia S Field, Alejandro Manosalva, Muzaffar Siddiqui, Atif Zafar, Oje Imoukhuede, Gary Hunter, Andrew M Demchuk, Sachin Mishra, Laura C Gioia, Shirin Jalini, Caroline Cayer, Stephen Phillips, Elsadig Elamin, Ashkan Shoamanesh, Suresh Subramaniam, Mahesh Kate, Gregory Jacquin, Marie-Christine Camden, Faysal Benali, Ibrahim Alhabli, Fouzi Bala, MacKenzie Horn, Grant Stotts, Michael D Hill, David J Gladstone, Alexandre Poppe, Arshia Sehgal, Qiao Zhang, Brendan Cord Lethebe, Craig Doram, Ayoola Ademola, Michel Shamy, Carol Kenney, Tolulope T Sajobi, Richard H Swartz, for the AcT Trial Investigators

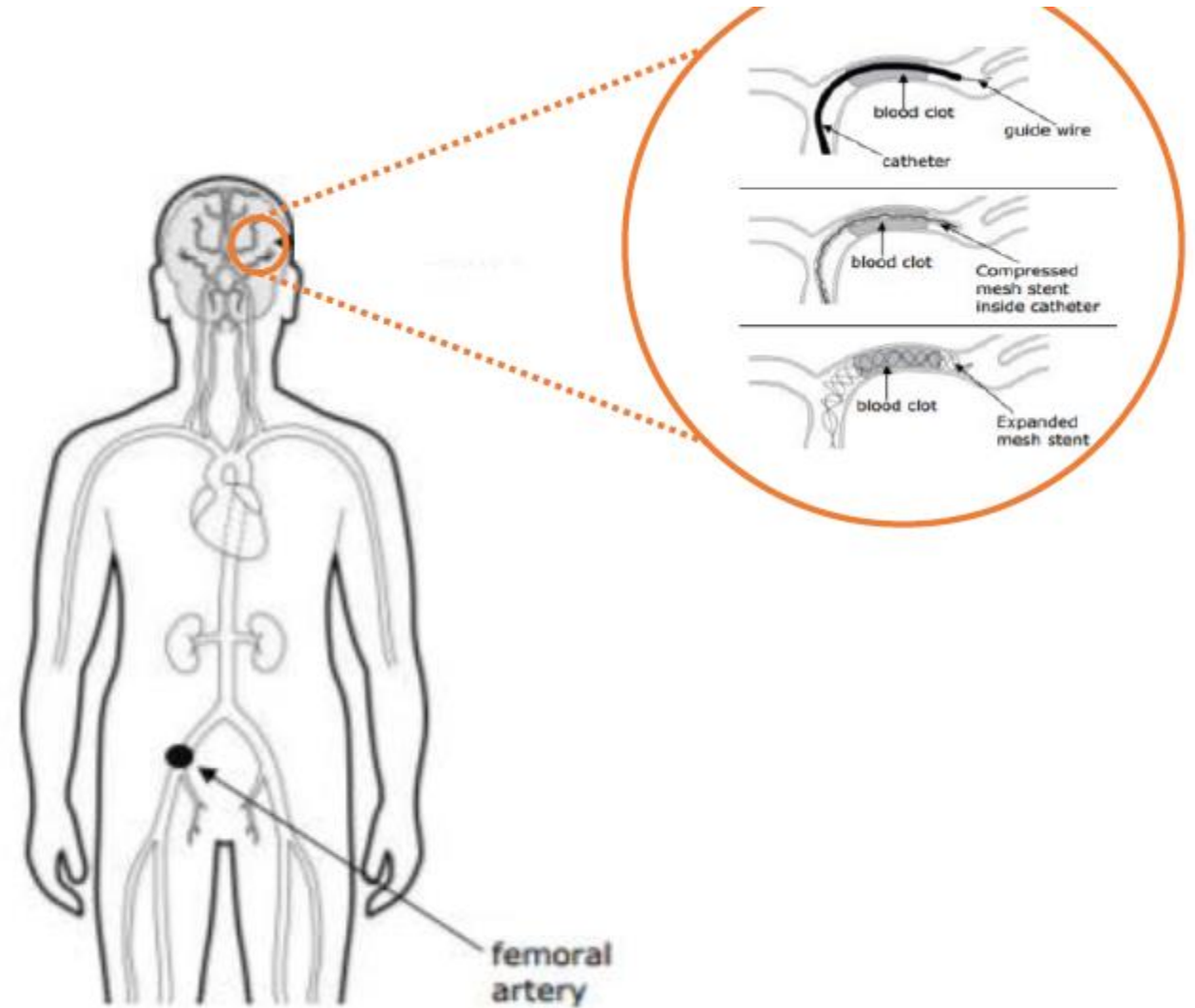
www.thelancet.com Published online June 29, 2022 [https://doi.org/10.1016/S0140-6736\(22\)01054-6](https://doi.org/10.1016/S0140-6736(22)01054-6)

Box 5A Time Windows for Reperfusion in Acute Ischemic Stroke

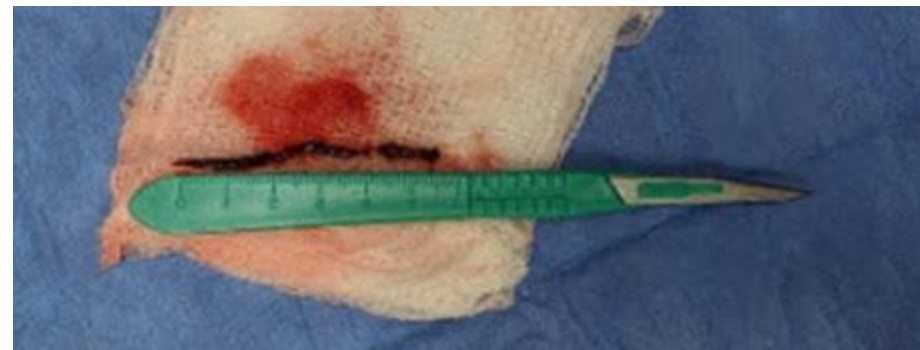
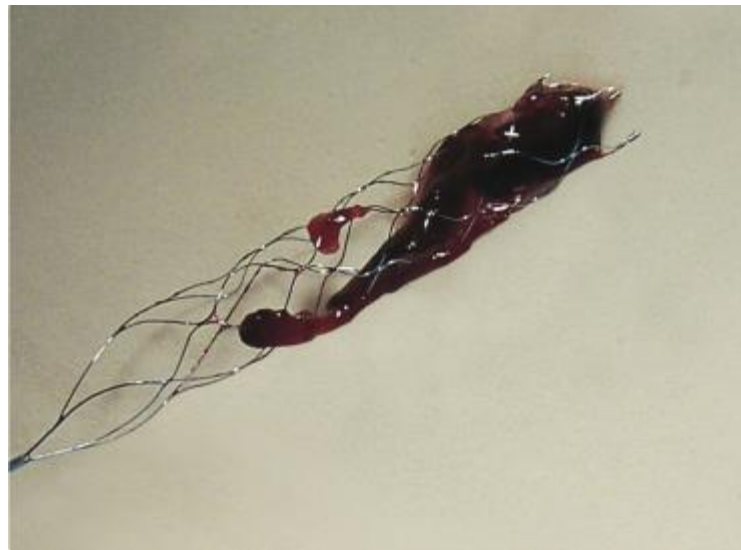
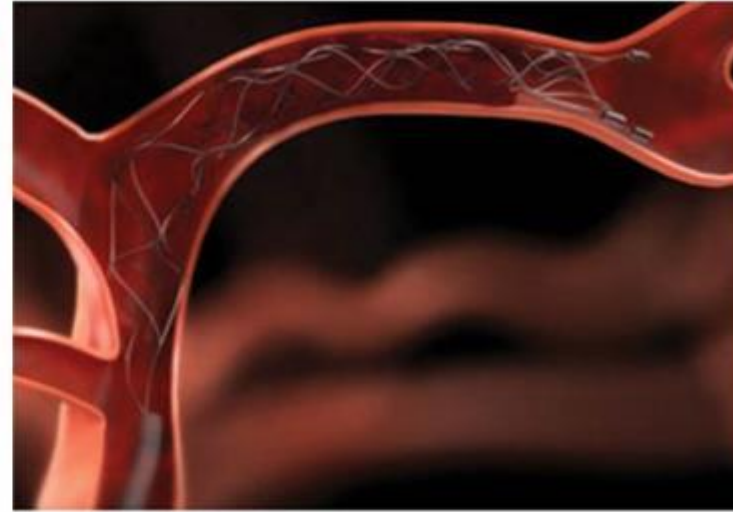
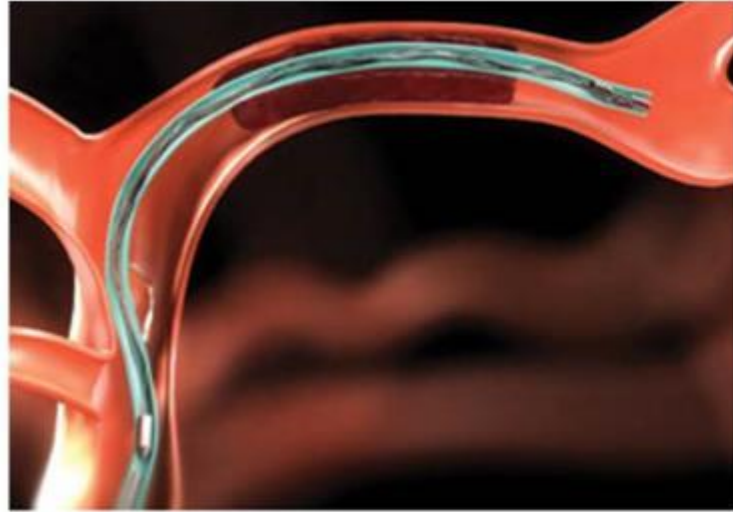
| Available treatments | Time from stroke onset or last known well | Population | Notes and criteria |
|---|---|---|--|
| Screening for stroke signs and symptoms | Within 24 hours | All patients showing signs of acute disabling stroke | |
| Intravenous thrombolysis | 0 to 4.5 hours | All patients showing signs of acute disabling stroke | Based on CT/CTA |
| | 4.5 to 6 hours | Select patients showing signs of acute disabling stroke | Requires advanced imaging for tissue-based decision-making |
| | 6 to 9 hours | Select patients - in discussion with a stroke expert | Requires advanced imaging for tissue-based decision-making |

EVT is now a critical aspect of acute stroke care

- There are a limited number of sites in Ontario that can perform EVT
- Fortunately, Kingston is one of them



EVT with retrievable stent



Five major clinical trials in 2015 brought us EVT

Five RCTs in 2015 changed the way we approach hyperacute stroke, showing that EVT was superior to IV tPA:

MR CLEAN

EXTEND IA

ESCAPE

REVASCAT

SWIFT PRIME

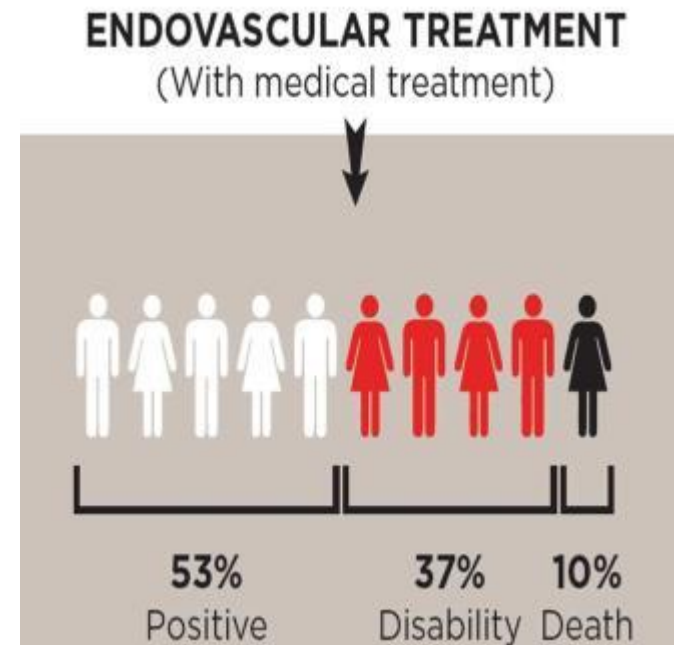
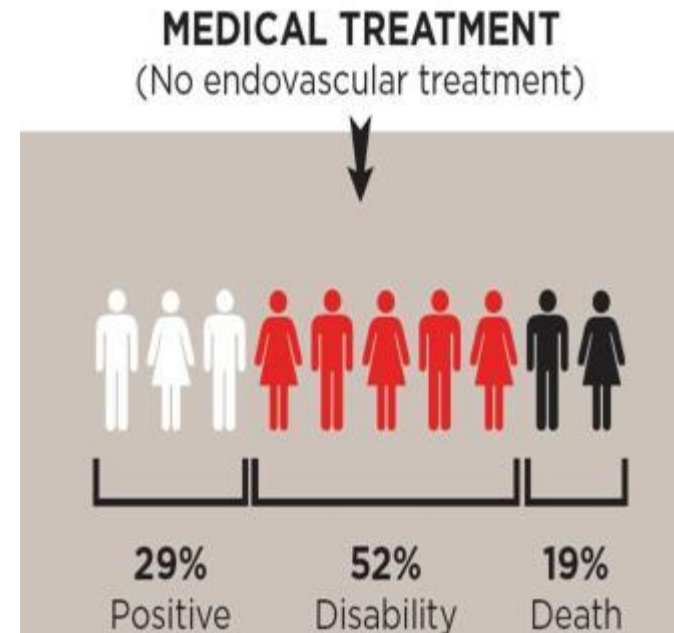
ORIGINAL ARTICLE

Randomized Assessment of Rapid Endovascular Treatment of Ischemic Stroke

M. Goyal, A.M. Demchuk, B.K. Menon, M. Eesa, J.L. Rempel, J. Thornton, D. Roy, T.G. Jovin, R.A. Willinsky, B.L. Sapkota, D. Dowlathshahi, D.F. Frei, N.R. Kamal, W.J. Montanera, A.Y. Poppe, K.J. Ryckborst, F.L. Silver, A. Shuaib, D. Tampieri, D. Williams, O.Y. Bang, B.W. Baxter, P.A. Burns, H. Choe, J.-H. Heo, C.A. Holmstedt, B. Jankowitz, M. Kelly, G. Linares, J.L. Mandzia, J. Shankar, S.-I. Sohn, R.H. Swartz, P.A. Barber, S.B. Coutts, E.E. Smith, W.F. Morrish, A. Weill, S. Subramaniam, A.P. Mitha, J.H. Wong, M.W. Lowerison, T.T. Sajobi, and M.D. Hill for the ESCAPE Trial Investigators*

Benefits of EVT

- ARR = 23.7%
- NNT = 4 (to live independently)
- Risk of ICH = 3%

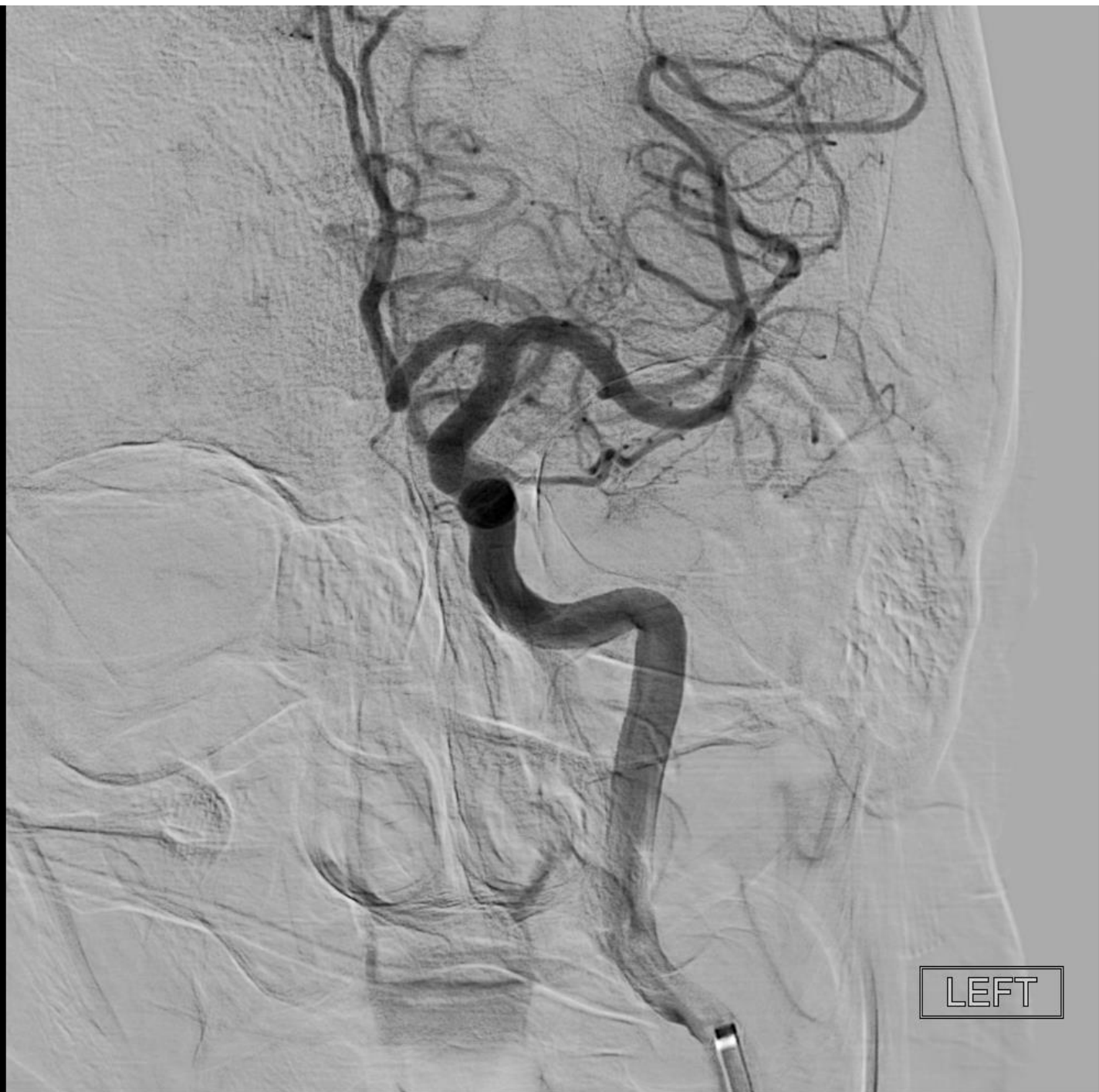


| | | | |
|--------|----|--------|----|
| AO | 75 | 16 | 6 |
| CRAN | | | 9 |
| Height | | | -4 |
| ID | | 105 | |
| D | | 31 | |
| xp | | 2 | |
| flu | | N 15fr | |
| ime | | 03:53 | |
| DAP | | 12794 | |
| K | | 65 | |
| | | 01:29 | |



LEFT





LEFT

The First Day after Thrombolysis and EVT

- Patients are admitted to a Critical Care Unit for monitoring
 - Vitals q1h, including neurovitals, and supportive care
 - NPO
 - Dysphagia is common in the immediate post-stroke period and can be difficult to detect
 - Angioedema after thrombolysis in about 1%
 - Treated with diphenhydramine, ranitidine, hydrocortisone
 - Very, very rarely requires intubation
 - Antithrombotic medications are held until follow up CT head at ~24 hours rules out hemorrhagic transformation
 - **Update family on ongoing care and prognosis**

Outcome

- Vision and strength returned almost to normal within 2 days
- Started to walk by day 3
- Transferred to Brockville General Hospital Acute Stroke Unit
- After 2 weeks of care and rehabilitation in the BGH Stroke Unit, the patient had recovered enough to return home with follow up visits for physiotherapy, occupational therapy and Stroke Clinic arranged.

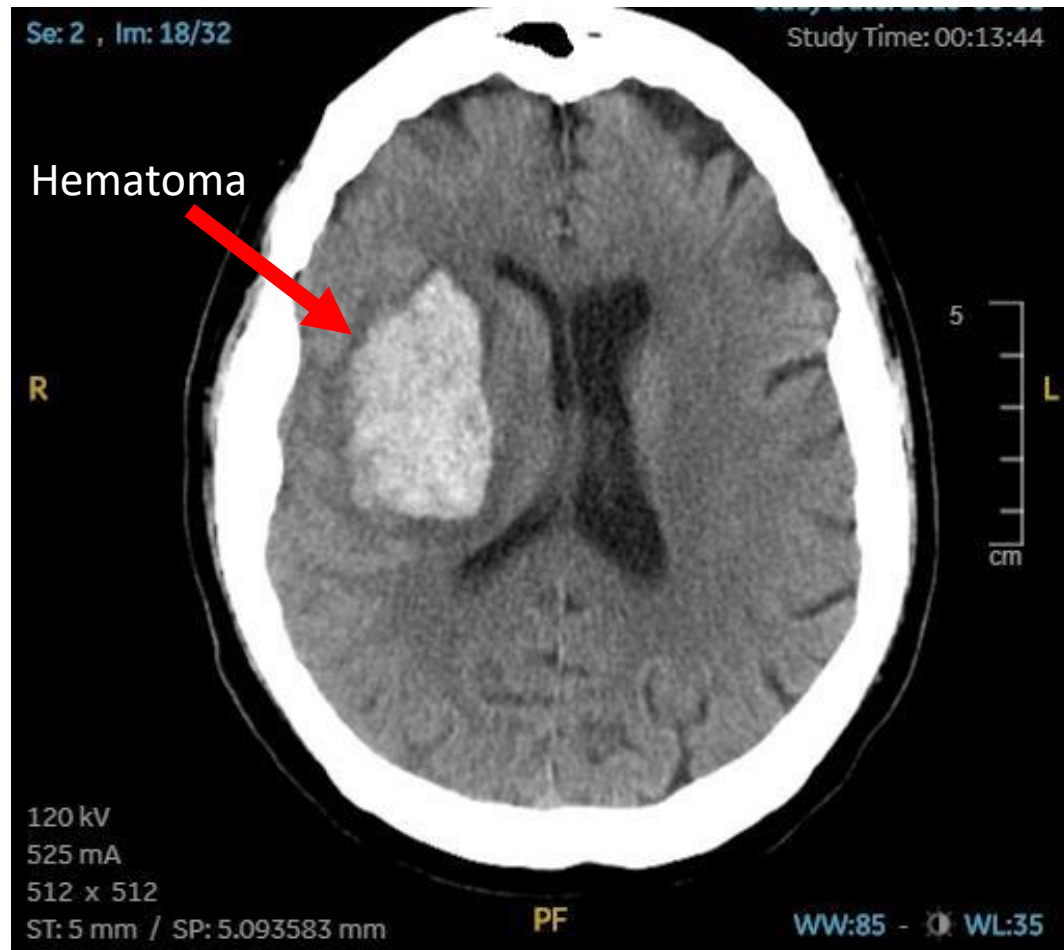
Hyperacute Hemorrhagic Stroke

- The clinical presentation of intracerebral hemorrhage (ICH) can be very similar to ischemic stroke
- CT imaging is the most important diagnostic tool for ICH diagnosis
- MRI can also play a role in the assessment of ICH etiology

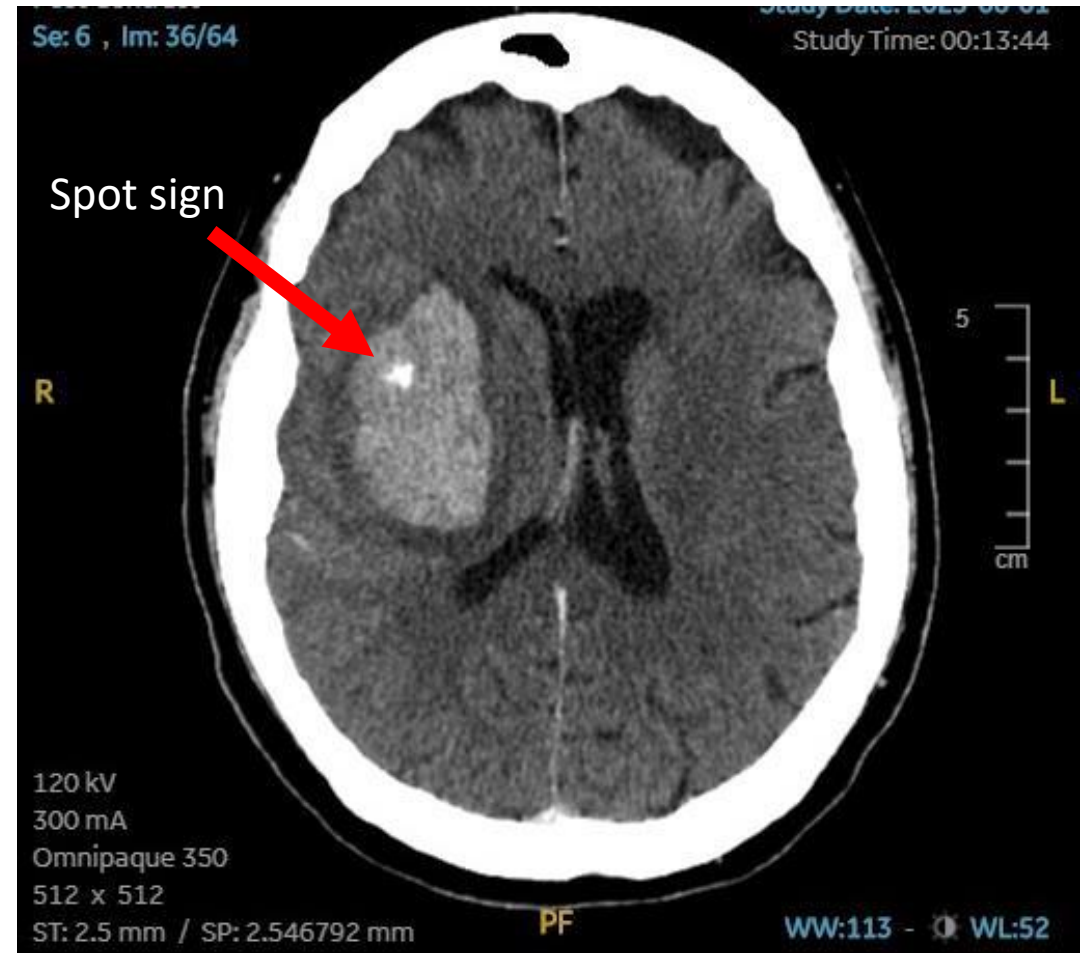
A recent ICH case in a 65F with atrial fibrillation and hypertension

- Acute onset mild headache and left side weakness
- Can speak and understand well but is unaware of any weakness
- Blood pressure: 210/113
- She is taking apixaban for atrial fibrillation

CT scan



Non-contrast scan



Contrast-enhanced scan

ICH Management

- This ICH is due to two things: hypertension and anticoagulation
1. Ensure airway is protected if patient has impaired consciousness
 2. Reverse anticoagulation:
 1. Prothrombin complex concentrate, 25-50 mg/kg, usual dose 2000 units (max dose 3000 units)
 2. Tranexamic acid 1g IV bolus, then 1g over 8 hrs
 3. If the patient is taking dabigatran, the specific reversal agent is idarucizumab

ICH Management, continued

3. Maintain systolic BP < 140 mm Hg

1. We have known for many years that the higher the sBP, the worse the outcome in ICH
2. There were two clinical trials of BP lowering in ICH:
INTERACT2 (N Engl J Med 2013; 368:2355-2365), and
ATACH2 (N Engl J Med 2016; 375:1033-1043)
3. Although neither showed that targeting sBP< 140 mm Hg was better than targeting 160 mm Hg, it was shown that targeting sBP< 140 mm Hg was safe
4. IV labetalol is commonly used to lower blood pressure quickly
5. IV hydralazine can also be used

Prognosis in ICH can be difficult to assess

- Mortality is high for ICH, with 30% dying within one month
- *But one commonly used ICH assessment tool may lead to excess mortality:*

Severity assessment in maximally treated
ICH patients

Neurology® 2017;89:423-431

The ICH score

- Often used to predict ICH outcome
- Based on clinical practices from over 20 years ago

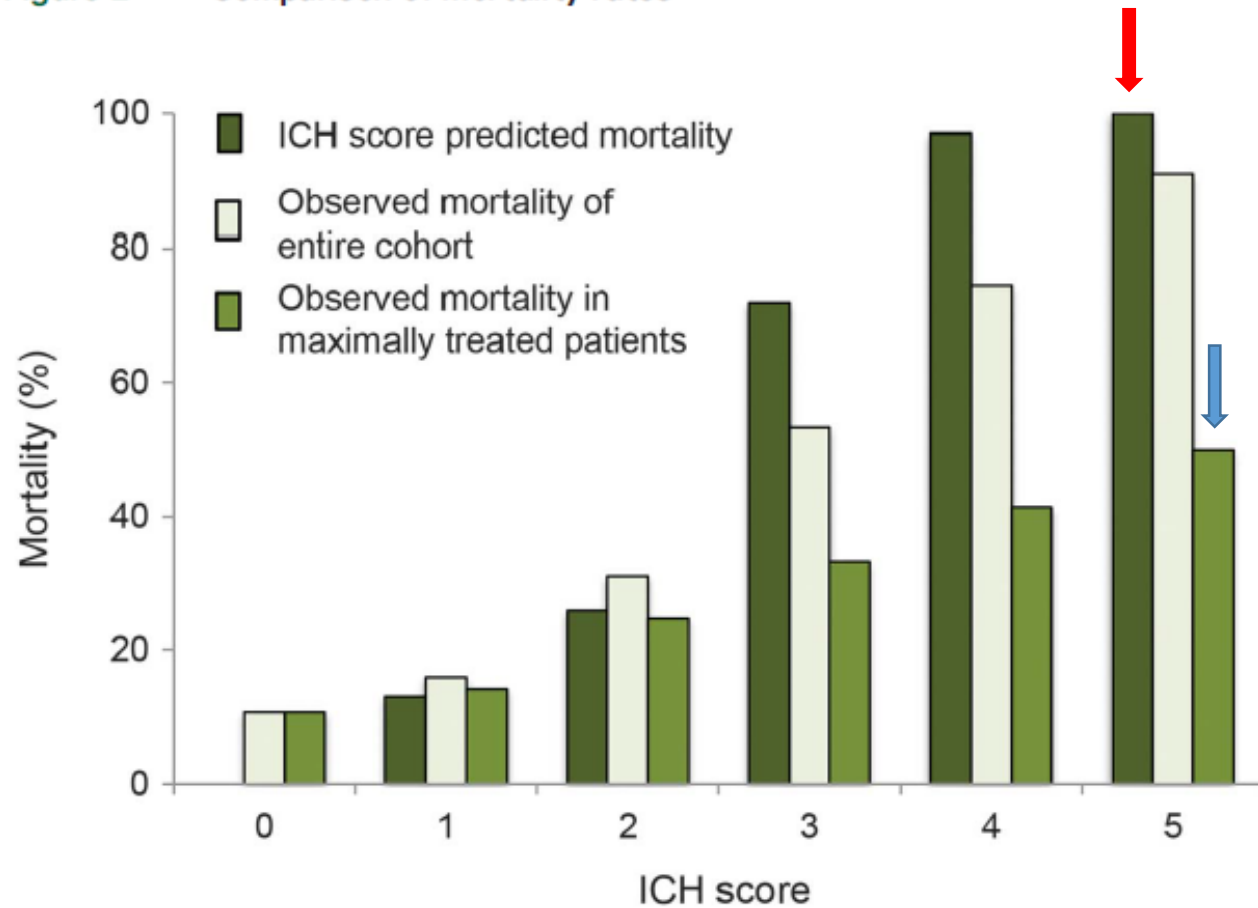
| Component | ICH Score Points |
|-------------------------------|------------------|
| GCS score | |
| 3–4 | 2 |
| 5–12 | 1 |
| 13–15 | 0 |
| ICH volume (cm ³) | |
| ≥ 30 | 1 |
| < 30 | 0 |
| IVH | |
| Yes | 1 |
| No | 0 |
| Infratentorial origin of ICH | |
| Yes | 1 |
| No | 0 |
| Age (year) | |
| ≥ 80 | 1 |
| < 80 | 0 |
| Total ICH Score | 0–6 |

The GCS score refers to the GCS score at initial presentation (or after resuscitation); ICH volume, volume on initial CT calculated using the ABC/2 method; IVH, presence of any IVH on the initial CT.

GCS, Glasgow coma scale; ICH, intracerebral hemorrhage; CT, computed tomography; IVH, intraventricular hemorrhage.

Adapted from Hemphill JC 3rd, Bonovich DC, Besmertis L, Manley GT, Johnston SC. The ICH score: a simple, reliable grading scale for intracerebral hemorrhage. *Stroke* 2001 ;32:891–897.

Figure 1 Comparison of mortality rates



Observed short-term mortality rate in the entire intracerebral hemorrhage (ICH) cohort (n = 583) and in maximally treated patients (n = 471) in contrast to predicted short-term mortality rate by the ICH score.

Summary

- For hyperacute ischemic stroke, time is critical
- Treatment options include thrombolysis with TNK and endovascular thrombectomy (EVT)
 - For every minute of delay in treatment there is substantial loss of neurons, glia, and lifespan
 - Treatment window for thrombolysis is evolving beyond 4.5 hours
- For intracerebral hemorrhage, CT imaging remains the key diagnostic tool
- Treatment of ICH is focused on BP management and reversal of coagulopathy
- Prognosis of ICH is often unclear in the acute phase and overreliance of the ICH score should be avoided

Thank you for the fantastic care you are providing to stroke patients throughout Leeds and Grenville (and Lanark).