Developments in Stroke Prevention

Tackling Stroke Prevention in Primary Care and Stroke Prevention Clinic

Wednesday, February 5th, 2020

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Presenter Disclosure

Faculty: Ramana Appireddy

Relationships with commercial interests:

- Grants/Research Support: PSI, DOM, AHSC IF
- Speakers Bureau/Honoraria: none
- Consulting Fees: none
- Other:

Potential for conflict(s) of interest:

- None

Mitigation of Potential Bias:

- The content of the talk is not based on my research / grants

Presentation Objectives

At the end of this session the participant will be able to:

- **Increase their understanding in stroke prevention**
- **Better manage patients with stroke / TIA**
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Triage categories and target times for TIA and non-disabling stroke

Risk Stratification

Risk Stratification & Management
Very HIGH RISK

Patients presenting **within 48 hours** with transient, fluctuating or persistent symptoms of unilateral motor weakness or speech disturbance/ aphasia or without (e.g., hemibody sensory symptoms, monocular vision loss, hemifield vision loss, +/- other symptoms suggestive of posterior circulation stroke)

- **Immediately sent to ED** with advanced stroke care ideally acute stroke treatments on site
- **Urgent brain & vascular imaging (CTA or MRA) ASAP within 24 hours**
- ECG

Risk Stratification & Management
HIGH RISK

Present **between 48 hours and 2 weeks, WITH** transient, fluctuating or persistent motor unilateral weakness or speech disturbance

- Evaluation & investigations by stroke experts as soon as possible, ideally initiated **within 24H**

Risk Stratification & Management
Moderate (Increased) RISK

Present **between 48 hours and 2 weeks,** with transient, fluctuating or persistent symptoms WITHOUT motor unilateral motor weakness or speech disturbance ((e.g., hemibody sensory symptoms, monocular vision loss, hemifield vision loss, binocular diplopia, or ataxia)

- Evaluation & investigations by stroke experts as soon as possible, ideally initiated **within 2 weeks**

Risk Stratification & Management: LOWER RISK

- Patients who present **more than two weeks** following suspected TIA or ischemic stroke may be considered less urgent:
  - Should be seen by a neurologist or stroke specialist ASAP, ideally within 1 month of symptom onset

(Based on CSBPR Secondary Prevention of Stroke, Section One: Initial Risk Stratification and Management)

Risk For Recurrent Stroke	Time from Stroke Symptom Onset to Healthcare Presentation	Presenting Symptoms	When Patients Should be Seen by Healthcare Professional	Where Patients Should be Seen	Tests to be Done on Initial Assessment
Very HIGH RISK	Within 48 hours	- Transient, fluctuating or persistent unilateral weakness (face, arm and/or leg) - Transient, fluctuating or persistent speech disturbance /aphasia. - Fluctuating or persistent symptoms **without motor weakness or speech disturbance** (eg. hemibody sensory symptoms, monocular visual loss, hemifield visual loss, +/- other symptoms suggestive of posterior circulation stroke such as diplopia, dysarthria, and/or ataxia).	Immediately	Emergency Department [ideally ED with brain imaging onsite and access to alteplase (tPA)]	CT/CTA or MRI/MRA (aortic arch to vertex), ECG, Lab Work (Table 3)
HIGH RISK	Between 48 hours and 2 weeks	- Transient, fluctuating or persistent unilateral weakness (face, arm and/or leg), or speech disturbance/aphasia	As soon as possible, ideally within 24 hours	Stroke Prevention Clinic with Neurologist or Stroke Specialist, Nurse Practitioner	CT/CTA or MRI/MRA (aortic arch to vertex), ECG, Lab Work (Table 3)

TABLE 2A: Summary of Canadian Stroke Best Practices Recurrent Stroke Risk Levels and Initial Management (Based on CSBPR Secondary Prevention of Stroke, Section One: Initial Risk Stratification and Management)

Moderate (INCREASED) RISK	Between 48 hours and 2 weeks	- Fluctuating or persistent symptoms ***without motor weakness*** or speech disturbance (e.g., hemibody sensory symptoms, monocular vision loss, binocular diplopia, hemifield vision loss, or ataxia)	As soon as possible, ideally within 2 weeks	Stroke Prevention Clinic with Neurologist or Stroke Specialist, Nurse Practitioner	CT/CTA or MRI/MRA (aortic arch to vertex), ECG, Lab Work (Table 1)
LOWER RISK	More than 2 weeks	- Any typical or atypical symptoms of stroke or transient ischemic attack	Ideally within 1 month	Ambulatory Clinic with access to Neurologist or Stroke Specialist, Nurse Practitioner	As appropriate based on assessment by healthcare team

TABLE 2A: Summary of Canadian Stroke Best Practices Recurrent Stroke Risk Levels and Initial Management (Based on CSBPR Secondary Prevention of Stroke, Section One: Initial Risk Stratification and Management)

Recommended investigations for suspected Stroke / TIA

Initial Recommended Laboratory Investigations for Patients with Stroke and TIA			
Complete Blood Count (CBC)	International Normalized Ratio (INR)	Partial Thromboplastin Time (PTT)	Random Glucose or Hemoglobin A1C
Electrolytes	Creatinine/eGFR	ALT	Troponin
Follow-up Blood work: to be completed as soon as possible after initial bloodwork once patient has fasted for an appropriate amount of time.		Either a fasting plasma glucose, or 2 hour plasma glucose, or glycated hemoglobin (A1C), or 75 g oral glucose tolerance test	Lipid profile (Fasting optional and decision should be based on individual patient factors)

Additional Laboratory Investigations for Consideration in Specific Circumstances

Note: All patients are individual and some may require additional investigations to fully understand their clinical situation. The investigations noted below may not be indicated in many stroke patients and should be considered in selected stroke patients based on clinical presentation and medical history.

Optional Laboratory Investigations		
Calcium, Magnesium, Phosphate	If female less than 50 years of age, consider pregnancy test	Blood cultures x 3 (per individual institutional protocol)
Blood and/or urine drug screen	HIV, syphilis serology	
Coagulopathy Screen – For consideration in selected patients *only if clinically indicated* *Recommend consultation with a specialist in thrombosis to evaluate for hypercoagulable state*		
Anticardiolipin (Antiphospholipid) antibody	Lupus anticoagulant	Sickle cell screen	Homocysteine (fasting serum level)
Special considerations especially in young adults and children with stroke in absence of identified etiology *(Note there is not a strong evidence base for these investigations, and they should be considered only in selected stroke patients based on clinical presentation and medical history*		
Consider LP for CSF analysis (cell count and differential, protein, glucose, bacterial and viral cultures; possibly cytology/flow cytometry if CNS lymphoma is a consideration)	Brain biopsy (if vasculitis of the central nervous system or angiocentric lymphoma is a consideration)	
Catheter cerebral angiography	Further genetic tests – CADASIL, Fabry's, MELAS	

- 12 lead EKG
- Neurovascular imaging
  - CT/CTA or MRI /MRA (level A)
  - CTA (Arch to vertex) – Ideal (Level B)
  - Carotid doppler (Level C)

Embolic stroke / Embolic TIA

More than 24-hour EKG recommended as part of initial workup (Level A)

Suspected Embolic Stroke of Undetermined Source (ESUS)

- Prolonged EKG monitoring for more than 2 weeks is recommended in patients with suspected ESUS and >55 years (Level A)

Lifestyle and Risk Factor Management

At each stroke prevention visit, assess adherence to individualized secondary prevention plans (pharmacotherapy and lifestyle changes)

Healthy Balanced Diet

- Variety of natural & whole foods at each meal
- Fewer highly processed foods
- High in vegetables and fruit choosing fresh or frozen unsweetened fruit, or fruit canned in water without added/free sugars or artificial/non-caloric sweeteners; fresh or frozen vegetables without added sauce, or canned vegetables with no added salt
- Lean meats, whole grains and protein from plant sources low in saturated, trans fats, low in cholesterol
- Follow Mediterranean-type diet
- Free sugars should not exceed 10% of total daily calorie intake

Lifestyle and Risk Factor Management

Sodium Intake

- Lower sodium to less than 2000 mg/day

Exercise

- Reduce sedentary behaviours; work towards increased activity goals as tolerated; moderate intensity 4-7 days/wk accumulating at least 150mins in episodes of 10mins or more in addition to routine ADL
- Regular exercise program

Weight

- Body mass index (BMI) of 18.5 to 24.9 kg/m^2; or a waist circumference of <88 centimetres for women and <102 centimetres for men*
- Set healthy weight loss goals; develop individualized plans to achieve goals
- Referral to dietitian should be considered

Lifestyle and Risk Factor Management

Alcohol Consumption

- Avoid heavy alcohol use
- No more than 2 drinks/day for women most days-10 drinks /week. No more than 3 drinks/day for men-15 drinks/week. (Canada's Low-Risk Alcohol Drinking Guidelines, 2011)

Oral Contraception & HRT

- Discourage and discontinue HRT or estrogen-containing oral contraceptives

Recreational Drug Use

- Discontinue use if not prescribed for medical indications; provide appropriate support/referrals to services & resources for drug addiction and rehabilitation

Smoking Cessation

- Smoking status should be identified, assessed & documented
- Provide unambiguous, non-judgmental, & patient-specific advice regarding the importance of cessation
- Offer assistance with the initiation of a smoking cessation attempt; People not ready to quit offer motivational intervention to enhance readiness to quit
- Combination of pharmacological therapy and behavioural therapy

Sleep Apnea

- Removed from previous 2015 recommendations
  - Results from SAVE trial showed that although treatment with CPAP for moderate-to-severe sleep apnea in patients with history of coronary & cerebrovascular disease was associated with benefits, risk of recurrent stroke or major cardiovascular events were not reduced significantly
- Screening & treatment should still continue as part of routine primary care

Blood Pressure

- People at risk of stroke measure routinely, no less than once annually & more frequently based on individual clinical circumstances
- Systolic greater than 130 mmHg and/or diastolic greater than 85 mmHg should undergo thorough assessment for diagnosis of hypertension
- BP lowering treatment is recommended to achieve **target consistently lower than 140/90 mm Hg**
  - **Small subcortical stroke-target consistently systolic BP less than 130 mmHg**
  - **Diabetes**- target consistently systolic BP **less than 130 mm Hg & diastolic BP less than 80 mm Hg**
- Patients not started on hypertensive therapy in acute care should have arrangements made for follow-up with primary care or stroke prevention service for ongoing evaluation & management
- ***Initially stroke patients require frequent monitoring (e.g., monthly) until achieving target BP levels & optimal therapy established***

Lipid Management

- Measure **total cholesterol, total triglycerides, LDL cholesterol, HDL cholesterol**
- Aggressive therapeutic lifestyle changes to lower lipid levels, including dietary modification, unless contra-indicated
- Prescribe Statin for ischemic stroke or TIA to **achieve target LDL consistently less than 2.0 mmol/L or >50% reduction of LDL**, from baseline (CCS Lipid Guideline update 2016)
  - **Ischemic Stroke + recent acute coronary syndrome or established coronary disease, treat to more aggressive targets (LDL-C <1.8 mmol/L or >50% reduction)**
- Statin therapy is not indicated for prevention of intracerebral hemorrhage

Diabetes

- Screen using fasting glucose, or 2 hr plasma glucose, or A1C, or 75 g oral glucose tolerance test
- Ischemic stroke or TIA + Diabetes, measure A1C
- Glycemic targets should be individualized: however, lowering A1C ≤7% in both type 1 & type 2 diabetes + stroke or TIA, provides benefit for microvascular complications prevention

Clinical Considerations :

- The results from *Pioglitazone after Ischemic Stroke or* TIA suggest benefit of pioglitazone for stroke prevention in patients with positive insulin resistance, it is offset by increased risk of fractures & bladder cancer.
- More intensive glucose control (A1C ≤6.5%), may be considered in patients with shorter duration of diabetes, no evidence of significant CVD & longer life expectancy, provided does not result in significant hypoglycemia increase (CDA 2016)

Antiplatelet treatment

Antiplatelet Therapy

- Prescribe antiplatelet therapy for **all** patients **with ischemic stroke/TIA** unless indication for anticoagulation
- ASA (80 mg – 325 mg), combined ASA (25 mg) and extended-release dipyridamole (200 mg), or clopidogrel (75 mg) are all appropriate options
  - **Short-term concurrent** use of ASA + clopidogrel (**up to 21 days)** has not shown increased risk of bleeding & may be protective
  - **Longer-term** use of ASA + clopidogrel is **not recommended** for secondary stroke prevention, unless there is an alternate indication (e.g., coronary drug-eluting stent requiring dual antiplatelet therapy), due to increased risk of bleeding and mortality. *This combination being investigated in the POINT trial*

Antiplatelet Treatment

- High risk TIA / Minor Stroke
  - POINT trial
    - Protocol : ASA (160 mg) + Clopidogrel (600mg)
    - Duration: 3 months
  - CHANCE
    - Protocol : ASA (160 mg) + Clopidogrel (300mg)
    - Duration: 3 weeks

Antiplatelet Treatment

- CSBPR – 21 days to 30 days
- Add GI protection if using for 90days
- Bleeding risk with DAPT
  - POINT : 0.9% vs 0.4%
  - CHANCE: 0.3% vs 0.3%

Afib Screening

EKG monitoring for Afib (Level A)

- Suspected TIA or Ischemic Stroke
  - 12 lead EKG for all
- All acute embolic stroke / TIA
  - At least 24 hours of EKG monitoring
  - Suspected Cardioembolic
    - 2 weeks monitoring

Atrial Fibrillation

•Prevention

- Patients with TIA or ischemic stroke *&* non-valvular afib should receive oral anticoagulation. When selecting oral anticoagulants, patient specific criteria should be considered *Refer to Summary Table for Selection of Anticoagulant Agents for Management of Atrial Fibrillation*
- In most patients direct non-vitamin K oral anticoagulants (DOAC) such as apixaban, dabigatran, edoxaban, or rivaroxaban should be prescribed over warfarin
- For patients already receiving warfarin with good INR control (Range 2.0 – 3.0) continuing warfarin is reasonable
- If unable to take oral anticoagulant therapy, ASA alone is recommended
  - –Clopidogrel + ASA may be reasonable and decisions should be individualized based on patient bleeding risk

Anti-coagulation for mechanical valves

- For patients with mechanical heart valve, warfarin is recommended; DOACs are contraindicated

Direct Oral Anticoagulants

Overdosing and Underdosing of NOACs in patients with AF

Table 1 Prevalence of overdosing and underdosing of NOACs in patients with AF

Study	Setting	Drug	Overdose (%)	Underdose (%)
Camm *et al*[6]	XANTUS international registry	Rivaroxaban	5	13
Steinberg *et al*[7]	ORBIT-AF II US Registry	Any	3.4	9.4
		Dabigatran	0.5	7.5
		Rivaroxaban	4.8	8.0
		Apixaban	2.1	11.8
Yao *et al*[8]	OptumLabs US administrative database	Any	4.3	12.0
		Dabigatran	0.6	8.7
		Rivaroxaban	6.6	12.7
		Apixaban	4.9	14.8
García Rodríguez *et al*[9]	UK primary care	Any	7	13
		Dabigatran	16.9	8.7
		Rivaroxaban	6.6	9.1
		Apixaban	3.5	21.6

AF, atrial fibrillation; NOAC, non-vitamin K antagonist oral anticoagulant; ORBIT-AF II, Outcomes Registry for Better Informed Treatment of Atrial Fibrillation II.

- Annual monitoring of renal function

Yao X, Noseworthy P. doi:10.1136/ heartjnl-2019-316099

Timing to start anticoagulation

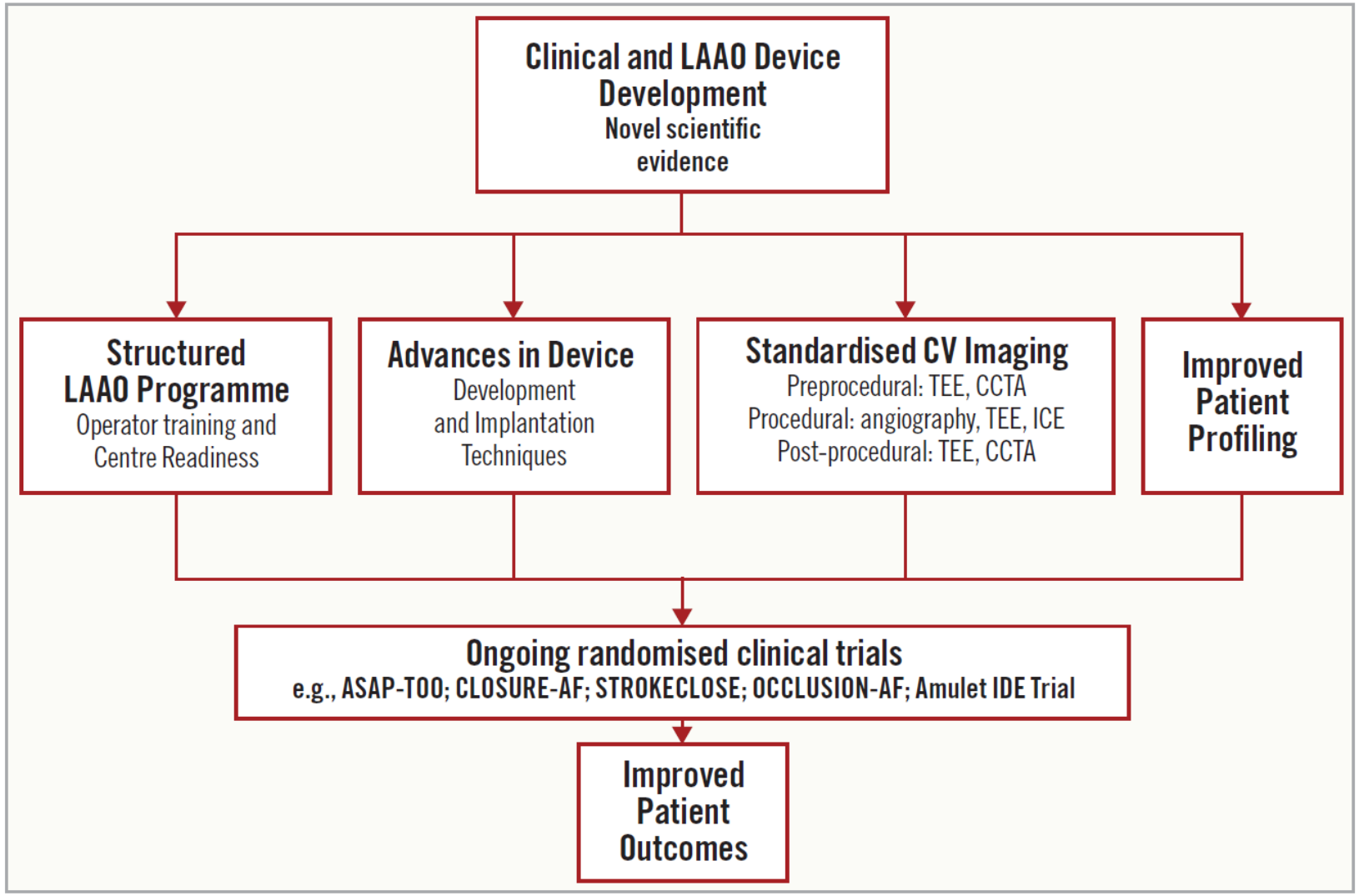
- Optimal timing to start anticoagulant therapy after stroke has not been defined; should be based on individual benefit/risk assessment--infarct size, imaging appearances, age, comorbidities, estimated stroke recurrence risk
- General target time to start oral anticoagulant therapy post stroke is: 1 day after TIA, 3 days after mild stroke, 6 days after moderate stroke, and 12 days after severe stroke.

LAA Occlusion for Stroke prevention

LAA Occlusion in patients with Afib

- > 20% patients on DAOC's do not tolerate them after 2 years
  - Major bleeding, poor renal function, perceived higher bleeding risk
  - Major bleeding is 2-3% per year

LAA Closure



EuroIntervention 2020;15:1117-1119

PFO Closure

PFO

- ~30% strokes – cryptogenic
- ~ 40-50% cryptogenic strokes have PFO
- CLOSE (2017), CLOSURE (2012), DEFENSE-PFO(2018), PC TRIAL (2013), REDUCE (2017), RESPECT 2013/2017

World J Cardiol 2019 April 26; 11(4): 126-136

PFO Detection

- TEE with bubble study – gold standard for non-invasive diagnosis of PFO
  - 89.0% sensitivity and 91.2% specificity
- + Bubble study with in 3 cardiac cycles
- TEE quantifies shunt size and allows operators to document anatomical PFO characteristics for potential closure device planning.

Table 1 Study characteristics

Study name,year	Country of origin	Study design	Indication of PFOC	Total Patients (PFOC + medical therapy), *n*	Medical therapy	Type of device	Follow-up, in years (mean)
CLOSE[6], 2017	France and Germany	Multicenter, randomized, open-label, superiority trial	Recent stroke due to PFO with atrial septal aneurysm or substantial right-to-left intra-atrial shunt	663[1] (238 + 235)	Antiplatelet therapy (aspirin + clopidogrel)[1]	11 different devices	5.4 PFOC, 5.2 AC-AP
CLOSURE I[11], 2012	United States and Canada	Multicenter, randomized, open-label trial	Stroke or TIA within 6 mo	909 (447 + 462)	Warfarin, aspirin or both	STARFlex device	2
PC Trial[9], 2013	Europe, Canada, Brazil, and Australia	Multicenter, randomized, superiority trial	Stroke, TIA or systemic thromboembolism	414 (204 + 210)	Aspirin+ ticlopidine/clopidogrel	Amplatzer PFO occluder	4.1 PFOC, 4.0 AC/AP
REDUCE[8], 2017	Europe and United States	Multinational, prospective, randomized, controlled, open-label trial	Stroke within 180 d	664 (441 + 223)	Aspirin, aspirin + dipyridamole, or clopidogrel	Helex or Cardioform Septal Occluder	3.2
RESPECT[7], 2017	United States and Canada	Multicenter, randomized, open-label, controlled clinical trial	Stroke within 270 d	980 (499 + 481)	Aspirin + clopidogrel	Amplatzer PFO occluder	5.9
DEFENCE PFO[14], 2018	South Korea	Multicenter, randomized, open-label, superiority	Ischemic stroke in past 6 mos	120 (60 + 60)	Aspirin, aspirin + clopidogrel, aspirin + cilostazol, or warfarin	Amplatzer PFO occluder	2.8

[1]There were patients who received anticoagulation alone but the comparator for that arm was antiplatelet therapy not PFOC. AC: Anticoagulation; AP: Anti-platelet; PFOC: Patent foramen ovale closure.

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Table 3 Procedural success and complications

Study name, year	Total patients PFOC	Type of Device	Success of device implantation	Success of PFO closure	Procedural complications	Atrial fibrillation/ flutter in PFOC, *n* (%)	Timing of Afib/flutter	Recurrence of Afib/flutter at f/u
CLOSE[6], 2017	238	11 different devices	234/235 (99.6)	202/228 (88.6)	14/238 (5.9)	11 (4.6)	10/11 within a month	None
CLOSURE I[11], 2012	447	STARFlex device	362/405 (89.4)	315/366 (86.1)	13/402 (3.2)	23 (5.7)	14/23 within a month	6 persistent
PC Trial[9], 2013	204	Amplatzer PFO occluder	188/196 (95.9)	142/148 (95.9)	3/204 (1.5)	6 (2.9)	Timing not defined	1 persistent
REDUCE[8], 2017	441	Helex or Cardioform Septal Occluder	408/413 (98.8)	408/413 (98.8)	11/441 (2.5)	29 (6.6)	24 within 45 d	Not defined
RESPECT[7], 2017	499	Amplatzer PFO occluder	462/464 (99.1)	NR	25/499 (5.0)	7 (1.4)	Periprocedural period	NR
Defense Trial PFO[14], 2018	60	Amplatzer PFO occluder	53/60 (88.3)	53/53 (100)	2/60 (3.3)	2 (3.3)	1 periprocedural	NR

Afib: Atrial fibrillation; f/u: follow-up; NR: Not reported; PFOC: Patent foramen ovale closure.

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PFO Closure

- Reduced risk of recurrent IS and the composite outcome of stroke, TIA, and systemic thromboembolism with PFO closure compared to Antiplatelets
- PFO Closure vs Anti-coagulation – unresolved
- More benefit in patients < 45 years, Large PFO ASA

Extracranial Carotid Disease

Symptomatic Carotid Stenosis (CS)

- Patients with recent TIA or non-disabling stroke and ipsilateral **50 to 99** percent symptomatic carotid stenosis **should have evaluation** by stroke expert and be offered carotid endarterectomy **ASAP**
- Carotid stenosis should ideally be measured by CTA to guide surgical decision-making
- Patients with non-disabling stroke or TIA and **70-99** percent symptomatic carotid stenosis, **carotid endarterectomy should be performed on an urgent basis**.
  - Ideally should be performed within the first days following non-disabling stroke or TIA and within 14 days of ischemic event onset for patients who are not clinically stable
- Carotid endarterectomy is generally more appropriate than carotid stenting for patients over 70 who are otherwise fit for surgery
- Carotid stenting may be considered for patients who are not OR candidates

Extracranial Carotid Disease

Asymptomatic Carotid Stenosis (CS)

- Patients with asymptomatic carotid stenosis should be evaluated by stroke expert; should receive aggressive medical management of risk factors
- Carotid endarterectomy may be considered for selected patients with **60 to 99** percent carotid stenosis who are asymptomatic or were remotely symptomatic (i.e., greater than six months)
- Carotid stenting may be considered in patients with 60 to 99 percent carotid stenosis who are not operative candidates provided there is less than 3% risk of peri-procedural morbidity and mortality

Intracranial Stenosis

- Intracranial stenting is not recommended for treatment of recently symptomatic intracranial 70% to 99% stenosis
- ASA 325 mg + Clopidogrel 75 mg started within 30 days of stroke or TIA & **treated up to 90 days** should be considered on individual basis.
- Provide aggressive management of all vascular risk factors
- In patients with recurrent stroke managed with maximal medical therapy, there is lack of clear evidence to guide further management decisions; intracranial angioplasty (with or without stenting) may be reasonable in carefully selected patients

Cervicocephalic Artery Dissection

- CTA or MRA is preferred, as neck ultrasound does not fully visualize vertebral arteries and can miss carotid dissection above angle of jaw
- Uncertainty about antiplatelet therapy vs. anticoagulation with heparin or warfarin; either treatment is considered reasonable
  - Insufficient evidence regarding DOACs in patients with arterial dissections
- Lack of evidence regarding optimal duration of antithrombotic therapy & role of repeat vascular imaging in decision-making. Decisions based on individual factors

Cardiac Issues

Aortic Arch Atheroma

- Optimize stroke prevention recommendations
- ARCH trial showed no significant difference when treated with ASA + clopidogrel compared to warfarin; effectiveness of anticoagulant therapy compared with antiplatelet therapy is uncertain

Heart Failure, Decreased Ejection Fraction, Thrombus

- Patients with ischemic stroke or TIA in SR who have left atrial or left ventricular thrombus - anticoagulant therapy is recommended for greater than 3 mos
- Patients with ischemic stroke or TIA in SR with severe left ventricular dysfunction (ejection fraction ≤35%) without evidence of left atrial or left ventricular thrombus, the benefit of anticoagulant therapy compared with antiplatelet therapy is uncertain; choice of management should be individualized
- Risk of stroke, including recurrent stroke, is increased by HF- therefore manage with aggressive stroke prevention therapies

JAMA Neurology | Original Investigation

Rate and Prognosis of Brain Ischemia in Patients With Lower-Risk Transient or Persistent Minor Neurologic Events

Shelagh B. Coutts, MD; Francois Moreau, MD; Negar Asdaghi, MD; Jean-Martin Boulanger, MD; Marie-Christine Camden, MD; Bruce C. V. Campbell, PhD; Andrew M. Demchuk, MD; Thalia S. Field, MD; Mayank Goyal, MD; Martin Krause, MD; Jennifer Mandzia, MD; Bijoy K. Menon, MD; Robert Mikulik, MD; Andrew M. Penn, MD; Richard H. Swartz, MD; Michael D. Hill, MD; for the Diagnosis of Uncertain-Origin Benign Transient Neurological Symptoms (DOUBT) Study Group

- Cohort study of 1028 patients
- 13.5% with low-risk transient focal neurologic events had a stroke on MRI
- 30.0% of patients had a revision of diagnosis after MRI
- Risk of recurrent clinical stroke at 1 year in this low-risk population was low, at 0.7%

JAMA Neurol. 2019;76(12):1439-1445

Stroke Risk in Indigenous people

Stroke Risk for Indigenous People

- 4.5% of South East Region reported Indigenous identity; SE has 4th highest % of Indigenous population in Ont. & most of the southern regions (SE LHIN, 2016)
- Experience stroke at a higher rate & at a younger age than non-indigenous peoples (International Medicine Journal, 2019)
- Significantly more carotid atherosclerosis, other risk factors & higher frequency of CVD (18·5% *vs* 7·6%) (Lancet, 2001).
- CV mortality 30% higher for First Nations men and 76% higher for First Nations women in Canada (Chronic Dis Inj Can, 2012).
- Generational trauma (e.g., legacy of residential schools) has influenced a disparate burden of vascular risk factors & stroke in Indigenous people especially for women (H&S, 2018).

What Can HCP Do?

- Increase knowledge. HCPs lack education about effects of colonization
  - Beginning to embed training in medical and health education
  - Cultural safety training
- Advocate for better health care access
- Increase awareness of Indigenous Health Resources
  - Indigenous Interprofessional Primary Care Team is being established
  - Primary Care Indigenous Community Development Worker (Kingston CHC)
    - "Involvement of Indigenous Community Health Workers is essential for Indigenous Cardiovascular Disease programs (Huffman & Galloway, 2010). "
- Collaborate on Indigenous-led initiatives
    - Deseronto Indigenous BP
- Understand importance of Indigenous data sovereignty & Indigenous-led research processes
  - Data from large First Nations health research study cohort are being used by First Nations communities to answer questions that ultimately promote wellbeing, effective policy, & healing (IJPDS, 2018).

Increasing Volumes across the stroke spectrum

STROKE NETWORK of Southeastern Ontario

Regional Stroke Dashboard - Fiscal 2019-20 Q2

Updated Jan 21 2020

	Indicator	Indicator Definition	Target	HPE QHC F2016-17	HPE QHC F2017-18	HPE QHC F2018-19	HPE QHC Q4 18-19	HPE QHC Q1 19-20	HPE QHC Q2 19-20	KFLA KGH F2016-17	KFLA KGH F2017-18	KFLA KGH F2018-19	KFLA KHSC Q4 18-19	KFLA KHSC Q1 19-20	KFLA KHSC Q2 19-20	LLG BGH F2016-17	LLG BGH F2017-18	LLG BGH F2018-19	LLG BGH Q4 18-19	LLG BGH Q1 19-20	LLG BGH Q2 19-20	LLG PSF F2016-17	LLG PSF F2017-18	LLG PSF F2018-19	LLG PSF Q4 18-19	LLG PSF Q1 19-20	LLG PSF Q2 19-20
Hyperacute	Volumes	Volume of stroke/TIA patients in ED								659	800	856	236	239	227	226	216	205	45	68	39	226	213	231	53	61	66
	LOS in ED	Median Length of Stay in ED (Total time-Arrival Time -to physically leaves ED for admitted patients; hrs:min)			09:41	7	08:40	06:48	08:15	11:08	09:05	08:52	13:07	07:25	08:41	05:02	04:22	04:37	04:43	03:56	03:53	03:13	03:13	03:26	03:11	03:34	03:46
	Brain Imaging	Proportion of patients who received brain CT or MRI (within 24 hours of arrival) at an ED (%)			87.9%	82.60%	82.6%	77.2%	68.0%	88.6%	88.7%	89.4%	87.5%	84.7%	81.3%	84.1%	83.3%	79.4%	84.4%	73.5%	71.8%	67.8%	53.5%	61.0%	62.3%	62.3%	65.2%
	tPA	Median Door-to-Needle Time for IV tPA(Minutes)	30 min	63.5	52	54	50.5	42	49	33.0	23.5	25.5	31	24	27	tPA for LLG is delivered by KHSC						tPA for LLG is delivered by KHSC					
	tPA	Proportion of ischemic stroke patients arriving who receive IV tPA (%)			14.2%	17.2	14.5%	18.5%	21.5%	24.3%	22.5%	23.9%	28.1%	27.3%	29.5%												
	EVT	Volume of patients receiving EVT								9	35	30	9	21	5												
	Vascular Imaging	Proportion of stroke/TIA patients who receive Brain/Neck CTA or MRA or Carotid Doppler (neck) in ED of patients discharged home(%)																				In Development					
Acute Stroke Unit (ASU)	Volumes	Volume of stroke/TIA patients admitted to acute care hospital (number)		288	389	422	118	117	96	466	526	553	148	180	163	196	185	173	47	46	37	Acute Stroke Unit provided in Brockville effective May 2016					
	LOS - Total	Median Length of Stay in an acute care hospital setting (Total,)(days)	5-7 days	3	3	4	5	5	6	6.2	6.8	6.7	8.3	5	6	4	3.1	3	3	3.5	3						
	Brain Imaging	Proportion of patients who received brain CT or MRI (within 24 hours of arrival) at an ED (%)			97.9%	95.90%	96.7%	97.4%	97.9%	98.3%	97.3%	97.8%	97.3%	96.7%	96.3%	84.5%	99.4%	100.0%	100.0%	100.0%	97.3%						
	ASU utilization	Proportion of patients treated in a designated Stroke Unit at any time during their inpatient stay	80%	89.0%	93.1%	78.90%	88.5%	83.4%	76.0%	78.8%	76.4%	69.3%	68.9%	65.0%	64.4%	87.8%	85.6%	85.0%	80.9%	82.5%	73.0%						
	Mortality	In-hospital Mortality Rate (30 days, all cause) (%)		8.3%	8.2%	11.10%	8.7%	9.4%	13.5%	11.8%	12.4%	13.2%	13.5%	15.0%	13.5%	6.6%	4.3%	5.8%	12.8%	6.5%	5.4%						
	Discharge	Proportion of stroke patients (discharged alive) to each discharge disposition: Inpatient Rehab (%)		36.0%	24.9%	22.60%	20.2%	26.4%	20.5%	21.7%	25.5%	27.3%	28.6%	18.5%	22.5%	6.1%	5.9%	12.8%	5.8%	6.5%	13.5%						
	Discharge	Proportion of stroke patients (discharged alive) to each discharge disposition: Home or Home with Support(%)		50%	62.7%	65.6	72.6%	59.4%	56.6%	62.3%	53%	53.6%	48.4%	55.5%	56.5%	57.2%	61.6%	59.5%	55.3%	63.0%	56.7%						
	Vascular Imaging	Proportion of stroke/TIA patients who receive Brain/Neck CTA or MRA or Carotid Doppler (neck) in ED or after admission to acute care hospital(%)																				In Development					
Prevention	Referral from ED	Proportion of stroke/TIA patients discharged from ED who receive a referral to Stroke Prevention Clinic (%) - (Stroke Report Card)		68.4% (2017/18) Includes Belleville 82.9%(34/41 pts), Bancroft 60% (6/12 pts), Trenton 76.3% (16/23 Picton 36.8% (7/19 pts).						93.8% (2017/18) KHSC rate KGH 92.7% (114/123 pts), HDH 100% (21/21 pts), (LACOH <=60% (<=6/8)						56.5% (2017/18) BGH 13/23 pts						81.25% (2017/18) Perth 73.9% (17/23 pts) Smiths Falls 100% (9/9 pts).					
	Volumes	Number of New Referrals		752	848	849	223	243	216	975	1169	1199	311	321	311	227	200	205	51	48	56	319	349	389	98	99	100
	Wait time	Wait time for Priority 2 patients (days)	3	6	4.7	4.5	6	4.5	5	4.1	3.6	3.3	3.1	4.2	3.1	7.9	4.2	3.8	3.3	4.8	5.3	1.4	0.8	1.4	1.8	2	1.5

Green circles - noticeable change in positive direction

Orange circles - noticeable change requiring attention

Note: QHC stroke unit was dispersed in Q1,2018/19
Q5 Closed due to fire May 8 - June 27

Several entries missing arrival time in Project 340 cases - ED LOS calculated on full data encounters only

Note: Endovascular Thrombectomy
Q2 2019/20: Total Volume 5
By geography: HPE: 1, KFLA: 3(1 L&A), LLG: 1
Q1 2019/20: Total Volume 21
By geography: HPE: 6, KFLA: 10(3 L&A), LLG: 5

FY 2018/19: Total Volume 30
By geography: HPE: 9, KFLA: 12(3 L&A),LLG: 9
FY 2017/18: Total Volume 35
By geography: HPE: 10, KFLA: 18 (6 L&A),LLG: 7
Began 24/7 service Q3 of 2017/18

Note: BGH flow to rehab is not accurately reflected by data:
1) Many transfers to CCC bed to await rehab
2) PSF patients repatriated to Perth rehab are coded as acute.

Tenecteplase for Thrombolysis

Tenecteplase for stroke thrombolysis

- Genetically engineered mutant tPA
- Potentially superior efficacy
- Better safety profile
- Easier administration
- Higher affinity binding to fibrin
- Greater resistance to inactivation by plasminogen activator inhibitor-1
- Less disruption of hemostasis
- Longer free plasma half life allowing single IV bolus administration.

Tenecteplase for stroke thrombolysis

Trial	Year	Study design	TNK dose groups (mg/kg)	Non-TNK thrombolytic comparator group	N
Haley[30]	2005	RCT	0.1 vs. 0.2 vs. 0.4 vs. 0.5	No	88
Parsons[31]	2009	Obs	0.1	No	15
Haley[38]	2010	Obs	0.1 vs 0.25 vs 0.4	Alteplase 0.9 mg/kg	112
Parsons[28]	2012	RCT	0.1 vs. 0.25	Alteplase 0.9 mg/kg	75
ATTEST[27]	2015	RCT	0.25	Alteplase 0.9 mg/kg	104
TEMPO-1[33]	2015	Obs	0.1 vs. 0.25	No	50
NOR-TEST[35]	2017	RCT	0.4	Alteplase 0.9 mg/kg	1100
EXTEND-IA TNK[36]	2018	RCT	0.25	Alteplase 0.9 mg/kg	202
Kate[39]	2018	Obs	0.25	No	16

RCT: randomized-controlled trial; Obs: observational study.

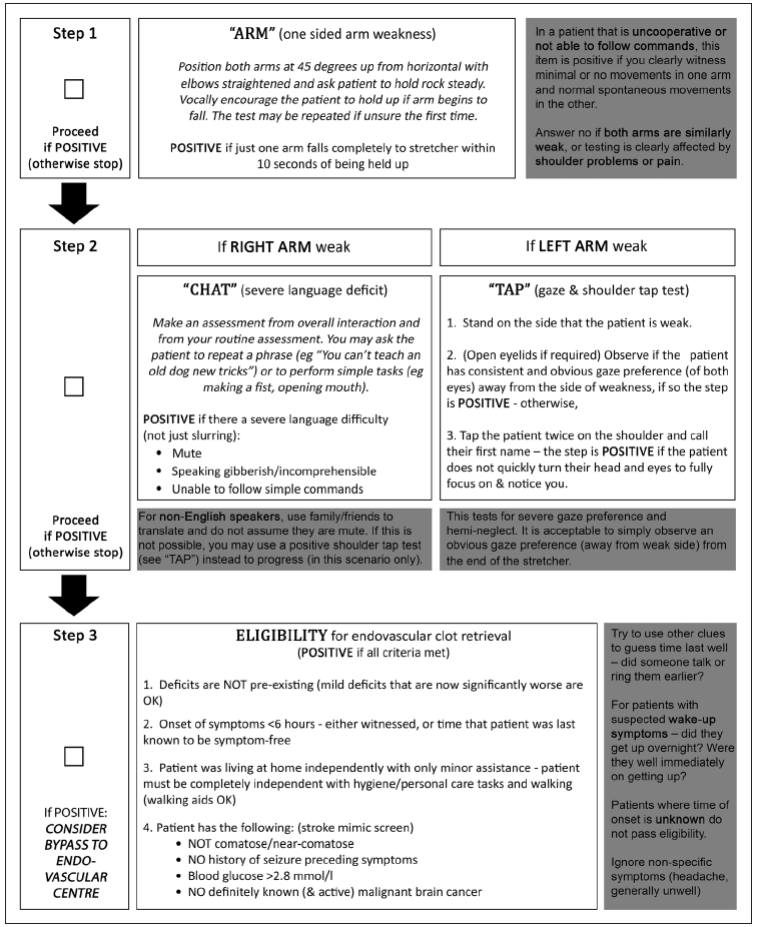
Trial	TNK dose groups (mg/kg)	Non-TNK thrombolytic comparator group	Timing	N
ATTEST-2 (NCT02814409)	0.25	Alteplase 0.9 mg/Kg	<4.5 h	1870
TASTE-2 (ACTRN12613000243718)	0.25	Alteplase 0.9 mg/Kg	<4.5 h	Up to 1024[a]
EXTEND-IA TNK II (NCT03340493)	0.25 vs. 0.4	No		Up to 656[a]
TWIST (NCT03181360)	0.25	No (non-thrombolytic standard of care)	<4.5 h from awakening	500
TEMPO-2 (NCT02398656)	0.25	No (non-thrombolytic standard of care)	<12 h	1274

Coutts, et al. International Journal of Stroke 2018, Vol. 13(9) 885–892

Emergency Triage tools for stroke

- ACT – FAST
  - 3-step paramedic triage tool for pre-hospital recognition of large vessel occlusion (LVO)
  - 100% sensitivity
  - 87% specificity

- ACT FAST is used in our region



Step 1

☐ Proceed if **POSITIVE** (otherwise stop)

"ARM" (one sided arm weakness)

Position both arms at 45 degrees up from horizontal with elbows straightened and ask patient to hold rock steady. Vocally encourage the patient to hold up if arm begins to fall. The test may be repeated if unsure the first time.

POSITIVE if just one arm falls completely to stretcher within 10 seconds of being held up

In a patient that is **uncooperative or not able to follow commands**, this item is positive if you clearly witness minimal or no movements in one arm and normal spontaneous movements in the other.

Answer no if **both arms are similarly weak**, or testing is clearly affected by **shoulder problems or pain**.

Step 2

☐ Proceed if **POSITIVE** (otherwise stop)

If **RIGHT ARM** weak

"CHAT" (severe language deficit)

Make an assessment from overall interaction and from your routine assessment. You may ask the patient to repeat a phrase (eg "You can't teach an old dog new tricks") or to perform simple tasks (eg making a fist, opening mouth).

POSITIVE if there a severe language difficulty (not just slurring):

- Mute
- Speaking gibberish/incomprehensible
- Unable to follow simple commands

For **non-English speakers**, use family/friends to translate and do not assume they are mute. If this is not possible, you may use a positive shoulder tap test (see "TAP") instead to progress (in this scenario only).

If **LEFT ARM** weak

"TAP" (gaze & shoulder tap test)

1. Stand on the side that the patient is weak.

2. (Open eyelids if required) Observe if the patient has consistent and obvious gaze preference (of both eyes) away from the side of weakness, if so the step is **POSITIVE** - otherwise,

3. Tap the patient twice on the shoulder and call their first name – the step is **POSITIVE** if the patient does not quickly turn their head and eyes to fully focus on & notice you.

This tests for severe gaze preference and hemi-neglect. It is acceptable to simply observe an obvious gaze preference (away from weak side) from the end of the stretcher.

Step 3

☐ If POSITIVE: *CONSIDER BYPASS TO ENDO-VASCULAR CENTRE*

ELIGIBILITY for endovascular clot retrieval (**POSITIVE** if all criteria met)

1. Deficits are NOT pre-existing (mild deficits that are now significantly worse are OK)

2. Onset of symptoms <6 hours - either witnessed, or time that patient was last known to be symptom-free

3. Patient was living at home independently with only minor assistance - patient must be completely independent with hygiene/personal care tasks and walking (walking aids OK)

4. Patient has the following: (stroke mimic screen)
   - NOT comatose/near-comatose
   - NO history of seizure preceding symptoms
   - Blood glucose >2.8 mmol/l
   - NO definitely known (& active) malignant brain cancer

Try to use other clues to guess time last well – did someone talk or ring them earlier?

For patients with suspected **wake-up symptoms** – did they get up overnight? Were they well immediately on getting up?

Patients where time of onset is **unknown** do not pass eligibility.

Ignore non-specific symptoms (headache, generally unwell)

Endovascular thrombectomy

Endovascular thrombectomy

A

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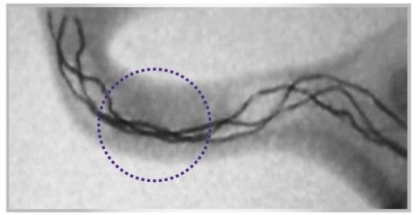
Trevo® XP ProVue Retriever 4x20mm

B



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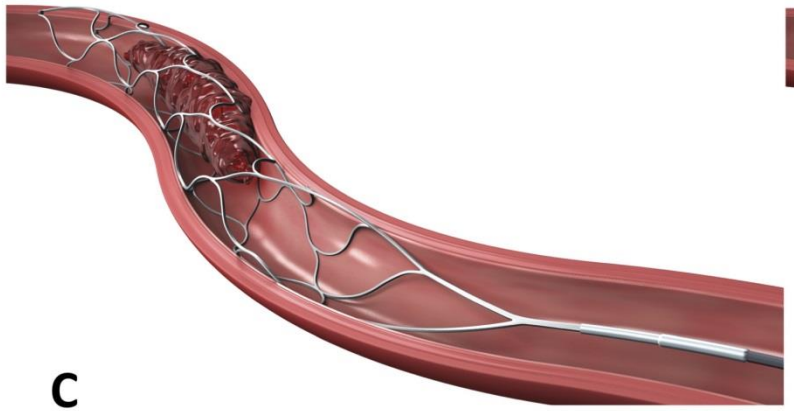
Bench Model Photo Trevo® XP ProVue Retriever
Visible Under Fluoroscopy
Image courtesy of Stryker Neurovascular

C



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Clot Integration into Trevo® XP ProVue Retriever
Image courtesy of Stryker Neurovascular

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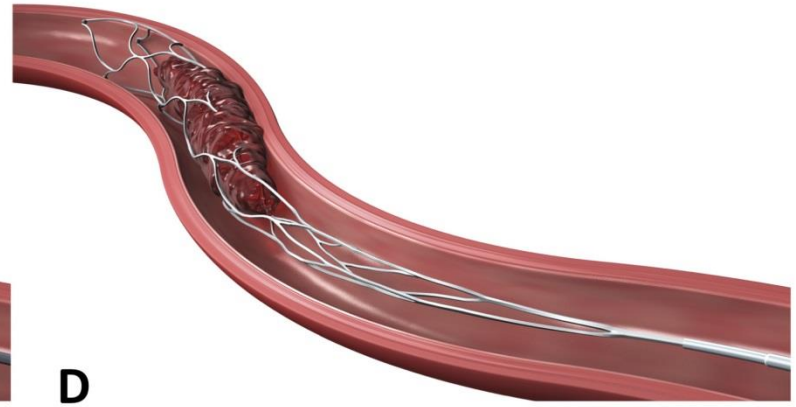
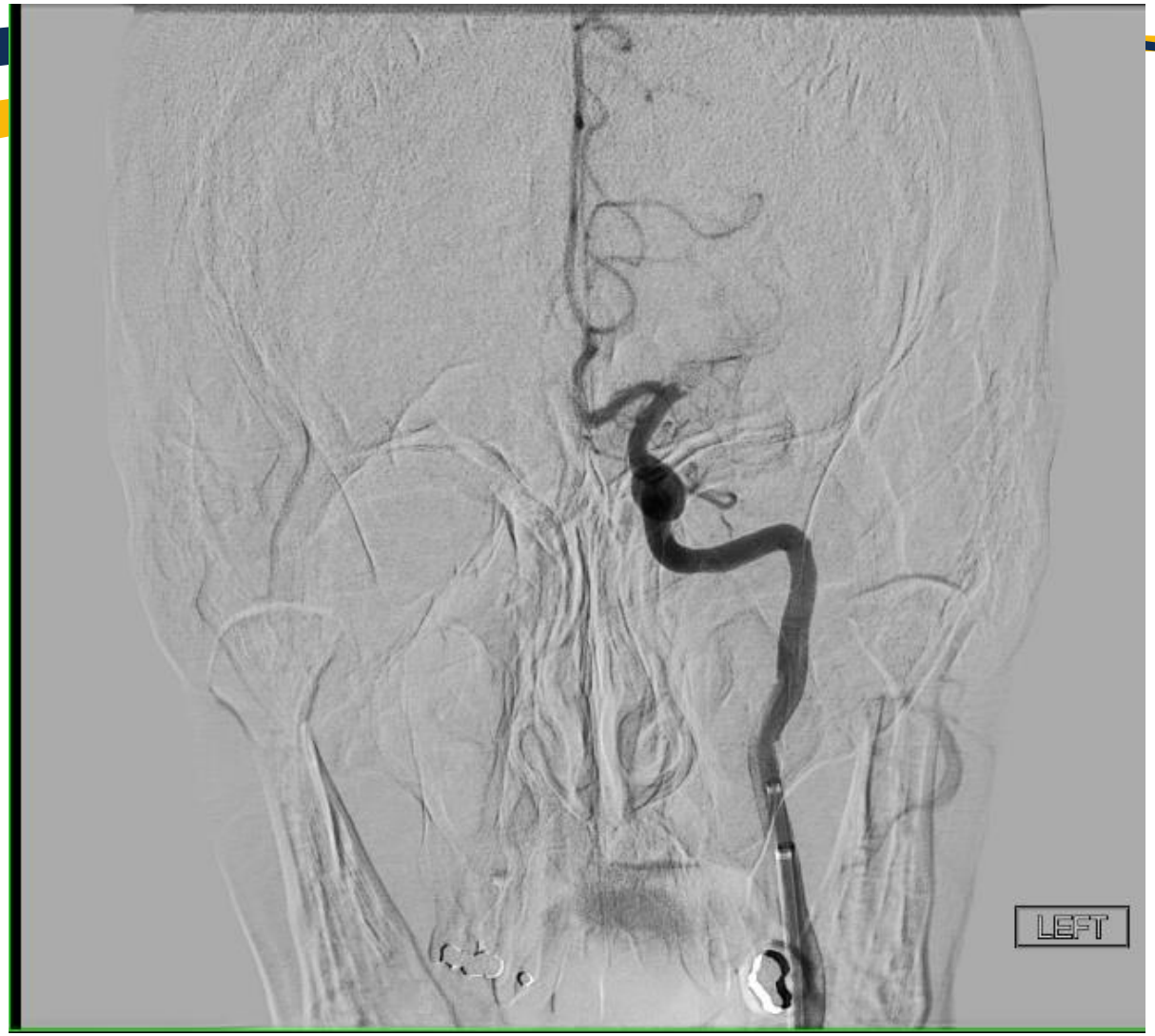
D



Trevo® XP ProVue Retriever secures clot during retrieval
Image courtesy of Stryker Neurovascular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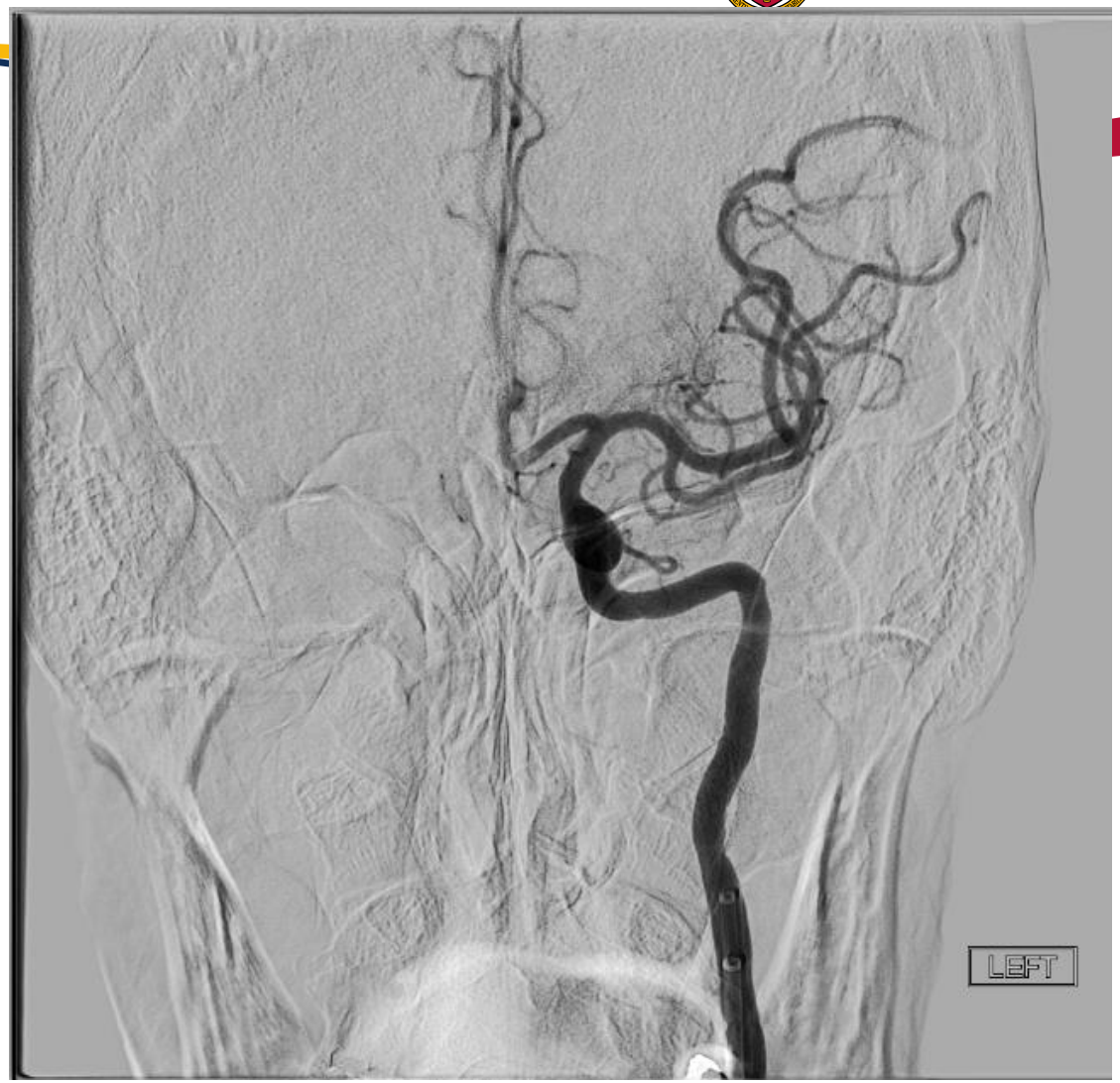

LEFT

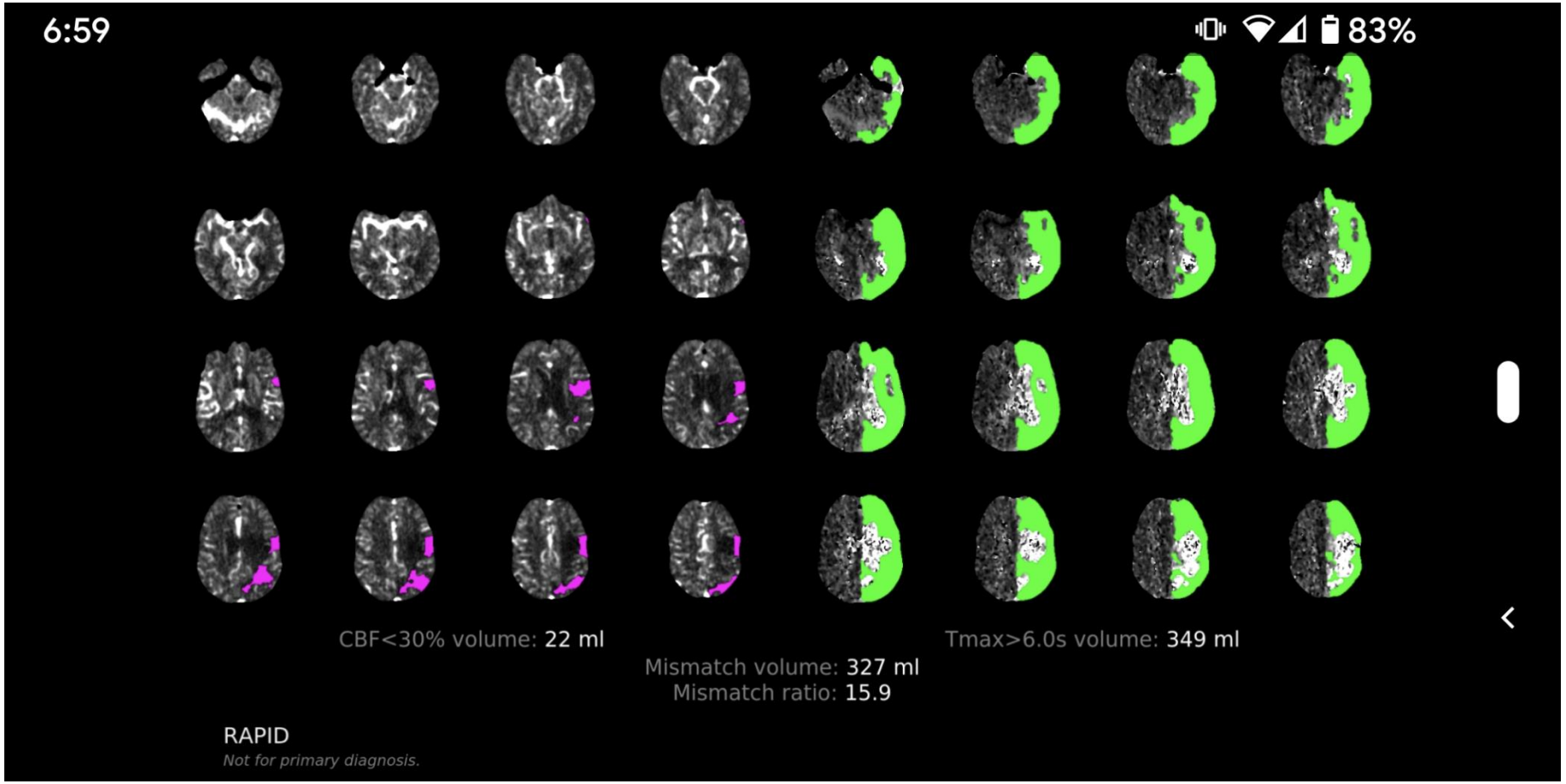
EVT beyond 6 hours to 24 hours.

- Evidence present that it is helpful
- CT Perfusion imaging is needed to select patients.
- Ischemic core is a good predictor of outcome
- CSBPG recommend treatment up to 24 hours in highly selected patients.
- Current Ontario EMS protocols
  - Patients with stroke < 6 hours - transferred to designated stroke centers
  - Patients with stroke > 6 hours – transferred to nearest hospital
- Telestroke – currently filling the gap for decision making for 6-24 hours
- Work in progress..

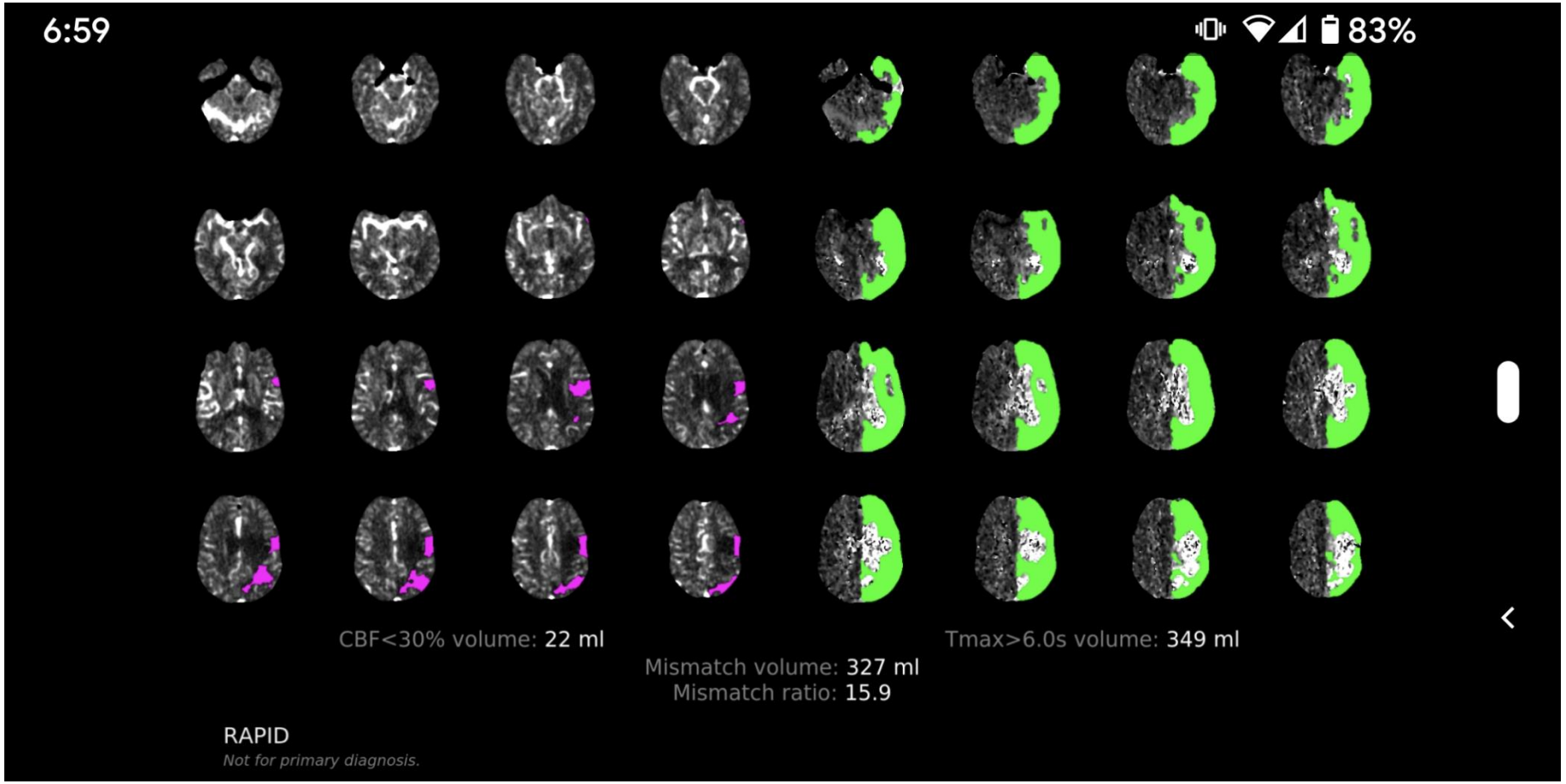
CT Perfusion imaging

- Cerebral blood flow provides useful information on
  - Core – ischemic brain already irreversibly damaged
  - Penumbra – ischemic brain that can be saved
- Helps in
  - Selecting patients with salvageable brain.
  - Selecting patients beyond 6 hours
  - Avoid futile recanalization

RAPID Perfusion analysis



RAPID Perfusion analysis



Questions