

Transferring of Patients Across the Region for Stroke Care: What is the impact on the CIHI Stroke Special Projects?

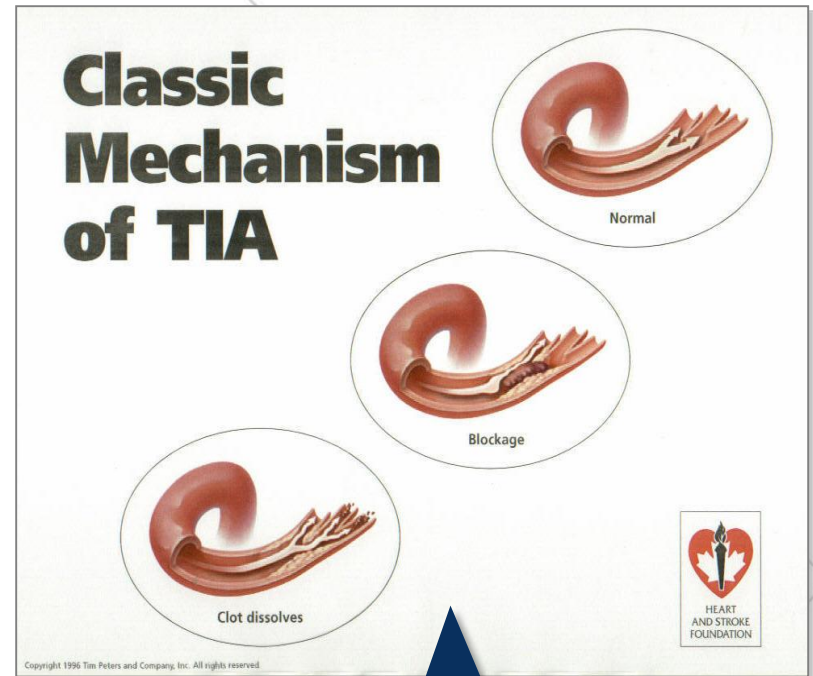
Central South Regional Stroke Network
Health Information Management Workshop
February 17, 2022

Objectives

- To discuss the various stroke subtypes and stroke etiologies.
- To describe the scenarios that patients are transferred across the region for stroke care and the implications these transfers have on the CIHI Stroke Special Projects.

Transient Ischemic Attack (TIA)

- Neurological deficit that resolves within 24 hours
- 75% resolve within 1 hour and 90% within 4 hours
- Without treatment, 80% of patients will have a recurrence of symptoms
- TIA patients discharged home from the ED should be referred to HGH Stroke Prevention Clinic (MD Referral)



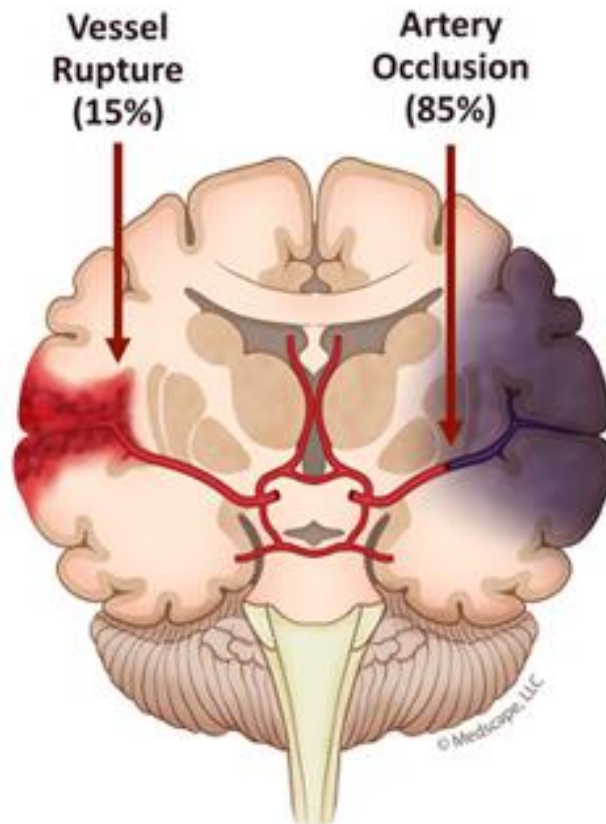
KEY POINT

A TIA is a clear warning sign that a stroke may occur.

Types of Stroke

Hemorrhagic Stroke

Bursting of a artery in the brain due to weakening of the wall of the artery.

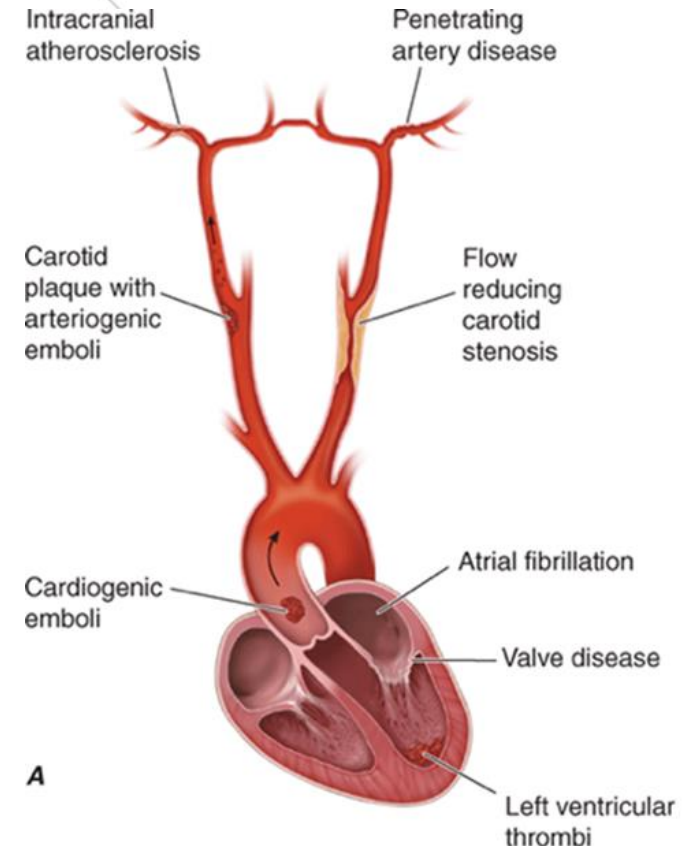


Ischemic Stroke

Artery supplying blood to the brain is blocked by either a thrombus or embolus.

Ischemic Stroke Etiologies

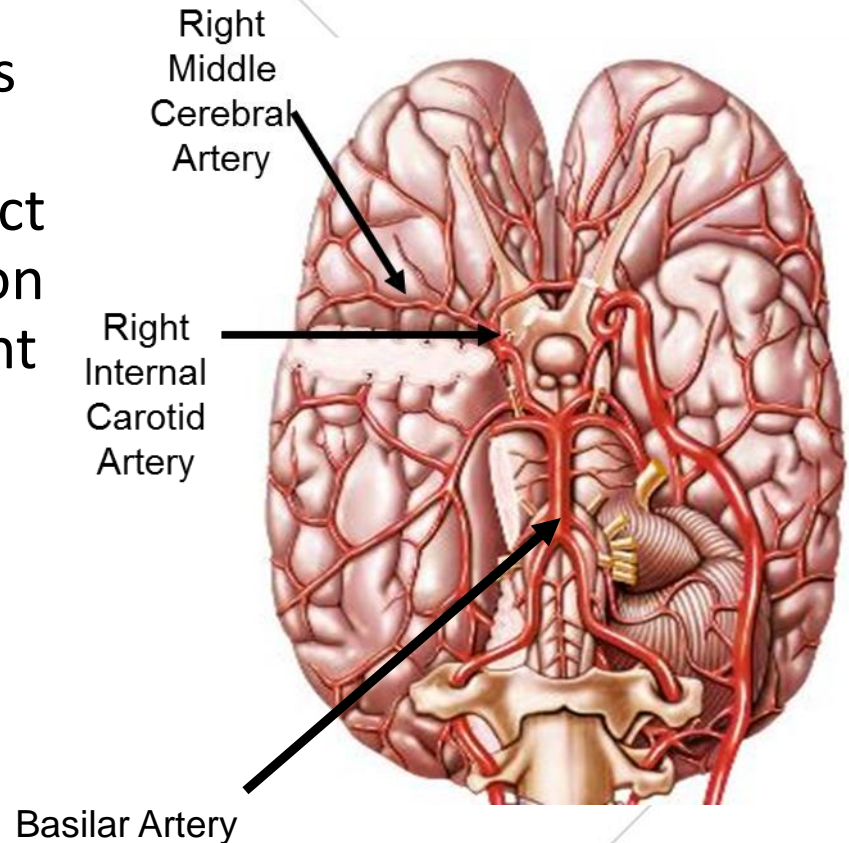
%	Ischemic Stroke Etiologies
20%	Atherothrombotic /atherosclerotic cerebrovascular disease (ICAD) of the large arteries including extra and intracranial stenosis, dissection and vasculitis
25%	Lacunar or small vessel ischemic disease of the small penetrating arteries of the brain
20%	Cardioembolic related to atrial fibrillation, dilated cardiomyopathy, patent foramen ovale (PFO), endocarditis, left ventricular thrombi, aortic artery plaque
30%	Cryptogenic or no identifiable cause
5%	Venous thrombosis, watershed strokes due to hypoperfusion related to shock or myocardial infarction or cardiac surgery, hypercoagulable states, cocaine use



Source: Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J: *Harrison's Principles of Internal Medicine, 18th Edition*: www.accessmedicine.com
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Large Vessel Occlusion (LVO) Stroke

- Large vessel occlusion strokes are the most serious kinds of ischemic stroke as they restrict blood supply to a large portion of the brain causing significant stroke deficits and severe morbidity and mortality
- Large Vessel Occlusion are:
 - Internal Carotid Artery
 - Middle Cerebral Arteries (M1 branch and M2 branches)
 - Basilar Artery



Hyperacute Ischemic Stroke Treatments

Intravenous Thrombolytic Therapy

- Tissue Plasminogen Activator (tPA)
- Thrombolytic Agent (Clot Buster)
- Dose 0.9 mg/kg to a maximum of 90 mg total with 10% administered IV bolus over one minute and the rest by IV infusion over 60 minutes
- 4.5 hours from Last Known Well

**Median ED Door to
Needle: 30 minutes**

AND/
OR

Endovascular Thrombectomy (EVT)

- Mechanical removal of clot using a catheter and stent or aspiration
- Patients who are not eligible for tPA may still be eligible for EVT
- Patients may be eligible for Treatment up to 24 hours:
 - 0 – 6 Hr Protocol
 - 6 – 24 Hr Protocol

No Hyperacute Ischemic Stroke Treatment

- A patient may have contraindications for tPA or not have a large vessel occlusion and receive no hyperacute stroke treatment
- Patient should receive antiplatelet therapy (sometimes dual antiplatelets) and be admitted to stroke unit

Hemorrhagic Stroke Etiologies



Medical

Hypertensive ICH

Lobar ICH – amyloid angiopathy

Anticoagulant associated ICH

Hemorrhagic transformation of cerebral infarction



Surgical

Subdural (traumatic or anticoagulant related)

Aneurysmal subarachnoid hemorrhage

Arteriovenous malformation

Hemorrhagic Stroke Treatment

ICH:

- Aggressive blood pressure management
- Reverse oral anticoagulation
- Monitor for signs and symptoms of increased intracerebral pressure:
 - ICP Monitoring or External Ventricular Drain
- Surgery to decompress the hematoma:
 - Usefulness of surgery is uncertain but some situation – cerebellar hemorrhage, hydrocephalus, clots in the cerebral hemispheres close to the surface

Aneurysmal subarachnoid hemorrhage

- Coiling or clipping

Arteriovenous Malformation:

- Gluing and/or surgical removal

Subdural Hematoma:

- Craniotomy or craniectomy
- Burr Holes
- Twist Drill

TRANSFERRING PATIENTS ACROSS THE REGION FOR STROKE CARE

Transferring Patient Across the Region

- Access to Hyperacute Stroke Care (tPA and EVT) for community non thrombolysis hospitals
- Stroke Endovascular Therapy
- Carotid Revascularization Surgery
 - Endarterectomy or Stenting
- Tertiary Level Stroke or Neurosurgery care
- Acute Stroke Unit Care
- Repatriation back to home stroke unit from regional stroke centre

Access to Hyperacute Stroke Care for Non Thrombolysis Centres (ED Patients or Inpatients)

Hamilton General Hospital

- West Lincoln Memorial Hospital
- Juravinski Hospital, St. Joseph's Healthcare Hamilton, Haldimand War Memorial Hospital

Brant Community Healthcare System

- Norfolk General Hospital
- West Haldimand General Hospital

Grand River Hospital

- Cambridge Memorial Hospital
- St. Mary's Hospital

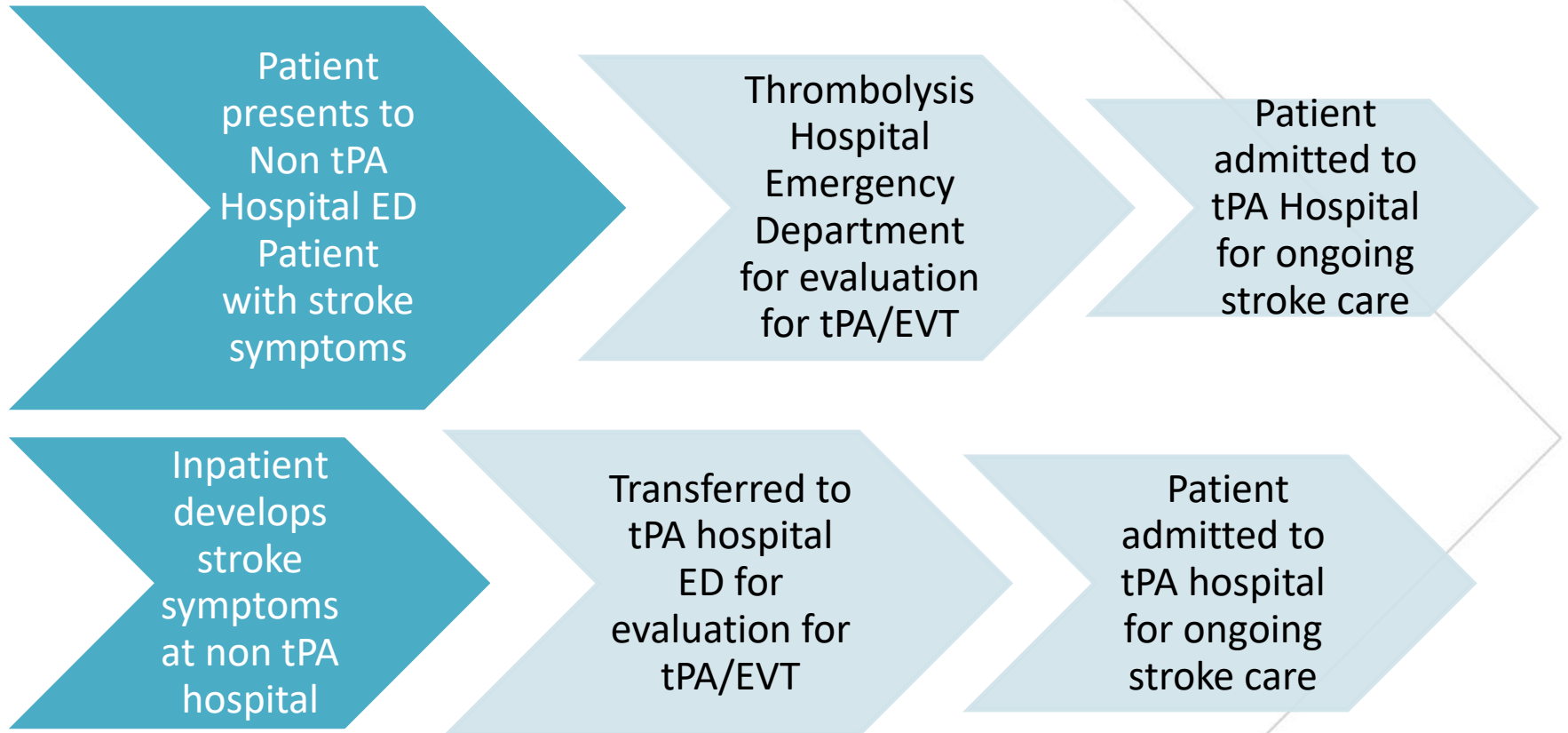
Guelph General Hospital

- Groves Memorial Community Hospital
- North Wellington Health Care: Louise Marshall Hospital & Palmerston & District Hospital

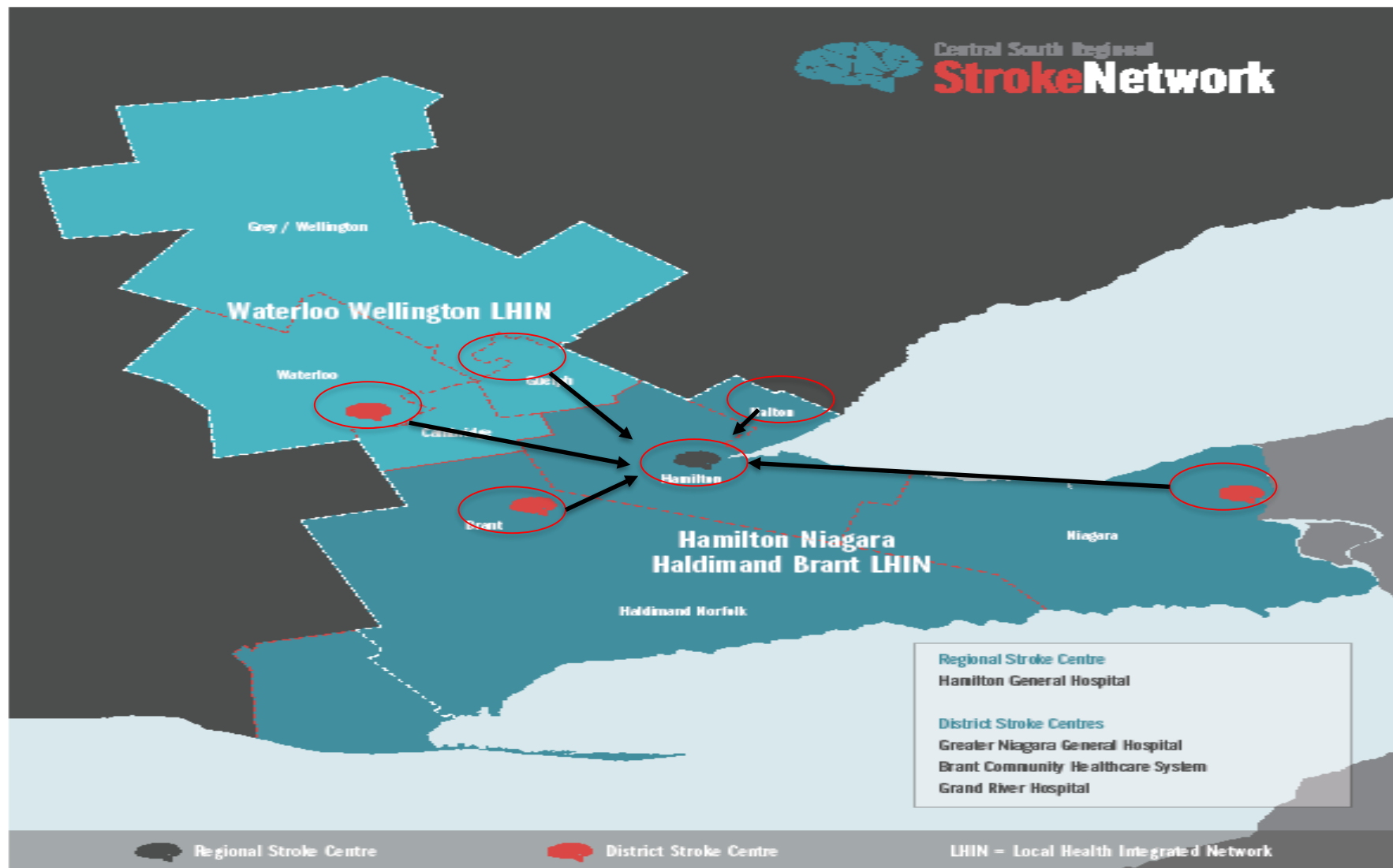
Niagara Health - Niagara Site

- St. Catherine's Site, Welland Hospital, Fort Erie Hospital

Impact on CIHI Stroke Special Projects



Stroke Endovascular Therapy



Impact on CIHI Stroke Special Projects

Patient presents to tPA/Telestroke Hospital ED Patient with Large Vessel Occlusion Stroke may receive tPA or Not and Transferred to HGH EVT Centre

Patient is admitted to HGH as a DAD Admission for EVT

Patient arrives at HGH and undergoes imaging, and evaluation by stroke/NIR Team

Patient improves or worsens and not longer eligible for EVT

Patient undergoes EVT

Patient significantly improves & discharged home

Patient dies as a result of stroke

Patient repatriated back to home stroke unit

Patient discharge to RRC Inpatient Rehab

Access to Carotid Revascularization Surgery



The Hamilton General is the only hospital that performs Carotid Stenting.

Three Centres Provide Carotid Endarterectomy:

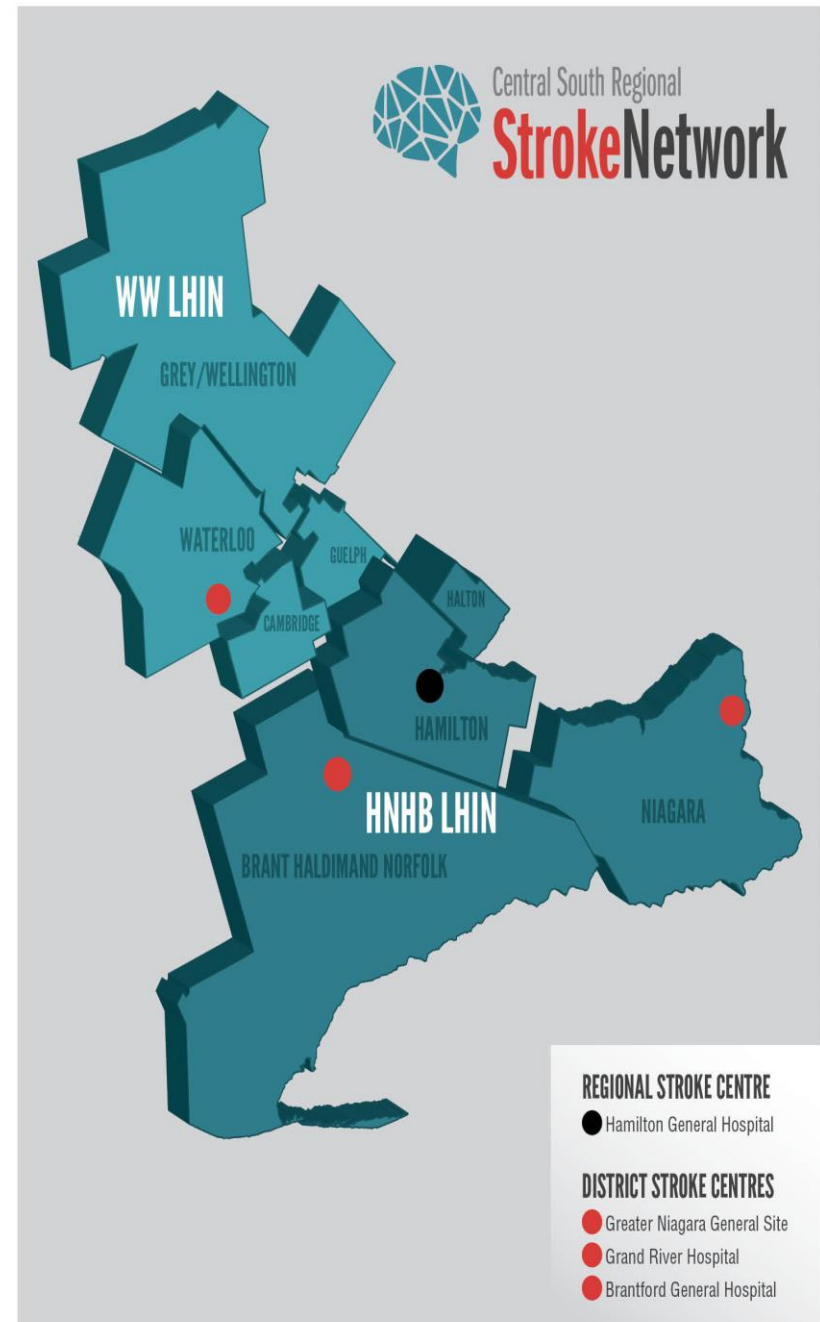
- Hamilton General Hospital (Neurosurgeons and Vascular Surgeons)
- Niagara Health – St. Catharines Hospital (Vascular Surgeons)
- Guelph General Hospital (Vascular Surgeons)

Impact on CIHI Stroke Special Projects

- Patients may be transferred to an inpatient bed usually at the carotid revascularization hospital from a:
 - ED with diagnosis of TIA or ischemic stroke
 - Inpatient bed with a diagnosis of TIA or ischemic stroke
 - Community after evaluation in Stroke Prevention Clinic

HHS as the Regional Stroke Care

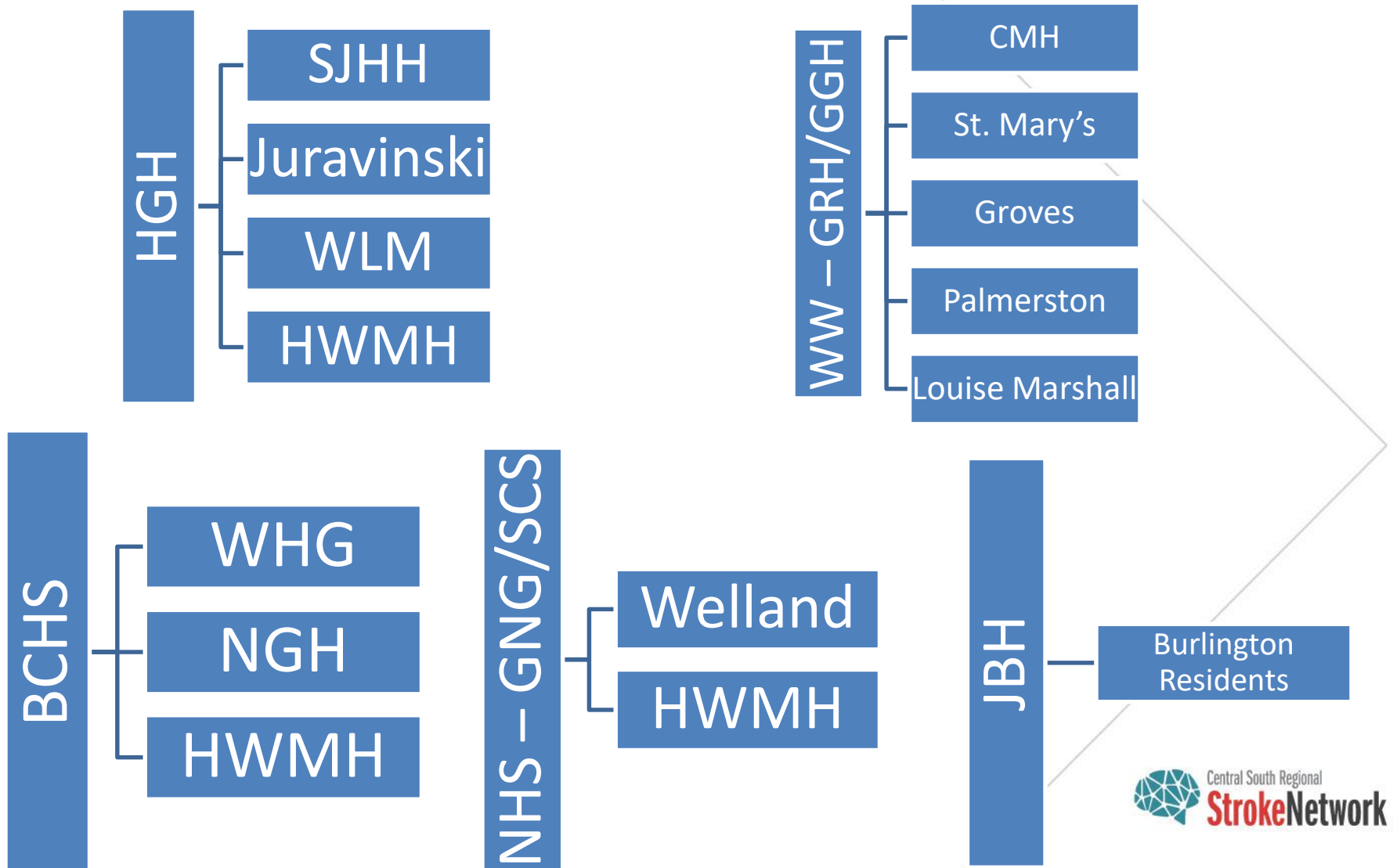
- ▶ HHS is the Regional Stroke Centre for Central South Ontario – a population of 2.3 million people
- ▶ As a Regional Stroke Centre, responsible to provide:
 - Tertiary Level Stroke Care
 - Stroke Endovascular Therapy
 - Neurosurgery
 - Neurointerventional Services



Impact on CIHI Stroke Special Projects

- Patients are typically transferred from an ED or an inpatient bed at referring hospital to an inpatient bed at Regional Stroke Centre under:
 - ICU Intensivist (ICU)
 - Neurosurgeon, NeuroInterventionalist (7 West, 7 WSDU)
 - Stroke Neurologist (7 South)
- After Tertiary Level Care, patient may:
 - Died at HGH
 - Be Discharged Home
 - Repatriated back to Acute Stroke Unit for ongoing acute care
 - Discharged to Inpatient Rehabilitation in Home Community

Transferred for Acute Stroke Unit



Impact on CIHI Stroke Special Projects

Patient transferred
from a Non Stroke Unit
Hospital ED

Admitted to Stroke
Unit Hospital

Patient
transferred from
a Non Stroke
Unit Inpatient
Unit

Admitted to Stroke
Unit Hospital

Repatriation to Home Stroke Unit Hospital

- When a patient that is transferred to the Regional Stroke Centre and no longer requires Tertiary Level Stroke, Neurosurgical or NeuroInterventional Care the patient is transferred back to Home Acute Stroke Unit for ongoing care and management

Questions



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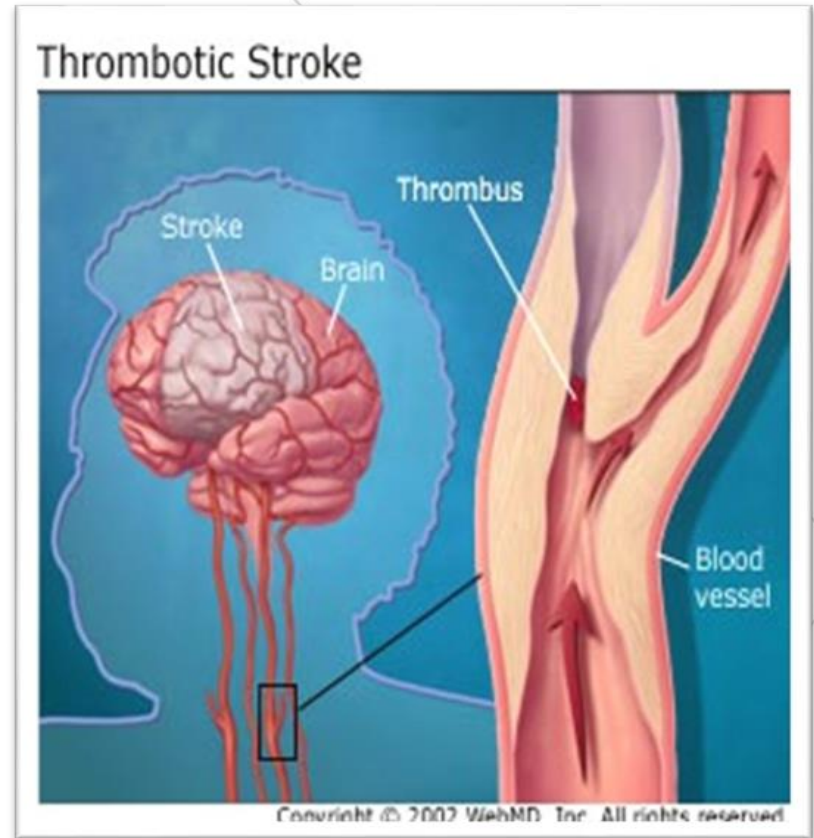
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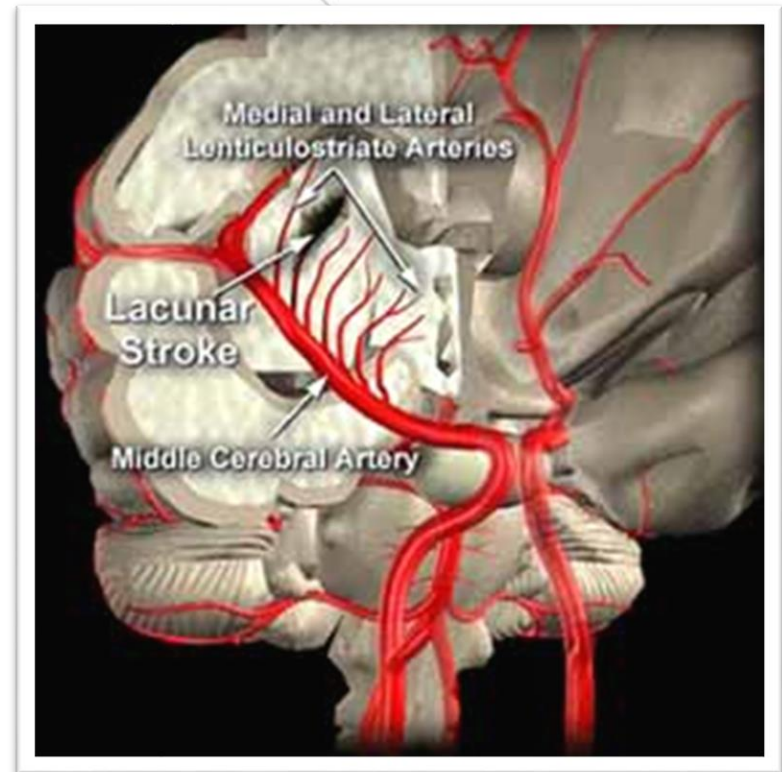
Large Vessel Thrombotic Stroke

- Clot forms in large artery due to atherosclerosis
- Patient usually wakes up with symptoms or is sedentary
- Most common type



Small Vessel Thrombotic Stroke – Lacunar Stroke

- Thrombotic stroke affecting the small penetrating arteries arising from the cerebral arteries
- Deep within the brain
- Often caused by uncontrolled hypertension
- Lacunar Syndromes



Lacunar Stroke Syndromes

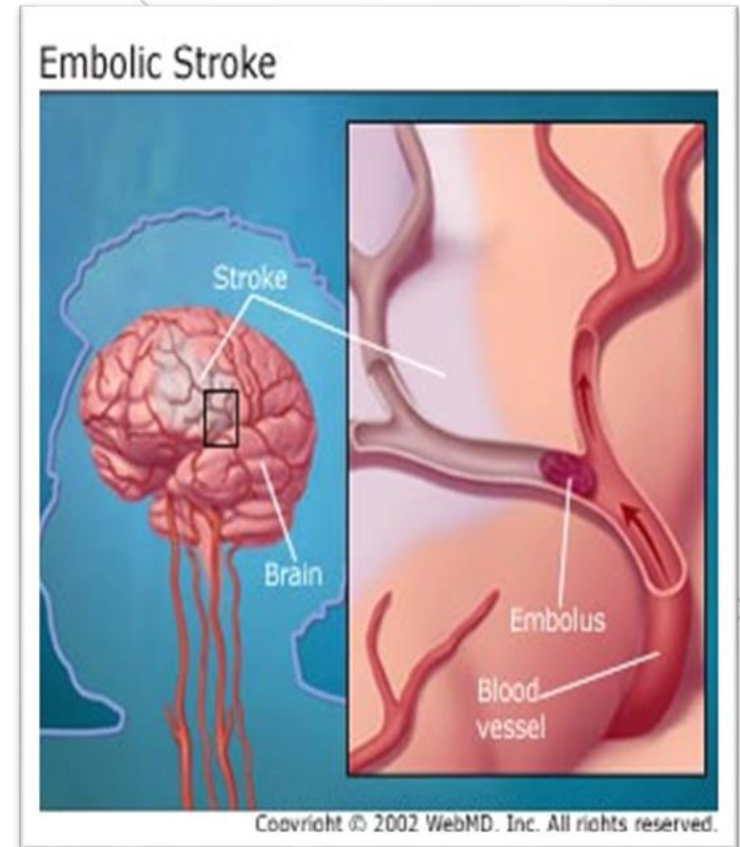
Type of Syndrome	Patient Presentation
Pure motor hemiparesis Results from an infarct in the internal capsule or pons	Contralateral hemiparesis of face, arm and leg, dysarthria
Pure motor hemiparesis with motor aphasia Results from an infarct of the internal capsule and adjoining corona radiat	Hemiparesis of face, arm and leg with inability to speak
Ataxic hemiparesis Results from an infarct in the pons	Paresis of the contralateral leg and side of the face, ataxia of the contralateral leg and arm

Lacunar Syndromes

Type of Syndrome	Patient Presentation
Dysarthria and clumsy hand syndrome Results from an infarct in the pons or internal capsule	Dysarthria, dysphagia, contralateral facial and tongue weakness, paresis and clumsiness of the contralateral arm and hand
Pure sensory stroke Results from an infarct in the thalamus	Contralateral sensory loss to all modalities that usually affect the: Face, upper and lower extremities

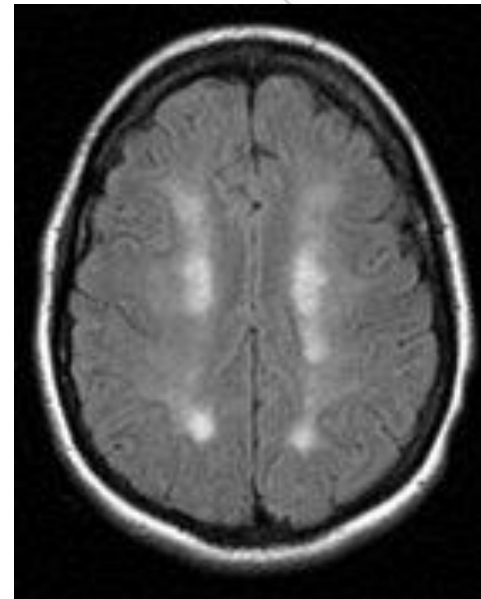
Embolic Stroke

- Clot travels from outside the brain
- Clot travels from origin through carotid artery to vessel in brain where narrowing occurs
- Usually affects Middle Cerebral Artery
- Commonly cardiac related: atrial fibrillation, valve disease, ventricular thrombi, atherosclerosis of proximal aorta



Watershed Strokes

- A watershed stroke describes a **stroke that affects one or more of the watershed regions of the brain**. The watershed regions of the brain are located at the farthest end branches of two adjacent vascular territories (areas supplied by arteries).
- two separate sets of arteries supply blood to the watershed regions
- A watershed stroke can occur if the blood supply is decreased, either by blockage of the vessel or restriction of blood flow such as in myocardial infarction, sudden or severe low blood pressure as in severe dehydration or sepsis, cardiac surgery or advanced carotid stenosis



<https://radiopaedia.org/articles/watershed-cerebral-infarction>

Cryptogenic Stroke and Other Stroke

Cryptogenic Stroke:

- The etiology is unknown
- Approximately 25% of all ischemic strokes
- Diagnosis made by exclusion of other established cause of stroke
- Challenge determining secondary stroke prevention as unknown cause

Other Stroke:

- Coagulopathies
- Arteritis
- Migraine
- Drug Abuse (Cocaine)

Secondary Stroke Prevention

Patients with a history of stroke/TIA should be assessed for optimal secondary stroke prevention:

Risk factor identification & management:

- Hypertension
- Diabetes Mellitus
- Hyperlipidemia

Diagnosis & management predisposing conditions:

- Atherosclerosis
- Ischemic Heart Disease
- Atrial Fibrillation

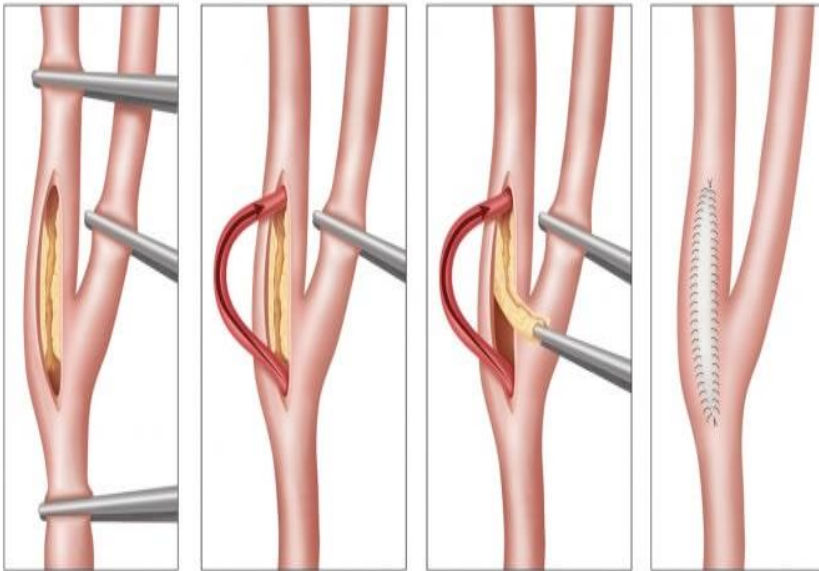
Specific stroke preventive therapy:

- Antiplatelet Agents
- Anticoagulants
- Antihypertensives
- Statins
- Carotid Intervention

Carotid Revascularization Surgery

- Patients with a symptomatic event attributed to an ipsilateral 50 to 99 percent carotid artery stenosis should be evaluated without delay for potential carotid revascularization by a health professional with stroke expertise [Evidence Level B].
 - In men with 50 to 99 percent and women with 70 to 99 percent symptomatic carotid artery stenosis, carotid endarterectomy (CEA) is recommended and should be performed as soon as possible following the qualifying event [Evidence Level A].
 - In women with 50 to 69 percent symptomatic carotid stenosis, CEA may be considered in those at highest risk of stroke recurrence and upon consideration of other patient factors [Evidence Level B].

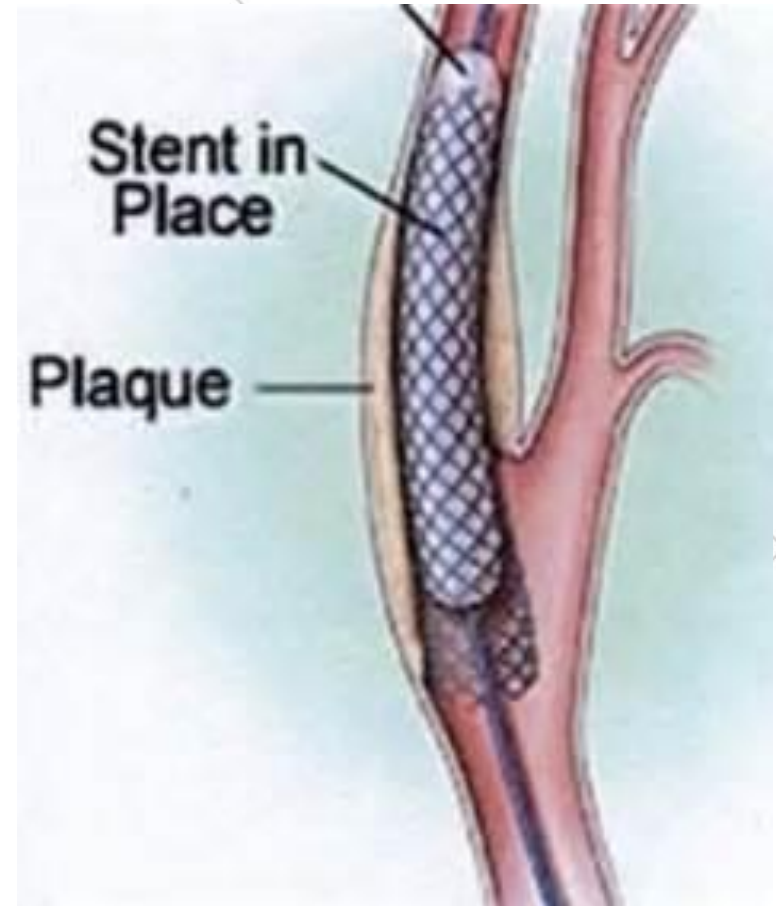
Carotid Endarterectomy



- Surgical removal of atherosclerotic plaques within the extracranial carotid artery usually the common carotid and proximal internal carotid artery to prevent thromboembolic stroke
- Performed by neurosurgeons or vascular surgeons
- Ideally done within 14 days of onset to prevent risk of stroke

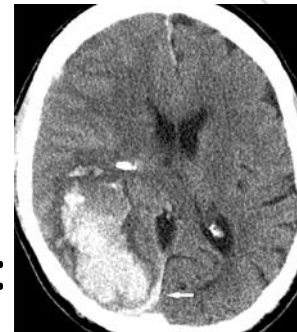
Carotid Artery Stenting (CAS)

- An endovascular procedure where a stent is deployed within the lumen of the carotid artery to prevent a stroke by treating the narrowing of the carotid artery
- Used to treat carotid artery stenosis in high risk patients, when carotid endarterectomy is considered too risky



Intracerebral Hemorrhage

- Intracerebral Hemorrhages can occur:
 - Lobes of the brain
 - Midbrain or brainstem
 - Cerebellum
- Causes of Intracerebral Hemorrhages:
 - Hypertension
 - Cerebral Amyloid Angiopathy
 - Vascular malformation
 - Anticoagulation ICH
- Intracerebral Hemorrhages have a high mortality rate (10 – 50%) in first 30 days



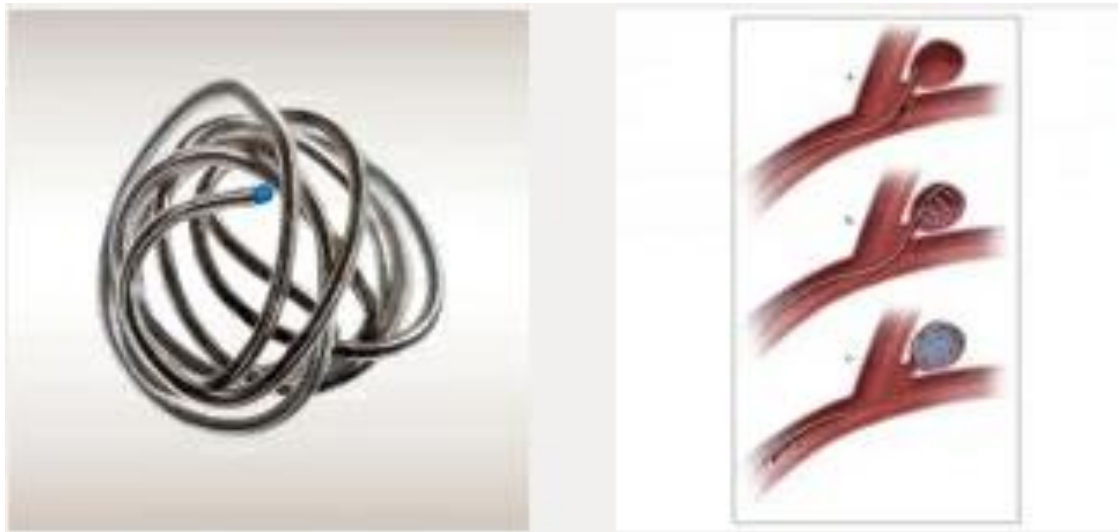
Cerebral Amyloid Angiopathy

- Affects the elderly:
 - 65 – 75 years – 3%
 - 75 – 85 years – 8%
 - Over 85 years – 12%
- Occurs sporadically through the lobar regions of the brain
- Deposition of congophilic material in small to medium size vessels in the brain – similar to the plaques of Alzheimer
- Have better clinical outcomes after first bleed versus hypertensive bleeds
- Higher risk for re-bleeds:
 - 21% risk for re-bleed after first bleed
 - 35 – 50% after second bleed

Treatment

Endovascular Coiling

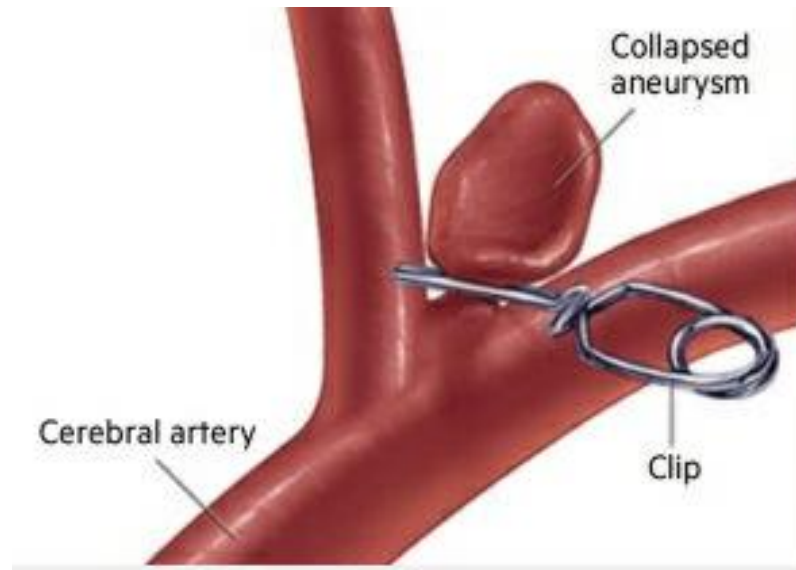
- Interventional radiology-BiPlane suite
- Femoral access using sheaths, guidewires and catheters
- Coils launched into aneurysm to obstruct blood flow



Treatment

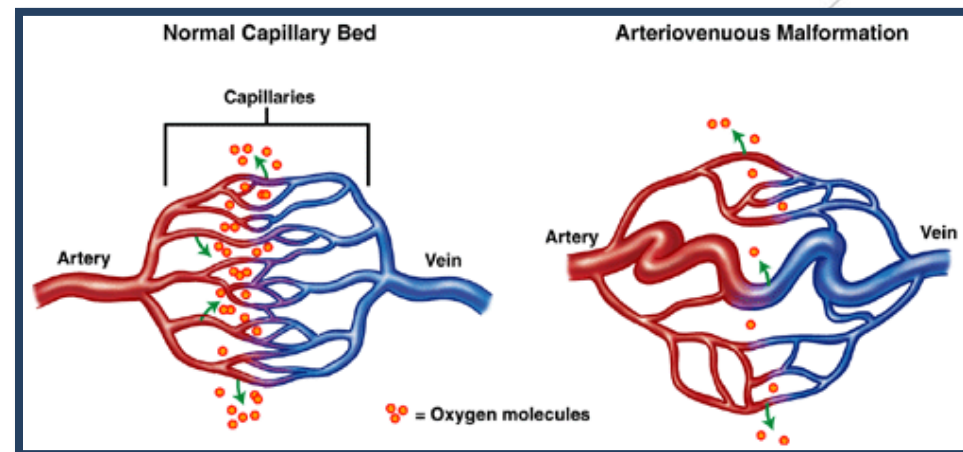
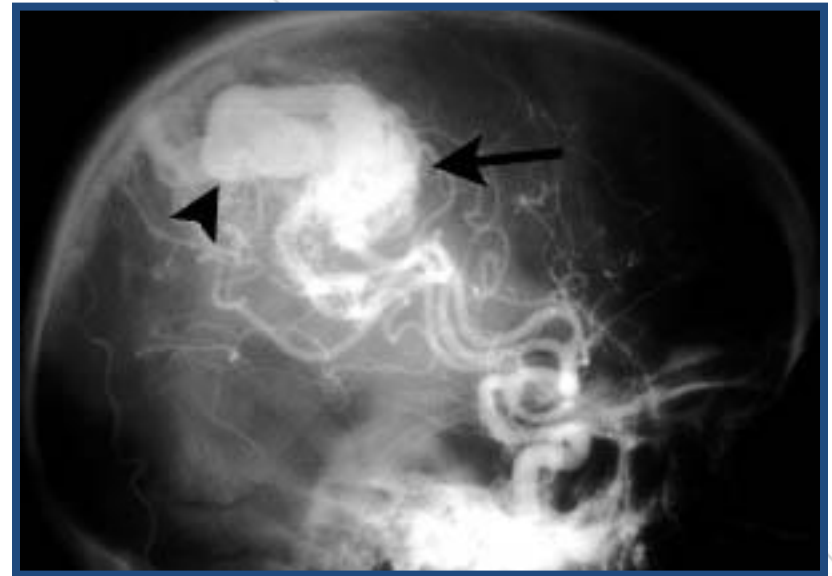
Surgical Treatment (Clipping)

- Craniotomy performed
- Metal clip placed across the base of the aneurysm
- Titanium clips used as these are compatible with MRI



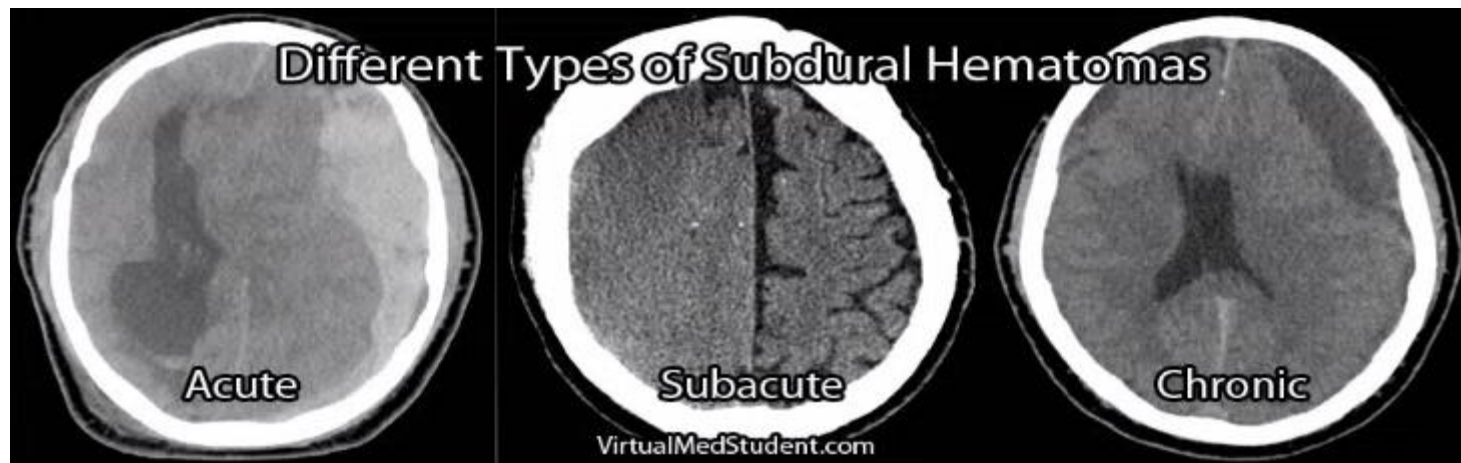
Brain Arteriovenous Malformations (AVM)

- Tangle of abnormal and poorly formed blood vessels (arteries and veins) called a Nidus
- Higher rate of bleeding than normal vessels
- Can occur anywhere in the body
- Rare and occur in less than 1% of general population
- Cause is unknown but usually due to abnormal development of blood vessels in utero



Subdural Hematoma

Acute	Sub-Acute	Chronic
Isolated collection of Venous blood	Venous blood	Slow Venous bleed
Hyper dense clot	Mix of both types of blood (hyper dense and hypo dense)	Hypo dense Recurrent collection of plasma
Symptoms start less than 72 hours	Symptoms start 3-14 days after acute injury	Symptoms start 2-3 weeks after initial injury



Subdural Hematoma Management

Acute

- Thickness greater than 10mm
- Midline shift greater than 5mm
- Craniotomy or craniectomy with duraplasty
- GCS less than 9 = ICP monitor

Chronic

- Burr Holes
- Twist drill with JP drain or Hemovac
- Surgical intervention if bleed is increasing or neurological deterioration