Stroke CLINICAL Reference Guide

A RESOURCE TOOL FOR HEALTHCARE PROVIDERS

Disclaimer

This resource tool has been developed to support foundational stroke education across multiple disciplines. It is designed for educational purposes only, and not as a substitute for professional education, nor does it replace the expertise, skill, knowledge, and judgment of healthcare professionals.

Every effort has been made to ensure that the following information is accurate, up-to-date, and complete, but no guarantee is made to that effect.

The Ontario Regional Stroke Networks assume no responsibility for errors or omissions in the contents, nor for actions taken based on the content.

The Clinical Stroke Reference Guide Working Group would like to acknowledge the existing resources that were referenced in creation of this guide including the Canadian Stroke Best Practice Recommendations, and the Ontario-developed: Stroke Core Competency Framework, Smart Tips for Stroke Care, and Standardized Stroke Education Series. The working group includes provincial and regional representation from across the continuum and has leveraged subject matter experts for the review of content.

Design by Definity Creative Inc.

For the most current recommendations always refer to the Canadian Best Practice Recommendations for Stroke Care at:
www.strokebestpractices.ca

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Recognize Signs Of A Stroke

B — BALANCE

Complete finger-to-nose test, heel-to-shin test, and/or heel-to-toe walking test with the person.

Does the person have a sudden loss of balance or coordination?

E — EYES

Complete H-pattern test and/or confrontation visual field test with the person.

Is the person experiencing double vision, nystagmus, or are they unable to see out of one eye?

F — FACE

Ask the person to smile.

Is one side of the face drooping?

A — ARM

Have the person raise both arms in the air.

Does one arm drift downward?

S — SPEECH

Have the person repeat a simple phrase.

Is speech slurred, jumbled, or incomprehensible?

T — TIME

This is a medical emergency.

Call 911 when in the community.

Activate stroke protocol when in the hospital.

Use the 5 Ds to Recognize Posterior Circulation Strokes

Why Are Posterior Circulation Strokes Missed?

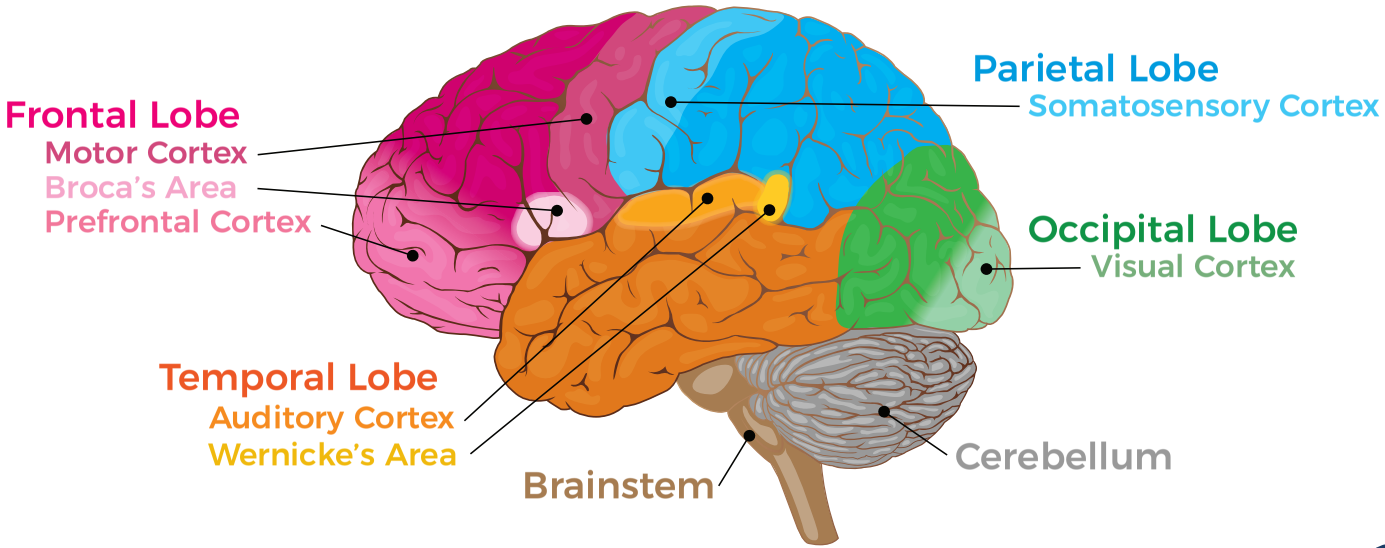
Posterior circulation strokes often present with **non-specific symptoms** (e.g., dizziness, nausea, headache, visual disturbance, or incoordination), rather than the classic face and arm/leg weakness. **30% to 60% of posterior strokes are missed in the Emergency Department** because standard stroke screenings (i.e., FAST) do not adequately represent signs and symptoms of posterior circulation strokes, including those affecting the brainstem, cerebellum, and occipital lobes.

The 5 Ds are key warning signs for strokes affecting posterior circulation

Symptom	Dizziness	Diplopia/Visual Changes	Dysarthria	Dysphagia	Dystaxia
Clinical Presentation	• Sudden, severe, unprovoked dizziness or vertigo, often with a feeling of spinning, not relieved by rest	• Double vision (diplopia) • Rapid, involuntary eye movements (nystagmus) • Blurry vision	• Slurred or slowed speech • Difficulty controlling voice volume	• New or worsened complaints of choking on food or liquid	• Unsteady gait (ataxia), or clumsiness, making it hard to walk or perform precise movements like finger-to-nose test

A common approach to the 5 Ds is "**Dizzy +1**," where sudden dizziness combined with any of the other Ds (or other signs like headache, vision loss) warrants urgent stroke evaluation.

Brain Anatomy and Physiology



Frontal Lobe

Prefrontal Cortex: Executive Functioning

- Problem solving
- Reasoning
- Judgment
- Concentration
- Decision making
- Planning
- Emotional regulation

Motor Cortex: Voluntary motor movement

Broca's Area: Motor function related to speech (expressive language)

Parietal Lobe

Somatosensory Cortex

- Sensation
  - Pressure
  - Temperature
  - Pain
  - Taste
- Spatial/perceptual
  - Body orientation
  - Proprioception
  - 2-point discrimination

Reading

Mathematical calculations

Occipital Lobe

Visual Cortex: Integration of visual stimuli

- Colour perception
- Visuospatial processing
- Depth perception
- Face recognition

Storage of visual memories

Temporal Lobe

Auditory Cortex: Auditory processing and interpretation

Wernicke's Area: Understanding language

Interpretation and storage of auditory and olfactory sensations

Behaviour

Memory

Hearing

Cerebellum

Balance

Coordination

Control of voluntary movement

Fine muscle control

BRAINSTEM: Midbrain, Pons, Medulla

Houses cranial nerves 3 to 12

Controls:

- Blood pressure
- Heart rate
- Respiratory rate
- Arousal
- Vomiting
- Swallowing

Cerebral Hemisphere Functions

Left Hemisphere

Controls right side of the body

Motor movement and sensation, right side

Speech

Language

Math

Objectivity

Reasoning

Analytical

Logic

Science

Vision, right field

Right Hemisphere

Controls left side of the body

Motor movement and sensation, left side

Music

Subjectivity

Intuition

Creativity

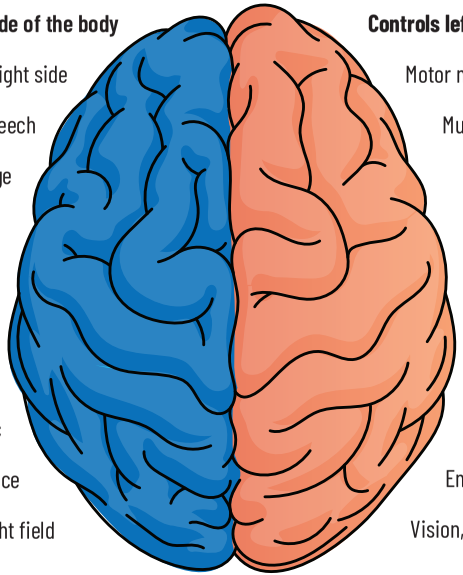
Face recognition

Spatial body awareness

Proprioception

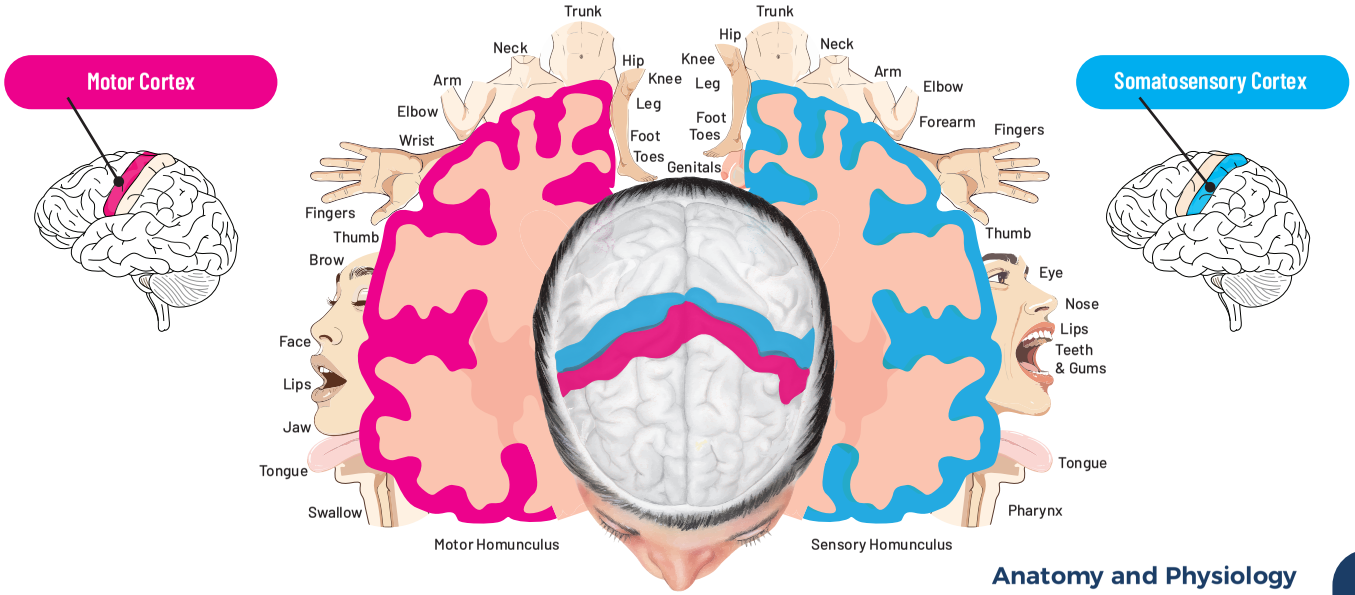
Emotion

Vision, left field



Motor and Sensory Homunculus

The homunculus is a topographic representation of the human body, identifying where motor and sensory functions are processed in the motor cortex and somatosensory cortex. The portion of cortex dedicated to each body area is not based on the area's physical size, but on the density of its nerve supply.



Cerebral Circulation

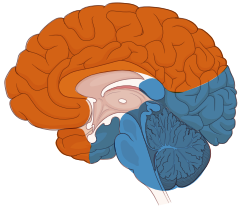
Anterior Circulation

Anterior Cerebral Artery

Supplies the medial parts of the frontal and parietal lobes

Middle Cerebral Artery

Supplies ⅔ of the lateral surface of the hemispheres (including frontal, parietal, and temporal lobes), basal ganglia, and internal capsule



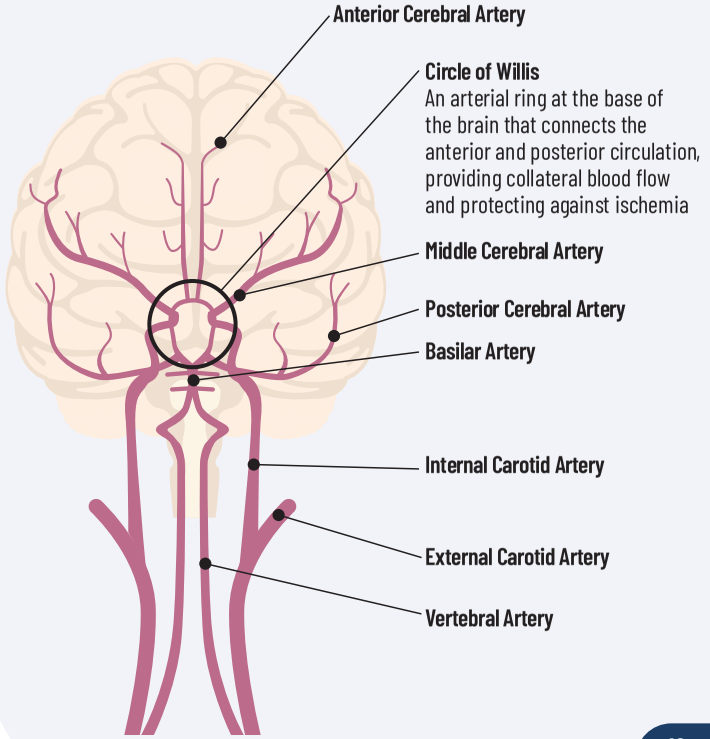
Posterior Circulation

Posterior Cerebral Artery

Supplies blood to the occipital lobe, inferior temporal lobe, thalamus, and midbrain

Vertebrobasilar Artery

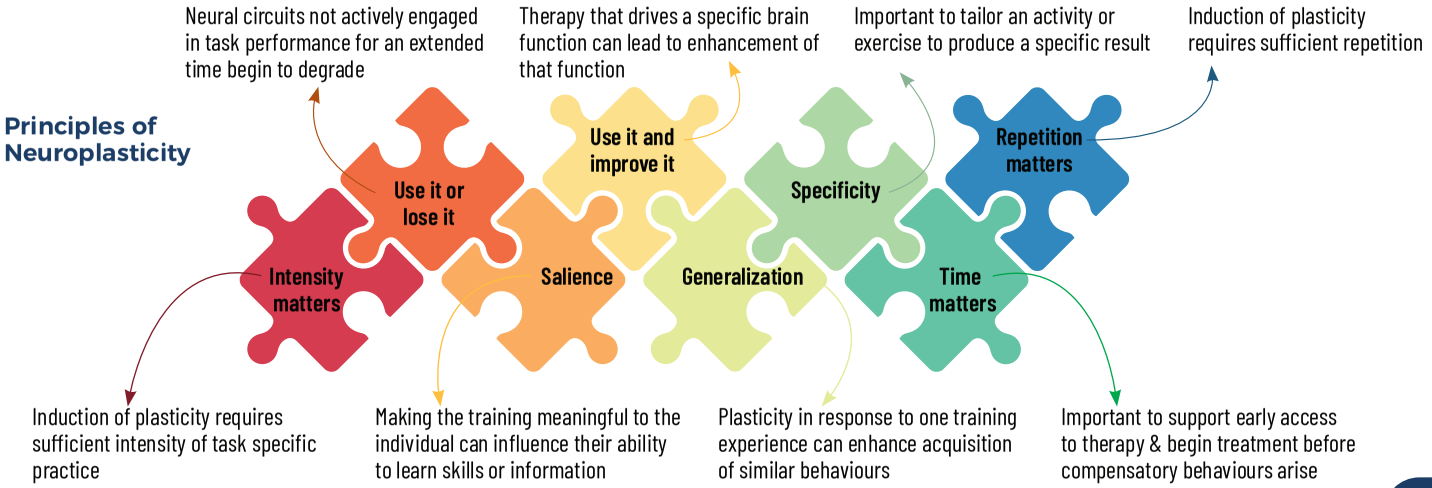
Supplies the brainstem and cerebellum



Neuroplasticity and Recovery

Neuroplasticity is the brain's lifelong ability to reorganize itself by forming new neural connections, adapting its structure and function in response to learning, experiences, injury, or environmental changes.
Neurological recovery is a spontaneous and intrinsic process; peak neurological recovery occurs within the first 3 months.
Functional recovery involves relearning skills in daily activities, though full return to prior function may not always occur. Recovery is influenced by rehabilitation approaches and extrinsic factors, with greatest progress typically in the early stages—though progress can continue more slowly over time and may plateau at any stage.

Principles of Neuroplasticity



Stroke Risk Factors

NON-MODIFIABLE

Age
Increases with age

Ethnicity
Increases for African, South Asian, and Indigenous people due to predisposition to hypertension and diabetes

Family history
Increases when parent or sibling had a stroke or heart attack at an early age

Prior TIA or stroke

Socio-economic or environmental factors
Increases with lack of access to: safe water, healthy food, healthcare, and preventative strategies

Women
Increases with hormonal factors: pregnancy, post-partum, menopause

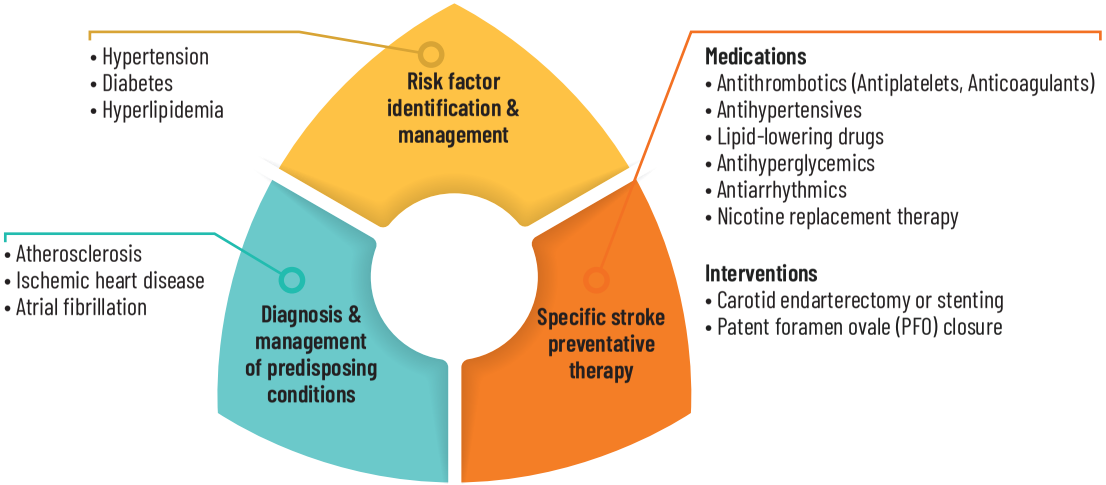
MODIFIABLE

Secondary Stroke Prevention

Secondary prevention is an individualized approach aimed at reducing the risk of a recurrent vascular event. Risk of a recurrent stroke is **10-20% within 90 days**, with half of recurrent strokes occurring in the first 2 days following initial symptom onset.

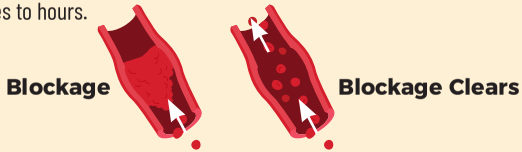
Recommendations for secondary prevention should be implemented **throughout the recovery phase,** and on an **ongoing basis.**

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



Transient Ischemic Attack (TIA)

A TIA is caused by a short-term lack of blood flow to the brain. Symptoms may last minutes to hours.



A TIA must be treated as a MEDICAL EMERGENCY

It is an important warning sign that a more serious stroke may occur soon. TIA and minor ischemic strokes are associated with an elevated risk of recurrent stroke, greatest within the first 30 days and heavily concentrated in the initial 48 hours.

Stroke

A stroke occurs when blood flow is disrupted to any area of the brain. The disruption of blood flow damages brain cells.

Ischemic
Blood supply in the brain is blocked by blood clots and/or plaque buildup in the blood vessels

87%
of strokes are ischemic

Hemorrhagic
A non-traumatic rupture or leak of a blood vessel in the brain

13%
of strokes are hemorrhagic

Patients with **TIA and non-disabling strokes discharged from the Emergency Department should be referred to a Secondary Stroke Prevention Clinic** for rapid access to stroke consultation, diagnostic investigations, carotid intervention, and risk factor management.

Types of Ischemic Strokes

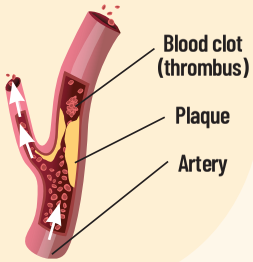
THROMBOTIC STROKES

A clot formed inside one of the brain's arteries **(thrombus)** blocks blood flow to a part of the brain

Large Vessel Thrombosis – A blockage that is caused in one of the brain's larger cerebral arteries
- Incidence: 20%

Small Vessel Thrombosis – A blockage that involves the smaller perforating arteries of the brain, known as a lacunar stroke
- Incidence: 25%

Etiology:
- Intracranial atherothrombotic/atherosclerotic disease leading to stenosis
- Arterial dissection
- Inflammatory conditions (e.g., vasculitis)
- Hypercoagulable states (e.g., blood clotting disorders)
- Cardiovascular risk factors (e.g., high blood pressure, hyperlipidemia, smoking, and diabetes)



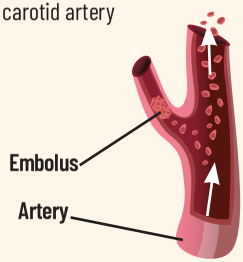
EMBOLIC STROKES

A clot formed in another part of the body **(embolus)** travels through the bloodstream until it blocks blood supply to the brain
- Incidence: 20%

Cardioembolic – Clot from the heart

Artery to Artery – Clot from carotid artery

Etiology:
- Atrial fibrillation
- Dilated cardiomyopathy
- Patent foramen ovale (PFO)
- Endocarditis
- Left ventricular thrombi
- Aortic artery plaque
- Ulcerative carotid artery plaque



CRYPTOGENIC STROKES

Strokes where no known cause can be identified after diagnostic evaluation and work-up
- Incidence: 25-30%

Middle Cerebral Artery (MCA) Stroke Syndrome

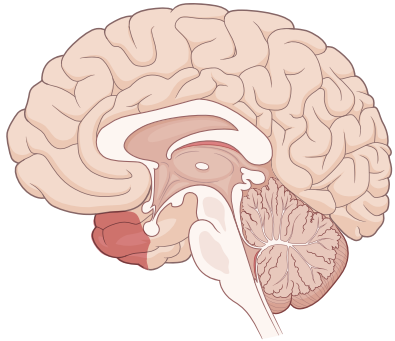
Middle Cerebral Artery

- Supplies blood to 2/3 of the lateral surface of the hemispheres (frontal, parietal, and temporal lobes), basal ganglia, and internal capsule
- Largest of the brain arteries

~67%
of all strokes are MCA

Potential Deficits

- Contralateral sensory and motor deficits
- Contralateral homonymous hemianopia
- Left MCA
  - Aphasia
- Right MCA
  - Contralateral neglect
  - Decreased motivation, executive functioning, initiation, and ability to sequence



Lacunar Stroke Syndrome

Lacunar Strokes

- A blockage of a small deep penetrating branch of a major cerebral artery most often due to small vessel disease
- The blockage results in tiny infarcts in deep brain structures such as:
    - Internal capsule
    - Thalamus
    - Basal ganglia
    - Pons

25%
of ischemic strokes are lacunar strokes

"Classic" Lacunar Stroke Syndromes

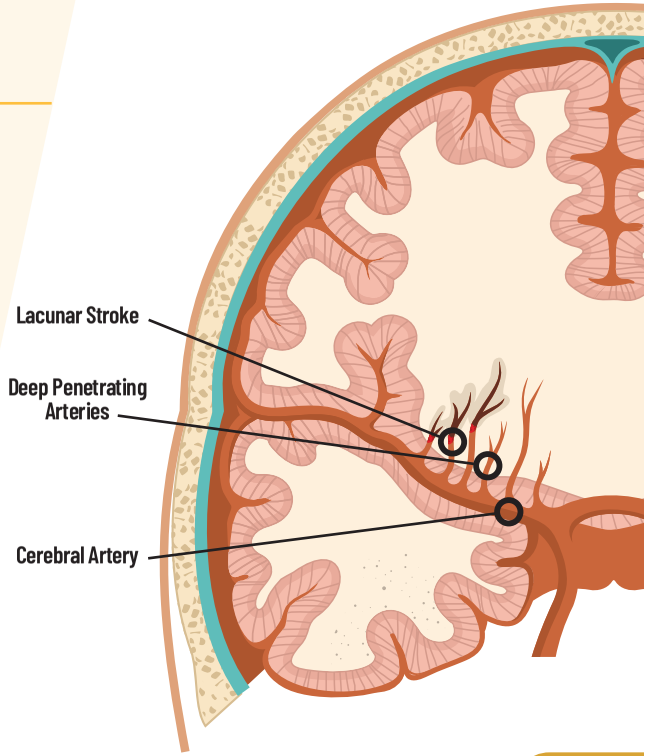
Pure Motor Stroke: Hemiparesis/hemiplegia in the contralateral face, arm and leg

Pure Sensory Stroke: Contralateral paresthesia on one side of the body affecting face, arm, and leg

Sensory Motor Stroke: Hemiparesis/hemiplegia and paresthesia on contralateral side of the body

Ataxic Hemiparesis: Issues with balance and coordination

Dysarthria-Clumsy Hand Syndrome: Difficulty speaking and weakness of hand



Posterior Cerebral Artery (PCA) Stroke Syndrome

Posterior Cerebral Artery

Supplies blood to the occipital lobe, inferior temporal lobe, thalamus and midbrain

5-10%
of all strokes are PCA

Potential Deficits

Occipital Lobe

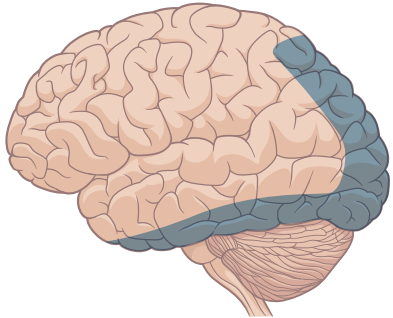
- Visual deficits:
  - Contralateral homonymous hemianopia
  - Cortical blindness
  - Visual agnosia
  - Loss of colour differentiation

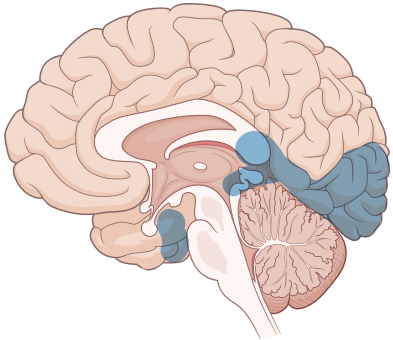
Medial Temporal Lobe

- Transcortical sensory aphasia
- Memory impairment
- Behaviour changes

Thalamus

- Contralateral sensory loss
- Confusion
- Dysarthria
- Decreased level of consciousness





Anterior Cerebral Artery (ACA) Stroke Syndrome

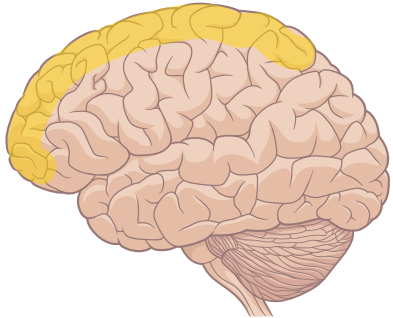
Anterior Cerebral Artery

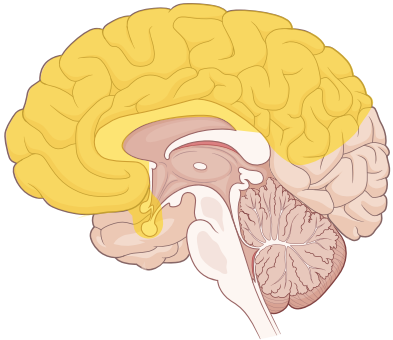
Supplies blood to the medial part of the frontal and parietal lobes

2-4%
of all strokes are ACA

Potential Deficits

- Contralateral sensory and motor deficits of lower limb
- Ataxic gait
- Slow to initiate response
- Flat affect
- Mute
- Short-term memory loss
- Impulsivity
- Lack of concentration
- Personality and behaviour changes
- Bladder incontinence





Brainstem Stroke Syndrome

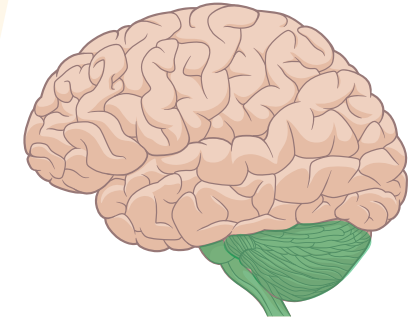
Vertebrobasilar Artery

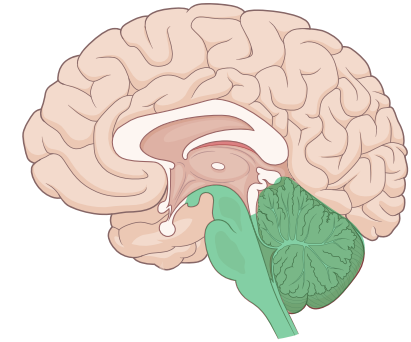
Supplies blood to the brainstem and cerebellum

10-15%
of all strokes

Potential Deficits

- Vital functions can be disrupted (breathing, swallowing, heart rate)
- Vomiting
- Blurred or double vision
- Headache
- Altered mental status (including confusion, disorientation, lethargy, coma)
- Physical symptoms:
  - Crossed motor signs - unilateral facial numbness or weakness
  - Contralateral arm or leg numbness or weakness
- Hoarse voice
- Dysphagia
- Locked-in syndrome





Cerebellar Stroke Syndrome

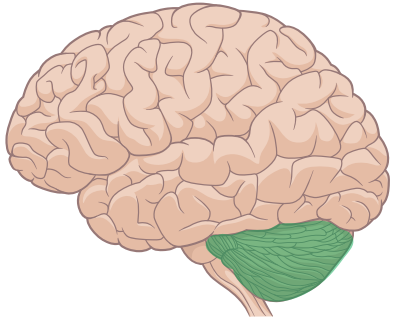
Superior, Anterior, or Posterior Inferior Cerebellar Arteries

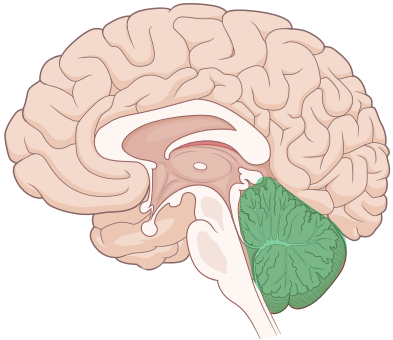
The branches of the basilar artery supply blood to the cerebellum

2%
of all strokes

Potential Deficits

- Dizziness
- Vertigo
- Nausea
- Vomiting
- Severe headache
- Double vision
- Nystagmus
- Dysarthria
- Ataxia/decreased coordination





Types of Hemorrhagic Strokes

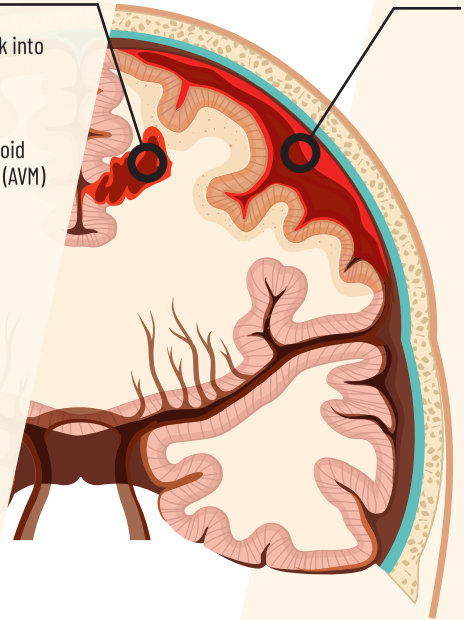
Intracerebral Hemorrhage (ICH)

A blood vessel within the brain bursts, allowing blood to leak into brain tissue

Etiology:
Most often caused by hypertension (chronic), cerebral amyloid angiopathy, anticoagulants, or arteriovenous malformation (AVM)

Clinical Presentation:
- Sudden, severe headache
- Nausea and vomiting
- Seizure
- Reduced level of consciousness
- Uncontrolled blood pressure
- Focal neurological deficits

Patient may deteriorate within first 48 hours due to increased intracranial pressure



Subarachnoid Hemorrhage (SAH)

Bleeding into the subarachnoid space (between the arachnoid and pia mater surrounding the brain)

Etiology:
A rupture of an aneurysm or arteriovenous malformation (AVM)

Clinical Presentation:
- Sudden and severe thunderclap headache (worst headache of their life)
- Nausea and vomiting
- Photophobia
- Nuchal rigidity (neck stiffness or pain)
- Altered level of consciousness
- Focal neurological deficits

Assessment Tools for Acute Stroke Severity

CANADIAN NEUROLOGICAL SCALE

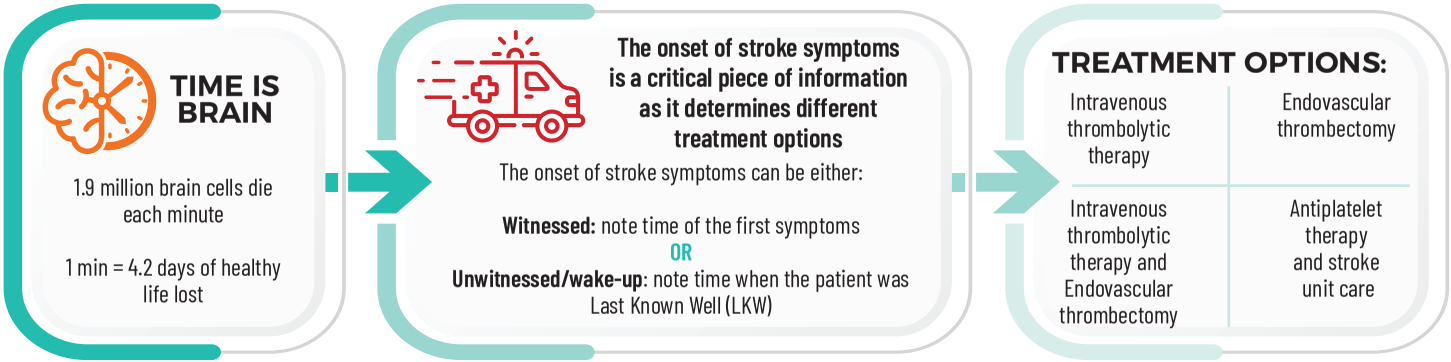
- Eight question neurological assessment tool
- Screens for expressive and receptive speech and language deficits
- For alert or drowsy patients
- Monitors neurological status
- Requires training

NATIONAL INSTITUTES OF HEALTH STROKE SCALE (NIHSS)

- A 15-item standardized neurological examination
- Has a strong prognostic value for long term functional outcomes after stroke
- Utilized to determine eligibility for hyperacute stroke treatments and ongoing monitoring of neurological status
- Requires certification and recertification

NIHSS Score	Stroke Severity
0	No Stroke Symptoms
1 – 4	Minor Stroke
5 – 15	Moderate Stroke
16 – 20	Moderate to Severe Stroke
21 – 42	Severe Stroke

Hyperacute Ischemic Stroke Treatments



INTRAVENOUS THROMBOLYTIC THERAPY (IVT)

Using drugs to activate the body's natural clot-dissolving system (fibrinolysis)

Eligibility
- Patients with an ischemic stroke causing disabling neurological deficits
- Within 4.5 hours from Last Known Well

Contraindications
- Hemorrhagic stroke
- Active bleeding or conditions that increase the risk of bleeding post thrombolysis

ENDOVASCULAR THROMBECTOMY (EVT)

Mechanical removal of clot using a stent retriever and/or aspiration device

Eligibility
- Patients with a large vessel occlusion (LVO) of internal carotid, middle cerebral, or vertebrobasilar artery
- Within 24 hours from Last Known Well

* **Patients with contraindications for IVT may be eligible for EVT**

* **Patients who have received IVT may also be eligible for EVT**

Post-Intravenous Thrombolysis (IVT) Complications

Notify physician immediately AND stop thrombolytic infusion (tPA)

Complication	What to Look for	Intervention
Orolingual Angioedema • Potentially **life threatening** allergic reaction • Incidence less than 1.0%	• Acute swelling of the lips, tongue, face, or oropharynx • Shortness of breath	• Assess for angioedema every 15 minutes for the first 1.5 hours after thrombolysis and then every 4 hours for first 24 hours • Treat with antihistamines, steroids • Avoid epinephrine (if possible) due to risk of hypertension • Patient may need to be intubated
Intracerebral Hemorrhage (ICH) • Potentially serious complication • 3.4% risk after thrombolysis • All symptomatic fatal hemorrhages occur within first 24 hours	• Headache, nausea, and vomiting • Lethargy or confusion • Sudden weakness or numbness of the face, arm, or leg (usually one side) • Loss of consciousness • Temporary loss of vision • Seizures	• Keep blood pressure less than 180/105 to prevent risk of ICH post thrombolysis • Obtain immediate non-contrast CT scan and blood work including CBC, INR, and type and cross
Systemic Bleeding • Incidence requiring blood transfusions is less than 1.0%	• Bleeding in intestines, eyes, or kidneys • Evaluate urine, stool, emesis, and secretions for blood • Check puncture sites for bleeding or hematomas	• Avoid IM injections, blood draws, and invasive lines/procedures for 24 hours after thrombolysis treatment

Post-EVT complications can occur; EVT sites should refer to organizational EVT protocols for monitoring and interventions.

Conditions Leading to Deterioration of Neurological Status

Condition	What to Look for	Notify physician immediately Intervention

Cerebral Edema & Increased Intracranial Pressure
Typically occurs 24-48 hours following the event
	Change in neurological status:
	• Decreased level of consciousness
	• Worsening of stroke symptoms or development of new stroke symptoms
	• BE FAST signs
	• 5 Ds
	• Headache
	• Nausea and vomiting
	• Restlessness
	• Pupil changes
		• Monitor for changes in neurological status using the appropriate tool based on the patient's level of consciousness:
		  • Canadian Neurological Scale (CNS)
		  • National Institutes of Health Stroke Scale (NIHSS)
		  • Glasgow Coma Scale (GCS)
		• Brain imaging is repeated with a change in neurological status and is always repeated 24 hours post-thrombolysis

Hemorrhagic Transformation Blood vessels in the area around the infarct become more fragile and blood leaks across into the brain with reperfusion May occur in patients post-IVT/EVT, or spontaneously		
New Stroke Event		
Seizures The incidence of post-stroke seizures ranges from 5 - 15% depending on stroke etiology, severity, and location Post-stroke seizures may be a result of the injured brain tissue sending out abnormal electrical signals	• Signs and symptoms of seizure activity, generalized or focal	• Keep patient safe/reduce risk of injury • A seizure lasting more than 5 minutes is a medical emergency • Document duration of seizure, observations of seizure activities

Venous Thromboembolism (VTE) Complications

Deep Vein Thrombosis (DVT)/ Pulmonary Embolism (PE)

Stroke patients are at high risk of developing a VTE

Factors that put patients at higher risk:
- History of thromboembolism
- Dehydration
- Other relevant co-morbidities (e.g., malignancy)
- Inability to move one or both limbs
- Unable to mobilize independently

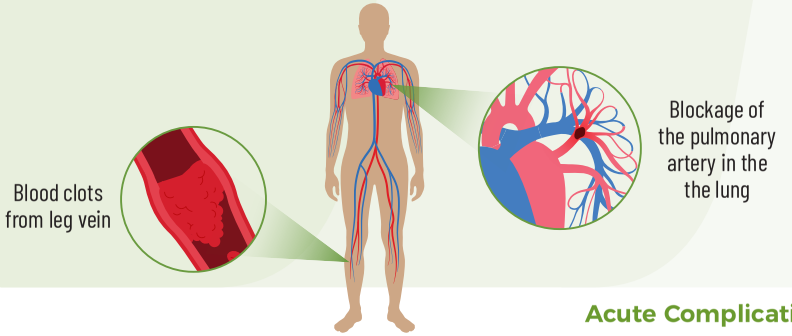
What to Look for

- Lower extremity swelling, tenderness, and warm to touch
- Shortness of breath
- Chest pain
- Cough

Intervention

Compression stockings NOT recommended

- Screen all patients for VTE risk
- For patients at high risk:
  - implement thigh-high intermittent pneumatic compression (IPC) devices **or**
  - pharmacological venous thromboembolism prophylaxis
- Ensure adequate hydration
- Mobilize as soon as medically stable (typically 24-48 hours) to prevent complications, unless contraindicated



Clinical Considerations in the Acute Phase

Managing Vitals	What to Look for	Intervention
Blood Pressure (BP) Management In the first **48 to 72 hours**, allow permissive hypertension to promote cerebral perfusion in ischemic stroke BP that is too low can also cause problems, such as dizziness and fainting	• BP outside of the ordered parameters	• Monitor BP as per order set and notify physician if falls outside of the protocol • Avoid rapid or excessive lowering of blood pressure as that may induce ischemia • Gradual lowering to achieve target BP after initial acute phase
Blood Glucose (BG) Abnormalities Prevalence of hyperglycemia is 30-50% in post-stroke patients without a history of diabetes mellitus A stroke causes elevated blood glucose due to the body's acute stress response and has been associated with larger final infarct volume and worse clinical outcome	• Abnormal BG levels	• Monitor BG as per order set and notify physician if falls outside of the protocol • Hyperglycemia should be treated • Hypoglycemia should be corrected immediately

Cardiovascular Investigations Used to identify dysrhythmia and evidence of other cardiac disease that may change management	• Bradycardia • Tachycardia • Irregular heartbeat (e.g., atrial fibrillation)	• Monitor pulse rate and rhythm and notify physician of any abnormalities • EKG, telemetry, or Holter monitoring may be ordered to rule out abnormalities
Temperature Management Fever can induce secondary brain injury and be associated with worse outcomes and higher mortality rates post-stroke	• Fever	• Monitor every 4 hours for the first 48 hours, and then as per unit routine or based on clinical judgment • If greater than 37.5°C, treat to reduce fever and consider underlying infection
Oxygen Monitoring Hypoxia after stroke worsens brain damage leading to poorer outcomes	• Oxygen saturation levels	• Monitor every 4 hours for the first 48 hours, and then as per unit routine or based on clinical judgment • Supplemental oxygen is not required for patients with normal oxygen saturation levels

Possible Effects/Sequelae of Stroke

Stroke sequelae are the range of physical, cognitive, emotional, and functional changes that can occur as a result of injury to the brain after a stroke. These effects can be temporary or permanent, and often depend on the location, size, and severity of the brain damage. Although **secondary complications** may develop as a consequence of these sequelae, they are generally preventable with appropriate interventions.

Changes in Physical Function

Altered Muscle Tone

Low Tone

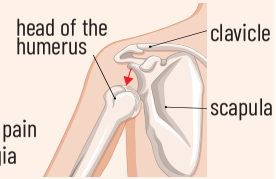
Typically occurs in early stages, posing a risk for injury and pain if the limb is unsupported, particularly at the shoulder

Low tone may lead to **secondary complications,** including:

- **Shoulder Subluxation** - shoulder instability caused by partial dislocation of the shoulder joint

What to Look for

- Limb feels heavy/weak, flaccid



- Shoulder pain
- Hemiplegia

Intervention

- **Refer to OT/PT** for positioning and transfer recommendations
- Shoulder slings should only be considered in the flaccid stage when no other upper extremity support is possible
- Initiation of Hemiplegic Arm Protocol

DO NOT:

- ✘ Pull on affected arm
- ✘ Leave affected arm in sling (i.e., use sling only during mobility, if recommended)
- ✘ Elevate above 90° of shoulder flexion or abduction

High Tone

Can occur later post-stroke, as a flexor pattern in the upper extremity

Can impact ROM, ADLs, skin care, mobility, and pain management

High tone can lead to **secondary complications** including:

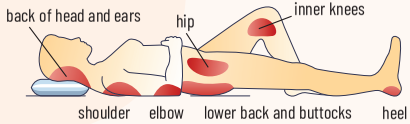
- **Contracture** - a permanent tightening or shortening of muscles, tendons, ligaments, or skin that results in reduced flexibility and limited range of motion in a joint or body part

- Stiffness
- Spasms
- Spasticity: a velocity-dependent increase in tone due to hyperexcitability of the stretch reflex

- Promote positioning that is opposite to flexor pattern position for extended periods (up to 1 hr or more)
- Use positioning devices, (e.g., pillows, wedges, orthoses) as recommended

flexibility and limited range of motion in a joint or body part

Impaired Mobility A limitation in an individual's ability to move independently, affecting walking, standing, or daily activities that can lead to **secondary complications**, including:	• Muscle weakness • Decreased balance • Altered muscle tone • Changes in sensation	• Mobilize as soon as medically stable (typically 24-48 hours) to prevent complications, unless contraindicated • **Refer to OT/PT** to complete a more detailed assessment • Follow safe mobilization principles **Mobilization is the responsibility of all team members
Falls Increased risk due to medical, functional, cognitive, perceptual, and environmental factors	Impairments that increase risk of falls: • Weakness • Impaired sensation or coordination • Changes in posture/balance • Changes in vision/perception • Fatigue • Pain • Spasticity/tone Previous history of falls	• Follow universal fall precautions and address individual risk factors
Pressure Injury Breakdown of skin integrity due to pressure; can occur when a bony prominence is under persistent contact with an external surface Increased risk due to: • Poor nutrition and dehydration • Dry skin • Increased moisture from incontinence and perspiration • Sensory perceptual changes • Impaired mobility	Localized skin or soft-tissue damage, especially over bony prominences that appears: • Reddened • Non-blanching • Discoloured • Blistered • Visible breakdown	• Complete Braden Scale • Follow Pressure Injury Prevention Policy of your organization • **Refer to OT** for pressure management strategies • **Refer to RD** for strategies to optimize nutritional status to promote tissue repair and prevent infection



Dysphagia

Difficulty swallowing may lead to **secondary complications** including:

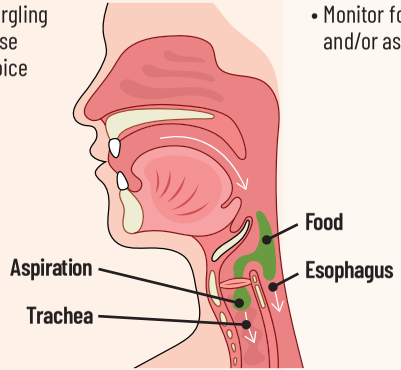
- **Airway obstruction**
- **Aspiration**
  The entry of food, liquid, and/or saliva into the airway. The absence of throat clearing and/or coughing might indicate **silent aspiration**
- **Dysphagia related aspiration pneumonia**
  Respiratory infection that may result from bacteria in saliva, foods, and liquids and/or refluxed material from the stomach entering the lungs

What to Look for

Poor oral hygiene

Signs and symptoms of dysphagia:

- Coughing, choking, or persistent throat clearing before, during or after swallowing
- Difficulty swallowing
- Pocketing of food
- Drooling, gurgling
- Wet or hoarse sounding voice



Intervention

- **Keep NPO**, including medications, food, and liquid
- Screen within 24 hours using a validated dysphagia tool prior to any oral intake
- An abnormal swallow screen should **prompt a referral to an SLP** to complete a more detailed assessment and recommendations
- **Oral care routine**, even if patient is NPO
- Safe feeding practices
- Monitor for signs and symptoms of dysphagia and/or aspiration

Malnutrition & Dehydration

In addition to dysphagia, malnutrition and/or dehydration can occur post-stroke due to various factors, including:

- Decreased level of consciousness
- Post-stroke depression
- Poor oral hygiene
- Difficulty with self-feeding and/or meal set-up
- Slow eating
- Poor intake

Malnutrition and/or dehydration after stroke can be associated with poor long-term outcomes

Symptoms of malnutrition:
- Appetite
- Weight loss
- Tiredness and low energy
- Low mood
- Reduced physical ability

Symptoms of dehydration:
- Dark yellow and strong smelling urine
- Dizziness
- Tiredness
- Reduced urine output
- Headaches
- Constipation

- Screen for malnutrition using a validated tool within 24 hours of admission
- An abnormal screen should **prompt a referral to an RD** to complete a more detailed assessment and recommendations
- Screen for signs and symptoms of dehydration
- Monitor weight and intake
- Encourage appropriate and preferred fluids at routine interactions throughout the day
- **Refer to:**
  - **SLP** to monitor for any texture and consistency modifications
  - **OT** for strategies to support patients with decreased functional ability and/or visual perceptual changes

1 in 3
elderly patients are dehydrated upon admission

1 in 2
patients are malnourished upon admission

17-72%
of stroke patients
suffer from malnutrition during the course of their admission

Changes in Cognition

Refer to OT for task specific strategies

	What to Look for	Interventions
Decreased Attention 	• Inability to concentrate on one thing for a period of time • Includes level of alertness and ability to react to interventions	• Minimize distractions • Give short, simple instructions • Make direct eye contact • Give the patient time to think • Write down key points
Disorientation 	• Reduced awareness of time, place, and/or person	• Provide a calendar to help the patient keep track of the date • Use a bulletin board to list personal information and post family pictures • Ensure the whiteboard in the patient's room is accurate • Create and follow consistent routines • Provide regular re-orientation
Memory Impairment 	• Deficits in the ability to register, process, and store new information, and retrieve information that has been previously stored	• Use memory aids (e.g., phone reminders) • Repeat information • Store items in the same place • Provide simple, clear instructions; key information only • Present new information one step at a time
Ideational Apraxia **Ideomotor Apraxia** 	• Breakdown in the concept or planning of a multi-step task, and planning how to purposefully use objects within the context of a task • Difficulty executing a known movement	• Use short and simple instructions • Break the task into simple steps • Encourage repetition using the same steps every time • Context is important (e.g., practicing ADL's in the morning in the bathroom) • Provide hand-over-hand guidance

Decreased Insight	• Difficulty recognizing and understanding abilities and limitations • Awareness of deficits post-stroke may take weeks or months; some never become aware of how the stroke has affected them	• Have assistive devices close at hand • Provide education about the stroke and resulting limitations • Provide the necessary amount of supervision to ensure safety • If a patient is becoming agitated, use de-escalation strategies
Impaired Judgement	• Reduced ability to make safe or appropriate decisions • Characterized by difficult recognizing personal limitations or adapting to new functional changes (e.g., attempting to get out of bed independently despite being advised to seek assistance due to weakness)	• Discuss concerns about the patient's safety with the patient, family, and team; develop strategies to optimize safety and functioning • Maximize safety of the environment • Provide needed support for decision-making
Impaired Sequencing	• Inability to arrange actions or items in the correct order	• Give clear step-by-step instructions • Help patient initiate the task with verbal or visual cues, if needed • Give patient time to practice the task • Lay out objects in order
Impaired Problem Solving	• Inability to recognize a problem and find a good solution • Problems with insight, sequencing, and memory can affect the patient's problem solving ability	• Break tasks into small steps, focus on one step at a time • Help the patient identify different ways of solving the problem • Allow the patient to learn from their mistakes, as long as it safe

Impulsivity is acting quickly without thinking things through, resulting from decreased insight and poor judgment. After stroke, patients may act on sudden urges that could risk injury.

Changes in Vision and Perception

Refer to OT for task specific strategies

What to Look for	Interventions
Impaired Vision 	• Blurred vision • Diplopia (double vision) • Hemianopia (missing half the visual field)	• Consider environmental adaptations and compensatory techniques to assist with daily activities (e.g., position objects in central gaze, use verbal cues for task initiation) • Modify the physical environment when mobilizing to reduce fall risk (e.g., remove clutter, secure cords, good lighting)
Impaired Eye Movement 	• Nystagmus (oscillating eyes) • Strabismus (misaligned eyes) • Impaired tracking (trouble following objects)	• Practice simple eye-tracking exercises (e.g., follow finger side-to-side/up-down without head movement)
Impaired Visual Perception 	• Difficulty with object/face recognition • Spatial disorientation • Difficulty navigating environments	• Reduce clutter on surfaces and enhance lighting to make objects and faces easier to see and recognize • Introduce visual prompts and aids such as cue cards, pictures, photos, or mood indicators when face and object processing is limited • Use visual markers to help patients navigate their surroundings (e.g., signs on doors)

Unilateral Spatial Neglect 	• Lack of awareness of one side of space • Sometimes referred to as inattention	• Teach visual scanning strategies (e.g., the lighthouse strategy - imagining the head as a lighthouse, turning it from side to side to "scan" the environment, ensuring no area is missed) • Use verbal cues to draw attention to the neglected space and promote greater awareness of the affected area • Position the bed or chair so the affected side faces activity hubs (e.g., doorway or visitor)
Impaired Depth Perception and Contrast Sensitivity 	• Reduced ability to judge distances or see differences in shading	• Add coloured tape or markings on step edges, and uneven surfaces to boost visibility and depth cues during mobility • Encourage consistent use of handrails on stairs and ramps for stability and tactile feedback • Optimize use of high contrast items (e.g., tableware contrasts sharply with table surface and food/drink to encourage independence with self-feeding)
Impaired Spatial Awareness 	• Deficits in integrating vision with movement • Spatial misjudgment	• Encourage gait aid use to provide ground contact feedback and stability support • Provide education and feedback about the patient's body position in space (e.g., keep shoulders level and weight centered over hips during transfers) • Implement compensatory strategies to maximize safety (e.g., guide the patient to feel for the arm of the chair or edge of the bed before attempting to sit down)

Post-Stroke Fatigue

Common after stroke, regardless of severity or stage of recovery

It often goes unrecognized and typically peaks in the early months as the brain heals and individuals adapt to new physical and cognitive demands

Can significantly limit participation and recovery

What to Look for

- Persistent tiredness or low energy during daily activities
- Exhaustion after minimal effort, with frequent naps or prolonged sleep
- Difficulty concentrating or reduced motivation
- Fatigue worsening with increased activity, stress, or at care transitions

Intervention

- Periodically screen for post-stroke fatigue using a validated tool
- An abnormal screen should **prompt a referral to OT/PT** for a more detailed assessment and recommendations
- Educate patients and families about the possibility of post-stroke fatigue and energy conservation strategies
- Use the "4 Ps" to help manage fatigue
- Encourage adequate rest and good sleep hygiene
- Support gradual, personalized exercise programs to improve physical conditioning without overexertion
- Promote adequate hydration and nutrition to support energy recovery

Use the "4 Ps" to Help Manage Fatigue

Prioritize: have patient complete important activities first and ask for help when needed

Plan: have patient schedule demanding tasks for times of peak energy

Pace: have patient take breaks when needed and avoid rushing

Position: have patient's body well supported with good positioning

Changes in Mood and Behaviour	What to Look for	Intervention
Changes in Mood Common post-stroke, particularly depression and anxiety Symptoms can emerge at any time; in the first few weeks, through the first year of recovery, and may persist long-term Mood changes are associated with: • Poorer recovery • Greater dependence • Cognitive decline • Reduced participation • Increased mortality	• Emotions such as fear, frustration, anger, sadness, or grief may resurface during major transitions **Anxiety** • Feelings of fear, worry and unease that can manifest emotionally, socially, and physically • May occur alone or with depression **Post-Stroke Depression** • Persistent low mood or loss of interest lasting two weeks or more **Pseudobulbar Affect (PBA) and Emotional Lability** • Sudden involuntary episodes of laughing or crying that are disproportionate to the person's actual feelings and are typically recognized by the individual as inappropriate reactions	• Screen for mood changes using validated tools across the continuum, at care transitions, and when a change in status is observed • Abnormal results should **prompt notification of the physician and a referral to SW** • Promote daily structure, meaningful activity, and social engagement • Address communication barriers to reduce isolation, and normalize emotional changes by involving family in support strategies • Monitor mood regularly to enable timely intervention, including medication when indicated
Changes in Behaviour Common post-stroke, often peaking within the first 3-6 months as the brain and the individual adjusts to recovery	• Impulsivity • **Apathy:** reduced interest or motivation (distinct from depression) • Increased anger, frustration, or irritability • Confusion, forgetfulness, or poor concentration	• Identify and minimize triggers such as noise, fatigue, or overstimulation • Promote coping and relaxation strategies • Maintain predictable routines and provide explanations to reduce anxiety • Approach from the unaffected side, using calm and patient communication • Provide gentle support, redirection, and positive reinforcement

Altered Bladder & Bowel Function

Altered bladder and bowel function can increase risk for **secondary complications,** including:

Urinary Dysfunction

- Urinary incontinence and/or urinary retention
- Approximately 50% have urinary incontinence during acute admission post-stroke
- Increased risk:
  - Stroke in frontal lobe, pons, hypothalamus
  - Age
  - Diabetes
- Can lead to a urinary tract infection (UTI)

Constipation

Patients are prone to constipation for physiological and clinical reasons

Fecal Incontinence

Affects 30% in the first 7 to 10 days post-stroke

What to Look for

- Urge incontinence
- Urinary retention (with or without overflow)
- Stress incontinence
- Mixed incontinence

- Delayed colonic transit time
- Impaired mobility
- Dehydration
- Polypharmacy
- Dietary factors
- Impaired cognition

Intervention

- Patients should be screened for urinary incontinence and retention (with or without overflow), fecal incontinence and constipation
- Follow bladder and bowel protocol/routine
- Ensure and educate re: adequate hydration and fibre intake/diet intervention
- Minimize use of indwelling catheters due to risk of catheter-associated urinary tract infection (CAUTI)
  - Assess daily and remove as soon as it is no longer needed
- Monitor for signs and symptoms of UTI
- Peri-care and infection prevention strategies should be implemented

Changes in Communication	What to Look for	Intervention
Aphasia A communication disorder that can affect speaking, understanding spoken language, reading, writing, and/or participation in daily conversations, including:		• **Refer to SLP** to complete a more detailed assessment and recommendations • Ensure use of glasses, hearing aids, and dentures, as appropriate • Use supported communication strategies
Expressive/Non-Fluent Aphasia e.g., Broca's aphasia	• Slow, halting, effortful speech in short, broken phrases while comprehension is relatively less impaired	
Receptive/Fluent Aphasia e.g., Wernicke's aphasia	• Challenges understanding spoken and/or written language • Speech 'fluent' in nature, but message may not make sense to listener • Errors are typically not recognized; therefore, no attempt to correct	
Global Aphasia	• Severe language impairments, impacting both receptive (i.e., understanding spoken word, reading) and expressive (i.e, speaking, writing) communication skills	
Dysarthria A motor speech disorder affecting speech sounds because of weakness or discoordination of muscles	• Slurred speech • Reduced volume or breathy sounding voice • Changes in vocal quality	
Verbal Apraxia A motor speech disorder affecting planning and coordinating speech movement	• Struggling to articulate the right word, especially longer words • Inconsistent errors • Retained ability to use short, everyday sayings (e.g., "How are you?")	
Cognitive Communication Disorder Underlying cognitive difficulties affecting functional areas of communication	• Changes to attention, concentration, memory, and/or executive functioning	

Supported Conversation for Adults with Aphasia (SCA™)

SCA™ is an evidence-based communication method developed by the Aphasia Institute that can facilitate the understanding and expression of spoken and written messages, as well as demonstrate respect for the competence of the person with aphasia.

Foundational Communication Skills

Remove Distractions
- Background noise
- Busy settings
- Messy desks/tables

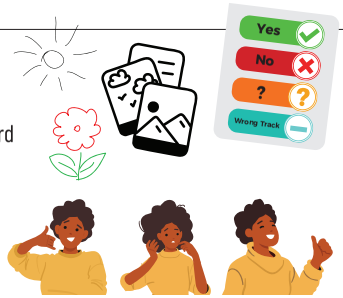
Allow Extra Time
- To listen and understand
- To convey a message
- To read/write

Observe Carefully
- Watch face and body language
- Are words being understood?
- Can they say, write, point
- Imagine what they are trying to say, don't focus on mistakes

Visual Supports (In order of usage)

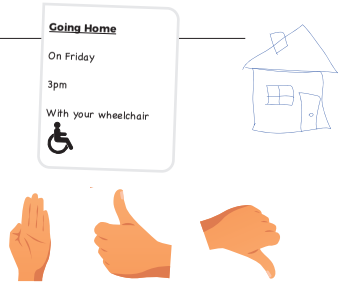
IN

While talking, add:
- Gesture
- Written key words
- Yes/No/?/Wrong Track card
- Objects
- Pictures
- Simple line drawing



OUT

Encourage person with aphasia to:
- Gesture
- Write (single letter clue or words)
- Point to written choices, Y/N, pictures
- Draw what they can



Acknowledge Competence (Interact Respectfully)

Implicit
- Make eye contact
- Include the person in conversations
- Use natural tone of voice
- Use adult topics/vocabulary

Explicit
- Say 'I know you know', in your own words
- At bedside, get permission to talk to others about the person with aphasia
- Take ownership, "I'm sorry. I'm not getting it."

Reveal Competence (Exchange Information)

Message IN (help to understand spoken language)
- Use modified spoken language
- Slow rate
- Simple language
- Expressive voice
- Add visual supports while speaking

Message OUT (help to express ideas verbally)
- Clarify unclear messages
- Say what you think is the intended message
- Ask for more information, hints, and ask follow-up questions
- Start with open-ended questions, if necessary, switch to Y/N questions or offer choices
- Add visual supports while speaking

Verify (Ensure Accurate Information Exchange)
- Use all necessary IN and OUT strategies
- Paraphrase what they say and summarize after a longer exchange

Making Materials Communicatively Accessible

Short Messages
- **Write** down your information
- **Cut out** anything not needed
- **Separate** messages out

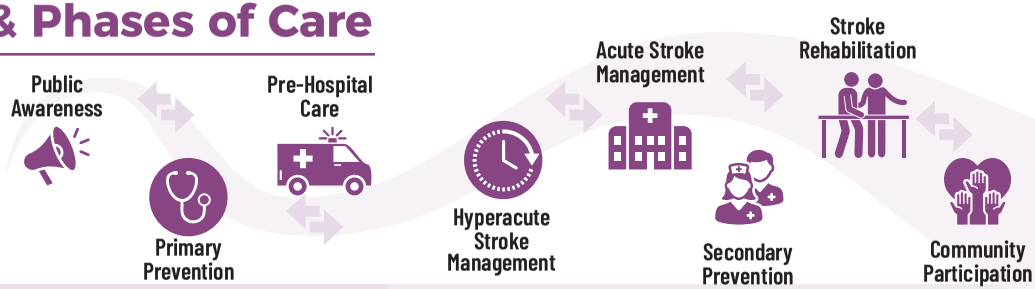
Clear Sentences
- Keep it **short**
- Make **one point** only in a sentence
- Aim for **~5 words/sentence**

Easy Words
- Use **everyday** words (e.g. doctor, not physician)
- Use **whole** words, not acronyms

Good Layout
- Use **sans serif** font
- Make important words **bold**, larger
- Use **14pt font** or larger
- Use **images**

Patient Journey & Phases of Care

Every person with stroke has a **unique** journey. Not every person will move through each of the phases in a linear fashion. It will depend on their clinical needs.



Phases of Care

Hyperacute Stroke Management

Hyperacute refers to the time-sensitive window within the first 24 hours after a TIA or acute stroke

What is the goal of Hyperacute Stroke Management?

To do the following as quickly as possible:

- Diagnose the stroke type
- Organize and implement an individualized treatment plan
- Determine eligibility for hyperacute stroke treatment

Acute/Integrated Stroke Unit Care

- Geographically defined unit
- Dedicated to the care of acute stroke patients
- Staffed by an interprofessional team with stroke expertise

Acute Stroke Unit - Provides only acute care
Integrated Stroke Unit - Provides both acute and rehabilitation care

Why is Stroke Unit Care important?

Stroke unit care is associated with:

- Reductions in the likelihood of death and disability, and/or the need for institutionalization by approximately 25%
- Regaining function to return home
- Decreases their chances of subsequent strokes

Secondary Stroke Prevention Clinic

A Secondary Stroke Prevention Clinic is an outpatient clinic for adults who have signs and symptoms of a recent stroke or TIA to reduce the incidence of future strokes

What are the goals of the Secondary Stroke Prevention Clinic?

- Expedite assessment, treatment and access to carotid revascularization
- Provide quick access to consultation by a stroke specialist and diagnostic testing
- Identify risk factors for stroke
- Educate patients and family members about risk factor management

Stroke Rehabilitation

Provided by an interprofessional team with stroke expertise, as part of:

Rehabilitation/Integrated Stroke Unit Care

- Geographically defined unit
- Dedicated to the care of stroke rehabilitation patients

Community Stroke Rehabilitation

- Co-ordinated care, delivered in the setting(s) that best meets the needs of the person with stroke (outpatient clinics, home-based, community programs) to promote ongoing recovery, maintain function/quality of life, and support reintegration to life after stroke

What is Stroke Rehabilitation?

- A progressive, dynamic goal-focused process created to help patients achieve optimal levels physically, cognitively, emotionally, communicatively, and socially
- Engage patients and their families in setting rehabilitation goals that align with the individual's overall goals of care

Rehabilitation is a Process, not a Place

Rehabilitation starts when the patient is stable and able to participate. It occurs across the continuum of care, in formal and informal settings

Community Participation

Longest phase of stroke recovery which includes:

- Individualized goal-setting to resume meaningful:
  - Daily activities
  - Life roles (e.g., social, familial, vocation, driving, education)
  - Recreation and leisure interests
- Connecting patients and families to community resources
- Accessibility planning (e.g., home modifications, mobility devices, communication aids, transportation services)

Why is community participation important?

- Promotes recovery, independence, and reduces social isolation
- Improves psychosocial health, well-being, and addresses relationships/sexuality
- Builds confidence, sense of identity, and renewed sense of value and purpose
- Minimizes secondary complications and supports secondary prevention with regular healthcare follow-up

Transition Planning

Transition refers to the movement across various healthcare locations, services, settings, providers, stages of care, and recovery (physical, psychological, emotional, social, and environmental).

Goal: To facilitate and support seamless movement, to achieve and maintain optimal treatment, outcomes, adaptation, and quality of life for individuals with stroke, their families, and caregivers.

Collaborative Goal Setting

Involve the individual with stroke, healthcare team, and families to establish shared goals that guide the transition process and address evolving needs

Education & Support

Provide individuals with stroke and care partners with education on self-management, secondary stroke prevention, as well as emotional and practical support to prepare for post-discharge life

- **Written** instructions and recommendations
- **Communicatively accessible** (e.g., aphasia friendly language, and in patient's first language)

Comprehensive Transition Planning

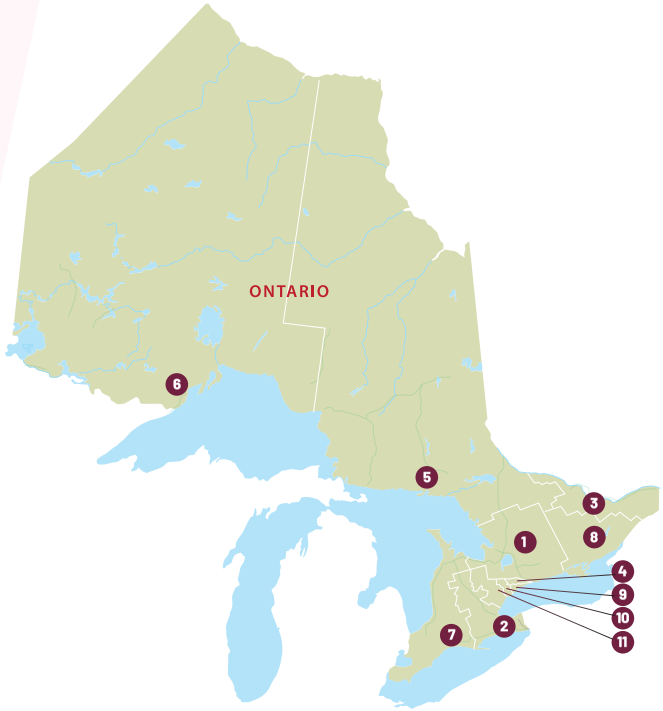
Includes tailored discharge plans and follow up care to ensure continuity as individuals move through the stages and settings for stroke treatment, recovery, reintegration, adaptation, and end-of-life care

Regional Stroke Networks

There are eleven stroke networks within Ontario working within a broader coordinated provincial stroke system (Ontario Stroke System).

1. **Central East Stroke Network**
2. **Central South Regional Stroke Network**
3. **Champlain Regional Stroke Network**
4. **North & East GTA Stroke Network**
5. **Northeastern Ontario Stroke Network**
6. **Northwestern Ontario Regional Stroke Network**
7. **Southwestern Ontario Stroke Network**
8. **Stroke Network of Southeastern Ontario**
9. **South East Toronto Stroke Network**
10. **Toronto West Stroke Network**
11. **West GTA Stroke Network**

For more information about stroke reach out to the stroke network in your region. Websites can be found on the back cover.



Ontario Regional Stroke Networks

Stroke CLINICAL Reference Guide

A RESOURCE TOOL FOR HEALTHCARE PROVIDERS

CESNStroke.ca

CSNStroke.ca

CRSN.ca

ToStroke.com

NEOStrokeNetwork.com

NWOStroke.ca

SWOStroke.ca

StrokeNetworkSEO.ca

ToStroke.com

ToStroke.com

WestGTAStroke.ca