



All about
Stroke



Changi
General Hospital

SingHealth

What is stroke or “brain attack”?

A stroke or “brain attack” is the result of a sudden interruption of blood supply due to blockage of a blood vessel that goes to the brain or a rupture of a blood vessel inside the brain. The patient’s signs and symptoms depend on the location and extent of the injured area of the brain.

What are the types of stroke?

Ischaemic stroke / Infarct

- ➔ Caused by blockage of a blood vessel supplying an area of the brain.
- ➔ The blockage may be of a small blood vessel or a large blood vessel.
- ➔ The blockage may occur because of thrombus formation in the blood vessel or embolism (blockage by a blood clot that escapes from another place and travels to the brain artery. Such sources include a blood vessel in the neck or the heart).



Haemorrhagic stroke / Haemorrhage

- ➔ Caused by bursting or rupturing of a blood vessel in the brain. This condition is less common than ischaemic stroke.
- ➔ The bleeding may be intraparenchymal (bleeding within the brain) or subarachnoid (bleeding into the space around the brain).
- ➔ The most common cause of bleeding is hypertension (high blood pressure).
- ➔ Rarely, it may be due to an arteriovenous malformation (AVM, abnormal connection of blood vessel) or aneurysm (a balloon-like bulge in an artery).



What is TIA (Transient Ischemic Attack)?

- ➔ Also called “mini-stroke” or pre-warning stroke.
- ➔ Patients show signs and symptoms of stroke that lasts only for a few minutes to hours.

Mechanism of TIA



Normal

Blood flows easily through clear artery

Blockage

Plaque fragment and / or blood clot blocks artery, reducing blood flow to the brain

Blockage cleared

The plaque or blood clot dissolves or breaks up quickly, restoring blood flow to the brain. The brain cells recover, and no permanent brain damage occurs

What are the risk factors that can be modified?

1. Smoking

Smoking increases the risk of stroke by 1.5 to 2.5 times for you and your family. This risk is significantly reduced when you stop smoking. Your risk of stroke will be equivalent to that of a non-smoker after five years of stopping.



2. Hypertension

Uncontrolled hypertension increases the risk of stroke by four times. High blood pressure should be treated if it is repeatedly above 140/90 mmHg. If you have diabetes, your blood pressure should be below 130/80mmHg.



3. Diabetes mellitus

Uncontrolled diabetes over a long period of time can cause damage to your blood vessels and nerves. The risk of stroke is 1.5 times higher in diabetic patients.



4. Increased cholesterol

Increased cholesterol levels can cause the narrowing of blood vessels in your body. This can lead to blockage of the blood flow to your vital organs including the brain, thus increasing the risk of stroke.

5. Irregular heartbeat

Patients who suffer from irregular heartbeat have 5 times the risk of having a stroke. Patients with irregular heartbeat who are on oral anticoagulants can decrease their risks of stroke by 60-80%.

6. Excessive alcohol consumption

An average of more than one alcohol drink a day for women (30 ml of hard liquor, 330 ml of beer or 120 ml of red wine) or two drinks a day for men, can raise blood pressure and lead to stroke.



7. Obesity

Obesity is the accumulation of excess body fat. It is associated with various stroke risk factors such as diabetes, high blood pressure and high cholesterol levels.

8. Sedentary lifestyle

Stroke risk is higher with sedentary lifestyle. Exercise at least three to five times a week, 30-60 minutes each time. Regular exercise helps to reduce obesity and also aids in the prevention and management of high blood pressure, diabetes and high cholesterol.



9. Substance abuse

Intravenous drug abuse enhances blood vessel disorders. Oral drug abuse like amphetamines increases sympathetic response causing increased blood pressure.

What are the risk factors that cannot be modified?

Age	Gender	Hereditary	Previous stroke or TIA
The chance of stroke increases with age.	Males have higher risk of stroke compared to females but this rate becomes equal after menopause.	Those who have family history of stroke at a young age are at a higher risk.	Those who previously had a stroke or TIA will be at a higher risk of recurrent stroke.

What are the signs and symptoms of stroke?

You may be having a stroke when you have sudden onset of:

- ➔ Weakness of facial, arm, leg muscles on one side of your body
- ➔ Numbness of face, arm, leg on one side of your body
- ➔ Slurred speech or difficulty expressing oneself
- ➔ Inability to comprehend
- ➔ Unsteady gait or loss of coordination
- ➔ Blurred or double vision
- ➔ Difficulty swallowing
- ➔ Severe headache with nausea and vomiting



F

Face

Does one side of the face droop?



A

Arm

Does one arm drift downwards?



S

Speech

Does the speech sound slurred or strange?



T

Time

Call 995 and go to a hospital immediately.

Seek urgent medical attention if these symptoms develop. These symptoms may also be caused by other illnesses that would also need treatment.

What to do if you have a stroke?

Call 995 for an ambulance immediately.

Complications of stroke

Patients with a large stroke may suffer from many complications such as:

Infections

Because of swallowing impairment or drowsiness, food or saliva may accidentally enter the lungs and cause an infection (pneumonia). Urinary tract infection may occur if good hygiene is not maintained in the genital area.

Bed sores

Constant pressure over certain body parts may cause the skin at that area to break down, resulting in bed sores.

Dehydration, malnutrition

This occurs when there is inadequate intake of food or water due to swallowing impairment or drowsiness.

Constipation

This occurs when there is inadequate intake of fluids or fibre, or when the patient does not open the bowels regularly.

Incontinence

Stroke patients may be unable to control their bladder or bowel movements. This is more likely to occur in patients who are drowsy or have suffered a large stroke.

Contractures

This occurs when limbs become fixed in a certain position due to irreversible contraction and fibrosis of muscles.

Heart attack

Stroke and heart attack have similar risk factors. The factors that cause blockage of arteries in the brain may also cause blockage of arteries in the heart, causing heart attack.

Another stroke

Despite taking medications and modifying risk factors, the risk of having another stroke cannot be totally removed.

What are the diagnostic procedures available for stroke?

Depending on the kind of stroke and its location, the doctor may order any of the following diagnostic procedures:

Brain scan

➤ CT Scan (Computerised tomography)

To detect haemorrhagic stroke or large ischemic stroke.

➤ MRI / MRA (Magnetic resonance imaging / magnetic resonance)

MRI is used to detect very small stroke especially in the brainstem that may not be seen well in the CT scan while the MRA can noninvasively show the blood vessels in the brain.



Blood tests

To check for risk factors like diabetes, increased cholesterol, clotting problem etc.

Electrocardiogram (ECG) / 2D echocardiogram (ultrasound of the heart)

To check for underlying heart conditions.



Holter monitoring

To catch underlying irregular heartbeat.

Carotid and vertebral ultrasound

To assess the major blood vessels of the neck that supply blood to the brain.



Computed tomography angiography (CTA) carotid

Is a non-invasive procedure to confirm the narrowing or severity of occlusion of the blood vessel that may be the cause of stroke.

Four vessel angiogram

A small tube is inserted in the groin and moved to the level of the brain, where dye will be injected. It provides more information where necessary, on the location and severity of blood vessel abnormality that may be responsible for the stroke.

How is stroke treated?

You may receive the following treatments:

Clot dissolving medication - recombinant tissue plasminogen activator (rTPA)

Used to dissolve blood clot for patients who fulfill the criteria.



Endovascular Thrombectomy (EVT)

A procedure used to remove the blood clot from the vessels in the brain. This is only for patients who fulfill the criteria.

Blood thinner (anti-platelet like aspirin or anti-coagulant like warfarin)

This is used for patients with ischemic stroke as it significantly decreases the risk of a second stroke.

Cholesterol lowering medication (“statins”)

This significantly decreases the risk of a stroke.

Blood pressure lowering medication

This medication is avoided during the first 24 hours from the stroke onset. After 24 hours, it may be given depending on the patients' clinical condition and blood pressure readings during hospital stay.

Surgery

Surgery will only be done according to the neurosurgeon's assessment of the patient's condition. There are several options for surgical interventions:

- ➡ **Carotid endarterectomy (CEA)**
For severe narrowing of the blood vessels in the neck
- ➡ **Hemicraniectomy**
Intervention for patients who have large strokes by taking off the skull from the affected area
- ➡ **External ventricular drainage (EVD) / ventricular peritoneal (VP) shunting**
To decrease excessive amount of fluid in the brain
- ➡ **Clipping of aneurysm / coiling**
To clip or insert coils into the outpouching of the blood vessel in the brain to prevent further rupture

What happens when you are hospitalised for stroke?

You may be in the hospital for two weeks or more depending on your recovery.

Day	Treatment and Monitoring	Activity	Nutrition
1-3	<ul style="list-style-type: none"> ➔ You will be admitted to either Acute Stroke Unit (ASU) or General Ward for close monitoring and treatment ➔ Your consciousness level, heart beat and blood pressure will be monitored ➔ You will be fasted from midnight to take your blood sugar and cholesterol levels in the morning ➔ You will be started on medical management according to your stroke type ➔ Investigation will be done according to your stroke type 	<ul style="list-style-type: none"> ➔ You may be referred to allied health professionals (Speech Therapist / Physiotherapist / Occupational Therapist / Dietitian / Diabetic Nurse / Smoking Cessation Counsellor / Medical Social Worker) when necessary 	<ul style="list-style-type: none"> ➔ Depending on the swallowing test or the speech therapist assessment, you will start feeding either orally or by nasogastric tube (NGT)
4-6	<ul style="list-style-type: none"> ➔ Doctors will advise you if further test and other medical management are required ➔ You will be referred to Rehabilitation Medicine if necessary 	<ul style="list-style-type: none"> ➔ Continue rehabilitation by PT/OT/ST ➔ Care giver training if required 	<ul style="list-style-type: none"> ➔ Continue oral feeding. ➔ If you are on NGT, you will be reassessed by ST for your safety of oral feeding
Discharge from Hospital	<p>If you are stable for discharge, in the Acute Hospital setting, you will be:</p> <ul style="list-style-type: none"> ➔ discharged home with / without a caregiver, or ➔ transferred to community hospital for further rehabilitation or ➔ referred to Day Rehab Centre or ➔ follow up at CGH out-patient Rehab or ➔ admitted to a Nursing Home 	<p>You will continue to take your medications, do your exercises, modify your lifestyle and follow-up with doctors for the control of your risk factors</p>	

What to expect after discharge from hospital?

1. Take your medications

- ➔ Medications improve quality of life, prevent a second stroke and improve survival. Take your medications as prescribed.
- ➔ The pharmacist will explain your medication to you. It is important to know the names of your medications, what they are used for, how often and at what times to take them.
- ➔ Keep a list of your medications and bring them along when you visit any doctor. Inform your doctor if you are taking any supplements, vitamins and over the counter medications.
- ➔ Talk to your doctor or pharmacist if you have any doubt or problem regarding your medications. Never stop taking your medications without first discussing with your doctor.

Medications prescribed by your doctor may be used to:

- a) Prevent stroke
- b) Control blood pressure
- c) Control diabetes
- d) Lower cholesterol

2. Regular follow-up with doctor as scheduled

3. Dietary modifications

Avoid food that are high in cholesterol, saturated fats, trans fats, salt, sugar and alcohol. Bake, boil or steam your food. Avoid frying. Consume more fibre rich fresh fruits and vegetables.

4. Exercise regularly

5. Quit smoking

If you smoke after a stroke, your chance of having a second stroke is higher. You can quit smoking by gathering support from family and friends or joining a smoking cessation clinic.

CGH Smoking Cessation Counselling





To make an appointment, please call CGH Appointment Centre
Tel: 6850 3333

Health Information Centre (Level 3) Health Promotion Board (HPB)

3 Second Hospital Avenues
Singapore 168937
Tel: 6435 3954
Fax: 6536 1277
Website: <http://www.hpb.gov.sg>

6. Limit alcohol intake

This is a list of medications that you may be on:

Class of Medication	Name of Medication	What the Medication Does	Reason for Medication	Common Side Effects	Precautions and Advice
Antiplatelet agents 	Aspirin, Clopidogrel, Dipyridamole, Ticagrelor	Prevent platelets in the blood from sticking together.	Reduce likelihood of clot formation.	-	Best to take with food. Look for increase in bleeding or bruising.
Anticoagulants  	Coumadin/ Warfarin Apixaban, Dabigatran, Rivaroxaban	Decreases the clotting ability of the blood.	Prevent harmful clots from forming in the blood vessels. May prevent the clots from becoming larger and causing more serious problems.	-	Patients on this medication need to be monitored closely with regular blood testing. These medications do not need blood testing.
Statins Cholesterol lowering drugs 	Atorvastatin, Lovastatin, Pravastatin, Rosuvastatin, Simvastatin	Lower cholesterol in your body. Keep the plaques in your arteries stable.	To lower LDL ("bad" cholesterol) and lower triglyceride levels.	-	Patients on these medications must be monitored to check effectiveness and how well their liver is tolerating the medication.

Class of Medication	Name of Medication	What the Medication Does	Reason for Medication	Common Side Effects	Precautions and Advice
Angiotensin-converting enzyme (ACE) inhibitors 	Captopril, Enalapril, Lisinopril, Perindopril, Ramipril	Expand blood vessels and decrease resistance to blood flow. Help the heart to work more efficiently.	Treat high blood pressure and heart failure and prevent stroke.	Dry cough, dizziness and changes in taste.	Do not take additional potassium supplements. Avoid use of salt substitute.
Angiotensin II receptor blockers (or inhibitors) (also known as ARBs) 	Candesartan, Losartan, Telmisartan, valsartan	Expand blood vessels and decrease resistance to blood flow. Help the heart to work more efficiently.	Treat high blood pressure. Prevent stroke and heart failure.	Dizziness and changes in taste.	Do not take additional potassium supplements. Avoid use of salt substitute.
Beta blockers 	Atenolol, Bisoprolol, Carvedilol, Metoprolol, Propranolol, Sotalol	Decrease workload and oxygen demand of the heart. Lower blood pressure and make the heart beat more slowly.	Treat high blood pressure, abnormal heart rhythms and chest pain.	Tiredness, dizziness, cold hands and feet, slow heart beat, and breathlessness.	This side effect of tiredness wears off over time. Inform your doctor if you have asthma, fainting or near fainting spells.
Calcium channel blockers 	Amlodipine, Diltiazem, Nifedipine	Relax the blood vessels.	Used to treat high blood pressure, chest pain and some abnormal heart rhythms.	Headache, flushing, dizziness, palpitation, swelling of feet.	

Frequently asked questions

Q What are the chances of recovery?

A The rate of recovery after a stroke differs for each person but most of the recovery is usually observed in the first three to six months.

In general:

- 30 % of stroke patients will have very good or full recovery
- 30 % of the patients will have partial recovery.
- 30 % of the patients will have poor recovery.
- 10 – 20 % of stroke patients do not survive, especially those with serious stroke cases.

Q Is there a stroke support group for stroke patients and carers?

A The Singapore National Stroke Association is the national stroke support group. It organises talks and activities for the public including stroke patients and their families.

Tel: 6222 9514

Email: contact@snsa.org.sg

Website: www.snsa.org.sg

Q Is there a resource for stroke survivors and their caregivers?

A Stroke survivors and their caregivers may visit this website for support and information:

<http://healthhub.sg/strokehub>

Q Is there any service which we could consult if we have other questions?

A Changi General Hospital has an “Ask-a-CGH Nurse” service as an additional avenue for you to ask health-related questions. This service is provided by our team of experienced nurses, in consultation with our medical specialists and paramedical staff. It is not intended to substitute any medical advice or consultation.

To use this service, go to our website at <http://www.cgh.com.sg> to submit your question. You will hear from us within three working days.

Q When can I start driving again?

A

	Group 1 (Class 1, 2 and 3 licences)	Group 2 (Class 4, 5 and vocational licences)
Stroke	<p>Patients without any residual disability may resume driving after 1 month.</p> <p>Patients with disabilities such as residual weakness, significant visual field defects, perceptual or mental impairment, in coordination etc, which are severe enough to interfere with control of the vehicle; should not drive.</p> <p>Patients with mild residual disabilities that may not interfere with control of the vehicle may undergo Driving Assessment and Rehabilitation Programme (DARP) >1 month after stroke. They may be allowed to drive if they pass DARP or after final review by a doctor.</p>	<p>Able to return to driving if all following conditions are met:</p> <ul style="list-style-type: none"> ➤ >1 year post stroke ➤ Stroke is not due to high-risk underlying condition which is left untreated (e.g. high grade carotid stenosis, untreated aneurysm) ➤ Fully recovered ➤ Passed DARP ➤ Compliant with treatment ➤ Final clearance given by a doctor
Transient ischemic attack (TIA)	<p>Single TIA: Allowed to return to driving once free of TIA for 1 month</p> <p>Multiple TIA: Allowed to return to driving once free of TIA for 6 months</p>	<p>Able to return to driving if all following conditions are met:</p> <ul style="list-style-type: none"> ➤ >6 months post-TIA (for single TIA) or > 1 year post-TIA (multiple TIAs or brainstem TIA) ➤ TIA is not due to high-risk underlying condition which is left untreated (e.g. high grade carotid stenosis) ➤ Compliant with treatment ➤ Final clearance given by a doctor



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8.30 am to 8.00 pm (Monday to Friday)

8.30 am to 12.30 pm (Saturday & Sunday)

Closed on Public Holidays

For more information, please visit www.cgh.com.sg



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