

## Assessment and Management of Stroke

Stroke is the fifth leading cause of death, as well as the leading cause of disability for Americans (Davis & Lockhart, 2016). Early evaluation and treatment of stroke reduces motor and cognitive deficits and lowers mortality. Use this tip sheet to assist in the identification and treatment of stroke.

### Types of Stroke and Risk Factors

There are two types of stroke, both of which result in a reduction in oxygen reaching the brain.

- **Ischemic Stroke** – Occurs when a thrombus (blood clot) blocks blood supply to a cerebral artery which supplies oxygenated blood to the brain. Major causes include arterial thrombus, venous emboli that migrate, atrial fibrillation, arteritis, patent foramen ovale, left ventricular dysfunction, and refractory septic shock.
- **Hemorrhagic Stroke** – Occurs when areas of the cerebral arterial system become weakened or thin due to acute or long-term episodes of hypertension. These thin areas of the vessel wall can either result in an outpouching of the arterial blood vessels (aneurysm) or they can rupture due to acute hypertension. Intracerebral hemorrhages are typically caused by a rupture of the vessels due to long-term atherosclerotic damage and arterial hypertension.

**Transient Ischemic Attack (TIA)** or “mini-stroke” occurs when there is a temporary occlusion or blockage of blood flow to the brain that disappears without any long-term effects. The symptoms mimic a stroke and may include slurred speech, visual changes, weakness in an extremity, or changes in level of consciousness (LOC).

### Common Risk Factors for Stroke (Davis & Lockhart, 2016)

- Age > 45 years
- History of TIA, previous stroke or myocardial infarction
- Atrial fibrillation (increases risk 5-fold)
- Sleep apnea
- Hypertension
- Heredity
- Ethnicity (Black, Hispanic, Asian)
- Smoking
- Substance abuse or alcoholism
- Female gender (women ages 55-75 have a slightly higher risk of stroke compared to men)

### Signs and Symptoms of Stroke (Anderson, 2016)

**Cardinal signs of stroke** such as sudden motor and sensory deficits include:

- Facial droop

- Hemiparesis
- Unilateral extremity weakness
- Slurred speech

**Additional signs and symptoms:**

- Sudden-onset dizziness (vertigo)
- Loss of coordination or balance
- Gait disturbances
- Vision loss in one or both eyes
- Expressive or receptive aphasia
- Visuospatial neglect: inability to report, respond, or orient to stimuli, generally on the opposite side of the lesion

**Signs of thrombosis of the basilar artery:**

- Acute-onset quadriparesis (muscle weakness of all four limbs)
- Loss of consciousness
- Respiratory failure

Assessment

**Stroke Assessment Tools**

The National Institute of Neurological Disorders and Stroke (NINDS) recommends using a specific stroke assessment tool (Davis & Lockhart, 2016). Examples include:

- **Cincinnati Prehospital Stroke Scale (CPSS)** – commonly used by emergency medical services (EMS) and paramedics:
  - **F**acial droop: one side of the face does not move at all
  - **A**rm drift: one arm drifts compared with the other
  - **S**peech: the patient uses slurred or inappropriate words, or is mute
  - **T**ime to call 911

The American Hospital Association (AHA) and the NINDS promote educating the community on these symptoms and to notify emergency services (FAST).

- **National Institutes of Health Stroke Scale (NIHSS)** – identifies the severity of ischemic stroke by assessing 11 areas including LOC, eye gaze, visual fields, facial palsy, motor arm (drift), motor leg (drift), limb ataxia, sensation, language, aphasia/dysarthria, and inattention. An NIH stroke scale should be administered and scored when stroke is suspected, 24 hours after fibrinolytic therapy, 7 days post stroke, and 30 days post stroke.
  - Score  $\leq 4$  – indicates a high likelihood of functional independence
  - High Score  $> 22$  – indicates the patient may experience severe debilitation
- **Miami Emergency Neurologic Deficit (MEND)** –

- Incorporates CPSS (speech, droop, drift) and 8 components of NIHSS including LOC, eye gaze, orientation, commands, visual fields, leg motor strength, ataxia, and sensation.

### Emergency Department Triage (Anderson, 2016):

Early interventions when a stroke is suspected are critical to improving outcomes.

- Ensure medical stability with airway, breathing, and circulation.
- Determine if signs and symptoms are consistent with stroke and if onset of symptoms is within the 3-hour timeframe for treatment with alteplase [intravenous tissue plasminogen activator (tPA)]. Time of onset is defined as the time the patient was last known to be neurologically normal. In a select group of patients, the treatment window may be extended to 3-4.5 hours of last known neurologically normal time.

### The Golden Hour

The AHA and American Stroke Association (ASA) developed the 60-minute or less stroke protocol with a goal of intervention within 60 minutes upon arrival to the Emergency Department.

Time	Plan
Time Zero	Arrival to the Emergency Department (ED).
10 Minutes	Patient seen by ED physician for initial assessment.
15 Minutes	Patient seen by stroke team.
25 Minutes	Non-contrast computed tomography (CT) scan performed.
45 Minutes	CT scan results available to stroke team and decision made for treatment.
60 Minutes	Door-To-Needle (DTN): Fibrinolytic therapy initiated within 3 hours unless contraindicated.

### Physical Exam (Anderson, 2016)

Important components of the physical exam include:

- Inspect head and extremities for signs of trauma.
- Auscultate heart for irregular rhythm and abnormal rate and murmurs.
- Auscultate carotid arteries for bruits.
- Auscultate lungs for adventitious breath sounds.
- Inspect skin for ecchymoses and evidence of surgery or other invasive procedures.

### Diagnostic Studies (Anderson, 2016)

Immediate diagnosis and treatment are required to prevent brain tissue hypoxia and death (Davis & Lockhart, 2016). Laboratory and diagnostic tests should NOT delay the initiation of fibrinolytic therapy if stroke is suspected (Powers, et al., 2018).

Test	Indication
Non-contrast CT or magnetic resonance imaging (MRI)	Rule out intracranial hemorrhage or non-stroke lesions. Identify the degree of ischemic brain injury. Identify the vascular lesion responsible for the ischemic attack.
Oxygen saturation (O <sub>2</sub> sat)	Rule out acute ischemic stroke associated with hypoxemia.
Serum glucose	Rule out hypoglycemia and hyperglycemia. <i>*Serum glucose is the only lab test that <b>must</b> be measured before IV fibrinolytic therapy is started, unless there is strong clinical suspicion for contraindication</i>
Complete blood count (CBC)	Check red blood cells (RBC), white blood cells (WBC), and platelets.
Coagulation studies	Check prothrombin time (PT), activated partial thromboplastin time (aPTT), international normalized ratio (INR). <i>*INR, aPTT, and platelets may be needed if coagulopathy is suspected, however fibrinolytic therapy should <b>NOT</b> be delayed while waiting for results.</i>
Basic metabolic panel	Check serum electrolytes, blood urea nitrogen (BUN), and creatinine.
Cardiac biomarker	Check troponin level to rule out myocardial infarction (MI).
Electrocardiogram (ECG)	Rule out acute MI and atrial fibrillation.
Blood alcohol & toxicology	Include liver panel for patients with suspicion of alcohol intoxication.
Arterial blood gas (ABG)	Assess for hypoxemia.
Chest X-ray	Assess for suspected lung disease or injury.
Electroencephalogram	Rule out ongoing seizures.
Lumbar puncture	Used to rule out suspected subarachnoid hemorrhage when brain imaging is negative.

#### Medications (Davis & Lockhart, 2016; Schweickert, et Al., 2016)

- **Alteplase:** A tissue plasminogen activator (tPA); the only FDA approved drug to treat ischemic stroke. It is a natural enzyme that initiates fibrinolysis (breaks down thrombus).
- **Tenecteplase:** May be used as an alternative to alteplase in patients with minor neurological impairment and no major intracranial occlusion (Powers, et al. 2018).
- **Heparin:** Used for an acute stroke during mechanical thrombectomy, when administering intraarterial alteplase, and in the presence of large, intraluminal thrombotic or embolic filling defect of the major cerebral arteries.
- **Furosemide (Lasix):** Loop diuretic used to reduce intracranial fluid volume in hemorrhagic stroke and to decrease the risk of herniation.
- **Mannitol:** Osmotic diuretic used to decrease cerebral edema, tissue damage and reduce the risk of herniation.

- **Fosphenytoin:** Antiepileptic drug that stabilizes neuronal membranes and decreases seizure activity.
- **Phenytoin:** Antiepileptic drug used to inhibit the spread of seizure activity in the cerebral motor cortex and brainstem centers responsible for the tonic phase of grand mal seizures.
- **Antiplatelet treatment:** Administer aspirin within 24 to 48 hours after stroke onset. For patients that have been treated with alteplase, delay aspirin until 24 hours following therapy.
- **Anticoagulant:** Urgent anticoagulation is **NOT** recommended.

### Surgical Procedures (Davis & Lockhart, 2016)

#### For acute ischemic stroke

- Endovascular thrombectomy: mechanical removal of the thrombus to reestablish blood flow.
  - Treats thrombus in minutes versus alteplase which may take 2 hours to dissolve the clot.
  - Effective in large cerebral vessels, but not in smaller arterial cerebral vessels.
  - Do not delay mechanical thrombectomy to observe a clinical response after IV alteplase.
  - Maintain BP  $\leq$  180/105 mmHg during and for 24 hours after the procedure.

#### For hemorrhagic stroke

- Superficial temporal artery to middle cerebral artery bypass graft: the graft bypasses the cerebral vessel that has the thrombus or unruptured aneurysm (may also treat ischemic stroke).
- Guglielmi detachable coils: small platinum coils are used to occlude an inoperable, ruptured, or unruptured aneurysm.
- Aneurysm clipping: surgical clips may be placed to seal bleeding from a fusiform aneurysm (ruptured or unruptured) or multiple small vessel aneurysms.

### Nursing Interventions for the Stroke Patient (Davis & Lockhart, 2016; Powers, et Al., 2018)

- Support airway, breathing and circulation
  - Provide supplemental oxygen to maintain oxygen saturation  $>$  94% in hypoxic patients.
  - Ventilator support for respiratory depression, fatigue, decreased consciousness or a compromised airway.
- Monitor vital signs at least every 15 minutes.
- Neurologic assessments should be performed hourly or as needed.

- Monitor for signs of brain stem herniation (increased intracranial pressure, decreased strength in extremities, focal or global seizure activity, or asymmetrical pupils.)
- Monitor for seizure activity, implement seizure precautions.
- Do not administer anti-seizure medication prophylactically.
- Treat hyperthermia with antipyretic medications.
- Treat hyperglycemia to keep blood glucose levels between 140-180 mg/dL and treat hypoglycemia (blood glucose < 60 mg/dL) per hospital protocol.
- If surgery is performed, assess the patient for the following and if present, notify the health care team immediately.
  - Surgical site for a puncture site hematoma or signs of infection, such as localized edema and erythema.
  - Change in vital signs such as tachycardia, hypo- or hypertension, and elevated temperature.
  - Neurologic changes (decreased LOC, visual changes, new-onset weakness), which may indicate extension of the stroke area, cerebral vasospasm, or cerebral brainstem herniation.

#### **Strategies to Minimize Post-Procedure Complications:**

- Ensure the patient remains NPO to prevent aspiration; a bedside swallowing assessment should be performed before allowing the patient to eat, drink or consume medications.
- Keep the head of bed elevated at a minimum of 30 degrees unless contraindicated.
- Blood pressure management (Anderson, 2016):
  - Avoid hypotension in patients with ischemic stroke to prevent further cerebral ischemia; correct hypotension and hypovolemia to maintain perfusion and organ function.
  - Avoid hypertension in patients with hemorrhagic stroke to prevent expansion of intracranial bleeding.
  - Avoid rapidly lowering BP which can lead to worsening ischemia.
  - Do not lower the BP during the initial 24 hours of acute ischemic stroke unless BP > 220/120 mmHg.
  - Start or restart antihypertensive therapy during hospitalization in neurologically stable patients with BP > 140/90 mmHg to improve long-term BP control, unless contraindicated.

#### **Nutrition (Powers, et al., 2018)**

- Start enteral diet within 7 days of admission after an acute stroke.
- Screen for dysphagia before the patient begins eating, drinking or receiving oral medications to identify risk for aspiration.

- For patients with dysphagia, use nasogastric tubes for feeding in early phase of stroke (first 7 days); percutaneous gastrostomy tube may be needed if unable to swallow safely for longer than 2-3 weeks.
- Consider nutritional supplements for patients who are or at risk for malnourishment.
- Implement oral hygiene protocols to reduce the risk of pneumonia.

### **Deep Vein Thrombosis (DVT) Prophylaxis (Powers, et al., 2018)**

- Use intermittent pneumatic compression (IPC) in addition to routine care (aspirin and hydration) to reduce the risk of DVT in immobile stroke patients, unless contraindicated.
- Do **NOT** use elastic compression stockings in ischemic stroke patients.

### **Additional Recommendations (Powers, et al., 2018)**

- Screen for post-stroke depression and administer antidepressants if not contraindicated.
- Avoid routine use of indwelling bladder catheters to prevent catheter-associated urinary tract infections.
- Perform regular skin assessments during hospitalization and inpatient rehabilitation. Minimize skin friction and pressure; provide support surfaces; avoid excessive moisture; and maintain nutrition and hydration to prevent skin breakdown. Regular turning, good skin hygiene, special mattresses, wheelchair cushions, and seating should be used until mobility returns.
- Antithrombotic treatment
  - In non-embolic stroke, use antiplatelet agent in place of oral anticoagulation to reduce risk of recurrent stroke.
  - For most patients with atrial fibrillation and stroke, it is reasonable to begin oral anticoagulation within 4-14 days after onset of neurological symptoms.
  - For patients with extracranial carotid or vertebral artery dissection, it is reasonable to treat with antiplatelet or anticoagulant therapy for 3 to 6 months.
- Statins: Continue statin therapy for patients taking statins or initiate in-hospital statin therapy for patients who qualify.
- Carotid revascularization: When revascularization is indicated for secondary prevention in patients with minor, nondisabling stroke, the procedure may be performed between 48 hours and 7 days after the stroke.
- Smoking cessation: Advise every patient to quit smoking and provide counseling and high-intensity behavioral therapies in-hospital.
- Stroke education: Provide patients with stroke education, information, advice, and the opportunity talk about the impact of illness on their lives.

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