Rationale:

Stroke is the fifth most common cause of death and the leading cause of disability in the United States. Advances in the treatment of stroke including thrombolysis and mechanical embolectomy has dramatically improved patient outcome. Rapid response, recognition, treatment, and transport by EMS to the appropriate stroke center as part of a stroke system of care has been proven to dramatically improve survival and neurologic outcome.

Signs and Symptoms:

1. Sudden numbness or weakness of the face, arm, or leg, especially on one side.
2. Sudden trouble walking, dizziness, loss of balance, or coordination.
3. Sudden confusion, trouble speaking, or difficulty understanding.
4. Sudden trouble seeing in one or both eyes.
5. Sudden severe headache with no known cause.
6. 88% of strokes are ischemic with 64% of those being thrombotic and 24% embolic. 12% are hemorrhagic. Hemorrhagic strokes commonly present with headache, loss of consciousness, and signs of increased intracranial pressure (ICP). Ischemic strokes do not typically present with signs of elevated ICP. With an ischemic stroke, increasing ICP usually takes 48 to 72 hours to develop.

Treatment:

1. Secure the airway. Secretions may be copious, so be prepared to suction frequently. If the patient is unconscious or unable to maintain the airway; intubate the trachea or establish an advanced airway. If intubated, monitor end-tidal CO_2 and maintain at 35 - 40 mmHg.
2. Administer oxygen to maintain SpO_2 at 94%. If the patient is conscious and able to maintain their airway, start with 2 – 4 LPM via nasal cannula. Be prepared to assist ventilations with BVM. Do not hyperventilate.
3. Determine the "last known well" and perform prehospital stroke assessment with the Cincinnati Prehospital Stroke Scale or FAST exam. Positive assessment findings warrant rapid recognition, treatment, and transport to the appropriate accredited stroke center (refer to SOP #121 Hospital Selection Criteria) as a time critical diagnosis (TCD).
4. Explain all procedures to the patient and offer calm, professional reassurance. Obtain complete history to include other pertinent findings or complaints such as a stiff neck or headache that may have preceded the initial assessment findings.
5. Monitor vital signs and reassess neurologic function every 5 minutes and document.
6. Apply ECG and document rhythm. Acquire 12-Lead ECG as time permits.
7. **Establish large bore IVs in the a/c or a humeral head IO of 0.9% NS at TKO. 20 ga. or larger IVs are required for CT angiography and advanced imaging. Administer**

fluids cautiously. Fluid boluses should only be given if hypovolemia is suspected affecting end organ perfusion.

8. Check serum glucose and **treat if blood sugar is ≤ 60 mg/dcl or per hypoglycemia protocol #212.**

9. Conduct a thorough physical exam en route to receiving facility to rule out the possibility of any recent trauma. Complete the NIHSS and monitor for changes during transport.

10. Maintain a core body temperature that is within a normal range.

11. Do not treat hypertension unless pressures reach critical levels. If the systolic pressure is greater than 220 mmHg, and/or the diastolic pressure is greater than 120 mmHg, consider the administration of nicardipine (Cardene). Do not drop the pressure by more than 20% of the presenting systolic pressure. The goal is to maintain a MAP of 65 - 70 mmHg, however if stroke or head injury with increased intracranial pressure is suspected, maintain MAP at 80 – 100 mmHg.

    - ***Administer Nicardipine (Cardene) at 5 mg/hr as a slow IV infusion. Dose may be increased by 2.5 mg/hr every 5 minutes to a max dose of 15 mg/hr.***

    ☎ ***Call for orders when treating hypertension in pediatrics. Nicardipine (Cardene) can be administered as a continuous infusion at 0.5 – 1 mcg/kg/min.***

12. Watch closely for seizure activity and treat per seizure protocol #215.

13. If airway and secretions are manageable, transport the patient supine. If secretions are copious and require frequent suctioning, transport the patient on the affected side with head elevated at 15° and protect from further injury.

14. Observe closely for signs of CHF.

15. Assess vital signs, LOC, and neurologic status every 5 – 10 minutes.

16. Transport the patient to the appropriate receiving facility. If the patient has a known onset of stroke-like signs and symptoms within 3 hours, transport the patient to the closest emergent stroke ready hospital or primary stroke center depending on patient preference.

    Consider transport directly to a comprehensive stroke center if:
    - The time of onset is unknown or is known to be greater than 3 hours.
    - The patient has an NIHSS of 6 or higher which may be indicative of large vessel occlusion (LVO).
    - The patient has a history of intracerebral hemorrhage.
    - The patient takes Xarelto®, Pradaxa®, or Eliquis® or any of the next generation anti-coagulants for atrial fibrillation. IV tPA is contraindicated in the first 48 hours with the use of any of these medications.
    - Paramedic judgment is suggestive that the patient's presenting condition warrants transport to a comprehensive stroke center.

17. Advise receiving facility of signs and symptoms and time of onset. Repeat the NIHSS during transport and begin screening criteria for tPA.

The Transfer of Patients Receiving tPA:

Due to the risk of hemorrhagic conversion of ischemic stroke with tPA administration, patients receiving tPA must be closely monitored. Some considerations include:

1. ***Follow tPA dosing guidelines initiated by the referring hospital. The typical dosing regiment for tPA consists of 0.9 mg/kg with 10% given as an initial bolus and the remaining 90% infused over 1 hour. The max dose is 90 mg.***

2. Obtain baseline neurological status utilizing NIHSS prior to transport.

3. Monitor for hypertension. To reduce the risk of hemorrhagic conversion, maintain blood pressures less than 180/105 mmHg. If anti-hypertensive therapy has been initiated by EMS or the referring facility, continue therapy per the referring facility's guidelines.

4. Continually reassess neurological status utilizing the NIH stroke scale. An increase of 4 or more points in the NIHSS may be indicative of hemorrhagic conversion. Closely monitor the patient and obtain complete vital signs every 15 minutes.

5. The benefits of invasive procedures (i.e. foley catheters, IVs, NG tubes, etc.) should be weighed carefully against the risk of increased bleeding with tPA administration.

6. If a significant decline in neurological status is noted such as an increase in total NIH score (typically by 4 or more points) or if the patient presents with any of the following:

   - New onset headache
   - Acute increase in Mean Arterial Pressure
   - Sudden onset of nausea, vomiting
   - Change in pupillary reaction or unequal pupils
   - Change in LOC

   If any of these signs or symptoms present, suspect hemorrhagic conversion. Contact the receiving facility for orders to discontinue tPA. Continue anti-hypertensive therapy unless otherwise directed by the receiving physician.

Note: Stroke is relatively rare in pediatrics. Presenting signs and symptoms may vary. A seizure may be reported and is the most common presenting complaint. Seizures in pediatrics should be controlled with an anticonvulsant such as Lorazepam (Ativan®). (See Seizure protocol #215.) Treatment should be geared toward supportive measures including fever control, normalization of serum glucose, and maintenance of oxygenation. Efforts should be made to ameliorate increased intracranial pressure (ICP) and treat dehydration.

The Cincinnati Prehospital Stroke Scale:

Facial Droop: (have patient show teeth or smile)

Normal--both sides of face move equally well.

Abnormal--one side of face does not move as well as other side.

Arm Drift: (patient closes eyes and holds both arms out)

Normal--both arms move the same or not at all, checking pronator grip may be helpful.

Abnormal--one arm does not move or one arm drifts down compared to the other.

Speech: (have the patient say "you can't teach an old dog new tricks" or similar saying)

Normal--patient uses correct words with no slurring.

Abnormal--patient slurs words, uses inappropriate words, or is unable to speak.

NIH Stroke Scale:

Category	Description	Score
Level of Consciousness(LOC)	0=alert / 1=not alert but arousable by mild stimulation / 2= not alert –requires repeated stimulation to attend / 3= responds only with reflex motor/unresponsive	
LOC questions	0= answers both month and age correctly / 1 = answers one question correctly/ 2= answers neither question correctly	
LOC Commands	0= performs both tasks correctly/ 1= performs 1 task correctly/ 2= performs neither task correctly	
Gaze	0= normal/ 1= partial gaze palsy/ 2= forced deviation	
Visual Fields	0= no visual loss/ 1= partial hemianopia/ 2= complete hemianopia/ 3= bilateral hemianopia	
Facial movement (or paresis)	0= normal symmetrical movements/ 1= minor paralysis/ 2= partial paralysis/ 3= complete paralysis of one or both	
Motor Function-Arms	0= no drift/ 1= drift/ 2= some effort against gravity/ 3= no effort against gravity/ 4= no movement/ UN= amputation or joint fusion	Right Left
Motor Function-Legs	0= no drift/ 1= drift/ 2= some effort against gravity/ 3= no effort against gravity/ 4= no movement/ UN= amputation or joint fusion	Right Left
Limb Ataxia	0= absent/ 1= present in one limb/ 2= present in two limbs/ UN= amputation or joint fusion	
Sensory	0= normal; no sensory loss/ 1= mild to moderate sensory loss/ 2= severe to total sensory loss	
Best Language	0= no aphasia/ 1= mild to moderate aphasia/ 2= severe aphasia/ 3= mute	
Dysarthria	0= normal/ 1= mild to moderate dysarthria/ 2= severe dysarthria/ UN= intubated or other physical barrier	
Extinction/Inattention	0= no abnormality/ 1= visual, tactile, auditory, spatial, or personal inattention/ 2= profound hemi-inattention/extinction	
	Total NIHSS	