**PREHOSPITAL PEDIATRIC STROKE TRIAGE AND MANAGEMENT**

1. **Goals:**

   To increase EMS awareness and identification of strokes in the pediatric population (infants and children less than 18 years of age) and to facilitate rapid triage and transport to the nearest appropriate facility.

2. **Purpose:**

   Pediatric Stroke is a rare disease that is, nevertheless, included among the top ten causes of death in pediatrics.[1] However, rapid recognition and appropriate treatment of pediatric stroke can profoundly improve outcomes for these children, sparing them from decades of disability.[2,3] Thrombectomy has been shown to improve outcomes in pediatric large artery occlusion stroke.[4] This guidance document is designed to help EMS providers recognize and triage pediatric stroke patients quickly, facilitating improved outcomes throughout the state.

   The **GETAC Prehospital Pediatric Stroke Triage Algorithm** was developed in consultation with EMS, EMS leaders, and local, regional, and state medical authorities. The GETAC pediatric stroke algorithm was developed in consultation with the GETAC Stroke, EMS, Pediatric, EMS Medical Directors Committees, and the Council. Available guideline statements and guidance from the GETAC Pediatric Stroke Task Force (a consensus of expert opinion based on clinical experience in the fields of Vascular Neurologists, Neuroendovascular Surgeons, and Pediatricians) were integral in the development of this resource document and algorithm.[5-13] The recommendations were developed to ensure that all pediatric patients with a known or suspected stroke are rapidly identified, assessed, and triaged as outlined below. Standardizing care to rapidly diagnose and provide appropriate treatment will improve outcomes.[9-12] The prehospital pediatric stroke triage and transport recommendations serve to direct the regional triage of pediatric patients with acute stroke to the most appropriate facility. See **Annex A: GETAC Pediatric Prehospital Stroke Triage Algorithm**. There are no formal national or statewide guidelines, certifications, or recognition systems for Pediatric Stroke Destinations. EMS Medical Directors should determine which nearby facilities they will direct pediatric patients with suspected or confirmed stroke. A pediatric stroke destination should have personnel available to care for pediatric stroke patients and a pediatric intensive care unit. Pediatric stroke destinations should have a multidisciplinary team to care for pediatric stroke patients, the capability to administer antiplatelet drugs, anticoagulants, thrombectomy, and thrombolytic therapies, and the ability to treat complications. Pediatric stroke destinations should have the technical capabilities (including imaging capability, MRI if possible), policies, and procedures to facilitate optimal care of a pediatric stroke patient.[9-12] Pediatric hospitals that do not meet the above capabilities should be able to identify, stabilize, consult, and transfer patients to a center that can provide the appropriate care and rehabilitative resources.[9-12]

## 3. Prehospital Triage of Stroke in Pediatric Patients

Pediatric stroke can present with focal neurologic signs, as well as nonspecific signs like seizure or altered mental status.[9,14-16]

**Sudden onset of any of the following suggests the possibility of acute stroke:**

- Numbness or weakness of the face, arm, and/or leg (especially on one side of the body)
- Confusion
- Trouble speaking or understanding language.
- Double vision, trouble seeing in one or both eyes.
- Altered Mental Status
- Trouble walking
- Dizziness
- Loss of balance or coordination
- Severe headache with no known cause (suggests hemorrhagic stroke), especially with altered mental status.

❖ For patients with any of the above neurological signs, especially with the listed conditions below, consider triaging as an acute stroke.

**Patients with any of the following are at higher risk for acute stroke:**

- Heart disease
- History of blood vessel problems in the brain
- History of stroke
- Sickle cell disease
- Cancer
- History of blood clots

**Common pediatric stroke mimics:**

- Alcoholic intoxication
- Cerebral infections
- Drug overdose
- Hypoglycemia
- Hyperglycemia
- Genetic/metabolic disorders
- Atypical migraines
- Neuropathies (e.g., Bell's palsy)
- Seizure
- Post-ictal state
- Tumors

**Basic Level**

In suspected pediatric stroke cases, assess and treat ABCDEs per universal pediatric recommendations:

- **A (Airway):** Airway support and ventilation assistance are recommended for patients with acute stroke who have decreased consciousness or who have a

compromised airway. Suctioning and oropharyngeal or nasopharyngeal airway as needed to ensure airway patency.

- **B (Breathing):** Supplemental oxygen should be provided to maintain oxygen saturation > 94% (continuous monitoring). Consider adding end tidal CO2.
- **NOTE:** Some patients with congenital heart disease have a different goal saturation level (80-90% in some cases). If unsure, confirm the normal level with parents or caretakers.
- **C (Circulation):** Evaluate and treat signs/symptoms of shock according to the Shock Clinical Practice Guidelines
- **D (Disability)**: Assess and document GCS, pupillary size, and reactivity.
- **E (Exposure/Environmental):** Assess for evidence of traumatic injury, especially head injury.

**Stabilization and Initial Management:**

- If there is evidence of shock, treat according to the Shock clinical practice guidelines.
- If there is hypoglycemia (POC glucose < 70 mg/dL),[17] treat according to the diabetic emergencies clinical practice guidelines.
- If seizures occur, treat according to the seizure clinical practice guidelines.
- Place the patient in a supine position, head of the bed elevated 30 degrees.
- Cardiac monitoring during transport is recommended.

**Cardiovascular Examination:**

- Record blood pressure, rate, rhythm, respiratory rate, and oxygen saturation.
- Obtain an EKG if it will not delay transport.

**Neurological Assessment for Pediatric Stroke:**

- Weakness of the face, arm, and/or leg (especially on one side of the body)
- Numbness on one side of the face or body
- Confusion
- Trouble speaking or understanding language.
- Double vision, trouble seeing in one or both eyes.
- Altered Mental Status
- Trouble walking
- Dizziness
- Loss of balance or coordination
- Severe headache with no known cause (suggests hemorrhagic stroke), especially with altered mental status.
- Seizure with post-ictal focal deficit (like weakness) that does not resolve quickly (~15 minutes).

**History:**

Interview the patient, family members, and other witnesses to determine symptoms, the time of symptom discovery, and the last known well (LKW) or the last time the patient was without symptoms. Ask about seizure at onset, head trauma, history of recent surgeries, history of bleeding problems/diagnosed bleeding disorders, and signs of possible brain hemorrhage (severe headache of sudden onset, nausea/vomiting with

headache or loss of consciousness). Obtain a mobile number for the next of kin and witnesses.

- ❖ **NOTE:** For "wake-up strokes," the last known well time is the last time the patient was witnessed to be at baseline, which may have been the night before. The time they are found is not the time of the last known well.

**Additional History:**

- Obtain past medical history and history of past and recent surgeries.
- Allergies (e.g., iodinated contrast)
- Pre-existing substantial disability (e.g., unable to walk independently)
- Device and implant history (e.g., left ventricular assist device, pacemaker, valve replacement, VP shunt)

**Medications:**

- Obtain a list of all medications including antiplatelet agents (e.g., aspirin, clopidogrel [Plavix]) and blood thinners (direct thrombin inhibitors [dabigatran/Pradaxa], factor Xa inhibitors [fondaparinux/Arixtra, rivaroxaban/Xarelto, apixaban/Eliquis, edoxaban/Savaysa]), low molecular weight heparin [enoxaparin/ Lovenox], unfractionated heparin, bivalirudin, argatroban, warfarin [Coumadin].
- If possible, record when the last dose was taken.

**Management:**

EMS personnel should address ABCDEs per universal pediatric guidelines. Additional initial management steps include:

- Prevent aspiration, HOB > 30. Ensure airway patency with suctioning and OPA or NPA as needed.
- Provide supplemental oxygen if needed to keep oxygen saturation > 94%.
    - (Adjust if the patient has known congenital heart disease with a different goal oxygen saturation)
- Treat hypotension per regional pediatric protocols.
- Maintain blood pressure below 20% above the 95$^{th}$ percentile for age.[12] Call online medical control if the systolic blood pressure is consistently above this percentile. The table below is an example of the upper limit of systolic blood pressure by age.

| Age | Goal Systolic Blood Pressure |
|---|---|
| 1-4 years | <130mmHg |
| 5-10 years | <145mmHg |
| 11-17 years | <160mmHg |

- Hypoglycemia (blood glucose < 70 mg/dL) should be treated in patients suspected of acute ischemic stroke.[17] Evidence indicates that persistent in-hospital hyperglycemia during the first 24 hours after stroke is associated with

worse outcomes and increased risk of hemorrhagic conversion in adults than normoglycemia. You should treat hyperglycemia with a blood glucose range of 140-180 being preferred.
- To facilitate expedited stroke workup in the ED, place two peripheral IVs, so long as it does not delay transport time.

**System Triage:**

- The goal on-scene time is 10-15 minutes or less. If the family is not transported with the patient, encourage them to go directly to the ED.
- See **Annex A: GETAC Pediatric *Prehospital Stroke Triage Algorithm*** forthe pediatric prehospital stroke triage algorithm.

**Destination Decision-Making for Suspected Pediatric Stroke in Rural, Urban, and Suburban Areas**

**Age Criteria and Appropriateness for ADULT Stroke Facility:** Please note that different adult stroke facilities will have different capabilities and willingness to evaluate and treat stroke patients under 18. EMS Medical Directors and stroke facility leadership should outline the age appropriateness for adult stroke facility admission based on regional facility resources and hospital policies.

**Triage Recommendation:**

1. Pediatric patient suspected of having a stroke who is medically stable and last known well **≤ 24 hours**; triage patient based on the following criteria:

   **Age appropriateness for adult stroke facility:**

   - Pediatric patient with suspected stroke, **age < appropriate:**
     - Transport suspected stroke patient to the nearest **Pediatric Stroke Destination***
       - **Pediatric Stroke Destination** – EMS Medical Director will recommend local pediatric stroke destinations. Typically, these are pediatric hospitals with the capability to care for pediatric patients with stroke. Please note, there are **NO** formal national or statewide guidelines, certifications, accreditations, or recognition systems for 'Pediatric Stroke Destinations'.
     - If no Pediatric Stroke Destination is within 60 minutes by air or ground total transport time, or the patient is unstable, transport to the nearest Pediatric Facility.
   - Suspected pediatric stroke, **age ≥ appropriate:**
     - Perform Validated Stroke Severity Screening Tool to assess for potential large vessel occlusion (LVO), such as RACE score.[18]
     - **If LVO Screening Tool Positive:**
       - Transport suspected stroke patients to the nearest adult Comprehensive Stroke Center (CSC/ Level 1) if within ≤ 30 minutes from the nearest Pediatric Stroke Destination and no more than 60 minutes total transport time by air or ground.
       - If no CSC is available within 30 minutes, transport to the nearest thrombectomy capable stroke center (TSC/ Level 2) if within < 30 minutes from the nearest Pediatric Stroke Destination and no more than 60 minutes total transport time by air or ground.

        - If neither a CSC nor TSC is available within ≤ 30 minutes, transport to the nearest Pediatric Stroke Destination.
        - If no Pediatric Stroke Destination is available within ≤ 60 minutes or the patient is unstable, transport to the nearest Pediatric Facility.
    - **If LVO Screening Tool Negative:**
        - Transport suspected stroke patients to the nearest Pediatric Stroke Destination.
        - If no Pediatric Stroke Destination is within 60 minutes by air or ground total transport time, or the patient is unstable, transport to the nearest Pediatric Facility or most appropriate facility.

2. Pediatric patient suspected of having a stroke and last known well **> 24 hours**, triage based on the following criteria:
    - Suspected pediatric stroke, **for all ages:**
        - Transport suspected stroke patients to the nearest Pediatric Stroke Destination.
        - If no Pediatric Stroke Destination is within a 60-minute total transport time or the patient is unstable, transport to the nearest Pediatric Facility.

❖ **For all ages:** consider air medical if transport time is prolonged > 60 minutes.

❖ **Stroke Prenotification**: alert the receiving facility that a suspected pediatric stroke patient is en route prior to arrival. A stroke alert prior to arrival will mobilize appropriate resources before patient arrival.
    - Prenotification should include: Age, last known well, time of symptom discovery, current vital signs, stroke screening tool score (if performed), and symptoms (weakness on one side, altered mental status, etc.).

❖ **Hand-off Goal**: 120 seconds for EMS to ED triage nurse hand-off.

**(Note – Plan is adapted from the 2022 North Central Texas Trauma Regional Advisory Council Regional Stroke Plan)**

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