



Pediatric Stroke Program

Children's Hospital of Philadelphia Stroke Program

Stroke Care at CHOP: The Bare Essentials for Primary Care & ED Physicians v. June 2013

Background and key pediatric stroke facts: Stroke syndromes affect 6-13/100,000 children per year, an incidence which is comparable to childhood brain tumors. The mean interval to diagnosis is 24 hrs after symptom onset in children with ischemic stroke, longer for venous thrombosis. In the majority of children with ischemic stroke, parents seek medical attention within the first 6 hrs, but the child's diagnosis or institution of specific treatment are delayed due to limited awareness by pediatric primary care givers of signs/symptoms and treatment strategies for stroke, or limited access to specialized pediatric stroke care. Many children with stroke syndromes are diagnosed with more common conditions that mimic stroke, e.g. migraine, epilepsy, viral illness. Mortality approaches 15% in cerebral venous thrombosis, and is ~5% for ischemic stroke. Long-term disability affects ~60% of survivors of ischemic stroke. Stroke recurs in ~20% of children (non-neonates) with ischemic stroke. This document provides a very brief introduction to childhood stroke syndromes, initial assessment and treatment suggestions as typically provided at CHOP, and the CHOP Stroke Program. For more information, go to www.chop.edu/stroke, and see the references listed at the end of this document.

AT-A-GLANCE SIGNS & SYMPTOMS OF CHILDHOOD STROKE SYNDROMES*

ACUTE ARTERIAL ISCHEMIC STROKE OR TIA		
<i>Medical description</i>	<i>Lay description</i>	<i>Comment</i>
Hemiparesis	Weak arm or leg, facial droop, paralyzed on one side	Combination of face with arm, or face, arm & leg strongly suspicious for stroke
Aphasia	Stopped speaking, talking nonsense, won't follow command	Sometimes mistaken for confusion or oppositional behavior
Visual field cut	Loss of vision, can't see right	Often causes gaze preference toward the side of intact vision, away from the hemiparetic side
Ataxia	Unsteady gait, can't walk straight, seems drunk, can't sit steady, uncoordinated reach/grasp	Often associated with headache, complaint of dizziness, vomiting
Dysarthria (slurred speech)	Speech is slurred, though word choice & comprehension are correct	
Hemisensory loss	Numbness, tingling on one side of body	Usually involves one side of body & more than one body region (face+arm, or face+arm+leg)
New-onset focal seizures with atypical prolonged (>1 hr) post-ictal deficit		No previous dx of epilepsy, now has several focal seizures followed by persisting weakness in location of the seizure (usually face+arm or face+arm+leg)
ACUTE CEREBRAL SINOVENOUS THROMBOSIS		
<i>Medical description</i>	<i>Lay description</i>	<i>Comment</i>
Triad of unremitting & escalating headache, repeated vomiting and decreased mental status	Lethargic, vomiting, irritable, headache	Frequently has 6 th nerve palsy & papilledema
In newborns, lethargy & seizures	Lethargic, poor feeding, seizures	
PRIMARY INTRACRANIAL HEMORRHAGE (IVH, subarachnoid hemorrhage, AVM)		
<i>Medical description</i>	<i>Lay description</i>	<i>Comment</i>
Hyperacute severe headache	"Worst headache of my life"	Often quickly followed by decreased mental status
Sudden sustained loss of consciousness	"collapsed", hard to wake up	Often preceded by c/o headache, vomiting &/or seizure
One or both of above with new focal deficit	Paralyzed on one side, eyes going to one side, face drooping	

*Developed by the Stroke Team at Children's Hospital of Philadelphia, for screening & triage by nursing staff and emergency medicine providers.



Initial Treatment Guidelines

The following suggested management guidelines are relevant to any child with suspected acute stroke syndromes, as suggested by a constellation of symptoms and exam findings described in the table above for "Acute Signs and Symptoms", with or without imaging confirmation. These are simple emergency room interventions which can be instituted to stabilize the child's condition while arrangements are made for definitive diagnostic procedures and, if needed, transfer to a specialized pediatric center for continuing treatment.

- *ABCD's*: Confirm that the patient has a stable airway, adequate ventilation/oxygenation, and intact circulation. Ask for continuous cardiorespiratory monitoring and hourly documentation of VS. Suggest oxygen supplementation if mental status is depressed, or perfusion or oxygenation are compromised, and to maintain SaO₂ at $\geq 95\%$. Verify that pt has normal dextrostick, and supplement prn if hypoglycemic (<60 mg/dl).
- *Activity*: For patients with suspected ischemic stroke, restrict to bedrest with head of bed flat. For patients with suspected intracranial hemorrhage or cerebral venous thrombosis, restrict to bedrest with head of bed elevated 30 degrees. Warn against allowing child to ambulate or to sit upright for such things as toileting or to transfer to/from ED or radiology. This is not needed for neonates and non-mobile infants (<6 mo).
- *NPO*: restrict oral intake pending evaluation of level of consciousness, determination about need for sedation for diagnostic studies, and pending assessment of aspiration risk by speech therapy if there is any cranial nerve deficit.
- *Fluids/electrolytes*: For ischemic stroke or TIA, start IV fluids immediately with isotonic non-dextrose containing solution to be run at maintenance rate. For cerebral venous thrombosis, consider fluid rate above maintenance to improve perfusion. For intracranial hemorrhage, discuss fluid management with neurosurgery & ICU providers. Neonates will usually require dextrose-containing solutions to maintain normoglycemia.
- *Thermoregulation*: antipyretics prn for fever. Aim to keep temperature $\leq 37^{\circ}$ C.
- *Anti-thrombotic treatment*: tPA is rarely an option in children, and presently is being advised only in stroke centers. In most cases of suspected acute ischemic stroke, give initial dose of aspirin in ED once initial head CT has been obtained and rules out hemorrhage. Use of systemic anticoagulation is reserved for selected diagnoses (arterial dissection, cardiogenic embolic stroke, and venous thrombosis), and only after evaluation by the stroke team.
- *Anticonvulsant treatment*: Any child who had acute symptomatic seizure at/around stroke symptom onset should be loaded with standard loading dose of an AED (phenytoin or Phenobarbital). Neonates and young infants with recurring seizures (multiple per day), or with clinical events of uncertain character, should be considered for videoEEG monitoring ASAP.
- *Initial/ admission lab studies*: Obtain CBC, platelet count, PT, PTT, INR, and basic metabolic panel (electrolytes, glucose, BUN). Other labs (eg thrombophilia or vasculitis work up) should be discussed with Stroke Attending and admitting service.
- *Imaging*: Head CT scan is appropriate for the initial screen, is specific and sensitive for hemorrhagic lesions and may provide clues to other diagnoses. It is insensitive and nonspecific for ischemic injury and for many stroke look-alikes such as tumors or demyelinating disease. Brain MRI is usually required, including diffusion weighted sequences. In case of a suspicion of stroke, vascular imaging is necessary, either a brain and cervical MRA, or CT angiogram.
- *Special cases*: For children with sickle cell anemia, contact on-call hematology fellow to discuss imaging plans in relationship to decisions about emergency exchange transfusion.

For more information:

References on pediatric stroke diagnosis and management:

1. Roach, E. S., M. R. Golomb, et al. (2008). "Management of stroke in infants and children: a scientific statement from a Special Writing Group of the American Heart Association Stroke Council and the Council on Cardiovascular Disease in the Young." *Stroke* **39**(9): 2644-91. <http://stroke.ahajournals.org/cgi/content/short/STROKEAHA.108.189696>
2. Monagle P, Chan AK, Goldenberg NA, Ichord RN, Journeycake JM, Nowak-Göttl U, Vesely SK American College of Chest Physicians [Antithrombotic therapy in neonates and children: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines](#). *Chest* **February 2012** 141 (2): suppl e737S-e801S
3. Ganesan F, Kirkham FJ (ed) [Stroke and Cerebrovascular Disease in Childhood](#) 2011 London:MacKeith Press for the International Child Neurology Association