

# Cook Children's Pediatric Stroke and Thrombosis Program

The Cook Children's Stroke and Thrombosis Program is led by Marcela Torres, M.D. and Fernando Acosta, M.D. Both are members of The International Pediatric Stroke Society which is a network of pediatric hospitals that are current world leaders in therapy and research in the areas of pediatric stroke and thrombosis. The program is comprised of a multidisciplinary team consisting of a hematologist, neurologist, neurosurgeon, neuro-radiologist, neuropsychologist, nurse practitioner, nurse, social worker and child life specialist dedicated to the early recognition, treatment and prevention of pediatric stroke.

Commonly stroke is considered an adult phenomenon; however the management of pediatric stroke patients requires specialized care in a recognized pediatric stroke center with resources available to meet the needs of pediatric patients. Challenges include safety with sedation and imaging required urgently in pediatric stroke patients.

## Incidence:

The incidence of pediatric stroke is increasing with new reports indicating a rate between 2 and 13 per 100,000 children per year; similar to that of childhood brain tumors.

- Almost 40 percent of strokes occur within the first year of life
- Stroke is one of the 10 most common causes of death in children
- 10 percent of children with stroke die and 20 percent have a recurrent stroke
- Three quarters of survivors have residual neurological impairment

## Symptoms:

The symptoms of stroke are dependent on the area of brain affected and often may be subtle, difficult to recognize, and most commonly include:

- Numbness or weakness on one side of the body
- Confusion, difficulty speaking, or difficulty understanding
- Difficulty seeing or double vision
- Difficulty walking or unsteadiness of gait (ataxia)
- Seizures (especially in children)
- Worst headache of life or rapidly progressive headache

## Differential:

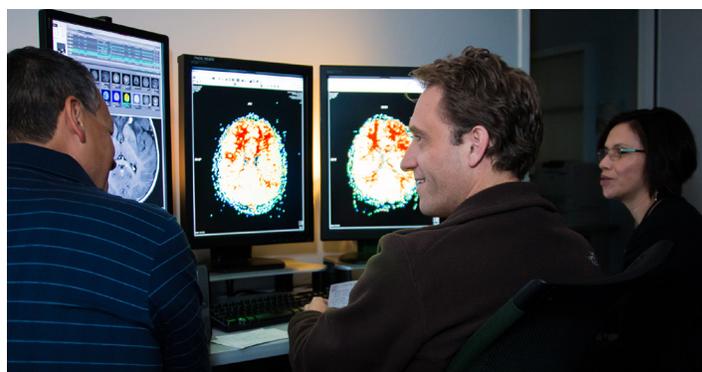
20 percent of children with an acute neurologic event have a mimic rather than an acute stroke. The mean time to definitive diagnosis is greater than 24 hours leading to a delay of care at the most critical time points. Young age, milder stroke and absence of altered consciousness predict delay in diagnosis.

Common stroke mimics include:

- Migraines
- Psychogenic symptoms
- Musculoskeletal abnormalities
- Epilepsy (post ictal hemiparesis)
- Infection/post-infection
- Hypertensive encephalopathy
- Mitochondrial encephalomyelopathy (MELAS)
- Chemotherapy induced encephalopathy

## Referrals

The Cook Children's Pediatric Stroke and Thrombosis Program also accepts referrals for children with history of stroke, call 682-885-8050 for more information.



## Possible etiologies:

Causes and risk factors for pediatric stroke are different and vary widely from that of adults. Stroke should be considered in the differential diagnosis of children with an acute neurologic event to promote early diagnosis and intervention to facilitate best possible outcomes. The common etiologies for pediatric stroke include:

- Idiopathic
- Autoimmune disorders such as systemic lupus erythematosus (SLE)
- Congenital heart disease
- Cardiac surgery (embolic, bypass machine)
- Cardiomyopathies (primary and secondary)
- Cancer particularly leukemia and brain tumors (h/o cranial radiation)
- Hemoglobinopathies: sickle cell disease

**TIME IS CRITICAL**  
If you suspect your patient  
has had an acute stroke, call

**Cook Children's Teddy Bear Transport**  
**1-800-543-4878**

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## Cerebral sinus vein thrombosis

Cerebral sinus vein thrombosis (CSVT) is an increasingly recognized etiology of childhood and neonatal stroke. The venous sinuses and veins lie within the subarachnoid space and thrombosis within the venous system results in outflow obstruction, venous congestion, resulting in an increase in capillary hydrostatic pressure, driving fluid into the interstitium and producing edema. A persistent increase in hydrostatic pressure resulting in red blood cell diapedesis with increased arterial pressure leads to a reduction of arterial inflow and arterial ischemia can occur.

## Incidence:

- Incidence of childhood CSVT varies between 0.4 and 0.7 per 100,000 children per year; with greater than 40 percent in the neonatal period.
- During the acute period many children require anticoagulation therapy to reduce clot propagation while brain injury due to associated ischemia requires both acute and follow up intervention; therefore prompt referral to pediatric stroke center is required.

## Symptoms

Children with CSVT, especially neonates, will likely present with non-focal neurologic signs and symptoms which leads to rate underestimations. Some symptoms to consider:

- Severe headache especially with vomiting, sleepiness, or double vision
- Unilateral or bilateral vision changes
- Severe dizziness or ataxia
- Seizure activity
- Lethargy especially in infants
- Hemiparesis

## Common Triggers

Many times children with CSVT will have more than one triggering factor. Some triggering factors to consider include:

- Dehydration
- Otitis media, sinusitis or mastoiditis
- Thrombophilia
- Heart disease
- Serious infections or sepsis
- Cancer and cancer treatments
- Autoimmune diseases
- Head and neck surgery or injury
- Birth control pills in adolescents

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## Perinatal or Remote infarcts

The risk of stroke in children peaks in the perinatal period and is the greatest during the first year of life and occurs in 1 out of every 4,000 births. It is estimated 50-80 percent of children with prior stroke including those during the perinatal period will have permanent neurologic deficits. These deficits include cognitive, behavioral, emotional, and motor concerns. Some concerns which might prompt further investigation for prior stroke include:

- Hemiplegia
- Cognitive impairments
- Sensory impairments
- Epilepsy
- Speech and language impairments
- Visual impairments
- Attention and behavior issues

Due to the peak incidence of stroke in children occurring in the perinatal period obtaining a perinatal history on any child with a constellation of symptoms concerning for prior stroke is warranted. Some perinatal factors to consider include:

- Maternal history of infertility
- Chorioamnionitis
- Premature rupture of membranes
- Maternal preeclampsia

## For non-emergent referrals and consults contact:



**Fernando Acosta, M.D.**  
Cook Children's Medical Center  
Neurosciences Center  
682-885-8050



**Marcela Torres, M.D.**  
Cook Children's Medical Center  
Hematology and Oncology Center  
682-885-8050

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