

THINK STROKE... AT ANY AGE



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International Alliance for Pediatric Stroke

iapediatricstroke.org

DEFINING PEDIATRIC STROKE

The background features abstract, overlapping geometric shapes in various shades of blue, ranging from light sky blue to deep navy blue. These shapes are primarily located on the right side of the frame, creating a modern, dynamic feel.

Pediatric Stroke Categories

Perinatal Stroke

Last 18 weeks of gestation through
1-month old



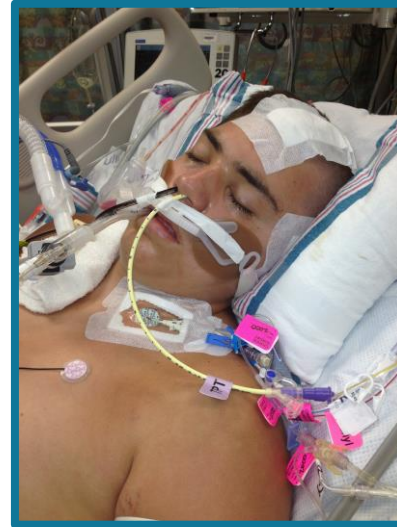
Michelle

**Hemorrhagic Stroke between 20 and 29
weeks gestation**

No known cause for stroke

Childhood Stroke

1-month old to 18 years



Ryley

Multiple Ischemic Strokes at age 15

Caused by bacterial infection

Pediatric Stroke Statistics

- ▶ There is no universal surveillance for this population
 - The prevalence of *Perinatal Stroke* is 1 in 4,000 live births (AHA 2019)
 - Incidence of *Perinatal Stroke* may be as high as 1 in 1,000 live births (Canada)
 - The annual incidence of *Childhood Stroke* ranges from 3 to 25 per 100,000 children (AHA 2019)
 - Affects 5 out of 100,000 children per year in the UK (combines perinatal with childhood stroke)
 - In Canada there are more than 10,000 children (0 - 18 years) living with stroke
 - Annual estimated incidence rates for Australia: *Perinatal Stroke* - bet. 76 and 122 newborns; *Childhood Stroke* - bet. 58 and 390 children
- ▶ The majority of pediatric strokes occur in the perinatal period

Pediatric Stroke Facts

- ▶ Stroke is one of the top 10 causes of death in children ages 1 - 19
- ▶ Approximately 80% of ***Perinatal Strokes*** are Ischemic
- ▶ About 50% of ***Childhood Strokes*** are Hemorrhagic
- ▶ Pediatric stroke is as common as brain tumors in kids
- ▶ Incidence of ***Childhood Stroke*** is highest in infants and children under 5 years-old
- ▶ For children, boys have a higher incidence rate than girls
- ▶ Black and Asian children have a higher incidence than white children
- ▶ Increased stroke risk in black children due to Sickle Cell Disease

What Are the Effects of Pediatric Stroke?

Of children surviving stroke, over 75% are left with long-term neurological deficits.

These include:

- ▶ Hemiplegia/Hemiparesis – paralysis or weakness on one side of the body (most common deficit)
- ▶ Learning and memory problems
- ▶ Difficulty with speech and language
- ▶ Different types of impaired vision
- ▶ Behavioral or personality changes
- ▶ Development of epilepsy (not typically seen in adults)

CAUSES AND RISK FACTORS

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Some Risk Factors for Pediatric Stroke

PERINATAL

- ▶ Cardiac disorders
- ▶ Coagulation disorders
- ▶ Infections
- ▶ Trauma
- ▶ Maternal placenta disorders
- ▶ Maternal medications and toxins

In most perinatal strokes, no risk factors are ever found

Overall risk for another stroke is extremely low, < 1%

CHILDHOOD

- ▶ Congenital heart disease
- ▶ Cardiac disorders (e.g. Myocarditis)
- ▶ Cerebral vascular disorders (e.g. Moyamoya, Arterial Dissection)
- ▶ Infections (e.g. Varicella, Meningitis)
- ▶ Head or neck trauma
- ▶ Sickle cell disease
- ▶ Autoimmune disorders

No previous risk factor is identified in about half of childhood stroke cases

After an initial stroke, ~20% will have a recurrent stroke

International Alliance for Pediatric Stroke & American Heart Association, "Strokes Can Happen at Any Age", 2014 infographic.

American Heart Association, "Youths and Cardiovascular Diseases, Statistical Fact Sheet 2015 Update".

University of North Carolina Comprehensive Stroke Center, "An Overview of Pediatric Stroke: Prenatal Through Teenager, An Educational Guide for Healthcare Providers", 2015 edition.

“No modifiable risk factors have yet been identified for stroke in the fetus, newborn or child, resulting in no ability for parents or physicians to prevent children from suffering a stroke.”

Dr. Adam Kirton

*Professor of Pediatrics and Clinical
Neurosciences at the University of Calgary*

Risk Factors and Causation

- ▶ A risk factor implies an association with stroke, but not necessarily the cause.
- ▶ Many children possess multiple risk factors which may have to combine in order for stroke to occur.
- ▶ The causes of strokes in children are not well understood.
- ▶ Genetic problems are responsible for a very small number of known causes.
- ▶ A significant number of children will have no risk factors identified despite extensive investigation.

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SIGNS AND SYMPTOMS

Signs and Symptoms for Perinatal Stroke

Newborns

- ▶ Seizures may be an early sign: repetitive twitching of face, arm or leg
- ▶ Apnea, especially associated with staring
- ▶ Lethargy, poor feeding

Developing Babies

- ▶ Decreased movement or weakness on one side of the body
- ▶ Showing a hand preference, or consistently reaching out with only one hand before one year of age
- ▶ Developmental delays

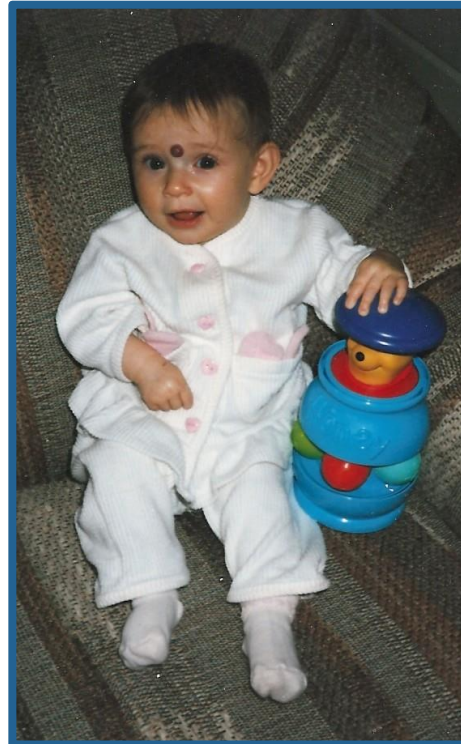


Solomon

Delay in Diagnosing Perinatal Stroke



Avery
Photo at 6 months
Diagnosed at 11 months



Dana
Photo at 7 months
Diagnosed at 19 months



Brendon
Photo at 8 months
Diagnosed at 19 months

Signs and Symptoms for Childhood Stroke

Signs and symptoms of acute stroke in children are similar to those in adults (F.A.S.T.)

- ▶ Sudden Hemiparesis/Hemifacial weakness - numbness/weakness on one side (67% to 90%)
- ▶ Sudden Difficulty Speaking or understanding others (20% to 50%)
- ▶ Sudden, severe Headache (20% to 50%)
- ▶ Sudden Vision Loss or double vision (10% to 15%)
- ▶ Sudden Ataxia - loss of full control of body movements/coordination (8% to 10%)
- ▶ Sudden altered Mental Status (17% to 38%)
- ▶ Seizures at stroke onset are more common in children than adults (15% to 25%)

Delay in Diagnosing Strokes in Children

- ▶ Often unrecognized and untreated
 - Poor awareness of strokes in children among emergency physicians, frontline providers, and parents/caregivers
 - Symptoms mimic other diseases (e.g. migraine, seizures, Bell's Palsy)
- ▶ Accuracy and timeliness of diagnosis are important challenges
 - 1.7 to 21 hour delay from symptom onset to seeking medical help
 - 15 to 24 hour delay before brain imaging done
 - Delays in accessing MRI due to need for sedation/anesthesia
 - MRI delays greatest in evenings/weekends
 - ED providers correctly diagnose a stroke in 60% of children

Nazhai



- Age 16
- Dancer
- Active in her church
- In the high school business program

- ▶ At the pool on a hot afternoon
- ▶ Sudden, excruciating headache
- ▶ Right arm numb
- ▶ Slurred speech
- ▶ Couldn't stand up
- ▶ First Responders diagnosed as heat stroke and migraine
- ▶ Taken to the hospital an hour after EMS arrival
- ▶ No urgency for assessment, treatment or MRI upon arrival at hospital
- ▶ Given pain meds for pounding headache
- ▶ Results of MRI were given ~7 hours after hospital arrival
- ▶ 2 brain aneurysms/hemorrhagic stroke - 12 hours after initial symptoms
- ▶ No cause found for aneurysms

“Know the symptoms of stroke and consider the possibility of a stroke no matter what a person’s age and have the child rapidly evaluated.”

Dr. Lori Jordan

*Associate Professor of Pediatrics
Director, Pediatric Stroke Program
at Vanderbilt University School of Medicine*

Lelaina (Laney) Jaymes Fitzsimons

August 19, 2012 - March 27, 2017





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