

Project for Expansion of Education in Pediatric Stroke (PEEPS)

An Overview of Pediatric Stroke: Prenatal Through Teenager

An Educational Guide for Healthcare Providers

Natalie Aucutt-Walter, MD

Nicole Burnett, RN, BSN, CNRN, SCRNI

Gretchen Delametter, CPNP-AC

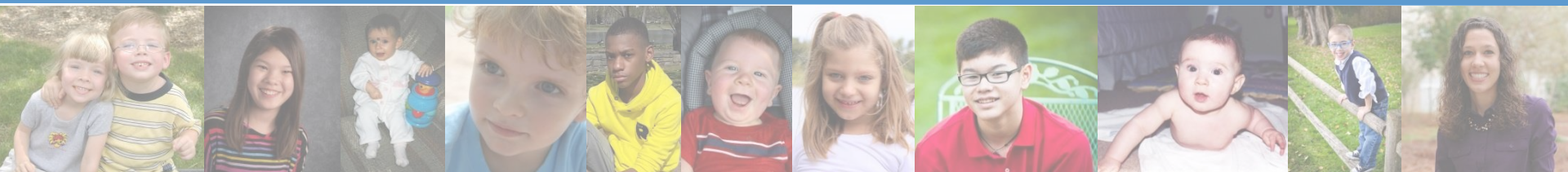
David Huang, MD, PhD

Leonardo Morantes, MD

Casey Olm-Shipman, MD, MS

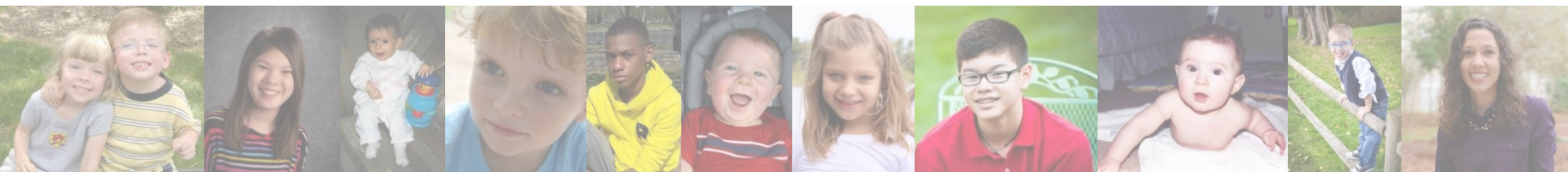
Rebecca Smith, MD

Michael Wang, MD



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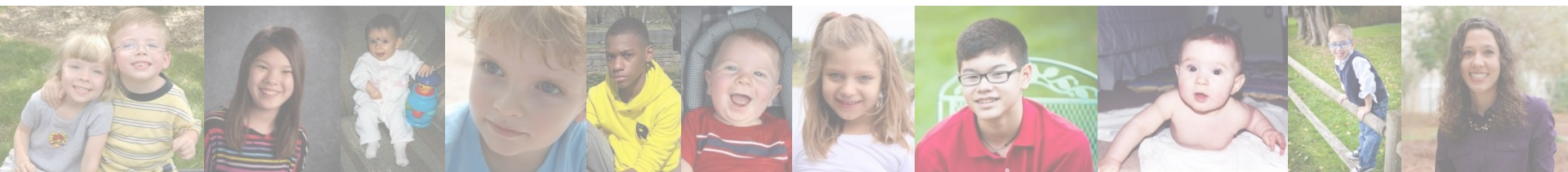
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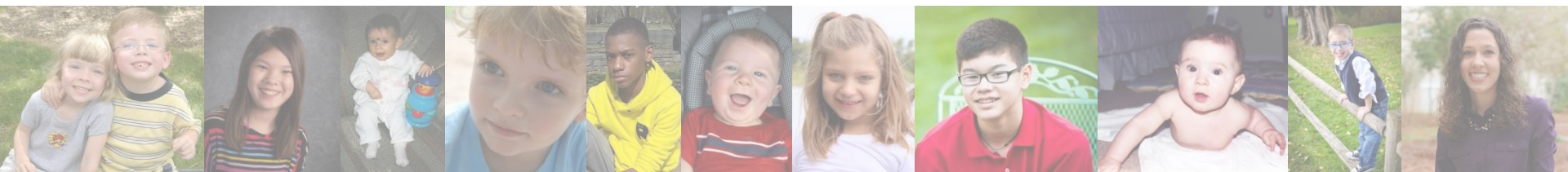
The stroke survivors, parents and caregivers that provided pictures and quotes for this guide



Objectives

This guide is designed to give healthcare providers basic information on:

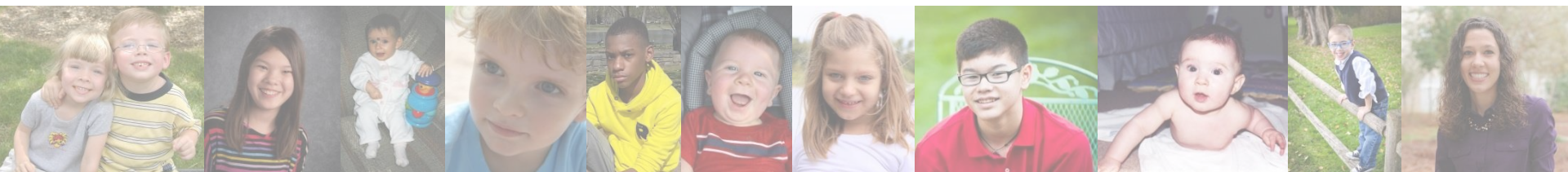
- ☐ Types of stroke in the pediatric population
- ☐ Recognition of stroke signs and symptoms in the pediatric population
- ☐ Diagnosis of perinatal and childhood stroke
- ☐ Acute and long term treatment options



Intended Audience

This guide is designed for healthcare providers who are:

- ☐ Caring for children and need more information on recognition of stroke signs and symptoms
- ☐ Caring for children post-stroke after hospitalization or rehabilitation
- ☐ Looking for general knowledge about stroke in the pediatric patient population

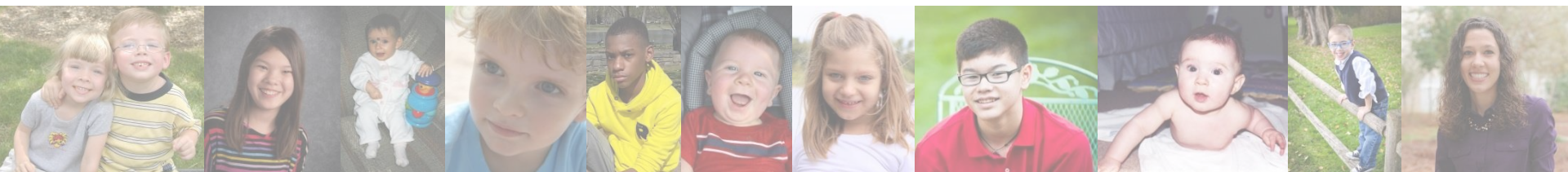


Pediatric Stroke Overview



Rhys, Prenatal Stroke

“Despite efforts to raise awareness regarding stroke in children, this condition is often overlooked as a cause of symptoms by health care providers and family.”¹



Pediatric Stroke: Classification



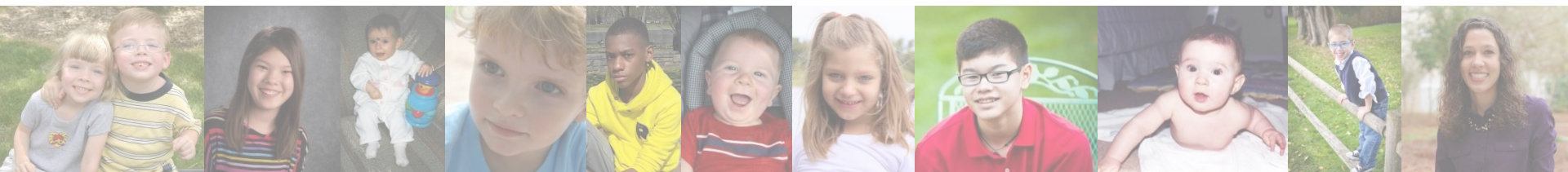
Perinatal Stroke Week 22 of pregnancy – 1 month old

- About 80% Ischemic Stroke and 20% Cerebral Venous Sinus Thrombosis & Hemorrhagic Stroke^{10,8}
- Because perinatal stroke is often underdiagnosed, we only have estimates of incidence of perinatal stroke¹⁸:
 - ❑ Ischemic stroke occurs in approximately 1:3,500 live births.³
 - ❑ Hemorrhagic stroke occurs in approximately 1:16,000 live births.³

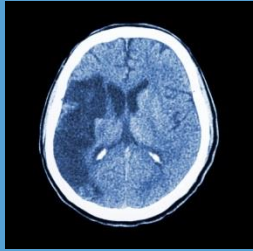


Childhood Stroke 1 month old – 18 years old

- About 50% Ischemic Stroke and 50% Hemorrhagic Stroke²
- Because childhood stroke is often underdiagnosed, we only have estimates of incidence of childhood stroke¹⁸:
 - ❑ Occurs in approximately 1.2-13 per 100,000 children per year.^{1,2}



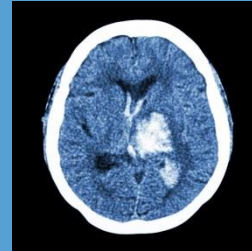
Pediatric Stroke: Types



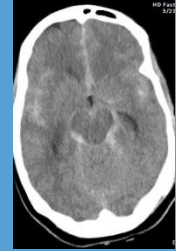
Arterial
Ischemic Stroke
(AIS)⁹



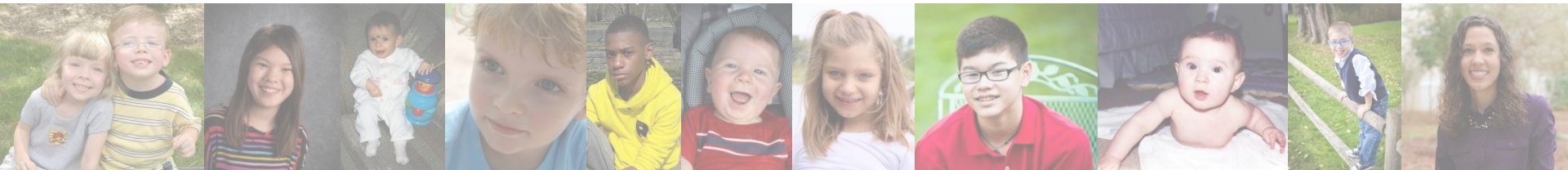
Venous
Infarction
caused by
Cerebral
Venous Sinus
Thrombosis
(CVST)⁹



Intracerebral
Hemorrhage
(ICH)⁹



Subarachnoid
Hemorrhage
(SAH)⁹



Pediatric Stroke: Signs & Symptoms



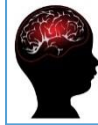
Perinatal Stroke

• Acute Presentation:

- **Seizures**⁴
- Periods of **apnea** with staring⁴
- Any focal weakness, including face, arm and leg.⁴
- Hemiparesis⁴
- Any focal deficit⁴

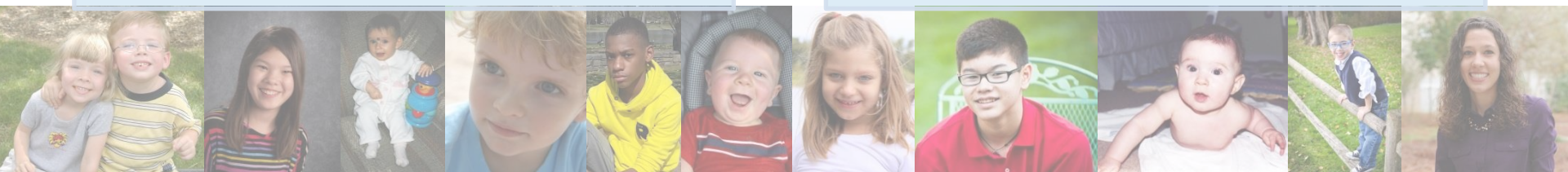
• Presentation in the Developing Child:

- Showing a **hand preference** or consistently reaching out with only one hand **before the age of one**⁴
- Hemiparesis⁴
- **Missed developmental milestones** as child grows⁴
- Any focal weakness, including face, arm and leg.⁴
- Any focal deficit⁴
- **Seizures**⁴



Childhood Stroke

- **Sudden** numbness or weakness of the face, arm or leg (especially one-sided)⁴
- **Sudden** confusion, difficulty speaking or understanding⁴
- **Sudden** trouble seeing, loss of vision or double⁴
- **Sudden** difficulty walking, dizziness, loss of balance or coordination⁴
- **Sudden** severe headache, especially if associated with vomiting or sleepiness⁴
- New onset **seizures**⁴
- Diminished **level of consciousness**



Pediatric Stroke: The Need for More Education

“Strokes can happen at any age”⁴

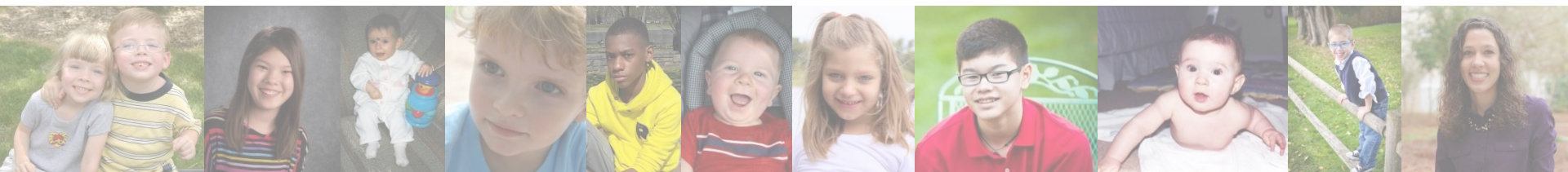
Perinatal stroke is often **undiagnosed** or **misdiagnosed** due to the subtleness of signs and symptoms.⁶

Childhood stroke may be missed because of a **lack of awareness** that stroke can occur at any age. It may also be **misdiagnosed**.⁶

The full neurologic deficits from stroke may only emerge as the child develops, but can **impact their life permanently**. Of children who survive a stroke, about **60%** will have **permanent neurologic deficits**.

These deficits include:

- Hemiplegia**
- Hemiparesis**
- Learning and memory difficulties**
- Visual disturbances**
- Behavior or personality changes**
- Epilepsy**
- Swallowing & eating difficulties**^{6,5}



Pediatric Stroke: Facts & Figures

Stroke is one of the **top ten** causes of death in kids ages 1-19.⁵

While the clot-busting drug **tPA** is a key treatment of ischemic stroke in adults, its use for treating **infants and young children** has **not been tested for efficacy and safety**.⁵

Stroke is as common as **brain tumors** in kids.⁶

Did you Know?

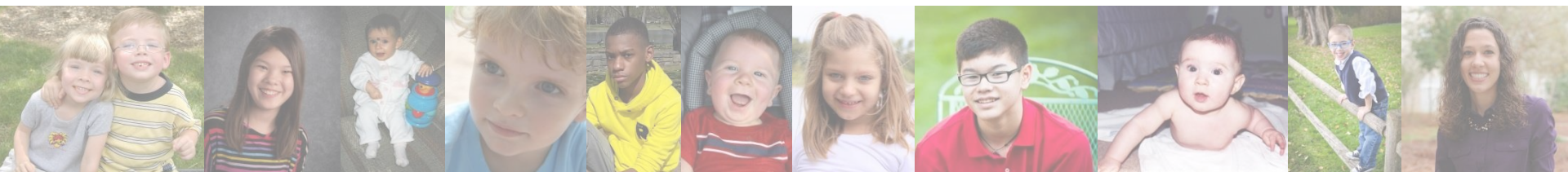


Boys are more likely to have a stroke than girls.⁵

African American children are at more risk when compared to Caucasian and Asian children.⁵

Hemiplegia/hemiparesis is the most common form of **cerebral palsy** in children born at term and **stroke** is its **leading cause**.⁵

When **perinatal stroke** occurs, symptoms may not be apparent for **months to years**.⁶



Pediatric Stroke: Risk of Recurrence



Perinatal Stroke

Overall recurrent stroke risk is very low, <1%.⁶



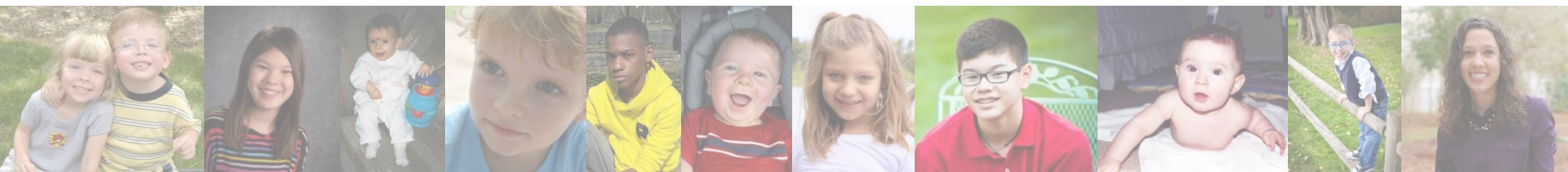
Childhood Stroke

For children who have a first stroke between 1 month and 18 years, the risk of recurrent stroke is 15-18%.⁶



Cardiac Disease

Children with cardiac disease can have up to a five fold increased recurrence risk as compared to children without cardiac disease.¹⁷

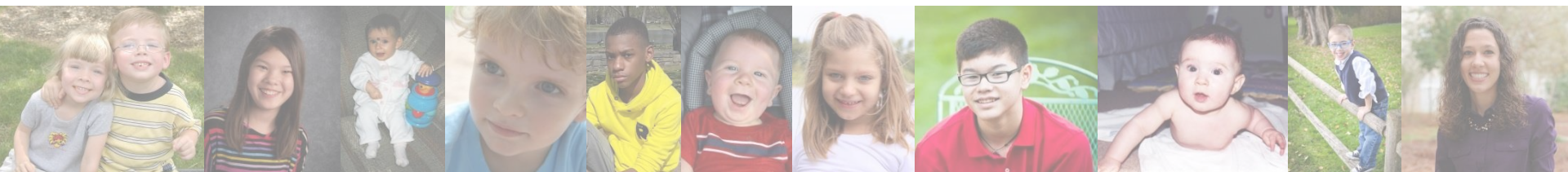


Perinatal Stroke

Week 22 of Pregnancy – 1 Month of Life



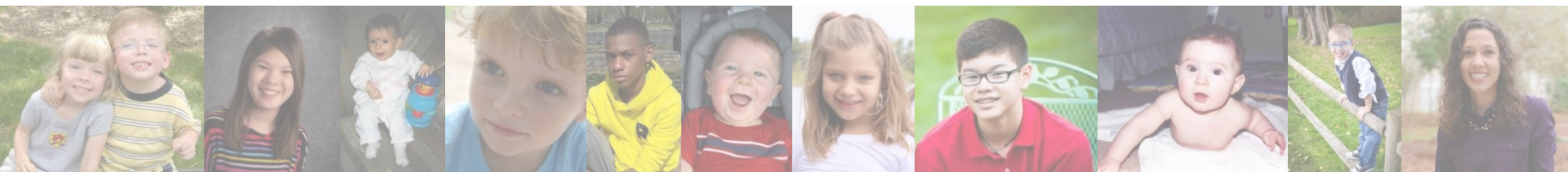
Mario, Perinatal Stroke





Michelle, Prenatal Stroke

“It is very important for mothers to know that there is usually nothing they did or did not do during their pregnancy that caused their child’s stroke.” ⁷

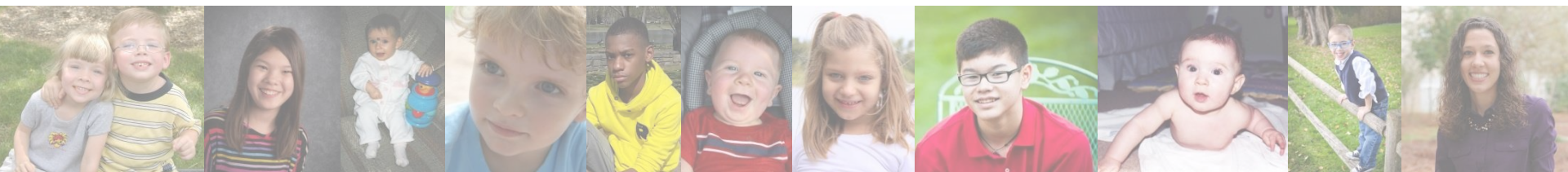


What is Perinatal Stroke?

Perinatal stroke identifies the time period between **week 22 of pregnancy** and the **first month of life**.^{4,6}

The **critical period** in the pregnancy for stroke is the **end of the second trimester** and the **entire third trimester**.⁶

A stroke that occurs **before birth** may also be referred to as **prenatal, fetal or in-utero**.⁸



Perinatal Stroke: Facts & Figures

In a majority of cases, a **cause** for perinatal stroke is **unknown**.⁶

Did You Know?

Ischemic stroke occurs in approximately **1:3500** live births per year.³

The risk of having **another child** with perinatal stroke is **extremely low**.⁶

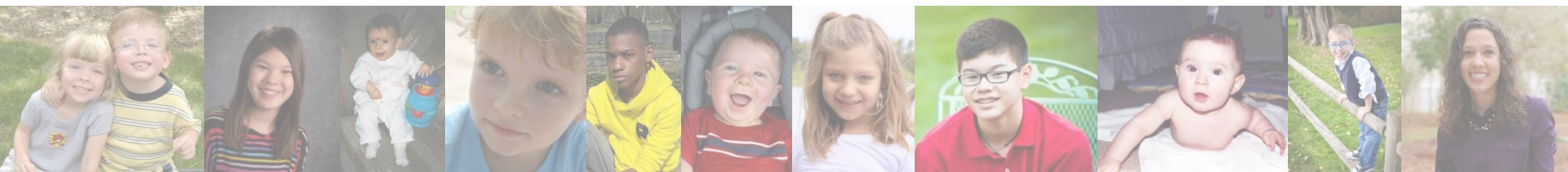


Hemorrhagic stroke occurs in approximately **1:16000** live births per year.³

About **80%** are ischemic stroke and **20%** Cerebral Venous Sinus Thrombosis (CVST) & hemorrhagic stroke.^{7,9}

Parental **support is key** during this period and as the infant grows into childhood and beyond.

A comprehensive multidisciplinary team should participate in the identification, work-up, short and long term care.



Perinatal Stroke: Risk Factors

In most cases, the **cause** of Perinatal Stroke is **unknown**. It may be due to a combination of causes including maternal, placental and neonatal factors. Some factors that may put the child at higher risk include:

Cardiac Disorders

Coagulation Disorders

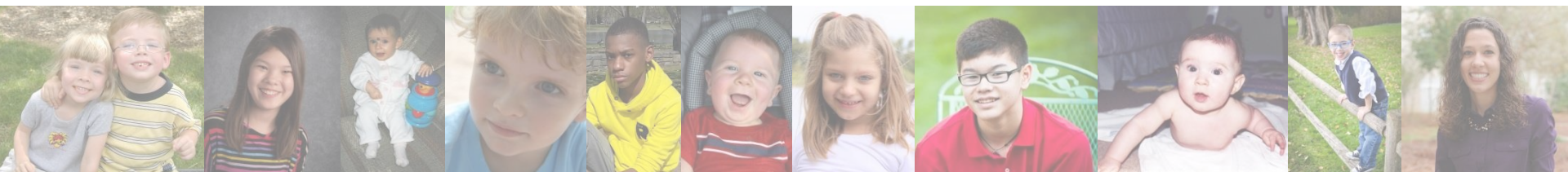
Infection

Trauma

Maternal Medications & Toxins

Maternal Placental Disorders

Perinatal Asphyxia⁹



Perinatal Stroke: Signs & Symptoms



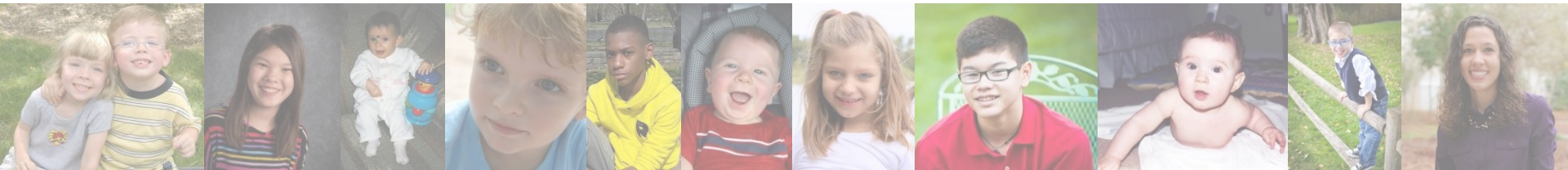
Acute

- Obvious signs may be noted within hours to days of birth.
- Neonatal **seizures** are a common acute presentation (up to 75%).^{4,18}
- Seizures are typically focal and involve only one extremity.⁹
- Stroke accounts for approximately 10% of seizures in term neonates.⁹



Long-Term

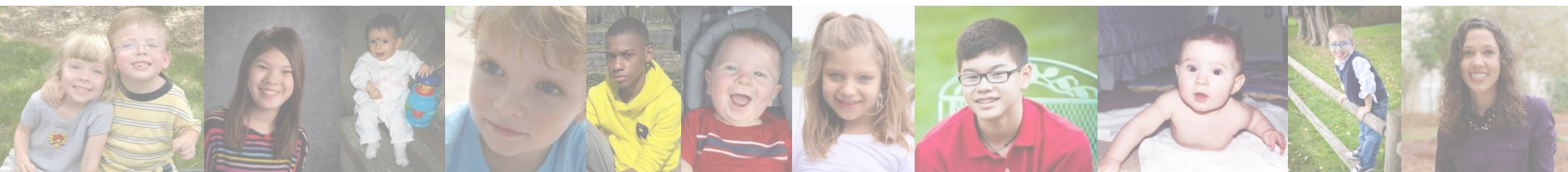
- Subtle signs may not reveal themselves in the newborn period.
- Symptoms may only be identified as the child grows and develops.
- Most common sign as the child ages is weakness or decreased movement on one side of the body. Parents commonly report **one-handedness** or **hand preference** before age one.⁴
- **Developmental milestones** may be delayed or missed.^{4,10}



Perinatal Stroke: Diagnosis

General Considerations

- Understanding of developmental expectations and milestones in this age group is imperative.
- Comprehensive assessment of neurologic status, clinical presentation and radiological imaging is also necessary.



Perinatal Stroke: Diagnosis

Cranial US

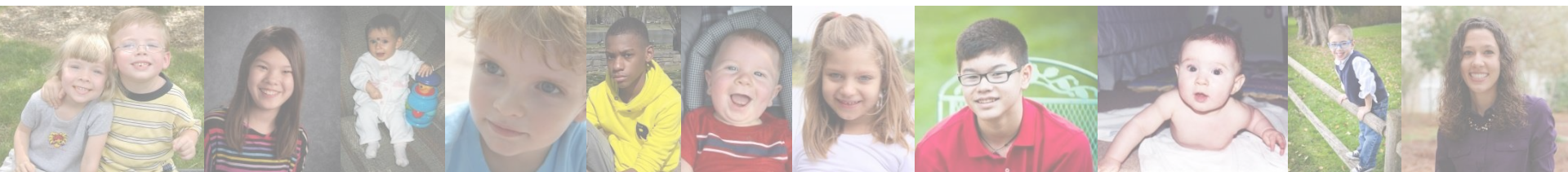
- Cranial Ultrasound (US) is non-invasive & readily available.
- May miss superficial or evolving lesions.⁹

CT

- CT is quick and readily available.
- Can identify superficial lesions.
- May miss Cerebral Venous Sinus Thrombosis (CVST) and early Acute Ischemic Stroke..
- Consider risk of radiation .⁹

MRI

- MRI may more accurately show ischemic lesion and CVST.
- The patient may require sedation.
- MRA/MRV may demonstrate vessel pathology.
- MR Spectroscopy may be helpful in diagnosing metabolic disorders.⁹



Perinatal Stroke: Diagnosis

EEG

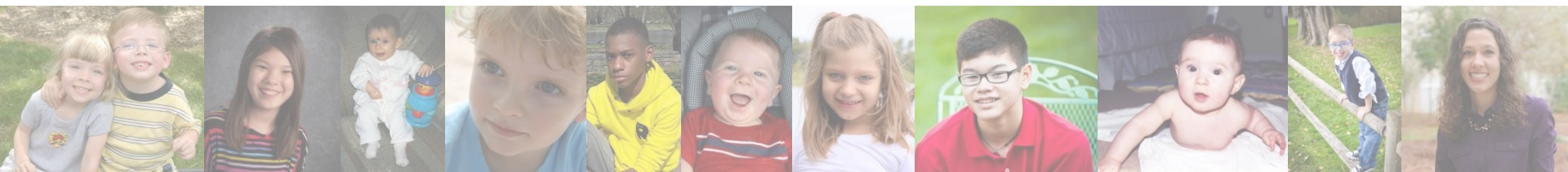
-May be completed if associated or suspected seizure activity.⁹

Labs

-May or may not be indicated (Blood, Urine, Cerebrospinal Fluid).
-Extended hematologic workup may be indicated as per subspecialist recommendations.
-Placental pathology may be indicated as per subspecialist recommendations.⁹

ECHO, ECG

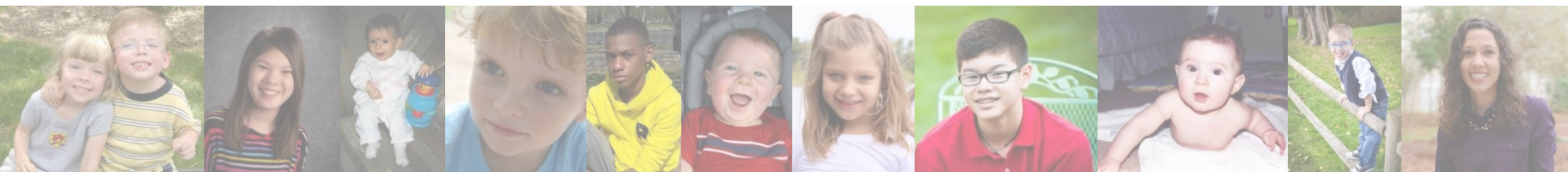
-May be completed to evaluate for cardiac causes.¹⁰



Perinatal Stroke: Treatment (Acute)

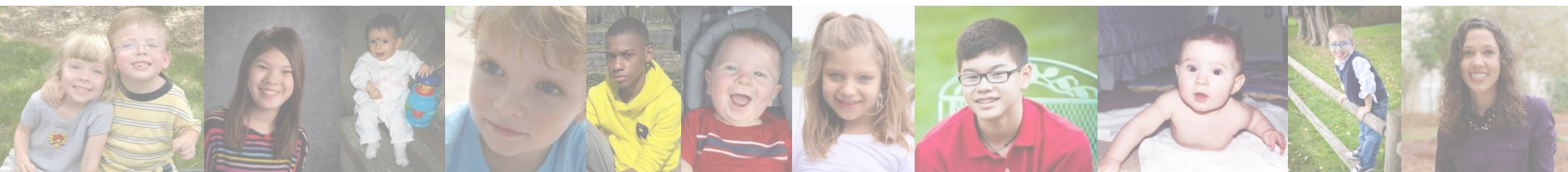
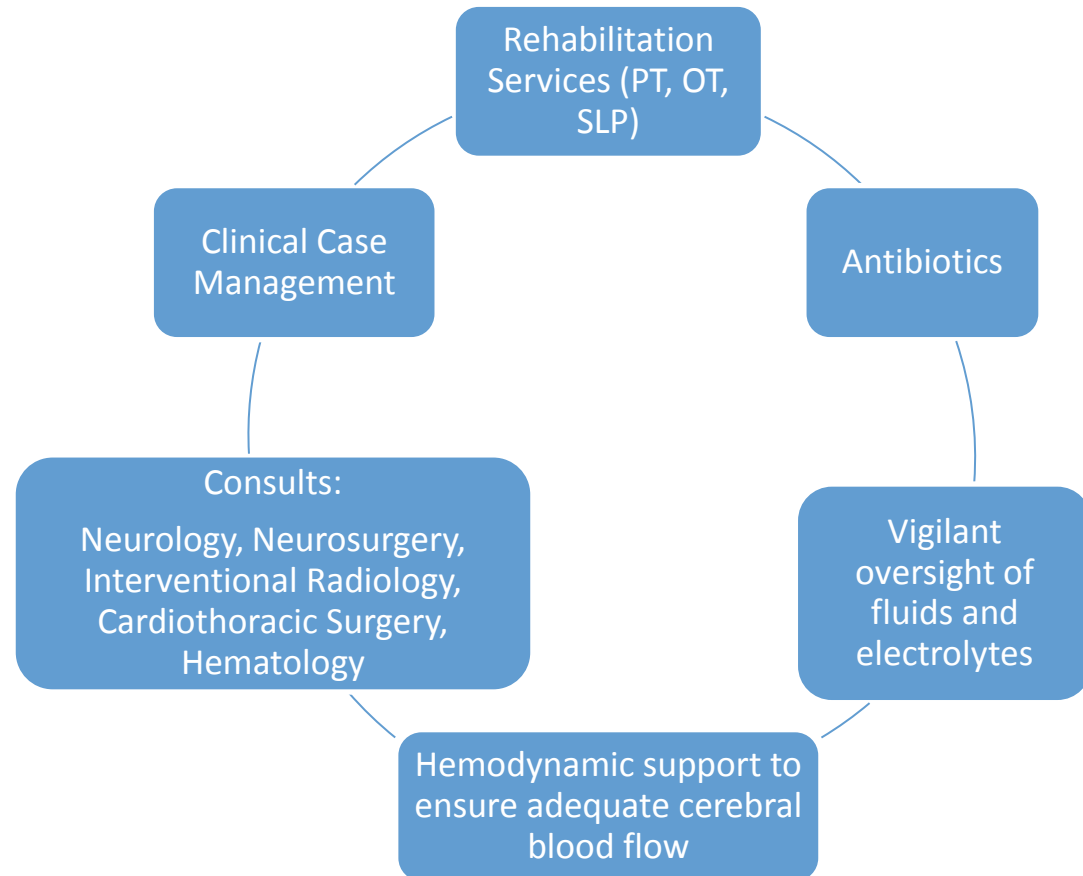
General Considerations

- Short term treatment first includes the early identification of the stroke and rapid evaluation by pediatric specialists.
- Supportive care is indicated for all types of perinatal stroke.⁹
- Attention to maintaining airway, breathing, and circulation with specific attention to oxygenation and ventilation is imperative. Hypoxia may be the cause of the stroke or may have a significant contribution.⁹



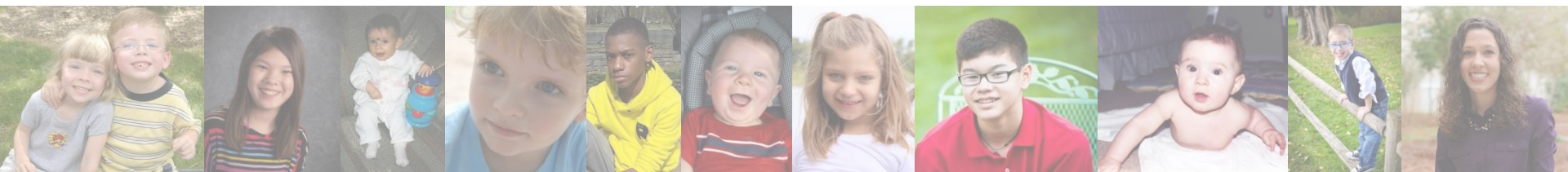
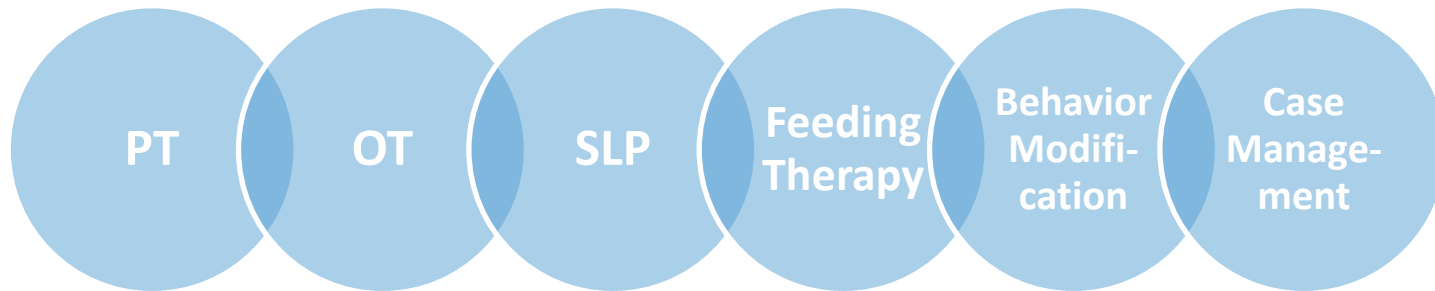
Perinatal Stroke: Treatment (Acute)

Once the stroke is identified, multiple therapies will ensue while the cause is explored. These therapies may include:^{9,10}



Perinatal Stroke: Treatment (Long Term)

- Rehabilitation is key to help with long term outcome.
- Long term treatment encompasses multiple therapies and pediatric subspecialists.
- The stroke will cause injury to the brain and the area of the brain injury may include challenges for the newborn as they grow and age. These challenges include motor and movement, learning, speech, language, vision, hearing, and seizures.¹⁰
- Therapies may include:

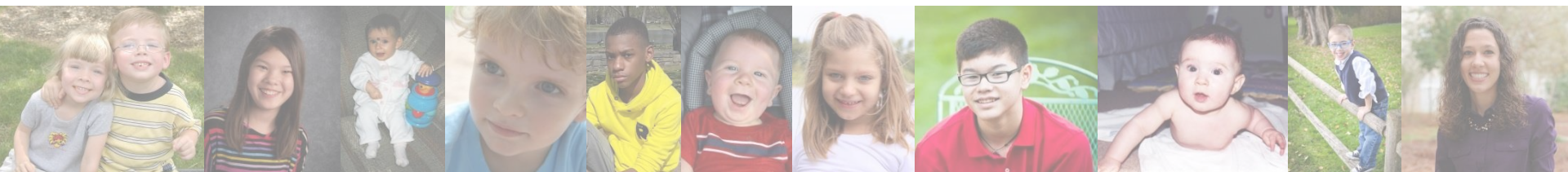


Perinatal Stroke: Treatment (Long Term)

In addition, specialized equipment may be needed including:

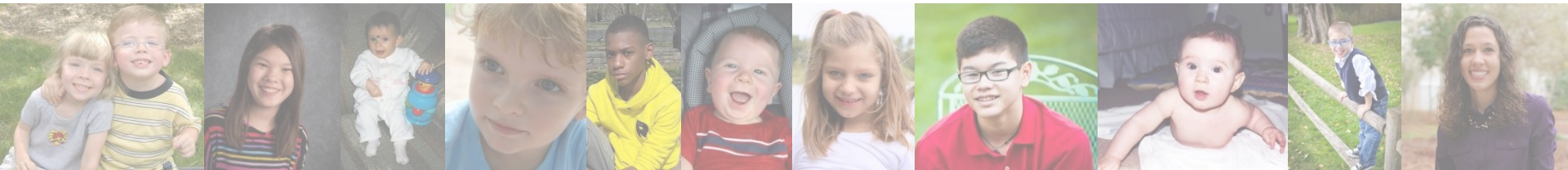
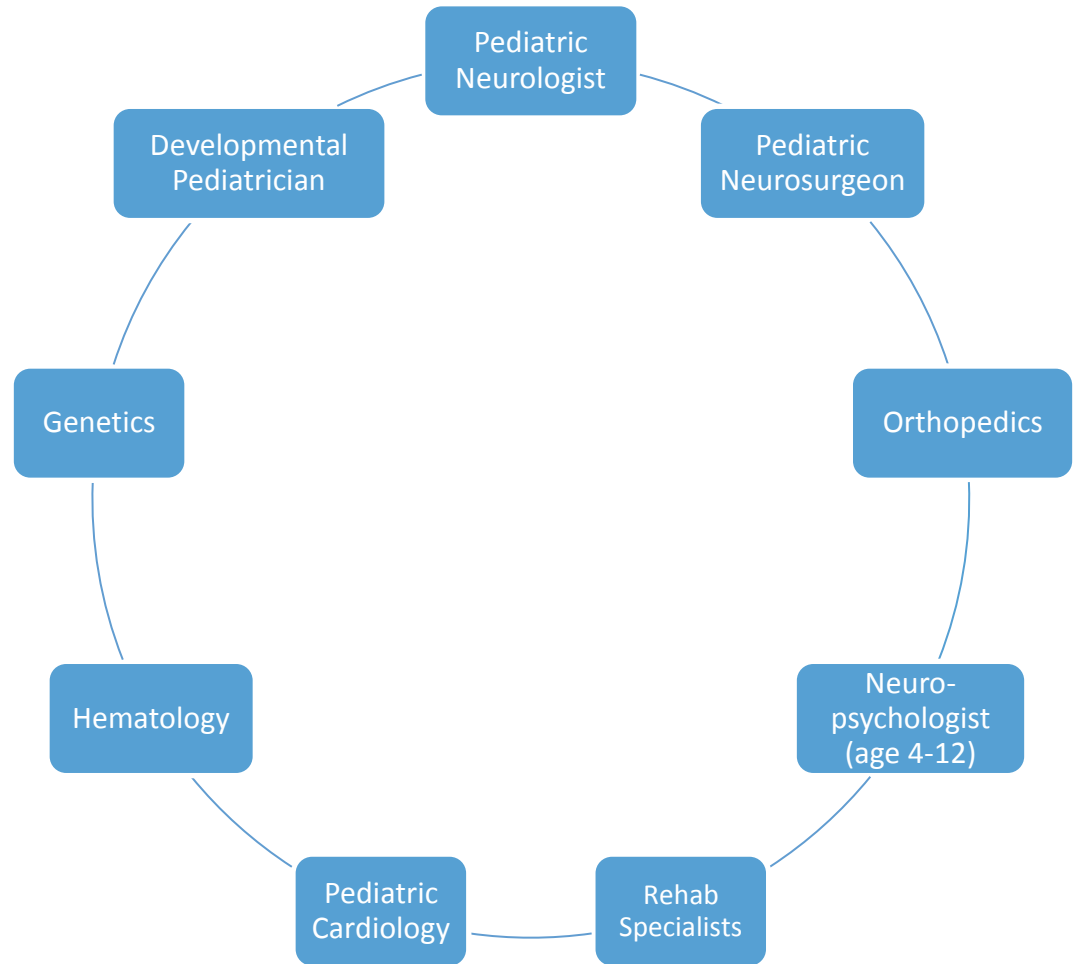


- ☐ Orthotics for upper & lower extremities
- ☐ Wheelchair
- ☐ Glasses
- ☐ Sensory objects



Perinatal Stroke: Treatment (Long Term)

In addition to the primary care provider, there may be multiple subspecialists involved in the care. These specialists may include¹⁰:

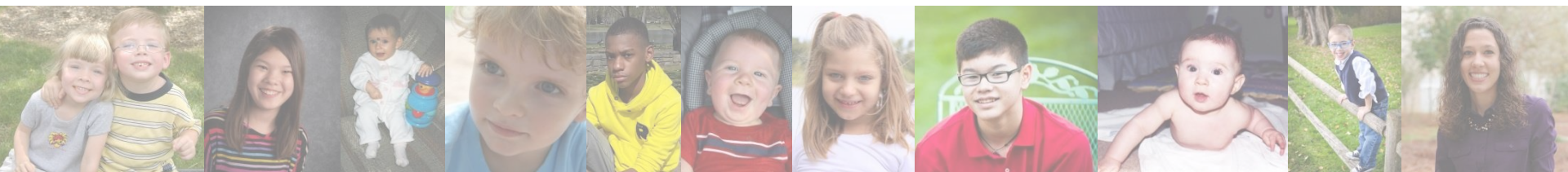


Perinatal Stroke: Treatment (Long Term)

Rehabilitation is key to help with long-term outcome:



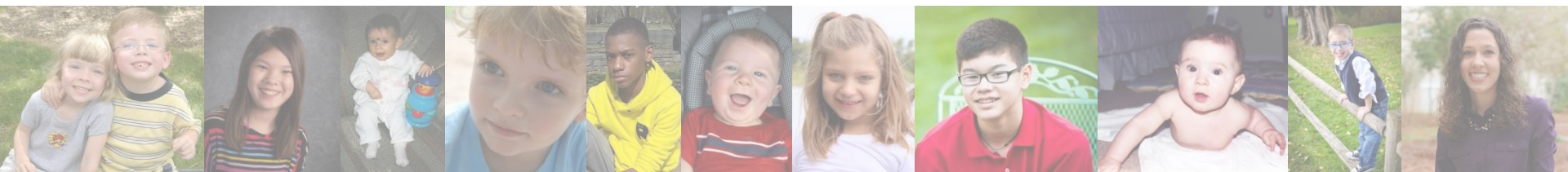
- ☐ It is important to note that the child's rehabilitation needs may change as they grow and develop .
- ☐ Please refer to the 'Additional Considerations' section of this guide, which reviews more detailed therapy information by age group.



Perinatal Stroke: Guidelines

Detailed guidelines from the American Heart Association/American Stroke Association can be found online:

<http://stroke.ahajournals.org/content/39/9/2644.full>

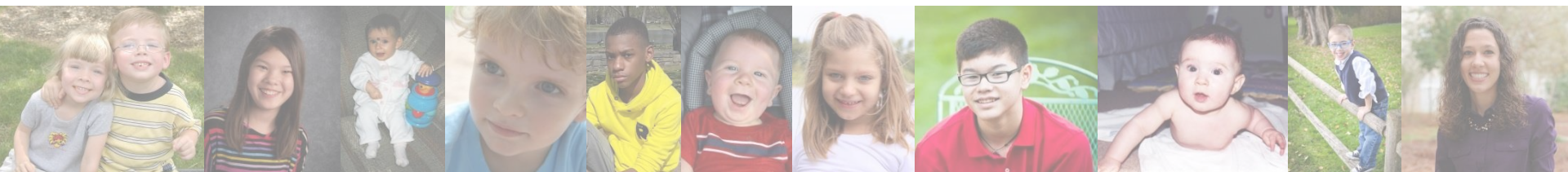


Childhood Stroke

1 month old – 18 years old



Aidan, Childhood Stroke at age 2 months

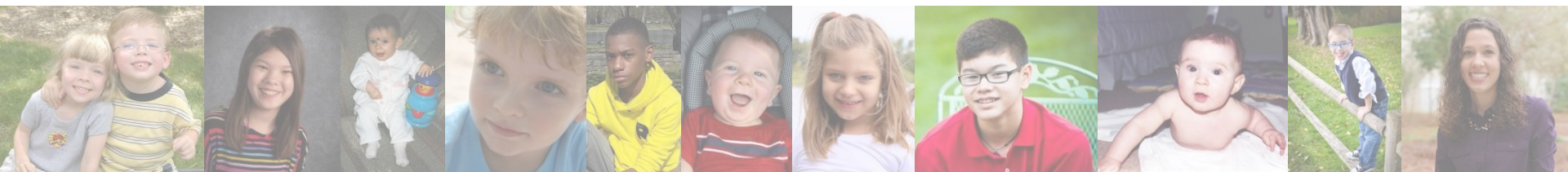




Addison, perinatal stroke

“Our children are an inspiration, they are much more than a diagnosis and they will continue to teach us all that difference can be beautiful and to never underestimate what they can overcome.”

Kaysee, Addison's Mom



Childhood Stroke (1 month-18 years): Facts & Figures

About **50%** are Ischemic Stroke and **50%** Hemorrhagic Stroke.²

Did You Know?

Occurs in approximately **1.2-13 children per 100,000** each year. The risk of recurrence is **15-18%**.^{2,6}

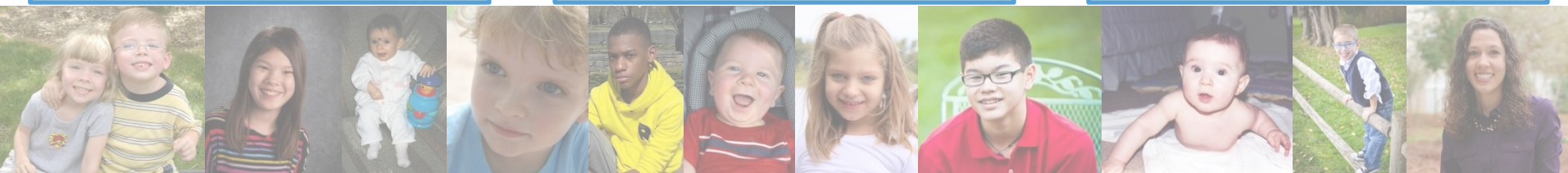
Children and adolescents with stroke may have **atypical presentations** when compared with adult patients.⁹

Prior illness (like infection), or events (like trauma) **should not prevent** a diagnosis of stroke. These may often be a cause of the stroke.⁹

Children with **CVST** commonly present with **headache or seizure**.⁹

Children with symptoms compatible with TIA commonly have **brain infarction** on imaging despite the **transient symptoms**.⁹

Over **50%** of children with ischemic stroke have a **known risk factor** at the time of infarct. In at least **2/3** of children who have stroke, **more than one stroke risk factors** can be identified after a thorough work-up.⁹



Childhood Stroke

Risk Factors

Congenital Heart Disease¹¹

Cardiac Disorders (including myocarditis, arrhythmias, cardiac surgeries/procedures)⁹

Cerebral Vascular Disorders (including vascular malformation, arterial dissection, vasculitis, Moya Moya, transient arteriopathy, prior radiation therapy)^{11,9}

Infections (including meningitis, varicella)¹¹

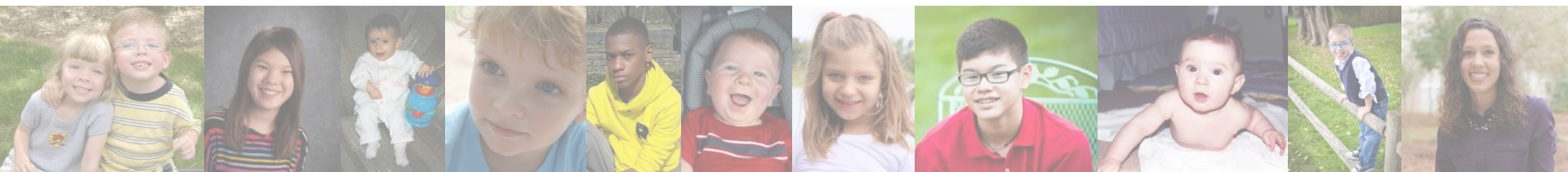
Traumatic Brain and Traumatic Neck Injury^{11,9}

Autoimmune Disorders (including lupus, inflammatory bowel disease)¹¹

Hypercoaguable States (including Sickle Cell Disease, malignancy, TTP, use of chemotherapeutic agents)^{11,9}

Genetic Causes (including dyslipoproteinemia, connective tissue disorders, acidemias, Fabry disease)⁹

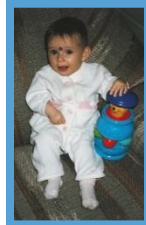
Unknown Cause⁹



Childhood Stroke: Signs & Symptoms



New onset **seizures**¹¹



Sudden numbness or weakness of the face, arm or leg (especially one-sided)¹¹



Sudden confusion, difficulty speaking or understanding¹¹



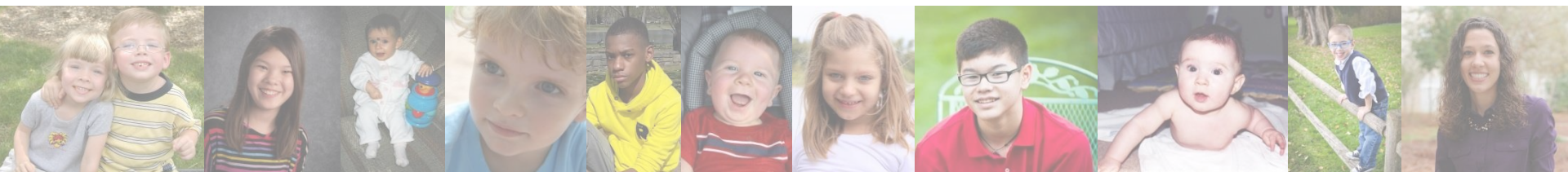
Sudden trouble seeing, loss of vision or double vision¹¹



Sudden difficulty walking, dizziness, loss of balance or coordination¹¹



Sudden severe headache, especially if associated with vomiting or sleepiness. **Decreased** level of consciousness.¹¹



Stroke Mimics

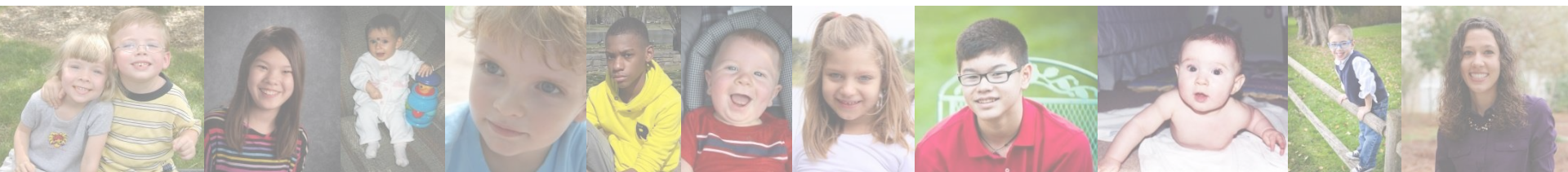
Stroke should always be considered first and is a diagnosis of exclusion. In children, there are many stroke mimics that are **not benign**. Because of this, it is imperative that the child should receive **emergent evaluation** as soon as the symptoms are recognized. Some common stroke mimics in this age group include:

Benign

- Migraine
- Psychogenic
- Musculoskeletal abnormalities
- Delirium
- Periodic hypertensive episodes³⁴

Not Benign

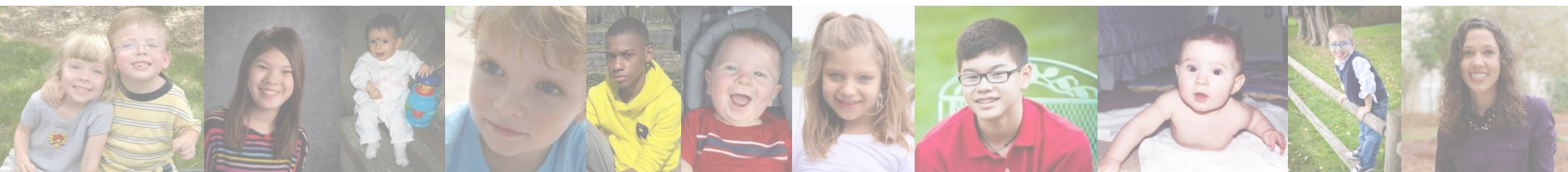
- Seizures/Epilepsy, postictal paralysis
- Tumor
- Cerebellitis
- Drug toxicity
- Idiopathic intracranial hypertension
- Subdural hematoma
- AVM
- Moyamoya
- Intracranial abscess³⁴



Childhood Stroke: Diagnosis

General Considerations

- Understanding of developmental expectations and milestones in this age group is imperative.
- Comprehensive assessment of neurologic status, clinical presentation and radiological imaging is also necessary.
- There is a battery of tests that need to be done if no cause or risk factor is evident. Finding out the cause of a stroke provides some relief to the family and also aids in answering questions about prognosis and recurrence. In many cases a definitive cause for the stroke is never found.



Childhood Stroke: Diagnosis

CT

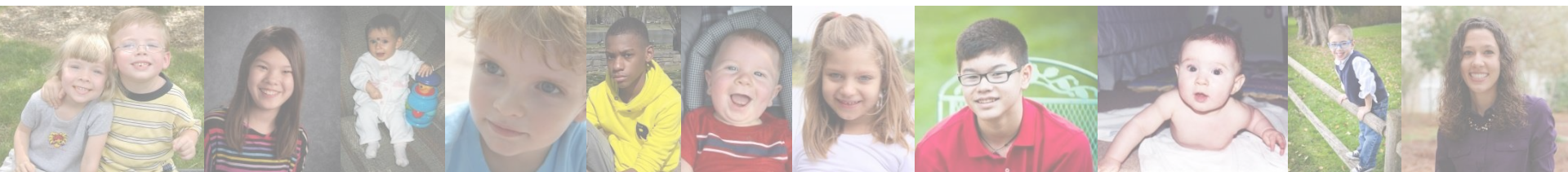
- CT is quick and readily available.
- Can identify superficial lesions.
- May miss Cerebral Venous Sinus Thrombosis (CVST) and early Acute Ischemic Stroke.
- Consider risk of radiation , especially if CTA or CTV is utilized.⁹

MRI

- MRI may more accurately show hyperacute and acute ischemic lesion and CVST.
- May also more accurately diagnose stroke mimics, like brain tumors.
- The patient may require sedation.
- MRA/MRV may be considered to evaluate for vessel disease, such as arterial or venous occlusion. MR Spectroscopy may be considered to evaluate for metabolic disorders.⁹

Angio-gram

- May be needed to identify vascular lesions, like aneurysm and AVM.
- The patient may require sedation or general anesthesia.⁹



Childhood Stroke: Diagnosis

EEG

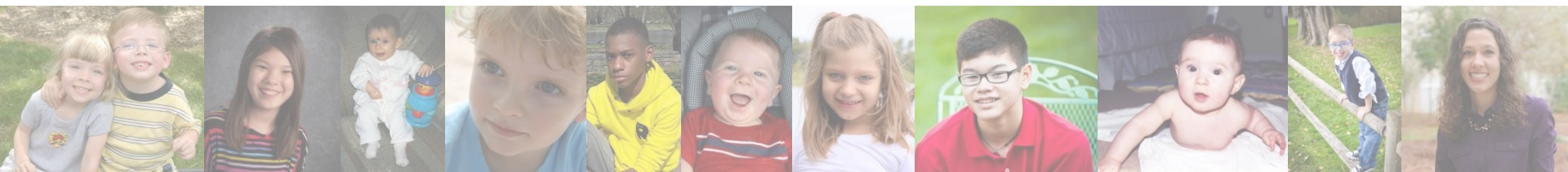
May be completed if associated or suspected seizure activity.⁹

Labs

- Blood (may need extended hematologic workup per subspecialist recommendations).
- Urine.
- Cerebrospinal Fluid (may be indicated to assess for inflammatory, autoimmune or infectious causes).⁹

ECHO, ECG

- May be completed to evaluate for cardiac causes.
- ECHO may be needed urgently if a cardioembolic source is suspected.¹⁰



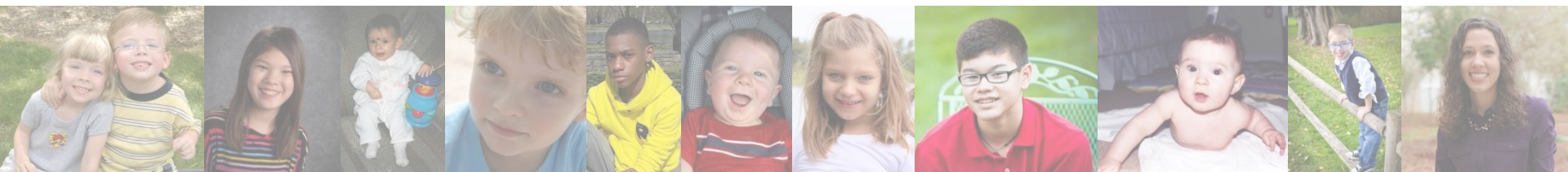
Childhood Stroke: Treatment

General Considerations

Time = Brain:

Early recognition of stroke symptoms, emergent transport and evaluation

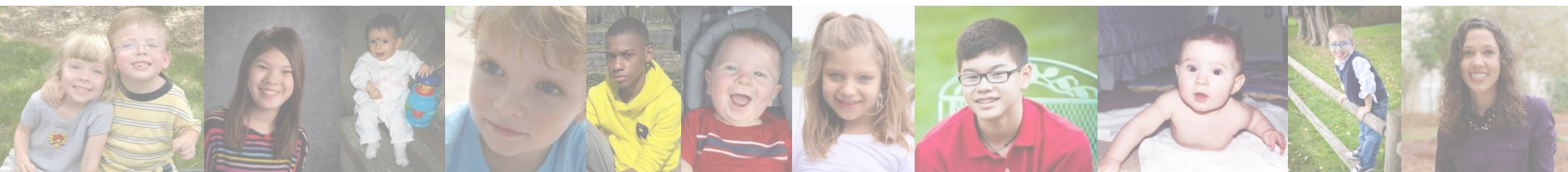
- Treatment is important, yet understudied in this patient population. It depends on the type of stroke and should be considered in both the short and long term.⁹
- Comprehensive assessment of neurologic status, clinical presentation and radiological imaging is also necessary.
- There is a battery of tests that need to be done if no cause or risk factor is evident. Finding out the cause of a stroke provides some relief to the family and also aids in answering questions about prognosis and recurrence. In many cases a definitive cause for the stroke is never found.



Childhood Stroke: Treatment

Emergent Treatment Considerations

- ☐ Time is Brain, Stroke is an **EMERGENCY**
- ☐ **Delays** in diagnosis, management, triage and evaluation **may result in worse outcomes** and **limit treatment options**.



Childhood Stroke: Treatment (Emergent)

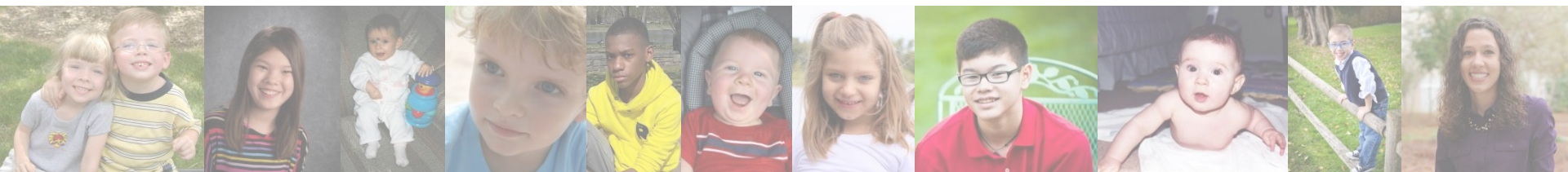
Acute Ischemic Stroke

The clot-busting drug tPA is a key treatment of ischemic stroke in adults. No consensus exists about the use of IV tPA in older adolescents who otherwise meet the standard adult tPA eligibility criteria.⁹

IV tPA has been utilized on a case by case basis in children >2 years old who present within less than 4.5 hours of initial symptom onset.⁹

The safety and efficacy of IV tPA in children is not known and is generally not recommended as standard therapy outside of a clinical trial.⁹

Children presenting with possible acute ischemic stroke should undergo rapid evaluation in consultation with a pediatric stroke specialist, to determine management strategies and candidacy for acute intervention.⁹



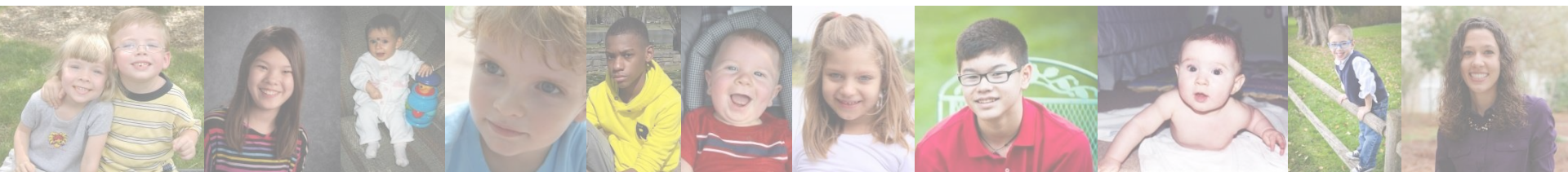
Childhood Stroke: Treatment (Emergent)

Hemorrhagic Stroke

Severe coagulation factor deficiencies should receive replacement therapy.⁹

Vascular anomalies should be corrected when clinically feasible.⁹

Surgical intervention may be indicated in some patients with elevated ICP.⁹

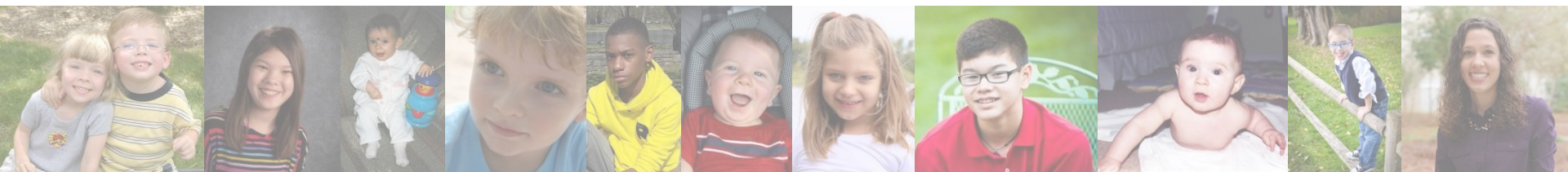


Childhood Stroke: Treatment (Emergent)

Cerebral Venous Sinus Thrombosis (CVST)

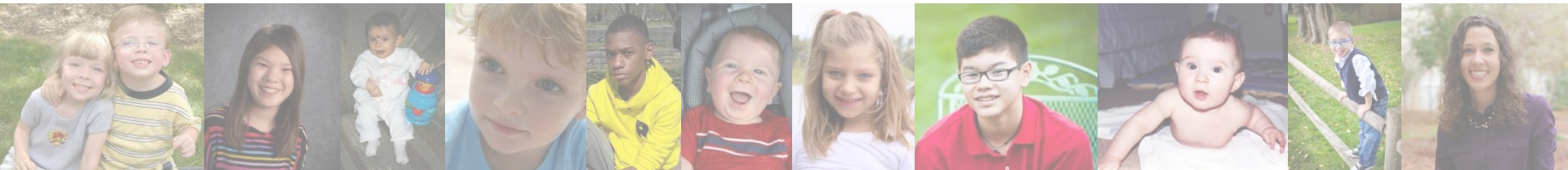
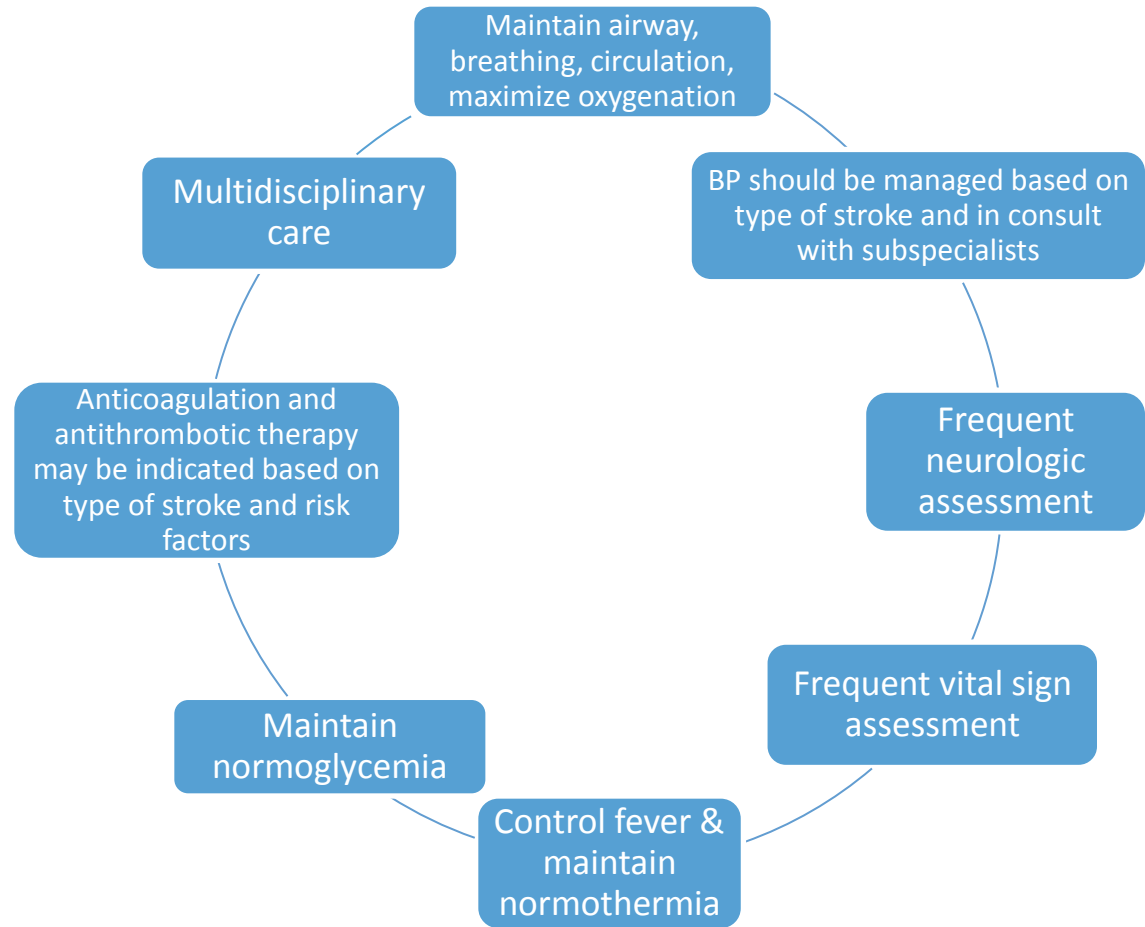
Anticoagulation therapy.⁹

Thrombolytic therapy with tPA may be considered in selected children with CVST.⁹



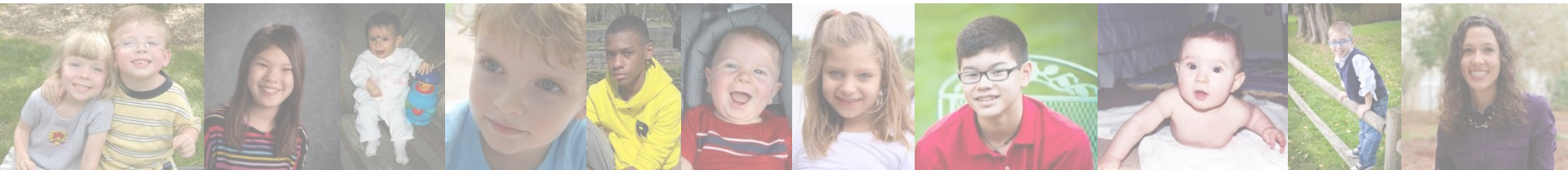
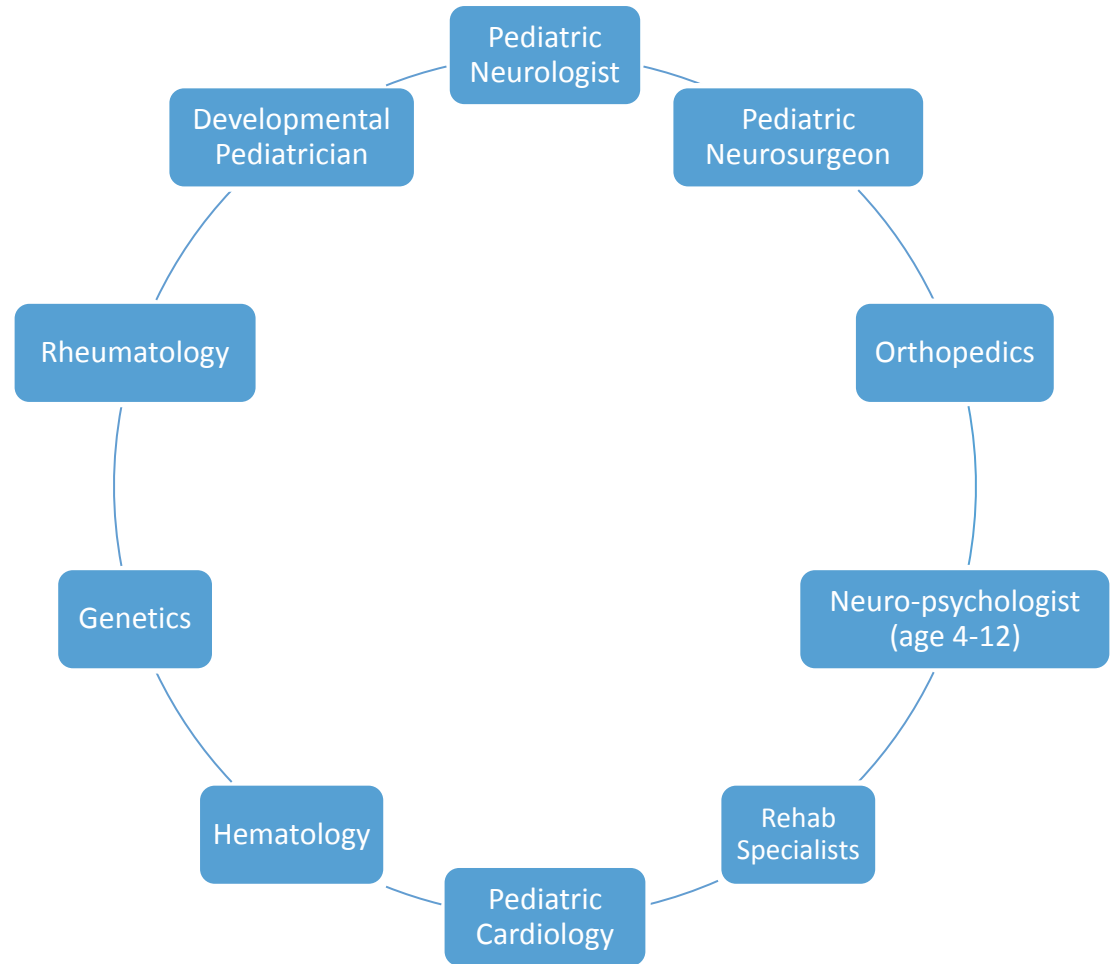
Childhood Stroke: Treatment (Acute)

Acute treatment is focused on supportive care⁹:



Childhood Stroke: Treatment (Long Term)

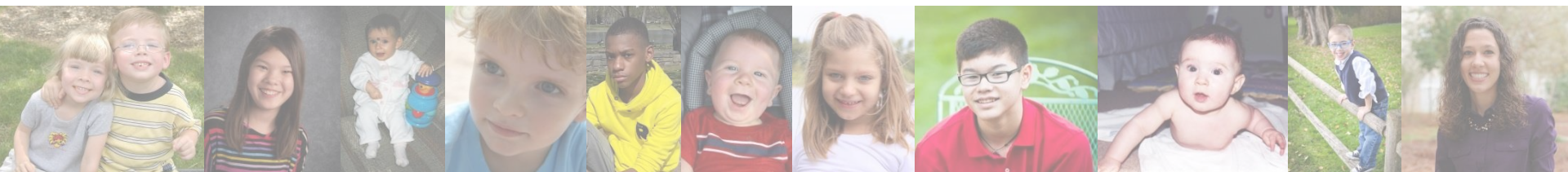
In addition to the primary care provider, there may be multiple subspecialists involved in the care. These specialists may include¹⁰:



Childhood Stroke: Guidelines

Detailed guidelines from the American Heart Association/American Stroke Association can be found online:

<http://stroke.ahajournals.org/content/39/9/2644.full>



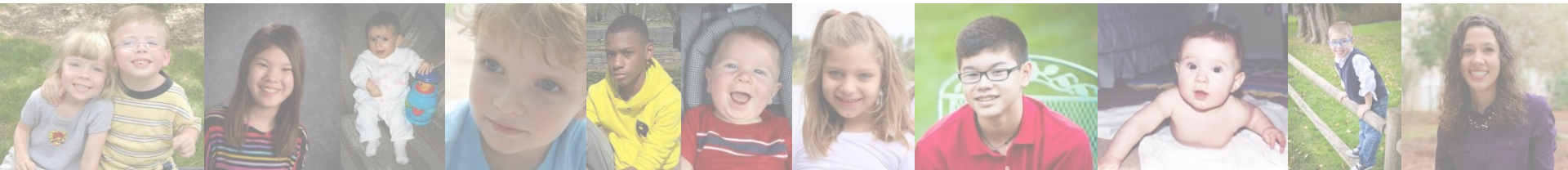
Childhood Stroke:

Additional Considerations for Infants & Toddlers

(1 month old – 3 years old)

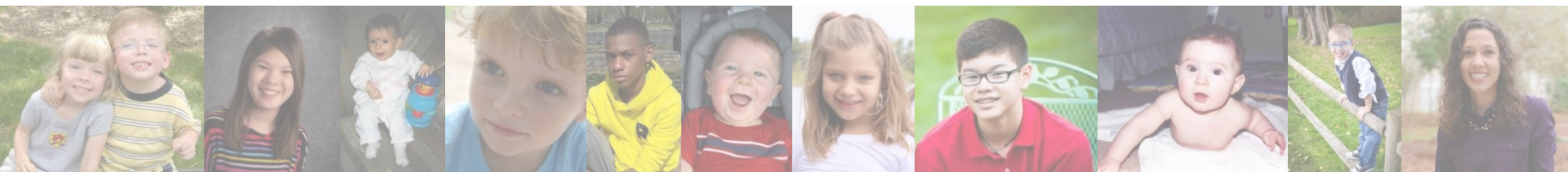
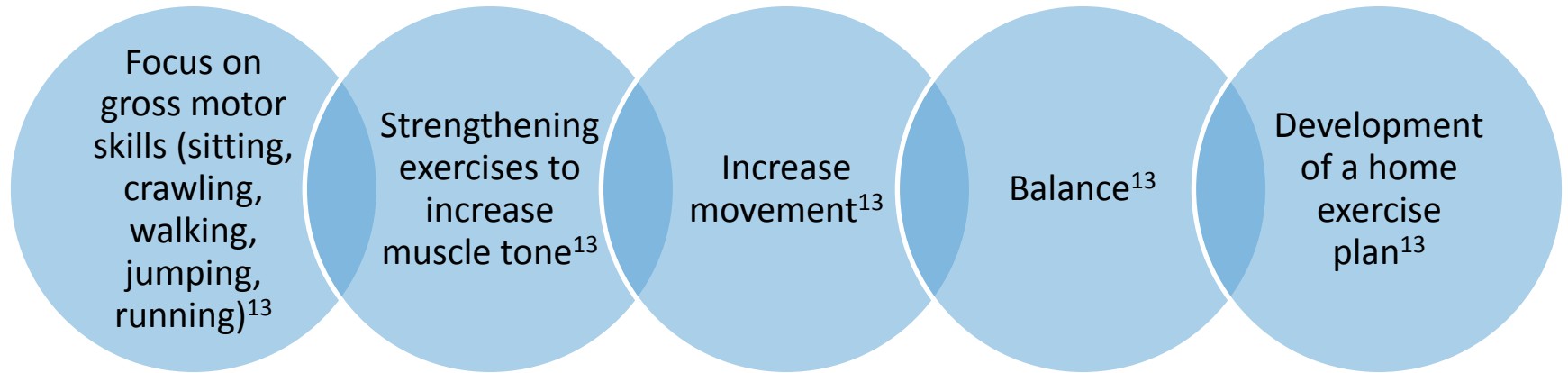


Bella, Childhood Stroke at age 3



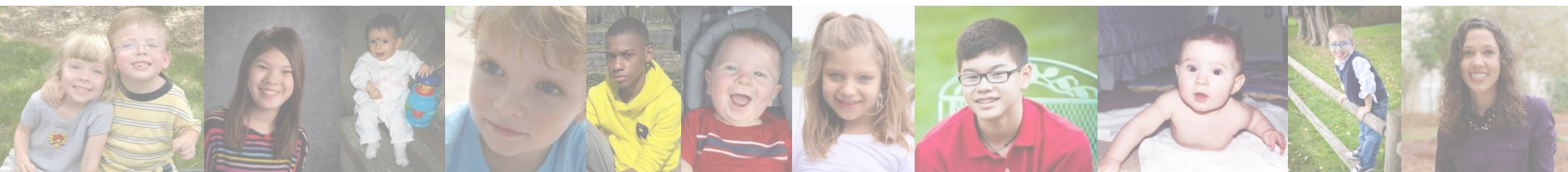
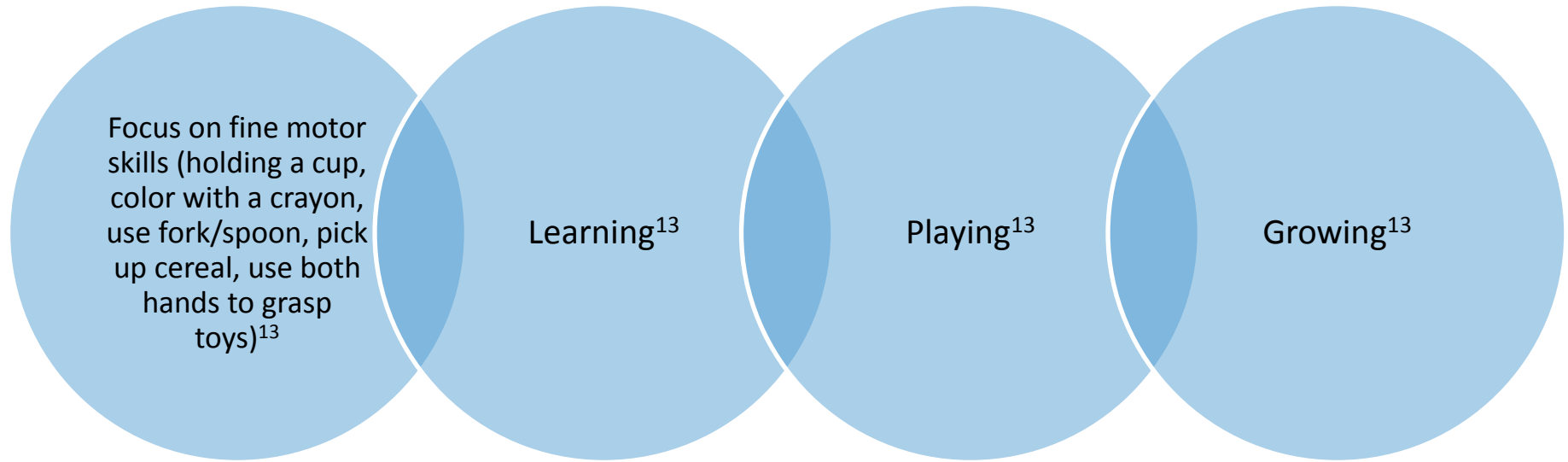
Treatment: Long Term

Physical therapy in this age group can help the child:



Treatment: Long Term

Occupational therapy in this age group can help the child:



Treatment: Long Term

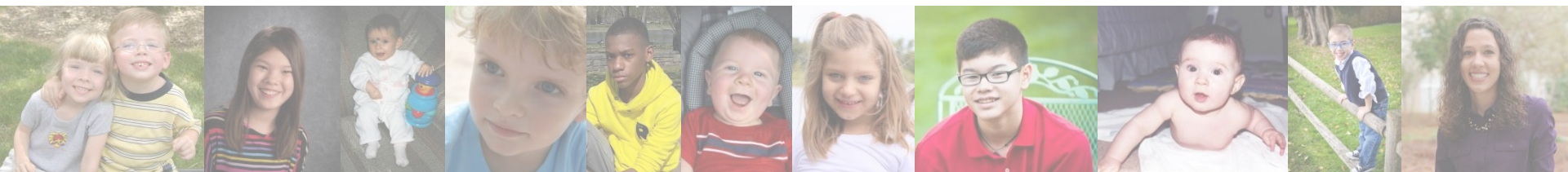
Speech therapy in this age group can help the child:

Focus on speech development, swallowing & eating¹³

Evaluate infants for suck-swallow coordination¹³

Evaluate toddlers for speech development (toddlers)¹³

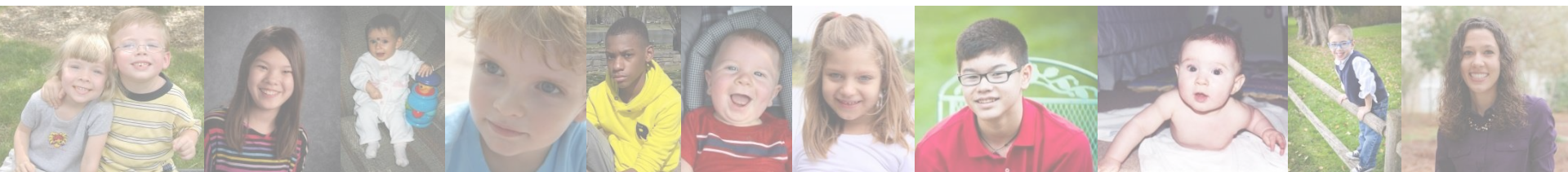
Sign-language¹³



Treatment: Long Term

Early Intervention Educational Services

- Available to address educational and developmental needs of children younger than age 3.
- Services are provided at the local level with state supervision.
- Encourage parents to find out more about early intervention resources in their state.



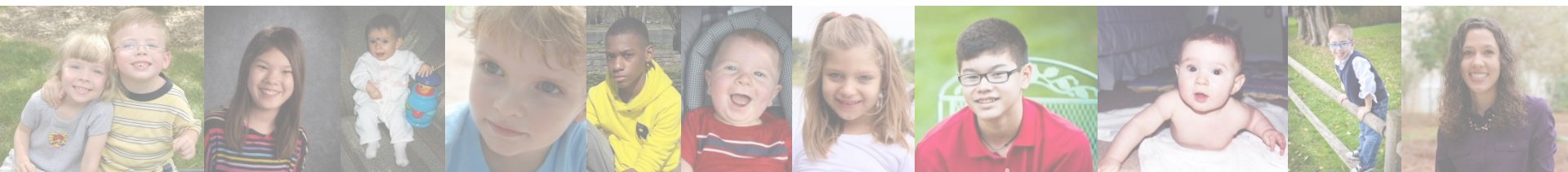
Childhood Stroke:

Additional Considerations for Early Childhood

(4 years old – 12 years old)

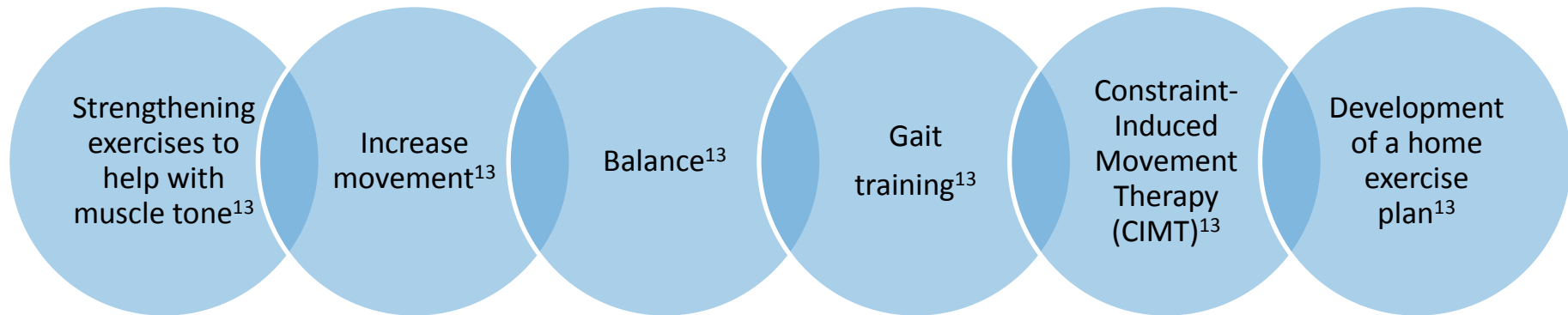


Hailey, Childhood Stroke at age 9

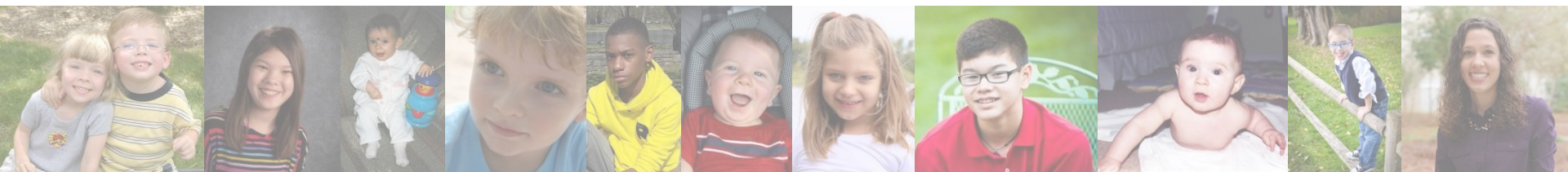


Treatment: Long Term

Physical therapy in this age group can help the child:

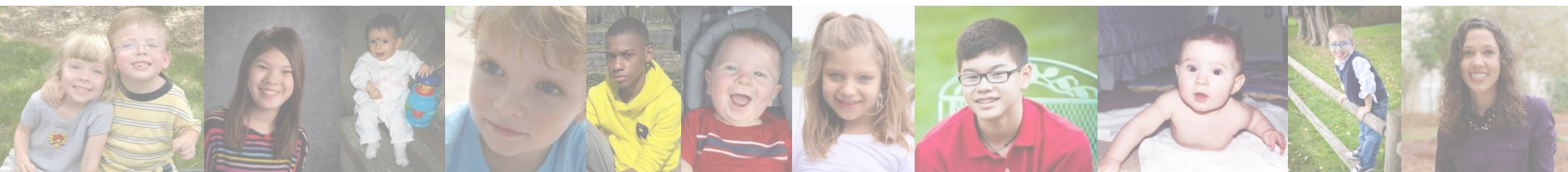
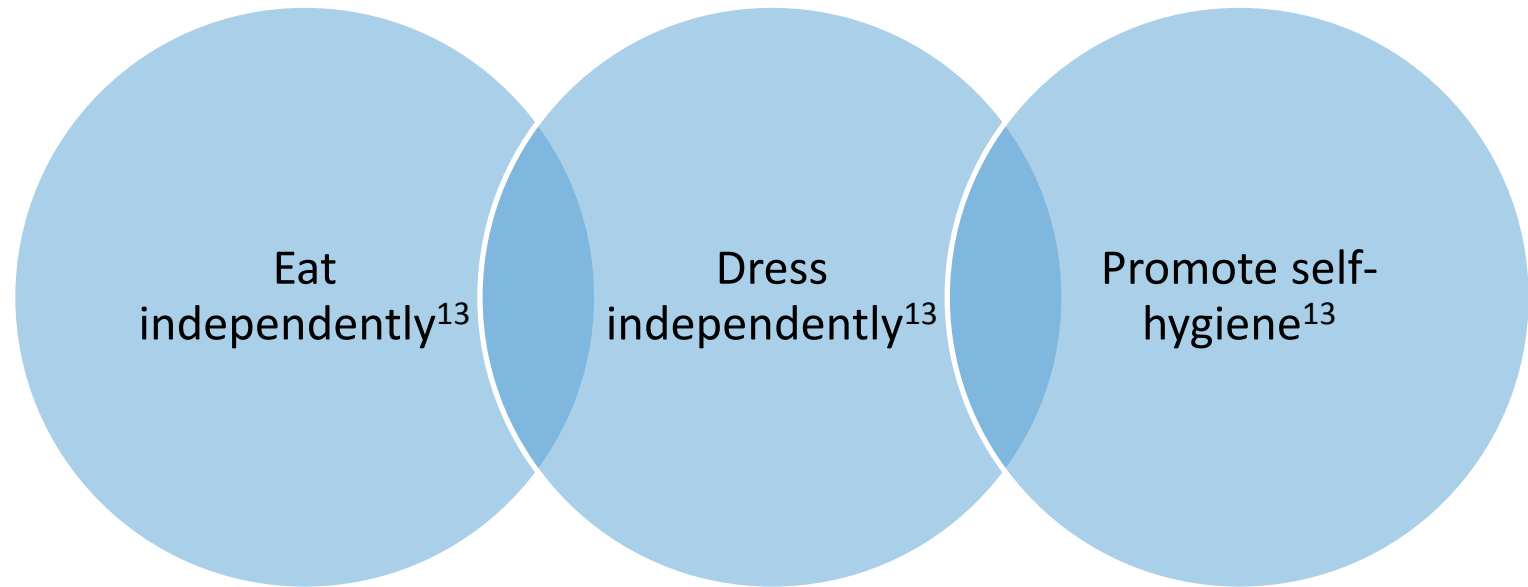


Constraint-Induced Movement Therapy (CIMT) is a therapy that promotes hand and arm function by using restraint. The unaffected side is restrained with a brace or cast promoting function on the affected side. More research needs to be done on its effectiveness in children. Because of this, it is typically not covered by insurance.¹⁰



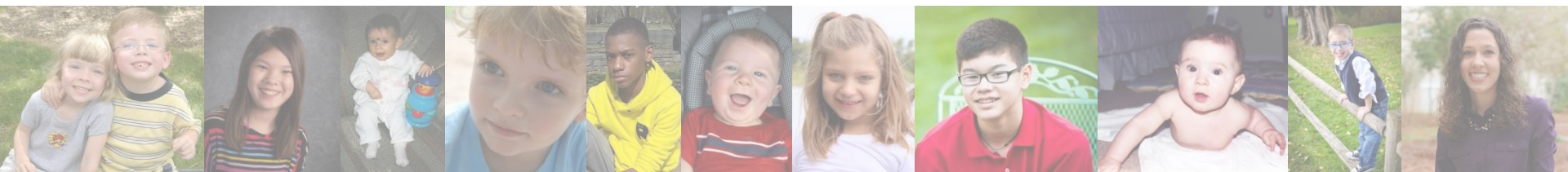
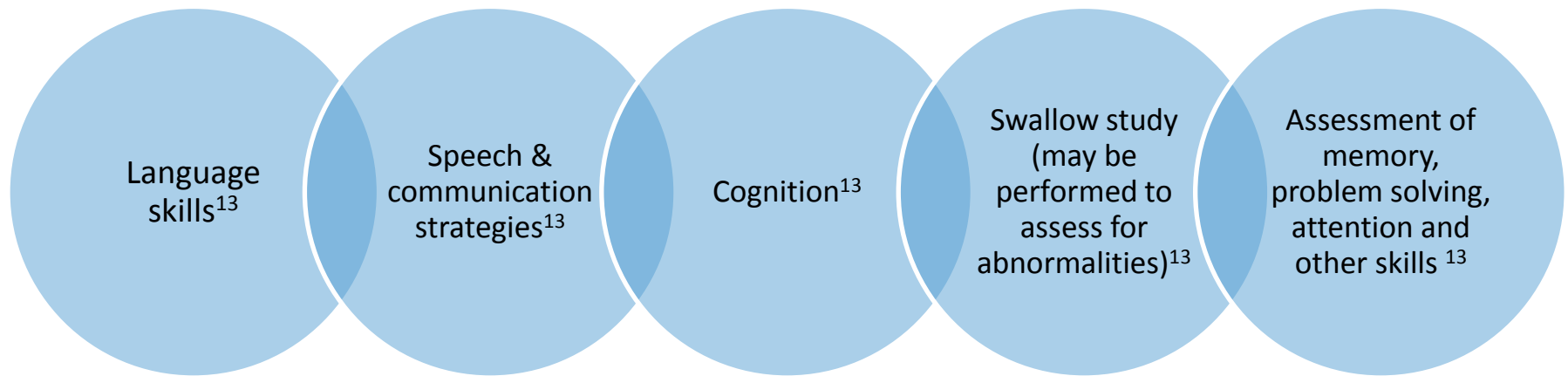
Treatment: Long Term

Occupational therapy in this age group can help the child:



Treatment: Long Term

Speech therapy in this age group can help the child:



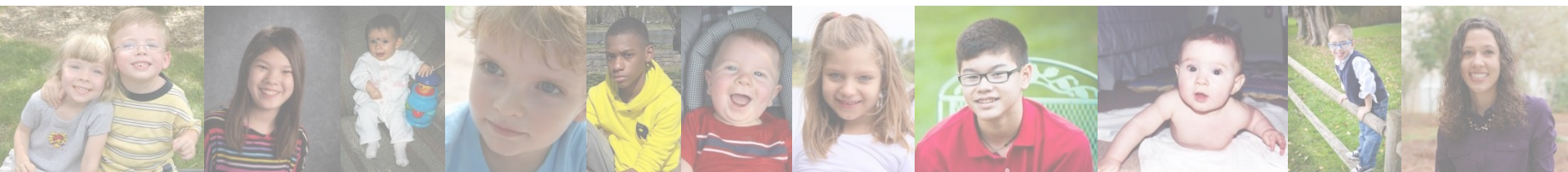
Treatment: Long Term

Pre-School Educational Services

- Available to address educational and developmental needs of children ages 3-5.
- Services are provided at the local level with state supervision.
- Encourage parents to find out more about educational resources in their state for this age group.

Neuropsychology Evaluation

- An assessment of skills and ability in this age group can help to identify any additional needs including educational, emotional and social.¹⁹



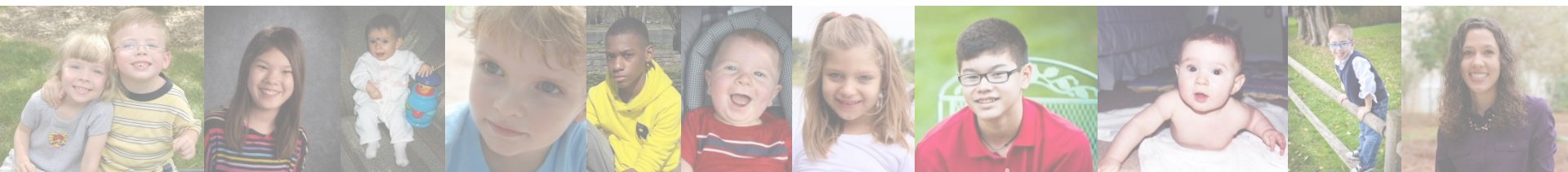
Childhood Stroke:

Additional Considerations for Teenagers

(13 years old – 18 years old)



Ryley, Childhood Stroke at age 15



Additional Risk Factors For Consideration in Teenagers

Smoking^{14,15}

Substance Abuse^{14,15}



Oral Contraceptive Pills (OCP)

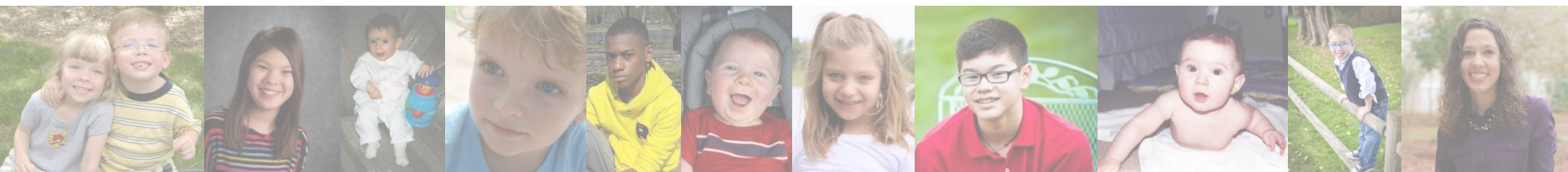
More research needs to be done for the following risk factors that may also be present in teenagers:



High
Cholesterol^{14,15}

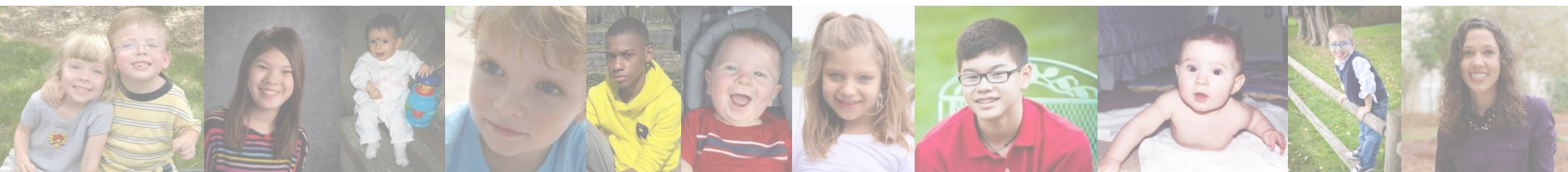
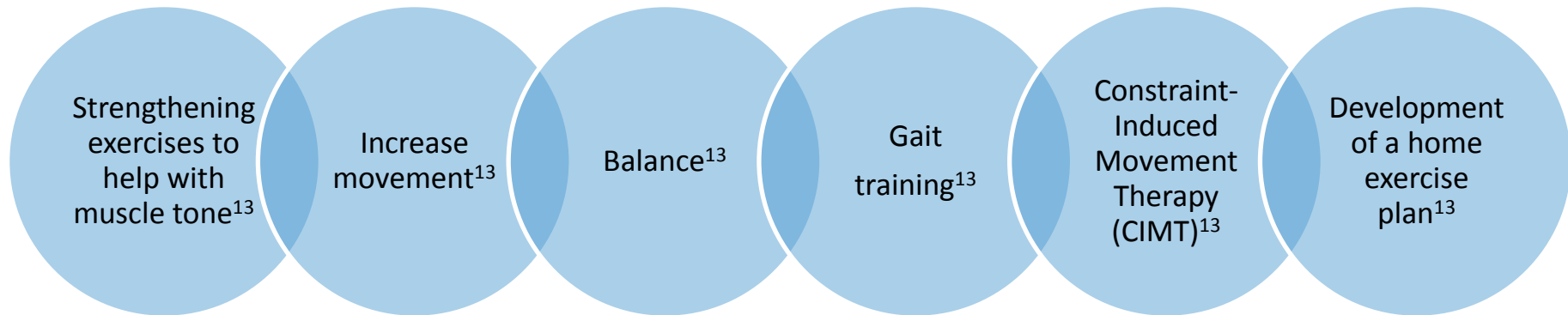
Diabetes^{14,15}

High Blood Pressure^{14,15}



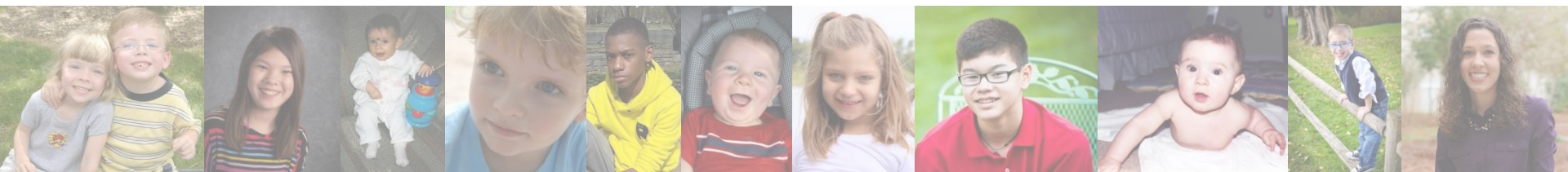
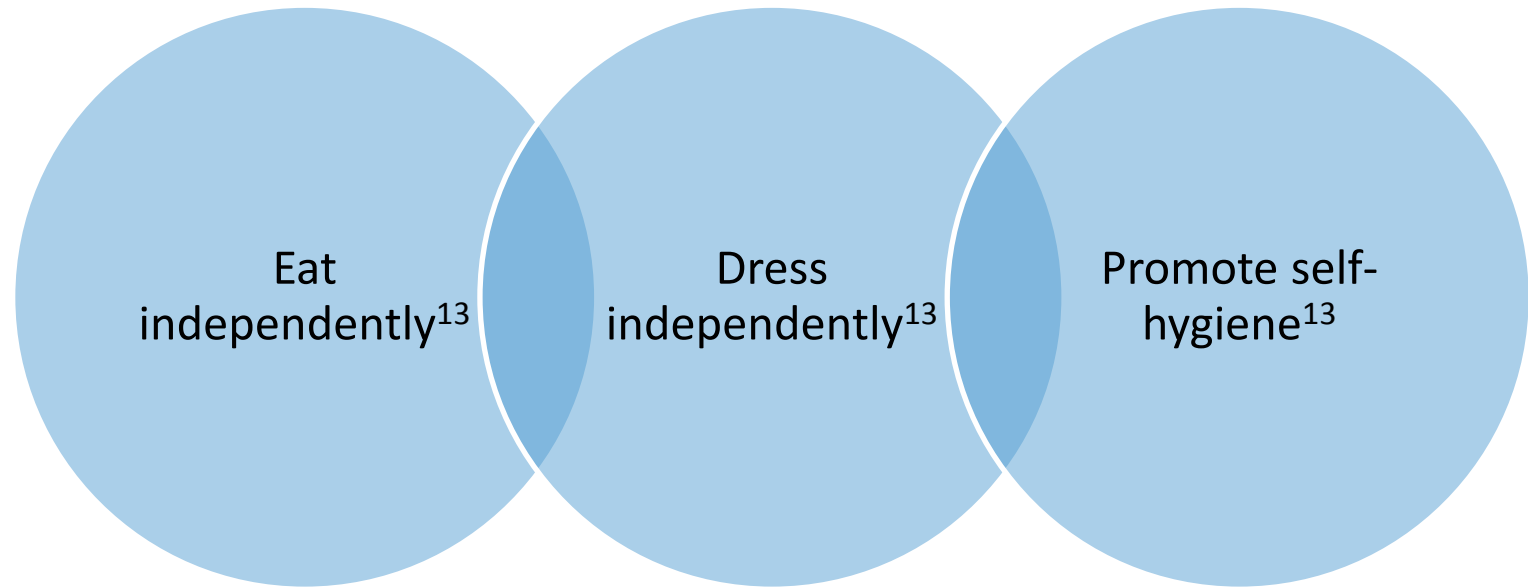
Treatment: Long Term

Physical therapy in this age group can help the teen:



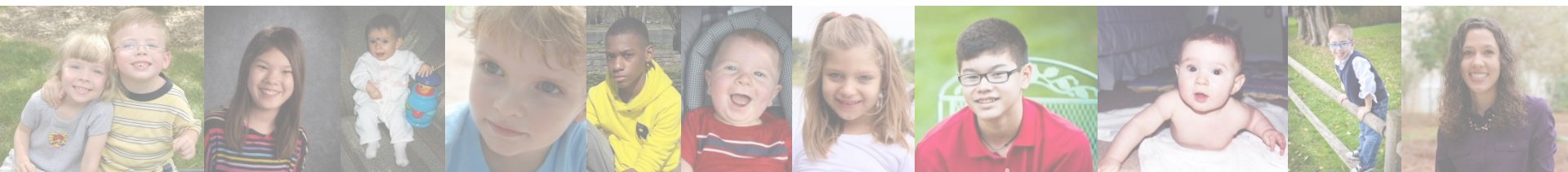
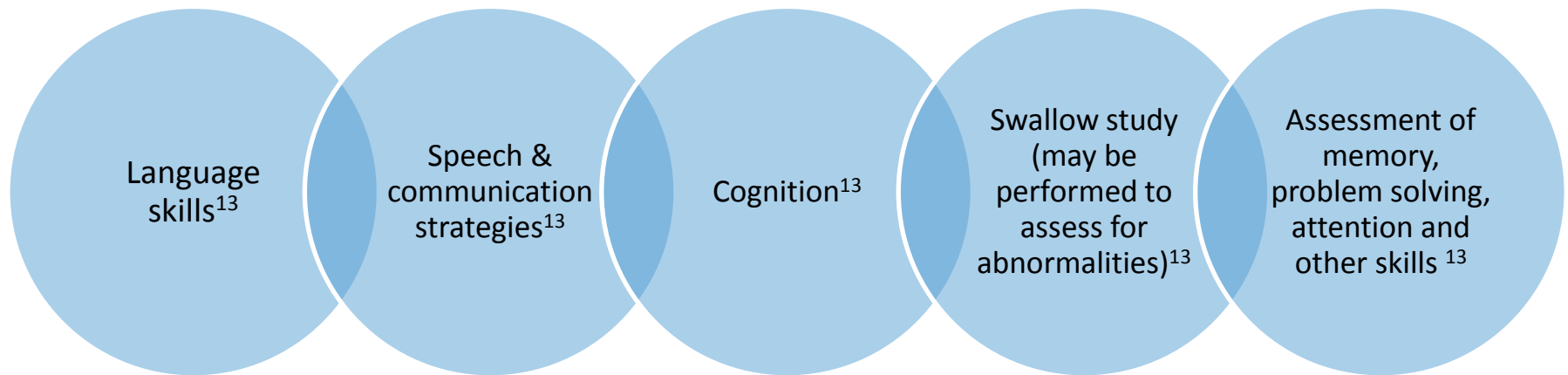
Treatment: Long Term

Occupational therapy in this age group can help the teen:



Treatment: Long Term

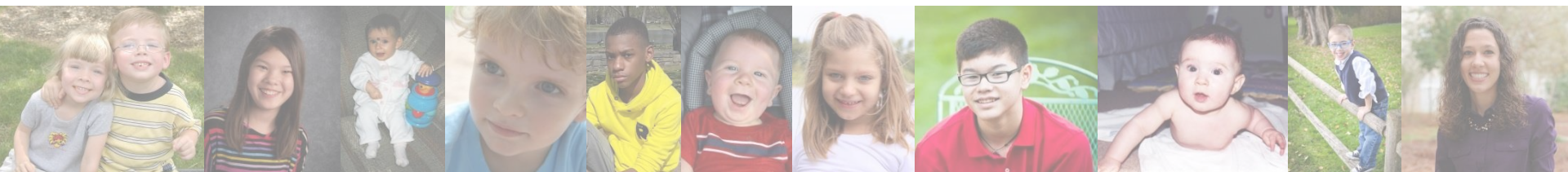
Speech therapy in this age group can help the teen:



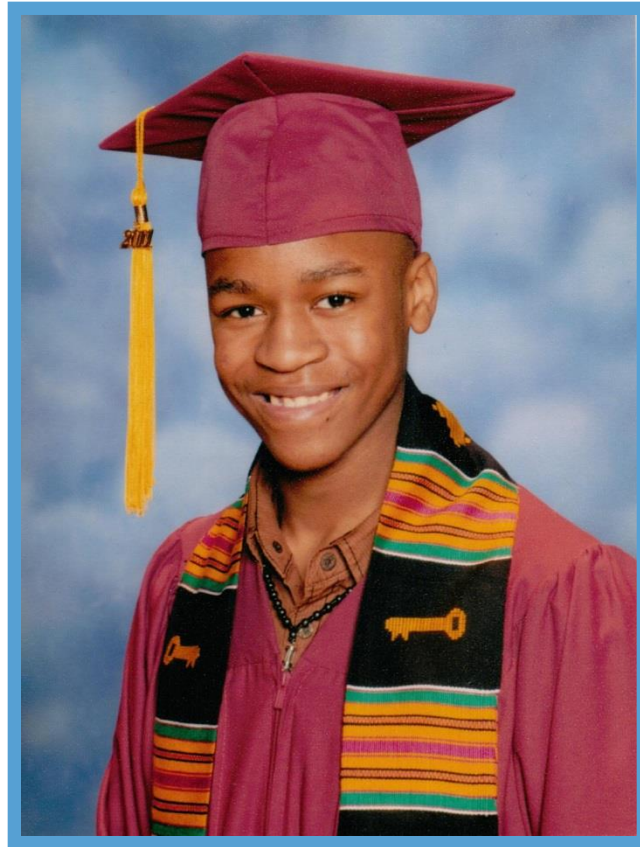
Treatment: Long Term

Young Child & Teenage Educational Services

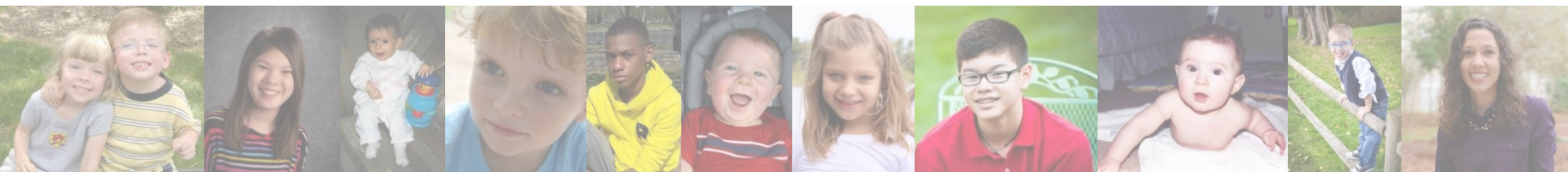
- Available to address educational and developmental needs of children ages 5-18.
- Services are provided at the local level with state supervision.
- Encourage parents to find out more about educational resources in their state for this age group.



Secondary Stroke Prevention: General Considerations



Brandon, Perinatal Stroke

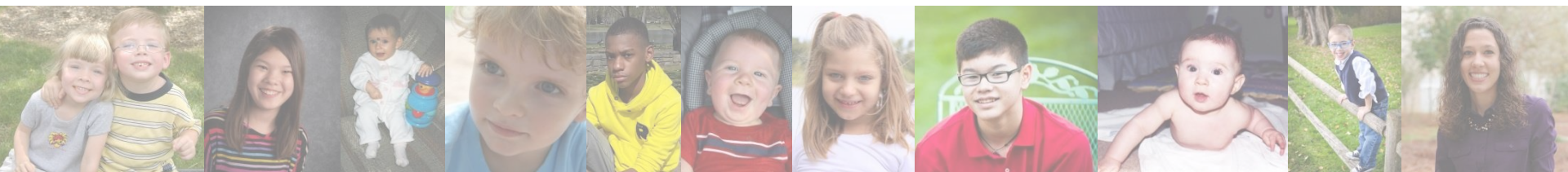


Secondary Stroke Treatment

Considerations

There are no controlled trials looking at the effectiveness of secondary stroke treatment in children.¹⁶

It is important for practitioners to identify risk factors and manage accordingly.¹⁶



Secondary Stroke Prevention: Controlling Risk Factors

Tobacco

- Assess for use of tobacco products by patient AND members of household.¹⁶
- Encourage avoidance of tobacco and second-hand smoke.¹⁶

Oral Contraceptives

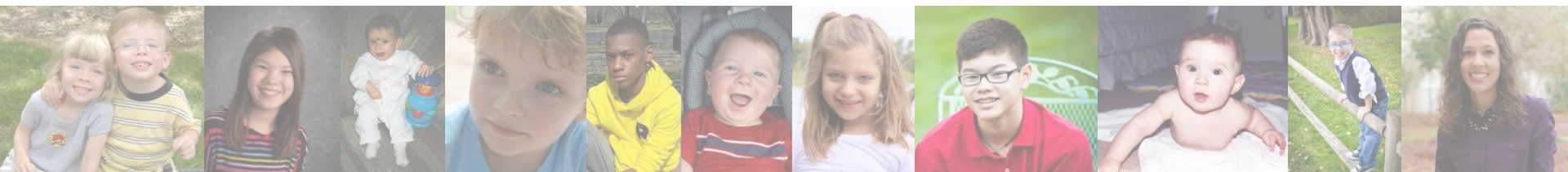
- Assess for usage of oral contraceptive s containing estrogen in older children & teenagers.¹⁶
- Discontinue and switch to alternate means of birth control under the guidance of hematologist or qualified obstetrician.¹⁶

Sickle Cell Disease

- Periodic blood transfusion in children age 2-16.⁹
- Regular monitoring of Transcranial Dopplers (TCD).⁹

Antithrombotics, Anticoagulants

- Consider based on cause of stroke per AHA/ASA guidelines.⁹
- Dual antiplatelet therapy is not typically recommended.^{9,16}



Secondary Stroke Prevention: Controlling Risk Factors

Migraines

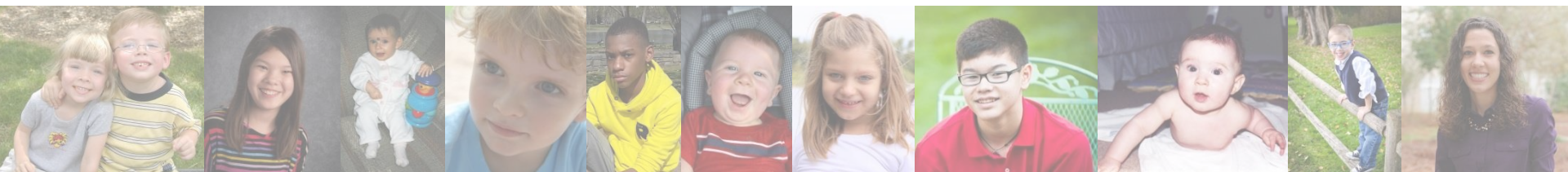
- Avoid oral contraceptives that contain estrogen.⁹
- Evaluate for other stroke risk factors.⁹
- Avoid triptans in patients with hemiplegic migraines, migraines with brainstem aura, known vascular risk factors or prior cardiac/cerebral ischemia.^{16,9}

Lifestyle

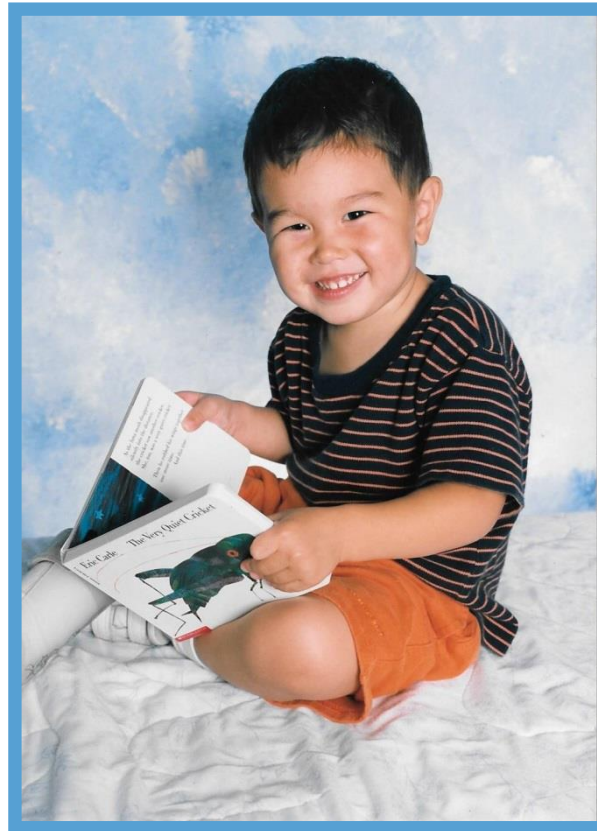
- Encourage healthy balanced diet.¹⁶
- Encourage benefits of regular exercise routine.¹⁶

Vitamin Supplementation

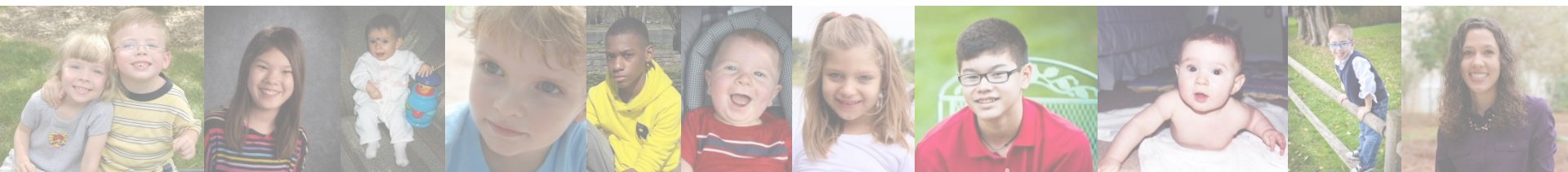
- When homocysteine levels are elevated, consider diet modification and vitamin supplements (B6, folate or B12) as well as testing for homocysteinuria.¹⁶
- Iron deficiency should be treated with diet or supplements if present.¹⁶
- Other metabolic and mitochondrial diseases may benefit from dietary modification or vitamin supplementation.¹⁶



Additional Education & Resources



Nick, Perinatal Stroke



Resources



The International Alliance for Pediatric Stroke (IAPS)

iapediatricstroke.org

- Created to unite pediatric stroke communities around the world to advance knowledge, awareness and research for pediatric stroke.
- IAPS provides information, inspiration, resources and the connection between families, medical specialists, researchers, healthcare providers and anyone affected by pediatric stroke.
- *Coming Soon*** A list of pediatric stroke specialty centers and hospitals across the country.

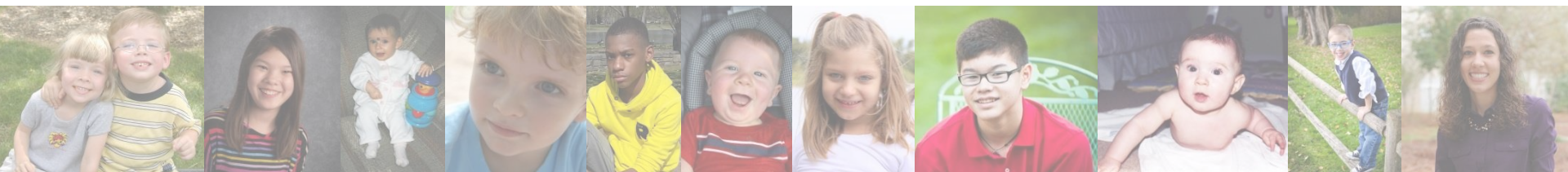
The American Stroke Association (ASA)

strokeassociation.org

- The ASA serves consumers (stroke survivors, caregivers, and family and friends of those affected by stroke), healthcare professionals, organizations, hospitals and all Americans interested in receiving information about stroke.

Direct Link to Pediatric Resource Page:

http://www.strokeassociation.org/STROKEORG/AboutStroke/StrokeInChildren/Stroke-In-Children_UCM_308543_SubHomePage.jsp



Resources



Brendon's Smile

brendonssmile.org

-The mission is to increase awareness and knowledge among both the general public and medical professionals about strokes and cerebrovascular disease in the unborn, newborns, and children up to 18 years of age.

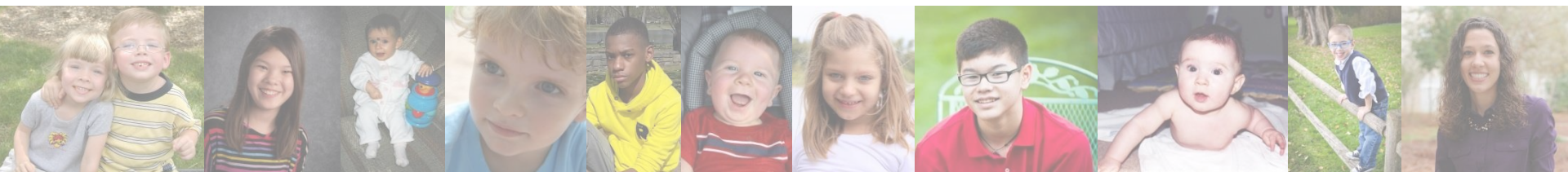
The National Stroke Association (NSA)

stroke.org

-The National Stroke Association provides stroke education and programs to stroke survivors, caregivers, and healthcare professionals.

Direct Link to Pediatric Resource Page:

<http://www.stroke.org/understand-stroke/impact-stroke/pediatric-stroke>



Resources



Fight The Stroke

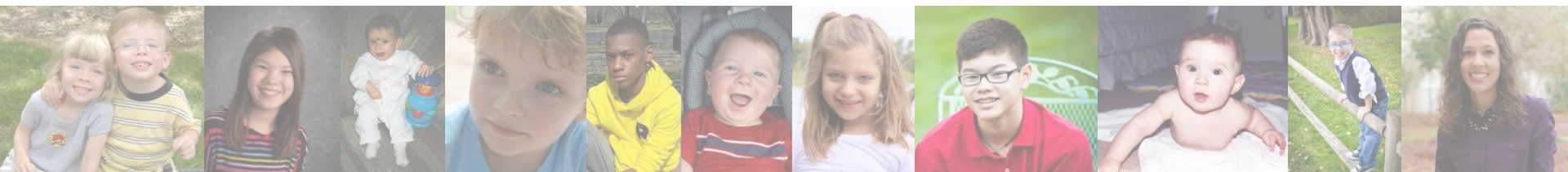
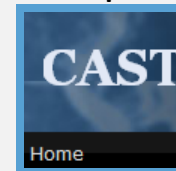
fightthestroke.org

-The mission is to increase awareness and knowledge among both the general public and medical professionals about strokes and cerebrovascular disease in the unborn, newborns, and children up to 18 years of age.

Carolina Acute Stroke Training (CAST)

<https://learn.pharmacy.unc.edu/>

- Modules designed to educate healthcare workers on stroke care from basic to advanced levels.
- Available free of charge to healthcare workers 24 hours a day, 7 days a week.
- *Coming Soon*** A pediatric module will be available in spring 2016.



Resources



Project for the Expansion of Education in Pediatric Stroke (PEEPS)

Patient and Family Guide

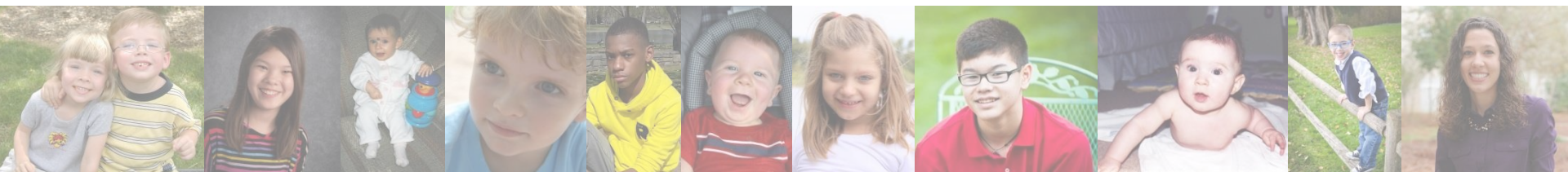
Available for download at:

uncstroke.org

PEDIATRIC STROKES: THE WHO, WHAT, WHEN, AND BEYOND...



A Patient and Family Guide



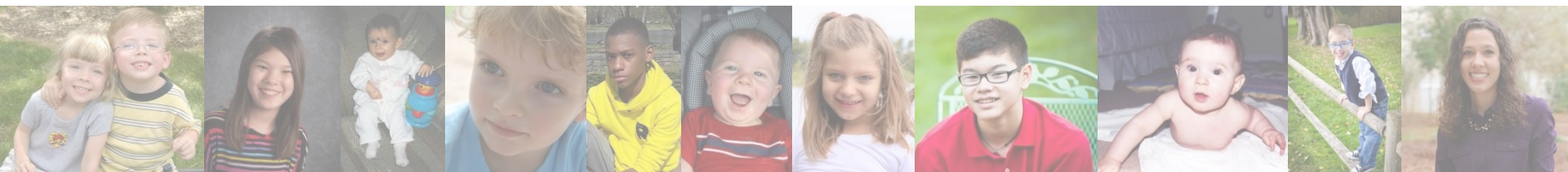
Resources



Helping Kids with Hemiplegia Camp

Helping Kids with Hemiplegia is a therapeutic summer day camp using constraint-induced movement therapy to help children diagnosed with hemiplegia.

<http://bit.ly/UNCHemiplegiaCamp>

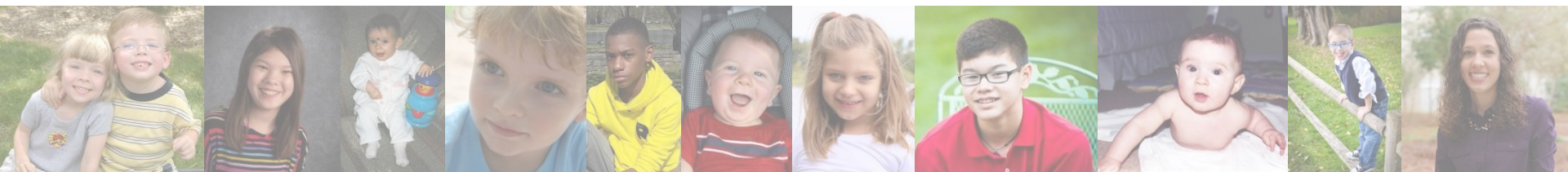




We welcome your feedback and suggestions for improvements to this guide. Please forward to:

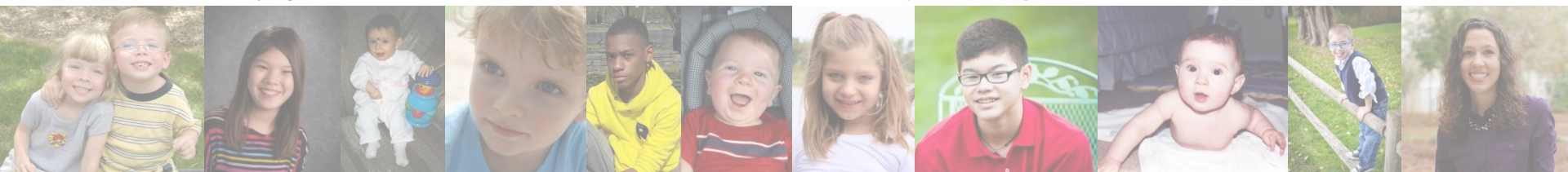
Nicole Burnett, UNC Stroke Program Coordinator

Nicole.Burnett@unchealth.unc.edu



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- ³Ichord, R. (2015). *Stroke in the newborn*. UpToDate. Retrieved <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3255104/>
- ⁴ American Heart Association. (2014). *Strokes can happen at any age*. Retrieved from http://www.strokeassociation.org/STROKEORG/AboutStroke/StrokeInChildren/What-is-Pediatric-Stroke-Infographic_UCM_466477_SubHomePage.jsp
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- ⁶International Alliance for Pediatric Stroke. (2014). *Get the facts about pediatric stroke*. Retrieved from http://iapediatricstroke.org/about_pediatric_stroke.aspx
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- ⁹Roach, E.S., Golomb, M.R., Adams, R., Biller, J., Daniels, S., deVeber, G., Ferriero, D., Jones, B.V., Kirkham, F.J., Scott, M., Smith, E.R. (2008). *Management of stroke in children*. Stroke. 39: 2644-2691.
- ¹⁰ Calgary Pediatric Stroke Program. (2015). *Frequently asked questions on perinatal stroke*. Retrieved from <http://perinatalstroke.com/faq>
- ¹¹ American Heart Association. (2014). *Strokes can happen at any age*. Retrieved from http://www.strokeassociation.org/STROKEORG/AboutStroke/StrokeInChildren/What-is-Pediatric-Stroke-Infographic_UCM_466477_SubHomePage.jsp
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