

Only the Young

Pediatric Stroke Rehabilitation Assessment & Intervention

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childserve

Believing in the spirit of a child.

Disclosures

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**No financial relationships to disclose.*

**No non-financial relationships to disclose.*

Employed at ChildServe as Director of Pediatric Rehabilitation



ChildServe

ChildServe partners with families to help children with special healthcare needs live a *great* life.





Complex Medical

- Long-term Care
- Homecare
- Medical Group Home
- Medical Childcare



Pediatric Rehabilitation

- Outpatient Therapy
 - Physical
 - Occupational
 - Speech
- Pediatric Rehabilitation
- Physical Medicine & Rehabilitation
- Adaptive Equipment/Orthotics

Autism & Behavioral Health

- Autism Day Program
- Applied Behavioral Analysis (ABA)
- Psychology
- Mental Health Therapy



Community Services

- Case Management
- Childcare
- Day Habilitation
- Homes
- Respite
- Supported Community Living (SCL)

Social Services & Supports:

Care Coordination/Case Management, Medical Social Work, Family Support

ChildServe excels at coordination and collaboration between services. Along with comprehensive care across the continuum, we partner with families to recommend the right programming, resources, and funding options that children need to thrive.

Objectives

1. Compare the causes, assessments, and interventions for pediatric stroke and how it differs from stroke in the adult population.
2. Identify standard rehab assessment components for pediatric stroke
3. Explore treatment approaches, goals, techniques, and technology
4. Highlight the pediatric stroke experience through case studies



The “Journey”

- A U.S. case control study estimated an average five year medical cost of \$110,921 per child
- The key difference between children and adults is that pediatric stroke results in the inability to achieve (rather than lose) functional independence.
- Functional, behavioral and social consequences may not be apparent at the time of the stroke event, particularly in very young children, who typically grow into their deficits

Epidemiology

Perinatal Stroke

- Last few months of pregnancy to 1 month old
- 10.2/100,000 (per live birth)

Childhood Stroke

- 1 month-18 years
- 1.72/100,000 (per yr)

- Incidence and prevalence higher in boys than girls
- Mortality rate 10-25%
- Following first stroke, 25% will have a second
- Children of color more likely to suffer from stroke

Prognosis

- 10-25% death
- 25% recurrence
- 66% ongoing neurological involvement
- 25-57% of ischemic stroke has chronic hemiplegia
- 21% have sensory deficits (vision, altered limb sensation, neglect)

Etiology

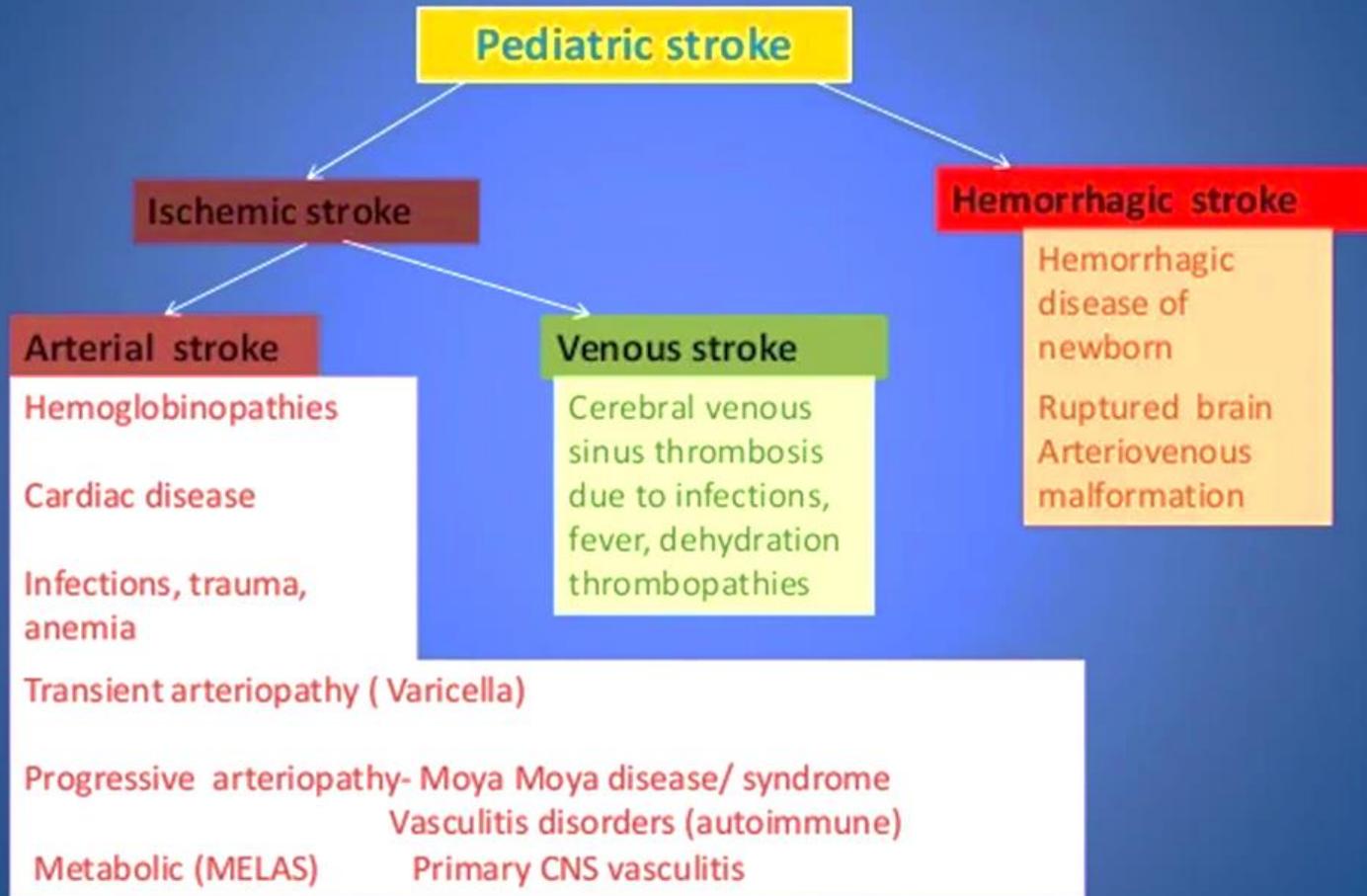
Hemorrhagic

- Cerebral aneurysm
- Arteriovenous malformations
- Tumor
- Other medical/anatomical causes

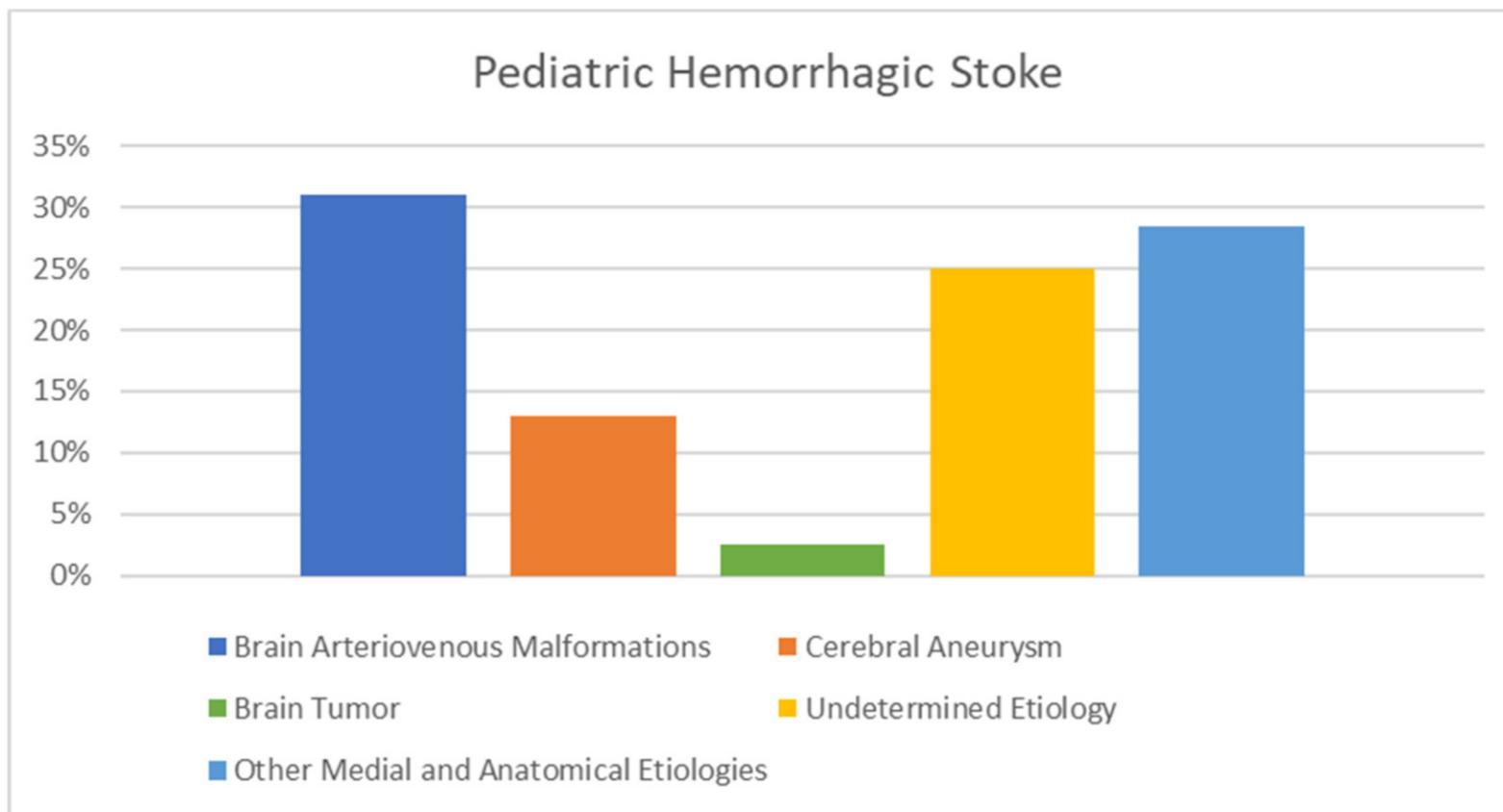
Ischemic

- Pregnancy risk factors
- Fetal/Infant risk factors
- Acquired & congenital heart disease
- Arteriopathies
- Thrombophilia (Inherited & Acquired)
- Rheumatologic disease
- Sickle Cell Anemia

Overview of stroke in children



Etiology of Pediatric Hemorrhagic Stroke



Risk Factors

PERINATAL STROKE

Last few months of pregnancy to 1-month-old

The cause in most perinatal strokes remains unknown.

Risk factors that could lead to stroke include:

- Congenital heart disease
- Disorders of the placenta
- Blood clotting disorders
- Infections (e.g. Meningitis)

RISK FACTORS



CHILDHOOD STROKE

1-month-old to 18 years

Risk factors in children ≠ Risk factors in older adults
Risk factors for children include:

- Congenital heart disease
- Diseases affecting the brain's arteries
- Infections affecting the brain or other organs
- Head trauma
- Sickle cell disease
- Autoimmune disorders

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

Presentation of Stroke Symptoms

WARNING SIGNS

Signs of a perinatal stroke may go unrecognized for months or years because the signs can be subtle.

NEWBORNS:

Seizures may be an early sign:

- Repetitive twitching of face, arm or leg
- Apnea (pauses in breathing) associated with staring

DEVELOPING CHILDREN:

- Decreased movement or weakness on one side of the body
- Showing a hand preference, or consistently reaching out with only one hand before 1 year of age

Signs are often missed in children because there is a lack of awareness that strokes can happen in this age group.

STROKE SIGNS ▶

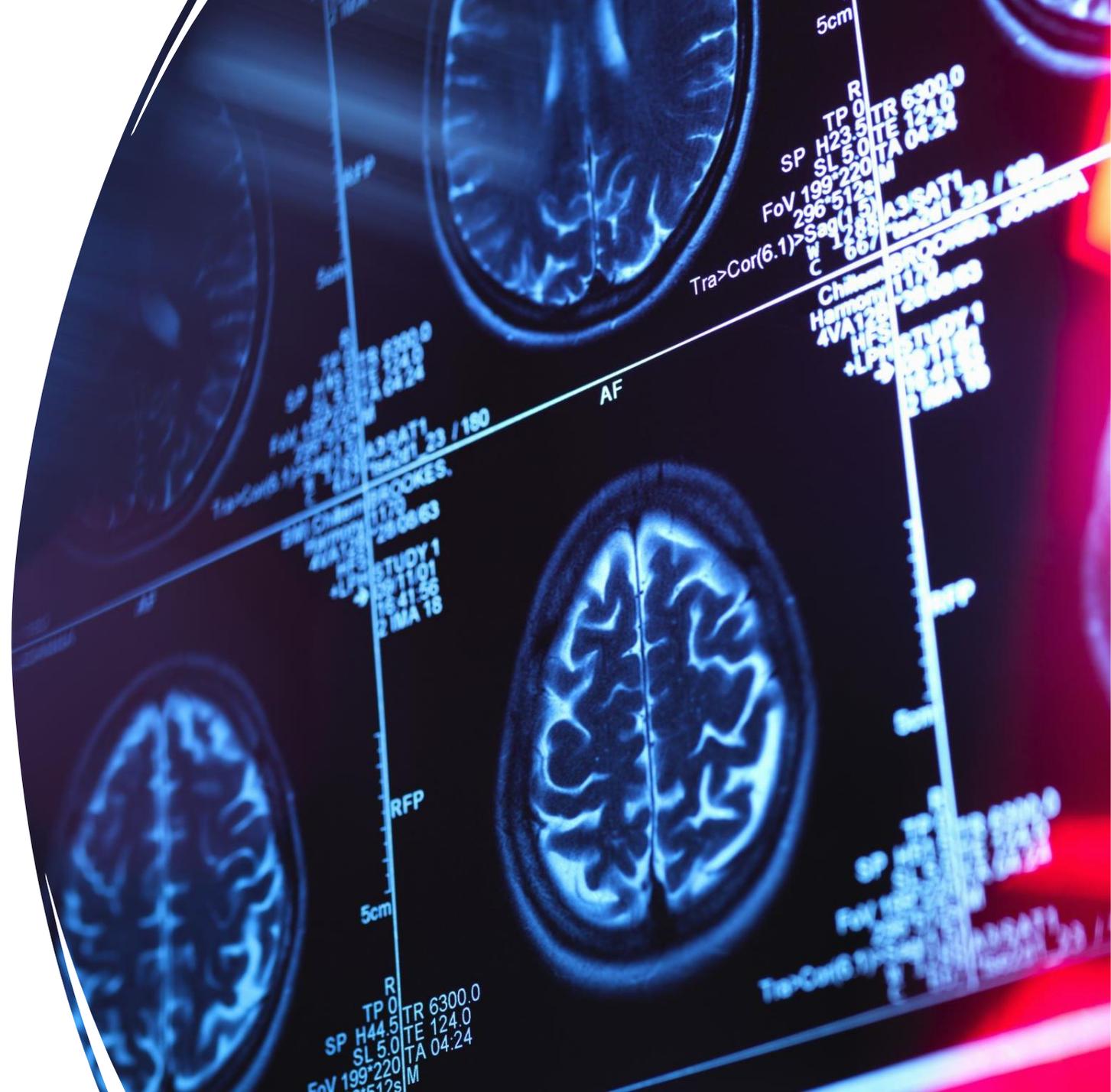
F | **A** | **S** | **T**
FACE DROOPING | ARM WEAKNESS | SPEECH DIFFICULTY | TIME TO CALL 911

ADDITIONAL SIGNS IN CHILDREN INCLUDE:

- Severe sudden headache, especially with vomiting and sleepiness
- Weakness or numbness on one side of the body difficulty speaking or understanding others
- Vision loss or double vision
- Severe dizziness or loss of coordination
- New-onset of seizures usually on one side of the body

Differential Diagnosis

- Migraines
- Focal seizure (typically transient weakness)
- Neoplasm
- Rare metabolic disorders
- Infections: meningitis, abscess



Common Issues Following Stroke

Motor impairments

- Gross and fine motor, strength, coordination, speed; may also include rigidity, tremors, spasticity, ataxia, or apraxia

Physical effects

- Disruption in growth, eating disorders, development of diabetes, or thermoregulation difficulties

Feeding disorders

- Dysphagia

Sensory impairments

- Vision, hearing

Communication impairments

- Expressive and receptive language
- Pragmatics

Cognitive impairments

- Attention, memory, executive functioning, speed of processing, splinter skills

Academic or learning difficulties

Fatigue

- Physical and cognitive

Medical issues

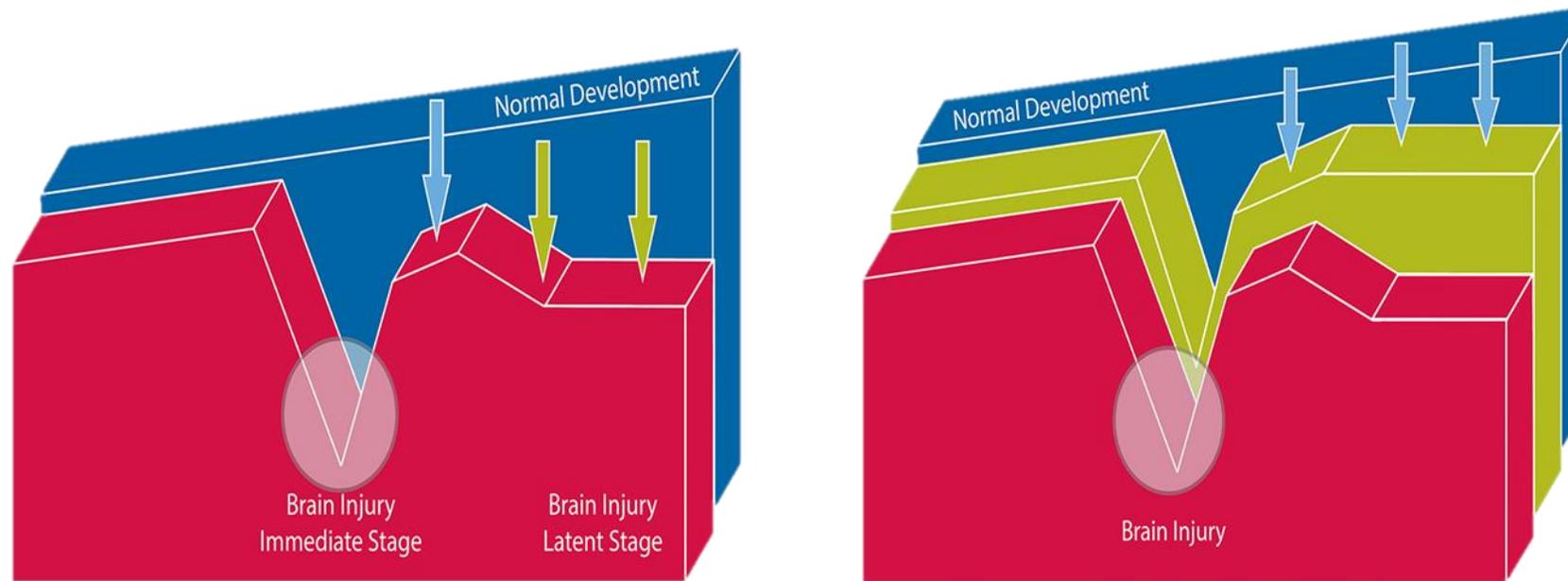
- Seizures, headache, pain, orthopedic issues

Social-emotional or behavioral difficulties

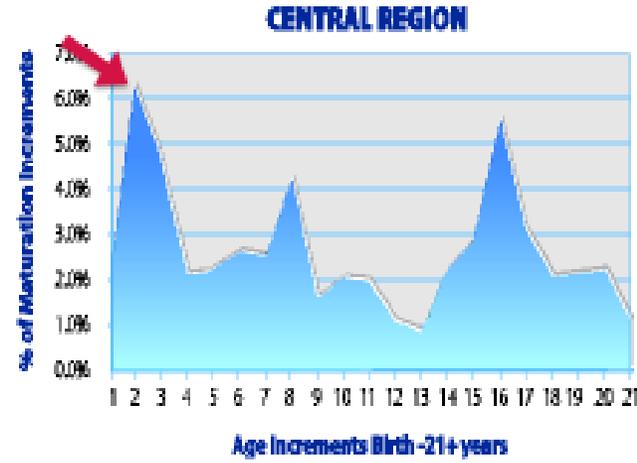
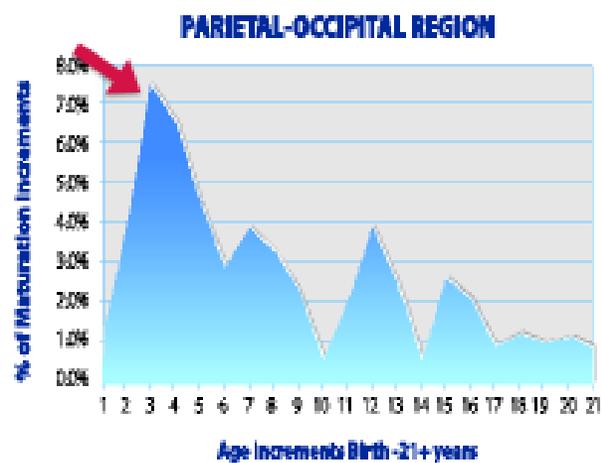
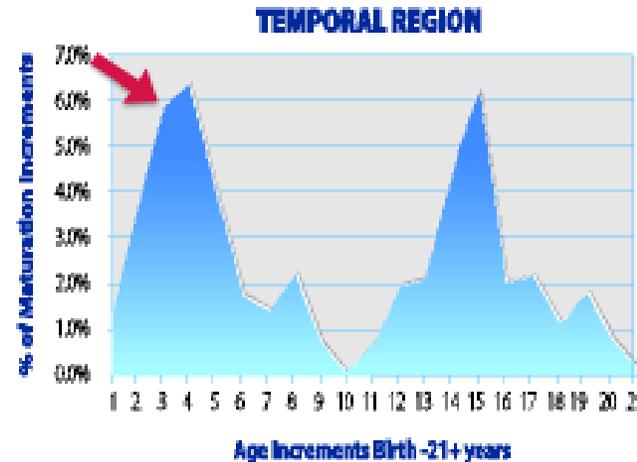
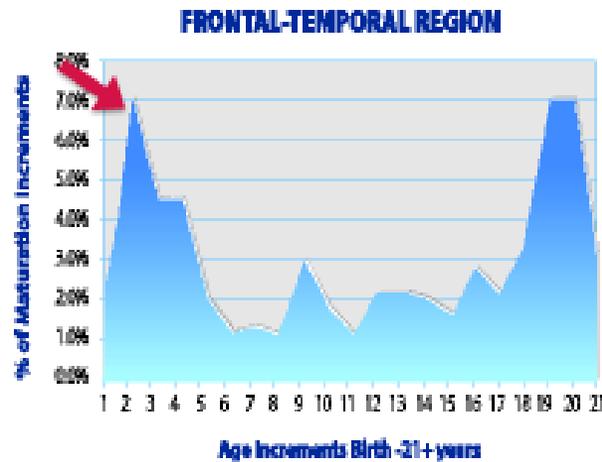
Family difficulties

Post-school or vocational issues

Kids' Brains and Recovery



Kids' Brains



Brain Maturation by Lobe

The age of the child at injury will impact the challenges the child may experience.

Interdisciplinary Team



- Rehab Doctors
- Neurologists
- Neuropsychiatrists
- Neuropsychologists
- Behavior Analysts
- Psychotherapists
- Transportation
- Social Workers
- Case Managers
- Equipment/Tech Specialists
- Teachers
- School Nurses
- Special Education
- AEA
- Before/After School Services
- Counselors
- Occupational Therapists
- Physical Therapists
- Speech and Language Pathologists
- School Psychologists

Rehab Assessment & Treatment

Social & Behavioral

Motor

Eating & Swallowing

Communication

Activities of Daily Living & Leisure

Sensory/Vision

Pain

Social & Behavioral

Assessment

- Mental health
 - Anxiety, impulsivity, emotional lability, aggression
- Parents & support system
- Family structure
- School
- Home environment
- Access to services
- Future addiction and risk taking

Treatment

- Care coordination/management
- Support groups
- Mental health therapy
- ABA
- Education



Motor



Assessment

- Strength
- Spasticity
- Motor control
- Gait pattern
- Balance
- Grasp & release
- Hand dexterity
- Orthotics & Splints

Treatment

- Spasticity management (botox, serial casting, medications)
- Supported weight bearing and gait
- Functional E-stim
- Gait training
- CIMT
- Motor learning exercises
- Adaptive equipment
- UEU

Bioness Vector

This harness training system, which is attached to the ceiling, physically supports the patient as he practices walking or balancing on flat or uneven surfaces, including stairs, the ground or a treadmill.



Functional Electrical Stimulation

RT-300 Bike



Xcite



RT-600 Elliptical Stepper



Motor Activities



**Universal Exercise
Unit**



Aquatics

Eating & Swallowing

Assessment

- Dysphagia
 - Oral prep
 - Oral
 - Pharyngeal
 - Esophageal
- Nutrition quality & quantity
- Texture
- Hydration

Treatment

- Feeding therapy
- Vital Stim
- Dysphagia diet
- NG tube
- G-tube/PEG
- Accommodations & techniques
 - Chin tuck, jaw support, head rotation, double swallow, small bites, pacing, visual feedback



Communication



Assessment

- Receptive & expressive language
- Dysarthria
- Apraxia
- Social language
- Reading



Treatment

- Articulation & phonological
 - rhythmic activities, pacing, articulation drills
- AAC
- Language practice
 - word finding, comprehension, cueing, syntactic or semantic therapy, language drills, or literacy intervention
- Functional communication
 - communication partner, prompting hierarchy, task-based practice or social skills training

Daily Living Activities & Leisure



Assessment

- Eating
- Bathing
- School tasks
- Dressing
- Cooking
- Play



Treatment

- Adapted aids
 - Velcro, nonslip mats, pickup stick, sock donner and/or long handled shoe horn, cups, utensils, plate, Saebo
- Intensive motor learning & practice
- Environmental modifications
- Functional e-stim
- Integrated rec activities

Sensory/Vision

Assessment

- Altered limb sensation
- Neglect
- Visual field deficits
- Proprioception

Treatment

- Graded sensory exposure
- Teaching accommodations
- Vision exercises
- Sensory-level E-stim
- Environmental modifications
- Compression garments



BITS (Bioness Integrated Therapy System)

- Interactive touchscreen computer system
- Assessment and treatment activities:
 - Physical
 - Visual
 - Auditory
 - Cognitive



Pain

Assessment

- Headache
- Altered sensory
- Spasticity
- Joint (subluxation, alignment)



Treatment

- Compression garments
- Splints & orthotics
- Medications
- Hip & spine surveillance
- Psychological approaches
- Spasticity managements
- Child Life



Cognitive



Assessment

- Information processing
- Memory
- Executive function
- Attention
- Learning
- Visuospatial

Treatment

- Compensatory techniques
 - Simplifying or 1:1 instructions, written instructions, visual cues, schedules, additional time, breaking down tasks or information
- Environmental modifications
 - Reducing stimuli, lighting, avoiding overstimulation, decreasing distraction, rest periods
- Memory aids
- Fatigue management

Case Study



Case Study



<https://youtu.be/cLzCCtMr04U>

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