Traumatic Brain Injury in Preschool Children

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What are the issues for preschool children?

- Young children are most at risk for long term consequences
- Young children may have delayed effects of the injury
- The brain injury occurs within the context of development within a family unit
- Family response to the injury and symptoms
- Identification of services for children and families who need help

What happens during a closed brain injury?

TBI Severity

- Mild (most prevalent)
- Moderate
- Severe

Disclosures

The study, "Language and Literacy Outcomes of Preschool Children with Traumatic Brain Injury" is funded by the National Institute on Disability Rehabilitation and Research (NIDRR). Julie Haarbauer-Krupa receives salary support as Principal Investigator.
Brain and Spinal Cord Injury Trust Fund
Central Registry

- 100% of Georgia Hospitals report data on visits
- Data captures
  - Children treated and released in the hospital’s emergency department
  - Children admitted as inpatients to the hospital.
- Since 2004, managed by The Brain and Spinal Cord Injury Trust Fund, lead agency for traumatic brain injury in the state of Georgia

Type of Injury

Causes vary by age

- Children under age 5: Falls primary cause
  - Infants
    - Physical abuse/inflicted injuries
  - Toddlers
    - Falls and MVA passengers
  - Preschoolers
    - Falls, MVA passenger/pedestrian
- Children over 5
  - Elementary school
    - MVA
    - Bicycling
    - Falls
    - Recreation injuries
  - Adolescents
    - MVA
    - Sports injuries
    - Assaults and gun shots.

Children are different than adults

- Young infants at risk for inflicted injury (Shaken Baby syndrome)
- Less likely to lose consciousness
- Higher survival rates for serious injuries
- Quicker physical recovery of motor skills
- Damage to developing brain
- Effects not always seen immediately
- Injury disrupts development before a solid foundation of knowledge and skills are established
- New learning

Any different than other preschool children????

- Easily distracted
- Impulsive
- Disorganized
- Lack of initiation
- Disinhibition
- Temper outbursts
- Low frustration tolerance
- Mood swings
Special Issues for children

- Children dependent on parents to take care of them
  - Differences in parental safety awareness and supervision
  - Variation of parental management of siblings, household management, jobs, priorities, stress

Special Issues for young children

- Peak injury rates related to developmental milestones (Agran, Wren, Anderson, Trent, Walton-Hayes, & Thayer, 2003)
  - Airway obstruction peak between 9-11 months when children are more mobile
  - Falling from furniture peaks at 15-17 months

What Research Tells Us

- Outcomes
  - Children at a younger age of injury may not immediately show effects that turn up in later in elementary school or middle school
  - Preschool Children do have not have a single place of entry into a system after leaving the hospital

What Research Tells Us: Predictors of Outcome in Children

<table>
<thead>
<tr>
<th>Play Equipment</th>
<th>Injury</th>
<th>Head Injury</th>
<th>% with a Head Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swings</td>
<td>100,649</td>
<td>18,407</td>
<td>18</td>
</tr>
<tr>
<td>Monkey Bars</td>
<td>75,489</td>
<td>8794</td>
<td>11</td>
</tr>
<tr>
<td>See-Saws</td>
<td>53,219</td>
<td>9472</td>
<td>17</td>
</tr>
</tbody>
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Change of thinking about young children

- Infants and children under the age of 5 are particularly vulnerable to the effects of acquired global brain injuries (Civalleri & Amin, 2010; Swing-Collins & Barnes, 2002; Swing-Collins & Barnes, 2002; Lemonthal, 1998)
- The majority of research reports long term cognitive effects on preschool children with moderate to severe injuries that impact school readiness and school performance (Swing-Collins et al., 2002)
- Available reports particularly describe the effect on cognitive and language development (Swing-Collins & Barnes, 2002; Swing-Collins et al., 2002; Lemonthal, 1998) that influence school readiness and later school achievement (Detrash et al., 1999)
Change in thinking about young children

Even preschool children with mild injuries (defined by an emergency department visit not requiring admission) can demonstrate persisting effects in cognition and have a disability (Barrow, Dennis, & Wilkenerson, 1999; Wrightson, McGregor, & Garbowell, 1999; Kincaid, Kenyon, Wang, Tarnow, Drottz, Quaidolo, Durbin & Jaffe).

What happens to young children after the injury?

Why the huge discrepancy?

• Children may appear similar to pre-trauma skill and behavioral level immediately following the injury
• Delayed effects of the injury
• Parents may not understand the effects of the injury and not access services
• Not a single point of entry for children who do need help
• How many children actually successfully progress through school without issues?

Change in thinking about young children

- Previously developed skills may be preserved but new learning may be difficult
  - Cognitive Reserve: Skill attainment at preschool versus teenage years
- Effects of brain injury may not be apparent until more advanced skills are expected to develop
  - "Sleeper" effect of executive functions
- Research reporting the lasting consequences of the injury on development prior to the school years is limited.
  - Rate of special education for school age children with a moderate to severe injury is 68-72%

Comparison to Georgia Department of Education Counts

Models of Service

• Medical Model
  - Treatment of the injury or illness
  - Recovery
  - Medical necessity
  - Insurance funding
  - Therapies as the mainstay of care
• Educational Model
  - Learning support
  - Classroom is the hub
  - Therapies as ancillary services
  - Nurse provides medical care
  - Mentors for emotional support
Medical Model

- Physician
- Therapists
- Neuropsychologists
- Therapeutic Recreation Specialists
- Counselors and Social Workers

School Re-entry

- Length of stay in the medical model
- Transition to school program
- Adjustment to changes
- Family adjustment to the injury

Disability and access to services

- Rivara et al 2012 - Incidence of Disability 12 months later
  - Incidence of children ages 3-8, 12 months post injury receiving new services is 10X higher than the general population of children
  - Children scoring below norm means on outcome measures is 28X for mild TBIs than for severe (mostly from the large incidence of mild TBIs!)

Parent's perceptions

- Gfroerer, Wade & Wu, 2008
  - Majority of parents did not perceive a need for school-based services despite injury severity
    - 38% indicated special education needed
    - 25% thought class changes were not necessary (e.g. from honors to regular pace)
  - Few students received school-based counseling
  - Parents cannot advocate for their child if they do not perceive a need

Definition of Traumatic Brain Injury in the School System

“An acquired injury to the brain caused by an external physical force resulting in total or partial functional disability or psychosocial impairment or both that adversely affects a child’s educational performance.”

Note: This includes both Open and Closed Head Injuries

Eligibility for TBI

Evaluation for eligibility shall include the following:
(a) A summary of the student’s pre-injury functioning status.
(b) Verification of the TBI through medical records, health department or social services reports and/or parents’ medical bills/records.
(c) A neuropsychological, psychological or psychoeducational evaluation that addresses the impact of the TBI on the following areas of functioning:
   1. Cognitive
   2. Social/Behavioral
   3. Physical/Motor

Deficits in one or more of the above areas that have resulted from the TBI and adversely affect the student’s educational performance shall be documented.

From Federal Law, Individuals with Disabilities Education Act (IDEA)
Effects of TBI

**Impact on Brain Development**

- Disrupts current developmental processes
- Effects may be delayed
  - Brain periods of maturation
    - “Sleeper effect” or Neurocognitive Stall (Chapman)
  - “Developing disability”
    - Symptoms evolve over time

**Cognitive Consequences**

- Most reported
  - Executive Functions
  - Memory
- Other symptoms
  - Attention
  - Information processing
  - Reasoning/judgment
  - Organization
  - Problem solving
  - Impulse Control
  - Language

**Physical Consequences of Brain Injury**

- General somatic effects
  - Fatigue, reduced awareness
  - Headaches, pain
  - Risk for endocrine problems
- Physical effects
  - Speech articulation
  - Vision
  - Hearing
  - Sensory processing
  - Gross and fine motor function

**Developmental Issues**

- Cognition
  - Executive function differences reported
  - Changes in speed and timing of responses
  - Attention
  - “Emerging Skills”

  “Before and After age 7” Anderson et al 2000
Executive Functions

- Components of executive function
  - Set realistic goals
  - Plan and organize behavior
  - Self initiate and inhibit
  - Self monitor
  - Solve Problems
  - Flexibly shift sets
  - Transfer newly acquired skills
  - Think abstractly

Behavioral Consequences

- Even children who did not have a behavior problem prior to their accident are 30% likely to have one following the accident
- Possible Symptoms
  - Lack of initiation/passivity
  - Frustration tolerance
  - Distractibility
  - Impulsivity
  - Mood swings
  - Overstimulation
  - Emotional labiality
  - Verbal/physical aggression

Family and Caregiver Response

- Catastrophic Injury
- Caregiver understanding and adjustment to injury
- Family Stress
- Family Burden
  - Longer periods of time until the child is majority age
  - Child’s injury, changes in routines, lost time from work
  - Caregiver coordinates medical and educational services

Models of Service for preschool children

- Medical model, based on the premise of recovery and rehabilitation
  - This model of service is typically more interactive and responsive to family needs immediately following the injury
  - Access to this service is limited by physician orders and third party payment for services.
  - Funding for services diminishing

Developemental Issues

- Language
  - Discourse in school age children
  - Language comprehension
  - Weaknesses in reading achievement (word reading) have been reported in children who sustain a TBI in preschool (Anderson et al., 2006; Barnes, Dennis & Wilkinson, 1999; Growmnnl, Wrightson et al, 1995; Taylor et al., 2008).
  - Limited studies on language acquisition over time

Response from developmental literature

- Morrongiello & Schwebel, *Child Development, 2008*
  - Apply developmental approaches to understand how children are injured and target prevention efforts
  - Examine how the role of developmental processes relates to injury risk
  - Identify how group differences related to gender and cultural influences relate to disparities in rate of injuries
  - Explore how family processes and relationships influence injury risk
Models of Service for preschool children

- **Community Service Model** (not a single entry point)
  - Private Services
  - Preschool education programs and child care programs
    - Georgia Department of Early Care and Learning (Bright from the Start)
    - Sheltering Arms
  - Children's Medical Services
  - State government program for early intervention (ages 0-3)
    - Babies Can't Wait
  - Preschool special education programs through the department of education (ages 3-5)

Developmental Issues

- **Long term findings**
  - Changes in behavior and emotional regulation in late childhood and early adolescence
  - Lower academic and vocational achievement
  - At risk for adverse outcomes

Developmental Issues

- **Identification**
  - Important to monitor
    - Young children's skill attainment and achievement
    - Family response and adjustment to the injury

Concussions in Preschool Sports

Why is identification important?

- **Outcomes**
  - Prison Populations
  - Homeless Population
  - Substance Abuse Populations
  - Mental Illness
Nebraska Study

- Screening children ages birth to 2 in pediatrician offices
- Parent complete a form that asks if
  - They have observed an event
  - The child experiences symptoms
- 2% incidence of combination of event and symptoms identified

Language and Literacy Outcomes of Preschool children with Traumatic Brain Injury (Haarbauer-Krupa, King and Wise, 2011)

- Grant Funded by the National Institute of Disability and Rehabilitation Research (NIDRR)
- Longitudinal Study examining reading and language skills of children injured by a traumatic brain injury before age 5

Follow-up of preschool children with acquired brain injuries (Haarbauer-Krupa and Vova, 2010)

- Followed children with an acquired brain injury before age 5 from their rehabilitation admission
- Learned several pathways
  - Return to pre-injury preschool
  - Outpatient services
  - Babies Can’t Wait
  - Special needs preschool (N=17 annually)
  - Home and no further care until school

What next?

- Examine longer term outcomes for children who sustain their injury prior to age 5
  - What exactly are their effects?
    - Does it change language and cognitive development and reduce learning of important skills for school readiness?
  - How do the effects from their injury change the course of development?
  - How does their injury impact their family’s ability to take care of them?

What to do?

- Refer children who you suspect have a brain injury to their doctor
- Establish a safe environment for playgrounds and fall prevention
- Check on children with identified injury-make sure the bridge to elementary school is successful
Parent to Parent

• Partner with the Children and Youth Committee of the Brain and Spinal Injury Trust Fund Commission
• Staff received training in brain injury
• Contact
1-800-229-2038
http://www.p2pga.org/

Language and Literacy Research Study

Researchers at Children’s Healthcare of Atlanta and Georgia State University want to learn how to help children who had a traumatic brain injury and their families.

Call to volunteer for the study if:

- Your child had a head injury or a broken bone at or before the age of 5.
- Your child is now 6-10 years old

What will you do in the study?

- Your child will receive language and reading testing.
- We will see your child once a year for 3 years at a Children’s Healthcare of Atlanta facility that is convenient for you.
- Flexible scheduling is available

Participants will be paid for their time.

For more information please contact Schauna Gillam, Research Coordinator at 404-785-8299 or schauna.gillam@choa.org

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