Recognizing and Responding to Students with Traumatic Brain and Spinal Cord Injuries

Presented by:

Shelley Greif, RN, BSN, MPH
Florida Department of Health-Children's Medical Services
Southeast Region
Brain & Spinal Cord Injury Program
Shelley_Greif2@doh.state.fl.us
PhDc
Florida Atlantic University, Christine E. Lynn College of Nursing
sgreif1@fau.edu

Adapted from presentations by Toby Gilbert, Psy.D., Florida Institute for Neurological Rehabilitation and Lane Carlee, Consultant – Palm Beach County School District, School TBI Liaison

FASN Conference Theme

Students + School Nurses
= Educational Success

Traumatic Brain Injury

An insult to the skull, brain, or its covering, resulting from external trauma, which produces an altered state of consciousness or anatomic, motor, sensory or cognitive deficits.

Source: State of Florida Department of Health

A traumatic brain injury is caused by a blow or jolt to the head or a penetrating head injury that disrupts the normal function of the brain . Not all blows or jolts to the head result in a TBI. The severity of a TBI may range from "mild". i.e. a brief change in mental status or consciousness to "severe", i.e. an extended period of unconsciousness or amnesia after the injury.

Source: Centers for Disease Control & Prevention

Traumatic Brain Injury

A traumatic brain injury (TBI) means 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 educational performance. The term applies to mild, moderate, or severe open or closed head injuries. The term includes anoxia due to trauma but does not include brain injuries that are congenital, degenerative, or induced by birth trauma. There is evidence that the traumatic brain injury impacts or more of the following areas:

cognition	problem-solving
language	sensory
memory	perceptual or motor abilities
attention	psychosocial behavior
reasoning	physical functions
abstract thinking	information processing
judgment	speech

Source: Florida Department of Education

Incidence

The most frequent causes of TBI

- Falls (28%)
- Motor vehicle accidents (20%)
- Struck by/against events (19%)
- Abuse and assault (11%)

"Signature wound" for 62% of wounded soldiers returning from Iraq.

Source: Brain Injury Association of America 2006

Demographics

- Males are 1.5 times more likely to have a head injury.
- Age groups at highest risk are 0-4 year olds and 15-19 year olds.

Brain Injury Association of America 2006

- Children receiving special education services for behavioral disorders are 3 times more likely to have had a head injury, compared with peers in regular education (Semrud-Clikeman, 2001).

Florida Total TBI Incidence 2005

Age Group	Number	Percent	Crude Rate
0 – 4 years	10,984	11.8	1020.0
5 – 14 years	9,403	10.1	413.2
15 – 24 years	16,329	17.6	699.4

Source: Enhancing the Traumatic Brain Injury System of Care, Florida's Five-Year Strategic Plan, FY 2009-2010 – FY 2013-2014, WellFlorida Council

Florida Average Annual TBI-Related Hospitalizations 1999 - 2005

Age Group	Number	Percent	Crude Rate
0 – 4 years	680	4.6	67.9
5 – 14 years	867	5.9	40.4
15 – 24 years	2,133	14.4	101.0

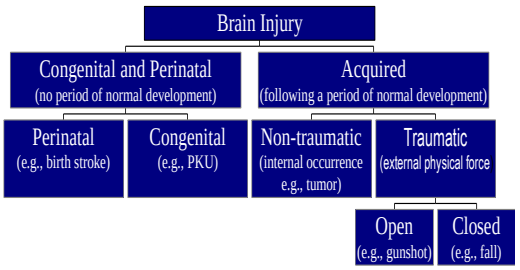
Source: Enhancing the Traumatic Brain Injury System of Care, Florida's Five-Year Strategic Plan, FY 2009-2010 – FY 2013-2014, WellFlorida Council

Florida TBI-Related Emergency Department Visits 2005

Age Group	Number	Percent	Crude Rate
0 – 4 years	10,166	14.2	944.0
5 – 14 years	8,430	11.8	370.4
15 – 24 years	13,311	18.6	570.2

Source: Enhancing the Traumatic Brain Injury System of Care, Florida's Five-Year Strategic Plan, FY 2009-2010 – FY 2013-2014, WellFlorida Council

Types of Brain Injury



Types of Traumatic Brain Injury

- Open Head Injury
  - Brain injury in which the skull and brain is penetrated by an external object
- Closed Head Injury
  - Brain injury in which the skull and brain is NOT penetrated

Closed Head Injury

More common than open head injuries and cause more diffuse damage to the brain than open head injuries

Acceleration/ Deceleration Injuries
- Falls
- Vehicular accidents
- Shaken baby syndrome
- Sports accidents

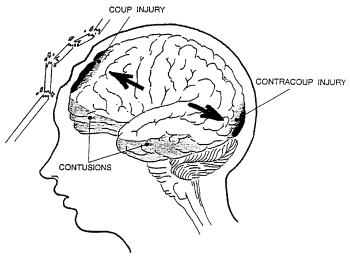
Anoxic Episodes
- Near-drowning
- Strangulation
- Smoke inhalation

Focal Injuries
- Non-penetrating blows

Closed Head Injuries

- Diffuse Axonal Injury- Shearing and tearing of nerve fibers
- Concussive Damage- The brain hitting the inside of the skull
- Coup/Contra-Coup- The brain hits one side and propels back to hit the other side of the brain

Coup/Contra Coup



Primary Effects of Closed Head Injury (Injury Due To The Accident Itself)

- Injury to brain tissue at the site of coup and contra coup
- Shearing and tearing of neurons throughout the brain
- Swelling leads to increased intracranial pressure
- Lack of oxygen to the brain
- Bleeding leads to increased intracranial pressure

Common Causes of Acquired Brain Injury by Age

- Infants
  - ✓ Abuse
  - ✓ Neglect
- Toddlers
  - ✓ Abuse
  - ✓ Falls
- Early Elementary
  - ✓ Falls
  - ✓ Pedestrian-motor vehicle accidents

Common Causes of Acquired Brain Injury by Age

- Late Elementary/Middle School
  - ✓ Pedestrian-bicycle accidents
  - ✓ Pedestrian-motor vehicle accidents
  - ✓ Sports
- High School
  - ✓ Motor vehicle accidents

(Savage & Wolcott, 1994)

Typical Medical Course for a Child with a Moderate/Severe Brain Injury

- Emergency room
- Regional trauma center if necessary
- Surgery if necessary
- Acute care setting (hospital)
- Inpatient rehabilitation unit or center
- Outpatient rehabilitation
- School (Community Reintegration)

Outcome Predictors

- **Severity of injury**
- **Duration of coma and area of brain injury**
- **Age**
- **Pre-injury functioning – social, education, family**
- **Family Management**
- **Support systems**

Glascow Coma Scale

Assesses level of consciousness and is used to classify severity of injury:

- Eye Opening
  - Spontaneous 4
  - To speech 3
  - To pain 2
  - No response 1
- Motor Response
  - Obeys 6
  - Localizes 5
  - Withdraws 4
  - Abnormal Flexion 3
  - Extensor Response 2
  - No response 1

Glascow Coma Scale

- Verbal Response
  - Oriented and converses 5
  - Disoriented and converses 4
  - Inappropriate words 3
  - Incomprehensible sounds 2
  - No response 1

Mild: 13 – 15
Moderate: 9 – 12
Severe: 3 – 8

Post-traumatic Amnesia (PTA)

- Retrograde: Failure to remember events leading up to injury
- Anterograde: Failure to accumulate new memories after injury

Severity of Acquired Brain Injury: Mild

- Brief or no loss of consciousness and/or signs of concussion
  - ✓ nausea, vomiting, headache
  - ✓ fatigue, dizziness
  - ✓ dizziness, confusion
  - ✓ poor recent memory
  - ✓ blows to the head may be cumulative
- PTA less than 1 hour
- GCS of 13-15
- 50 to 75% of all acquired brain injuries
- Children under 12 with minor head injuries have been found to have difficulties such as attention deficits and low frustration tolerance even four years post-injury (Semrud-Clikeman, 2001).

Severity of Acquired Brain Injury: Moderate

- **Coma less than 24 hours**
- **Post-traumatic amnesia 1- 24 hours**
- **GCS of 9-12**
- **Secondary symptoms more common**
- **Many children with moderate deficits experience difficulty in caring for their needs**

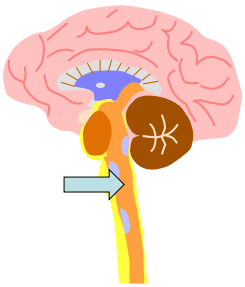
Severity of Acquired Brain Injury: Severe

- **Coma more than 24 hours**
- **Post-traumatic amnesia more than 1 day**
- **GCS 3-8**
- **50% die**
- **Recovery can be a long process and cognitive deficits are often missed following physical recovery**

Age Is An Important Variable In Understanding the Sequelae of Brain Injury

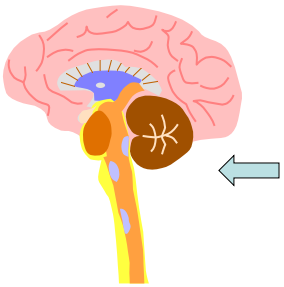
- Prior to age 1
  - ✓ Is likely to result in significant impairment
- Between the ages 1 to 5
  - ✓ Allows for reorganization of functions
  - ✓ Better prognosis
- After age 5
  - ✓ Impairment is likely to be quite significant
  - ✓ Normal process of brain development is likely to be impaired

The Brainstem



- At the base of the brain above the spinal cord
- Comprised of the medulla, pons, and midbrain
- Responsible for basic life functions
- Severe injury causes death

The Cerebellum



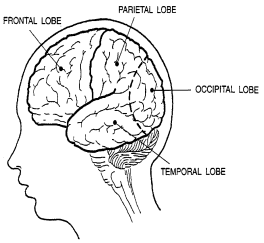
- Primarily helps modulate motor responses
- Regulates direction, rate, force, and steadiness
- Injury disrupts coordination and muscle tone

The Cerebral Cortex

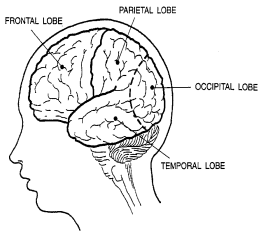
- Divided into two hemispheres
- These hemispheres are connected by the corpus callosum
- The right side of the brain controls the left side of the body and vice versa

The Four Lobes of the Cerebral Cortex

- Each hemisphere of the brain is divided into four lobes
  - ✓ Frontal
  - ✓ Temporal
  - ✓ Parietal
  - ✓ Occipital

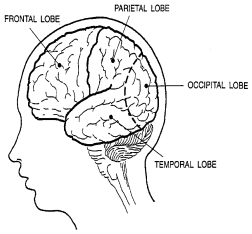


The Frontal Lobe



- Susceptible to injury
- Control executive functions
- Deficits may become apparent as student develops
- Motor cortex

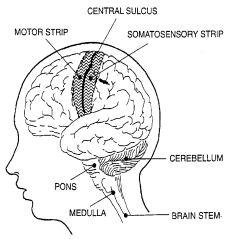
The Parietal Lobe



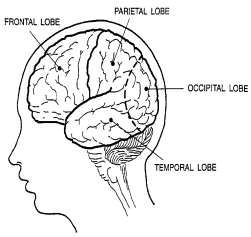
- Receives, analyzes, and integrates sensory and motor stimuli
- Recognizes touch, location in space
- Role in recognizing faces, objects, and ability to assemble and draw

Motor and Sensory Strips

- The motor and sensory strips are located on either side of the central sulcus
- The motor strip is responsible for movement
- The sensory strip is responsible for sensation

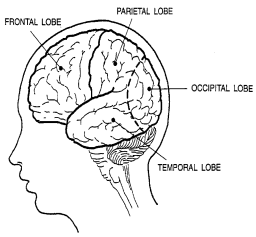


The Occipital Lobe



- Receives, analyzes and integrates visual information
- Visual disturbances such as restricted vision, impaired visual recognition and scanning, visual neglect

The Temporal Lobe



- Receives, analyzes, and integrates auditory information
- Center for language (expressive and receptive)
- Forms memories

Common Impairments of Children and Adolescents with Brain Injuries

- Certain types of difficulties are common in children and adolescents
- Anticipating these difficulties can facilitate successful re-entry to school and home. Impairments may occur in varying degrees
- Course of recovery is very difficult to predict for any given child

Common Impairments of Children and Adolescents with Brain Injuries

- Damage to a particular area of the brain does not result in the same symptoms for all individuals
- Problems can be physical/medical, motor, sensory/perceptual, communication, cognitive, social-emotional, and behavioral.
- Early and ongoing therapeutic intervention can remediate symptoms (but in varying degrees)
- Failure to recognize TBI related needs/concerns can result in less than optimal outcomes

Unmet & Unrecognized Need

- Slomine et al (2006) - health care use and needs of children after TBI; factors associated with unmet or unrecognized health care needs during the first year after injury.
- 4 level 1 trauma centers screened children ages 5 – 15 over a 1 ½ year period for inclusion in the study. N=330
  - hospitalized for at least one night with traumatic brain injury.
- Found significant amount of unmet and unrecognized need in the first year after TBI.
  - No needs – high PedsQL scores
  - Unmet needs – low PedsQL scores

Unmet & Unrecognized Need

- Children with Medicaid and dysfunctional families were at highest risk.
- Caregivers of children with unrecognized needs were more likely to have not completed high school and to report family dysfunction.
- Children with pre-existing psychosocial conditions were also more likely to report unmet need.
- Opportunity for school nurse to be attentive to and identify these children and initiate appropriate referrals:
  - Primary care provider
  - School ESE contact
  - Developmental or psychoeducational evaluation

Unmet & Unrecognized Need

- Keenan et al (2006) – longitudinal study of all children 0-3 years of age admitted to any of the state's 9 PICU's for TBI
- The only significant predictor of outcomes was a Glascow Coma Scale score of less than or equal to 12.
- "Early cognitive and social interventions designed to support the mother and provide an improved environment for the child, such as the intensive nurse visiting program designed by Olds, et al, would be advantageous and improve outcomes for both the family and child."

Common Physical/Medical Problems

- Vision Impairments
- Headaches
- Fatigue
- Swallowing/Eating
- Activities of Daily Living (self-care)
- Medication Issues

Common Motor Problems

- Apraxia
- Ataxia
- Coordination and balance problems
- Paresis or paralysis
- Impaired speed of movement

Common Sensory/Perceptual Problems

- Visual deficits
  - ✓ Field Cuts
  - ✓ Tracking
  - ✓ Spatial Relationships
  - ✓ Double Vision (diplopia)
- Neglect
- Auditory deficits
- Tactile deficits

Common Communication Problems

- Word retrieval
- Expressive language organization
- Comprehension of abstract language
- Pragmatics

Common Cognitive Problems

- Short and long-term memory deficits
- Impaired concentration
- Slow processing speed
- Limited attention span
- Poor communication, reading, and writing skills
- Difficulty with planning, sequencing, and judgment (Executive Functioning)

Social-Emotional Problems

- Mood swings, anxiety and depression
- Self-injurious behaviors
- Lowered self-esteem
- Restlessness
- Inability to self-monitor
- Agitation
- Low frustration tolerance
- Difficulty relating to others (peer conflict)

Common Behavioral Problems

- Deficits may lead to behavioral difficulties
  - ✓ Non-compliance
  - ✓ Aggression
  - ✓ Confrontational Behavior
  - ✓ Lack of Initiative
  - ✓ Alcohol and/or substance abuse
  - ✓ Sexual disinhibition

Behavioral Difficulties Often Result In…

- Rejection by peers
- Family frustrations and “acting out” of other siblings
- Teacher frustrations
- Substance Abuse
- Delinquency

School Psychological & Neuropsychological Assessments

School Psychological/Psychoeducational Assessments focus on achievement and skills needed for academic success.

Neuropsychological Assessment assists in understanding functioning in memory, attention, perception, coordination, language and personality. Identifies treatments and interventions that will help with learning needs.

Neuropsychological assessment

- General Intellect
- Achievement skills (reading/math)
- Executive skills (planning, organization, inhibition, flexibility)
- Attention
- Learning & memory
- Language
- Visual-spatial skills
- Motor coordination
- Behavioral and emotional functioning
- Social skills

Variables:
- Rapidly changing skills (especially during first 6-12 months post injury)

Transition to Home And School

- Preparing for transition to home and school begins at the time of the injury
- It is a process that takes time and patience
- When a child recovers physically, families can lose sight of the cognitive and behavioral changes
- Specialized services, rehab, and educational professionals must all meet prior to re-entering the school

Strategies to Facilitate Transition Home

- Provide the family with accurate information about the child's health
- Provide them with information about community agencies that may be of assistance
- Recognize that caregivers have focused most energy during hospitalization and rehab on child, and may not have absorbed a lot of information
- Develop individualized family plan (community reintegration plan)

Transition to School

- Physically Impaired
- Other Health Impaired
- Traumatic Brain Injury
  - If child is confined to home or hospital you may call your child's school for the Hospital Homebound forms or the Hospital Homebound office directly Hospital Homebound.
  - Obtain results from all assessments from the hospital and any rehabilitation services. Contact the *Exceptional Student Education Coordinator* at your child's school. Request a child study team meeting.

Active involvement of school nurse as health care "go to" person

Strategies to Facilitate Transition Back to School

- Prior to Discharge
  - ✓ Provide a discharge summary in non-technical language
  - ✓ Participate in IEP Team meeting, if possible
- Educate necessary professionals and serve as a resource (School TBI liaison, CMS/BSCIP, BIAF)

Educational Implications

- A child's brain injury significantly impacts the child's family, friends, and professionals working with the child.
- Children with brain injuries are too often inappropriately classified – difference between brain injury, LD & EBD
- Children with brain injuries can often remember how they were before the trauma, which can result in a constellation of emotional and psychosocial problems not usually present in children with congenital disabilities.
- As a child grows and develops, parents and teachers may notice new problems. This is because, as children grow, they are expected to use their brain in new and different ways.

Role of School Nurse

- Recognize that the school is the locus of community reintegration
- Many parents of students with TBI have not had experience navigating the health care system or special education
- Parents want their child who has had brain injury to be "the same as they were" at home, school and with friends
- Communication among all members of the team is crucial to successful reintegration.

Role of School Nurse

Advocate
- First person to recognize injury, particularly mild TBI. Frequent trips to nurse's office may signify difficulties
- Understand medical basis for changes that student experiences
- Offer safe haven in midst of chaotic school day

Prevention
- Include messages about importance of protecting brain from injury in programs that deal with drug & alcohol abuse, driver education, pedestrian safety, protective helmets for biking, boarding, skiing and horseback riding, sports safety and violence prevention.

Coordination
- Participate in school planning meetings for successful re-entry
- Direct family to services and work with ESE contact to assure appropriate educational services

Role of School Nurse

Education
- Educate teacher and students about importance of rests or breaks
- Help teachers and school staff understand physiological changes in brain

Intervention
- Plan for necessary treatments, rest and medications during school day
- Plan and advise school personnel of emergency measures
- Maintain telephone numbers/contact information for emergencies
- Reinforce importance of medical home, well-child check-ups with primary care provider

Source: Brain Injury Association of New Jersey
Yim-Chiplis 1998

Resources

- Florida Department of Health
  Brain & Spinal Cord Injury Program:
  http://www.doh.state.fl.us/demo/BrainSC/index.html
  Children's Medical Services: www.cms-kids.com
- Brain Injury Association of Florida: (800) 992-3442
  www.biaf.org
  www.byyourside.org
- Brain Injury Association of America: www.biausa.org
- Centers for Disease Control & Prevention:
  www.cdc.gov/TraumaticBrainInjury/

Contact Information

Shelley Greif, RN, BSN, MPH
Florida Department of Health-Children's Medical Services Southeast Region
Brain & Spinal Cord Injury Program
Shelley_Greif2@doh.state.fl.us
(561) 881-5040 x 3054

Eleanor K. Cofer, RN
Florida Department of Health-Children's Medical Services
4052 Bald Cypress Way, Bin A06
Tallahassee, FL 32399-1707
Ph: (850) 245-4200, ext. 2217
Fax: (850) 488-3813
Eleanor_Cofer@doh.state.fl.us

For additional information please contact the BSCIP Program Office

Phone: (850) 245-4045
FAX: (850) 921-0499
Central Registry: 1-800-342-0778

Department of Health
Brain and Spinal Cord Injury Program
4025 Bald Cypress Way, Bin C25
Tallahassee, Florida 32399-1744

www.myflorida.com
Program Toll Free Number:
(866) 875-5660

References

- Brain Injury Association of New Jersey, Chapter 9. Role of the School Nurse
- Gilbert, T. (2008) Neurologic Impairment: Challenges Faced and Opportunities Embraced (presentation). *Florida Institute for Neurologic Rehabilitation 2008*
- Keenan, H.T., Runyan, D.K., and Nocera, M. (2006) Longitudinal follow-up of families and young children with traumatic brain injury. (Disease/Disorder overview). *Pediatrics* (*117*)4:1291
- Semrud-Clikeman, M (2001): *Traumatic Brain Injury in Children and Adolescents: Assessment and Intervention*. New York, Guilford.
- Slomine, B.S., McCarthy, M.L., Ding, R., MacKenzie, E.J., Jaffe, K.M., Aitken, M.E., Durbin, D.R., Christensen, J.R., Dorsch, A.M., Paidas, C.N., CHAT Study Group. (2006) Health care utilization and needs after pediatric traumatic brain injury. *Pediatrics (117)*4:e663
- Yim-Chiplis, P.K. (1998). The child with traumatic brain injury returns to school. *Pediatric Nursing May-June 1998*