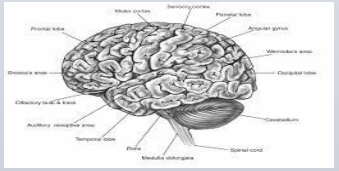
Pediatric Traumatic Brain Injuries: Challenges in Providing Effective Patient Care and Importance of Proper Family Support

By: Kaitlyn Conners
Faculty Advisor: Nancy Ebersole PhD, RN

ABSTRACT

The human brain is one of the most important, yet least understood, organs in the human body. This functional unit innervates every aspect of human life and is ever changing from conception until full maturity around age 25. Considering this, it makes sense that pediatric traumatic brain injuries are so misunderstood. Attempting to diagnose and monitor a traumatic injury to a complex organ that is still growing and developing is challenging for clinicians. Proper interaction with these children and their families is vital to physical health and psychosocial development. Identifying current knowledge and disseminating it is crucial for planning interventions and promoting healthy outcomes. A review of the literature was done using the CINAHL database, and articles collected identify themes that are important and unique to caring for these patients. The themes are (a) impact of age at time of injury on post injury behavior; (b) importance of proper identification of TBI related behaviors and appropriate interventions; (c) relationship between severity of injury and post injury behaviors; (d) patient challenges with internalizing and externalizing problems; and (e) role of home environment on post injury behaviors and recovery process. When caring for this patient population, it is important for health care providers to not use a "one size fits all" approach, as each patient will have a different presentation and different needs based on the factors listed above. The themes identified here provide a point of reference for clinicians when planning care for children who have experienced a traumatic brain injury.



BACKGROUND

- Of the 37,000 children under the age of 14 that are admitted to the hospital each year for traumatic brain injuries in the United States, 30,000 of these patients will suffer permanent disability, and 3,000 of them will die.
- Pediatric patients are more susceptible to brain injuries than adults:
  - The developing brain has a higher water concentration than an adult brain, which is associated with only having partial neuronal synapse formation and arborization. This means that the synapses that have been successfully formed are weaker and fewer in number than what would be found in an adult brain, therefore making any injury to the pediatric brain more detrimental.
  - Pediatric brains are also less buoyant and have less protection than the mature adult brain due to a smaller subarachnoid space. The subarachnoid space in a fully developed adult acts as a buffer that allows some movement of the brain within the skull without causing injury. In pediatric patients, this "buffer" space is much smaller which makes them much more susceptible to TBI's, even when the mechanism of injury is one that seems insignificant and may not have any effect on an adult brain.
- This category of injury is a leading cause of morbidity and mortality in pediatric patients, and is most often caused by falls, unintentional blunt trauma, motor vehicle accidents, or assault/child abuse.

METHODS

Key words: "pediatric traumatic brain injury", "age at time of TBI", "TBI severity", "behavior problems", "social problems", "long term problems following TBI".

→ 2,729 total articles identified via CINAHL.

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891 articles eliminated due to being published prior to 2009, making them not the most up to date research available, leaving 1,838 articles to review.

→ Search results limited to full text, peer reviewed research articles with abstracts, written in the English language. This left 1,093 articles remaining that met criteria.

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Remaining articles sorted by "relevance" (according to CINAHL) to place the articles that best matched my keywords at the top of the search results.

→ Top 75 articles underwent an abstract review (abstract read and used to determine if the article fulfilled the criteria desired for the systematic review).

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25 articles underwent a full text review (article read from start to finish and all tables/charts examined).

→ 10 articles that meet all criteria and to be included in systematic review.

RESULTS

Articles analyzed in this systematic review of the literature were found to have common themes including:

Age at Time of Injury → The younger the patient at the time of injury, the more symptomatic behavior they will exhibit post-injury (particularly symptoms of ADHD and anxiety). This is because while older patients who suffer a TBI already have an established set of basic skills and some level of functioning, younger patients have yet to develop these skills, therefore causing the damage of the TBI to be more detrimental long-term.
Identifying TBI Behaviors, Proper Interventions → Proper identification of abnormal behaviors associated with a pediatric patient's traumatic brain injury allows for early implementation of appropriate intervention programs that will assist these patients with their behavior and promote a better long-term outcome.
Severity of Injury → The more severe the TBI and the more damage that occurs to the brain, the more problems the child will display with post-injury behaviors, particularly regarding internalizing problems, externalizing problems, social functioning, and academic functioning.
Internalizing and Externalizing Problems → Children who suffered pediatric TBI's showed higher rates of internalizing problems (anxiety, social withdrawal) and externalizing problems (aggression, rule breaking) compared to their peers. These high rates of behavior problems that occur post-TBI result in problems at home and at school, and require intervention.
Home Environment and Recovery Process → Households with poorer family functioning, patient guardians who have maladaptive parenting styles, and maternal figures with high levels of post-injury distress have all been shown to have a negative impact on a pediatric patient's traumatic brain injury recovery process, particularly regarding the patient's behavior. The most ideal environment for a child post-injury would be one that is nurturing, supportive, and allows for participation in age-appropriate activities that will help improve cognitive functioning.

DISCUSSION

- The common themes found among articles included in this systematic review articulate the various factors that influence pediatric traumatic brain injuries, and highlight the many challenges faced when caring for a child (either as the parent, healthcare provider, or other caretaker) who has suffered a traumatic brain injury.
- TBI in a child is vastly different than it is for an adult because the child's brain is still growing and developing at this age. Injury during this stage in life results in various behavior problems, which unfortunately are sometimes overlooked or incorrectly identified by adults in the patient's life.
- Additional challenges are introduced when the child does not have an ideal home environment that will support an optimal recovery, which could so seriously stunt the recovery process that it results in an increased number of permanent deficits from the initial injury.
- Using this information to identify day to day challenges of this patient population helps healthcare providers to identify where interventions are needed in order to best support these children and ultimately aid in their recovery process.

CONCLUSION

After completing a review of the most current literature, it has been found that the age at time of injury, severity of injury, and role of home environment play significant roles in a pediatric patient's behavior, both short term and long term, after suffering a traumatic brain injury. A younger age at time of injury, a more severe injury, and a home environment with poor family functioning and high levels of parental distress have all been found to be related to increased behavior problems, particularly surrounding ADHD, anxiety, and aggression in pediatric patients who have suffered traumatic brain injuries. It has also been found that identification of internalizing and externalizing behavior problems faced by patients, along with other traumatic brain injury related behaviors, are crucial to initiating proper interventions for these patients and providing them with the high level of care they need. By disseminating this information to healthcare professionals who work with this patient population, higher quality and more effective patient care can be provided to these children. Having a better working knowledge of the themes previously highlighted and how they play a role in a pediatric patient's traumatic brain injury allows healthcare professionals to be more deliberate with the type of interventions put into place, along with the timing of these interventions post-injury. This, combined with proper education to the parents and caregivers of these children will provide the most optimal environment that will allow for proper support of the TBI recovery process.

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