

## September 2017- National Traumatic Brain Injury (TBI) Awareness Month



### A note from the author—

*Happy September NCP Friends! This month, the featured topic is Traumatic Brain Injuries (aka TBIs). In the medical profession, patients suffering from these type of brain injuries are a complex subset... unpredictable, hard to treat, and long lasting. Since these type of injuries can affect absolutely ANYONE, I felt that it would be very appropriate and helpful to give some basic information about traumatic brain injuries, the patient experience, and what treatment and diagnosis of TBIs involves.*

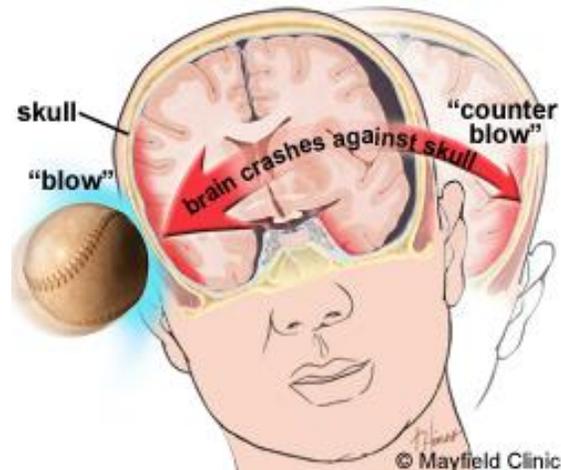


### What are Traumatic Brain Injuries?

Brain injury is not an event or an outcome. It is the start of a misdiagnosed, misunderstood, under-funded neurological disease. People who sustain brain injuries must have timely access to expert trauma care, specialized rehabilitation, lifelong disease management, and individualized services and supports in order to live healthy, independent, and satisfying lives.

Traumatic brain injury (TBI) happens when a bump, blow, jolt, or other head injury causes damage to the brain. Every year, millions of people in the U.S. suffer brain injuries. More than half are bad enough that people must go to the hospital. The worst injuries can lead to permanent brain damage or death. Half of all TBIs are from motor vehicle accidents. Military personnel in combat zones are also at risk.

Traumatic brain injury (TBI) is a complex injury with a broad spectrum of symptoms and disabilities. The impact on a person and his or her family can be devastating. Traumatic brain injury, often referred to as TBI, is most often an acute event similar to other injuries. That is where the similarity between traumatic brain injury and other injuries ends. One moment the person is normal and the next moment life has abruptly changed.



### ***The Unique Nature of Traumatic Brain Injuries***

In most other aspects, a traumatic brain injury is very different. Since our brain defines who we are, the consequences of a brain injury can affect all aspects of our lives, including our personality. A brain injury is different from a broken limb or punctured lung. An injury in these areas limit the use of a specific part of your body, but your personality and mental abilities remain unchanged. Most often, these body structures heal and regain their previous function.

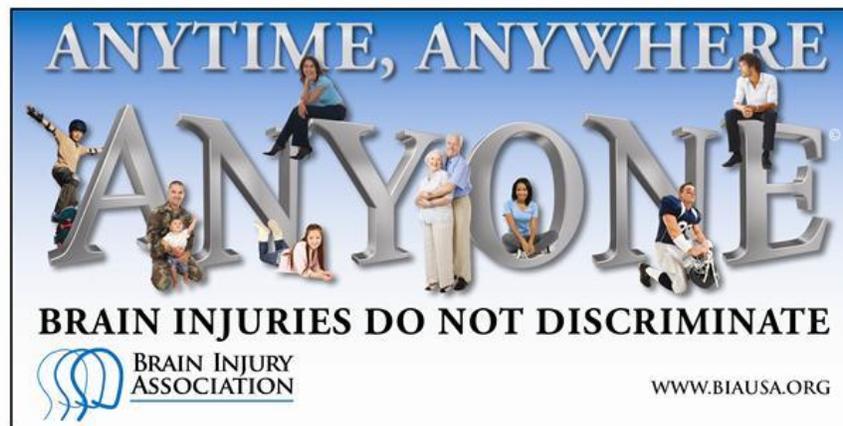


Brain injuries do not heal like other injuries. Recovery is a functional recovery, based on mechanisms that remain uncertain. No two brain injuries are alike and the consequence of two similar injuries may be very different. Symptoms may appear right away or may not be present for days or weeks after the injury.

One of the consequences of brain injury is that the person often does not realize that a brain injury has occurred.

### **The Impact of Brain Injuries**

According to the Brain Injury Association of America, each year an estimated 2.5 million children and adults in the United States sustain a traumatic brain injury (TBI), and another 795,000 individuals sustain an acquired brain injury (ABI) from nontraumatic causes. TBIs can affect the functionality of the brain—affecting thinking, reasoning, and memory. Whether the victim is an adult, a child, or an infant, TBIs can have a major impact on individuals and their families.



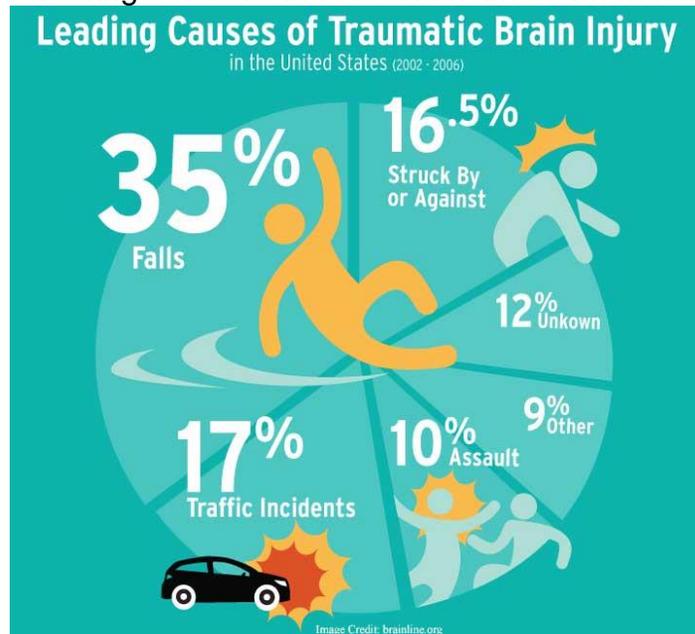
Below are some more important facts about traumatic brain injuries:

- Traumatic brain injury (TBI) is the leading cause of death and disability in children and adults from ages 1 to 44.
- Brain injuries are most often caused by motor vehicle crashes, sports injuries, or simple falls on the playground, at work or in the home.
- Every year, approximately 52,000 deaths occur from traumatic brain injury.
- An estimated 1.5 million head injuries occur every year in the United States emergency rooms. An estimated 1.6 million to 3.8 million sports-related TBIs occur each year.
- At least 5.3 million Americans, 2 percent of the U.S. population, currently live with disabilities resulting from TBI.
- Moderate & severe head injury (respectively) is associated with a 2.3 and 4.5 times increased risk of Alzheimer's disease.
- Males are about twice as likely as females to experience a TBI.
- Exposures to blasts are a leading cause of TBI among active duty military personnel in war zones.
- Veterans' advocates believe that between 10 and 20 percent of Iraq veterans, or 150,000 and 300,000 service members have some level of TBI.

- 30 percent of soldiers admitted to Walter Reed Army Medical Center have been diagnosed as having had a TBI. The number of people with TBI who are not seen in an emergency department or who receive no care is unknown.

### **Causes of Brain Injuries**

Brain injuries such as concussions have received more attention than ever thanks to a heightened focus put on the safety of professional football players' brains, but it is important to remember the majority of brain injuries don't occur on the field. Falls, car accidents, and bicycle accidents are the leading causes of brain injuries for most age-groups and many of these incidents could have been prevented with proper safety precautions such as wearing seatbelts in cars and helmets when riding bicycles.



### ***Who's at Risk?***

According to the Centers for Disease Control and Prevention (CDC), approximately 1.7 million people experience a TBI in the United States each year. This number does not include injuries seen at military or Veterans Health Administration health facilities. CDC data show that about 53,000 people in the United States die from TBI-related causes every year.

Anyone can experience TBI because it is caused by common events such as car crashes, sports injuries, and falls. However, certain groups of people are more likely to sustain a TBI. The age groups in which TBI is most common are:

- Children up to 4 years old
- Adolescents 15 to 19 years old
- Adults 65 and older

Within every age group, TBI rates are higher for males than for females.

In addition, active duty and reserve service members, who engage in dangerous training and operational activities in addition to combat, face a greater risk of TBI than their civilian peers.



### **What are the Symptoms of Traumatic Brain Injuries?**

TBI symptoms vary depending on the extent of the injury and the area of the brain affected. Some symptoms appear immediately; others may appear several days or even weeks later. A person with TBI may or may not lose consciousness—loss of consciousness is not always a sign of severe TBI.

#### ***Symptoms of Mild TBI***

A person with a mild TBI may experience:

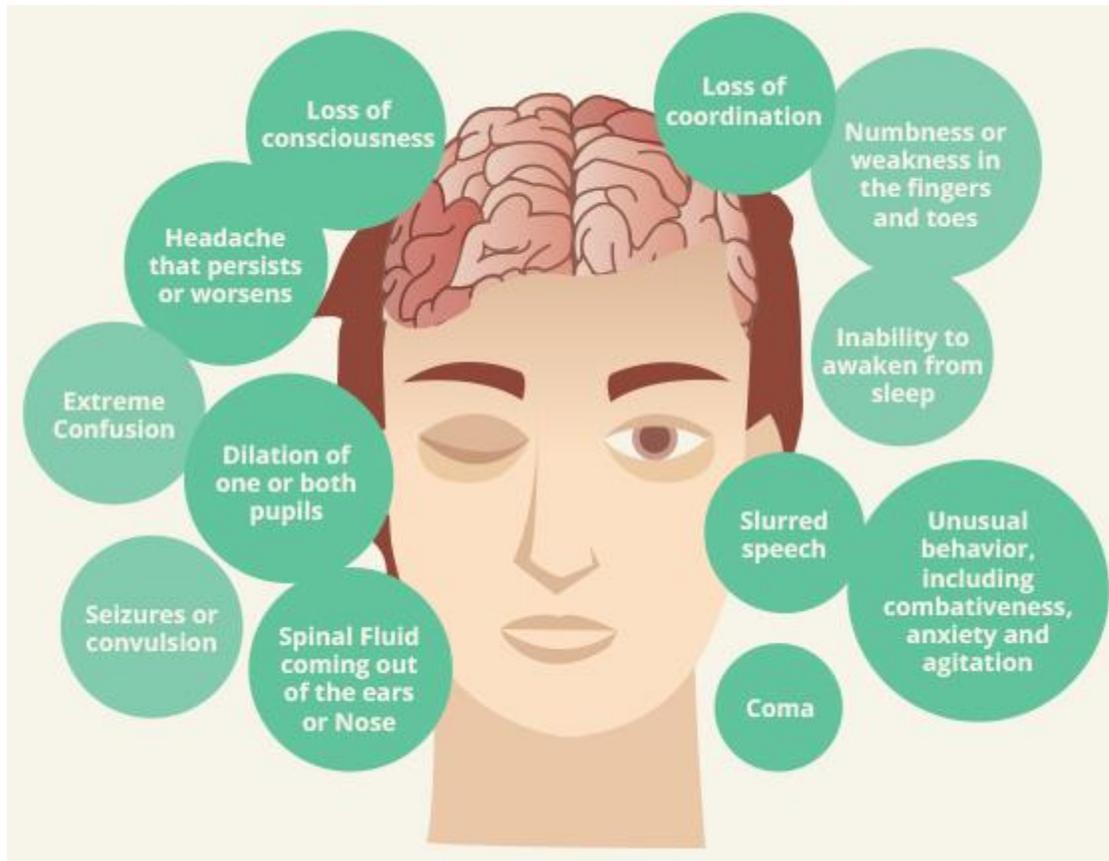
- Headache
- Confusion
- Lightheadedness
- Dizziness
- Blurred vision
- Ringing in the ears
- Tiredness or sleepiness
- A bad taste in the mouth
- A change in sleep habits
- Behavior or mood changes
- Trouble with memory, concentration, attention, or thinking
- Loss of consciousness lasting a few seconds to minutes<sup>1</sup>
- Sensitivity to light or sound
- Nausea or vomiting

### ***Symptoms of Moderate or Severe TBI***

A person with moderate or severe TBI may have some of the symptoms listed above. In addition, the person may experience any of the following:

- Headache that gets worse or won't go away
- Repeated vomiting or nausea
- Slurred speech
- Convulsions or seizures
- An inability to wake up from sleep
- Enlargement of the pupil (dark center) of one or both eyes
- Numbness or tingling of arms or legs
- Loss of coordination
- Increased confusion, restlessness, or agitation
- Loss of consciousness lasting a few minutes to hours

A person who suffers a blow to the head or another trauma that may have caused a TBI should seek medical attention.



### **What is the Brain Injury Association of America (BIAA)?**

BIAA's mission is to advance awareness, research, treatment, and education and to improve the quality of life for *all* people affected by brain injury. We are dedicated to increasing access to quality health care and raising awareness and understanding of

brain injury. With a network of state affiliates, local chapters, and support groups, we are the voice of brain injury.

### **How are TBIs Diagnosed?**

Health care professionals use a neurological exam and imaging tests to assess TBI. Serious traumatic brain injuries need emergency treatment. Treatment and outcome depend on how severe the injury is. TBI can cause a wide range of changes affecting thinking, sensation, language, or emotions. TBI can be associated with post-traumatic stress disorder. People with severe injuries usually need rehabilitation.

To diagnose TBI, health care providers may use one or more tests that assess a person's physical injuries, brain and nerve functioning, and level of consciousness. Some of these tests are described below.

- **Glasgow Coma Scale (GCS):** The GCS measures a person's functioning in three areas:
  - **Ability to speak**, such as whether the person speaks normally, speaks in a way that doesn't make sense, or doesn't speak at all
  - **Ability to open eyes**, including whether the person opens his or her eyes only when asked
  - **Ability to move**, ranging from moving one's arms easily to not moving even in response to painful stimulation

A health care provider rates a person's responses in these categories and calculates a total score. A score of 13 and higher indicates a mild TBI, 9 through 12 indicates a moderate TBI, and 8 or below indicates severe TBI.<sup>1</sup> However, there may be no correlation between initial GCS score and the person's short- or long-term recovery or abilities.



- **Measurements for Level of TBI:** Health care providers sometimes rank the person's level of consciousness, memory loss, and GCS score. A TBI is considered mild if:
  - The person was not unconscious or was unconscious for less than 30 minutes.
  - Memory loss lasted less than 24 hours.
  - The GCS was 13 to 15.

NICHD-supported research has found, however, that diagnosis of mild TBI (concussion), in practice, uses inconsistent criteria and relies heavily on patients' self-reported symptoms.

A TBI is considered moderate if:

- The person was unconscious for more than 30 minutes and up to 24 hours.
- Memory loss lasted anywhere from 24 hours to 7 days.
- The GCS was 9 to 12.

A TBI is considered severe if:

- The person was unconscious for more than 24 hours.
- Memory loss lasted more than 7 days.
- The GCS was 8 or lower.

- **Speech and Language Tests:** A *speech-language pathologist* completes a formal evaluation of speech and language skills, including an oral motor evaluation of the strength and coordination of the muscles that control speech, understanding and use of grammar and vocabulary, as well as reading and writing.
  - Social communication skills are evaluated with formal tests and role-playing scenarios.
  - If a patient has problems with swallowing, the speech-language pathologist will make recommendations regarding management and treatment to ensure that the individual is able to swallow safely and receive adequate nutrition.



- **Cognition and Neuropsychological Tests**
  - **Cognition** describes the processes of thinking, reasoning, problem solving, information processing, and memory. Most patients with severe TBI suffer from cognitive disabilities, including the loss of many higher level mental skills.Z

# HOW TRAUMATIC BRAIN INJURY (TBI) AFFECTS DAILY LIFE

HEALTHY		TBI
<ul style="list-style-type: none"><li>● Frontal: Concentration, Problem Solving, Speech</li><li>● Parietal: Sense of Touch, Pain, Temperature</li><li>● Occipital: Healthy Vision</li><li>● Temporal: Memory, Organization</li><li>● Cerebellum: Balance &amp; Coordination</li><li>● Brainstem: Breathing, Steady Heart Rate</li></ul>		<ul style="list-style-type: none"><li>● Frontal: Lack of Focus, Irritability, Language Difficulty</li><li>● Parietal: Difficulty with Reading, Spatial Misperception</li><li>● Occipital: Blind Spots, Blurred Vision</li><li>● Temporal: Problems with Short- &amp; Long-Term Memory</li><li>● Cerebellum: Difficulty Walking, Slurred Speech</li><li>● Brainstem: Changes in Breath, Difficulty Swallowing</li></ul>

Data © Mayfield Clinic

- **Neuropsychological assessments** are often used to obtain information about cognitive capabilities.
  - These tests are specialized task-oriented evaluations of human brain-behavior relationships, evaluating higher cognitive functioning as well as basic sensory-motor processes.
  - Testing by a neuropsychologist can assess the individual's cognitive, language, behavioral, motor, and executive functions and provide information regarding the need for rehabilitative services.
  - For this assessment, a neuropsychologist reviews the case history and hospital records of the patient, and interviews the patient and his/her family.
  - The neuropsychologist acquires information about the "person" the individual was before the injury, based on aspects like school performance, habits, and lifestyle, in order to detail which abilities remain unchanged as well as areas of the brain that are adversely affected by the injury and how the injury is expected to impact the individual's life.
- **Imaging Tests:** Health care providers may also use tests that take images of a person's brain. These include, but are not limited to:
  - **Computerized tomography (CT).** A CT (or "cat") scan takes X-rays from many angles to create a complete picture. It can quickly show bleeding in the brain, bruised brain tissue, and other damage.
  - **Magnetic resonance imaging (MRI).** MRI uses magnets and radio waves to produce more detailed images than CT scans. An MRI likely would not

be used as part of an initial TBI assessment because it takes too long to complete. It may be used in follow-up examinations, though.

- **Intracranial pressure (ICP) monitoring.** Sometimes, swelling of the brain from a TBI can increase pressure inside the skull. The pressure can cause additional damage to the brain. A health care provider may insert a probe through the skull to monitor this swelling. In some cases, a shunt or drain is placed into the skull to relieve ICP.
- **Tests for Assessing TBI in Military Settings-** A severe trauma may be obvious in a military situation, but a milder TBI may not be as easy to identify. The U.S. Department of Defense and Department of Veterans Affairs have therefore established procedures to assess quickly whether the person suffered:
  - A loss of consciousness
  - Memory problems
  - Neurologic symptoms, such as confusion or poor coordinationThis assessment, combined with other measures, helps determine the type of care necessary, including evacuation for a higher level of treatment

### **Treating TBIs**

A variety of treatments can help promote recovery from the physical, emotional, and cognitive problems TBI may cause. The types and extent of treatments depend on the severity of the injury and its specific location in the brain.

#### ***Treatment for Mild TBI***

Mild TBI, sometimes called concussion, may not require specific treatment other than rest. However, it is very important to follow a health care provider's instructions for complete rest and gradual return to normal activities after a mild TBI. If a person resumes normal activities and starts experiencing TBI symptoms, the healing and recovery process may take much longer than if he or she had followed the health provider's instructions. Certain activities, like working on a computer and concentrating hard, can tire the brain even though they are not physically demanding. The person with the concussion might need to reduce these kinds of activities or might need to rest between periods of such activities to let the brain rest. In addition, alcohol and other drugs can slow recovery and increase the chances of re-injury.

Children and teens who may have sustained a concussion during sports should stop playing immediately. They should not return to play until a health care provider who is experienced in evaluating concussion confirms they are ready. Re-injury during recovery can slow healing and increase the chances of long-term problems. On rare occasions in which a person gets another concussion before healing from the first one, permanent brain damage and even death may result.

#### ***Emergency Treatment for TBI***

In most cases, emergency care focuses on stabilizing the patient and promoting survival. This care may include ensuring adequate oxygen flow to the brain, controlling

blood pressure, and preventing further injury to the head or neck. Once the patient is stable, other types of care for TBI and its effects can begin.

Surgery may be needed as part of emergency care to reduce additional damage to the brain tissues. Surgery may include:

- **Removing clotted blood.** Bleeding in the brain or between the brain and skull can lead to large areas of clotted blood, sometimes called hematomas, that put pressure on the brain and damage brain tissues.
- **Repairing skull fractures.** Setting severe skull fractures or removing pieces of skull or other debris from the brain can help start the healing process of the skull and surrounding tissues.
- **Relieving pressure in the skull.** Making a hole in the skull or adding a shunt or drain can relieve pressure inside the skull and allow excess fluid to drain.



### **Medications**

Medications may be used to treat symptoms of TBI and to lower some of the risks associated with it. These medications may include, but are not limited to:

- **Anti-anxiety medication** to lessen feelings of nervousness and fear
- **Anticoagulants** (pronounced *an-tee-koh-AG-yuh-luhnts*) to prevent blood clots
- **Anticonvulsants** (pronounced *an-tee-kuhn-VUHL-suhnts*) to prevent seizures
- **Antidepressants** to treat symptoms of depression and mood instability
- **Diuretics** (pronounced *dahy-uh-RET-ikz*) to help remove fluid that can increase pressure inside the brain
- **Muscle relaxants** to reduce muscle spasms
- **Stimulants** to increase alertness and attention

Researchers continue to explore medications that may aid recovery from TBI. For example, an NICHD study investigated the effectiveness of citicoline, a drug meant to help protect neurological functioning. The study found, however, that patients with TBI

who took citicoline did not have any greater improvement in function than those who took a placebo.

### ***Rehabilitation Therapies***

Therapies can help someone with TBI relearn skills such as walking or cooking, or develop strategies for self-care, such as making lists of the steps involved in getting dressed. Rehabilitation can include several different kinds of therapy for physical, emotional, and cognitive difficulties. Depending on the injury, these treatments may be needed only briefly after the injury, occasionally throughout a person's life, or on an ongoing basis.



### ***Types of therapies for TBI***

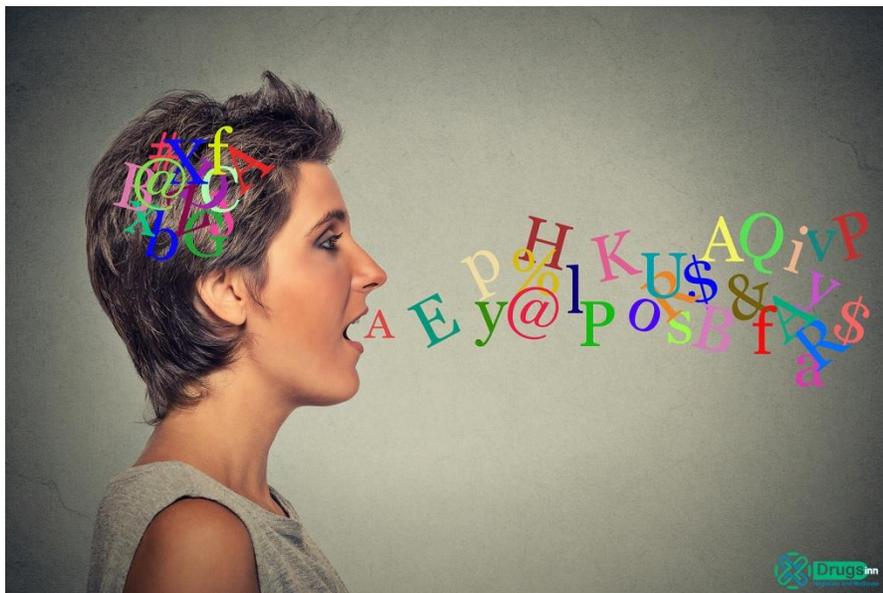
Most people with a moderate to severe brain injury will need some type of rehabilitation therapy to address physical, emotional, and cognitive issues from the TBI. Therapies will likely include relearning old skills or learning new ways to make up for lost skills. A treatment program should be designed to meet each person's specific needs and to strengthen his or her ability to function at home and in the community.

Therapy usually begins in the hospital and can continue in a number of possible settings, including in a skilled nursing facility, at home, in a school, and in an outpatient program at a clinic. Therapy can be brief or long-term, depending on the type of injury, and it may need to change over time. Rehabilitation generally involves a number of health care specialists, the person's family, and a person who manages the team.<sup>8</sup> When devising a long-term treatment plan, patients, their families, and their providers should be aware that moderate and severe TBI impairs patients' ability to make sound medical decisions even a month after injury.

Types of rehabilitation therapy may include:

- **Physical therapy.** This treatment works to build physical strength, coordination, and flexibility.
- **Occupational therapy.** An occupational therapist helps a person learn or relearn how to perform daily tasks, such as getting dressed, cooking, and bathing.

- **Speech therapy.** This therapy works on the ability to form words and other communication skills as well as how to use special communication devices if necessary. Speech therapy can also include evaluation and treatment of swallowing disorders (dysphagia).
- **Psychological counseling.** A counselor can help a person learn coping skills, work on relationships, and improve general emotional well-being.
- **Vocational counseling.** This type of rehabilitation focuses on a person's ability to return to work, find appropriate opportunities, and deal with workplace challenges.
- **Cognitive therapy.** This includes activities designed to improve memory, attention, perception, learning, planning, and judgment. For many people with TBI, cognitive therapy is among the most common types of rehabilitation.



### Preventing TBIs

Some causes of TBI are avoidable. The list below offers some ways to help prevent TBI.

- Always wear a seat belt when riding in a motor vehicle.
- Make sure a child in a car is protected with a child safety seat and/or seat belt.
- Never drive while under the influence of alcohol or drugs.
- Wear a helmet and make sure children wear the appropriate helmets for such activities as bike-riding, skateboarding, and playing certain sports.
- Make living areas safer for older people with measures such as removing rugs and other tripping hazards and improving lighting throughout the home.
  - Install window guards to keep young children from falling out of windows, and use safety gates at the top and bottom of stairs when young children are around.

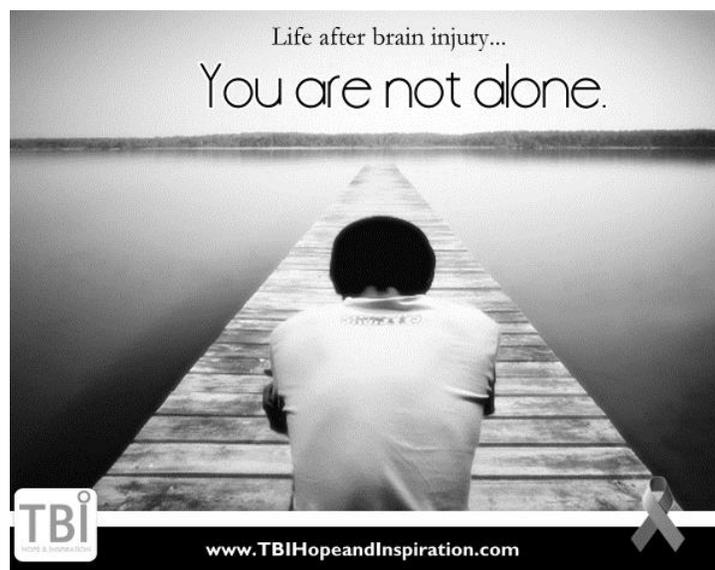
Another preventable cause of TBI is shaken baby syndrome (SBS). The syndrome can occur when an infant is shaken violently or hit. Nearly all victims of SBS suffer serious

health consequences, and at least one of every four babies who are violently shaken dies. Preventing SBS involves helping people understand the dangers of shaking a baby, the risk factors and the triggers for SBS, and how to support overstressed parents and caregivers



### **Living with TBIs**

The effects of TBI range in duration and seriousness, depending on the extent of the injury and its location. According to the Centers for Disease Control and Prevention, nearly 45% of people who are hospitalized after a TBI have a related disability one year after the injury.



### ***Immediate Problems***

Sometimes, a person will have medical complications as a result of TBI, and the risk of these problems increases with the severity of the injury. Some complications of TBI include seizures, nerve damage, blood clots, contraction of a blood vessel, stroke, coma, and infections in the brain. The risks of many of these problems decrease as more time passes from the initial TBI and as the person's condition stabilizes.

### ***Longer-term Effects of TBI***

TBI may cause problems with various brain functions. The types and extent of these problems depend on where the brain was injured.

Possible problems from TBI include:

- **Cognition**, such as difficulty learning, remembering, making decisions, and reasoning
- **Senses**, such as double vision, a consistent bitter taste in the mouth or a loss of the sense of taste, ringing in the ears, and tingling or pain
- **Communication**, such as trouble talking, reading, writing, and explaining feelings or thoughts
- **Behavior**, including difficulty with social situations, relationships, and self-control, or aggression
- **Emotions**, including depression, anxiety, mood swings, and irritability

### ***Degenerative Effects of TBI***

Research suggests that having one or more TBIs may increase the risk of diseases that cause the degeneration, or break down, of brain cells. Some evidence indicates that TBI is associated with:

- Alzheimer's disease, which impairs memory, emotions, and thinking skills
- Parkinson's disease, which causes the loss of motor skills and control over motor skills
- Chronic traumatic encephalopathy, which often affects athletes involved in sports with head impacts, including boxing, football, and hockey, and causes problems with memory, thinking, and motor skills.



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