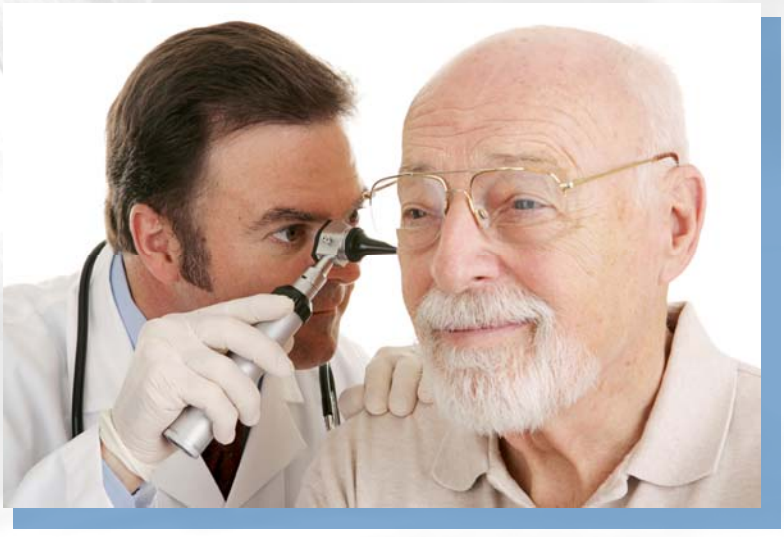
1. Information on Brain Injury



1-A. Information on Brain Injury

The brain controls everything we do, say, feel, and think. It controls the very functions that keep us alive including our breathing, circulation, digestion, hormones, and immune system. The brain allows us to experience emotion and express ourselves. Damage to this vital organ can have far reaching implications and significantly impact an individual's life and the lives of those around them for the rest of their lives.

A **traumatic brain injury** (TBI) is an insult to the brain caused by an external physical force that can produce a diminished or altered state of consciousness (such as a coma). A TBI can result in physical, psychological, behavioral or emotional impairments and may be temporary or permanent. It can cause partial or total disability. A TBI does not include degenerative (brain disease) or congenital (hereditary) disabilities. Causes of TBIs include motor vehicle accidents, assaults, falls, sports injuries, bicycle and pedestrian accidents and shaking babies.

Acquired brain injury is the term given to all brain injuries. These include injuries that, unlike TBI, are not caused by an external force or trauma. Non-traumatic brain injuries result in many of the same symptoms associated with Traumatic Brain Injury. Major causes of non-traumatic brain injury include strokes, infectious diseases, seizure disorders, substance abuse and incidents associated with a lack of oxygen to the brain.

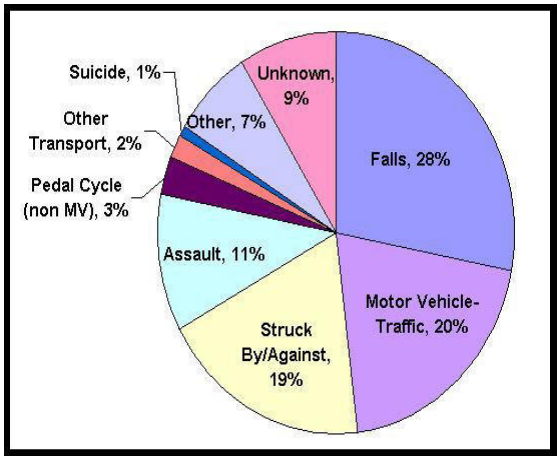
A **mild brain injury, or concussion,** may occur even if there is no loss of consciousness or noticeable physical injury. Even mild brain injuries can cause temporary or permanent changes in the way a person thinks, feels, acts and interacts with others.

1-B. Quick Facts about Incidence and Prevalence of Brain Injury

Brain injury happens in all communities. It can happen to a person of any race, age, gender, ethnicity, culture, sexual orientation or socio-economic background. According to the Centers for Disease Control and Prevention (CDC):

- In Kansas, approximately 2,500 residents are hospitalized annually due to TBI-related events.
- Approximately 600 Kansans die due to TBI-related events every year.
- 1.4 million Americans sustain a TBI every year, of those, 50,000 people die, 235,000 are hospitalized, and 1.1 million are treated and released from an emergency department.
- For children, birth -14 years, TBI is to blame for 435,000 emergency room visits, 2,685 deaths, and 37,000 hospitalizations annually.
- Males are about 1.5 times as likely as females to sustain a TBI.

Leading Causes of TBI (U.S.)



- About 75% of TBIs that occur each year are concussions or other forms of mild TBI.
- Alcohol is a significant factor in approximately 50% of the TBI cases that occur.
- Abuse accounts for 64% of all infant brain injuries.
- Falls from two or more feet account for children brain injuries.
- Falls are a major cause of brain injury in persons over the age of 75 years.
- Every 15 seconds, one person in the United States sustains a TBI.
- CDC estimates that total direct medical and indirect costs were $56.3 billion in 1995 in the U.S.

1-C. Brain Functions/Map of the Brain

The brain is a very complex organ. However, an overview of brain functions can help one understand what happens when someone sustains a TBI. Each brain injury is unique. This diagram illustrates the parts of the brain and their relationships to physical, emotional, cognitive and behavioral functions.

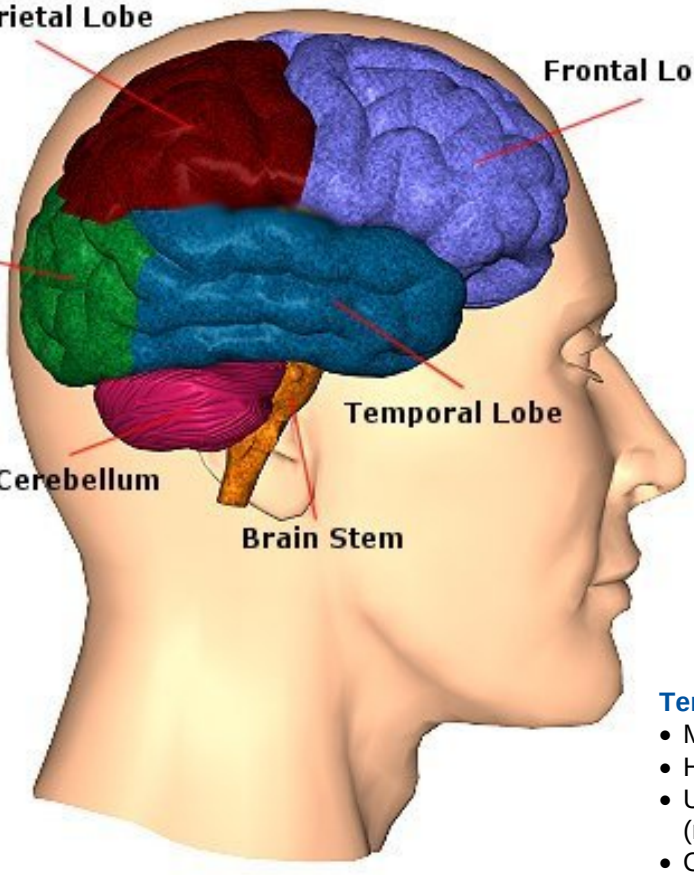
Simplified Brain-Behavior Relationships

Parietal Lobe
- Sense of touch
- Differentiation: Size, Shape, Color
- Spatial perception
- Visual perception

Occipital Lobe
- Vision

Cerebellum
- Balance
- Coordination
- Skilled motor activity

Brain Stem
- Breathing
- Heart rate
- Arousal/Consciousness
- Sleep/Wake functions
- Attention/Concentration



Frontal Lobe
- Initiation
- Problem-Solving
- Judgment
- Inhibition of behavior
- Planning/Anticipation
- Self-Monitoring
- Motor planning
- Personality/Emotions
- Awareness of abilities/limitations
- Organization/Concentration
- Mental flexibility
- Speaking (expressive language)

Temporal Lobe
- Memory
- Hearing
- Understanding language (receptive language)
- Organization and sequencing

1-D. The Mechanics of a Brain Injury

The skull protects the soft matter of the brain. In an uninjured brain the nerves or neurons are protected from direct contact with blood cells. At the moment of impact, the brain hits the skull and becomes stretched or torn and allows blood cells and other toxic substances to flow into the spaces containing the neurons. This flow of blood causes the brain to swell. Some brain cells die immediately, or at least within the first 24 hours. Other cells may continue to die for weeks and months.

Because each brain injury is unique, precise recovery cannot be forecasted. Brain cells that appear to be normal may remain weakened, more vulnerable to stress and may continue to dysfunction throughout life. Other cells may be injured, heal and function properly again. In some cases, scar tissue is formed. Seizure activity may occur. Brain cells are fragile, yet resilient and unpredictable.

Often brain trauma cannot be detected. Even advanced medical diagnosis techniques may not find subtle damage to the brain. However, some can locate concentrated areas of injury. Two diagnostic tests currently being used to measure brain injury are Computerized Tomography (CT) Scans and Magnetic Resonance Imaging (MRI).

1-E. Symptoms of a Brain Injury

Many people who sustain a brain injury experience challenges for the rest of their lives. The CDC estimates that at least 5.3 million Americans currently have a long-term or life long need for help to perform daily living activities as a result of a TBI. Unlike a broken bone that heals and has an anticipated recovery time, brain injury isn't so predictable. Damage to brain cells can be temporary or permanent. Recovery may take weeks, months, or years. Some individuals never regain the brain functions they had before their injury. Consequences of brain injury may include, but are not limited to:

Cognitive Outcomes

- Short or long-term memory loss
- Slowed ability to process information
- Trouble concentrating or paying attention for periods of time
- Difficulty with conversation and other communication difficulties such as trouble finding the correct words
- Reading and writing challenges
- Difficulty in judging distance and space - called spatial disorganization
- Organizational problems
- Impaired judgment
- Inability to do more than one thing at a time

Physical Outcomes

- Seizures
- Fatigue, increase need for rest
- Sleep difficulties
- Sensory loss-smell, touch, taste
- Loss of hearing or ringing in the ears
- Slow or slurred speech

Physical Outcomes Continued

- Vision impairments-double or low vision, even blindness
- Difficulty speaking or understanding language
- Decreased motor skills
- Headaches or migraines
- Lack of balance
- Increased or decreased muscle control
- Partial or total paralysis

Emotional and Behavioral Outcomes

- Depression, grief, or chemical changes caused by the injury
- Anxiety, restlessness, agitation
- Lower stress tolerance
- Behavior changes
- Inappropriate behaviors such as sexually acting out
- Irritability, frustration, impatience
- Mood swings such as excess laughing and crying
- Impulsiveness and a lack of judgment
- Emotional flatness and acting passive
- Anger that is uncontrolled
- Impaired self perception, like not seeing themselves as disabled

Signs and Symptoms Specific to Children *(may also include signs and symptoms of adults)*

- Tiredness or listlessness
- Irritability or crankiness (will not stop crying or cannot be consoled)
- Changes in eating (will not eat or nurse)
- Changes in sleep patterns
- Changes in the way the child plays
- Changes in performance at school
- Lack of interest in favorite toys or activities
- Loss of new skills, such as toilet training
- Loss of balance or unsteady walking
- Vomiting

1-F. Information on Mild/Concussive Traumatic Brain Injury

A blow or jolt to the head can disrupt the normal function of the brain. Doctors often call this type of brain injury a “concussion” or a “closed head injury.” Doctors may describe these injuries as “mild” because concussions are usually not life threatening. Even so, the effects of a concussion can be serious.

After a concussion, some people lose consciousness or are “knocked out” for a short time, but not always — you can have a brain injury without losing consciousness. Some people are simply dazed or confused. Whiplash can cause a concussion. Because the brain is very complex, every brain injury is different. Some symptoms may appear right away, while others may not show up for days or weeks after the concussion. Sometimes the injury makes it hard for people to recognize or to admit that they are having problems.

Because all brain injuries are different, so is recovery. Most people with mild injuries recover fully, but it can take time. Some symptoms can last for days, weeks, or longer. In general, recovery is slower in older persons. Also, persons who have had a concussion in the past may find that it takes longer to recover from their current injury.

Sports-related TBI

There are over 300,000 sports related TBIs (or concussions) per year. Collegiate and high school football players who have had at least one concussion are at an increased risk for another concussion. A repeat concussion that occurs before the brain recovers from the first—usually within a short period of time (hours, days, or weeks)—reportedly can result in brain swelling, permanent brain damage, and even death. This condition is called second impact syndrome. About 75 percent of TBIs that occur each year are concussions or other forms of mild TBI.

The following table outlines signs and symptoms that are typically observed or experienced when sports-related injuries occur. If any of the signs or symptoms in the following chart are present, an athlete should not return to activity until cleared by a medical professional.

Signs Observed by Coaching Staff	Symptoms Reported by Athlete
Appears dazed or stunned	Headache
Is confused about assignment	Nausea
Forgets plays	Balance problems or dizziness
Is unsure of game, score, or opponent	Double or fuzzy vision
Moves clumsily	Sensitivity to light or noise
Answers questions slowly	Feeling sluggish
Loses consciousness	Feeling foggy or groggy
Shows behavior or personality changes	Concentration or memory problems
Can't recall events prior to hit	Confusion

Military-related TBI

America's armed forces have sustained numerous attacks from weapons such as rocket-propelled grenades, improvised explosive devices and land mines. The number of these types of attacks has risen with Operation Iraqi Freedom. Soldiers suffering injuries from these devices require specialized care from providers experienced in treating TBI.

Military personnel are at a heightened risk for a TBI. According to the Defense and Visitors Brain Injury Center (DVBIC):

- In prior conflicts, TBI was present in at least 14-20% of surviving combat casualties; preliminary information from the current conflict in the Middle East suggests that this number is now much higher.
- Blast injuries are a growing cause of TBI in combat. Sixty-four percent of soldiers wounded in Operation Iraqi Freedom sustained blast injuries, according to the Office of the Surgeon General of the Army.
- Certain military assignments, such as airborne operations or policing in combat areas, carry above-average risk of TBI.
- In peacetime, over 7,000 Americans with TBI are admitted to military and veterans hospitals each year.

DVBIC is a group of seven TBI Programs in Department of Defense (DOD) and Department of Veterans Affairs (VA) hospitals and two civilian TBI rehabilitation programs. These DVBIC sites work collaboratively to provide and improve TBI care for active duty military, veterans and their eligible beneficiaries and help individuals with TBI return to duty, work and the community.

Aiding Recovery of Mild/Concussive TBI

A person suffering from a mild brain injury (commonly a concussion) should:

- Get lots of rest.
- Don't rush back to daily activities such as work or school.
- Avoid doing anything that could cause another blow or jolt to the head.
- Ask your doctor when it's safe to drive a car, ride a bike, or use heavy equipment because your ability to react may be slower after a brain injury.
- Take only the drugs your doctor has approved.
- Don’t drink alcohol until your doctor says it's OK.
- Write things down if you have a hard time remembering.

Notes

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