

# Brain Injury: The Golden Years

## Understanding and Preventing Adult Brain Injury

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### Introduction

According to the Centers for Disease Control and Prevention (CDC), an *estimated 5.3 million Americans, a little more than 2 percent of the U.S. population*, currently live with disabilities resulting from brain injuries. The CDC also reports that of the one million people who are treated in and released from hospital emergency rooms each year:

- 230,000 will be hospitalized and survive
- 80,000 will experience an onset of disabilities resulting from their brain injuries
- 50,000 will die

After many years of studies, the following findings have been released about the prevalence of brain injury:

- The risk of having a brain injury is especially high among adolescents and young adults, as well as people older than 75 years (CDC, 1999). In fact, it is males 14 to 24 years of age who are at the highest risk for sustaining a brain injury, followed by infants and the elderly (Kraus, 1993)
- For persons of all ages, the risk of brain injury among males is twice the risk among females, due to differences in risk exposure and lifestyle (CDC, 1999; Kraus, 1993)
- The leading causes of brain injury are motor vehicle crashes, violence and falls (CDC, 1999)
- The leading causes of brain injury vary by age. Falls are the leading cause among persons aged 65 years and older and five years of age and under, whereas transportation-related injuries are most frequent among persons ages 5 to 64
- The outcome of these injuries varies greatly depending on the cause: 91% of firearm-related brain injuries resulted in death, but only 11% of fall-related ones proved fatal (CDC, 1999)

## What Is Brain Injury?

*Traumatic brain injury (TBI)* has been defined as a physiological disruption of brain function resulting from trauma both external (an object striking the head or the head striking an object) and/or internal (the rapid acceleration/deceleration of the brain within the skullcap).

There are two basic types of brain injury. Open head injuries are caused by bullets or other penetrating objects. Closed head injuries are the more common of the two and usually are caused by a rapid movement of the head during which the brain is bounced back and forth within the skullcap. Closed head injuries often result from motor vehicle crashes, falls and injuries sustained during sports and other recreational activities (i.e., football, bicycling).

Brain injuries are classified in terms of severity (i.e., mild, moderate, severe):

### **MILD BRAIN INJURY**

Also known as concussion, a mild brain injury is defined as one in which an individual experiences at least one of the following: 1) any period of loss of consciousness; 2) any loss of memory of events immediately preceding and/or following the injury; 3) any alteration in mental state at the time of the injury and 4) focal neurological deficit(s) that may or may not be transient. The most common symptoms of mild brain injury fall into the following categories:

- physical (headache, dizziness, nausea, sleep problems, fatigue)
- cognitive (decreased attention span, concentration, mental speed and short-term memory)
- behavioral (irritability, emotional lability, depression, anxiety)

The majority of individuals who sustain a mild brain injury will recover spontaneously and with no residual deficits within one to three months, although some individuals may require a longer length of time. Even with a mild brain injury or concussion, a relatively subtle amount of damage occurs and a small subset of people will be left with permanent disability or deficits.

### **MODERATE BRAIN INJURY**

Although a mild brain injury can be identified and documented easily, distinctions between moderate and severe brain injury are less clear-cut. Generally, a moderate brain injury is one that results in a loss of consciousness lasting only a few minutes to a few hours, followed by days and/or weeks of confusion. Persons sustaining a moderate brain injury usually have physical, cognitive and/or behavioral impairments which can last for many months and even become permanent. Although to a lesser extent, these impairments are similar to those experienced by individuals with severe brain injury.

With treatment, however, individuals with moderate brain injuries usually are able to make a complete recovery or successfully learn to compensate for their deficits. (For more information about deficits after brain injury, see the “Consequences” section on page 9.)

### **SEVERE BRAIN INJURY**

Severe brain injury almost always results in prolonged unconsciousness or coma lasting days, weeks and even months after the injury. Coma is defined as a state of unconsciousness from which the individual cannot be awakened; in which the individual responds minimally or not at all to stimuli and initiates no voluntary activities. Although persons who sustain a severe brain injury can make significant improvements in the first year after the injury and continue to improve at a much slower rate for many years, these individuals often will be left with permanent physical, cognitive or behavioral impairments. (For more information about deficits after brain injury, see the “Consequences” section on page 9.)

## Brain Injury And The Adult

Injury is the leading cause of death among Americans under 45 years of age and brain injury is responsible for the majority of these deaths. In the adult population (ages 22-65 years of age) motor vehicle crashes are the leading cause of brain injuries. Alcohol is a significant factor in the occurrence of brain injury. More than 50% of persons with brain injury were intoxicated at the time of injury (Kreutzer et al., 1990; Ruff et al., 1990).

### Causes

#### **MOTOR VEHICLE-RELATED**

*Impaired Driving*—According to the National Clearinghouse for Alcohol and Drug Information (NCADI), within a 12-month period, an estimated 46.5 million drivers (28.5%) in the United States used alcohol and/or drugs within two hours prior to getting behind the wheel of a car (1998). According to this NCADI study, driving after alcohol consumption was most prevalent in adult drivers ages 21-49. Adults ages 21-34 accounted for 29% of drivers who drove a motor vehicle after alcohol consumption and those ages 50 and older accounted for 17% (NCADI, 1998). Impaired driving is so dangerous because it slows reaction time, alters judgement and affects alertness and coordination.

#### *Preventing Impaired Driving*

- Support the enactment of laws that will reduce impaired driving
- Encourage police to be proactive in the enforcement of laws prohibiting people to drive while under the influence of alcohol

- Support primary seat belt laws, as they have been proven to reduce brain injuries
- Support the efforts of groups such as Mothers Against Drunk Driving (M.A.D.D.) that are attempting to reduce and prevent impaired driving

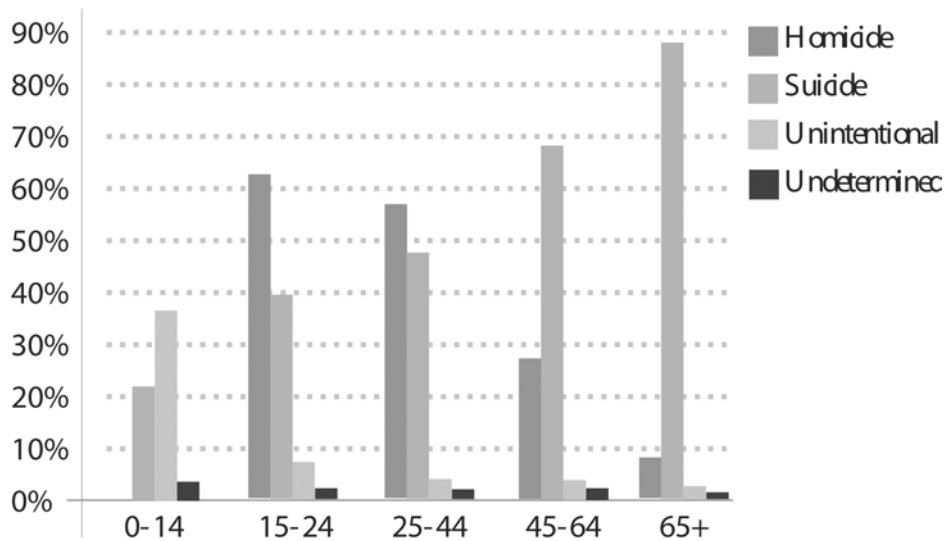
## VIOLENCE & FIREARMS

In 1992, firearms surpassed motor vehicles as the number one cause of brain injury fatalities in the United States (Sosin et al., 1995).

From 1985 to 1994, violent crimes committed with firearms increased by a much wider margin than those committed with other weapons (Think First Foundation, 1999). During this 10-year period, firearm-related offenses chiefly were responsible for the overall increase in murders, robberies and aggravated assaults (Think First Foundation, 1999). Although the reasons for firearm death vary with age, approximately 57% of all firearm deaths in the 25-34 age group are intentional (Think First Foundation, 1998). (See Table below for Reasons for Firearm Death.)

### The Reason For Firearm Death Varies with Age United States, 1986-1992

*Source: Unpublished data from the Centers for Disease Control and Prevention (CDC).  
Compiled by the Center to Prevent Handgun Violence, Handgun Control, 1999*



*Preventing Violence/Firearms* An estimated 30% of all unintentional shootings could be prevented by the presence of safety features such as trigger locks and loading indicators, but American-made guns are not subject to federal safety standards like other consumer products. To help prevent someone from sustaining a brain injury from firearms, always keep your gun unloaded and locked up. Lock and store bullets in a separate location and make sure no one has access to the keys. As always, the best way to reduce gun risks is to remove the gun from your home.

## **BOATING AND SWIMMING**

*Boating*—One-third of all boating fatalities are alcohol-related. It is illegal to operate a boat, or permit others to do so, while under the influence of alcohol or drugs. The effects of alcohol on a person while boating can be dangerous and is a major contributing factor to recreational brain injuries and fatalities. A boat operator who is intoxicated is 10 times more likely to be killed in a boating accident than a boater who has not been drinking (United States Coast Guard, Office of Boating Safety, 1999).

Research has shown that alcohol combined with boating stressors, such as sun, wind, noise, vibration and motion, can impair a person much faster than alcohol consumption on land (United States Coast Guard, Office of Boating Safety, 1999). Alcohol can decrease a person's ability to handle a boat in many ways. As a depressant, alcohol goes straight to the nerves, blood stream and the brain (Boat Safe.com, 1999). Recreational boaters who must remember a number of rules, regulations and boat handling techniques have difficulty performing these tasks safely after consuming alcohol (Boat Safe.com, 1999).

According to the United States Coast Guard, Office of Boating Safety (1999), consuming alcohol while boating can result in:

- *Eroding sense of balance* — Most boating deaths result from falling out of a small open boat, whether it capsizes or not
- *Diminished motor skills* — Should a person fall into the water they may have trouble floating and/or grasping onto a life ring or throwable device. Add the shock of the cold water and the risk of cramping and drowning is increased significantly
- *Impaired Judgement* — After a drink or two people tend to become relaxed and are more likely to perform dangerous acts that they might not normally do if not under the influence. Because their judgment is impaired they may not even realize they are doing something dangerous
- Diminished peripheral vision, balance and the ability to process information
- Slowed reaction and reflexive response time

*Preventing Boating Injury* The following tips were developed by the United States Coast Guard to prevent injuries from boating accidents:

- Always wear a life jacket
- Do not drink alcohol when operating or riding on a boat

- File a float plan. (Always tell people when you are leaving, where you are going and when you will return)
- Take a boating safety course to learn how to be safe on the water

*Swimming*—Drowning usually occurs quickly and silently. The rate of drownings and near-drownings increase when the individual has been drinking. The consequences on the individual and his/her brain are severe and can be devastating. Two minutes following submersion, an individual will lose consciousness (National Safe Kids Campaign, 1999). Irreversible brain damage occurs after four to six minutes and determines the immediate and long-term survival of the individual (National Safe Kids Campaign, 1999). Nearly all individuals who require cardiopulmonary resuscitation (CPR) are left with severe brain injuries or die (National Safe Kids Campaign, 1999).

#### *Preventing Swimming Injury*

- Never drink alcohol before or after a planned swim
- Never swim alone or in dangerous conditions
- Never dive in water less than nine feet deep

## Brain Injury And The Elderly

Each incidence of brain injury is unique, requiring individualized treatment, therapy and rehabilitation. Methods of brain injury treatment depend on several factors including: degree of severity, source of injury, pre-injury health and age (Patrick, 1996). While a four-year-old girl and her grandfather may sustain the same type of brain injury, the treatments and outcomes are vastly different.

There are physical changes in older individuals that make their brains more vulnerable to injury and reduce their chances to recover (Patrick, 1996). Generally speaking, older individuals have longer hospital stays, take longer to recuperate, need more time and effort to reach the same level of recovery that younger individuals attain and often have a less positive prognosis, recovery and outcome (Pilisuk & Feinberg, 1996). Studies have shown that the incidence of brain injury goes up sharply after age 70 (Pilisuk & Feinberg, 1996).

### **CAUSES**

*Falls*—People over the age of 65 have a very high rate of injury due to falls. In fact, falls are the leading cause of brain injury in the elderly. There are several factors that contribute to the great danger of falls to older individuals, including:

- Some elderly people take medications that may affect perception and/or balance, therefore increasing the risk of falling (Patrick, 1996)
- Many individuals over the age of 65 also may have other medical conditions, apart from a brain injury, that make falls likely (i.e., visual limitations, orthopedic problems)
- External factors associated with falls among the elderly include a history of one or more prior falls, lack of exercise, improper footwear and hazards in the home

*Preventing Falls* - Even older people (ages 65 and up) should exercise regularly, as daily physical activity will increase a person's strength and sense of well being. There are many exercises that improve balance, and health care providers can guide individuals to the exercise program that is best for them.

Another important preventative measure is home safety checks. During these checks, items that may pose potential trip hazards like magazines and shoes should be removed from stairs and all walking areas. Frequently used items should be stored in easy-to-reach places where using a step stool or chair is not necessary. Improved lighting in the house can help elderly people see better and reduce falling. Handrails and lights should be installed on all stairs and outside areas, as well as bathrooms.

#### **MOTOR VEHICLES AND OLDER DRIVERS**

According to the National Highway Traffic Safety Administration (NHTSA), today's senior citizens are mobility-minded and electing to drive longer (1999a). Some older drivers, however, are unable or unwilling to correctly assess their driving capabilities to continue operating a motor vehicle safely. Changes in visual acuity, ability to focus on daily occurrences, reaction time, coordination under stress and ability to effectively react to stress-related situations are common factors in the aging process. The changes in driving habits that occur as a result of aging can be directly attributed to physical changes.

#### *Preventing Motor Vehicle Injury*

- Elderly individuals that have difficulty driving can be referred to a local assistance agency that can coach and counsel them on safe driving habits
- Elderly individuals should be encouraged to reduce the amount that they drive and the conditions they drive in (i.e. nighttime, inclement weather, interstate driving)

*Pedestrian*—According to NHTSA (1996), older pedestrians (age 70 and older) had the highest pedestrian fatalities in 1995, accounting for approximately 18%. The pedestrian fatality rate among this group was higher than that of any other, with the second highest pedestrian fatality rate coming from the next older group of 55-to 64-year-old individuals (NHTSA, 1996). Factors contributing to these pedestrian casualties include: 1) a lack of

pedestrian safety practices, 2) improper pedestrian behaviors, 3) the physical impairments of many elderly walkers and 4) alcohol involvement of driver and/or pedestrian (NHTSA, 1996).

*Preventing Pedestrian Injury*-To prevent pedestrian injury and death, people should remember to:

- Use sidewalks. If no sidewalk is available, walk in the street facing traffic
- Cross only at intersections and crosswalks. Never cross the street between parked cars
- Look left, right and left again for traffic before stepping off of the curb
- Walk where you are visible to drivers
- When walking after dark, always wear reflective clothing

#### **SUICIDE AND THE ELDERLY**

Although authorities agree that many suicides are not reported, the National Center for Health Statistics records that between 25,000 and 30,000 self-inflicted deaths occur in the United States each year (NCADI, 1999). For every death from suicide, it is estimated that eight other attempts were made (NCADI, 1999). Suicide among the elderly (65 years of age and older) is becoming an increasing problem and high rates of alcohol involvement have been found among individuals who commit suicide by using firearms. Although the reasons for firearm death vary by age, 98% of people ages 65 and older that die by firearms have committed suicide. (See Table 1 in Firearm Section of “Adults and Brain Injury.”)

*Preventing Suicide*-The diagnosis and treatment of suicide requires trained professionals. The information provided is to be used for educational purposes only. It should not be used as a substitute for seeking professional care for the individual who has talked about suicide. If you feel that someone is suicidal, do not be afraid to ask - a suicidal person needs to see a doctor or psychiatrist immediately. Follow through when getting a person help by being available for doctor’s appointments, explaining medications and support in general. Remove any weapons from the home.

## CONSEQUENCES

Impairments from brain injury can be divided into three major categories: physical, cognitive and behavioral.

### *Physical Impairments*

- Speech, vision, hearing and other sensory impairments
- Headaches
- Lack of coordination
- Muscle spasticity (A condition that causes stiff, tight muscles, especially in the arms and legs, making movements stiff, jerky or uncontrollable.
- Paralysis
- Seizure disorders
- Problems with sleep
- Dysphagia (a disorder of swallowing)
- Dysarthria (a disorder of articulation and the muscular/motor control of speech)

### *Cognitive Impairments*

- Short- and long-term memory deficits
- Slowness of thinking
- Problems with reading and writing skills
- Difficulty maintaining attention and concentration
- Impairments of perception, communication, reasoning, problem solving, planning, sequencing and judgement

### *Behavioral Impairments*

- Mood swings
- Denial

- Depression and/or anxiety
- Lowered self esteem
- Sexual dysfunction
- Restlessness and/or impatience
- Lack of motivation
- Inability to self-monitor, inappropriate social responses
- Difficulty with emotional control and anger management
- Inability to cope
- Excessive laughing or crying
- Difficulty relating to others
- Irritability and/or anger
- Agitation
- Abrupt and unexpected acts of violence
- Delusions, paranoia, mania

#### **OUTCOME**

*Adult*—The adult with a brain injury is unique not only in comparison with younger and older individuals, but also to other adults with brain injuries. Each person’s recovery process, outcome and family are different and unique. Investigations of outcome on adults with severe brain injury have documented persistent cognitive, academic and behavioral impairments (Ewing-Cobbs et al., 1985). Following brain injury, deficits in function are likely in wide-ranging areas involving everyday skills that require differing degrees of mental alertness, information processing, planning, execution and mental monitoring of daily actions (Mattson, 1999). Owing to the different methods used to grade severity of brain injury and the lack of reliable outcome studies, however, it is not possible to accurately predict outcome in adults with brain injury.

*Elderly*—Most of the knowledge about outcome in older individuals with brain injury comes from studies involving age groups (Englander & Cifu, 1999). These studies have documented the effect that increasing age has on poorer outcomes and increasing deaths. The majority of these studies show a poorer prognosis for the older than the younger adult, with a correlation noted as young as 40 years (Englander & Cifu, 1999).

The National Institute on Disability and Rehabilitation Research (NIDRR) supports these findings in their TBI Model Systems Data Set that revealed that individuals aged 55 and older:

- Had significantly longer, more costly stays on rehabilitation units
- Recovered approximately half as quickly
- Had greater cognitive impairment at discharge than a group of individuals 55 and under who were matched for similar injury and severity (Cifu et al., 1996)  
Older individuals in good health tend to have better outcomes than ones who are in poorer health, have medical conditions or problems associated with aging. The severity of the injury and the time it takes to receive the proper medical attention all will affect the outcome of these older people. As always, the only cure for brain injury is prevention.

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